UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF VIRGINIA
RICHMOND DIVISION

FEDERAL ENERGY REGULATORY COMMISSION,	)	
Plaintiff,	)	Civil Action No. 3:15-cv-0452
v.	)	
POWHATAN ENERGY FUND, LLC, HOULIAN "ALAN" CHEN, HEEP FUND, INC., and CU FUND, INC.	)	**JURY TRIAL REQUESTED**
Defendants.	)	

FIRST AMENDED COMPLAINT

Plaintiff Federal Energy Regulatory Commission (FERC or Commission), by and through counsel, and in compliance with the December 28, 2017 Order of this Court (ECF No. 92), brings this action pursuant to section 31(d) of the Federal Power Act (FPA), 16 U.S.C. § 823b (2016), for an order affirming and enforcing the Commission's May 29, 2015 penalty assessment, without modification, as set forth in its Order Assessing Civil Penalties, *Houlian Chen, Powhatan Energy Fund, LLC, HEEP Fund, LLC, CU Fund, Inc.*, 151 FERC ¶ 61,179 (2015) (the Penalty Order). The Commission's Penalty Order is attached as Exhibit 1.

SUMMARY OF THE ACTION

1. This is an action for affirmance and enforcement of civil penalties assessed by the Commission, by order, against Defendants Powhatan Energy Fund, LLC, HEEP Fund, Inc., CU Fund, Inc., and against Defendant Houlian "Alan" Chen, who executed trades

on behalf of Powhatan, HEEP Fund, and CU Fund between June 1 and August 3, 2010 (the Manipulation Period). The FPA authorizes the Commission to issue orders assessing penalties for violations of the statutes the Commission administers, and the rules, regulations, and orders issued pursuant to those statutes. 16 U.S.C. § 825*o*-1 (2016). The FPA also authorizes the Commission to file this action to seek from this Court "an order affirming the assessment of the civil penalty." 16 U.S.C. § 823b(d)(3)(B). It provides jurisdiction to this Court to enter a judgment affirming, enforcing, modifying, or setting aside in whole or in part such penalty assessments. *Id*.

2. In its Penalty Order, issued on May 29, 2015, the Commission, after examining the arguments submitted by all parties and after reviewing the extensive factual record, found that Powhatan Energy Fund, LLC, HEEP Fund, Inc., CU Fund, Inc., and Houlian "Alan" Chen (collectively, "Defendants" or, in the administrative proceeding before the Commission, "Respondents") had manipulated the wholesale energy markets by implementing a scheme involving the execution of large volumes of offsetting trades – wash trades – for the purpose of capturing "excessive amounts of certain credit payments." Penalty Order at P 1.[1]

3. As discussed more fully below, the scheme involved trades of "Up-To Congestion" (UTC), a financially-settled product that allows market participants to hedge costs and arbitrage price differentials. During the Manipulation Period, most UTC trades

[1] The substantive paragraphs of Commission orders are numbered; ordering paragraphs in such orders are denominated by letter. It is to these paragraphs – designated by capital "P" – that the orders are conventionally cited. Thus, a citation would be made to a substantive paragraph as, e.g., "P 3," or to an ordering paragraph as, e.g., "Ordering P (B)". Plaintiff follows that convention herein.

received a small credit, the Marginal Loss Surplus Allocation (MLSA), described more fully below. The Commission found that Defendants executed a scheme of offsetting, or self-cancelling, UTC transactions which neither hedged costs nor arbitraged price differentials but, instead, were designed to capture the MLSA payments without exposing the Defendants to market prices. These trades were a form of "wash trading," a trading practice the Commission has explicitly prohibited. *Id.* P 6. In addition to being prohibited in FERC-jurisdictional financial markets, wash trading, in its various forms, is generally prohibited in the United States' major financial markets, including those overseen by the Securities and Exchange Commission and the Commodities Future Trading Commission.

4. Specifically, as described in the Penalty Order, the Commission found that

> [f]rom June 1 to August 3, 2010 (Manipulation Period), Respondents designed and implemented a fraudulent UTC trading scheme to receive excessive amounts of MLSA payments. To do this, Respondents intentionally placed a high-volume of 'round-trip' UTC trades that canceled each other out by placing the first leg of the trade from locations A to B, and simultaneously placing a second leg of equal volume from locations B to A. The contemporaneous evidence shows that Respondents artificially created these round-trip UTC trades solely to reserve transmission service to enable them to collect excessive MLSA payments during the Manipulation Period.

Id. P 3 (footnote omitted).

5. The Commission found that these wash trades constituted "a scheme to engage in fraudulent Up-To Congestion (UTC) transactions in PJM Interconnection L.L.C.'s (PJM) energy markets to garner excessive amounts of certain credit payments to transmission customers" in violation of the FPA's prohibition of market manipulation, 16 U.S.C. § 824v (2016), and the Commission's rule against market manipulation, 18 C.F.R. § 1c.2 (2017). Penalty Order at P 1.

6. Specifically, the Commission concluded, "based on the totality of evidence" that Defendants' round-trip UTC trades,

> operated as a course of business to defraud and a device, scheme, or artifice to defraud the PJM market and market participants . . . . The evidence demonstrates that Respondents placed high-volume round-trip UTC trades without regard to market fundamentals and with the intent to benefit not from the spread on UTC trades but solely from the MLSA payments, and we find those actions to constitute fraud. We also find that Respondents were engaged in wash trading, which the Commission has long recognized as fraudulent conduct. Moreover, we find that the Respondents had notice that the type of trading at issue here is fraudulent and violates FPA section 222 and our Anti-Manipulation Rule.

Id. P 51 (footnote omitted).

7. The Commission issued its Penalty Order on May 29, 2015, following a multi-year investigation conducted by the Commission's Office of Enforcement (Enforcement) pursuant to the Commission's rules for investigations, 18 C.F.R. Part 1b, and a subsequent contested on-the-record show cause proceeding conducted pursuant to the Commission's rules for hearings, 18 C.F.R. Part 385, in which the Commission acted as a neutral fact-finder. During the adversarial show cause proceeding, Defendants submitted evidence and argument directly to the Commission, including evidence not gathered during the investigation.

8. In determining whether Defendants violated the FPA and the Commission's regulations, the Commission relied upon its interpretation of 16 U.S.C. § 824v, and the Commission's rulemaking adopting regulations implementing Congress' prohibition of manipulation of energy markets. *See Prohibition of Energy Market Manipulation*, Order No. 670, FERC Stats. & Regs. ¶ 31,202 (2006), (adopting 18 C.F.R. § 1c.2 following a notice and comment rulemaking).

9. In assessing and imposing penalties for the violations, the Commission was required to consider and apply statutorily-prescribed criteria, namely, "the seriousness of the violation and the efforts of such person to remedy the violation in a timely manner." 16 U.S.C. § 825*o*-1(b); Penalty Order at P 36. The Commission also considered and applied the non-binding Penalty Guidelines it has adopted to shape its application of these statutorily-prescribed criteria. Penalty Order at PP 149-187.

10. The Commission concluded that, "[i]n light of the seriousness of these violations, we find that it is appropriate to assess civil penalties pursuant to section 316A of the FPA [16 U.S.C. § 825*o*-1(b)] in the following amounts: $16,800,000 against Powhatan; $10,080,000 against CU Fund; $1,920,000 against HEEP; and $1,000,000 against Dr. Chen." Penalty Order at P 1.

11. Additionally, pursuant to section 309 of the FPA, 16 U.S.C. § 825h (2016), the Commission directed disgorgement of unjust profits plus applicable interest in the following amounts: $3,465,108 for Powhatan; $1,080,576 for CU Fund; and $173,100 for HEEP. Penalty Order at P 1. The Commission directed that the disgorged amounts be distributed to market participants who were harmed by Defendants' unlawful scheme. *Id.* at Ordering P (H).

12. Defendants elected to proceed under the terms of FPA § 31(d)(3), 16 U.S.C. § 823b(d)(3), but failed to pay the assessed penalty within 60 days. As a result, the Commission brought this action for "an order affirming the assessment of a civil penalty" before the United States District Court for the Eastern District of Virginia, on July 31, 2015. ECF 1 *and see* Penalty Order at P 193.

13. Pursuant to the FPA, this Court has authority to "review de novo the law and the facts involved, and . . . jurisdiction to enter a judgment enforcing, modifying, and enforcing as so modified, or setting aside in whole or in [p]art, such assessment." 16 U.S.C. § 823b(d)(3)(B). Consistent with the Court's December 18, 2017 Order, Plaintiff hereby files this First Amended Complaint and asks the Court to affirm and enforce the Commission's penalty assessment without modification.

PARTIES

A. Plaintiff

14. FERC is an administrative agency of the United States, organized and existing as an independent, bipartisan Commission, pursuant to the FPA, 16 U.S.C. § 791a *et seq.* (2016).

15. For purposes of federal court litigation, FERC is an administrative agency with independent litigating authority. By statute, "[e]xcept as provided in section 518 of title 28, relating to litigation before the Supreme Court, attorneys designated by the Chairman of the Commission may appear for, and represent the Commission in, any civil action brought in connection with any function carried out by the Commission pursuant to this chapter or as otherwise authorized by law." 42 U.S.C. § 7171(i) (2016); *see also*, 16 U.S.C. § 823b(6)(A) ("the Commission may be represented by the general counsel of the Commission (or any attorney or attorneys within the Commission designated by the Chairman) who shall supervise, conduct, and argue any civil litigation to which paragraph (3) of this subsection applies").

B. Defendants

16. At all relevant times, Powhatan Energy Fund, LLC was a private investment fund organized as a Delaware corporation with its primary place of business in Henrico,

Virginia. The managing member of Powhatan is LSE Capital Management, LLC, a Delaware corporation with its primary place of business in Henrico, Virginia. The sole member of LSE Capital Management, LLC is Lawrence S. Eiben (Eiben), a resident of Henrico, Virginia. At all relevant times, Eiben was the sole executive officer of Powhatan.

17. At all relevant times Houlian "Alan" Chen maintained his residence in The Woodlands, Texas. He incorporated both HEEP and CU in Texas and maintains their principal places of business there. He was the signatory to Advisory Agreements with both Powhatan and with its predecessor companies, pursuant to which he traded in FERC-jurisdictional electricity markets, including the trades for Powhatan that are the basis for the civil penalties and disgorgement assessed by the Commission.

18. At all relevant times, HEEP Fund, Inc. was a private investment fund organized as a Texas corporation with its primary place of business in Texas. The sole shareholder and employee of HEEP Fund is Houlian "Alan" Chen, a resident of The Woodlands, Texas.

19. At all relevant times, CU Fund, Inc. was a private investment fund organized as a Texas corporation with its primary place of business in Texas. The sole owner and employee of CU Fund is Houlian "Alan" Chen, a resident of The Woodlands, Texas.

JURISDICTION

20. This Court has subject matter jurisdiction over this action pursuant to FPA section 31(d)(3)(B), 16 U.S.C. § 823b(d)(3)(B), which provides that this Court "shall have authority to review de novo the law and the facts involved, and shall have jurisdiction to enter a judgment enforcing, modifying, and enforcing as so modified, or setting aside in

whole or in [p]art, such [penalty] assessment" and 28 U.S.C. § 1331 (2016), which provides that "[t]he district courts shall have original jurisdiction of all civil actions arising under the Constitution, laws, or treaties of the United States."

21. This Court has personal jurisdiction over each of the Defendants pursuant to Fed. R. Civ. P. 4(k)(1)(C) in that FPA section 317, 16 U.S.C. § 825p (2012), provides for nationwide service of process and therefore satisfies this subdivision of Rule 4, which provides that "[s]erving a summons or filing a waiver of service establishes personal jurisdiction over a defendant . . . when authorized by a federal statute."

VENUE

22. Venue is also governed by FPA section 317, 16 U.S.C. § 825p (2016), which provides that "[a]ny suit or action to enforce any liability or duty created by . . . this Act, or any rule, regulation, or order thereunder may be brought in [the district wherein any act or transaction constituting the violation occurred] or in the district wherein the defendant is an inhabitant."

23. Venue is established in this district as to all Defendants pursuant to the "any act or transaction constituting the violation" clause of § 825p because the Commission found that they engaged in an unlawful scheme to manipulate energy markets in the mid-Atlantic United States, including in this District, from June to August 2010. Defendants' unlawful scheme resulted in the misdirection and capture of over $10 million in PJM market payments, including approximately $1,147,087 that would otherwise have flowed to Dominion Virginia Power and inured to the benefit of Dominion and its ratepayers, including ratepayers in this District. Penalty Order at P 68.

24. Furthermore, as to Chen, HEEP Fund, and Powhatan, venue is also established in this district based on the "any act or transaction" clause because they entered into an Advisory Agreement[2] (Powhatan Advisory Agreement) pursuant to which Chen, through HEEP, placed the Powhatan trades that the Commission found to violate FPA § 222 and Rule 1c.2. Penalty Order at P 46. In the Powhatan Advisory Agreement, these Defendants stipulated that, in the event of a dispute arising out of that agreement, legal recourse would be made "only in the courts of the Commonwealth of Virginia, City of Richmond, or . . . in the United States District Court for the Eastern District of Virginia," and states that Powhatan and HEEP "waive any objection to venue laid therein." Powhatan Advisory Agreement at 3. Prior to the Manipulation Period, Chen traded for two of Powhatan's predecessor companies, which were controlled by the same principals, and both of which maintained their principal places of business in the Richmond, Virginia area.

25. Powhatan is also an inhabitant of this District in that it maintains its principal place of business in Henrico, Virginia, within this District.

26. In addition to the basis applicable to all Defendants, CU Fund, which is incorporated and maintains its principal place of business in Texas, is venued in this District through Chen, who is its sole owner and lone employee. Penalty Order at P 191 n.415. Inasmuch as venue is established in this district as to Chen, it is necessarily established as to CU. Chen implemented a single scheme, not only through HEEP and on

[2] Advisory Agreement between HEEP Fund Inc. and Powhatan Energy Fund LLC (May 18, 2010). The Powhatan Advisory Agreement was submitted to the Court on December 10, 2014 as Administrative Record (AR) item 94.

behalf of Powhatan, but also through and on behalf of CU Fund, which was controlled by, and operated for the sole benefit of, Chen.

THE COMMISSION'S ANTI-MANIPULATION AUTHORITY

27. The Commission regulates "'the sale of electric energy at wholesale in interstate commerce,' including both wholesale electricity rates and any rule or practice 'affecting' such rates." *FERC v. Elec. Power Supply Assoc*., 577 U.S. ___ (2016) (*citing* 16 U.S.C. §§ 824(b), 824e(a)). In the wake of manipulative schemes in the western U.S. electricity markets by Enron and others, Congress, through the Energy Policy Act of 2005, expanded the Commission's jurisdiction and amended the FPA to give the Commission broad authority to prohibit market manipulation. In relevant part, FPA section 222, 16 U.S.C. § 824v(a), makes it "unlawful for any entity . . . directly or indirectly, to use or employ, in connection with the purchase or sale of electric energy . . . any manipulative or deceptive device or contrivance . . . in contravention of such rules and regulations as the Commission may prescribe as necessary or appropriate in the public interest or for the protection of electric ratepayers."

28. The Commission implemented this statute in 2006 by promulgating the Anti-Manipulation Rule, which prohibits an entity from: (1) (a) using a fraudulent device, scheme, or artifice, or (b) making a material misrepresentation or a material omission as to which there is a duty to speak under a Commission-filed tariff, Commission order, rule, or regulation, or (c) engaging in any act, practice, or course of business that operates or would operate as a fraud or deceit upon any entity, (2) with the requisite scienter, (3) in connection with the purchase or sale of electricity subject to the jurisdiction of the Commission. 18 C.F.R. § 1c.2 (Anti-Manipulation Rule). As the Commission noted in

the Penalty Order, "Under the Anti-Manipulation Rule, fraud includes, but is not limited to, 'any action, transaction, or conspiracy for the purpose of impairing, obstructing, or defeating a well-functioning market.'" Penalty Order at P 35 (quoting *Prohibition of Energy Market Manipulation*, Order No. 670, FERC Stats. & Regs. ¶ 31,202, at P 50 (2006)).

29. The Energy Policy Act of 2005 also provided the Commission with increased civil penalty authority for violations of Part II of the FPA or of "any rule or order issued thereunder." FPA section 316A, 16 U.S.C. § 825*o*-1, authorizes the Commission to assess civil penalties against violators of up to $1 million for each day that a violation occurs.[3] The Commission has found that each separate transaction that constitutes a violation is subject to a $1 million per day penalty. Penalty Order at P 150 (citing *Barclays PLC, et al*., 144 FERC ¶ 61,041, at P 120 n.347 (2013); *see also Energy Transfer Partners, L.P*., 120 FERC ¶ 61,086, at P 69 (2007)). In assessing penalties, the Commission must consider "the seriousness of the violation and the efforts of such person to remedy the violation in a timely manner." Penalty Order at P 151 (quoting FPA section 316A, 16 U.S.C. § 825*o*-1). The Commission's imposition of civil penalties on organizations is also guided by its advisory Penalty Guidelines. *Revised Policy Statement on Penalty Guidelines*, 132 FERC ¶ 61,216 (2010).

BACKGROUND

A. The PJM Market and the UTC Product.

[3] Consistent with the Federal Civil Penalties Inflation Adjustment Act (28 U.S.C. § 2461) (1990) the Commission's civil penalty authority has risen to $1,238,271 per day. *See* 83 Fed. Reg. 1550.

30. The Defendants placed the manipulative trades at issue in this case in markets administered by PJM, a Regional Transmission Organization (RTO) that operates a 13-state wholesale organized electricity market stretching from Illinois to North Carolina, and including all of Virginia except a small portion of the southwestern part of the state. Penalty Order at P 15. More than 61 million people depend on the electricity market administered by PJM. PJM, like other organized regional electricity markets in the United States, is established and maintained pursuant to rules established by FERC.[4]

31. PJM uses market-based systems to provide electricity at the lowest possible cost consistent with maintaining the reliable operation of the grid. To send appropriate price signals, "[e]lectricity prices in PJM vary based on the specific location, or node, within the market." Penalty Order at P 15. Since prices vary by location, market prices for energy at particular nodes are called "Locational Marginal Prices" (LMPs). LMPs are composed of three components: (i) the price of energy, (ii) the cost of congestion, and (iii) the cost of line losses.

32. The first component is the same at every node: the system-wide energy price. This represents the general commodity price for electricity in PJM. It "represents the

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[4] *See generally*, Energy Primer, A Handbook of Energy Market Basics, at 40-41, 58-61 (background on organized regional markets), available at http://www.ferc.gov/market-oversight/guide/energy-primer.pdf (visited Jan. 23, 2018) (Energy Primer) (attached as Ex. 3); *Regional Transmission Organizations*, Order No. 2000, FERC Stats. & Regs. ¶ 31,089 (1999) (Order No. 2000) (establishing requirements for RTOs); *and see* 18 C.F.R. § 35.34 (Part 35 Subpart F—Procedures and Requirements Regarding Regional Transmission Organizations). The technical protocols governing trading within an RTO are contained in the relevant RTO's Tariff, which must be filed with the Commission. The Commission interprets these Tariffs through its Orders, which arise primarily in the context of contested proceedings between stakeholders, rather than through proceedings in which the Office of Enforcement is a party.

cost to serve the next increment of load (demand) at a pre-determined reference location." Penalty Order at P 15; *see also* Energy Primer at 60-61 (attached hereto as Exhibit 3).

33. The second component is congestion. Because transmission lines have limited capacity, they can become "congested" in areas where demand exceeds nearby supply. "Transmission congestion occurs when there is not enough transmission capacity for all of the least-cost generators to be selected." Energy Primer at 65. Similar to traffic congestion, bottlenecks can arise on the transmission grid that prevent the flow of the lowest-cost power to demand. Penalty Order at P 15 ("congestion . . . varies at each node depending on the limitations of the transmission system to move power freely between constrained and non-constrained locations"). For example, if the lowest cost generator could only reach load via a 25 MW transmission facility, then it would be able to provide no more than 25 MW, even if the generator were capable of generating more. The remainder of the demand would need to be made up from higher-cost generation that could reach the load in some other way. Congestion typically accounts for the biggest share of difference between LMPs.

34. As for the third component, line losses occur because as electricity travels over the wires some of its energy is lost in the form of heat. So, more electricity must be generated than is ever actually consumed; the cost of the electricity lost to heat (and for which generators must be paid) as energy travels through wholesale transmission lines is the "line loss" component of LMP.

35. "PJM operates a dual settlement market, with both a day-ahead market and a real-time market." Penalty Order at P 16; *and see* Energy Primer at 59-60. In the day-ahead market, market participants engage in transactions involving energy that will flow

through power lines the following day (a "day ahead" of the proposed flow date). In the day-ahead market, participants may make bids and offers to buy or sell energy – either physically or "virtually" – for the next day, specifying the quantity, price, location, and hour of delivery. As the Commission has previously noted, "the vast bulk of transactions occur" in the day-ahead market. *Black Oak Energy, LLC v. PJM Interconnection, L.L.C.*, 125 FERC ¶ 61,042, at P 41 (2008).

36. In the real-time market, market participants engage in transactions involving energy that will flow through power lines the same day. The real-time market is also referred to as a "Balancing Market," because one of its functions is to "balance" any deviations in supply and demand schedules created by PJM based on the day-ahead market transactions. Each LMP settles at a unique price in both the day-ahead and real-time markets, reflecting the combination of the three above-described price components — energy, congestion, and line losses — applicable to that particular node. PJM provides the trading platforms and, with its Internal Market Monitor (IMM), oversees the trading activity.

37. This case involves Up-To Congestion (UTC), a financially-settled "virtual" energy product in PJM. The Commission has recognized that, in wholesale electric markets, virtual products can, in theory, "increase market liquidity, drive convergence between the day-ahead and real-time market, and provide vehicles for hedging." Penalty Order at P 17 (footnote omitted).[5] In other words, the premise underlying virtual trading

[5] The Commission explained in the Penalty Order that "Convergence in the PJM market is the reduction in the spread between day-ahead and real-time LMPs at a specific node." Penalty Order at P 17 n.26.

is that it will bring more participants and their acumen to the market, which will result in more trades at more locations and therefore better price formation, clearer price signals, and ultimately more efficient dispatch (i.e., the selection of specific amounts of energy from specific providers at specific prices).

38. While virtual trades do not result in the physical delivery of power, they are entered into the day-ahead market settlement software and thus impact the rates paid for physical electricity. The Commission had previously found that virtual transactions, including UTCs, were "integrated" into models for pricing and "dispatch" (scheduling generation units), so a UTC, like a physical transaction, affects pricing and dispatch. Penalty Order at PP 20 and 17 (describing how virtual trading has a "direct role in day-ahead price formation").

39. Even though virtual products like UTCs are not physically delivered, they help to set the prices for physically-delivered electricity. With virtual transactions, such as UTCs, a purchase (or sale) at the day-ahead price is automatically sold (or purchased) at the real-time price. Simplifying somewhat, if a trader made a 10 MW purchase at the day-ahead price of $20/MW, those 10 MW would financially settle at the real-time price, which may be higher or lower than $20 (with that difference, less transaction costs, being the gain or loss on the trade) without the need for the trader to actually make an offsetting sale.

40. A UTC transaction works much like the generic virtual transaction just described, but the settlement is based on locational price differentials, rather than the prices at a single location. That locational price differential is the "congestion" from which the "Up-To Congestion" product takes its name. When entering into a UTC transaction, the

trader specifies two locations (nodes), a market hour, and that she will pay "up to" a specified dollar amount (capped at $50) in the day-ahead market to receive the price differential between the two locations (nodes) in the real-time market. If the day-ahead market price differential calculated by PJM's pricing model is at or below the price specified by the person placing the transaction, the transaction will clear.

41. UTCs were designed to allow market participants to hedge the risks associated with their real-time trades, but have evolved into a financial product used to arbitrage price differences between points. *See* Penalty Order at PP 18-20.

42. During and prior to the Manipulation Period, placing a UTC trade was a two-step process: as the first step, the trader would use PJM's Open Access Same Time Information System (OASIS) to reserve some amount of transmission for the intended transaction.[6] If transmission capacity was available, the trader would receive an OASIS reservation number, which enabled the trader, as the second step, to enter the transaction specifics – time of day, source and sink nodes (i.e., the pricing points),[7] volume (i.e., the amount of MW), and the "up-to" price limit he was willing to pay – into a different PJM system. After the time period for entering transactions closed, PJM would establish the day-ahead prices at the nodes. For a trader's bid to be accepted (i.e., to "clear"), his bid had to equal or exceed the day-ahead price spread on the trader's specified path (i.e., the difference in day-ahead price between the source and sink nodes).

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[6] Transmission is how electricity gets from one place to another.

[7] A "source" is the point of injection of energy; a "sink" is the point of withdrawal. Energy flows from the "source" to the "sink." UTCs combine an offer to sell at the source LMP with a bid to buy at the sink LMP in the day-ahead market.

43. If the bid cleared, then the profitability of the transaction (exclusive of transaction costs) would be determined by whether the price spread in the real-time market on the chosen path was higher or lower than it had been in the day-ahead market, that is, whether the trader had accurately predicted any change in congestion between the day-ahead and real-time. Thus, in principle, both the market and traders can benefit from UTC trades: traders by profiting from spreads between day-ahead and real-time prices, and the market by the more efficient pricing and dispatch that convergence of day-ahead and real-time prices brings.

B. Marginal Loss Surplus and Its Allocation.

44. As discussed above, one of the components of LMP is the cost of the megawatts of electricity that are lost as the energy is transmitted across the grid. This is called "line loss." As the Commission has observed, the more demand there is on the grid, the greater the number of megawatts will be lost in transmission. Penalty Order at P 23 (citing *Atlantic City Elec. Co., et al. v. PJM Interconnection, L.L.C.*, 115 FERC ¶ 61,132, at PP 3, 5 (2006)). To ensure that customers pay the true cost of transmitting electricity to their particular location, the Commission required that the "line loss" component of the LMP reflect the marginal cost (i.e., the most expensive increment of line loss), rather than the average cost, of such losses. Without this, prices in PJM would be distorted because they would not reflect the true costs of generation. *See Atlantic City Elec.*, 115 FERC ¶ 61,132 at P 4. Remote generation would falsely appear to be cheaper than it is, because it would not account for the additional losses that would occur (and would have to be paid for) if it were called upon. Under average loss pricing, a remote generator that lost 10% of its output on the line and was only about 5% cheaper than a nearby generator that would not lose any of its output on the line would appear to be the lower cost option,

even though the costs imposed on the system would be greater. *Id*. P 4 n.2 (providing a detailed example). Marginal loss pricing, by contrast, reflects "the actual cost of meeting load" and thus reduces prices overall. *Id*.

45. In establishing marginal loss pricing, the Commission recognized that "because marginal costs of line losses are greater than average costs, PJM receives more payments [from purchasers of power] than necessary to compensate [generators] for actual line losses [i.e., the additional power they supply to make up for transmission-related losses], resulting in a surplus revenue." Penalty Order at P 23 (footnotes omitted). This additional revenue is called "marginal loss surplus."

46. The Commission directed PJM to develop a method for disbursing the marginal loss surplus and, in September 2009, approved PJM's proposal to distribute this surplus by a marginal loss surplus allocation (MLSA) that "paid MLSA on a *pro rata* basis to network service users and transmission customers (including virtual traders) in proportion to their ratio shares of the total MWs of energy: (i) delivered to load [i.e., demand] in PJM; (ii) exported from PJM; or (iii) cleared in a UTC transaction that paid for transmission services during such hour." *Id*. P 24 (footnote omitted). In other words, MLSA payments were allocated on an hourly basis to network services users and transmission customers, including UTC traders, in proportion to the volume of MWs of paid-for transmission that they had reserved in connection with their trades.

C. Defendants Partner to Fraudulently Trade and Collect MLSA Payments.

47. Chen, who has a doctoral degree in power engineering and worked for years as an analyst in energy market modeling, first became familiar with the UTC product while working as an analyst at Merrill Lynch. In September 2007, Chen left Merrill Lynch to establish HEEP Fund for the sole purpose of making UTC trades. Penalty Order at P 11.

48. In February 2008, Lawrence S. Eiben contacted Chen to propose that Chen provide portfolio management services to TFS Capital, LLC with regard to TFS Capital's trading in the UTC market. Staff Report at 6.[8] At that time, Eiben was an employee-owner of TFS Capital. *Id*.

49. TFS Capital and HEEP Fund, through Chen, executed an Advisory Agreement[9] (the First Advisory Agreement) commencing May 1, 2008, pursuant to which Chen agreed to execute, on behalf of TFS Capital, trades identical to the trades he executed on behalf of HEEP Fund, albeit in greater volumes. Penalty Order at P 12 (citing Staff Report). As with Chen's later agreement with Powhatan, TFS Capital compensated Chen based on a percentage of the profits earned by his trades for TFS. Staff Report at 6-7.

50. Eventually, another company, Huntrise Energy Fund, LLC (Huntrise), succeeded TFS Capital's interest in the First Advisory Agreement. Penalty Order at P 12 n.22 (citing Staff Report at 6-7). Huntrise, which has since been shut down, was a private investment fund with its principal place of business in Richmond, Virginia. *Id*. Chen traded UTCs on behalf of TFS Capital until June 2008. From June 3, 2008 through May 5, 2010, Chen traded UTCs on behalf of Huntrise. *Id*.; *see also* Staff Report at 7.

51. The Commission found that during the period of September 2007 to October 2009, Chen traded UTC lawfully, on the basis of "market fundamentals and the models he developed." Penalty Order at PP 38-39 nn.87-88. This trading was characterized by a

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[8] App. A to Order to Show Cause, *Houlian Chen, et al*., 149 FERC ¶ 61,261 (2014), revised, 149 FERC ¶ 61,263 (Staff Report). The Staff Report and Order to Show Cause are attached hereto as Exhibit 2.

[9] Advisory Agreement between HEEP Fund Inc. and TFS Capital LLC (May 1, 2008).

"careful, low-risk approach" to taking positions in the market. *Id*. P 39. The Commission called this "the first phase of Dr. Chen's UTC trading." *Id*.

52. During autumn 2009, while he traded for HEEP and Huntrise, Chen discovered that his UTC trades had retroactively been credited with MLSA payments. *Id*. P 41. As he analyzed this new information, Chen discovered that the credits associated with trades executed in certain predictable periods exceeded the costs of executing those trades during those periods. *Id*.

53. This analysis caused Chen, beginning in autumn 2009, to "alter[] his UTC trading strategy away from fundamentals-based spread trading to a strategy designed to capture increased volumes of MLSA payments." *Id*. P 42 (footnote omitted). Thus began what the Commission calls the "second phase" of Chen's UTC trading. *Id*.

54. Chen shared this analysis with Powhatan investor Kevin Gates, who in turn shared it with his partners and advised them to "ramp up" their trading volumes. *Id*. PP 42-43. Chen disclosed to Gates that, beginning in February 2010, he had "kicked up" his trading volumes "to target" MLSA payments. *Id*. PP 43-44 (quoting Email from Alan Chen to Kevin Gates (Mar. 5, 2010, 9:37 PM)). Chen and Gates agreed that they wanted to increase their trading volumes in summer 2010 in order to capture a greater share of the larger MLSA payment pool available during the "hot summer." Penalty Order P 43 (quoting Chen Test. Vol. I Tr. 94:10-12 (Oct. 7, 2010)).

55. During this second phase of Chen's UTC trading, Defendants learned that they could incur substantial losses from transaction costs and price spread changes but still generate gains due to MLSA payments. *Id*. P 42. Consequently, Defendants increased their trading volumes and their focus on MLSA payment capture. *Id*. PP 42-46.

56. In early 2010, Chen began implementing a new strategy on behalf of HEEP and Huntrise, which sought to maximize MLSA payment capture while minimizing exposure to market prices. This "correlated pairs" strategy involved identifying closely correlated nodes (i.e., geographically proximate nodes whose prices tended to move in tandem) and placing trades between them and a third node. *Id*. P 42. Thus, an A to B trade was paired volumetrically and in the same hour with a B to C trade. In effect, this created an A to C trade. Because the price spread and volatility between A and C was expected to be de minimis (given that they are close to one another and experience similar pricing), profits from the correlated pairs strategy were derived from the difference between MLSA payments on the one hand and, on the other, transaction costs plus spreads (which, again, were expected to be de minimis) between A and C.

57. In March 2010, Chen explained to Gates that "[w]ithout [MLSA payments], I would not touch some of the trades and/or would not put in large volumes for some of the trades. But with [MLSA payments] as is, they are suddenly becoming risk-free (almost to the point) trades." *Id*. P 69 n.175 (quoting email from Alan Chen to Kevin Gates (Mar. 5, 2010, 9:37 PM)).

58. In March 2010, Gates and his fellow investors created a new fund, Powhatan Energy Fund, LLC. *Id*. P 13. Gates and his fellow investors created Powhatan "[i]n order to 'ramp up' their participation in this new form of UTC trading and to avoid the potential liability of having to return MLSA payments" in the event PJM attempted to reclaim them. *Id.* P 46 n.108.

59. In spring 2010, HEEP and Powhatan executed the Powhatan Advisory Agreement, which superseded the First Advisory Agreement. *Id*. P 13. Under the terms

of the Powhatan Advisory Agreement, Chen agreed to trade UTCs for Powhatan on the basis of a 20-to-1 multiplier: '"This means that for every megawatt that HEEP trades for HEEP's account, HEEP will place trades for 20 megawatts in [Powhatan's] account."' Staff Report at 8 (quoting Powhatan Advisory Agreement). The multiplier in the First Advisory Agreement was 2.5-to-1.

60. Shortly after Chen began trading for Powhatan, the correlated pairs strategy failed. A price spike unexpectedly affected only one leg of a correlated pair, which caused a sharp and unexpected price divergence (i.e., the A node did not experience a spike, but the C node did, meaning that, contrary to the purpose of the trades, the A to B and B to C price spreads did not offset). Penalty Order at P 47. The net result was that HEEP and Powhatan lost money – in Powhatan's case, a significant amount, due to the multiplier effect – over the course of only a few hours on May 30, 2010. *Id*. P 47.

61. After Defendants' unexpected loss, Chen changed his trading strategy again. *Id*. In this "third phase" of trading, the Commission found that

> Dr. Chen developed his round-trip UTC trading strategy between the same two points (A-to-B, B-to-A). Round-trip trading would effectively eliminate any risk of losing (or earning) money based on price spreads because the matched trades' price spreads canceled each other out. Dr. Chen's round-trip UTC strategy canceled [price] spread risk; profits instead came only from collection of MLSA payments, which themselves were now collected in a more effective way than they had been in phase two where some price spread risk was possible if the selected nodes did not move in tandem.

Id. (footnote omitted).

62. In summer 2010, Chen created a second fund, called CU Fund, Inc., for which he traded UTCs. *Id*. P 14. Because CU Fund was not bound by any advisory agreement with Powhatan, "Dr. Chen was able to trade UTCs on behalf of CU Fund and collect the

associated MLSA payments solely for his own economic benefit." *Id*. Chen did not inform Powhatan about the existence of CU Fund. *Id*. P 14; Staff Report at 29.

63. For CU Fund, Chen implemented the same round-trip UTC trading strategy (i.e., trades in opposite directions on the same paths in the same hours, e.g., an A to B trade and a B to A trade both at 3:00pm) that he had implemented for HEEP and Powhatan, often placing round-trip trades on the same paths in the same hours for all three funds. Penalty Order at P 22.

64. Defendant Chen placed manipulative round-trip trades on behalf of Defendant CU Fund every day from July 17, 2010 through July 31, 2010 (inclusive) and August 3, 2010. He placed such round-trip trades on behalf of Defendants HEEP Fund and Powhatan every day from June 1, 2010 through August 3, 2010 (inclusive).

65. Over the course of the Manipulation Period, Defendants executed approximately 16.6 million MWh of round-trip UTC trades. This amounted to approximately 10% of all reservations to flow electricity across PJM during that time. *Id.* P 99. These trades resulted in the misdirection of approximately $10.1 million of MLSA payments to Defendants. *See* Staff Report at 32.

ENFORCEMENT'S INVESTIGATION OF DEFENDANTS

66. In late July 2010, certain market participants informed PJM that they were experiencing unexpected difficulty in reserving transmission. Following these inquiries, PJM discovered that, beginning on June 1, 2010, several market participants (including Defendants) had been reserving large quantities of transmission in OASIS (see ¶ 42 above) associated with high volumes of UTC bids. Penalty Order at P 26. With respect to Defendants, PJM discovered (and described in its letter referring the matter to the

Office of Enforcement) that Defendants had been submitting high volume UTC transactions '"in opposite directions between the same two points."' *Id*. (quoting PJM Referral), *and see* AR No. 179.[10]

67. The Commission's Office of Enforcement (Enforcement) started investigating UTC trading by Defendants (and others) after reviewing the information in PJM's Referral and receiving a separate oral referral from PJM's Internal Market Monitor (IMM).[11] On August 18, 2010, Defendants received letters directing them to preserve documents and information relevant to this investigation.[12] *See* AR Nos. 56 and 64. On

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[10] For the Court's convenience, reference is made throughout this section to the Administrative Record Plaintiff filed at the Court's request on December 10, 2015. The Court's Memorandum Opinion of December 28, 2017 states that "the entire record before the Court—to which FERC refers as the 'administrative record'—consists of information compiled before the Commission issued the OSC and before Respondents made their penalty assessment election." Memorandum Order, at 4. However, it is not so limited. While the Administrative Record filed in this case does include materials gathered in the investigation, it also includes material submitted to the Commission by Defendants after the Order to Show Cause and while the Commission was considering its merits order. Notably, it contains all of the pleadings submitted by the parties in the underlying administrative hearing. *See* Administrative Record Index, ECF No. 37 (materials submitted after the Order to Show Cause include Defendants' Answer to the Order to Show Cause and numerous exhibits in support thereof).

[11] The IMM subsequently provided a written referral as well. AR No. 214.

[12] Defendants' receipt of this directive mere days after PJM provided its referral – as well as contemporaneously and subsequently-issued data requests and testimony taken from Houlian Chen, Kevin Gates, and Larry Eiben, among others – put Defendants' on notice that they were under investigation years before the OSC issued. Defendants' awareness of this is reflected in, among other things, the defenses they made of their conduct in written submissions beginning on December 8, 2010 – just four months after receiving the preservation directive and almost exactly four years before the Commission issued its Order to Show Cause on December 18, 2014. *See*, *e.g.*, AR No. 2 (first written submission of Chen presenting defenses) *and* AR Nos. 44-55 (testimony transcripts); *see also*, 18 C.F.R. § 1b.18 (authorizing "any person" to submit statements, arguments or evidence "at any time" during an investigation).

August 25, 2010, the Commission issued an order of formal investigation. *PJM Up-To Congestion Transactions*, 132 FERC ¶ 61,169 (2010) (AR No. 1).

68. During the investigation, Enforcement obtained and reviewed Defendants' emails, trade records, and responses to interrogatories, along with similar materials from PJM, and other participants in the UTC market. Enforcement analysts reviewed transactional information and Enforcement attorneys took Chen's testimony and the testimony of a number of Powhatan's investors and officers. Enforcement also studied the multiple submissions made by Defendants. AR Nos. 2-5.

69. After reviewing and considering these materials, Enforcement preliminarily concluded that Defendants had committed violations. Consistent with the Commission's established practice, *see Enforcement of Statutes, Regulations, and Orders*, 123 FERC ¶ 61,156, at P 32 (2008), on August 9, 2013, Enforcement provided written notice that it had preliminarily determined that Defendants had violated the Anti-Manipulation rule; explained the evidence on which it relied; and invited Defendants to provide an explanation for their behavior (Preliminary Findings Letters) (AR Nos. 6, 7).

70. Defendants responded on October 8 and 9, 2013, respectively. AR Nos. 8, 9. In their responses, Defendants did not dispute having executed any of the trades described in the Preliminary Findings Letters.

71. In September 2014, Enforcement determined that it would recommend to the Commission that the agency initiate a public proceeding wherein Enforcement could bring its allegations against Defendants. Consistent with the Commission's regulations, 18 C.F.R. § 1b.19 (2017), Enforcement notified Defendants of this forthcoming recommendation and again invited a response. AR Nos. 10, 11.

72. Defendants responded on September 24, 2014. AR Nos. 12, 13 (1b.19 Responses).

73. After considering Defendants' 1b.19 Responses, Enforcement staff prepared and submitted an investigative report (Staff Report) recommending that the Commission initiate a show cause proceeding to determine whether Defendants violated the Anti-Manipulation Rule, require disgorgement of unjust profits with interest, and impose civil penalties. Enforcement transmitted Defendants' 1b.19 Responses to the Commission along with its investigative report.

THE CONTESTED ON-THE-RECORD ORDER TO SHOW CAUSE PROCEEDING AND ORDER ASSESSING PENALTIES

74. On December 17, 2014, the Commission issued an Order to Show Cause and Notice of Proposed Penalty to Defendants, directing Defendants to show cause why the recommended penalties and disgorgement set forth in the Staff Report should not be imposed. *Houlian Chen, Powhatan Energy Fund, LLC, HEEP Fund, LLC, CU Fund, Inc*., 149 FERC ¶ 61,261 (2014), *revised*, 149 FERC ¶ 61,263 (attached hereto as Ex. 2).

75. The Order to Show Cause provided the statutorily-required notice of proposed penalties under FPA sections 31(d)(1), 16 U.S.C. § 823b(d)(1), and 316A(b), 16 U.S.C. § 825*o*-1. The Order to Show Cause did not make any findings or impose any sanctions. *See*, *e.g*., *Hunter v. FERC*, 569 F. Supp. 2d 12, 17 (D.D.C. 2008) (a FERC order to show cause imposes "practical consequences of answering and participating in an enforcement proceeding," but does not "impose an obligation, deny a right, or fix some legal relationship.") (alterations, quotations omitted); *Indiana & Mich. Elec. Co*., 33 F.P.C. 739, 760 n.18 (1965) ("statements of fact or conclusions of law contained in Orders to Show Cause . . . are tentative, i.e., subject to proof as issues in the proceeding.").

76. Under the Commission's Regulations, issuance of the Order to Show Cause commenced a "contested on-the-record proceeding," subject to the Commission's Rules of Practice and Procedure, 18 C.F.R. Part 385 (2017). *See* 18 C.F.R. §§ 385.209(a)(2) (authorizing the Commission to initiate a proceeding by issuing an order to show cause) and 385.2201(c)(1)(i) (defining "any proceeding initiated by the Commission on its own motion . . . or any proceeding arising from an investigation under part 1b of this chapter beginning from the time the Commission initiates a proceeding governed by part 385 of this chapter" as a "contested on-the-record proceeding").

77. The Show Cause proceeding was subject to the Commission's *ex parte* rule, 18 C.F.R. § 385.2201 (2017) (prohibiting any off-the-record communications about a contested on-the-record proceeding) and Separation of Functions Rule, 18 C.F.R. § 385.2202 (2017) (providing that "no officer, employee, or agent assigned to work upon the proceeding or to assist in the trial thereof, in that or any factually related proceeding, shall participate or advice as to the findings, conclusions or decision, except as a witness or counsel in public proceedings."). *See* AR No. 14, ECF No. 37 (Notice of Designation of Commission Staff as Non-Decisional). Enforcement staff who had been involved in the investigation were thus prohibited from advising or communicating with the Commission during its deliberations with respect to findings, conclusions, or decisions, except through on-the-record filings.

78. With this Separation of Functions Rule in place, the four independent Commissioners listed on the cover page of the Penalty Order comprised a quorum of the Commission, and voted independently in favor of the Order. Penalty Order at 1; *see* 16 U.S.C. § 792 (2016) (establishing FERC as a five-member independent Commission,

with a quorum of three). The Commission's then-Chairman did not participate in the matter. Penalty Order at Ordering P (H).

79. Enforcement staff filed investigative materials confidentially with the Commission on January 2, 2015, which it supplemented on March 3, 2015, to correct certain inadvertent omissions. AR Nos. 20, 35. Both filings were served on Defendants contemporaneously.

80. On January 12, 2015, Defendants notified the Commission of their decision under section 31 of the FPA to waive their opportunity for a trial-type proceeding before an administrative law judge pursuant to 5 U.S.C. § 554 (2016) in favor of a hearing before the Commission, with the potential for review de novo by a federal district court of any penalty assessment. Penalty Order at P 33; *see* AR No. 21.

81. Defendants answered the Order to Show Cause on February 2, 2015. Penalty Order at P 33; *see* AR Nos. 28, 29. On February 9, 2015, Chen, HEEP, and CU Fund filed a Supplemental Answer. AR No. 31. Defendants' answers presented evidence and argument directly to the Commission, including evidence not gathered during the investigation. *See*, *e.g*., AR No. 29, Ex. A (Affidavit of Houlian Chen).

82. Enforcement Staff replied to the answers on March 3, 2015. AR Nos. 33, 34.

83. The Commission reviewed the briefs and the extensive administrative record – encompassing materials compiled during the investigation, materials submitted by Defendants during the contested on-the-record show cause proceeding, and the pleadings of the parties (i.e., the Defendants (then called "Respondents") and Enforcement) – and, on May 29, 2015, unanimously issued the Penalty Order. In the Penalty Order, the Commission found, "[b]ased on the totality of the record in this proceeding, . . . that

Respondents' round-trip UTC trading during the Manipulation Period [i.e., June 1, 2010 to August 3, 2010] violated section 222 of the FPA and the Anti-Manipulation Rule." Penalty Order at P 4. The Penalty Order, attached as Exhibit 1, is expressly adopted and incorporated by reference in this First Amended Complaint.

DEFENDANTS' VIOLATIONS

84. Section 222 of the FPA, 16 U.S.C. § 824v, prohibits manipulation in connection with the electricity and transmission markets subject to Commission jurisdiction. The Commission's Anti-Manipulation Rule, 18 C.F.R. § 1c.2, adopted by the Commission through notice-and-comment rulemaking pursuant to the express rulemaking authority granted to it by the FPA, likewise prohibits manipulation in such markets. For the reasons set forth in the Penalty Order and described below, each of the Defendants violated both of these prohibitions by knowingly engaging in a practice that operated as a fraudulent device, scheme, or artifice involving Commission-jurisdictional transactions.

85. Defendants' scheme involved executing offsetting volumes of UTC trades in opposite directions between the same pricing points (i.e., A to B and B to A) in the same hours for the purpose of capturing MLSA payments.

A. Defendants Engaged in a Manipulative Scheme.

86. Defendants' conduct was fraudulent and manipulative because it was deceptive and because it impaired, obstructed, or defeated a well-functioning market.

87. Defendants' "round-trip UTC transactions were deceptive and manipulative" because the trades were entered separately and thus appeared to be independent, rather than deliberately offsetting. As the Commission described it, the trading activity involved "plac[ing] separate bids for each leg of their round-trip UTC transactions in the PJM market, just as other market participants would place routine arbitrage-based UTC

trades. As a result, the two separate legs of Respondents' offsetting trades were not connected and falsely appeared to PJM as legitimate UTC trades, thus concealing their fraudulent nature and purpose." Penalty Order at P 5.

88. Defendants' round-trip trades were fraudulent and manipulative because they impaired, obstructed, or defeated a well-functioning market inasmuch as they intentionally distorted the allocation of payments provided for by the tariff. In making this finding, the Commission noted that "the term 'well-functioning market' is not limited just to consideration of price or economically efficient outcomes in a market." *Id*. P 49. Rather, the Commission "view[s] the term to also broadly include consideration of 'such rules and regulations as the Commission may prescribe as necessary or appropriate,' which necessarily includes the rates, terms, and conditions of service in a market. Here, we find that intentionally subverting the allocation of payment provided by a tariff approved by the Commission constitutes interference with a 'well-functioning market.'" *Id*. (citing 16 U.S.C. § 824v).

89. Defendants' round-trip UTC trades were wash trades. As the Commission explained, "Respondents' round-trip UTC trades were designed to ensure that both legs of a transaction would cancel each other out, thereby eliminating any associated price risk. As the Commission has previously articulated, trades that are pre-arranged to cancel each other out and involve no economic risk are wash trades, which are inherently fraudulent." Penalty Order P 6 (citing *Investigation of Terms and Conditions of Public Utility Market-Based Rate Authorizations*, 105 FERC ¶ 61,218, at P 53 (2003)).

B. Defendants Acted Knowingly and Intentionally.

90. Defendants implemented their manipulative wash trading scheme knowingly and intentionally. The Commission found that "the evidence shows that Respondents,

individually and together, knowingly and intentionally participated in a manipulative scheme to engage in wash trading and deceive PJM about the true nature of their transactions, thereby harming the market and other market participants." Penalty Order P 128.

91. Defendants Chen, HEEP, and CU Fund acted with scienter. The Commission based its finding of scienter "principally on: (1) evidence that Dr. Chen understood that his fraudulent trading scheme was inconsistent with, and obstructed the market design purpose of, UTC trading in PJM; (2) evidence of the pattern and evolution of Dr. Chen's round-trip UTC trading; and (3) Dr. Chen's deliberate decision to increase profits for himself after perfecting his scheme." *Id*. PP 129-136.

92. Defendants' alternative explanation of their purposes, the so-called "home run" strategy, is disproven by the contemporaneous evidence. The supposed "home run" strategy was an explanation for Defendants' trading proffered during the investigation and show cause proceeding which posited that the round-trip trades had not been placed for the purpose of capturing MLSA payments, but rather for the purpose of capitalizing on unforeseeable and unlikely "black swan" type events. *Id*. P 52 n.124; Staff Report at 42 n.232. The home run theory suggested that Defendants desired for one leg of a round-trip pair to be rejected in the hopes that the resulting market exposure would result in windfall profits (rather than significant losses). The Commission rejected this explanation and found that Defendants' "creation of a *post hoc* explanation – the home run strategy – for which there is no evidentiary support contemporaneous with the relevant trading conduct" provided further support for the Commission's finding that they acted with scienter. Penalty Order at P 129; *see also* PP 86-93 (footnote omitted).

93. Powhatan acted with scienter. The contemporaneous evidence demonstrates that it knew of Chen's round-trip trading scheme; understood the implications of that scheme; knowingly supported the implementation of that scheme; and deliberately sought to maximize the profits it derived from that scheme. *Id.* PP 137-40.

94. Defendants understood exactly what they were doing. The Commission found that Defendants' "communications and testimony show that Respondents understood that their round-trip UTC trades had little price risk by design, were not undertaken to arbitrage price spreads, were certain themselves to lose money, and were placed only to create the illusion of volume trading to obtain transmission and thereby earn MLSA payments that otherwise would have gone to other market participants." *Id*. P 72.

C. Defendants' Manipulative Scheme Caused Harm.

95. Defendants' manipulative scheme harmed other market participants. For one thing, the scheme involved the misallocation of credits to Defendants and away from market participants who, having executed bona fide transactions, were legitimately entitled to receive them. *Id*. P 98 ("identifiable market participants were harmed by Respondents' conduct; they did not receive the MLSA payments they would have received absent Respondents' unlawful round-trip UTC trades, as provided for under the then-effective PJM Tariff's MLSA provision.")

96. In addition, Defendants' hoarding of transmission in order to execute their manipulative trades also harmed market participants because it meant that the transmission was not available (or was greatly reduced) when those other market participants sought to use it for their own non-manipulative transactions. The Commission found that "[d]uring the Manipulation Period, Respondents scheduled more than 16.6 million MWh of transmission service in connection with their fraudulent,

round-trip UTC trades, which amounted to more than 10 percent of all day-ahead transmission service reservations in PJM." *Id*. P 99 (footnotes omitted). This "impacted the availability of transmission from the time they reserved this transmission service until the time it was released for other market participants' use in the real-time market." *Id*.

D. Defendants' Manipulative Scheme Involved Jurisdictional Transactions.

97. The Commission has jurisdiction over Defendants' UTC trading. *Id*. PP 144-148. UTCs are "integral to the operation and settlement of Commission-jurisdictional wholesale markets," and "can affect the outcomes of the settlement of the day ahead physical market." *Id*. P 146 (footnotes and citation omitted).

98. Defendants' UTC transactions involved reservation of transmission. "[T]he Commission's jurisdiction over transmission is extremely broad." *Id*. P 147 (citing *New York v. FERC*, 353 U.S. 1, 16-17 (2002)).

99. The Commission has jurisdiction over conduct "in connection with jurisdictional trades" under FPA section 222, 16 U.S.C. §824v(a). Defendants' trades were sufficiently "in connection" with jurisdictional transactions to satisfy the jurisdictional nexus under that provision as well. Penalty Order at P 148.

100. Finally, Defendants' UTC trades and the transmission reservations and marginal loss surplus allocation payments associated with them were all implemented pursuant to a Commission-approved tariff by PJM, a Commission-regulated RTO. *Id*. P 145. The Commission must ensure that the terms and conditions embodied in filed tariff provisions that are in connection with jurisdictional transactions are just and reasonable. *Id*. P 144 n.344 (citing 16 U.S.C. §§ 824d(a) and 824e(a) (2012)).

E. The Commission Determined Appropriate Civil Penalties.

101. Having concluded that Defendants manipulated the wholesale electric market in PJM, the Commission assessed penalties of $16,800,000 for Powhatan; $10,080,000 for CU Fund; $1,920,000 for HEEP Fund; and $1,000,000 for Chen.

102. The Commission found these penalties to be statutorily authorized under the FPA and appropriate in this case. Penalty Order at PP 149-87. The Commission determined that the penalties were well below the statutory maximum authorized in this case. *Id*. P 150.

103. In determining the appropriate civil penalties for the corporate Defendants (Powhatan, HEEP, and CU Fund), the Commission applied statutory factors and its own Penalty Guidelines.

104. The statutory factors require the Commission to consider '"the seriousness of the violation and the efforts of such person to remedy the violation in a timely manner."' *Id*. P 151 (quoting FPA Section 316A(b), 16 U.S.C. § 825o-1(b)). The Commission determined that the violations were serious, and that there was no attempt to remedy the violations in a timely manner. *Id*. PP 186-187 n.408.

105. The Commission explicitly applied its non-binding Penalty Guidelines and, in so doing, explained in detail its reasons for concluding that the penalties were reasonable.

106. The Commission found that it was appropriate to hold Powhatan and HEEP jointly and severally liable for the $1,920,000 penalty assessed against HEEP. *Id*. P 164. The Commission found that "[w]ere we not to adopt joint and several liability, entities engaged in the intentional act of fraud could potentially avoid paying the full penalty and disgorgement amounts. This would be improper." *Id*. P 165 (citing Email from Kevin

Gates to Richard Gates (Mar. 21, 2010, 7:55 AM) (noting that if PJM sought to claw back MLSA payments "we'd bankrupt our company and not pay PJM")).

107. The Commission similarly found that it was appropriate to hold Powhatan and HEEP jointly and severally liable for the $16,800,000 penalty assessed against Powhatan "given the collusion between them." *Id*. P 175 (footnote omitted).

108. The Commission's Penalty Guidelines do not apply to individuals. *See Id.* P 155. Therefore, in determining the appropriate civil penalty for Chen, the Commission conducted a "separate penalty analysis" which was "guided by the facts and circumstances of his violations and some of the same factors described in the Penalty Guidelines." *Id*. In determining the appropriate penalty for Chen, the Commission therefore applied five factors it has previously applied in assessing penalties against individuals: "(1) seriousness of the violation; (2) commitment to compliance; (3) self-reporting; (4) cooperation; and (5) reliance on OE [Enforcement] Staff guidance." *Id*. P 179 (footnote omitted).

109. Applying these factors, the Commission found that

> there is a critical need to discourage and deter the fraudulent conduct at issue and that a civil penalty of $1,000,000 is fair and reasonable. We find this civil penalty to be particularly appropriate given that Dr. Chen designed and implemented the fraudulent scheme and course of business to defraud on behalf of multiple entities, and given the widespread scope of and harm caused by his violations. Also, Dr. Chen never made any efforts to remedy or cease his violations and stopped trading only after being contacted by PJM's IMM.

Id. P 187.

CLAIM FOR RELIEF

110. The Commission repeats each and every allegation set forth in Paragraphs 1 through 109, inclusive, as if set forth fully herein.

111. Defendants used or employed a fraudulent device, scheme, or artifice, or engaged in an act, practice, or course of business that operates or would operate as a fraud or deceit, with scienter, in connection with electric energy subject to the jurisdiction of the Commission in contravention of FPA section 222, 16 U.S.C. § 824v, and the Commission's Anti-Manipulation Rule, 18 C.F.R. § 1c.2, promulgated to implement that section of the FPA. Defendants' manipulative scheme involved multiple trades on each of 16 days for CU Fund and 64 days for HEEP, Powhatan, and Chen. Penalty Order at P 150. Each of these separate days, and each manipulative trade during such days, constitutes a separate violation of FPA section 222, 16 U.S.C. § 824v, and the Commission's Anti-Manipulation Rule, 18 C.F.R. § 1c.2.

112. Accordingly, the Commission seeks an order from this Court affirming and enforcing its assessment of civil penalties against Defendants under FPA section 31, 18 U.S.C. § 823b(d)(3)(B), and ordering Defendants to disgorge their unjust profits.

JURY DEMAND

113. Plaintiff respectfully submits that this Court can and should affirm and enforce the Commission's penalty assessments without modification as set forth in the Penalty Order.

114. Should the Court determine that this matter requires a trial on any issues, the Commission, pursuant to Rule 38 of the Federal Rules of Civil Procedure, demands a trial by jury on all issues triable as such.

RELIEF REQUESTED

WHEREFORE, the Commission respectfully requests that this Court:

(A) Enter an order and judgment affirming the Commission's assessment of a $16,800,000 civil penalty, plus interest, against Powhatan and ordering Powhatan to pay that penalty;

(B) Enter an order and judgment affirming the Commission's assessment of a $1,000,000 civil penalty, plus interest, against Chen and ordering Chen to pay that penalty;

(C) Enter an order and judgment affirming the Commission's assessment of a $1,920,000 civil penalty, plus interest, against HEEP and ordering HEEP to pay that penalty;

(D) Enter an order and judgment affirming the Commission's assessment of a $10,080,000 civil penalty, plus interest, against CU Fund and ordering CU Fund to pay that penalty;

(E) Enter an order and judgment requiring Powhatan to disgorge $3,465,108 in unjust profits, plus interest, it obtained as a result of its illegal manipulative scheme;

(F) Enter an order and judgment requiring HEEP to disgorge $173,100 in unjust profits, plus interest, it obtained as a result of its illegal manipulative scheme;

(G) Enter an order and judgment requiring CU Fund to disgorge $1,080,576 in unjust profits, plus interest, it obtained as a result of its illegal manipulative scheme;

(H) Grant such other and further relief as the Court may deem just and proper; and

(I) Retain jurisdiction over this action to enforce any Orders or Final Judgments issued by this Court.

Dated: January 29, 2018

Respectfully submitted,

FEDERAL ENERGY REGULATORY COMMISSION

Larry Parkinson
Director
Office of Enforcement

Geo. F. Hobday
Acting Director
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/s/

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CERTIFICATE OF SERVICE

I hereby certify that on January 29, 2018, I filed the foregoing First Amended Complaint, using the CM/ECF system, which will send a notification of such filing to counsel of record, including:

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EXHIBIT 1

Order Assessing Civil Penalties
Houlian Chen, et al., 151 FERC ¶ 61,179 (2015)

151 FERC ¶ 61,179
UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Before Commissioners: Philip D. Moeller, Cheryl A. LaFleur,
Tony Clark, and Colette D. Honorable.

Houlian Chen
Powhatan Energy Fund, LLC
HEEP Fund, LLC
CU Fund, Inc.

Docket No. IN15-3-000

ORDER ASSESSING CIVIL PENALTIES

(Issued May 29, 2015)

Paragraph Numbers

1. In this Order, we find that Dr. Houlian Chen (Dr. Chen), Powhatan Energy Fund, LLC (Powhatan), HEEP Fund, LLC (HEEP), and CU Fund, Inc. (CU Fund) (collectively, Respondents) violated section 222 of the Federal Power Act (FPA)[1] and section 1c.2 of the Commission's regulations,[2] which prohibit energy market manipulation, through a scheme to engage in fraudulent Up-To Congestion (UTC) transactions in PJM Interconnection L.L.C.'s (PJM) energy markets to garner excessive amounts of certain credit payments to transmission customers. In light of the seriousness of these violations, we find that it is appropriate to assess civil penalties pursuant to section 316A of the FPA[3] in the following amounts: $16,800,000 against Powhatan, $10,080,000 against CU Fund, $1,920,000 against HEEP, and $1,000,000 against Dr. Chen. The Commission further directs the disgorgement of unjust profits, plus applicable interest, pursuant to section 309 of the FPA,[4] in the following amounts: $3,465,108 for Powhatan, $1,080,576 for CU Fund, and $173,100 for HEEP.

I. Executive Summary

2. Respondents' scheme involved financial trading in the wholesale electricity market administered by PJM. As discussed in further detail below,[5] PJM operates both a day-ahead market, in which generation is scheduled one-day prior to the relevant operating day, and a real-time market, in which generation is scheduled and dispatched to correct for variations between the day-ahead schedule and actual demand for electricity. PJM's energy market offers products that involve the physical movement of electricity, as well as various financial or virtual products that do not involve the exchange of physical energy, including the UTC product. A UTC product is a type of spread trade that allows market participants to arbitrage the difference between day-ahead and real-time congestion prices at two different locations.[6] When the UTC transactions discussed

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[1] 16 U.S.C. § 824v(a) (2012).

[2] 18 C.F.R. § 1c.2 (2014) (Anti-Manipulation Rule).

[3] *Id.* § 825o-1(b).

[4] *Id.* § 825h.

[5] Details regarding the PJM Market, UTC product, and transmission credit payments at issue in this proceeding are discussed in the background section. *See* discussion *supra* PP 15-25.

[6] In particular, a UTC bid that clears PJM's market will pay the difference between the day-ahead prices at location A and location B, and receive the difference between the real-time prices at location A and location B.

in this proceeding were made, PJM's market rules required market participants to reserve transmission service in connection with their UTC trade.[7] As a result, UTC transactions became eligible to receive certain transmission credits, known as Marginal Loss Surplus Allocation (MLSA).[8] PJM distributed the MLSA payments on a *pro rata* basis to all customers who paid for transmission service.

3. From June 1 to August 3, 2010 (Manipulation Period),[9] Respondents designed and implemented a fraudulent UTC trading scheme to receive excessive amounts of MLSA payments. To do this, Respondents intentionally placed a high-volume of "round-trip" UTC trades that canceled each other out by placing the first leg of the trade from locations A to B, and simultaneously placing a second leg of equal volume from locations B to A. The contemporaneous evidence shows that Respondents artificially created these round-trip UTC trades solely to reserve transmission service to enable them to collect excessive MLSA payments during the Manipulation Period.

4. Based on the totality of the record in this proceeding, we find that Respondents' round-trip UTC trading during the Manipulation Period violated section 222 of the FPA and the Anti-Manipulation Rule. When used appropriately, UTC trades in PJM permit financial traders to profit by arbitraging market prices between two locations in the day-ahead and real-time market; these transactions can benefit PJM's market by encouraging convergence between day-ahead and real-time market prices.[10] Respondents' testimony makes clear that they understood this, yet they intentionally placed fraudulent round-trip UTC trades that did not provide any benefit to the PJM market. Respondents knew that their round-trip UTC trades would net no market position, and that on their own these

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[7] Confidential Referral of Potential Violations of FERC Market Rule, at 2, 4 (Aug. 16, 2010) (PJM Referral). A reservation for transmission service that is accepted by PJM provides the market participant with the right to flow electricity on a designated transmission path. Any given transmission path has a limited amount of capacity.

[8] *See* discussion *infra* PP 22-25.

[9] While HEEP continued to place certain UTC trades through August 18, 2010, Respondents' UTC trades that are the subject of this order ceased on August 3, 2010. Thus, we will define the Manipulation Period for purposes of this order as June 1 through August 3, 2010.

[10] *Black Oak Energy, L.L.C., et al. v. PJM Interconnection, L.L.C.*, 122 FERC ¶ 61,208, at n.85 (2008); *Black Oak Energy, L.L.C., et al. v. PJM Interconnection, L.L.C.*, 125 FERC ¶ 61,042, at P 43 (2008) (noting that financial arbitrage transaction is of value in energy markets); *see also* discussion *infra* PP 18-21.

round-trip trades would not generate a profit or a loss based on price spreads. But, by making these trades, Respondents collected MLSA payments exceeding the transaction costs they incurred for the trades, and yielding a significant profit, as they expected.

5. We disagree with Respondents' argument that their round-trip UTC trading scheme does not constitute fraud because the trades were permissible under a "loophole" in PJM's tariff and, according to them, did not involve any active deception, such as false statements or active concealment. As the Commission has previously articulated, "[a]n entity need not violate a tariff, rule or regulation to commit fraud."[11] The fact that the PJM tariff does not explicitly prohibit round-trip UTC trades does not create a loophole or otherwise render Respondents' transactions lawful. Moreover, Respondents' round-trip UTC transactions were deceptive and manipulative. Respondents placed separate bids for each leg of their round-trip UTC transactions in the PJM market, just as other market participants would place routine arbitrage-based UTC trades. As a result, the two separate legs of Respondents' offsetting trades were not connected and falsely appeared to PJM as legitimate UTC trades, thus concealing their fraudulent nature and purpose.

6. Moreover, we find that Respondents' round-trip UTC transactions constitute wash trades, and that all market participants had notice that wash trades violate section 222 of the FPA and the Commission's Anti-Manipulation Rule.[12] Respondents' round-trip UTC trades were designed to ensure that both legs of a transaction would cancel each other out, thereby eliminating any associated price spread risk. As the Commission has previously articulated, trades that are pre-arranged to cancel each other out and involve no economic risk are wash trades, which are inherently fraudulent.[13]

7. Further, we conclude that Respondents engaged in this scheme knowingly and intentionally. Testimony, email communications, and other evidence demonstrate that Respondents chose to engage in UTC trades solely to garner excessive MLSA payments in a manner inconsistent with the market function of UTC transactions. Respondents also understood that, as a consequence of this trading scheme, other market participants would

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[11] *Competitive Energy Services, LLC*, 144 FERC ¶ 61,163, at P 50 (2013) (citations omitted); *Richard Silkman*, 144 FERC ¶ 61,164, at P 50 (2013); *Lincoln Paper and Tissue, LLC*, 144 FERC ¶ 61,162, at P 36 (2013). *See also In re Make-Whole Payments and Related Bidding Strategies*, 144 FERC ¶ 61,068, at P 83 (2013) (citations omitted).

[12] *See* discussion *infra* PP 103-107.

[13] *Investigation of Terms and Conditions of Public Utility Market-Based Rule Authorizations*, 105 FERC ¶ 61,218, at P 53 (2003).

receive a proportionally smaller share of MLSA payments. As Respondents' UTC transactions increased, their transmission service reservations and proportionate share of MLSA payments increased, thus decreasing the available transmission and MLSA payments for other eligible market participants. Accordingly, by targeting MLSA payments through these artificial, high-volume, round-trip UTC trades, Respondents fraudulently obtained MLSA payments that otherwise would have been distributed to other market participants.

8. We also find that the Commission has jurisdiction over Respondents' conduct. The U.S. Court of Appeals for the District of Columbia Circuit has held that the Commission has authority under the FPA to regulate the activity of traders, like the Respondents, who participate in energy markets.[14] Moreover, the Commission has jurisdiction over the transmission or sale of electric energy at wholesale in interstate commerce,[15] as well as a responsibility to ensure that the rates and charges for transmission and wholesale power sales are just and reasonable and not unduly discriminatory or preferential.[16] As applicable here, virtual transactions, including UTC trades, are integral to the operation and settlement of Commission-jurisdictional wholesale electricity markets. Respondents engaged in UTC transactions, reserved transmission capacity, and received MLSA payments pursuant to PJM's Commission-approved tariff.

9. Finally, having found that Respondents knowingly and intentionally devised and participated in a fraudulent scheme to manipulate PJM's wholesale electricity market in violation of the Commission's regulations, we conclude that both civil penalties and disgorgement should be assessed against Respondents. This determination is consistent with the Commission's long-standing practice to require disgorgement of unjust profits,[17] as well as the Commission's discretion to assess civil penalties against any person who violates Part II of the FPA, or any rule or order thereunder.[18]

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[14] *Kourouma v. FERC*, 723 F.3d 274, 276 (D.C. Cir. 2012).

[15] 16 U.S.C. § 824(b)(1) (2012).

[16] *Id.* §§ 824d, 824e.

[17] *Enforcement of Statutes, Regulations, & Orders*, 123 FERC ¶ 61,156, at P 43 (2008) (Revised Policy Statement on Enforcement).

[18] 16 U.S.C. § 825o-1(b).

II. Background

A. Relevant Entities

10. Respondents in this case consist of Dr. Chen and a series of financial entities on whose behalf Dr. Chen traded UTCs in PJM during the Manipulative Period. Certain of Respondents (HEEP and CU Fund) are wholly-owned by Dr. Chen, while Respondent Powhatan was owned by investors who sought to capitalize on Dr. Chen's UTC trading expertise.

11. Dr. Chen started HEEP in August 2007 and began trading in PJM markets in September 2007. On and after September 2007, nearly all of HEEP's trading was in UTCs.[19] Starting in May 2008, Dr. Chen, through HEEP, began trading UTCs pursuant to a contractual arrangement with companies owned, in part, by brothers Richard and Kevin Gates, first with TFS Capital LLC (TFS) and Huntrise Energy Fund, LLC (Huntrise), which were effectively predecessors in interest to Respondent Powhatan.[20]

12. On May 1, 2008, HEEP executed an agreement with TFS (the Advisory Agreement), under which Dr. Chen agreed to conduct UTC trades on behalf of TFS "mirroring UTC trades he executed for HEEP on a two-and-a-half-to-one basis."[21] This meant that for every megawatt (MW) Dr. Chen placed on behalf of HEEP he placed 2.5 MW for TFS at the same nodes. Thus, to the extent Dr. Chen profited, TFS and its investors earned more profit. In June 2008, Dr. Chen stopped trading for TFS and began trading on behalf of Huntrise, which succeeded to TFS's interest in the Advisory Agreement (under the same two-and-a-half-to-one trading basis).[22]

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[19] Chen Test. Vol. I Tr. 37:1-2; 38:10-16; 78:1-4; 76:6-24.

[20] When we refer to Mr. Gates in the remainder of this Order, we are referring to Mr. Kevin Gates.

[21] *Houlian Chen, et al.*, 149 FERC ¶ 61,261 (Order to Show Cause), *revised*, 149 FERC ¶ 61,263 (2014) (Revised Order to Show Cause); App. A to Order to Show Cause at 6 (Staff Report) (citing POW00000071).

[22] Staff Report at 6-7; Chen Test. Vol. I Tr. 40:14-23; POW00000071. During the relevant period of time, Huntrise had one investor: the Huntrise Fund of Funds, which, in turn, was controlled by its managing members, the Gates brothers and Mr. Eiben. Staff Report at 7 n.35. TFS was "controlled by the same small circle of individuals as Huntrise and Powhatan." *Id.* at 7; Chen Test. Vol. I Tr. 40:17-41:1.

13. In March 2010, the Gates brothers formed Powhatan along with Larry Eiben. On May 18, 2010, HEEP executed a new Advisory Agreement with Powhatan that increased the ratio of Dr. Chen's UTC trades from the earlier two-and-a-half-to-one basis for TFS and Huntrise to a twenty-to-one basis for Powhatan.[23]

14. Later, on July 17, 2010, Dr. Chen formed Respondent CU Fund. Unlike HEEP, CU Fund had no Advisory Agreement with Powhatan obligating him to make trades on behalf of Powhatan. Thus, Dr. Chen was able to trade UTCs on behalf of CU Fund and collect the associated MLSA payments solely for his own economic benefit.

B. The PJM Market

15. PJM, one of several Commission-regulated Regional Transmission Organizations (RTOs) and Independent System Operators (ISOs), operates a wholesale electricity market, which balances the minute-by-minute supply and demand requirements for electric power, in a 13-state region extending from Illinois to North Carolina.[24] PJM uses market-based systems to determine a least-cost solution by optimizing available assets within its territory to meet electricity demand and reliability requirements. Electricity prices in PJM vary based on the specific location, or node, within the market. For this reason, electricity prices at the various locations are called Locational Marginal Prices (LMP). Three components summed together form the LMP: (i) an energy price (which is the same at each node and represents the cost to serve the next increment of load (demand) at a pre-determined reference location); (ii) the cost of congestion (which varies at each node depending on the limitations of the transmission system to move power freely between constrained and non-constrained locations); and (iii) the cost of line losses (which are central to this proceeding and which we discuss in greater detail below).

16. PJM operates a dual settlement market, with both a day-ahead market and a real-time market. PJM determines LMPs through the least-cost solution on an hourly basis in the day-ahead and on a five-minute basis (which can be integrated into an hourly figure) in the real-time for all nodes.

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[23] Staff Report at 8; Advisory Agreement between HEEP and Powhatan, dated May 18, 2010 (POW00000067).

[24] PJM's footprint includes all or parts of Delaware, Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia, and the District of Columbia. http://www.pjm.com/about-pjm/who-we-are/territory-served.aspx (last visited May 8, 2015).

17. In addition to physical transactions, which are premised on the actual delivery of electricity, PJM offers various virtual products, including UTCs[25] for which no generation is dispatched and no load is served, and obligations are met through cash settlement. Virtual products are designed to increase market liquidity, drive convergence[26] between the day-ahead and real-time market, and provide vehicles for hedging. While virtual products carry no obligation to buy or sell physical power, they serve a direct role in day-ahead price formation as reflected in day-ahead LMPs. As such, virtual products can: (1) be the price setting marginal factor in determining day-ahead LMPs; (2) affect day-ahead dispatch; and (3) affect other market participant positions.[27]

C. PJM's Up-To Congestion Product

18. UTCs were initially created as a tool to hedge congestion price risk associated with physical transactions,[28] and later became a way for market participants to profit by arbitraging the price differences between two nodes in the day-ahead and real-time

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[25] A virtual transaction does not require generation to be dispatched or load to be served. Rather, it allows a market participant to arbitrage day-ahead versus real-time prices by either purchasing or selling a position in the day-ahead market, and then doing the opposite in an equal volume at the same location in the real-time market, thereby taking no physical position when the system is dispatched.

[26] Convergence in the PJM market is the reduction in the spread between day-ahead and real-time LMPs at a specific node. As indicated by PJM's Independent Market Monitor (IMM), "price convergence does not necessarily mean a zero or even a very small difference in prices between [d]ay-[a]head and [r]eal-[t]ime [e]nergy [m]arkets. There may be factors, from operating reserve charges to risk that result in a competitive, market-based differential." PJM's IMM, *2010 State of the Market for PJM*, vol. 2 (Mar. 10, 2011), *available at* http://www.monitoringanalytics.com/reports/PJM_State_of_the_Market/2010/2010-som-pjm-volume2-sec2.pdf

[27] Howard J. Haas, *Spread Bidding: MA Concerns and Mitigation Outline* (Sept. 10, 2009), *available at* http://www.monitoringanalytics.com/reports/Presentations/2009/Spread_Bidding_MA_Concerns_and_Mitigation_Outline_20090910.pdf.

[28] *PJM Interconnection, L.L.C.*, 144 FERC ¶ 61,121, at P 3 (2013); *see also Calif. Indep. Sys. Operator Corp.*, 143 FERC ¶ 61,087, at P 6 (2013) (noting that market participants can use virtual transactions to "hedge financial expectations").

markets.[29] A UTC bid that clears "will pay the difference between the [d]ay-ahead sink LMP and the source LMP and be paid the difference between the [r]eal-time sink LMP and source LMP."[30] Thus, "cleared UTC transactions in the direction of congestion are profitable when real-time congestion is greater than day-ahead congestion. In the counter-flow direction, UTC transactions are profitable when real-time congestion decreases or reverses from the counter-flow direction toward the direction of congestion."[31]

19. UTC transactions in PJM are designed to serve two purposes. First, market participants use them as a congestion management tool to hedge exposure to real-time congestion charges between the source and sink (which can differ significantly from day-ahead congestion charges) of physical energy transactions in PJM.[32] Second, financial traders use them as a "purely virtual product."[33] Specifically, arbitrageurs can use UTCs to take on directional price risk related to the differences between LMP in the day-ahead and real-time markets. As the Commission has explained:

> Under an Up-To congestion price arrangement, arbitrageurs may sell power at point A and buy power at point B in the [d]ay-[a]head market as long as the price differential between these points is no greater than the specified amount. If during the [r]eal-[t]ime market, the spread between these points increases, the arbitrageur makes money; if the spread decreases, it loses money.[34]

20. UTCs, like other virtual products, can promote market efficiency because, as we have recognized, virtual products "increase[] market liquidity and [create] price

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[29] *PJM Interconnection, L.L.C.*, 144 FERC ¶ 61,121, at P 19 (2013).

[30] *PJM Interconnection, L.L.C.*, 148 FERC ¶ 61,144, at n.8 (2014).

[31] *Id*.

[32] *PJM Interconnection, L.L.C.*, 144 FERC ¶ 61,121 at P 3.

[33] *Id.* P 19 (noting the "evolution of the UTC product from a day-ahead financial hedge of a real-time physical transaction to its present primary use as a purely virtual product").

[34] *Black Oak Energy, L.L.C., et al. v. PJM Interconnection, L.L.C.*, 122 FERC ¶ 61,208 at n.85.

convergence between the day-ahead and real-time markets."[35] Although they are settled financially, virtual (including UTC) transactions can affect prices in the day-ahead market as well as what units are dispatched by PJM to provide energy to the wholesale grid.[36]

21. At the time Respondents traded the UTCs at issue in this proceeding, PJM required all UTC transactions to be associated with transmission service reservations,[37] which once obtained, provided the right to flow electricity across the PJM system. In 2010, Respondents reserved non-firm point-to-point transmission for their UTC trades.

D. Marginal Loss Surplus Allocations

22. At the time of Respondents' conduct, all UTC transactions associated with transmission service in PJM were eligible to receive a portion of MLSA payments. MLSA refers to the PJM-developed and Commission-accepted distribution to market participants of the surplus revenues that PJM collects for transmission line losses.

23. When electricity flows through a transmission line, a certain amount of energy is lost in the form of heat. The farther electricity travels on any given transmission line, the greater the loss.[38] In calculating the cost of line loss, as part of LMP, PJM sets the price

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[35] *PJM Interconnection, L.L.C.*, 104 FERC ¶ 61,309, at P 20 (2003); *see also ISO New England Inc.*, 110 FERC ¶ 61,250, at P 30 (2005) ("In fact, virtual trading activities provide important benefits to the market, including price convergence between the [d]ay-[a]head and [r]eal-[t]ime markets, price discovery, market liquidity, and increased competition.").

[36] *Black Oak Energy*, 122 FERC ¶ 61,208 at P 38 (noting that there is a "price impact of the virtual transaction on the physical transmission system that forms the basis for both the [d]ay-[a]head and [r]eal-[t]ime [e]nergy [m]arkets").

[37] PJM Referral at 2, 4. PJM assessed certain transmission charges for transmission service reservations. Reserved capacity with a Midcontinent Independent System Operator, Inc. (MISO) point of delivery, however, was not assessed any transmission fees. Monitoring Analytics' PJM Marginal Loss Surplus Allocation and Market Participant Transaction Activity: May 15, 2010 through September 17, 2010, at 7 (Jan. 6, 2011) (IMM Referral).

[38] *Atlantic City Elec. Co., et al. v. PJM Interconnection, L.L.C.*, 115 FERC ¶ 61,132, at P 3 (2006) ("As in the case of all electric transmission, there is some loss of the scheduled megawatts as the power is transmitted from the point of generation to the point of delivery. That is, the total megawatt-hours of energy received by customers is

(continued...)

at marginal cost, rather than average cost.[39] Because marginal costs of line losses are greater than average costs, PJM receives more payments than necessary to compensate for actual line losses, resulting in a surplus revenue.[40]

24. The Commission recognized that "a method needs to be determined for disbursing the over collected amounts" of line loss payments.[41] In September 2009, the Commission accepted PJM's proposed distribution method, which paid MLSA on a *pro rata* basis to network service users and transmission customers (including virtual traders) in proportion to their ratio shares of the total MWs of energy: (i) delivered to load in PJM; (ii) exported from PJM; or (iii) cleared in a UTC transaction that paid for transmission services during such hour.[42]

25. Mathematically, MLSA was calculated hourly as a market participant's eligible MW (i.e., in energy delivered to load or transmission reservations for exports and UTCs) divided by the total PJM eligible MW (i.e., total energy delivered to load and transmission reservations). Under this distribution mechanism, as a market participant's cleared UTC transactions increased, its transmission reservations increased and, thus, its share of the available MLSA also increased (while inversely decreasing the available MLSA for other market participants).

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less than the total megawatt-hours of energy produced by generators. Such loss results in a cost PJM incurs to maintain the level of the scheduled power and to deliver it under conditions of system reliability.").

[39] *Id.* P 4.

[40] *Id.* P 5.

[41] *Id.* P 24.

[42] *Black Oak Energy, L.L.C., et al. v. PJM Interconnection, L.L.C.*, 128 FERC ¶ 61,262, at P 23 (2009). The Commission found that PJM's proposed method of distributing line loss surplus to those that pay to support the fixed costs of the transmission grid is reasonable. *Id.* ("The Commission finds that PJM's proposal is a just and reasonable method of allocating the surplus, subject to the condition that PJM clarify that its tariff complies with our finding that payments be made only to those who pay for the costs of the transmission grid.").

E. PJM and IMM Referrals, Office of Enforcement Investigation, and Order to Show Cause

26. In August 2010, PJM sent the Commission's Office of Enforcement (OE) a referral related to Respondents' round-trip UTC trades. The PJM referral was prompted by a market participant who contacted PJM on July 23, 2010, complaining about unusually high volumes of transmission reservations on PJM's Open Access Same-Time Information System (OASIS) and wondering whether certain market participants "were 'trying to game the system in some way' by 'trying to lock people out of transmission purchases.'"[43] PJM confirmed that several market participants reserved large quantities of transmission and discovered that such reservations were associated with high volumes of UTC bids, beginning on June 1, 2010.[44] PJM identified Powhatan, HEEP, and CU Fund as market participants submitting high volumes of UTC transactions "in opposite directions between the same two points."[45] PJM explained that such transactions "result[ed] in no risk of any day-ahead or balancing market settlement (because the settlement of the transactions in the opposite directions would offset each other in both the day-ahead and balancing markets)."[46] PJM explained that these offsetting UTC transactions resulted in an "allocation of marginal loss surplus based on the cleared MWh of transactions."[47]

27. PJM believed that Respondents' "opposite-direction" UTC transactions "constituted a scheme of 'wash' or offsetting trades that created no economic value and little to no risk to the participant, solely to inflate transaction volumes in order to receive an improper allocation of marginal loss surplus allocation revenue."[48] PJM believed "that these offsetting trades were undertaken with the intent of manipulating PJM market rules so as to gain an allocation of marginal loss surplus revenue without any corresponding usage of the transmission system."[49] PJM asked OE to investigate the

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[43] PJM Referral at 1. Another market participant contacted PJM on July 28, 2010, with a similar complaint. *Id.*

[44] *Id.* at 1.

[45] *Id.* at 2.

[46] *Id.*

[47] *Id.*

[48] *Id.* at 4.

[49] *Id.*

conduct and to require Respondents to disgorge any of the revenue they received since June 1, 2010, as a result of this scheme.[50]

28. In August 2010, based on the referral from PJM, OE Staff launched an investigation of Dr. Chen's UTC transactions on behalf of the Respondents.[51] On August 25, 2010, the Commission issued an order formalizing the investigation.[52] In that order, we noted PJM's allegations that "trades were undertaken with the intent of manipulating PJM market rules so as to gain an allocation of marginal loss surplus revenue without any corresponding usage of the transmission system," and authorized OE to conduct an investigation "regarding violations of the Commission's . . . Prohibition of electric energy market manipulation, that may have occurred in connection with, or related to, certain [UTC] transactions in PJM."[53] We also directed OE Staff to report the results of that investigation to the Commission.[54]

29. On January 6, 2011, PJM's IMM submitted a similar referral to OE. The IMM stated that Respondents' "offsetting" UTC transactions were "similar in fundamentals to wash trades, which have been expressly identified as prohibited activities by the Commission."[55] The IMM further compared the trades to wash trades conducted by Enron that also "took the form of energy market transactions that canceled out but created the illusion of volume trading."[56] Similar to PJM, the IMM asserted that the referred trading activities "exploit the marginal loss allocation rules implemented by PJM to derive a benefit from transactions with no fundamental economic rationale or value."[57] The IMM emphasized that because "there is no rational basis for characterizing such transactions as economic without the marginal loss surplus allocation, a determination that such transactions were intended to operate as a fraud or deceit upon PJM and

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[50] *Id.* at 6.

[51] Staff Report at 43.

[52] *PJM Up-To Congestion Transactions*, 132 FERC ¶ 61,169 (2010).

[53] *Id.* PP 1-2 (citation and internal quotations omitted).

[54] *Id.* at Ordering Paragraph.

[55] IMM Referral at 4.

[56] *Id.*

[57] *Id.* at 3.

participants in the markets administered by PJM is warranted. Such behavior violates the Commission's rule prohibiting energy market manipulation . . . ."[58]

30. On August 9, 2013, OE Staff issued Preliminary Findings Letters to Respondents explaining the factual and legal bases for its preliminary findings of violations.[59] Respondents replied to the Preliminary Findings Letters on October 9, 2013.[60] The Office of the Secretary issued a Notice of Alleged Violations on August 5, 2014. After settlement discussions proved unavailing, OE Staff provided notices under section 1b.19 of the Commission's regulations[61] of its intent to recommend the initiation of a public proceeding against the Respondents. On September 24, 2014, Respondents provided their responses to OE Staff's 1b.19 letters.[62]

31. On December 17, 2014, the Commission issued an Order to Show Cause, which commenced this public proceeding.[63] In the Staff Report attached to the Order to Show Cause, OE Staff alleges that the Respondents violated the Commission's Anti-Manipulation Rule from June 1, 2010 to August 18, 2010. OE Staff recommends that the Commission assess: (1) a civil penalty of $16,800,000 and disgorgement of $3,465,108, plus interest, against Powhatan; (2) a civil penalty of $10,080,000 and disgorgement of $1,080,576, plus interest, against CU Fund; (3) a civil penalty of $1,920,000 and disgorgement of $173,100, plus interest, against HEEP; and (4) a civil penalty of $500,000 against Dr. Chen for trades executed through and on behalf of HEEP and

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[58] *Id.* at 3-4.

[59] *See* Letter from S. Tabackman, OE Staff, to J. Estes, III, counsel for Dr. Chen (Aug. 9, 2013); Letter from S. Tabackman to W. McSwain, counsel for Powhatan (Aug. 9, 2013).

[60] Dr. Chen's attorney provided a substantive response. *See* Letter from J. Estes, III, counsel for Dr. Chen, to S. Tabackman, OE Staff (Oct. 9, 2013). Powhatan's attorney did not. *See* Letter from W. McSwain, counsel for Powhatan, to S. Tabackman, OE Staff (Oct. 8, 2013).

[61] 18 C.F.R. § 1b.19 (2014).

[62] *See* Letter from J. Estes, III, counsel for Dr. Chen, to S. Tabackman, OE Staff (September 24, 2014); Letter from W. McSwain, counsel for Powhatan, to S. Tabackman (September 24, 2014).

[63] Order to Show Cause, 149 FERC ¶ 61,261 at 1.

Powhatan and an additional $500,000 against Dr. Chen for trades executed through and on behalf of CU Fund.[64]

32. In the Order to Show Cause, the Commission directed Respondents to file an answer within 30 days showing cause why they should not be found to have violated section 222 of the FPA and section 1c.2 of the Commission's regulations by engaging in fraudulent UTC transactions in PJM's energy markets.[65] In addition, the Commission directed Respondents to show cause why the proposed penalties should not be assessed.[66] The Revised Order to Show Cause also directed Respondents to show cause why they should not be required to disgorge unjust profits with interest.[67] The Order to Show Cause also stated that Respondents must, within 30 days, elect either an administrative hearing before an Administrative Law Judge at the Commission prior to the assessment of a penalty pursuant to section 31(d)(2) of the FPA or, if the Commission finds a violation, an immediate penalty assessment by the Commission pursuant to section 31(d)(3)(A) of the FPA.[68] The Revised Order to Show Cause further allowed OE Staff to file a reply within 30 days of the filing of Respondents' answers.[69]

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[64] Revised Order to Show Cause, 149 FERC ¶ 61,263.

[65] Order to Show Cause, 149 FERC ¶ 61,261 at Ordering Paragraph (A). On December 31, 2014, the Commission extended the Respondents' deadline to respond to the Order to Show Cause to February 2, 2015. On January 30, 2015, the Commission denied the Respondents' request for a second extension of time but permitted the Respondents to file supplemental answers by February 9, 2015 in response to materials produced by OE Staff on January 29, 2015.

[66] *Id.* at Ordering Paragraph (B).

[67] Revised Order to Show Cause, 149 FERC ¶ 61,263. The recommended disgorgement amounts were as follows: (1) Powhatan: $3,465,108, plus interest, (2) CU Fund: $1,080,576, plus interest and (3) HEEP: $173,100, plus interest.

[68] 16 U.S.C. §§ 823b(d)(2) and 823b(d)(3)(A) (2012); Order to Show Cause, 149 FERC ¶ 61,261 at P 4.

[69] On January 2, 2015, OE Staff submitted non-public investigative materials to the Commission and, pursuant to the cover letter accompanying those materials, the Commission understands Respondents received them as well.

33. On January 12, 2015, Respondents submitted a joint notice of their election under section 31(d)(3)(A) of the FPA and the Order to Show Cause,[70] thereby electing an immediate penalty assessment if the Commission finds a violation. On February 2, 2015, Dr. Chen, HEEP, and CU Fund (Chen Answer) and Powhatan (Powhatan Answer) submitted answers to the Order to Show Cause (together, Respondents' Show Cause Answers). On February 3, 2015, Eric S. Morris submitted a non-party protest in this proceeding in support of the Respondents.[71] On February 9, 2015, Dr. Chen, HEEP, and CU Fund submitted a Supplemental Answer (Supplemental Answer). On March 2, 2015, OE Staff filed its Reply to Respondents' answers (Staff Reply). On March 18, 2015, Dr. Chen, HEEP, and CU Fund submitted an answer to the Staff Reply (Dr. Chen's second answer).[72] On April 1, 2015, PJM submitted comments in this proceeding.[73] On April 14, 2015, Dr. Chen submitted a response to PJM's comments. On April 23, 2015, Dr. Chen submitted a "Citation of Supplemental Authority."

34. As part of our adjudication of this matter, we have considered all accepted pleadings and attachments, as well as the investigative materials submitted to the Commission.

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[70] Order to Show Cause, 149 FERC ¶ 61,261 at Ordering Paragraph (D).

[71] Rule 214 of the Commission's Rules of Practice and Procedure provides that "[n]o person . . . may intervene as a matter of right in a proceeding arising from an investigation pursuant to Part 1b of this chapter." 18 C.F.R. § 385.214(a)(4) (2014). Therefore, Mr. Morris is not a party to this proceeding and we will not accept Mr Morris' protest.

[72] We note that the Order to Show Cause directed Respondents to submit answers in response to the Order and allowed OE Staff to submit a reply within 30 days of the Respondents' answer. The Order to Show Cause did not authorize a second answer in response to OE Staff's reply. Additionally, Rule 213(a) of the Commission's Rules of Practice and Procedure, 18 C.F.R. § 385.213(a) (2014), prohibits an answer to a protest or an answer, unless otherwise permitted by the decisional authority. We are not persuaded to accept Dr. Chen's second answer or his later filed "Citation to Supplemental Authority."

[73] As we noted above, Rule 214 of the Commission's Rules of Practice and Procedure provides that "[n]o person . . . may intervene as a matter of right in a proceeding arising from an investigation pursuant to Part 1b of this chapter." 18 C.F.R. § 385.214(a)(4). Therefore, PJM is not a party to this proceeding and we will not accept PJM's comments or Dr. Chen's response to those comments.

III. Discussion

35. Section 222 of the FPA makes it unlawful for any entity to use a deceptive or manipulative device in connection with the purchase or sale of electric energy or the transmission of electric energy subject to the Commission's jurisdiction.[74] Order No. 670 implemented this prohibition, adopting the Anti-Manipulation Rule. That rule, among other matters, prohibits any entity from: (1) using a fraudulent device, scheme, or artifice, or making a material misrepresentation or a material omission as to which there is a duty to speak under a Commission-filed tariff, Commission order, rule, or regulation, or engaging in any act, practice, or course of business that operates or would operate as a fraud or deceit upon any entity; (2) with the requisite scienter; (3) in connection with the purchase, sale or transmission of electric energy subject to the jurisdiction of the Commission.[75] Under the Anti-Manipulation Rule, fraud includes, but is not limited to, "any action, transaction, or conspiracy for the purpose of impairing, obstructing, or defeating a well-functioning market."[76]

36. Pursuant to section 316A(b) of the FPA, the Commission may assess a civil penalty of up to $1 million per day, per violation against any person who violates Part II of the FPA (including section 222 of the FPA) or any rule or order thereunder.[77] In determining the amount of a proposed penalty, section 316A(b) requires the Commission to consider "the seriousness of the violation and the efforts of such person to remedy the violation in a timely manner."[78]

37. As discussed below, we find that the Respondents violated section 222(a) of the FPA and section 1c.2 of the Commission's regulations by engaging in fraudulent UTC transactions in the PJM energy market to receive large shares of MLSA payments that otherwise would have been allocated to other market participants.

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[74] 16 U.S.C. § 824v(a) (2012).

[75] 18 C.F.R. § 1c.2 (2014); *Prohibition of Energy Market Manipulation*, Order No. 670, FERC Stats. & Regs. ¶ 31,202, P 38, *reh'g denied*, 114 FERC ¶ 61,300 (2006) (Order No. 670); s*ee also Barclays Bank PLC, et al*., 144 FERC ¶ 61,041 (2013) (*Barclays*).

[76] Order No. 670, FERC Stats. & Regs. ¶ 31,202 at P 50.

[77] 16 U.S.C. § 825o-1(b) (2012). Under section 3 of the FPA, "'person' means an individual or a corporation." *Id.* § 796(4).

[78] *Id.* § 825o-1(b).

A. Findings of Fact – Relevant UTC Trading Conduct

38. Dr. Chen's UTC trading in PJM can be broken into an introductory period in which he learned of the UTC product and three subsequent phases in which he evolved his strategies for trading that product. The introductory period extended from 2005 to 2007 when, as an analyst for Merrill Lynch, Dr. Chen first studied PJM's UTC product.[79] Dr. Chen's studies provided him with an understanding of the use of the UTC trading product as a tool for both physical and financial transactions. For physical transactions, Dr. Chen then realized that the UTC "provides a mechanism to hedge in [the] day-ahead market the price spread between the source node and sink node by specifying the maximum price you are willing to pay for the congestion."[80] For financial transactions, Dr. Chen described UTC products as "[y]ou're just trying to improve day-ahead and real-time price spreads . . . trying to make them converge, and so that the goal is to improve market efficiency."[81] Based on these understandings, Dr. Chen developed a model to forecast conditions under which UTC trading was likely to be profitable.[82] Specifically, Dr. Chen identified the most profitable nodes for both UTC import and export and developed a "similar day" model that enabled him to anticipate prices based on similar historical circumstances.[83] In 2007, Dr. Chen left Merrill Lynch to form his own company, HEEP, which would enable him to trade UTCs.[84]

39. In the first phase of Dr. Chen's UTC trading, extending from September 2007 through October 2009, Dr. Chen actively traded UTC products in PJM based on market fundamentals and the models he developed.[85] Here, Dr. Chen took a careful, low risk approach of what he called "directional bets."[86] Nearly all of his UTC bids in this first phase were under 100 MW, and his trades' profitability depended on favorable price

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[79] Chen Test. Vol. I Tr. 27:13-29:8, 30:15-31:10, 55:24-56:8.

[80] *Id.* at 31:18-21.

[81] *Id.* at 31:14-18.

[82] *Id.* at 28:10-18, 31:2-10.

[83] *Id.* at 73:19-74:20, 74:22-75:5.

[84] *Id.* at 27:21-28:4, 37:4-14, 70:20-71:4.

[85] *Id.* at 73:19-75:5.

[86] *Id.* at 51:3-6; Chen Test. Vol. II Tr. 105:15.

spreads.[87] Dr. Chen during this time also selected what he termed "correlated pairs," which he expected to typically move in similar ways, due to their geographic proximity.[88]

40. It was during this first phase that Dr. Chen met Mr. Gates and began trading UTCs on behalf of TFS, and later Huntrise, pursuant to their Advisory Agreements.[89] Throughout this time, Dr. Chen provided Mr. Gates with daily and monthly trading reports listing the UTC nodes he traded, hours and volumes traded, hourly prices, and other relevant information.[90] Additionally, on one occasion, Dr. Chen met with Mr. Gates (along with one of his partners) to deepen their understanding of UTC transactions and Dr. Chen's strategy in selecting particular nodes for trading.[91]

41. The second phase of Dr. Chen's UTC trading began in October 2009, after Dr. Chen discovered that he had received lucrative MLSA payments, and lasted through May 2010. In October 2009, Dr. Chen learned that his prior UTC transactions became eligible for retroactive MLSA distributions and he told Mr. Gates of this change.[92]

42. During this second phase, as he analyzed retroactive MLSA distributions, Dr. Chen altered his UTC trading strategy away from fundamentals-based spread trading to a strategy designed to capture increased volumes of MLSA payments.[93] In December 2009, Mr. Gates explained to his partners that although Dr. Chen's UTC trades had lost approximately $30,000 in November 2009, retroactive application of the MLSA

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[87] Chen Test. Vol. I Tr. 51:3-6, 78:5-19; Staff Report at 15, n.84.

[88] Staff Report at 15.

[89] *See, e.g.*, POW00000071 (TFS and HEEP execute an Advisory Agreement on May 1, 2008); Chen Test. Vol. I Tr. 39:12-40:2, 41:1-7; POW00000071 (TFS's interest in the Advisory Agreement was succeeded by Huntrise); K. Gates Test. Vol. I Tr. 55:20-56:5; Staff Report at 7 (Chen traded for Huntrise from June 2008 through May 2010).

[90] *See, e.g.*, POW00000488-91; POW0014142-46; POW00013949-53; POW00013998-14003; POW00000557 (K. Gates Test. Vol II Ex. 4).

[91] *See, e.g.*, POW0017336, POW00015175, K. Gates Test. Vol. I Tr. 19:13.

[92] Chen Test. Vol. I Tr. 44:17- 45:24, 90:10-12.

[93] Staff Report at 17; Chen Test. Vol. I Tr. 90:14-91:11, 93:15-18, 94:5-8.

meant that Huntrise would ultimately end up with a gain of over $400,000.[94] Dr. Chen then began to trade to cancel price spread risk and to profit from MLSA payments.[95] To obtain more MLSA payments, Dr. Chen ramped up the volumes of UTC transactions he executed on behalf of HEEP and Huntrise.[96] In addition, he used a new variation of his "correlated pairs" strategy, "which resulted in an internal transaction with nodal prices moving in tandem."[97] Because Dr. Chen's selected nodes had similar price movements, the price spread risk between those nodes was intended to be minimal, thereby shifting the economics more towards the difference between UTC's transactions costs and the MLSA payments.

43. Dr. Chen continued to share his insight about PJM's MLSA payments with Mr. Gates.[98] Based on his analysis, Dr. Chen concluded that MLSA would be much smaller in milder weather, too small to cover the transaction costs incurred in scheduling transmission service. However, MLSA payments would be larger in "the colder winter, hot summer" and that during those months, the MLSA payments would cover all transaction charges.[99]

44. By March of 2010, Dr. Chen told Mr. Gates that he expected to earn more from the MLSA-based strategy, especially given the approach of the summer months.[100] Dr. Chen noted that, prior to January 2010 he did not specifically target MLSA, but in February 2010, he "kicked up a notch to target" MLSA, and by March 2010, he "added

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[94] Email from Kevin Gates to Richard Gates, et al. (Dec. 8, 2009, 09:16:07 PM) (POW00008242).

[95] *See, e.g.*, Email from Alan Chen to Kevin Gates (March 5, 2010, 9:37 PM) (POW00016599) (explaining that in February 2010 he "kicked [it] up a notch targeting for [MLSA]" and that his UTC trades, with MLSA were "suddenly becoming risk-free (almost to the point) trades").

[96] Staff Report at 17 (citing Written Submission to Commission Investigation Staff on Behalf of Dr. Houlian Chen, at 14 (Dec. 13, 2010)).

[97] *Id.*

[98] Staff Report at 16-18; Chen Test. Vol. I 92:3-19.

[99] Chen Test. Vol. I Tr. 94:10-12.

[100] Email from Alan Chen to Kevin Gates (Mar. 5, 2010, 11:28:46 AM) (POW00011676).

some more."[101] He stated that he was "now using about 50% of the TLC ["Transmission Loss Credits" (another term for MLSA)] advantage in March 2010," and wanted to gradually lower it for April and May months and then increase it for the summer months.[102]

45. Both Dr. Chen and Mr. Gates understood the increasing centrality of the role played by the MLSA payments in Dr. Chen's UTC trading during the second phase. Dr. Chen's March 5, 2010 email emphasized that without MLSA, he "would not touch some of the trades . . . [b]ut with TLC as is, they are suddenly becoming risk-free (almost to the point) trades . . . ."[103] In the same communication, Dr. Chen told Mr. Gates that he would "take down a little bit starting tomorrow knowing that we are leaving a lot of money on the table."[104] In response, Mr. Gates directed Dr. Chen not to "take down tomorrow for my sake. I don't want to leave money on the table . . . ."[105] After reviewing Dr. Chen's February 2010 profit and loss report, Mr. Gates said in his email to his colleagues that he wanted to "scale-up and try to become rich."[106]

46. Mr. Gates also understood that Dr. Chen's UTC trades made their money through their transmission volumes not their underlying arbitrage economics. In a later email to Dr. Chen, Mr. Gates described the round-trip UTC trades as the ability to "make money by moving electricity around in a circle."[107] In order to "ramp-up" their participation in this new form of UTC trading and to avoid the potential liability of having to return MLSA payments should PJM decide to return to the days prior to MLSA payments, the

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[101] Email from Alan Chen to Kevin Gates (Mar. 5, 2010, 9:37 PM) (POW00016599).

[102] *Id*.

[103] *Id.*

[104] *Id.*

[105] Email from Kevin Gates to Alan Chen (Mar. 5, 2010, 09:40:46 PM) (POW00016599).

[106] Email from Kevin Gates to Richard Gates et al. (Feb. 26, 2010, 08:20:52 AM) (POW00008242).

[107] Staff Report at 30 (quoting Email from Kevin Gates to Alan Chen (Aug. 12, 2010, 4:18 PM) (POW00004685)).

Gates brothers and other investors created Powhatan in March 2010.[108] Powhatan and Dr. Chen signed another Advisory Agreement, this time requiring Dr. Chen to trade 20 MWs on behalf of Powhatan for every one MW he traded on behalf of HEEP.[109]

47. Finally, the third phase of Dr. Chen's UTC trading, lasting from June 1, 2010 through August 3, 2010, began after an unexpected $176,000 loss Dr. Chen suffered during three hours on May 30, 2010, when one leg of his correlated pair experienced an unexpected price spike.[110] Following this loss, Dr. Chen developed his round-trip UTC trading strategy between the same two points (A-to-B, B-to-A). Round-trip trading would effectively eliminate any risk of losing (or earning) money based on price spreads because the matched trades' price spreads canceled each other out.[111] Dr. Chen's round-trip UTC strategy canceled price spread risk; profits instead came only from collection of MLSA payments, which themselves were now collected in a more effective way than they had been in phase two where some price spread risk was possible if the selected nodes did not move in tandem.

48. This approach proved so profitable that, on July 17, 2010, Dr. Chen formed CU Fund, a new company through which he could pursue this strategy without being bound to any contractual arrangement with Powhatan, thus allowing him to keep all of the proceeds from his trading on behalf of CU Fund for himself.[112] Of more than 2.6 million MWh of UTC transactions that Dr. Chen scheduled on behalf of CU Fund, never was one leg of a paired trade rejected.[113]

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[108] *Id.* at 22, n.128; Email from Kevin Gates to Richard Gates (Mar. 21, 2010, 7:55 AM) (POW00007990) (explaining that if PJM decided to take back the MLSA payments, Dr. Chen "could bankrupt his company so that he doesn't pay us. If so, we'd bankrupt our company and not pay PJM").

[109] *Id.* at 6; Staff Reply at 11.

[110] *See* Written Submission to Commission Investigation Staff on Behalf of Dr. Houlian Chen, at 15 (Dec. 13, 2010).

[111] Staff Report at 24-27.

[112] Chen Test. Vol. I Tr. 41:18-22, Chen Test. Vol. II Tr. 139:9-12, 139:13-19.

[113] Staff Report at 29; Chen Test. Vol. II Tr. 13:6-10.

B. Determination of Violation

1. Fraudulent Device, Scheme or Artifice or Course of Business that Operated as a Fraud

49. Fraud is the first element necessary to establish a violation of the Commission's Anti-Manipulation Rule.[114] Fraud is a question of fact that must be determined based on the particular circumstances of each case.[115] The Commission has explained that, under the Anti-Manipulation Rule, fraud includes, but is not limited to, "any action, transaction, or conspiracy for the purpose of impairing, obstructing, or defeating a well-functioning market."[116] Section 222 of the FPA states that:

> It shall be unlawful for any entity . . . directly or indirectly, to use or employ, in connection with the purchase or sale of electric energy or the purchase or sale of transmission services subject to the jurisdiction of the Commission, any manipulative or deceptive device or contrivance . . . in contravention of such rules and regulations as the Commission may prescribe as necessary or appropriate in the public interest or for the protection of electric ratepayers.[117]

In light of the broad language of section 222 of the FPA, our use of the term "well-functioning market" is not limited just to consideration of price or economically efficient outcomes in a market. Instead, we view the term to also broadly include consideration of "such rules and regulations as the Commission may prescribe as necessary or appropriate,"[118] which necessarily includes the rates, terms, and conditions of service in a market. Here, we find that intentionally subverting the allocation of payments provided by a tariff approved by the Commission constitutes interference with a "well-functioning market."

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[114] Order No. 670, FERC Stats. & Regs. ¶ 31,202 at P 49.

[115] *Id.* P 50.

[116] *Id.*

[117] 16 U.S.C. § 824v (2012); *see generally* 16 U.S.C. §§ 824d, 824e.

[118] *Id.* § 824v.

50. OE Staff alleges that, from June 1, 2010 to August 18, 2010, Respondents engaged in a practice that operated as a fraud or deceit on PJM and PJM market participants and that Respondents' actions constituted a course of business that operated as a fraud, or a fraudulent device, scheme, or artifice, thereby violating FPA section 222 and the Anti-Manipulation Rule.[119]

51. As discussed below, based on the totality of evidence, we find that the Respondents' UTC trading during the Manipulation Period operated as a course of business to defraud and a device, scheme, or artifice to defraud the PJM market and market participants.[120] We find OE Staff's arguments are persuasive. The evidence demonstrates that Respondents placed high-volume round-trip UTC trades without regard to market fundamentals and with the intent to benefit not from the spread on UTC trades but solely from the MLSA payments, and we find those actions to constitute fraud. We also find that Respondents were engaged in wash trading, which the Commission has long recognized as fraudulent conduct. Moreover, we find that the Respondents had notice that the type of trading at issue here is fraudulent and violates FPA section 222 and our Anti-Manipulation Rule.

a. Course of Business to Defraud and Device, Scheme or Artifice to Defraud

i. Respondents' Show Cause Answers

52. Respondents claim that their Manipulation Period UTC transactions were legal, permissible, not fraudulent, and executed for a legitimate economic purpose.[121]

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[119] *See, e.g.*, Staff Report at 37-38; *see generally* Staff Reply *passim*.

[120] While OE Staff alleges that Respondents' actions constituted both a "course of business to defraud" and a scheme to defraud—each in violation of section 222 of the FPA and the Anti-Manipulation Rule—OE Staff's submissions frequently address the acts solely as a scheme. We find both occurred and rely on the same evidence to support each finding.

[121] Chen Answer at 13-29; Powhatan Answer at 4-8, 25-49. Respondents also provide twelve documents attached to the Chen Answer as "Expert Testimony," which are cited to by both the Chen Answer and Powhatan Answer. Chen Answer at 30 and *passim*; Powhatan Answer at 2 and *passim*. Respondents' Answers refer to twelve "expert reports." While we have reviewed those materials, we question the appropriateness of such statements as evidence. We do not find the reports persuasive; throughout this Order, we address various arguments raised therein and explain why they are rejected.

Respondents describe their trades as spread trades,[122] and argue that rather than lacking economic substance, Respondents affirmatively sought to profit from the trades in ways other than the MLSA payments.[123] In this regard, Respondents state that the trades not only had risk and exposure to congestion profit and loss, but that the trades were entered into to potentially profit from congestion revenues, especially should one of the legs of the transaction break (i.e., fail to clear) and hit a "home run."[124]

53. Respondents point out that Dr. Chen sometimes bid $35/MWh, rather than the maximum of $50/MWh, on certain transaction legs. Respondents allege that trading at less than $50/MWh increased the likelihood that the particular bid on one leg would not clear, proving that Respondents sought to expose themselves to risk and profit beyond the MLSA payments.[125] Respondents also state that not all of their Manipulation Period UTC trades were volumetrically-matched and therefore were exposed to risk.[126] Moreover, Respondents note that their UTC trades were especially exposed to congestion outcomes in times of stress such as the "Polar Vortex" of January 2014.[127] Respondents claim that had Dr. Chen's round-trip trades been in place during the 2014 Polar Vortex, at

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[122] Chen Answer at 20-29; Powhatan Answer at 7, 19, 45. *See also* Statement of Professor Larry Harris at 2-3; Affidavit of Stewart Mayhew (November 6, 2013) at 9, 15-17, 26-28.

[123] *See, e.g.*, Chen Answer at 3-8, 20-29; Powhatan Answer at 25-29.

[124] Chen Answer at 4-5; Powhatan Answer at 25-26. *See also* Affidavit of Houlian Chen, at 1-5 (Feb. 2, 2015) (Chen Affidavit) (explaining the "one leg breaking" element of his strategy); Affidavit of Dr. Craig Pirrong, at 8 (Dec. 8, 2010); Affidavit and Appendices of Richard D. Tabors, PhD., at 12 (Oct. 21, 2011). Powhatan describes the "home run" strategy as a "'spread trading' strategy in which [Dr. Chen] hoped to hit it big (or hit a 'home run') if one of the legs of his trades did not clear." Powhatan Answer at 25.

[125] Chen Answer at 23-29; Powhatan Answer at 25-29.

[126] Chen Answer at 16; Powhatan Answer at 33-34.

[127] Polar Vortex refers to the extreme weather conditions experienced in the Northeast Region in January 2014, impacting the wholesale energy markets, including PJM.

least one leg would have broken for each of the five paired nodal combinations he used.[128] Thus, Respondents posit that the possibility of one leg breaking was present.

54. Respondents assert that their UTC trades were not deceptive and that other traders, PJM, and the PJM IMM could see the trades.[129] Moreover, Respondents argue there is no evidence that their trades involved any false statements, active concealment, or explicit tariff violations.[130] In that regard, Respondents argue that their trading is unlike Enron's "Death Star" trades during the Western Energy Crisis.[131] Powhatan reasons that the Death Star trades were deceptive because the California Independent System Operator, Inc. (CAISO) could only see the portion of the scheme that occurred in California, whereas here, Respondents did not hide their transactions, strategy, or intent.[132] Dr. Chen distinguishes his trading from Enron's Death Star trades by noting that his trades did not involve physical flows of power, false schedules, or misrepresentations.[133] Moreover, Dr. Chen likens his UTC trading to the trading in the *Lake Erie Loop Flow* order, in which the Commission found there was no concealment because the transactions were openly placed and there was no deception or manipulation because system operators could see accurate, identifying information regarding the transactions.[134]

55. Respondents also claim that their UTC trades had a legitimate economic purpose to profit, including by the collection of MLSA payments, which they claim were as much a part of the pricing incentive as other information, such as transaction costs and other

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[128] Chen Answer at 7, 24-25.

[129] *See e.g.* Chen Answer at 15, Powhatan Answer at 45 (citing Statements of David Hunger at 4 and Chester S. Spatt at 8).

[130] Chen Answer at 15.

[131] Powhatan Answer at 44-45.

[132] *Id.* at 45.

[133] Chen Answer at 29-30.

[134] *Id.* (citing *New York Indep. Sys. Operator, Inc.*, 128 FERC ¶ 61,049 (*Lake Erie Loop Flow*), App. A, Non-Public Investigation into Allegations of Market Manipulation in Connection with Lake Erie Loop Flows at 21-22 (2009)).

potential profit making opportunities.[135] In that respect, Respondents claim that the Commission previously found that the existence of a pricing incentive suggests a lack of fraudulent intent.[136] Similarly, Respondents assert that the Commission previously determined that offsetting energy transactions entered into for the sole purpose of accruing benefits associated with renewable energy credits did not constitute market manipulation.[137] Respondents also note that, in a separate case, wind generators had an economic incentive to lose money on electricity sales by offering zero or negative bids into their respective markets to capture the wind energy production tax credit. In that instance, Respondents argue the Commission acknowledged that certain resources are incentivized to make negative bids to gain revenue through the credits.[138]

56. Further, Powhatan states that "maybe [Dr Chen] was, maybe [Dr.Chen] wasn't" exploiting a loophole in the PJM Tariff through his trading.[139] Nevertheless, Powhatan argues that exploiting loopholes is a "time-honored tradition," that market participants do the "market and rule makers a service" by exposing inefficiencies, and that a former Acting Director of the Office of Enforcement agrees that exploiting loopholes does not constitute fraud.[140] Dr. Chen disagrees, and concludes that this matter is "not about exploiting a loophole."[141] Respondents all agree, however, that even if they were exploiting a loophole, such behavior is neither fraudulent nor illegal.[142]

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[135] *Id.* at 16-19, 33; Powhatan Answer at 3, 4-8, 28-29, 31-32, 37-38; Electricity Market Design Flaws and Market Manipulation, William W. Hogan, at 8 (Feb. 3, 2014); Report of Chester S. Spatt (Nov. 4, 2013); Chen Answer at 16-17, 33.

[136] Powhatan Answer at 31 (citing *Lake Erie Loop Flow*, 128 FERC ¶ 61,049, App. A at 21-22 at 22, 24).

[137] *Id.* at 32 (citing *Idaho Wind Partners 1, LLC*, 134 FERC ¶ 61,217, at PP 6, 24 (2011) (*Idaho Wind*)).

[138] *Id.* at 32 (citing *Midwest Indep. Transmission Sys. Operator, Inc.*, 134 FERC ¶ 61,141, at P 83 (2011)).

[139] *Id.* at 4.

[140] *Id.* at 5-7.

[141] Chen Answer at 43.

[142] *Id.* at 8-9, 34-35; Powhatan Answer at 3-8.

57. Finally, Respondents contend that their trades caused no harm.[143] Specifically, the Respondents argue that no entity is entitled to any particular share of the MLSA payments.[144]

ii. OE Staff Report and Reply

58. OE Staff alleges that Respondents manipulated Commission-regulated markets by implementing a strategy of placing high-volume, volumetrically-matched, round-trip UTC trades for no purpose other than to receive MLSA payments, without regard to the relationship between supply and demand fundamentals, and not for the purpose of arbitraging price spreads for profit.[145] OE Staff alleges this UTC trading was done at the expense of other market participants.[146]

59. OE Staff avers that Dr. Chen, trading on behalf of Powhatan, HEEP and, later, CU Fund, conceived of a fraudulent scheme in connection with PJM's UTC product and that he communicated the details of that scheme to Powhatan's principals. In addition, OE Staff alleges that Powhatan's principals knowingly encouraged and approved of Dr. Chen's trading and increased their stake in the scheme by increasing the volume of trades Dr. Chen was obligated to trade on Powhatan's behalf.[147]

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[143] Chen Answer at 67; Powhatan Answer at 47-48. Respondents "incorporate by reference" prior submissions into their Answers to the Order to Show Cause. *See* Chen Answer at 11 n.21; Powhatan Answer at 3 n.2. The Commission addressed this practice again recently. *Barclays*, 144 FERC ¶ 61,041 at n.63. We have made clear that arguments not explicitly set forth in Respondents' Answers are not "salvaged" by the "incorporation by reference" of arguments and evidence from prior submissions. *Id.* Our precedent is clear and we will follow that precedent here: "to the extent [Respondent] simply claims to incorporate such defenses by general reference, we may properly exercise our discretion to decline to consider these additional arguments." *Barclays*, 144 FERC ¶ 61,041 at n.63.

[144] Powhatan Answer at 18.

[145] Staff Report at 36-74; Staff Reply at 56.

[146] Staff Report at 12-46; Staff Reply at 56.

[147] Staff Report at 22, 25-26, 28; Staff Reply at 10-11. Dr. Chen's solely-controlled HEEP and CU Fund also were aware of and supported the strategy.

60. OE Staff notes that Respondents' round-trip UTC trading evolved and differed from the UTC trading strategy Respondents engaged in during earlier timeframes.[148] Respondents' UTC trading strategy exhibited its first marked change after October 2009, when Dr. Chen and TFS/Huntrise's principals discovered they were receiving MLSA payments and began developing a scheme to access those payments to their benefit. OE Staff charges that Respondents developed the round-trip UTC trading strategy in direct response to large losses that their non-round-trip UTC trades incurred on May 30, 2010. OE Staff alleges that Respondents' round-trip trading scheme was "as far from the [d]ay-[a]head/[r]eal-[t]ime price arbitrage as one could go."[149]

61. In short, OE Staff states that the UTC trades themselves were uneconomic, lacked economic substance and were placed to garner MLSA payments. OE Staff notes that Dr. Chen sometimes placed directional, one-way bets in addition to and on the same path as one leg of the volumetrically matched, round-trip UTC trades.[150] OE Staff explains that to the "extent that Respondents trades took 'a significant directional bet,' staff has not included those trades in calculating harm, penalties, or disgorgement."[151]

62. OE Staff argues that there is no contemporaneous evidence to support Respondents' defense of a "home run" strategy, as there is no indication that Respondents intended to make trades premised on the economics of legs failing to clear.[152] OE Staff further argues that Respondents' reliance on the Polar Vortex to support the existence of a risk is inapposite because Respondents' trading occurred four years before the Polar Vortex.[153] OE Staff states there is no evidence that Dr. Chen had any expectation that what happened four year later during the 2014 Polar Vortex would occur in his 2010 summer trading.[154]

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[148] Staff Report at 17; Staff Reply at 10-11. Prior to Powhatan's establishment in March 2010, Powhatan's principals/investors traded through TFS and Huntrise.

[149] Staff Report at 24.

[150] Staff Reply at 13 n.25, 43.

[151] *Id.* at 13 n.25

[152] *Id.* at 53, 56.

[153] *See, e.g.*, Staff Reply at 22.

[154] Staff Reply at 22.

63. OE Staff further argues that profitability alone "does not inoculate trading from any potential manipulation claim,"[155] but that any profits Respondents earned resulted only from the MLSA payments. Staff avers that, rather than a valid measure of profitability, this represents the benefit from engaging in manipulative trades.[156] Moreover, OE Staff argues that Respondents' reliance on *Idaho Wind* is inapposite because the petitioners in that matter requested Commission approval prior to taking any action.[157]

64. OE Staff also argues that Respondents' round-trip UTC trading scheme was similar to Enron's Death Star, and that Respondents fail to distinguish their scheme in any meaningful way.[158] OE Staff asserts that Death Star was a circular scheduling strategy in which traders made money by moving electricity in a circle from A-B/B-A, resulting in no net position and no possibility for profit or loss from market prices. OE Staff avers that the Death Star strategy was profitable so long as the amount of credits received exceeded the cost of scheduling the transactions. OE Staff argues that Respondents similarly engaged in round-trip UTC trading from A-B/B-A that resulted in no net position and, thus, no possibility for profit or loss from market prices. The Respondents' strategy was profitable so long as the MLSA payments exceeded transaction costs.[159] OE Staff avers that in the current and Death Star matters, the trades were presented in a manner that appeared legitimate but instead disguised the transactions' true purpose. OE Staff further states that both the current and Death Star matters involved trading offsetting pairs to capture revenue without providing the corresponding benefit to the market.[160] Further, OE Staff rejects Respondents' argument that the Commission effectively reversed its condemnation of Death Star in the *Lake Erie Loop Flow* order. OE Staff argues that in *Lake Erie Loop Flow*, the market participants

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[155] Staff Report at 54 (quoting *Deutsche Bank Energy Trading, LLC*, 142 FERC ¶ 61,056, at P 20 (2013); other citations omitted).

[156] *Id.*

[157] Staff Reply at 40.

[158] Staff Report at 47-48; Staff Reply at 31-37.

[159] Staff Reply at 32.

[160] Staff Report at 48-49; Staff Reply at 33-34.

made spread trades based on the differences in price at different locations whereas here Respondents attempted to eliminate exposure to price differences.[161]

65. OE Staff further alleges that Respondents' trades were sham trades placed to appear as if they were legitimate spread trades.[162] OE Staff states that, contrary to the purpose of legitimate UTC spread trades, Respondents' round-trip trades neither hedged physical transactions nor promoted market efficiency by converging day-ahead and real-time prices.[163] OE Staff also states that Respondents knew that their trades provided the market with none of the benefits of arbitrage.[164] Instead, OE Staff avers that the "massive volume of sham trades" were placed to "lay a claim to" the MLSA payments without incurring the risk of spread trading.[165]

66. OE Staff rejects Respondents' suggestion in testimony and emails that trading to benefit from MLSA payments amounted to simply exploiting a loophole in the PJM Tariff.[166] OE Staff argues that Respondents misconstrue the relationship between market rules, like tariffs, and the Commission's anti-manipulation authority and the precedent arising from that authority.[167] OE Staff notes that the Commission need not decide whether it is permissible to exploit something characterized as a loophole, because it is a violation of the Commission's Anti-Manipulation Rule to "place what falsely appear to be spread trades to collect money that would otherwise go to other market participants doing real trades."[168]

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[161] Staff Reply at 37(citing *New York Indep. Sys. Operator, Inc.*, 128 FERC ¶ 61,049, at 61,256 (2009), *order granting clarification*, 128 FERC ¶ 61,239, *order on compliance*, 132 FERC ¶ 61,031 (2010)).

[162] *Id.* at 2.

[163] Staff Report at 2.

[164] Staff Reply at 2.

[165] *Id.* at 1.

[166] *See, e.g.*, Staff Report at 21, 27, 32, 77, nn.354, 367.

[167] Staff Reply at 50.

[168] *Id.* at 51.

67. On the issue of harm, OE Staff avers that Respondents' round-trip trades impaired, obstructed, and defeated a well-functioning market.[169] Specifically, OE Staff alleges that, as a consequence of Respondents' increased trading volume to garner more MLSA payments, Respondents also reserved "huge volumes of transmission capacity."[170] OE Staff notes that during the Manipulation Period, Respondents reserved 10 percent of all the reserved transmission capacity in PJM and by "hoarding" that transmission Respondents prevented other market participants from using the transmission for legitimate purposes to enter into real physical and arbitrage-based trades.[171]

68. OE Staff also avers that by collecting MLSA payments related to their illegitimate trades, Respondents impaired the market and took those funds from other PJM market participants who, but for Respondents' fraud, would have received larger shares of the MLSA payments. OE Staff emphasizes that the Respondents' conduct led to over $10 million in harm.[172] OE Staff provides additional information from PJM which demonstrated that:

> [H]arm from [Respondents'] trading was both widely distributed throughout PJM and significantly concentrated on certain load-serving entities. In fact, while hundreds of market participants were affected in some way, more than 20 market participants were deprived by [Respondents'] round-trip UTC trades of more than $100,000 each and four lost more than $500,000 each, including PECO Energy Company ($569,976), Commonwealth Edison Company ($656,933), Dominion Virginia Power (LSE) ($1,147,087) and Appalachian Power Company (AEP Generation) ($1,450,972).[173]

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[169] *Id.* at 1-2.

[170] Staff Report at 29.

[171] Staff Reply at 2, 45, 66 n.215 (citing Picard Test. Tr. 84:20-88:32).

[172] Staff Report at 2, 32, 81.

[173] OE Staff's Answer to Respondents' Request for Extension of Time, at 9 (filed January 29, 2015). OE Staff filed a corrected version of this material on February 2, 2015.

iii. Commission Determination

69. We find, based on the totality of evidence presented, that Respondents engaged in a course of business to defraud and a device, scheme, or artifice to defraud the PJM Market. As discussed in greater detail below, we find that: (i) Respondents' arguments are not persuasive; and (ii) OE Staff's allegations provide sufficient evidence that Respondents' actions violated section 222 of the FPA and the Anti-Manipulation Rule. The evidence demonstrates that Respondents engaged in round-trip UTC transactions not for hedging or arbitraging price spreads but instead to receive large shares of MLSA payments that otherwise would have been allocated to other market participants. This manipulative conduct had widespread effects because of Respondents' high volumes of round-trip UTC trades. PJM advised OE Staff that for the month of July 2010, the hourly UTC transaction requests for HEEP, Powhatan, and CU Fund were almost 9 million MWh.[174] Respondents neither dispute that they executed their round-trip trades during the Manipulation Period to collect MLSA payments, nor do they claim that they would have entered into the trades without the MLSA payments.[175]

(a) Communications, testimony, and other evidence demonstrate the existence of a scheme to defraud

70. We find that communications, testimony and other evidence demonstrate that Respondents did not engage in UTC trading for the arbitrage and convergence purposes, but instead to maximize MLSA payments that, but for their trades, would have gone to other market participants. For example, Dr. Chen explained to Mr. Gates "[o]n 5/30 we lost a lot of money on the one pair of trades and I tried to find a better hedged paired [sic] of trades. That's when I thought of using fully hedged paired trades."[176] Mr. Gates

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[174] PJM's Jan.11, 2011 Response to Office of Enforcement's Second Data Request to PJM, Response No. 6.

[175] Staff Reply at 4. In fact, Dr. Chen told Mr. Gates in March 2010, that "[w]ithout [MLSA], I would not touch some of the trades and/or would not put in large volumes for some of the trades. But with [MLSA] as is, they are suddenly becoming risk-free (almost to the point) trades." Email from Alan Chen to Kevin Gates (March 5, 2010, 9:37 PM) (POW00016599).

[176] *See* Email from Alan Chen to Kevin Gates (Aug. 24, 2010, 06:20:38 PM) (POW00004874).

understood and supported Dr. Chen's actions and strategy.[177] He testified that "I remember [Dr. Chen] saying . . . very early on during Powhatan's trading, that he was very clearly trying to eliminate that [congestion spread], and he was going from A to B-B to A."[178] Mr. Gates further testified that, with the round-trip trading strategy, Dr. Chen "was trying to remove the day-ahead/real-time spread" and the strategy was akin to a "monkey . . . throwing darts."[179] Thus, together, the Respondents understood that trading A-B/B-A would necessarily result in no profits on the spread—in fact, Mr. Gates recognized, when transaction costs were taken into account "[y]ou were going to absolutely lose money on that trade."[180]

71. We find Respondents also knew their trades were profitable only due to MLSA payments. For example, during the Manipulation Period, Dr. Chen informed Mr. Gates that "we are losing quite a bit of money and for the whole day it is probably approaching -$60k. But we are still making more than $40K up to date (due to the updated TLC [MLSA] data of 6/2: making $63 instead of losing $56,742). I think optimistically we could have made more than $100K once the TLC data are published."[181] Two days later, Mr. Gates informed his partners that "I think that everyone should expect to have the ability to double their investment in Powhatan."[182]

72. These communications and testimony show that Respondents understood that their round-trip UTC trades had little price risk by design, were not undertaken to arbitrage price spreads, were certain themselves to lose money, and were placed only to create the illusion of volume trading to obtain transmission and thereby earn MLSA payments that otherwise would have gone to other market participants. Dr. Chen's description of his trades to Mr. Gates as "fully hedged paired trades" demonstrates that Respondents

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[177] As a primary owner of Powhatan, Mr. Gates' statements and communications may be ascribed to Respondent Powhatan.

[178] K. Gates Test. Vol. II Tr. 178:12-15. These communications similarly provide evidence of scienter. *See* discussion *infra* PP 128-140.

[179] K. Gates Test. Vol. II Tr. 216:13-217:3, 309:20-21.

[180] *Id.* 175:2-4.

[181] Email from Alan Chen to Kevin Gates (June 7, 2010, 9:57 PM) (POW00003761).

[182] Email from Kevin Gates to Richard Gates, et al. (June 9, 2010, 03:04:45 PM) (POW00004350).

intended their strategy to be as risk free as energy trading could get: the trades in Dr. Chen's estimation were not only "fully hedged," but represented opposite sides of the same spread, or "paired trades." By engaging in a real "hedged" strategy, Dr. Chen could have provided Respondents some protection against price risk. However, by employing what he termed a "paired" strategy, Dr. Chen eliminated as much price risk as possible—short of not trading at all. We also find unavailing Respondents' argument that Dr. Chen affirmatively sought risk on these round-trip trades and economically wanted to hit a "home run" through one leg breaking.[183] The contemporaneous communications, and the other evidence in this proceeding, do not bear this out. In fact, we conclude he sought the opposite result as we explain further below.

73. We similarly reject Dr. Chen's view that Respondents' trades are nothing more than "ubiquitous" acts by market participants to "hedge congestion risks. . . ."[184] Respondents' trades were not a hedge; the trades were a nullity. By immediately nullifying the A-B path with a B-A path, there was no transaction left to hedge. Essentially, Dr. Chen argues that Respondents' trades "hedged" the underlying trade by completely reversing the risk in the underlying trade with a trade of the exact same product, at the exact same time, in the exact same volume, all in the opposite direction. Such trades are inconsistent with any definition of a "hedge." They are, however, consistent with the definition of a "wash trade" in our markets.[185]

(b) <u>Pattern: the difference between trades before and after MLSA payments</u>

74. We find Respondents' UTC trading pattern before they became aware of the MLSA payments was decidedly different from their UTC trading pattern after they became aware of those payments.[186] In short, Dr. Chen moved from arbitraging price

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[183] *See* Chen Answer at 4-7, 16, 20-21 n.47, 22, 25, 50 (referring to possibility of a leg breaking); Powhatan Answer at 25-27 (citing Expert Reports).

[184] Chen Answer at 3. Dr. Chen asserts: "[w]e do not know of any prior case in which the Commission has said that it is problematic – not to mention fraud-based market manipulation – to reduce or eliminate exposure to congestion gains and losses in RTO day-ahead and real-time markets." *Id.*

[185] *See* discussion *infra* PP 103-107.

[186] *See* Staff Report at 15, 17-18; Chen Test. Vol. I Tr. 51:3-6, 73:19-75:5; Email from Alan Chen to Kevin Gates (March 5, 2010, 9:37 PM) (POW00016599) (explaining that in February 2010 he "kicked [it] up a notch targeting for [MLSA]" and that his UTC trades, with MLSA were "suddenly becoming risk-free (almost to the point) trades");

(continued...)

spreads toward risk-free UTC trading whose purpose was to maximize MLSA payments through high-volume round-trip UTC trading.

75. During Dr. Chen's introductory period, he learned that the purpose of the UTC product as a financial transaction is to "improve the day-ahead and real-time price spreads . . . trying to make them converge, and so that the goal is to improve market efficiency."[187] From 2007 to 2009, during his first phase of trading, Dr. Chen based his trading on market fundamentals, using historical spreads and historical similar day models. Dr. Chen took a careful, low risk approach, bidding in small volumes under 100 MW, and his profitability depended on favorable changes in congestion price between the day-ahead and real-time markets. However, Dr. Chen abandoned this strategy after discovering the MLSA payments. He then in his second phase of UTC trading sought to cancel price spread risk and profit solely from MLSA payments, which he ultimately perfected as his round-trip trading scheme in his phase three strategy.[188] This pattern of trading demonstrates that, with increasing trading experience, Respondents honed their scheme to defraud PJM and PJM's market participants. This pattern further supports our conclusion of fraud in this matter.[189]

(c) <u>Respondents' round-trip UTC trades were uneconomic and contrary to market design purpose</u>

76. We also find that Respondents' round-trip UTC trades were routinely uneconomic and contrary to the market design purposes for which PJM offered the UTC product. Specifically, we find that not only were Respondents' round-trip UTC trades routinely unprofitable when measured from a price arbitrage perspective, but the evidence demonstrates that Respondents expected no more from them.[190] This lack of profit from

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Written Submission to Commission Investigation Staff on Behalf of Dr. Houlian Chen, at 14 (Dec. 13, 2010).

[187] Chen Test. Vol. I Tr. 31:14-18; *see also* discussion *supra* P 38.

[188] *See, e.g.*, K. Gates Test. Vol. II Tr. 178:12-15; Chen Test. Vol. I Tr. 66:9-15; Chen Test. Vol. II Tr. 94:10-11.

[189] *See Barclays*, 144 FERC ¶ 61,041 at PP 7, 32, 38-41, 60, n.152.

[190] *See* K. Gates Test. Vol. II Tr. 175:2-4; Email from Alan Chen to Kevin Gates (June 7, 2010, 9:57 PM) (POW00003761). We understand that Respondents argue that they were attempting to profit from the actual trading (irrespective of the MLSA) or that the round-trip trades were risky enough to expose them to potential profits if one of the

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economic fundamentals was an anticipated by-product of Respondents' risk-canceling, round-trip trading. Further, Respondents were required to purchase transmission service to effectuate their UTC trades and be eligible for MLSA. As a result, the profit and loss calculation associated with such round-trip UTC trades, absent MLSA payments, necessarily resulted in a net loss to Respondents. We agree with the underlying PJM IMM's referral that these trades had "no fundamental economic rationale or value."[191]

77. The Commission has previously noted that while "profitability is not determinative on the question of manipulation and does not inoculate trading from any potential manipulation claim,"[192] it "is an indicium to be considered among the overall facts that the Commission examines when considering a potential violation of its Anti-Manipulation Rule, but standing alone it is neither necessary nor dispositive."[193] Here, Respondents' underlying round-trip UTC trading (i.e., from the spread product, not the MLSA payment) was consistently and purposefully uneconomic which supports the conclusion that a course of business and a scheme to defraud existed.[194]

78. While Respondents argue that the round-trip trades were profitable, we find they only became profitable because of the MLSA payments. That the MLSA payments were not, and should not be considered, part of the underlying UTC trade is clear: UTCs were created as a tool for hedging congestion price risk associated with physical transactions,[195] and later became a way for market participants to profit by arbitraging the

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legs of the trades "broke." Chen Answer at 4-7, 16, 20-21 n.47, 22, 25, 50 (referring to the possibility of a leg breaking); Powhatan Answer at 25-27. As we set forth below, this argument is inconsistent with communications contemporaneous to the strategy and its development and with other evidence. *See* discussion *infra* PP 86-93.

[191] IMM Referral at 3.

[192] *Deutsche Bank Energy Trading, LLC*, 142 FERC ¶ 61,056 at P 20.

[193] *Barclays*, 144 FERC ¶ 61,041 at P 43.

[194] As Dr. Chen explained to Mr. Gates, "[t]he volumes have been increasing pretty significantly, but the risks associated with the trades are actually lower than before. . . . Without [MLSA], the transaction costs would absorb them and deem them unprofitable." Email from Alan Chen to Kevin Gates (March 5, 2010, 8:52 PM) (POW00012123).

[195] *PJM Interconnection, L.L.C.*, 144 FERC ¶ 61,121 at P 3; *see also Calif. Indep. Sys. Operator Corp.*, 143 FERC ¶ 61,087, at P 6 (2013) (noting that market participants can use virtual transactions to "hedge financial expectations").

price differences between two nodes in the day-ahead and real-time markets.[196] Dr. Chen recognized this early on in his career. He understood that for financial transactions, the purpose of the UTC product is to ". . . . improve day-ahead and real-time price spreads. You're actually trying to make them converge, and so that the goal is to improve market efficiency."[197]

79. We find that Mr. Gates similarly understood that financial UTC transactions were traded based on market fundamentals and market views of the spread between day-ahead and real-time prices. He testified, for example, that before Dr. Chen learned of his eligibility for MLSA payments, Dr. Chen traded UTCs based on his "ability to model congestion [and] his ability to model the day-ahead versus the real-time spread."[198]

80. Respondents' trades were neither consistent with how the UTC product historically traded nor aligned with the arbitrage purpose of those trades. Respondents' round-trip UTC trades did not "converge" the day-ahead and real-time spreads and, applying Dr. Chen's logic, did not "improve market efficiency." Moreover, we conclude that the UTC products' history and purpose demonstrate that engaging in round-trip UTC trades with the MLSA payments as the sole or primary price signal is improper. Speculative UTC trades placed to arbitrage price spreads will have as their sole or primary price signal the price risk of the underlying UTC spread and will be placed with the purpose of profiting based on the direction of the spread. Yet, despite the market purpose behind UTCs and despite Dr. Chen's and Mr. Gates' articulated understanding of that purpose,[199] Respondents engaged in round-trip UTC trades that had no relationship to this purpose.

81. We reject Powhatan's reliance on prior Commission orders to claim that any profit-driven actions in response to pricing incentives are not fraudulent. Those orders are distinguishable and involved trading behavior that differed significantly from Respondents' conduct. The *Lake Erie Loop Flow* matter involved responses to price signals, created by market fundamentals that indicated that it was cheaper to schedule energy to flow clockwise around Lake Erie than to flow it in the more direct, counterclockwise path. Those transactions were executed to lower market participants'

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[196] S*ee PJM Interconnection, L.L.C.*, 144 FERC ¶ 61,121 at P 19.

[197] Chen Test. Vol. I Tr. 31:14-18.

[198] K. Gates Test. Vol. II Tr. 172:25-173:2.

[199] *See, e.g.,* Chen Test. Vol. I Tr. 31:14-18; K. Gates Test. Vol. II Tr. 172:25-173:2.

costs based on market fundamentals for transactions they already sought to engage in, and were not "created by any intentional actions of market participants to obstruct an otherwise well-functioning market."[200] That differs significantly from Dr. Chen's risk-free round-trip UTC trades, which were devoid of independent economic substance and designed solely to capture MLSA payments.

82. The *Idaho Wind* case cited by Respondents is also distinguishable on several grounds. *Idaho Wind* involved (1) a bundled sale of energy and renewable energy credits (RECs) from eleven wind Qualifying Facilities (QFs) to a third party at market-based rates; (2) the QFs' instantaneous buy-back of only the energy (i.e., the same electric energy generated by the QFs but stripped of their RECs) pursuant to market-based rate authority at the same delivery point and same price; and (3) the subsequent sale of the QF output to Idaho Power pursuant to the Public Utility Regulatory Policies Act of 1978 (PURPA) mandatory purchase obligation at the avoided cost rate authorized by the Idaho Public Utilities Commission. The Commission stated explicitly that its conclusion was "based upon the facts presented and representations by Idaho Wind. . . . Any different or additional facts might lead us to a different determination."[201] First, *Idaho Wind* did not involve trading of virtual transactions in an RTO market. Second, the transaction involved entities (the QFs) that already possessed the benefit in question (the RECs) who were trying to sell that benefit. Idaho Wind did not have to engage in uneconomic trading designed to access the "benefit" like Respondents did. Finally, Idaho Wind sought declaratory judgment from the Commission before engaging in any transaction, which the Commission concluded: "suggest[s] that there is neither a fraudulent scheme nor scienter."[202] Nothing in the record before us here suggests that the comparison of the case to this proceeding is apt, or that Respondents consulted the Commission before engaging in the trading at issue.

83. Powhatan's reliance on *Midwest Independent Transmission Operator, Inc.* is similarly misplaced.[203] Powhatan claims that "[t]he Commission has acknowledged that certain resources are incentivized to make negative bids in order to gain revenue via [production tax credits] and has never suggested there is anything fraudulent about this

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[200] *Lake Erie Loop Flow*, 128 FERC ¶ 61,049, App. A at 26.

[201] *Idaho Wind*, 134 FERC ¶ 61,217 at P 25.

[202] *Id.* P 24.

[203] Powhatan Answer at 32 (citing *Midwest Indep. Transmission Sys. Operator, Inc.*, 134 FERC ¶ 61,141, at P 83 (2011)).

practice."[204] Powhatan is mistaken. In the MISO matter, the Commission ordered that resources should be settled in a manner that prohibited the creation of such an incentive through settlement at a different dollar value. Specifically, we found that it was appropriate for Dispatchable Intermittent Resources to be settled at the lower of the resource's offer price or the market price "even in the event that such resources submit negative offer prices."[205] We reasoned: "[s]ince any such negative offer prices would reflect the resources marginal cost for producing energy, settling excessive energy credits at $0 or at a non-negative market price instead of the resources negative offer prices would provide an incentive for Dispatchable Intermittent Resources to overproduce and gain revenues in excess of their marginal costs (e.g., via production tax credits)."[206]

84. We also reject Powhatan's argument that it did not engage in fraud because it had a legitimate economic purpose for its trades.[207] Here, the legitimate "economic" purpose Powhatan asserts is "profiting from each of the trades, which included the collection of transmission loss credits."[208] As we explained above, these trades were routinely uneconomic, and the idea that Respondents intended to hit a "home run" or profit from the trades in any way except from the MLSA payments is inconsistent with contemporaneous communications, testimony, and other evidence.[209]

85. Moreover, even if the notion that Respondents wanted to earn profits from the trades themselves (beyond earning MLSA payments) was supported by the evidence, and even if such statement was enough to substantiate a "legitimate business purpose" (which it is not), when promulgating the Anti-Manipulation Rule the Commission "rejected

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[204] *Id.* at 32.

[205] *Midwest Indep. Transmission Sys. Operator, Inc*., 134 FERC ¶ 61,141 at P 83.

[206] *Id.* Of course, such an argument – i.e., essentially, earning a profit is in and of itself a legitimate economic purpose, and the round-trip UTC trades and the associated MLSA payments at issue here were undertaken to earn a profit – would, if accepted, justify any and all fraud because fraud is almost invariably undertaken to make money.

[207] Powhatan Answer at 31.

[208] *Id.*

[209] *See* discussion *infra* PP 86-93.

'calls for inclusion of a 'legitimate business purpose' affirmative defense.'"[210] The Commission explained that:

> [T]he reasons given by an entity for its actions are part of the overall facts and circumstances that will be weighed in deciding whether a violation of the anti-manipulation regulation has occurred. Consequently, an entity's business purposes will be relevant to an inquiry into manipulative intent, but a "legitimate business purpose" is not an affirmative defense to manipulation. And that is true here.[211]

We therefore reject Respondents' argument.

(d) <u>Respondents had no "home run" strategy</u>

86. Respondents argue that their round-trip trades were part of a trading strategy under which Dr. Chen hoped to "hit it big (or hit a home run)."[212] In essence, Respondents' argument is that their round-trip UTC trades were exposed to substantial risk because at any time one leg of the two-leg trade might not clear (i.e., leg A-B might clear where leg B-A did not). Respondents aver that this would "expose Dr. Chen and

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[210] *Barclays*, 144 FERC ¶ 61,041 at P 61 (quoting *Investigation of Terms and Conditions of Public Utility Market-Based Rate Authorizations*, 114 FERC ¶ 61,165, at P 29 (2006)).

[211] *Id.* (quoting *Investigation of Terms and Conditions of Public Utility Market-Based Rate Authorizations*, 114 FERC ¶ 61,165 at P 29). The Commission also takes this opportunity to note that Powhatan is mistaken in its statement that the Commission "*must* look to 10b-5 precedent" when applying its Anti-Manipulation Rule. Powhatan Answer at 34-35 (emphasis added). As noted in Order No. 670, the Commission explained that it would apply specific securities law precedent on a case-by-case basis as appropriate under the specific facts, circumstances and situations in the energy industry. Order No. 670, FERC Stats. & Regs. ¶ 31,202 at PP 31, 42; *see also Barclays*, 144 FERC ¶ 61,041 at P 58. As we explained in *Barclays*, "The energy industry is not in all ways equivalent to the securities industry. Moreover, as we discuss below, our statutory mandate, unlike that of the SEC, is to ensure that rates for jurisdictional transactions are just and reasonable." *Barclays*, 144 FERC ¶ 61,041 at P 58.

[212] *See, e.g.*, Powhatan Answer at 25-27; Chen Answer at 4-7, 16, 20-21 n.47, 22, 25, 50 (referring to the possibility of a leg breaking, which is the same as the home run strategy).

Powhatan to a greater possibility of profit (as well as a corresponding greater risk of loss)."[213]

87. To illustrate his argument, Dr. Chen points to what would have happened to Respondents' spreads during the Polar Vortex.[214] He argues that "if [Dr. Chen's] A to B-B to A trades had been in place during the Polar Vortex in January 2014, one leg would have broken for each of the five paired nodal combinations he used, in a total of between 90 to 170 hours, depending on the ceiling price used, creating considerable profit."[215] Moreover, Powhatan argues that Dr. Chen sometimes bid $35/MWh on a leg, instead of the congestion limit of $50/MWh, stating that Dr. Chen would have always bid at the maximum congestion limit if he wanted both legs to clear.[216]

88. We reject each of these arguments as fundamentally flawed. First, we conclude that Respondents' suggestion that they sought to benefit from a "home run" or a "leg breaking" is an after-the-fact rationale, inconsistent with contemporaneous communications.[217] The evidence indicates that as Respondents developed their scheme and ultimately developed their round-trip strategy, they repeatedly discussed their desire to avoid risk.[218] And Dr. Chen affirmed in testimony that he selected the legs he did to

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[213] Powhatan Answer at 26.

[214] Chen Answer at 7, 16.

[215] *Id.* at 7 (citations omitted).

[216] Powhatan Answer at 25-26; *see also* Chen Answer at 4-5 (citation omitted).

[217] As Respondents recognize, no "home run" occurred during the Manipulation Period. Chen Answer at 18. Moreover, we reject Respondents' explanation that no contemporaneous communications exist concerning the "home run" strategy because Dr. Chen did not share every detail about his trading strategies with Mr. Gates. Chen Answer at 24 n.55; Chen Affidavit at ¶ 20; Powhatan Answer at 26 n.7. This explanation ignores evidence that demonstrates that the "home run" strategy did not exist, including: (i) Respondents' trading was completely inconsistent with a "home run" strategy; and (ii) that, inconsistent with a "home run" strategy, Mr. Gates understood that Dr. Chen's trades sought to reduce risk. *See* discussion *supra* PP 70-72. Thus, we are persuaded that the Respondents had no "home run" strategy and that they knowingly executed the round-trip UTC trades to receive MLSA payment. *See* discussion *infra* PP 86-93; *see also* Staff Reply at 26-27.

[218] For example, Respondents discussed that: (i) the "risk is very limited" Email from Alan Chen to Kevin Gates (July 22, 2008, 1:31 PM) (POW00008996); (ii) with the

(continued...)

minimize the risk that one of the legs would not clear.[219] Dr. Chen stated that his goal was not to have a leg rejected, noting that it could possibly be rejected but that he is "not really trying to asking [sic] for it."[220] Rather, he states that he was trying to reduce the risk of the possibility that a leg would be rejected.[221] We find this evidence is inconsistent with a "home run" strategy.

89. We do not find credible Dr. Chen's October 2010 testimony suggesting he earlier took into account the potential of earning profits from a leg breaking.[222] That testimony occurred after the trading at issue and after Dr. Chen had been contacted by both the IMM and OE Staff questioning his trades. The contemporaneous evidence from spring and summer 2010 makes no reference to a "leg-breaking" or "home run" strategy. Moreover, this October 2010 testimony is inconsistent with Dr. Chen's other testimony where he states his goal was to minimize a leg break. Finally, even if we believed that Dr. Chen did at some point consider the potential for profit from a leg breaking as an ancillary goal of his round trip trades, which we do not, we would still conclude that the primary and overwhelming reason he conceived of and entered into the round-trip UTC trades was to eliminate all other profits and risks and instead to earn MLSA payments.

90. Mr. Gates' testimony further contradicts the "home run" theory. He recalls that Dr. Chen considered the failure of a leg to be a risk of the round-trip strategy that could not be completely eliminated, and he understood that failure to be catastrophic.[223] Mr. Gates stated that it was something that he was "very concerned with," a "risk that . . .

MLSA payments the trades "are suddenly becoming risk free (almost to the point)" Email from Alan Chen to Kevin Gates (March 5, 2010, 9:37 PM) (POW00016599); (iii) even with the increased volume in trading "the risks associated with the trades overall are actually lower than before" Email from Alan Chen to Kevin Gates (March 5, 2010, 8:52 PM) (POW00012123); and (iv) in searching for a way to avoid another loss like that of May 30, 2010, Dr. Chen "tried to find a better hedged paired [sic] of trades. That's when I thought of using fully hedged paired trades." Email from Alan to Kevin Gates (August 24, 2010, 06:20:38 PM) (POW00004874).

[219] Chen Test. Vol. I Tr. 65:1-4; Chen Test. Vol. II Tr. 66:10-22.

[220] Chen Test. Vol. II Tr. 61:18-62:1 (objection omitted).

[221] *Id.* 66: 2-12.

[222] Chen Affidavit at 13-21.

[223] Powhatan Supplemental Response to Data Request #10 (Dec. 17, 2010).

would [keep] me up at night."[224] The evidence shows that Dr. Chen performed analyses concerning the historical performance of "all the combinations" of UTC paths[225] and that Mr. Gates understood Dr. Chen to have developed a model to determine the MLSA payments.[226] Yet, there is no record evidence that he even analyzed this alleged "home run" strategy.

91. Moreover, Dr. Chen's attempts to avoid risk were quite successful during the Manipulation Period: in approximately 12,000 round-trip UTC trades, Powhatan, HEEP, and CU Fund never experienced a "broken leg."[227] Given the weight of all of the evidence, we conclude that Respondents' argument that they were attempting to "hit a home run" or increase risk is not credible and is inconsistent with other evidence in the matter.

92. Respondents' Polar Vortex argument is similarly flawed and unpersuasive. There is no evidence that the Respondents ever contemplated a Polar-Vortex type event when developing their alleged home run strategy. Rather, Respondents appear to be citing the Polar Vortex as a *post hoc* rationalization for their trading conduct.[228]

93. Finally, the Commission does not find persuasive Respondents' argument that Dr. Chen's occasional bids at $35/MWh reflect a willingness to take the risk that one leg of the trade would not clear. As we noted above, in the Manipulation Period, Respondents never experienced a leg break. Moreover, a historical review of the UTC trading paths used by Respondents during the Manipulation Period demonstrates that those paths were selected by Dr. Chen because they were unlikely to experience divergent price spikes. Indeed, Dr. Chen's bids were above the day-ahead spreads in "well over" 99 percent of the hours from January 2008 through December 2010 and in

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[224] *Id.*; Gates Test. Vol. I Tr. 82:19-84:22.

[225] Chen Test. Vol. I Tr. 73:25-75:5.

[226] Staff Report at 26 n.149.

[227] Staff Reply at 3. Respondents do not deny the fact that the legs never broke during the Manipulation Period.

[228] We are therefore not persuaded by Dr. Chen's tables on this subject. *See* Chen Answer at 24-25.

every hour in the 12 months before Dr. Chen implemented his round-trip trading strategy.[229] As OE Staff calculated:

> In fact, between July 1, 2005 and June 1, 2010, when Respondents began implementing their scheme, only two of the five principal paths Respondents used to effectuate their round-trip trading scheme (MISO-AEP and MISOCOMED) had *ever* experienced [d]ay-[a]head prices above $50; on all five, [d]ay [a]head prices above $20 were rare. Of the five main paths, only AEP-MISO had experienced [d]ay-[a]head prices above $20 in the 12 months preceding Respondents' trading.[230]

Thus, during the Manipulation Period, a trader would have reasonably expected a $35/MWh bid to have the same likelihood of being accepted into the UTC market on the paths here at issue as a $50/MWh bid.[231]

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[229] Staff Reply at 21 (relying on data provided by PJM).

[230] *Id.* at 20 (footnote omitted, emphasis in original); *see also* Staff Reply at 21 n.52. The same data (a PJM data set twice made available to Respondents) also shows that only 3.6 percent of Dr. Chen's bids were on the AEP-MISO path in the direction that ever experienced congestion prices above $20. OE Staff Submission of Non-Public Investigative Materials, January 2, 2015, at Staff Doc and Data Submission Jan 2, 2015\Transactional Data\PJM Trade Data\Trade_Data_POWHEF.xls.

[231] We similarly find Dr. Chen's graphic analysis of historical aggregate profitability at various bid levels unpersuasive. Chen Answer at 27. That analysis rolls up all months for all years from April 1, 2005 to August 3, 2014 – improperly incorporating outcomes from months after the Manipulation Period – and ignores any transaction costs. Providing a figure that rolls in results from after the Manipulation Period cannot inform us of what Dr. Chen understood about path performance at the time he placed his trades, as he would not have been privy to future market results. We are persuaded, on the other hand, that OE Staff's revisions to the graph present a more accurate view of the results. OE Staff's revisions demonstrate that historic revenues, even before transaction costs, were "anemic" and that after transaction costs were taken into consideration, the strategy would have been uniformly unprofitable. Staff Reply at 21-24.

(e) Respondents' loophole and deception arguments are unavailing

94. We find that describing these round-trip UTC trades as being made in response to a "loophole" in the PJM Tariff belies their fraudulent nature. The Commission has made clear that "[a]n entity need not violate a tariff, rule or regulation to commit fraud."[232] Thus, the fact that the PJM Tariff did not explicitly prohibit round-trip trades does not create a loophole. As set forth in greater detail below, market participants in the Commission's jurisdictional markets have been on notice for some time that round-trip trades such as these are improper.[233] Moreover, Respondents' round-trip UTC trades did not expose a market inefficiency as argued by Powhatan; the round-trip UTC trades furthered a scheme to defraud PJM and the MLSA payment recipients. Nor was this trading behavior a "service" to the market, as Powhatan suggests. Instead we find this behavior to have resulted in the manipulation of electric energy markets contrary to section 222 of the FPA and the Anti-Manipulation Rule.[234]

95. Additionally, Respondents argue that their trades were not deceptive and without deception there is no fraud.[235] We disagree. As stated above, "[f]raud is a question of fact to be determined by all the circumstances of a case." The market purpose behind speculative UTC trades in PJM was to permit traders to arbitrage the market to encourage

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[232] *Competitive Energy Services, LLC*, 144 FERC ¶ 61,163, at P 50 (2013) (citing Order No. 670, FERC Stats. & Regs. ¶ 31,202 at P 25); *Richard Silkman*, 144 FERC ¶ 61,164, at P 50 (2013); *Lincoln Paper and Tissue, LLC*, 144 FERC ¶ 61,162, at P 36 (2013). *See also In re Make-Whole Payments and Related Bidding Strategies*, 144 FERC ¶ 61,068, at P 83 (2013) (citations omitted).

[233] *See* discussion *infra* PP 115-123.

[234] We find that Powhatan's attempt to rely on Commission staff's 2009 testimony before the Committee of Energy and Natural Resources, Subcommittee on Energy to be inapposite. Powhatan Answer at 7. First, we have found that there was no loophole in this matter and that Respondents' trading violated the Commission's Anti-Manipulation Rule. Further, as we discuss below, the trades in question are wash trades and therefore *per se* fraudulent and manipulative. Moreover, Powhatan ignores the fact that, in the very same response it relies on, staff stated: "The big difference is the legal definition of . . . market manipulation. It's really a fraud statute. So what we have to show is that the trader had an intent to manipulate the market . . . ." As we set forth below, Respondents intended to and did manipulate the PJM market. *See* discussion *infra* PP 115-123.

[235] Chen Answer at 8-10, 15; Powhatan Answer at 7, 43.

convergence between the day-ahead and real-time markets.[236] Respondents' fraudulent trades could not and did not provide that benefit to the market. Nonetheless, Respondents placed their trades as market participants would place an arbitrage-based spread trade, except Respondents' round-trip UTC trades canceled each other out. The connected nature and purpose of the offsetting trades was concealed and created the illusion of high volume trading thereby subverting the PJM market. Specifically, as a result of Respondents' deception, PJM distributed less in MLSA funds to those market participants who were engaged in behavior supportive of and beneficial to the PJM market and instead provided those MLSA funds to Respondents. In short, we find that the Respondents defrauded PJM into allocating MLSA payments to Respondents by engaging in high volumes of fraudulent round-trip UTC trades solely to collect MLSA payments.

96. We also reject Respondents' argument that their trades were nothing like Enron's Death Star trading. Like Death Star's circular strategy, Respondents engaged in round-trip UTC trading that resulted in no net position and, thus, no possibility for profit or loss from market prices. Moreover, Death Star's strategy was profitable so long as the credits received exceeded the cost of scheduling the transactions; similarly, Respondents' strategy was profitable so long as the MLSA payments exceeded their transaction costs. In addition, Respondents' round-trip UTC trades falsely appeared to PJM as legitimate, arbitrage-related trades when in fact they were nullities placed to garner MLSA payments. Thus, similar to Death Star, Respondents' UTC trades involved offsetting pairs to capture revenues without providing the corresponding benefit to the market.

97. Dr. Chen's argument that our decision in the *Lake Erie Loop Flow*[237] case "blunts" any comparison to Enron is similarly unavailing.[238] This argument is similar to Respondents' argument that their trades were conducted in a "transparent manner."[239] The *Lake Erie Loop Flow* matter involved transactions "scheduled on a single tag, and thus showed the source, sink and intervening transmission," and scheduling requests between the ISOs were coordinated.[240] In contrast, Respondents' trades were not

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[236] *Black Oak Energy, L.L.C., et al. v. PJM Interconnection, L.L.C.*, 122 FERC ¶ 61,208 at n.85; *see also* discussion *supra* PP 18-21.

[237] *Lake Erie Loop Flow*, 128 FERC ¶ 61,049.

[238] Chen Answer at 30.

[239] Powhatan Answer at 19; Chen Answer at 8-9, 15.

[240] *Lake Erie Loop Flow*, 128 FERC ¶ 61,049, App. A at 22.

scheduled via an electronic transmission tag so there was no mechanism by which PJM automatically could recognize their related nature, i.e., that the A-B transactions and the B-A transactions were linked and canceled each other out.[241]

(f) Respondents' conduct resulted in harm

98. We reject Powhatan's argument that Respondents' actions caused no harm because other market participants were not entitled to MLSA payments. While we have stated in the abstract that no market participant is entitled to a particular amount of MLSA payments and that PJM need not adopt a particular refund mechanism,[242] Powhatan ignores that PJM nevertheless filed a MLSA provision that later became effective as part of PJM's Commission-approved tariff.[243] Under the PJM Tariff's MLSA provision effective during the Manipulation Period, market participants who paid for transmission service for their transactions were entitled to receive the sum of MLSA payments established by the provision's Commission-approved hourly calculation. Accordingly, we find that identifiable market participants were harmed by Respondents' conduct; they did not receive the MLSA payments they would have received absent Respondents' unlawful round-trip UTC trades, as provided for under the then-effective PJM Tariff's MLSA provision. PJM's information included in OE Staff's Answer in Opposition to Respondents' January 27, 2015, Motion for a Two-Week Extension of Time indicated that Respondents' conduct led to over $10 million in harm, and deprived more than "20 market participants of more than $100,000 each, [and] four lost more than $500,000 each."[244]

99. In addition, we find Respondents' trades impacted transmission in PJM. During the Manipulation Period, Respondents scheduled more than 16.6 million MWh of transmission service in connection with their fraudulent, round-trip UTC trades, which

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[241] *See* Picard Test. Tr. 124:15-19 (in explaining the difficulty of deciphering Respondents' scheme, Mr. Picard explained, "there is 4000 OASIS that come up when you query it. You've got to go through every one of them. You could narrow it down through company. You have to know what you're looking at and we don't").

[242] *Atlantic City Elec. Co. v. PJM Interconnection, L.L.C.*, 115 FERC ¶ 61,132 at P 24.

[243] *Black Oak Energy, L.L.C. et al. v. PJM Interconnection, L.L.C.*, 128 FERC ¶ 61,262 at PP 25-26.

[244] OE Staff's Answer to Respondents' Request for Extension of Time, at 9 (Jan. 29, 2015). OE Staff filed a corrected version of this material on February 2, 2015.

amounted to more than 10 percent of all day-ahead transmission service reservations in PJM.[245] Therefore, Respondents impacted the availability of transmission from the time they reserved this transmission service until the time it was released for other market participants' use in the real-time market.

b. Wash Trades Have Been Explicitly Prohibited in Our Markets

i. Respondents' Show Cause Answers

100. Respondents explain that by definition, wash trades do not make money, are economically meaningless, take no risk, cancel each other and have no legitimate purpose. They assert that their trades were exposed to profits and losses, had a legitimate purpose, were profitable, did not cancel each other out, and possessed risk.[246] Respondents emphasize that their "A-B/B-A paired trades" were exposed to risk because "a significant portion of the paired trades had unmatched daily volumes, meaning that overall there was a directional congestion bet" and "both the matched and unmatched volume paired trades were exposed to congestion if one leg failed to clear."[247]

ii. OE Staff Report and Reply

101. OE Staff charges that Respondents' round-trip UTC trades are akin to wash trades.[248] Moreover, OE Staff alleges that it was just this type of "gaming" of the energy markets that the Commission has found to be improper and illegal.[249] OE Staff argues that the trades at issue are the functional equivalent of wash trades, noting specifically that they were paired in order to cancel out each direction's respective price spread risk

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[245] Staff Report at 81; Staff Reply at 85 (citing PJM Referral at 111-72). One market participant, Mr. Picard, testified that, by the beginning of Summer 2010, he began noticing that when purchasing transmission between two points in OASIS, the Available Transmission Capacity [ATC] amounts were going down dramatically. Serge Picard Test. Tr. 85:4-86:10.

[246] Chen Answer at 18-19; Powhatan Answer at 29-33.

[247] Chen Answer at 18-19.

[248] Staff Report at 50-58 (citing *Investigation of Terms and Conditions of Public Utility Market-Based Rate Authorizations*, 105 FERC ¶ 61,218 at PP 35, 53).

[249] *Id.* at 47-50.

so as to incur almost no economic risk.[250] Notwithstanding the existence of minimal risk should one leg fail to clear, OE Staff argues that these trades are wash trades because eliminating all risk is not an essential prerequisite to a finding of wash trading.[251]

102. OE Staff emphasizes that the Commission has explicitly prohibited wash trading as a *per se* violation, regardless of the trader's intent.[252] In addition, OE Staff states that the Commission was "clear that wash trading was merely a species of prohibited (even if not specifically defined) manipulative conduct, and that it would not be narrow, rigid, or formalistic in applying that concept when it came to defining market manipulation."[253] In this regard, OE Staff notes, the Commission has previously determined that any conduct functionally equivalent to wash trading, even if it differed in some immaterial way so as to fall outside a precise definition of wash trading, would nonetheless constitute a violation of the Commission's behavior rules against market manipulation.[254]

iii. Commission Determination

103. We find that the Respondents' round-trip UTC trades are wash trades, and therefore *per se* fraudulent and manipulative. The Commission's original Market Behavior Rules identified wash trades as possessing two key elements—that the transactions: (1) are pre-arranged to cancel each other out; and (2) involve no economic risk.[255] Order No. 670 later incorporated Market Behavior Rule 2 into the Commission's Anti-Manipulation Rule.[256] Pursuant to Order No. 670, the Commission stated explicitly

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[250] *Id.* at 53; Staff Reply at 37-48.

[251] Staff Report at 55; Staff Reply at 46-48.

[252] Staff Reply at 39 (citing *Investigation of Terms and Conditions of Public Utility Market-Based Rate Authorizations*, 105 FERC ¶ 61,218 at P 58; *Amendments to Blanket Sales Certificates*, Order No. 644, 105 FERC ¶ 61,217, at PP 46-57 (2003)).

[253] *Id.*

[254] *Id.* at 39-40 (citing *In the Matter of Amendments to Blanket Sales Certificates*, 107 FERC ¶ 61,174, at P 47 (2004); *Investigation of Terms and Conditions of Public Utility Market-Based Rate Authorizations*, 105 FERC ¶ 61,218 at P 41).

[255] *Investigation of Terms and Conditions of Public Utility Market-Based Rate Authorizations*, 105 FERC ¶ 61,218 at P 53.

[256] Order No. 670, FERC Stats. & Regs. ¶ 31,202 at P 58; *see also Investigation of Terms and Conditions of Public Utility Market-Based Rate Authorizations*,

(continued...)

that the prohibitions included in that Market Behavior Rule—including prohibitions against wash trades—would continue to be prohibited activities under the Anti-Manipulation Rule.[257]

104. As discussed above, we find Respondents' round-trip UTC trades satisfy both these elements and were, by design, wash trades.[258] That is, Respondents' trades were designed to cancel each other out and to eliminate price spread risk caused by differences in congestion prices between the selected nodes. We find that in Commission-regulated energy markets, the market risk associated with a wash trade need not be zero; it only need be small enough so that the risk has no practical or expected impact on the transaction, as was the case here.[259] While Respondents note the theoretical potential for one leg of the transaction to break, the evidence shows that Respondents' round-trip UTC trades always cleared during the Manipulation Period (as Respondents expected) and that because both legs cleared together, Respondents' round-trip UTC trades had no practical market risk.

105. Additionally, we disagree with Respondents' contention that their UTC trades were not wash trades because they were structured to produce a profit in their own right. As discussed above, we are persuaded that the way in which Respondents' profits were generated reveal a scheme that is supportive of and consistent with our finding of manipulation.[260] Respondents' trades generated profits only through the MLSA payments, which had no relationship to the underlying fundamentals of or the purposes

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114 FERC ¶ 61,165, at P 24 (2006) (rescinding Market Behavior Rule 2 because the "prohibited actions" were now prohibited under the Anti-Manipulation Rule).

[257] Order No. 670, FERC Stats. & Regs. ¶ 31,202 at P 59.

[258] Because we find that Respondents' round-trip UTC trades fall squarely within the definition of wash trades, we do not address OE Staff's and Respondents' arguments regarding whether those trades are "akin" to wash trades.

[259] *See Piasio v. CFTC*, 54 Fed. App'x 702, 705 (2nd Cir. 2002); *SEC v. Colonial Inv. Mgmt. LLC*, 659 F. Supp. 2d 467, 473 (S.D.N.Y. 2009). *See also Wilson v.* CFTC, 322 F.3d 555, 559 (8th Cir. 2003) ("Wash trading produces a virtual financial nullity because the resulting net financial position is near or equal to zero."). *Cf.* Securities Exchange Act, Section 9 (defining wash trades, in pertinent part, as "an order or orders of substantially the same size . . . .").

[260] *See* discussion *supra* PP 76-78.

for the UTC product. In that way, Respondents' scheme operated like other wash trades we have found to be unlawful.

106. We also reject Respondents' claim that their trades were not wash trades because some of their trades consisted of "unmatched daily volumes." The only trades at issue here are Respondents' volumetrically identical, round-trip UTC trades. To the extent that there existed additional MWh on a particular node pair in a given hour, we have treated those as additional directional "bets" by Respondents that are not part of the round-trip trade.

107. Respondents' arguments that the trades in question were not manipulative or otherwise prohibited also ignores the Commission's long-standing policy that wash trades are inherently manipulative:

> Wash trades, by their very nature, are manipulative and purposely so. By definition, parties to a wash trade intend to create prearranged offsetting trades with no economic risk. Thus, we know of no legitimate business purpose attributable to such behavior and no commenter has suggested one.[261]

Moreover, the very nature of a wash trade is to conceal the true purpose of the trade. In this case, Respondents' wash trades concealed the fact that Respondents had used the UTC product to obtain transmission service reservations and thereby collect MLSA payments.

c. Respondents had notice that their trading is fraudulent, violates our statute and regulations, and is afforded no safe harbor

i. Respondents' Show Cause Answers

108. Respondents claim the Commission cannot find them to be in violation of the Anti-Manipulation Rule because they did not receive "fair notice" that their trades were prohibited, as required by the Due Process Clause of the United States Constitution.[262] Respondents assert that an agency "has the responsibility to state with ascertainable

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[261] *Investigation of Terms and Conditions of Public Utility Market-Based Rate Authorizations*, 105 FERC ¶ 61,218 at P 58.

[262] Powhatan Answer at 8-25; Chen Answer at 37-54.

certainty what is meant by the standards [it] has promulgated."[263] In addition, Respondents argue that the trades were permitted under the PJM Tariff and that the Commission did not exclude round-trip UTC trades from receiving MLSA payments in the *Black Oak*[264] proceedings.[265]

109. Powhatan also argues that Respondents' trades should be protected pursuant to the safe harbor established in Order No. 670 because the Commission, in *Black Oak*, had specifically contemplated the type of trading Respondents pursued.[266] Because the Commission did not then state that trading to collect larger MLSA payments would be unlawful, Respondents claim that the Commission cannot now find Respondents' conduct to be manipulative.[267] Respondents each also point out that Dr. Chen stopped trading as soon as the PJM's IMM requested he do so.[268]

110. Moreover, Powhatan argues that this proceeding is similar to *National Fuel Marketing Co., LLC, et al.*[269] where two Commissioners raised issues regarding fair notice. Powhatan states that *National Fuel* involved issues related to the manipulation of natural gas markets and to the "shipper-must-have-title" requirement. In that proceeding, the Commission issued an order to show cause concerning bidding by multiple affiliates to obtain a larger allocation of pipeline capacity than the parent company could have acquired itself. According to Powhatan, two Commissioners dissented from the order to show cause, concluding that the company did not receive advance notice that multiple

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[263] Chen Answer at 39 (citing *Gates & Fox Co. v. OSHA*, 790 F.2d 154, 156 (D.C. Cir. 1986)*; see also* Powhatan Answer at 9.

[264] *Black Oak Energy, L.L.C. v. PJM Interconnection, L.L.C.*, 122 FERC ¶ 61,208, at P 51 (2008), *order on reh'g*, 125 FERC ¶ 61,042 (2008), *order on clarification*, 126 FERC ¶ 61,164 (2009), *order accepting compliance*, 128 FERC ¶ 61,262 (2009), *order on reh'g*, 131 FERC ¶ 61,024 (2010) (*Black Oak Proceeding*).

[265] Chen Answer at 15, 34-35, 40-48; Powhatan Answer at 3-12.

[266] Powhatan Answer at 9, 11-14 (citing Order No. 670, FERC Stats. & Regs. ¶ 31,202 at P 50).

[267] *Id.* at 12-14; Chen Answer at 40-48.

[268] Powhatan Answer at 13; Chen Answer at 44.

[269] *Nat'l Fuel Mktg. Co., LLC, et al*., 126 FERC ¶ 61,042 (2009) (Moeller, Comm'r dissenting) (Spitzer, Comm'r dissenting).

affiliate bidding could be a violation of the Commission's Anti-Manipulation Rule. Powhatan argues that, as in *National Fuel*, "no Commission order or express regulation or rule ever alerted Powhatan that trades motivated by the collection of [MLSA] were unlawful."[270]

ii. OE Staff Report and Reply

111. OE Staff argues that federal agencies routinely apply broad statutory prohibitions similar in scope to the Commission's Anti-Manipulation Rule in a flexible way without running afoul of fair notice concerns.[271] OE Staff avers that such flexibility is necessary because the Commission long ago determined that it cannot identify in advance all the possible misconduct in which a market participant might engage.[272] As with the Securities and Exchange Commission's (SEC) Rule 10b-5, OE Staff explains that market participants do not get "one free bite" under the Commission's Anti-Manipulation Rule[273] simply because a particular fraudulent scheme was not specifically prohibited.

112. OE Staff states that Respondents had fair notice, and that with minimal effort they would have discovered both that the Commission disapproved of their trading strategy and similar strategies in the past.[274] OE Staff asserts that any reasonably prudent person familiar with the Commission's Anti-Manipulation Rule—like the market participants who refrained from such trading strategies and denounced them when they came to light—had fair notice.[275] In addition, OE Staff claims that Respondents knew they were

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[270] Powhatan Answer at 18.

[271] Staff Reply at 61. OE Staff points to the Federal Trade Commission Act, the Sherman Antitrust Act, and the Securities Exchange Act as examples of other statutes that incorporate similar breadth and flexibility. *Id.* at 61-62 (citing 15 U.S.C. § 1 (2012); 15 U.S.C. § 78j (2012); 15 U.S.C. § 45 (2012)).

[272] *Id.* at 69 (citing *Am. Elec. Power Serv. Corp., et al.*, 106 FERC ¶ 61,020, at P 45 (2004)).

[273] *Id.* at 62.

[274] Staff Report at 66.

[275] *Id.* at 67, 69.

exploiting the MLSA mechanism, and further that they anticipated it could lead to disgorgement of the revenues they had received.[276]

113. Additionally, OE Staff argues that the *Black Oak* orders do not in any way reflect Commission approval of high-volume, round-trip UTC trades to collect MLSA revenues.[277] OE Staff acknowledges that certain participants in the *Black Oak* proceeding warned that the chosen MLSA allocation method could create perverse incentives for virtual traders to engage in volume trading to collect larger MLSA payments rather than to trade for arbitrage purposes.[278] But, OE Staff argues, other participants avowed that such conduct would not occur, and the Commission approved the MLSA allocation mechanism with those assurances in mind.[279] Also, OE Staff avers that if Respondents' interpretation of the *Black Oak* orders was correct, the Commission would have been silently reversing itself on several crucial points, including the purpose of virtual trading and the impropriety of wash trading.[280]

114. OE Staff further asserts that Powhatan's invocation of *National Fuel* is unavailing. OE Staff states that a majority of the Commissioners approved the order to show cause in *National Fuel* and that the two dissents were based on a prior order that appeared to explicitly allow the conduct at issue in *National Fuel*. Thereafter, the Commission became aware of the particular bidding technique (similar to those used in *National Fuel*) and the Commission declined twice to change its position. Moreover, OE Staff emphasizes that all such actions occurred before the show cause order in *National Fuel*. In the instant case, OE Staff asserts that:

> no market participant engaged in the relevant bidding strategy-volume trading to collect MLSA-until 2010, after the Commission issued the relevant Order (in 2009) approving PJM's tariff. As a result, unlike [*National Fuel*], when the

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[276] *Id.* at 70 (citing Email from Kevin Gates to Kevin Byrnes (July 26, 2010, 05:01:02 PM); Email from Kevin Gates to Larry Eiben, *et al*. (Aug. 19, 2010, 06:41:54 PM) (POW00006665); Email from Kevin Gates to Alan Chen (Mar. 5, 2010, 03:59:47) (POW00016981)).

[277] *Id.* at 59.

[278] *Id.* at 60-66, 68-69.

[279] *Id.* at 66.

[280] Staff Reply at 72-73.

> Commission issued the relevant Order, it was not aware of any market participant actually engaging in the relevant bidding strategy. . . Nor, obviously, did anyone ask the Commission to change the tariff rules approved in its 2009 Order until after Chen, Powhatan, and others carried out their volume trading strategy in the summer of 2010.[281]

iii. Commission Determination

115. We reject Respondents' claim that the Commission failed to provide fair notice that Respondents' trading strategy would be impermissible, and a violation of section 222 of the FPA and the Commission's Anti-Manipulation Rule. In short, we find that Respondents were on notice that placing round-trip UTC trades solely for the purpose of collecting MLSA payments violated the FPA and the Anti-Manipulation Rule.

116. Respondents improperly seek to use the fair notice doctrine as a shield to permit the very behavior that Congress sought to prohibit. Broadly written, FPA section 222 explicitly directed the Commission to adopt regulations in furtherance of the public interest and for the protection of electric ratepayers.[282] The Commission's implementing regulation, its Anti-Manipulation Rule, is written similarly broadly, like the statute, to encompass the full and wide variety of fraudulent activity that can occur.[283]

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[281] *Id.* at 74.

[282] 16 U.S.C. § 824v(a) (2012).

[283] *See, e.g.*, Order No. 670, FERC Stats. & Regs. ¶ 31,202 at P 50 ("The Commission defines fraud generally, that is, to include any action, transaction, or conspiracy for the purpose of impairing, obstructing or defeating a well-functioning market."). Similar broad language exists in the Securities Exchange Act, which states in part that it is "unlawful for any person . . . [t]o use or employ, in connection with the purchase or sale of any security . . . , any manipulative or deceptive device or contrivance in contrivention of such rules and regulations as the [SEC] may prescribe." 15 U.S.C. § 78j(b). *See also SEC v. Zanford*, 535 U.S. 813, 819 (2002) ("we have explained that the statute should be construed not technically and restrictively, but flexibly to effectuate its remedial purposes"). The Sherman Antitrust Act ("Every contract, combination in the form of trust or otherwise, or conspiracy, in restraint of trade or commerce among the several States, or with foreign nations, is declared to be illegal") and the Federal Trade Commission Act ("Unfair methods of competition in or affecting commerce, and unfair or deceptive acts or practices in or affecting commerce, are hereby declared unlawful")

(continued...)

117. Although courts articulate fair notice in slightly different ways, they consistently consider whether a "reasonably prudent person, familiar with the conditions that the regulations are meant to address and the objectives the regulations are meant to achieve, [has] fair warning of what the regulations require."[284] For an agency to fail to provide sufficient notice, the regulation must be so ambiguous that it cannot be interpreted correctly and the agency must have failed to provide guidance before imposition of the penalty.[285]

118. Commission precedent invalidates any claim of ambiguity concerning the scope of our Anti-Manipulation Rule. When the Commission adopted the Anti-Manipulation Rule, it defined fraud generally, that is, to include "any action, transaction, or conspiracy for the purpose of impairing, obstructing or defeating a well-functioning market."[286] The Commission specifically addressed and rejected arguments that the regulation was vague or overbroad.[287] No entity appealed that decision. To raise the issue now is to collaterally, and thus, impermissibly attack Order No. 670, which the Commission will not entertain.

119. Moreover, Respondents had notice that round-trip trading has long been deemed manipulative and inappropriate in Commission-jurisdictional markets. We have found that these trades are wash trades.[288] As noted above, even before the adoption of the Anti-Manipulation Rule, Market Behavior Rule 2(a) prohibited pre-arranged offsetting trades of the same product among the same parties, involving no economic risk and no

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each have similarly broad prohibitions that are interpreted with flexibility. *See* 15 U.S.C. § 1; 15 U.S.C. § 45(a)(1).

[284] *Freeman United Coal Mining Co. v. Fed. Mine Safety & Health Review Comm'n*, 108 F.3d 358, 362 (D.C. Cir. 1997) (*Freeman*). *See also Rock of Ages Corp. v. Sec'y of Labor*, 170 F.3d 148, 156 (2d Cir. 1999) (citing *Freeman*); *Moussa I. Korouma, d/b/a Quntum Energy LLC*, 135 FERC ¶ 61,245, at P 34 (2011) (citing *Freeman*).

[285] *United States v. Lachman*, 387 F.3d 42, 57 (1st Cir. 2004); *see also PMD Produce Brokerage Corp. v. USDA*, 234 F.3d 48, 53 (D.C. Cir. 2000).

[286] Order No. 670, FERC Stats. & Regs. ¶ 31,202 at P 50.

[287] *See id.* PP 30-32; *see also* 17 C.F.R. § 240.10b-5 (2014).

[288] *See* discussion *supra* P 103.

net change in beneficial ownership—i.e., wash trades.[289] As we explained, that prohibition continues under the Anti-Manipulation Rule.[290] Thus, the market has had notice that wash trading is not permitted for more than a decade (and for at least five years before Respondents' conduct here).

120. Respondents' arguments that their conduct is not actionable because it was not expressly prohibited in PJM's Tariff similarly ignore the meaning and purpose of the Anti-Manipulation Rule and Commission precedent. The Commission has explained that tariffs cannot be written to prohibit all possible fraudulent behavior[291] as "[t]he methods and techniques of manipulation are limited only by the ingenuity of man."[292] Accordingly, we have repeatedly held:

> An entity need not violate a tariff, rule or regulation to commit fraud. Nor does a finding of fraud require advance notice specifically prohibiting the conduct concerned. Fraud is a matter of fact and requires evaluation of all the facts and circumstances of each case. The Commission need not imagine and specifically proscribe in advance every example of fraudulent behavior.[293]

121. In this instance, the fact that the PJM Tariff did not explicitly prohibit the behavior is to no avail. Respondents participated in a scheme to manipulate, and thus have committed a fraud against our regulated markets, which violates section 222 of the FPA and the Anti-Manipulation Rule. Moreover, the Commission finds that Dr. Chen's

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[289] *Investigation of Terms and Conditions of Public Utility Market-Based Rate Authorizations*, 105 FERC ¶ 61,218 at P 52.

[290] *See* discussion *supra* P 103; Order No. 670, FERC Stats. & Regs. ¶ 31,202 at P 59.

[291] *See, e.g.*, *Investigation of Terms and Conditions of Public Utility Market-Based Rate Authorizations*, 114 FERC ¶ 61,165 at P 24.

[292] *Cargill, Inc. v. Hardin*, 452 F.2d 1154, 1163 (8th Cir. 1971).

[293] *Competitive Energy Services, LLC*, 144 FERC ¶ 61,163 at P 50 (citations omitted); *Richard Silkman*, 144 FERC ¶ 61,164 at P 50; *Lincoln Paper and Tissue, LLC*, 144 FERC ¶ 61,162 at P 36. *See also In re Make Whole Payments and Related Bidding Strategies*, 144 FERC ¶ 61,068 at P 83 (citations omitted).

compliance with the PJM IMM's request to stop trading has no bearing on whether Respondents' received fair notice.

122. We also reject Respondents' view that our *Black Oak* orders can be read to authorize Respondents' fraudulent round-trip UTC trades and that their trades somehow fall within the safe harbor provisions provided by Order No. 670. For the safe harbor to be invoked, the action must have been "explicitly contemplated in Commission-approved rules or regulations . . . ."[294] We find that Respondents' actions were not explicitly contemplated by PJM's rules and that the Commission did not approve round-trip trades in the *Black Oak* proceedings, and therefore Respondents misinterpret and attempt to misapply the "safe harbor" provision. The *Black Oak* decisions' holdings focused only on the merits of an MLSA distribution mechanism, and not on how market participants trade UTCs or the ways in which a market participant might manipulate that mechanism. The Commission's passing mention of the issue in response to third-party comments was not an affirmation of the conduct.[295] Because the Commission's *Black Oak* orders did not explicitly contemplate trading UTCs for the purpose of capturing MLSA revenues, Respondents cannot now claim to have reasonably concluded that their trades would not be subject to Commission scrutiny. When it is unclear whether conduct would be legal, the risk associated with pursuing that conduct falls on the market participant.[296] Moreover, Respondents' arguments suggest that they relied on the *Black Oak* decisions as affirmation that their trades were allowed. No one has brought to our attention contemporaneous evidence that Respondents relied on the *Black Oak* decisions when Dr. Chen consummated their trades; in fact, there is no evidence that Respondents read or relied on the *Black Oak* decisions before they began their UTC trading scheme.

123. We also disagree that the dissents in *National Fuel* require a different answer here. The dissenting Commissioners in *National Fuel* argued that shippers had asked the Commission to rule on the conduct at issue in that matter, and the Commission declined

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[294] Order No. 670, FERC Stats. & Regs. ¶ 31,202 at P 67.

[295] *See Black Oak Energy, L.L.C., et al. v. PJM Interconnection, L.L.C.*, 125 FERC ¶ 61,042, at PP 38, 43 (2008).

[296] *See Precious Metals Associates, Inc. v. CFTC*, 620 F.2d 900, 909 (1st Cir. 1980) ("Appellants went ahead with an operation knowing full well that it was probably illegal or, at the optimum, that its legality was doubtful. They cannot convert the Commission's silence into approval. They took their chances and must suffer the consequences."). Furthermore, as we set forth below, Respondents and all PJM market participants had notice that wash trading violates section 222 of the FPA and the Anti-Manipulation Rule. *See* discussion *supra* P 119.

their request to do so.[297] Notwithstanding those dissents, no entities have previously asked the Commission to rule on the lawfulness of using offsetting UTC positions to profit solely from the collection of MLSA payments. Therefore, the dissents in *National Fuel* provide no support to Powhatan.

2. Scienter

124. Scienter is the second element of the Commission's Anti-Manipulation Rule.[298] For purposes of establishing scienter, Order No. 670 requires reckless, knowing, or intentional actions taken in conjunction with a fraudulent scheme, material misrepresentation, or material omission.[299]

a. Respondents' Show Cause Answers

125. Respondents claim that they did not act with requisite scienter. First, they argue their UTC transactions responded to price incentives and thus had a legitimate economic purpose.[300] Second, HEEP, CU Fund, and Dr. Chen argue that Dr. Chen did not intend to engage in unlawful conduct.[301] Third, HEEP, CU Fund, and Dr. Chen argue that the communications OE Staff relies on fail to establish scienter because they predate the relevant trading conduct, involve exchanges with individuals other than Dr. Chen, or because OE Staff draws irrational conclusions from them.[302] Finally, Respondents argue that Dr. Chen executed his round-trip UTC transactions in an open, transparent manner,

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[297] *Nat'l Fuel Mktg. Co., LLC, et al*., 126 FERC ¶ 61,042 (Moeller, Comm'r dissenting) (noting that a group of shippers had requested that the Commission rule on the conduct at issue, and the Commission "twice declined its opportunity to act") (Spitzer, Comm'r dissenting) (noting that the Commission "declined to prohibit multiple-affiliate bidding" after entities previously asked it to consider the issue and after holding a technical conference on the issue).

[298] *See* Order No. 670, FERC Stats. & Regs. ¶ 31,202 at P 49.

[299] *Id.* PP 52-53.

[300] Chen Answer at 56; Powhatan Answer at 31.

[301] Chen Answer at 55-57.

[302] *Id.* at 57-61.

which is inconsistent with any sort of fraudulent intent.[303] As discussed below, we find that these arguments lack merit.

b. OE Staff Report and Reply

126. OE Staff asserts that Dr. Chen (and, hence, HEEP and CU Fund) acted with scienter based on evidence that he: (1) knew his round-trip UTC trading strategy manipulated PJM's rules; (2) intentionally implemented the scheme and course of business to defraud for the monetary benefit of himself and the other Respondents; (3) knew that a substantial risk existed that the profits from the scheme would be clawed back when discovered; and (4) communicated the essential details of his strategy to Powhatan through Mr. Gates.[304] OE Staff asserts that Powhatan acted with scienter based on evidence that it: (1) understood the essential details of the scheme; (2) endorsed, willingly and significantly increased its investment in, and approved the scheme; (3) earned millions of dollars in unjust profits as a result of the scheme; and (4) expected its profits to come to an end as soon as the scheme was discovered.[305]

127. In addition, OE Staff asserts that Respondents' scienter is evidenced by their invention of a false *post hoc* explanation—the "home run" theory—for their trading conduct.[306] Finally, OE Staff claims that scienter is established based on Dr. Chen's repeated admissions that he understood the purpose of UTC trading and, yet, traded for the opposite purpose.[307]

c. Commission Determination

128. We agree with OE Staff that Respondents acted with the requisite scienter in connection with their scheme. We find sufficient evidence demonstrating Respondents' manipulative intent, including contemporaneous e-mail communications, testimony and other evidence, the pattern and evolution of Dr. Chen's trading, the absence of market fundamentals underlying the UTC trades at issue, and Respondents' deliberate actions to expand and increase their profits from the scheme. As discussed below, the evidence

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[303] Powhatan Answer at 7, 43; Chen Answer at 8-9.

[304] Staff Report at 75.

[305] *Id.*

[306] Staff Reply at 78.

[307] *Id.*

shows that Respondents, individually and together, knowingly and intentionally participated in a manipulative scheme to engage in wash trading and deceive PJM about the true nature of their transactions, thereby harming the market and other market participants.

i. **Dr. Chen, HEEP, and CU Fund Acted With Scienter**

129. We find that Dr. Chen, HEEP, and CU Fund acted with scienter based, principally, on: (1) evidence that Dr. Chen understood that his fraudulent trading scheme was inconsistent with, and obstructed the market design purpose of, UTC trading in PJM; (2) evidence of the pattern and evolution of Dr. Chen's round-trip UTC trading; and (3) Dr. Chen's deliberate decision to increase profits for himself after perfecting his scheme. We are also persuaded by OE Staff's argument that Respondents' scienter is further shown by their creation of a *post hoc* explanation—the home run strategy—for which there is no evidentiary support contemporaneous with the relevant trading conduct.[308]

130. As described above, Dr. Chen understood that UTCs served to "improve day-ahead and real-time price spreads . . . .[by] trying to make them converge, ... so that the goal is to improve market efficiency."[309] Yet, despite this understanding, Dr. Chen's contemporaneous communications, discussed above, reveal his intent to avoid all price spread risk in his UTC trading and, instead, profit solely based on collection of MLSA payments.[310]

131. Dr. Chen's manipulative intent is also reflected in the pattern and evolution of his UTC trades. As discussed above, Dr. Chen's UTC trading evolved from a fundamentals-based strategy focused on arbitraging price spreads to a strategy focused on eliminating as much price spread risk as possible. Dr. Chen's discovery of his MLSA eligibility triggered this change in strategy and his intent was clear from this time forward when he

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[308] *See* OE Staff Reply at 78.

[309] Chen Test. Vol. I Tr. 31:14-21; *see also* discussion *supra* 38.

[310] *See, e.g.*, Email from Alan Chen to Kevin Gates (March 5, 2010, 9:37 PM) (POW00016599) (describing his trades as "suddenly becoming risk-free (almost to the point) trades"); Email from Alan Chen to Kevin Gates (Aug. 24, 2010, 6:20:38 PM) (POW00004874) (describing use of "fully hedged paired trades").

worked to perfect the strategy to find more effective ways to profit solely from MLSA payments.[311]

132. Dr. Chen further demonstrated his manipulative intent through his deliberate decision to increase his own profits after perfecting his round-trip trading scheme and seeing the profits it produced for HEEP. On July 17, 2010, Dr. Chen formed CU Fund, a company untethered to any contractual arrangement with Powhatan. CU Fund allowed Dr. Chen to implement his scheme without trading limits and to keep all of the proceeds for himself. As Dr. Chen testified, he made "much larger trades in CU Fund than [he] had ever done in the HEEP Fund," and "the overwhelming number of those [trades] . . . was equal and opposite pairs."[312] He testified further that a "goal" of creating CU Fund was "to take full advantage of the TLC."[313]

ii. Dr. Chen, HEEP, and CU Fund's Scienter Arguments Lack Merit

133. None of Dr. Chen's, HEEP's, and CU Fund's arguments convinces us that they acted without scienter. First, as noted above, we reject their claim that they traded for a legitimate economic purpose. Contemporaneous evidence show that, by his own admission, Dr. Chen executed the round-trip trades for the purpose of canceling the price spread risk of UTCs and profiting based solely on MLSA payments.[314] Seeking to obtain MLSA payments through round-trip trades is not a legitimate economic purpose. Moreover, assuming, *arguendo*, that Dr. Chen did have a legitimate economic purpose for engaging in these transactions, as we held in *Barclays*, "a 'legitimate business purpose' is not an affirmative defense to manipulation," but "just . . . one of many [factors] that the Commission would consider to determine whether each [Respondent] possessed scienter."[315]

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[311] *See* discussion *supra* PP 74-75.

[312] Chen Test. Vol. II Tr. 139:9-16.

[313] *Id.* at 139:17-19.

[314] *See, e.g.*, Email from Alan Chen to Kevin Gates (Aug. 24, 2010, 6:20:38 PM) (POW00004874) (explaining that he used "fully hedged paired trades" to reduce risk).

[315] *Barclays*, 144 FERC ¶ 61,041, at P 61 (2013) (citing *Investigation of Terms and Conditions of Public Utility Market-Based Rate Authorizations*, 114 FERC ¶ 61,165, at P 29 (2006)).

134. Second, we are not persuaded by the argument that Dr. Chen did not intend to engage in unlawful trading behavior. Scienter does not require evidence that Dr. Chen intended to break the law but, rather, only that he intended to take certain actions and knew the consequences of such actions.[316] Dr. Chen intended to trade UTCs in PJM in a way that eliminated risk from price spreads in order to obtain transmission and profit solely from MLSA payments, and he understood the consequences of his trading on this basis—that he would be able to draw a greater share of MLSA payments at the expense of other market participants.

135. Third, we reject Dr. Chen, HEEP, and CU Fund's argument that many of the e-mail communications on which OE Staff relies cannot show scienter because they predate the relevant trading conduct.[317] To the contrary, we find these e-mail communications are highly relevant as they show Dr. Chen's consistent scienter in the evolution of his scheme to target MLSA payments (including during the time of his round-trip trading). As described above, while Dr. Chen's specific trading strategies evolved over time, his intent remained the same throughout—to minimize risk and profit as much as possible from MLSA payments. Dr. Chen's earlier communications show the development of his scheme and demonstrate that he had the same intent while he implemented his scheme as he did when he perfected it.[318] In any event, we do not rely

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[316] *Pittsburgh Terminal Corp. v. The Baltimore and Ohio Railroad Co.*, 680 F.2d 933, 942 (3d Cir. 1982) ("A violation of Section 10(b) does not require a specific intention to break the law. It requires only knowing or intentional actions which, objectively examined, amount to a violation."); *SEC v. Falstaff Brewing Corp.*, 629 F.2d 62, 77 (D.C. Cir. 1980) ("Knowledge means awareness of the underlying facts, not the labels that the law places on those facts. Except in very rare instances, no area of the law not even the criminal law demands that a defendant have thought his actions were illegal. A knowledge of what one is doing and the consequences of those actions suffices.").

[317] They also point out that some of the e-mails cited by OE Staff involve statements of individuals other than Dr. Chen. However, the Commission does not rely on any such communications in finding that Dr. Chen, HEEP, and CU Fund acted with the requisite scienter.

[318] *See Barclays*, 144 FERC ¶ 61,041 at P 75 (noting that "the fact that a particular email or IM may not coincide precisely in time with the commission of a manipulative act does not dilute that evidence"). *Cf. In re REMEC Inc. Secs. Litig.*, 702 F. Supp. 2d 1202, 1222 (S.D. Cal. 2010) (holding in a securities fraud class action suit that "[s]tatements made before the class period can be relevant evidence on this issue of

(continued...)

solely on e-mail communications that predate Respondents' round-trip trading scheme in finding that they acted with scienter.[319]

136. Finally, even if we agreed that Respondents' trades were otherwise legal, which we do not, we reject Respondents' argument that their trades were not fraudulent because they were executed in an open, transparent manner. The United States District Court for the Eastern District of California recently rejected the same argument from Barclays, holding that such a view "is not supportable." [320] This decision supports the clear Commission precedent on the issue: that "otherwise legal conduct—or what Barclays refers to as "real" transactions—may be proscribed by our anti-manipulation provisions"[321] and that "transactions entered into with manipulative intent can serve as the basis for a manipulation claim, even in the absence of some other deceptive conduct."[322] The Commission also held that "in consideration of the nature and structure of our markets and of our statutory mandate, we hold that in matters which allege a violation of the FPA section 222 or the Anti-Manipulation Rule the defense that trades were 'real' trades is not dispositive of the question of manipulation."[323] While Dr. Chen might have accurately entered his trades into the machine-read PJM market system, he placed them for a manipulative, deceptive purpose, creating the false appearance that he was trading based on price spread risk when in fact he traded to eliminate that risk.

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scienter because 'they may provide insight into what the defendant knew during the class period'" (citations and quotations omitted)).

[319] *See, e.g.*, Email from Alan Chen to Kevin Gates (Aug. 24, 2010, 6:20:38) (POW00004874); Email from Alan Chen to Kevin Gates (June 7, 2010, 9:57 PM (POW00003761).

[320] *FERC v. Barclays Bank PLC, et al*., No. 2:13-cv-2093-TLN-DAD, at 33 (E.D. Cal. May 20, 2015) (rejecting Barclays' argument "that trades which involve willing counterparties made on the open market cannot be actionable under Section 10(b)").

[321] *Barclays*, 144 FERC ¶ 61,041 at PP 50-58.

[322] *Id.* P 54 (citing *Brian Hunter*, 135 FERC ¶ 61,054, at P 50, *order denying reh'g*, 137 FERC ¶ 61,146 (2011), *rev'd sub nom. Hunter v. FERC*, 711 F.3d 155 (2013)).

[323] *Id.* P 58.

iii. Powhatan Acted With Scienter

137. We find that Powhatan also acted with the requisite scienter based on contemporaneous evidence showing its: (1) knowledge and understanding of Dr. Chen's round-trip UTC trading scheme, including the consequences of the scheme; (2) support, increased investment in and encouragement for the scheme; and (3) deliberate actions to increase its profits resulting from the scheme.[324]

138. Like Dr. Chen, Powhatan understood the purpose of UTC trading in PJM. Mr. Gates acknowledged, for example, that before Dr. Chen learned of his eligibility for MLSA payments, Dr. Chen traded UTCs based on "his ability to model congestion [and] his ability to model the day-ahead versus the real-time spread."[325] In other words, he understood that Dr. Chen initially traded UTCs based on market fundamentals. Mr. Gates also understood that Dr. Chen altered his UTC trading purpose away from market fundamentals after discovering that he was eligible to receive MLSA payments. Mr. Gates explained that under this new purpose, Dr. Chen "was trying to remove the day-ahead/real-time spread."[326] Specifically, Mr. Gates understood that Dr. Chen was "trying to drive . . . the day-ahead versus the real-time . . . to zero and isolate the bet to his ability to model the marginal loss credit . . . ."[327] Mr. Gates understood that Dr. Chen

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[324] Although we rely on both direct and circumstantial evidence of intent here, circumstantial evidence of scienter is sufficient. *See, e.g.*, *Desert Palace, Inc. v. Costa*, 539 U.S. 90, 100 (2003) ("Circumstantial evidence is not only sufficient, but may be more certain, satisfying and persuasive than direct evidence."); *United States v. Philip Morris USA Inc.*, 566 F.3d 1095, 1118 (D.C. Cir. 2009) ("A person's state of mind is rarely susceptible of proof by direct evidence, so specific intent to defraud may be, and most often is, inferred from the totality of the circumstances, including indirect and circumstantial evidence."); *United States v. Kim*, 267 F. App'x 712, 713 (9th Cir. 2008) (citation omitted) ("Fraudulent intent may be, and often must be, proven by circumstantial evidence."); *United States v. Salameh*, 152 F.3d 88, 143 (2d Cir. 1998) ("… as a general rule most evidence of intent is circumstantial…"); *United States v. O'Brien*, 14 F.3d 703, 706 (1st Cir. 1994) (citation omitted) ("Guilty knowledge, like specific intent, seldom can be established by direct evidence. This principle has particular pertinence in respect to fraud crimes which, by their very nature, often yield little in the way of direct proof.").

[325] Staff Report at 25 (quoting K. Gates Test. Vol. II Tr. 172:25-173:2).

[326] *Id.* (quoting K. Gates Test. Vol. II Tr. 309:20-21).

[327] *Id.* (quoting K. Gates Test. Vol. II Tr. 172:3-9).

accomplished this scheme through round-trip trades. He testified, "I remember [Chen] saying . . . that he was very clearly trying to eliminate that [spread], and he was going from A to B – B to A."[328] Mr. Gates also understood the consequences of Dr. Chen's scheme, knowing that it yielded large payments from PJM and that it gave Powhatan an "edge" over other market participants.[329]

139. Knowing and understanding that Dr. Chen was executing round-trip trades to profit solely from MLSA payments, Powhatan supported and encouraged the scheme to move forward. For example, Mr. Gates, talking about Dr. Chen's risk-free strategy of targeting MLSA payments, told Dr. Chen, "I don't want to leave money on the table."[330]

140. Powhatan's scienter is also reflected in its decision in Spring 2010 to increase the multiple of UTC trades executed on its behalf from four to twenty. This willingness to increase its exposure by a multiple of five shows that Powhatan knew that Dr. Chen's improved UTC trading scheme would allow it to secure profits without taking any of the risks inherent in ordinary spread trading.[331]

3. <u>In Connection With Jurisdictional Transaction</u>

141. The third element of establishing a violation under FPA section 222 and the Commission's Anti-Manipulation Rule is determining whether the conduct in question was "in connection with" a transaction subject to the Commission's jurisdiction.[332] Section 201(b)(1) of the FPA confers jurisdiction on the Commission over "the transmission of electric energy in interstate commerce and . . . . the sale of electric energy at wholesale in interstate commerce."[333]

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[328] *Id.* (quoting K. Gates Test. Vol. II Tr. 178:12-15).

[329] *Id.* at 29 (quoting Email from Kevin Gates to Kevin Byrnes (July 26, 2010, 5:01:02 PM) (POW00001849)).

[330] *Id.* at 20 (quoting Email from Kevin Gates to Alan Chen (March 5, 2010, 9:40:46 PM) (POW00016599)).

[331] We reject Powhatan's scienter arguments—that Dr. Chen had a legitimate economic purpose and placed his trades in an open, transparent manner—for the same reasons we rejected similar arguments made by HEEP, CU Fund, and Dr. Chen.

[332] 16 U.S.C. § 824v(a) (2012); 18 C.F.R. § 1c.2 (2014).

[333] 16 U.S.C. § 824(b)(1).

a. Respondents' Show Cause Answers

142. Dr. Chen argues that the Commission lacks jurisdiction over the Respondents' UTC trades at issue in this proceeding. Dr. Chen contends that his UTC trades were purely financial and, thus, cannot be deemed to be jurisdictional sales of physical power or transmission.[334] Also, Dr. Chen argues that because the UTC transaction did not result in the physical delivery of electricity, its transmission reservation was not a reservation of physical transmission; therefore, Dr. Chen asserts, the UTC trades cannot be jurisdictional.[335] Moreover, Dr. Chen argues that the relevant UTC trades were not in connection with jurisdictional transactions because OE Staff's allegations are based on the proposition that "the trades were always offsetting in the time period at issue, and thus never affected congestion outcomes."[336] Powhatan does not contest jurisdiction in its Answer.

b. OE Staff Report and Reply

143. OE Staff asserts that, contrary to Dr. Chen's contention, Respondents' conduct falls within the Commission's jurisdiction. OE Staff argues that Respondents' UTC transactions affected, or had the potential to affect, the price of physical electricity because they are an integral part of PJM's day-ahead model and, therefore, play an important role in setting day-ahead prices.[337] OE Staff claims that the Commission has jurisdiction over virtual transactions even though no actual delivery of power is involved in the transaction.[338] OE Staff explains that the Commission has found that virtual bidding is an integral part of the operation of the wholesale markets[339] and, as such, it falls within the Commission's responsibility under FPA section 205 to ensure that rates for jurisdictional power sales are just and reasonable.[340] Moreover, OE Staff avers that

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[334] Chen Answer at 63.

[335] *Id*.

[336] Chen Answer at 63-64.

[337] Staff Report at 77-79; Staff Reply at 81-82.

[338] Staff Reply at 84 (citing *Cal. Indep. Sys. Operator Corp.*, 110 FERC ¶ 61,041, at P 31(2005)).

[339] Staff Report at 78 (citing *Cal. Indep. Sys. Operator Corp.*, 108 FERC ¶ 61,254, at P 74 (2004)).

[340] *Id.* (citing *Cal. Indep. Sys. Operator Corp.*, 110 FERC ¶ 61,041 at P 31).

Dr. Chen reserved and purchased Commission-jurisdictional transmission services when executing the UTC transactions at issue and that such transmission provided the physical link between the day-ahead and real-time markets.[341] OE Staff also argues that Respondents' reservations of huge volumes of transmission affected other market participants' available capacity and that the Commission's authority over transmission services extends to ATC.[342]

c. Commission Determination

144. We find that the Commission has jurisdiction over the Respondents' UTC trading during the Manipulation Period. Respondents challenge the Commission's jurisdiction because their round-trip UTC trades did not result in actual delivery of power. We find that such an argument ignores our broad statutory obligation that provides jurisdiction over the transmission or sale of electric energy at wholesale in interstate commerce,[343] as well as the responsibility to ensure that rates and charges for transmission and wholesale power sales are just and reasonable and not unduly discriminatory or preferential.[344] Moreover, the Court of Appeals for the District of Columbia Circuit has affirmed in recent years that the Commission has "authority under the FPA to regulate the activity of traders who participate in energy markets."[345]

145. Respondents engaged in round-trip UTC trades within PJM's energy market; their UTC transactions, associated transmission service reservations, and MLSA payments

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[341] *Id.* at 77-80; Staff Reply at 84-86.

[342] Staff Reply at 84-86.

[343] 16 U.S.C. § 824(b).

[344] Section 205(a) of the FPA charges the Commission with ensuring that rates and charges for jurisdictional sales by public utilities and "all rules and regulations affecting or pertaining to such rates or charges" are just and reasonable. *Id.* § 824d(a). Section 206(a) gives the Commission authority over rate and charges by public utilities for jurisdictional sales as well as "any rule, regulation, practice or contract affecting such rates and charges" to make sure that they are just and reasonable and not unduly discriminatory or preferential. *Id.* § 824e(a).

[345] *Kourouma v. FERC*, 723 F.3d 274, 276 (D.C. Cir. 2012).

were implemented under PJM's Commission-approved tariff.[346] Thus, by virtue of engaging in UTC transactions and benefiting from MLSA allocation, both of which operated under a Commission-approved tariff within PJM, a Commission-regulated RTO, we find the UTC trades at issue are under our jurisdictional purview.

146. Also, virtual transactions, including UTC transactions, are integral to the operation and settlement of Commission-jurisdictional wholesale markets.[347] In the context of CAISO's convergence bidding (virtual bidding), the Commission explained that:

> [t]o participate in virtual bidding, a participant is required to submit virtual bids in the same way and at the same time as all other day-ahead bids. Virtual bids are cleared along with those other bids, and can affect the outcomes of the settlement of the day-ahead physical market. Therefore, virtual bids can be seen as a substitute for bids for physical power.[348]

The Commission stated that it has jurisdiction over practices that affect rates and because "convergence bidding affects the market clearing price for wholesale power by determining, in conjunction with other bids, the unit that sets the market clearing price, the Commission has statutory authority over this type of bidding to ensure that the rates it produces are just and reasonable."[349] Therefore, we conclude that we have jurisdiction over the Respondents' virtual product trades conducted during the Manipulation Period.

147. Further, the Respondents' round-trip UTC trades involved the reservation of jurisdictional transmission services within the PJM market. At the time of the transactions at issue in this proceeding, all UTC transactions were required to reserve transmission service and, as such, the Respondents scheduled non-firm transmission service. As explained above, transmission of energy is within the Commission's jurisdiction. Moreover, the Commission's jurisdiction over transmission is extremely

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[346] *Black Oak Energy, L.L.C., et al.*, 128 FERC ¶ 61,262 (2009); *PJM Interconnection, L.L.C.*, 91 FERC ¶ 61,148 (2000); *Atlantic City Elec. Co., et al.*, 86 FERC ¶ 61,147 (1999).

[347] *Cal. Indep. Sys. Operator Corp.*, 108 FERC ¶ 61,254 at P 74.

[348] *Id.*

[349] *Cal. Indep. Sys. Operator Corp.*, 110 FERC ¶ 61,041 at P 31.

broad.[350] We reject the argument that this transmission service was not physical transmission because it did not result in delivery of physical energy. As OE Staff correctly points out, "[t]here is no such thing as 'virtual' transmission."[351] Respondents' UTC bids and associated transmission service reservations were integral to the settlement of PJM's day-ahead market, regardless of whether the transmission reservation lacked delivery of physical energy.

148. Apart from our direct jurisdiction, Respondents' conduct also was "in connection with" other market participants' jurisdictional transactions such that the necessary jurisdictional nexus under FPA section 222 is also satisfied on this basis. We have noted that the *in connection with* element encompasses "situations in which there is a nexus between the fraudulent conduct of an entity and a jurisdictional transaction."[352] Even where underlying fraudulent transactions do not involve the transmission or sale of electric energy in interstate commerce, they nonetheless can fall within the ambit of our jurisdiction if "the entity . . . . intend[s] to affect, or . . . . act[s] recklessly to affect, a jurisdictional transaction."[353] We find that Respondents' UTC transactions and associated transmission service reservations affected the amount of transmission service available to other market participants to use for their transactions, including physical power sales.

C. <u>Remedies and Sanctions</u>

149. Having concluded that Respondents, in connection with jurisdictional UTC transactions and associated transmission services, intentionally or knowingly devised and participated in a fraudulent scheme to manipulate and a course of business to defraud PJM's wholesale power market in violation of FPA section 222(a) and section 1c.2 of the Commission's regulations, we now must determine the appropriate remedies to assess. OE Staff recommends both civil penalties and disgorgement be assessed against Respondents. After assessing the legal and factual issues, including those raised by Respondents, and "tak[ing] into consideration the seriousness of the violation[s] and the

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[350] *New York v. FERC*, 535 U.S. 1, 16-17 (2002) (noting that the Commission has jurisdiction over the entire transmission grid).

[351] Staff Reply at 80 n. 258.

[352] Order No. 670, FERC Stats. & Regs. ¶ 31,202 at P 22; *see also Barclays*, 144 FERC ¶ 61,041 at P 113; *BP America Inc., et al.*, 147 FERC ¶ 61,130, at P 23 (2014).

[353] Order No. 670, FERC Stats. & Regs. ¶ 31,202 at P 22.

efforts of such person[s] to remedy the violation[s] in a timely manner,"[354] we agree with OE Staff's recommendations to assess penalties and disgorgement. As explained more fully below, although we disagree with one aspect of OE Staff's penalty analysis, we exercise our discretion and accept its proposed penalty amounts, which fall within the applicable Penalty Guidelines' ranges.

1. Penalties

150. Pursuant to FPA section 316A(b), the Commission may assess a civil penalty of up to $1 million per day, per violation against any person who violates Part II of the FPA (including section 222 of the FPA) or any rule or order thereunder.[355] HEEP and Powhatan each executed fraudulent trades on 64 days and CU Fund executed them on 16 days.[356] Even at a rate of one violation per day—an underestimation of the violations committed—we have the statutory authority to assess penalties of up to $64 million each against HEEP and Powhatan and $16 million against CU Fund.

151. In determining an appropriate penalty amount within the statutory maximums, section 316A(b) requires the Commission to consider "the seriousness of the violation and the efforts of such person to remedy the violation in a timely manner."[357] Although the Penalty Guidelines are not mandatory—and do not apply to individuals such as Dr. Chen—the Commission uses them and its Policy Statements on Enforcement,[358] to guide its penalty analysis for organizations, such as HEEP, CU Fund, and Powhatan.[359]

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[354] 16 U.S.C. § 825o-1(b).

[355] *Id.*

[356] Staff Report at 80 n.412.

[357] 16 U.S.C. § 825o-1(b).

[358] *Enforcement of Statutes, Orders, Rules, and Regulations*, 123 FERC ¶ 61,156 (2008); *Enforcement of Statutes, Orders, Rules, and Regulations*, 113 FERC ¶ 61,068 (2005).

[359] *See Enforcement of Statutes, Orders, Rules, and Regulations*, 132 FERC ¶ 61,216 (2010) (Revised Policy Statement on Penalty Guidelines); *Enforcement of Statutes, Orders, Rules, and Regulations*, 130 FERC ¶ 61,220, at PP 6, 26 (2010) (Initial Policy Statement on Penalty Guidelines) (seriousness of violation and timely efforts to remedy a violation will continue to be significant factors under the Penalty Guidelines). The Commission also stated when issuing its Initial Policy Statement on Penalty

(continued...)

152. The Penalty Guidelines use two sets of factors to establish penalties. First, the Penalty Guidelines calculate a Base Penalty amount based on factors specifically tailored to the seriousness of the violation, including the loss caused by the violation. Second, the Penalty Guidelines consider several culpability factors, including efforts to remedy violations, which lead to minimum and maximum multipliers of the Base Penalty amount to arrive at the applicable penalty range.

153. For fraud, the Penalty Guidelines start with a pre-assigned Base Violation Level (6 points) and then adjust this level based on the loss caused by the violation and an enhancement for either the amount of energy involved in the violation or the duration of the violation, whichever is greater.[360] A Base Penalty is then established as the greater of (1) a pre-established dollar amount associated with the final calculated Violation Level; (2) the pecuniary gain to the organization from the violation; or (3) the pecuniary loss caused by the violation.[361]

154. After establishing a Base Penalty amount, the Penalty Guidelines then determine the culpability score (using a variety of factors), which establishes corresponding minimum and maximum culpability score multipliers that are multiplied by the Base Penalty to establish a penalty range. By creating "a penalty *range*, rather than an absolute figure," we "retain some discretion," and the "[s]pecific facts of each case will determine where in the range the ultimate penalty might fall."[362] The specific facts determine, for example, whether the ultimate penalty should fall within, or, in appropriate circumstances, outside the indicated civil penalty range. Where facts warrant, the Commission retains discretion to deviate from the Penalty Guidelines range, but we have noted that we "do not intend to depart from the Penalty Guidelines regularly."[363]

Guidelines that it will continue to rely on factors identified in its previous policy statements on enforcement and policy statement on compliance to measure the seriousness of violations and timely efforts to remedy violations. The Commission noted that any conflict will be resolved in favor of the Penalty Guidelines. Initial Policy Statement on Penalty Guidelines, 130 FERC ¶ 61,220 at P 63. The Penalty Guidelines are appended to the Revised Policy Statement on Penalty Guidelines.

[360] FERC Penalty Guidelines § 2B1.1.

[361] *Id.* § 1C2.2(a).

[362] Initial Policy Statement on Penalty Guidelines, 130 FERC ¶ 61,220 at P 32 (emphasis in original).

[363] *Id.*

155. The foregoing Penalty Guidelines analysis does not apply to individuals, like Dr. Chen. Instead, we determine penalties for individuals "based on the facts and circumstances of the violation," and "look to [the Penalty] Guidelines for guidance in setting those penalties."[364] Thus, below we apply the Penalty Guidelines to HEEP, CU Fund, and Powhatan as part of our penalty determination, while conducting a separate penalty analysis for Dr. Chen, guided by the facts and circumstances of his violations and some of the same factors described in the Penalty Guidelines.

a. Assessment of Civil Penalty Against HEEP and CU Fund

156. OE Staff recommends civil penalties of $1,920,000 for HEEP and $10,080,000 for CU Fund.[365] Applying the Penalty Guidelines, OE Staff's recommendation accounts for the following factors: (1) after netting out transaction costs (i.e., the cost of the transmission purchased in the fraudulent wash trades) HEEP and CU Fund earned $173,100 and $1,080,576, respectively, in unjust profits; (2) the manipulative trades involved more than 100,000 MWh of electricity for each company; (3) both companies cooperated adequately with OE Staff's investigation; (4) neither company accepted responsibility for the violations; (5) neither company self-reported the violations; and (6) neither company had compliance programs in effect at the time of the violations.[366] In light of the collusion between them, OE Staff recommends holding HEEP and Powhatan jointly and severally liable for the penalty against HEEP.[367]

157. The Commission agrees with OE Staff that HEEP's and CU Fund's violations were serious and warrant penalties.

i. Seriousness of the Violations

158. In the following paragraphs, we discuss the factors in the Penalty Guidelines that are relevant to the seriousness of HEEP's and CU Fund's violations.

159. *Manipulation, Deceit, Fraud, and Recklessness or Indifference to Results of Actions (Penalty Guidelines § 2B1.1)*. As described above, HEEP and CU Fund, through Dr. Chen, developed and participated in a course of business to defraud and a

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[364] FERC Penalty Guidelines § 1A1.1, Application Note 1.

[365] Staff Report at 81-82.

[366] *Id.* at 81.

[367] *Id.* at 82.

manipulative scheme to defraud the PJM market in violation of FPA section 222(a) and section 1c.2 of the Commission's regulations.[368] This course of business and scheme operated as a fraud on PJM because it relied on wash trades and created the false appearance that Respondents were trading UTCs for their intended purpose—to take risk by arbitraging differences between day-ahead and real-time prices—when in fact they were placing those trades solely for the purpose of negating that arbitrage price risk in order to collect MLSA payments that otherwise would have gone to other market participants who reserved transmission service for their transactions. The Respondents' acts fall under section 2B1.1 of the Penalty Guidelines and thus our analysis begins with a pre-assigned Base Violation Level of 6.

160. *Loss Caused by the Violation (Penalty Guidelines § 2B1.1(b)(1))*. The Penalty Guidelines measure the seriousness of a fraud-based violation by considering the loss it caused, and specify that "loss" is the greater of "actual loss or intended loss."[369] "Actual loss" is defined as "the reasonably foreseeable pecuniary harm that resulted from the violation."[370] OE Staff's loss calculation for purposes of calculating the Violation Level used Respondents' unjust profits, which netted out transaction costs, instead of using the actual loss that resulted from Respondents' violations.[371] We disagree with this approach because the Penalty Guidelines distinguish loss from gain and make clear that "[t]he Commission will use the gain that resulted from the violation as an alternative measure of loss *only if* there is a loss but it reasonably cannot be determined."[372] In this case, the loss can reasonably be determined—it is the total amount of MLSA payments (without netting out any costs) Respondents received that otherwise would have been paid to other market participants making legitimate transactions.[373] Specifically, HEEP received $398,770 and CU Fund received $1,784,145 in MLSA payments attributable to their round-trip

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[368] As also discussed above, Powhatan was part of this scheme to defraud.

[369] FERC Penalty Guidelines § 2B1.1, Application Note 2(A).

[370] *Id*. § 2B1.1, Application Note 2(A)(i).

[371] Staff Report at 82.

[372] FERC Penalty Guidelines § 2B1.1, Application Note 2B (emphasis added).

[373] In addition to this loss caused by the misallocation of MLSA payments, Dr. Chen's fraudulent trading may have caused other more tangential market impacts. The Commission, however, "need only make a reasonable estimate of the loss." *Id.* § 2B1.1, Application Note 2(C).

UTC trade volumes. Using these loss figures increases HEEP's Base Violation Level by 12 points and CU Fund's by 16 points.[374]

161. *Scope of Violations as Measured by Volume and Duration (Penalty Guidelines § 2B1.1(b)(2))*. After accounting for loss, the Penalty Guidelines further adjust the Base Violation Level based on the scope of the violation, as measured by an adder based on either the amount of energy involved in the violation or the duration of the violation, whichever is greater. HEEP's and CU Fund's scheme each persisted from June 1, 2010 to August 3, 2010, and involved more than 100,000 MWh of electricity. Accordingly, a 6 point Violation Level increase is warranted for each Respondent under section 2B1.1(b)(2)(C) of the Penalty Guidelines.

162. *Base Penalty (Penalty Guidelines § 1C2.2)*. Based on the foregoing analysis, we find HEEP's and CU Fund's final Violation Levels are 24 and 28, respectively (calculated as the Base Violation Level of 6 points for fraud plus increases of 12 points for HEEP and 16 points for CU Fund based on the loss caused, and increases of 6 points to each for the volume involved in their violations). These final Violation Levels correspond to specific dollar amounts enumerated in a "Violation Level Penalty Table."[375] Referencing this table, HEEP's final violation level of 24 corresponds to $2,100,000 and CU Fund's final violation level of 28 corresponds to $6,300,000. We then use these figures to determine the Base Penalty, which is the greater of (1) these dollar amounts from the "Violation Level Penalty Table"; or (2) the pecuniary gain from the violations ($173,000 for HEEP and $1,080,576 for CU Fund); or (3) the pecuniary loss from the violations ($398,770 for HEEP and $1,784,145 for CU Fund). Accordingly, the Base Penalties are $2,100,000 for HEEP and $6,300,000 for CU Fund.

ii. Aggravating and Mitigating Culpability Factors

163. All violations start with a base culpability score of 5, which is then adjusted upward or downward depending on the various culpability factors.[376] The only

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[374] OE Staff's use of the lower unjust profit figure of $173,100 for HEEP would result in an increase of 10 points, instead of the 12 point increase in our analysis. In contrast, OE Staff's use of the lower unjust profit figure of $1,080,576 for CU Fund does not make a difference because any loss between $1 million and $2.5 million generates a 16 point increase. As we explain below, despite this difference in our Penalty Guidelines' analysis, we accept OE Staff's proposed penalties.

[375] FERC Penalty Guidelines § 1C2.2(b).

[376] *Id.* § 1C2.3(a).

adjustment appropriately made here is a reduction of 1 point as OE Staff has stated that HEEP and CU Fund cooperated in the investigation. We find HEEP's and CU Fund's culpability scores are 4 (base score of 5 reduced by 1 point for cooperation) which corresponds to a minimum multiplier of 0.80 and maximum multiplier of 1.60. Applying these multipliers to their respective Base Penalties produces a penalty range of $1,680,000 to $3,360,000 for HEEP and $5,040,000 to $10,080,000 for CU Fund. The penalties proposed by OE Staff fall within these ranges.

iii. Appropriate Penalty for HEEP and CU Fund

164. Based on the foregoing analysis and the record in this proceeding, the Commission finds that OE Staff's recommended civil penalties of $1,920,000 for HEEP and $10,080,000 for CU Fund are fair and reasonable. Although we could assess a higher civil penalty for HEEP within the Penalty Guidelines range, we have discretion where within the range to set the ultimate penalty, and we accept OE Staff's recommended penalty as fair and reasonable. HEEP and CU Fund, acting through Dr. Chen, used high volume of round-trip UTC trades to extract millions of dollars in PJM MLSA payments that otherwise would have been allocated to market participants. We find OE Staff's recommended penalties appropriate under these circumstances. Therefore, we direct HEEP and CU Fund to pay civil penalties of $1,920,000 and $10,080,000, respectively, within 60 days of the date of this Order.

165. Also, we agree with OE Staff that Powhatan should be held jointly and severally liable with HEEP for the $1,920,000 penalty assessed against HEEP. HEEP, CU Fund, and Dr. Chen erroneously claim that the Commission declined to adopt joint and several liability in its Order to Show Cause in this matter. We made no such ruling and did not address the issue in that Order.[377] HEEP, CU Fund, and Dr. Chen also cite a 2003 Commission order in which we found that apportionment, if possible, is preferable for distribution of funds from refund liability.[378] That order's expression of a general preference for apportionment, however, does not compel us to reject joint and several liability here. Unlike that case, which involved refunds apportioned to various unconnected entities' electricity purchases based on our finding of market flaws in California, this case involves a finding of intentional manipulation by multiple entities that acted together to execute a fraudulent scheme. We find that it is appropriate to apply

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[377] *See Houlian Chen, et al*., 149 FERC ¶ 61,261 (2014), *revised*, 149 FERC ¶ 61,263 (2014).

[378] Chen Answer at 69 (citing *San Diego Gas & Elec. Co. v. Sellers of Energy and Ancillary Servs*., 105 FERC ¶ 61,066, at P 170 n.101 (2003)).

joint and several liability under these circumstances.[379] Were we not to adopt joint and several liability, entities engaged in the intentional act of fraud could potentially avoid paying the full penalty and disgorgement amounts.[380] This would be improper.

b. Assessment of Civil Penalty Against Powhatan

166. OE Staff recommends a civil penalty of $16,800,000 for Powhatan.[381] Applying the Penalty Guidelines, OE Staff's recommendation accounts for the following factors: (1) Powhatan earned $3,465,108 in unjust profits; (2) the manipulative trades involved more than 100,000 MWh of electricity; (3) Powhatan cooperated with OE Staff's investigation; (4) Powhatan has not accepted responsibility for its conduct; (5) Powhatan did not self-report the violations; and (6) Powhatan lacked a compliance program at the time of the violations.[382]

167. Powhatan disputes the recommended penalty on the grounds that no other market participants could be harmed by Dr. Chen's trades because no entity is entitled to MLSA payments.[383]

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[379] *See SEC v. Levine*, 517 F. Supp. 2d 121, 147 (D.D.C. 2007) (finding multiple defendants jointly and severally liable for civil penalty where they worked together to fraudulently overstate assets and falsify records in violation of federal securities laws); *SEC v. Haligiannis*, 470 F. Supp. 2d 373, 386 n.13 (holding all four defendants in securities fraud case "to be joint and severally liable for civil penalties, as there is no meaningful difference in their culpability"). *Accord* Restatement (Third) of Torts: Apportionment of Liability § 12 (2007) ("Each person who commits a tort that requires intent is jointly and severally liable for any indivisible injury legally caused by the tortious conduct."); *Paper Sys. Inc. v. Nippon Paper Indust. Co., Ltd*., 281 F.3d 629, 632 (7th Cir. 2002) (holding that "each member of a conspiracy is liable for all damages caused by the conspiracy's entire output").

[380] *See, e.g*., Email from Kevin Gates to Richard Gates (March 21, 2010, 7:55 AM) (POW00007990) (noting that if PJM sought to claw back MLSA payments "we'd bankrupt our company and not pay PJM").

[381] Staff Report at 84.

[382] *Id.* at 81, 84.

[383] Powhatan Answer at 48.

168. We agree with OE Staff that Powhatan's violations were serious and warrant a civil penalty. Similar to its analysis for HEEP, we find that OE Staff erred by using unjust profits instead of loss to determine the Violation Level under the Penalty Guidelines. However, as explained below we again exercise our discretion and accept OE Staff's proposed penalty, which falls within the applicable Penalty Guidelines range. Our Penalty Guidelines analysis for Powhatan largely mirrors the HEEP and CU Fund analyses, differing only slightly to account for Powhatan's role and the market harm caused by its participation.

i. Seriousness of the Violations

169. *Manipulation, Deceit, Fraud, and Recklessness or Indifference to Results of Actions (Penalty Guidelines § 2B1.1)*. With full knowledge of and support for Dr. Chen's fraudulent round-trip UTC trades executed on its behalf, Powhatan participated in the manipulative scheme and a course of business to defraud PJM and other market participants in violation of FPA section 222(a) and section 1c.2 of the Commission's regulations.[384] Powhatan's Penalty Guidelines analysis thus begins with a Base Violation Level of 6.

170. *Loss Caused by the Violation (Penalty Guidelines § 2B1.1(b)(1))*. As with HEEP and CU Fund, OE Staff's penalty recommendation considered Powhatan's unjust profits (after netting out transactions costs) instead of the loss that resulted from the violations.[385] We again find that OE Staff erred in applying unjust profits instead of loss to calculate the Violation Level under the Penalty Guidelines. The loss caused by Powhatan's conduct is the total amount of MLSA payments (without netting out any costs) Powhatan received ($7,975,403) which would have been distributed to other market participants but for Respondents' fraudulent round-trip UTC trades.[386] Accordingly, we use this loss amount rather than OE Staff's lesser, unjust profits figure, thereby increasing Powhatan's Base Violation Level by 20 points.[387]

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[384] *See* discussion *supra* PP 137-140.

[385] Staff Report at 84.

[386] We reject Powhatan's argument that there is no harm because other market participants were not entitled to MLSA payments. *See* discussion *supra* at P 98.

[387] OE Staff's use of the lower unjust profit figure of $3,465,108 would result in an increase of 18 points, instead of the 20 point increase used in our analysis.

171. *Scope of* Violations *as Measured by Volume and Duration (Penalty Guidelines § 2B1.1(b)(2))*. Powhatan's volume and duration factors are the same as those of HEEP and CU Fund. The relevant conduct persisted for nearly three months and involved more than 100,000 MWh of electricity. Accordingly, a 6 point increase is warranted.

172. *Base* Penalty *(Penalty Guidelines § 1C2.2)*. Based on the foregoing analysis, we find Powhatan's final Violation Level is 32 (calculated as the Base Violation Level of 6 points for fraud plus increases of 20 points for the loss caused, and 6 points for the volume involved in the violations). A final Violation Level of 32 corresponds to $17,500,000 from the "Violation Level Penalty Table."[388] Powhatan's Base Penalty then becomes the greater of (1) $17,500,000; or (2) Powhatan's pecuniary gain from the violations ($3,465,108); or (3) the pecuniary loss caused by Powhatan's violations ($7,975,403). Accordingly, Powhatan's Base Penalty is $17,500,000.

ii. Aggravating and Mitigating Culpability Factors

173. Again, the only appropriate adjustment we find to the culpability score is a reduction of 1 point based on OE Staff's representation that Powhatan cooperated with the investigation. Thus, we find Powhatan's culpability score is 4 (base score of 5 reduced by 1 point for cooperation). A culpability score of 4 corresponds to a minimum multiplier of 0.80 and maximum multiplier of 1.60.[389] Applying these multipliers to Powhatan's Base Penalty of $17,500,000 produces a penalty range of $14,000,000 to $28,000,000. OE Staff's recommended penalty of $16,800,000 falls within this range.

iii. Appropriate Penalty for Powhatan

174. Based on the foregoing analysis, the pleadings in this case, and the OE Staff Report, the Commission finds that a $16,800,000 civil penalty for Powhatan is warranted and is fair and reasonable. This civil penalty amount is within the Penalty Guidelines range. Similar to our penalty assessment for HEEP, although we could assess a higher civil penalty for Powhatan within the Penalty Guidelines range, we have discretion where within the range to set the ultimate penalty, and we accept OE Staff's recommended penalty as fair and reasonable. With full knowledge of Dr. Chen's trading conduct, Powhatan supported and encouraged the scheme and course of business to move forward. The scheme was central to Powhatan's business—indeed, one purpose of Powhatan's creation was to protect its investors in case PJM sought to claw back the MLSA

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[388] FERC Penalty Guidelines § 1C2.2(b).

[389] *Id.* § 1C2.4.

payments.[390] Given Powhatan's integral role in the manipulative scheme and course of business, we find OE Staff's proposed penalty appropriate and direct Powhatan to pay a civil penalty of $16,800,000 within 60 days of the date of this Order.

175. As with HEEP's civil penalty, we agree with OE Staff that Powhatan and HEEP should be held jointly and severally liable for the $16,800,000 penalty assessed against Powhatan, given the collusion between them.[391]

c. Assessment of Penalty Against Dr. Chen

176. OE Staff recommends a total civil penalty of $1,000,000 for Dr. Chen—$500,000 for his acts on behalf of HEEP and Powhatan and $500,000 for his acts on behalf of CU Fund.[392] OE Staff's recommendation accounts for the following factors: (1) Dr. Chen knowingly devised and implemented the manipulative scheme; (2) Dr. Chen carried out the scheme over several months and stopped only after being contacted by PJM's IMM; (3) Dr. Chen's deliberate conduct harmed the integrity of the regulatory process and PJM's market without regard to deleterious market impacts; and (4) Dr. Chen cooperated with OE Staff's investigation, but did not self-report the violations and took no efforts to mitigate the harm his conduct caused.[393]

177. Dr. Chen raises five arguments against assessment of the penalty OE Staff recommends. First, he argues that the Commission lacks statutory authority to penalize individuals.[394] Second, he contends that we must look at the seriousness factor in context, which, he alleges, involved trading in a way contemplated by the Commission and never prohibited or even labeled as manipulation.[395] Third, Dr. Chen argues that his trades did not cause any harm because market participants are not entitled to MLSA payments.[396] Fourth, Dr. Chen asks the Commission to consider that he stopped the relevant conduct in a timely manner after being contacted by the PJM IMM and that he

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[390] Staff Report at 22, n.128.

[391] *See* discussion *supra* P 165.

[392] Staff Report at 82.

[393] *Id.*

[394] Chen Answer at 64-66.

[395] *Id.* at 67.

[396] *Id.*

did not remedy the violations sooner because he did not think he was acting unlawfully.[397] Finally, Dr. Chen asks us to consider the toll this proceeding has taken on him and that OE Staff's recommended sanctions would drive him into bankruptcy.[398]

178. As a threshold matter, we reject Dr. Chen's argument that the Commission lacks statutory authority to penalize individuals. We find that section 1c.2 of our regulations reaches Dr. Chen's conduct in this case, and that we have jurisdiction over Dr. Chen for purposes of enforcing this law. Section 1c.2 makes it unlawful for "any entity, directly or indirectly" to engage in fraudulent activities "in connection with" a transaction subject to the Commission's jurisdiction.[399] As we explained in Order No. 670, and have applied in multiple cases since, "'[a]ny entity'" is a deliberately inclusive term. . . . [that] include[s] any person or form of organization, regardless of its legal status, function or activities."[400] The phrase "any entity" is broad, and applies to natural persons, such as Dr. Chen, who have direct involvement in manipulative schemes.[401] The United States District Court for the Eastern District of California recently adopted this position in the *Barclays* matter, holding that "a meaning of 'entity' that includes natural persons appears more consistent with the goals of FPA section 222 and the surrounding statutory scheme."[402]

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[397] *Id.* at 67-68.

[398] *Id.* at 68.

[399] 18 C.F.R. § 1c.2 (2014); *see also* 16 U.S.C. § 824v(a) (2012) ("It shall be unlawful for any entity . . . directly or indirectly, to use or employ, in connection with the purchase or sale of electric energy . . . subject to the jurisdiction of the Commission, any manipulative or deceptive device or contrivance.").

[400] Order No. 670, FERC Stats. & Regs. ¶ 31,202 at P 18. The Commission previously has assessed civil penalties to individuals, for example, see *Maxim Power Corp., et al*., 151 FERC ¶ 61,094, at P 66 (2015); *Richard Silkman*, 144 FERC ¶ 61,164 at P 93; *Barclays*, 144 FERC ¶ 61,041 at PP 135-146; *Moussa I. Kourouma d/b/a Quntum Energy LLC*, 135 FERC ¶ 61,245, at P 53 (2011).

[401] As we stated in Order No. 670, "Congress could have used the existing defined terms in the NGA and FPA of 'person,' 'natural-gas company,' or 'electric utility,' but instead chose to use a broader term without providing a specific definition." Order No. 670, FERC Stats. & Regs. ¶ 31,202 at P 18.

[402] *FERC v. Barclays Bank PLC, et al*., No. 2:13-cv-2093-TLN-DAD, at 32 (E.D. Cal. May 20, 2015) (rejecting argument that claims against individual Barclays' traders

(continued...)

179. Having determined that we have authority to penalize Dr. Chen, we now turn to consider whether OE Staff's recommended penalty is appropriate. For individuals who are not subject to the Penalty Guidelines, the Commission has previously considered five factors in determining the amount of any civil penalty assessed pursuant to section 316A of the FPA: (1) seriousness of the violation; (2) commitment to compliance; (3) self-reporting, (4) cooperation; and (5) reliance on OE Staff guidance.[403]

i. Seriousness of the Violations

180. The Commission's Revised Policy Statement on Enforcement identifies several factors to consider in our analysis of the seriousness of the violations.[404] We discuss these factors below to the extent that they are relevant to Dr. Chen's conduct.

181. *Harm Caused by the Violation*. Dr. Chen's round-trip UTC trades financially harmed PJM and its customers by extracting more than $10 million in MLSA payments that otherwise would have gone to other market participants engaging in UTC transactions.[405] Also, Dr. Chen's scheme and course of business to defraud persisted for nearly three months and has affected some transmission service in PJM. In sum, Dr. Chen's scheme and course of business to defraud, executed on behalf of three separate entities, caused widespread harm to PJM, other market participants, and the integrity of the market, warranting a significant penalty.

182. *Manipulation, Deceit, Fraud, and Recklessness or Indifference to Results of Actions*. Dr. Chen's scheme operated as a fraud and deceit on PJM. Specifically, and as described above, Dr. Chen deceived PJM into disbursing MLSA payments by creating the false impression that he was trading to arbitrage price differentials when, in fact, he was engaging in round-trip UTC trades solely to collect MLSA.

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should be dismissed because "entity" under FPA section 222 does not include natural persons).

[403] *Moussa I. Kourouma d/b/a Quntum Energy LLC*, 135 FERC ¶ 61,245 at P 42. These factors stem from guidance we provided in our Revised Policy Statement on Enforcement. *See* Revised Policy Statement on Enforcement, 123 FERC ¶ 61,156 at P 54.

[404] Revised Policy Statement on Enforcement, 123 FERC ¶ 61,156 at P 55.

[405] For the same reasons expressed in our penalty determination for Powhatan, we reject Dr. Chen's argument that these other market participants were not entitled to MLSA payments and, thus, were not harmed. *See* discussion *supra* P 98.

183. *Willful Action or in Concert with Others*. Dr. Chen's scheme was willful and conducted in concert with, and on behalf of, others. Despite his understanding that the purpose of UTC trading was to try to arbitrage price differentials, Dr. Chen affirmatively implemented his scheme.[406] Dr. Chen also acted in concert with others, detailing his scheme to Powhatan and then executing trades on their behalf.

184. *Isolated Instance or Recurring Problem; Systematic and Persistent Wrongdoing and Duration*. Dr. Chen executed his scheme on behalf of all Respondents, systematically and persistently for a continuous period of close to three months. He stopped only after being contacted by PJM's IMM.

185. Based on the foregoing seriousness factors, we find that Dr. Chen's conduct was serious and warrants a substantial penalty. Moreover, we reject Dr. Chen's contention that we should view the seriousness of his conduct in the context of the Commission having contemplated and never prohibiting the behavior at issue. As we discussed above, we never approved the conduct at issue and have provided ample notice that wash trades and similar fraudulent transactions are unlawful.[407]

ii. Mitigating Factors Relating to Culpability

186. *Commitment to Compliance, Self-Reporting, Cooperation, and Reliance on Staff Guidance*. Only one mitigating factor, cooperation, serves to mitigate Dr. Chen's violations. Because he lacked a compliance program at the time of his violations, did not self-report the violations, and never sought guidance from staff, he is not eligible for a credit based on these factors.[408]

iii. Appropriate Penalty for Dr. Chen

187. Based on the foregoing factors, the pleadings in this case, and the OE Staff Report, the Commission finds that there is a critical need to discourage and deter the fraudulent

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[406] Chen Test. Vol. I Tr. 31:14-18.

[407] *See* discussion *supra* PP 103-107, 115-123.

[408] Regarding Dr. Chen's efforts to remedy the violations, we reject his contention that he stopped the conduct in a timely manner and that he did not make efforts to remedy the violations sooner only because he did not think he was acting unlawfully. Dr. Chen is a sophisticated, experienced trader. He reasonably knew or should have known that his round-trip trading scheme raised potential compliance concerns and, at a minimum, should have inquired further into the lawfulness of his behavior.

conduct at issue and that a civil penalty of $1,000,000 is fair and reasonable. We find this civil penalty to be particularly appropriate given that Dr. Chen designed and implemented the fraudulent scheme and course of business to defraud on behalf of multiple entities, and given the widespread scope of and harm caused by his violations. Also, Dr. Chen never made efforts to remedy or cease his violations and stopped trading only after being contacted by PJM's IMM. Therefore, we direct Dr. Chen to pay the $1,000,000 civil penalty within 60 days of the date of this Order.[409]

2. Disgorgement

188. OE Staff recommends that the Commission require Respondents to disgorge the full amount of their gain, plus applicable interest, resulting from Dr. Chen's manipulative trading scheme. Specifically, OE Staff asserts that after netting out the transaction costs, the fraudulent trades resulted in gains of $1,080,576 to CU Fund, $173,100 to HEEP, and $3,465,108 to Powhatan, and that these gains should be disgorged.[410] We agree. It is a long-standing Commission practice to require disgorgement of unjust profits.[411] In cases where pecuniary gain results from a violation, "the Commission enters a disgorgement order for the full amount of the gain plus interest."[412] Pecuniary gain includes "the additional before tax profit to the entity resulting from the relevant conduct of the violation."[413]

189. The disgorgement amount "need only be a reasonable approximation of profits causally connected to the violation,"[414] and we find that OE Staff correctly calculated "a reasonable approximation of the profits" by taking the MLSA payments Respondents collected as a result of the scheme and deducting the transaction costs of their trades.

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[409] Furthermore, we are not persuaded by Dr. Chen's request that we consider the toll this proceeding has taken on him. Dr. Chen willingly engaged in a fraudulent trading scheme that had a deleterious impact on the PJM market and other market participants.

[410] Staff Report at 82-83.

[411] Revised Policy Statement on Enforcement, 123 FERC ¶ 61,156 at P 43.

[412] FERC Penalty Guidelines § 1B1.1(a).

[413] *Id.* § 1A1.1, Application Note 3(g).

[414] *SEC v. Whittemore*, 659 F.3d 1, 7 (D.C. Cir. 2011).

190. Therefore, in addition to the civil penalties, we direct disgorgement payments, plus applicable interest, of (1) $1,080,576 for CU Fund; (2) $173,100 for HEEP; and (3) $3,465,108 for Powhatan. Such payments shall be made within 60 days of the date of this Order. We will require the interest on these sums to be calculated in accordance with 18 C.F.R. § 35.19a for the full period of time since Respondents received their MLSA payments from PJM.

191. Finally, we agree with OE Staff's recommendation to hold HEEP, CU Fund and Dr. Chen jointly and severally liable for HEEP's and CU Fund's required disgorgement payments, and to hold Powhatan, HEEP, and Dr. Chen jointly and severally liable for Powhatan's required disgorgement payment. We find that applying joint and several liability is appropriate where, as occurred here, multiple respondents collaborate or have a close relationship in executing the fraud.[415]

D. Request for Oral Argument

192. Dr. Chen requests oral argument related to the Order to Show Cause.[416] We do not agree with Dr. Chen's assessment that oral argument in this matter would be helpful to the Commission.[417] The record before the Commission and the arguments made by the parties provide us sufficient basis to make our findings, and there is no need for an oral

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[415] *Id*. at 1, 10-11 (affirming finding that multiple defendants are jointly and severally liable for disgorgement of unjust profits because of their collaboration in a fraudulent securities scheme). Holding Dr. Chen jointly and severally liable for the disgorgement against HEEP and CU Fund is appropriate because as the sole employee of HEEP and CU Fund, he would have the power to shut these companies down. *See Capital Tel. Co., Inc. v. FCC*, 498 F.2d 734, 738 (D.C. Cir. 1974) (holding that "[t]he courts have consistently recognized that a corporate entity may be disregarded in the interest of public convenience, fairness and equity . . . . [W]hen the notion of legal entity is used to defeat public convenience, justify wrong, protect fraud, or defend crime, the law will regard the corporation as an association of persons") (internal citations and quotations omitted)).

[416] *See, e.g.*, Chen Answer at 11-12.

[417] The Commission has not in the past held oral argument on Orders to Show Cause which have originated from OE Staff Reports. Thus, in denying Dr. Chen's request, he is being treated consistently with parties in other similar proceedings. *See, e.g.*, *Barclays*, 144 FERC ¶ 61,141; *Competitive Energy Services, LLC*, 144 FERC ¶ 61,163; *Richard Silkman*, 144 FERC ¶ 61,164; *Lincoln Paper and Tissue*, 144 FERC ¶ 61,162.

argument. We therefore decline Dr. Chen's invitation to allow oral argument in this matter.[418]

E. Rehearing

193. Given Respondents' election under section 31(d)(3)(A) of the FPA, this Order will not be subject to rehearing.[419] If a person elects the procedure under section 31(d)(3) of the FPA, the statute provides for (i) prompt assessment of a penalty by Commission order; (ii) if the penalty is unpaid within 60 days, the Commission shall institute a proceeding in the appropriate district court seeking an order affirming the assessment of a civil penalty and that court shall have the authority to review *de novo* the law and facts involved; and (iii) the district court shall have the jurisdiction to enforce, modify, or set aside, in whole or in part, such penalty assessment. Following this process, a person can appeal to a United States Court of Appeals within the appropriate time for review of the district court order.[420]

The Commission orders:

(A) The Commission hereby directs Dr. Chen to pay to the United States Treasury by a wire transfer a sum of $1 million in civil penalties within 60 days of the issuance of this order, as discussed in the body of this order. If Dr. Chen does not make this civil penalty payment within the stated time period, interest payable to the United States Treasury will begin to accrue pursuant to the Commission's regulations at 18 C.F.R. § 35.19a (2012) from the date that payment is due.

(B) The Commission hereby directs HEEP to pay to the United States Treasury by a wire transfer a sum of $1,920,000 in civil penalties within 60 days of the issuance of this order, as discussed in the body of this order. If HEEP does not make this civil penalty payment within the stated time period, interest payable to the United States

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[418] *See, e.g., Perez v. Mortgage Bankers Ass'n.*, No. 13-1041, *slip op.* at 8 (S. Ct. March 9, 2015) ("that the very basic tenet of administrative law [is] that agencies should be free to fashion their own rules of procedure," quoting *Vermont Yankee*, 435 U.S., 519, 544 (1978)).

[419] *See Process for Assessing Civil Penalties*, 117 FERC ¶ 61,317, at P 5 (2006); *see also Barclays*, 144 FERC ¶ 61,041 at P 152; *Competitive Energy Services, LLC*, 144 FERC ¶ 61,163 at P 104; *Richard Silkman*, 144 FERC ¶ 61,164 at P 96; *Lincoln Paper and Tissue, LLC*, 144 FERC ¶ 61,162 at P 80.

[420] 16 U.S.C §823b(d)(3) (2012).

Treasury will begin to accrue pursuant to the Commission's regulations at 18 C.F.R. § 35.19a from the date that payment is late.

(C) The Commission hereby directs CU Fund to pay to the United States Treasury by a wire transfer a sum of $ 10,080,000 in civil penalties within 60 days of the issuance of this order, as discussed in the body of this order. If CU Fund does not make this civil penalty payment within the stated time period, interest payable to the United States Treasury will begin to accrue pursuant to the Commission's regulations at 18 C.F.R. § 35.19a from the date that payment is due.

(D) The Commission hereby directs Powhatan to pay to the United States Treasury by a wire transfer a sum of $16,800,000 in civil penalties within 60 days of the issuance of this order, as discussed in the body of this order. If Powhatan does not make this civil penalty payment within the stated time period, interest payable to the United States Treasury will begin to accrue pursuant to the Commission's regulations at 18 C.F.R. § 35.19a from the date that payment is due.

(E) The Commission hereby directs HEEP, within 60 days of the issuance of this order, to distribute its unjust profits, plus interest, to PJM, as discussed in the body of this order.

(F) The Commission hereby directs CU Fund, within 60 days of the issuance of this order, to distribute its unjust profits, plus interest, to PJM, as discussed in the body of this order.

(G) The Commission hereby directs Powhatan, within 60 days of the issuance of this order, to distribute its unjust profits, plus interest, to PJM, as discussed in the body of this order.

(H) The Commission directs PJM to establish a method to resettle and distribute the resettled MLSA payments in a manner which identifies: (i) the market participants that would have received higher MLSA payments in the absence of Respondents' activity during the Manipulation Period; and (ii) the amounts of those higher payments. The Commission directs PJM to use the disgorgement funds and interest it receives pursuant to this Order from HEEP, CU Fund, and Powhatan to provide reimbursement of MLSA payments, and any available interest, to those entities identified as a result of PJM's proposed methodology. PJM shall provide its proposed methodology to resettle and distribute the MLSA payments to the Director of OE within 45 days of

receipt of all of the disgorgement and interest funds from HEEP, CU Fund and Powhatan for the Director's approval. PJM shall distribute the funds to the entities it has identified promptly after receiving the Director of OE's approval of the resettlement and distribution methodology.

By the Commission. Chairman Bay is not participating.

(S E A L)

Nathaniel J. Davis, Sr.,
Deputy Secretary.

EXHIBIT 2

Order Revising Show Cause Order, *Houlian Chen, et al*., 149 FERC ¶ 61,263 (2014)
Order to Show Cause and Notice of Proposed Penalty, *Houlian Chen, et al*., 149 FERC ¶ 61,261 (2014)

149 FERC ¶ 61,263
UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Before Commissioners: Cheryl A. LaFleur, Chairman;
Philip D. Moeller, and Tony Clark.

Houlian Chen
Powhatan Energy Fund, LLC
HEEP Fund, LLC
CU Fund, Inc.

Docket No. IN15-3-000

ORDER REVISING SHOW CAUSE ORDER

(Issued December 18, 2014)

On December 17, 2014, the Commission issued an order in the above-captioned proceeding. *Houlian Chen, et. al*, 149 FERC ¶ 61,261 (2014). The last sentence of Paragraph 1 and the subsequent bullets are hereby corrected to read as follows:

> The Commission further directs Respondents to show cause why they should not be required to disgorge unjust profits with interest and be assessed civil penalties in the following amounts:
>
> • *Powhatan Energy Fund*: $16,800,000 civil penalty; $3,465,108 disgorgement
> • *CU Fund*: $10,080,000 civil penalty; $1,080,576 disgorgement
> • *HEEP Fund*: $1,920,000 civil penalty; $173,100 disgorgement
> • *Houlian "Alan" Chen*: $500,000 for trades executed through and on behalf of HEEP Fund and Powhatan and an additional $500,000 for trades executed through and on behalf of CU Fund.
>
> This order also corrects Ordering Paragraph (B) to read as follows:
>
> (B) Within 30 days of the date of this order, Respondents must file an answer in accordance with Rule 213 of the Commission's Rules of Practice and Procedure, 18 C.F.R. § 385.213, showing cause why their alleged violation should not warrant the assessment of civil penalties and disgorgement with interest in the

amounts described in Paragraph 1 of this order, or a modification of ~~that~~ those amounts consistent with section 31(d)(4) of the FPA.

By the Commission. Commissioner Bay is not participating.

(S E A L)

Kimberly D. Bose,
Secretary.

149 FERC ¶ 61,261
UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Before Commissioners: Cheryl A. LaFleur, Chairman;
Philip D. Moeller, and Tony Clark.

Houlian Chen
Powhatan Energy Fund, LLC
HEEP Fund, LLC
CU Fund, Inc.

Docket No. IN15-3-000

ORDER TO SHOW CAUSE AND NOTICE OF PROPOSED PENALTY

(Issued December 17, 2014)

1. Pursuant to Rule 209(a)(2) of the Commission's Rules of Practice and Procedure,[1] the Commission's Revised Policy Statement on Enforcement,[2] and the Commission's Statement of Administrative Policy Regarding the Process for Assessing Civil Penalties,[3] the Commission directs the above-captioned respondents, Houlian "Alan" Chen, HEEP Fund, Inc., CU Fund, Inc., and Powhatan Energy Fund, LLC (together, Respondents), to show cause why they should not be found to have violated section 1c.2 of the Commission's regulations and section 222 of the Federal Power Act (FPA) by engaging in fraudulent Up To Congestion (UTC) transactions in PJM Interconnection L.L.C.'s energy markets.[4] The Commission further directs Respondents to show cause why they should not be assessed civil penalties in the following amounts:

- *Powhatan Energy Fund*: $16,800,000
- *CU Fund*: $10,080,000
- *HEEP Fund*: $1,920,000

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[1] 18 C.F.R. § 385.209(a)(2).

[2] *Enforcement of Statutes, Regulations and Orders*, 123 FERC ¶ 61,156, at P 35-36 (2008).

[3] *Process for Assessing Civil Penalties*, 117 FERC ¶ 61,317, at P 5 (2006).

[4] 18 C.F.R. § 1c.2; 16 U.S.C. § 824v(a).

- *Houlian "Alan" Chen*: $500,000 for trades executed through and on behalf of HEEP Fund and Powhatan and an additional $500,000 for trades executed through and on behalf of CU Fund.

Respondents may also seek a modification of those amounts consistent with section 31(d)(4) of the FPA.[5] Pursuant to Rule 213(a) of the Commission's Rules of Practice and Procedure,[6] the Commission directs Respondents to file an answer with the Commission within 30 days of the date of this order. Office of Enforcement Staff (OE staff) may reply to Respondent's answer within 30 days of the filing of the answer. The Commission will consider these pleadings as part of its review of this proceeding.

2. This case presents allegations by OE staff of Respondents' violation of the Commission's Prohibition of Energy Market Manipulation. These allegations arose out of an investigation conducted by OE staff and are described in the Enforcement Staff Report and Recommendation submitted to the Commission on December 2, 2014 (OE Staff Report).[7] Issuance of this order does not indicate Commission adoption or endorsement of the OE Staff Report.

3. The OE Staff Report alleges that Chen, trading on behalf of HEEP Fund and Powhatan Energy Fund, conceived of a fraudulent scheme in connection with the UTC markets operated by PJM; that he communicated the details of that fraudulent scheme to the principals of Powhatan Energy Fund, who knowingly encouraged him to implement it; and that he did implement it on behalf of Powhatan Energy Fund, HEEP Fund, and, later, CU Fund. Specifically, OE staff alleges that Chen devised and implemented a manipulative scheme to inflate trade volumes of UTCs – through a series of offsetting wash-like trades designed to wrongfully collect large amounts of market credits known as Marginal Loss Surplus Allocations (MLSA). The OE Staff Report alleges that, with Powhatan's knowledge and encouragement, Chen placed UTC trades in opposite directions on the same paths, in the same volumes, during the same hours for the purpose

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[5] We note that under section 31(d)(4) of the FPA, 16 U.S.C. 823b(d)(4), the Commission may "compromise, modify, or remit, with or without conditions, any civil penalty which may be imposed . . . at any time prior to a final decision by the court of appeals . . . or by the district court."

[6] 18 C.F.R. § 385.213(a).

[7] The OE Staff Report is attached to this order as Appendix A. The OE Staff Report describes the background of OE staff's investigation, findings and analysis, and proposed sanctions.

of creating the illusion of bona fide UTC trading and thereby to capture large amounts of MLSA that PJM distributed at that time to UTC transactions with paid transmission.

4. In light of the allegations contained in the OE Staff Report, the Commission directs Respondents to respond to this order as set forth above.[8] This order also is the notice of proposed penalty required pursuant to section 31 of the FPA.[9] In the answer to this order, Respondents have the option to choose between either: (a) an administrative hearing before an ALJ at the Commission prior to the assessment of a penalty under section 31(d)(2); or (b) an immediate penalty assessment by the Commission under section 31(d)(3)(A). If Respondents elect an administrative hearing before an ALJ, the Commission will issue a hearing order unless it is determined that the matter can be resolved in a summary disposition; if Respondents elect an immediate penalty assessment, and if, after a review of the full record to be developed in this proceeding, the Commission finds a violation, the Commission will issue an order assessing a penalty. If such penalty is not paid within 60 days of assessment, the Commission will commence an action in a United States district court for an order affirming the penalty.[10]

5. The Commission authorizes OE staff to disclose information obtained during the course of the investigation as necessary to advance this matter.

The Commission orders:

(A) Within 30 days of the date of this order, Respondents must file an answer in accordance with Rule 213 of the Commission's Rules of Practice and Procedure, 18 C.F.R. § 385.213, showing cause why they should not be found to have violated 18 C.F.R. § 1c.2 and 16 U.S.C. § 824v(a) with respect to their UTC trading in PJM.

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[8] Under 18 C.F.R. § 385.213(c), Respondents must file an answer that provides a clear and concise statement regarding any disputed factual issues and any law upon which he relies. Respondents must also, to the extent practicable, admit or deny, specifically and in detail, each material allegation contained in the OE Staff Report and set forth every defense relied upon. Failure to answer an order to show cause will be treated as a general denial and may be a basis for summary disposition under Rule 217. 18 C.F.R. § 385.213(e)(2).

[9] 16 U.S.C. § 823b(d).

[10] FPA Section 31(d)(3)(B), 16 U.S.C. § 823b(d)(3)(B). *See also Process for Assessing Civil Penalties, supra* note 3.

(B) Within 30 days of the date of this order, Respondents must file an answer in accordance with Rule 213 of the Commission's Rules of Practice and Procedure, 18 C.F.R. § 385.213, showing cause why their alleged violation should not warrant the assessment of civil penalties in the amounts described in Paragraph 1 of this order, or a modification of that amount consistent with section 31(d)(4) of the FPA.

(C) In any answer, Respondents should address any matter, legal, factual or procedural, that they would urge in the Commission's consideration of this matter. To the extent that Respondents cite any material not cited in the OE Staff Report, Respondents are directed to file non-publicly one (1) copy of such material on CD-ROM or DVD in the captioned dockets and to serve a copy of same on OE staff.

(D) Pursuant to section 31(d)(1) of the FPA, within 30 days of the date of this order, Respondents may also make an election to have the procedures set forth in section 31(d)(3) of the FPA apply to this proceeding. Under that provision, if the Commission finds a violation, the Commission will issue a penalty assessment and, if not paid within 60 days of the order assessing penalties, the Commission will institute an action in the appropriate United States district court. Should Respondents fail to make a timely election under section 31(d)(1), the procedures of section 31(d)(2) will apply.

(E) Within 30 days of the filing of the answer by Respondents, Enforcement staff may file a reply with the Commission.

By the Commission. Commissioner Bay is not participating.

(S E A L)

Kimberly D. Bose,
Secretary.

APPENDIX A

FEDERAL ENERGY REGULATORY COMMISSION

Houlian Chen, HEEP Fund Inc., CU Fund Inc.,
and Powhatan Energy Fund, LLC

Docket No. IN15-3-000

Enforcement Staff Report and Recommendation

Office of Enforcement

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I. Executive Summary

In this report, Enforcement staff recommends that the Commission issue to HEEP Fund Inc., CU Fund Inc., Powhatan Energy Fund, LLC, and to Houlian "Alan" Chen, the trader who traded on behalf of all three, an order to show cause why they should not be required to disgorge unlawfully obtained profits and to pay civil penalties for violating the Commission's Anti-Manipulation Rule.

This is a matter in which a successful and experienced trader – a man who had profitably traded in the PJM Interconnection (PJM) market for years, consistently pursuing legitimate arbitrage opportunities – decided to cheat. Through his meticulous study of the market, Chen discovered a method to make money "almost risk-free" by, in the words of Kevin Gates, the fund manager who partnered with Chen in this enterprise through Powhatan, "moving electricity around in a circle."

Chen's manipulation involved a product in PJM called "Up-to Congestion" (UTC), which functions as a swap of the difference or "spread" between the price of electricity at two locations in the Day-Ahead market and the same two points in the Real-Time market. Arbitrageurs of UTC can profit when the price spread between those locations moves favorably from the Day-Ahead to the Real-Time market, and lose money when the price movement is unfavorable. For example: a trader is willing to pay up to $15 for the spread between points A and B. If the Day-Ahead spread between A and B is $10, then the bid clears and the trader pays $10 (plus transaction costs). The next day the trader is paid the Real-Time spread between A and B. So if the Real-Time spread increases to $20, the trader earns a profit of $10 (less transaction costs), and if the Real-Time spread decreases to $5, the trader loses $5 (plus transaction costs).

Chen understood this product well, and had traded it profitably for years. But he transformed his trading when, in late 2009, he learned that PJM had begun to distribute pro rata shares of a pool of funds called the marginal loss surplus allocation (MLSA, sometimes called "transmission loss credits" or "TLC") to UTC trades. The MLSA is a pool of surplus money arising from the fact that PJM charges buyers more for transmission losses than it distributes to sellers. Previously, PJM had distributed MLSA only to market participants trading physical power. Soon after he began receiving MLSA, Chen figured out that the amount of MLSA was relatively predictable and that it could, during periods of high load, be greater than the transaction costs of scheduling UTC trades – costs that were themselves predictable.

Chen then figured out that he could do enormous volumes of wash-like trades and thereby qualify to receive payments of the MLSA, intended for bona fide transactions. In essence, Chen realized he could be paid simply for placing trades – and in particular, trades that cancelled one another out. Instead of contacting PJM, Chen shared this insight with Kevin Gates and the other investors in Powhatan, who, though they knew this opportunity was "something that nature shouldn't allow" and would be shut down as soon as it was discovered, eagerly endorsed a strategy of gaming the PJM settlement

system with a series of non-bona fide wash-type trades designed to collect large amounts of MLSA from sheer trading volume without taking a position in the market.

Chen began his MLSA volume trading with correlated transaction pairs involving electrically similar locations, the first from A to B and the second from B to C. In combination, these were effectively trades between A and C, where the change in price spread between A and C was expected to be very small. After this strategy unexpectedly failed one day in late May 2010, Chen decided that the best way to avoid the price spreads associated with UTCs was to make equal and opposite trades between the same two points (i.e., a trade from A to B paired with a trade from B to A). Since the two trades would face identical but opposite fluctuations in prices, these "round trip" trades would cancel out Chen's price risk and allow him to increase profits by ramping up his trading volume enormously. These trades make no sense from the standpoint of price arbitrage, since they wash themselves out and leave the trader with transaction costs. Though they were the opposite of legitimate spread arbitrage trades, Chen made them because he expected MLSA to exceed transaction costs, allowing him to come away with a profit. In short, pursuing this strategy would allow Chen to execute enormous volumes of trades and to collect a corresponding amount of MLSA because of the artificial appearance of economic activity.

With Gates' enthusiastic support, Chen implemented his manipulative strategy in large volumes on behalf of HEEP and Powhatan. In fact, Chen was soon one of the biggest traders in PJM by gross volume, even though a huge portion of his net volume was essentially flat (not completely flat, because Chen continued to do some actual spread trades during the period). The profits from this strategy were so great that Chen decided he wanted to capture an even greater share for himself, so he violated the spirit of his Advisory Agreement with Powhatan by surreptitiously creating another company – CU Fund –to capture profits he would otherwise have had to share with Gates.

Chen's scheme was to execute pairs of large volume UTC trades in identical volumes and hours and in opposite directions on the same paths – paths where Chen had every expectation that the UTC trades would clear. Like wash trades, these transactions left Chen with no net position in the market, but created the illusion of bona fide market activity. PJM's automated settlement software, however, was not programmed to detect this particular scheme, so it awarded these trades MLSA. The scheme was highly profitable, because PJM's predictable allocations of MLSA were substantially greater than the predictable transaction costs associated with the same transactions.

In sum, Chen went into PJM's UTC marketplace, where market participants are assumed either to be hedging physical transactions or promoting market efficiency by speculating on congestion price movements between the Day-Ahead and Real-Time markets, but he did neither of those things. He hedged nothing, provided no good, no service, nor any other benefit to the market, took no meaningful risk and yet came away with over $10 million that should have gone to bona fide market participants, and, ultimately, in large part to ratepayers in PJM.

II. Background

A. Respondents & Key Persons

1. Chen & the Chen Entities

a. Houlian ("Alan") Chen

Houlian "Alan" Chen is a native of the Zhejing Province in the People's Republic of China, and holds a doctorate in power engineering from Tsinghua University in Beijing.[1] He came to the United States in 1995 to perform postgraduate work at Drexel University.[2] He subsequently worked as an analyst at a succession of companies, including Entergy, Enron, and UBS.[3] Chen's responsibilities included creating and using models to forecast power prices.[4]

In 2005, Chen left UBS to join Merrill Lynch Commodities, where he gained his first exposure to UTC transactions.[5] After Merrill Lynch decided not to pursue UTC trading, Chen left to create his own firm, HEEP Fund, Inc.[6] He subsequently founded CU Fund in June 2010.[7]

Chen executed all of the transactions at issue in this proceeding. He is a respondent in this proceeding.

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[1] Testimony of Houlian Chen Vol. I (Oct. 7, 2010) (Chen Test. Vol. I) Tr. 12:1-22; Written Submission to Commission Investigation Staff on Behalf of Dr. Houlian Chen (Dec. 13, 2010) ("Chen Submission") at 12.

[2] Chen Test. Vol. I Tr. 13:13 – 14:12. Chen reports his status as of December 13, 2010 as that of a permanent resident alien, though he notes he has been in the process of seeking citizenship in the United States. Chen Submission at 12. He currently resides in Texas. Chen Submission at 12.

[3] Chen Test. Vol. I Tr. 14:13 – 27:13. Chen's employment at Enron Net Works ran from approximately 1999 – 2002, a period encompassing the Western Energy Crisis of 2000 - 2001. Chen Test. Vol. I Tr. 23:13-20. Chen wound up at UBS when Enron Net Works, L.L.C., along with Enron Power Marketing, Inc. and Enron North America Corp. were sold to UBS Warburg. Chen Test. Vol. I Tr. 23:15-18 *and see*, *UBS AG*, 98 FERC ¶ 61,255 (2002); *Enron Corp. et al*., 99 FERC ¶ 62,053 (2002).

[4] Chen Submission at 13.

[5] Chen Test. Vol. I Tr. 27:8 – 29:8.

[6] Chen Test. Vol. I Tr. 37:1-14.

[7] Chen Test. Vol. I Tr. 41:18-22; Chen Dec. 13, 2010 Response to Data Request #15a.

b. HEEP Fund Inc.

Chen created HEEP Fund, Inc., on August 15, 2007 with an initial investment of $200,000.[8] HEEP Fund is incorporated in Texas as an S-type corporation with Chen as sole shareholder and employee.[9] Chen executed his first UTC trade for HEEP Fund in PJM on September 7, 2007.[10] Chen, through HEEP Fund, executed certain advisory agreements pursuant to which trades executed for HEEP Fund would also be executed by Chen on behalf of certain funds owned in part by Kevin Gates.[11] Chen has traded primarily in UTCs on behalf of HEEP Fund.[12] Chen ceased trading on behalf of HEEP Fund on August 18, 2010.[13]

HEEP is a respondent in this proceeding.

c. CU Fund Inc.

Chen created a second fund, called CU Fund, Inc., on June 28, 2010.[14] Chen is the sole owner and employee of CU Fund.[15] Chen testified that he created CU Fund to allow him to take on more potentially profitable risk than he was able to do with HEEP Fund, and also to engage in the trading of Financial Transmission Rights (FTRs), which he was prohibited to do through HEEP Fund under the Advisory Agreement with Powhatan.[16] Chen never executed any FTR transactions on CU Fund's behalf, but instead used it to implement the same UTC trading strategy he was already implementing for HEEP and

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[8] Chen Test. Vol. I Tr. 38:10-16; Chen Submission at 13.

[9] Chen Test. Vol. I Tr. 37:18-22; Chen Dec. 13, 2010 Response to Data Request # 15a.

[10] Chen Dec. 13, 2010 Response to Data Request #15a.

[11] *See* POW00000071-73 (Advisory Agreement between HEEP Fund Inc. and TFS Capital LLC); POW00000067-70 (Advisory Agreement between HEEP Fund Inc. and Powhatan Energy Fund LLC). The Advisory Agreement with TFS Capital expressly contemplated that TFS Capital would be succeeded in interest by Huntrise Energy Fund LLC.

[12] Chen Submission at 13. As discussed below, HEEP Fund was barred by its Advisory Agreements from trading anything but UTCs. *See* Testimony of Kevin Gates Vol. II Exh. 11 (Sept. 7, 2011) (K. Gates Test. Vol. II) (POW00000071).

[13] Chen Test. Vol. I Tr. 47:14-15.

[14] Chen Test. Vol. I Tr. 41:18-22; Chen Dec. 13, 2010 Response to Data Request #15a.

[15] Chen Dec. 13, 2010 Response to Data Request #15c.

[16] Chen Test. Vol. I Tr. 41:23 – 42:8; Chen Submission at 17 n.16.

Gates. Chen began trading in the name of CU Fund on July 16, 2010 and ceased doing so on August 2, 2010.[17]

CU Fund is a respondent in this proceeding.

2. Kevin Gates and the Gates Entities

a. Kevin Gates

Gates received a B.S. in Chemical Engineering from the University of Virginia in 1994.[18] In 1997, he founded TFS Capital LLC along with his brother Richard Gates and Lawrence "Larry" Eiben.[19] In 2008, Eiben recruited Chen to trade on behalf of various companies in which he and Gates held an ownership interest.[20] During the period in which Chen traded on behalf of Gates' companies, Gates managed the relationship with Chen and was the primary point of contact between Chen and the other owners and investors.[21] Although Chen was not required to obtain Gates' approval before executing a trade, Gates was fully informed about Chen's trading strategies and their performance, had the opportunity and authority to approve or disapprove Chen's actions on behalf of his own companies, and personally profited (for himself and on behalf of the other owners of Powhatan) from Chen's trading.[22]

Gates is not a respondent in this proceeding.

b. TFS Capital

TFS Capital LLC (TFS or TFS Capital) is a Virginia limited liability company.[23] It describes itself as "an employee-owned independent advisory firm that provides

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[17] Second Testimony of Houlian Chen (Jul. 20, 2011) (Chen Test. Vol. II) Tr. 20:6-19.

[18] Resumé of Kevin Gates, POW00000019. Most of Chen's communications concerning the Huntrise and Powhatan Funds were with Kevin Gates, referred to in this Report as "Gates." When we refer to Kevin's brother and fellow portfolio manager at TFS Capital, Richard Gates, we use his full name.

[19] Testimony of Richard J. Gates Vol. I (May 7, 2012) (R. Gates Test. Vol. I) Tr. 21:9 – 22:5.

[20] *See* Chen Test. Vol. I Tr. 39:15-21.

[21] *See, e.g.*, Testimony of Lawrence Eiben (Sep. 23, 2010) (Eiben Test.) Tr. 31:22 – 32:12; Chen Test. Vol. I Tr. 41:6; POW00007910 (listing "Oversee Alan" as one of Gates' responsibilities).

[22] Testimony of Kevin Gates Vol. I (Sep. 23, 2010) (K. Gates Test. Vol. I) Tr. 27:5-21, 32:1-8.

[23] Certificate of Incorporation (POW00001492).

portfolio management services to investment funds."[24] The employee-owners of TFS include Larry Eiben, Richard Gates, and Kevin Gates.[25] TFS was founded in 1997 and has offices in Richmond and Crozet, Virginia, as well as in West Chester, Pennsylvania, where its trading operations appear to be centered.[26]

In February 2008, Larry Eiben, Chief Operating Officer and Co-Portfolio Manager of TFS Capital, contacted Chen to propose that Chen provide certain portfolio management services to TFS Capital.[27] On May 1, 2008, TFS Capital and HEEP executed an Advisory Agreement, pursuant to which Chen agreed to execute UTC trades on behalf of TFS Capital mirroring UTC trades he executed for HEEP Fund on a two-and-a-half-to-one basis.[28] That is, for each 1 MW of UTC Chen traded on behalf of HEEP Fund, the Advisory Agreement obligated him to execute a 2.5 MW trade at the same hour and location on behalf of TFS Capital.[29] Under the terms of the Advisory Agreement, TFS compensated Chen based on a percentage of the profits earned by his trades for TFS.[30]

Pursuant to the Advisory Agreement, Chen traded on behalf of TFS Capital in April 2008.[31] Shortly thereafter, Chen learned that a new entity had been created by his contacts at TFS Capital, and that the new entity, Huntrise Energy Fund, LLC (Huntrise),

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[24] *See* http://www.tfscapital.com/about/firm-overview/ (visited March 20, 2014); *see also* Powhatan Nov. 22, 2010 Response to Data Request #7(d).

[25] *See* K. Gates Test. Vol. I Tr. 41:20 – 42:19; Powhatan Nov. 22, 2010 Response to Data Request #7(e); R. Gates Test. Vol. I Tr. 17:20 – 18:17. TFS also has employees with "pseudo equity," who are compensated as if they were owners but who in fact are employees only. *See* R. Gates Test. Vol. I Tr. 32:23 – 33:11; K. Gates Test. Vol. I Tr. 42:6-19. Chao Chen and Eric Newman are, along with Eiben and the Gates brothers, co-portfolio managers. Gregory Sekelsky is Chief Financial Officer and Mike Frederick is Director of Business Development. *See* http://www.tfscapital.com/about/firm-leadership/ (visited Jul. 16, 2014).

[26] *See* http://www.tfscapital.com/contact-us/ (visited March 20, 2014).

[27] Chen Test. Vol. I Tr. 39:15-21; K. Gates Test. Vol. I Tr. 72:16 – 73:1; Eiben Test. Tr. 15:4 – 16:14; http://www.tfscapital.com/about/firm-leadership/ (visited March 20, 2014).

[28] POW00000071. The multiplier eventually grew to 4:1. Chen Test. Vol. I Tr. 39:10-14.

[29] *Id*. The agreement thus ensured that Chen had a personal financial stake for every trade Chen placed on Powhatan's behalf.

[30] *Id*.

[31] Chen Test. Vol. I Tr. 39:24 – 40:2.

would succeed to TFS Capital's interest in the Advisory Agreement.[32] In June 2008, Chen ceased trading on behalf of TFS Capital and began trading on behalf of Huntrise.

Staff does not allege that the UTC transactions executed by Chen on behalf of TFS Capital were manipulative. Consequently, TFS Capital is not a respondent in this proceeding. It is, however, a predecessor in interest in the Advisory Agreement pursuant to which Chen traded on behalf of Huntrise. This Advisory Agreement was nearly identical to that of Powhatan (other than the volumetric multiplier), in addition to which TFS is controlled by the same small circle of individuals as Huntrise and Powhatan.

c. Huntrise Energy Fund, LLC

During the period at issue in this proceeding, Huntrise Energy Fund, LLC (Huntrise) was a private investment fund with its principal place of business in Richmond, Virginia.[33] It was created on February 25, 2008.[34] During the time period under investigation, the Huntrise Energy Fund had one investor, the Huntrise Fund of Funds.[35]

On July 3, 2009, HEEP and Huntrise executed a non-disclosure agreement that permitted the two funds to share information with one another, while preserving the confidentiality of the information.[36] Chen traded UTCs on behalf of Huntrise from June 3, 2008 through May 5, 2010.[37] Because the manipulative trading for which this report recommends disgorgement and civil penalties occurred after Chen ceased trading for it, Huntrise is not a respondent in this proceeding.

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[32] Chen Test. Vol. I Tr. 41:17-21. This was contemplated by the terms of the Advisory Agreement. *See* POW00000071.

[33] Powhatan Nov. 22, 2010 Response to Data Request #7(a); POW0000105.

[34] Powhatan Nov. 22, 2010 Response to Data Request #7(d).

[35] Testimony of Gregory M. Sekelsky, Tr. 28:22-23. The Huntrise Fund of Funds (HFOF) is controlled by its managing members, Eiben and the Gates brothers. *See* K. Gates Test. Vol. I Tr. 50:5-8, 17-19. HFOF is owned by 11 individuals, including the Gates brothers, Eiben, Eric Newman, Chao Chen, Sam Harris, and Greg Sekelsky. POW00001824-27. TFS Capital Management was the sponsor and managing member of HFOF when it was founded in 2005. *See* Huntrise Fund of Funds Form D, available at http://www.sec.gov/Archives/edgar/vprr/05/9999999997-05-029004 (visited Jul. 11, 2014).

[36] POW00000074. The only representatives of Huntrise who were permitted access to HEEP's proprietary information were Kevin Gates and Chao Chen. POW00000075.

[37] Chen Test. Vol. II Ex. Nos. 44, 46; K. Gates Test. Vol. I Tr. 55:20 – 56:5.

d. Powhatan Energy Fund, LLC

On March 22, 2010, Gates and his fellow investors created a new fund, Powhatan Energy Fund, LLC (Powhatan).[38] During the period at issue in this proceeding, Powhatan was principally owned by Kevin Gates, his brother Richard, and Larry Eiben, though others had smaller ownership interests.[39] On May 18, 2010, Powhatan and HEEP Fund executed an Advisory Agreement under which Chen agreed to trade UTCs for Powhatan on the basis of a 20-to-1 multiplier: "This means that for every megawatt that HEEP trades for HEEP's account, HEEP will place trades for 20 megawatts in [Powhatan's] account."[40]

Powhatan is a private investment fund with no employees.[41] The managing member of Powhatan Energy Fund is LSE Capital Management LLC (LSE), the sole member of which is Larry Eiben.[42] The executive officers of Powhatan are Kevin Gates, Richard Gates, and Eric Newman.[43] Powhatan and LSE both have their principal place of business in Virginia, and Powhatan reports that all of its executive officers are based in Virginia as well.[44]

Powhatan is a respondent in this proceeding.

B. The PJM Marketplace

In several regions of the United States, entities regulated by the Commission, called Regional Transmission Organizations (RTOs) or Independent System Operators (ISOs), operate wholesale markets for electricity. One of these RTOs is PJM, which operates a 13-state wholesale electricity market stretching from Illinois to North Carolina.

In these regional markets, sellers and buyers (such as "load-serving entities," i.e., entities that provide electricity to retail customers) submit prices at which they are willing

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[38] Powhatan Nov. 22, 2010 Response to Data Request #7(d).

[39] According to discovery produced by Powhatan, during the period May – August 2010, Eiben and the Gates brothers together possessed an ownership stake of 86% - 91%. Eric Newman, Chao Chen, Sam Harris, Mike Frederick and Greg Sekelsky made up the remainder. POW00001824-27; Eiben Test. Tr. 21:15 – 22:8.

[40] POW00000067.

[41] Powhatan Nov. 22, 2010 Response to Data Request #1.

[42] Powhatan Nov. 22, 2010 Response to Data Request #7.

[43] *See* Powhatan SEC Form D, available at http://www.sec.gov/Archives/edgar/data/1489323/000148932311000002/xslFormDX01/primary_doc.xml (visited Jul. 11, 2014); *see also*, K. Gates Test. Vol. I Tr. 16:20-25.

[44] *See* POW00001445, POW00001455, POW00001325.

to transact. To send appropriate price signals, the prices at which electricity is bought and sold in ISOs and RTOs vary to some extent from one location to another (called "nodes") within the same region. For that reason, market prices for energy are called "Locational Marginal Prices," or "LMPs." There are three components to Locational Marginal Prices: an energy price (which is uniform throughout the RTO or ISO), congestion charges (which may vary from one node to another), and line loss charges (discussed below).[45]

PJM operates both "Day-Ahead" and "Real-Time" markets for energy. As the name indicates, the Day-Ahead market operates one day ahead of the date on which the energy actually flows through power lines. The Real-Time market operates on the day the energy is transmitted. The "vast bulk of transactions occur in the Day-Ahead market."[46]

C. Up-To Congestion Transactions

In PJM, both companies that actually flow electricity as well as purely financial traders (like Chen) can trade in a product called Up-To Congestion, or "UTC." UTC transactions were initially created at the Commission's behest as a tool for hedging congestion price risk associated with physical transactions. Over time, market participants came to view these as simply an alternative form of virtual transactions.

From the perspective of financial traders, UTC trades are a way to profit by correctly predicting whether, how much, and in what direction the price difference (or "spread") between two nodes will change between the Day-Ahead market and the Real-Time market. Successful UTC arbitrage trading requires both skill and specialized knowledge about, e.g., historical price trends, weather patterns, transmission outages, or generator status that may increase or decrease congestion at particular nodes.

A UTC transaction is a virtual product that "is nothing more than an Increment Bid and a Decrement Bid that clear together based on the price difference between the two nodes at which they are submitted."[47] Increments (INCs) and Decrements (DECs) are products traded in virtual transactions. A DEC is modeled in the Day-Ahead market as a purchase (demand), and pays the Day-Ahead price for the number of MW traded. But it is automatically matched with a sale (supply) in the Real-Time market and is paid the Real-Time price. An INC is the opposite. In virtual transactions, no energy is

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[45] *See generally* Energy Primer: A Handbook of Energy Market Basics at 65 (describing LMPs and their components), available at http://www.ferc.gov/market-oversight/guide/energy-primer.pdf (visited Jul. 21, 2014).

[46] *Black Oak Energy, LLC et al. v. PJM Interconnection, L.L.C.*, 125 FERC ¶ 61,042, at P 41 (2008).

[47] PJM Mot. for Leave to Answer, *Black Oak, LLC, et al. v. PJM Interconnection, LLC*, Docket No. EL08-14-000, at 6 (filed March 4, 2008).

supplied or consumed but, as discussed below, bona fide virtual transactions can be profitable to traders.

Although the historical purpose of the UTC was to "allow physical market participants to stipulate a maximum congestion charge they were willing to pay," by 2008 PJM permitted financial traders to "utilize[] up-to congestion transactions as purely financial trades to arbitrage price differences between points."[48] As the Commission described it:

> Under an Up-To congestion price arrangement, arbitrageurs may sell power at point A and buy power at point B in the Day-Ahead market as long as the price differential between these points is no greater than the specified amount. If during the Real-Time market, the spread between these points increases, the arbitrageur makes money; if the spread decreases, it loses money.[49]

The reason the Commission allows virtual traders to participate in ISOs and RTOs at all is that "market participants benefit from the trading activities engaged in by arbitrageurs through price convergence between the Day-Ahead and Real-Time market, a more stable market, [and] increased price discovery and market liquidity."[50]

The Commission and PJM approved the evolution of UTCs from a physical hedging tool to an instrument of financial speculation on the understanding that arbitrage between the Day-Ahead and Real-Time markets may make the prices in those markets converge and thereby make the PJM market as a whole more efficient. As the Commission has explained, "the purpose of arbitrage [by financial traders] is to try to take advantage of profitable price differences between the Day-Ahead and Real-Time markets."[51] Although they are purely financial, UTC transactions can affect prices in the Day-Ahead market as well as dispatch.[52]

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[48] *Id.* at 5.

[49] *Black Oak Energy, LLC, et al. v. PJM Interconnection, LLC*, 122 FERC ¶ 61,208, at P 22 n.85 (2008).

[50] *ISO New England*, 113 FERC ¶ 61,055, at P 46 (2005).

[51] *Black Oak Energy, LLC et al. v. PJM Interconnection, L.L.C.*, 122 FERC ¶ 61,208, at P 44 (2008) (Order Denying Complaint).

[52] Order Denying Complaint at 17 (noting that there is a "price impact of the virtual transaction on the physical transmission system that forms the basis for both the Day-ahead and Real-time Energy Markets"); *see also* Financial Marketers Mot. for Leave to Answer, *Black Oak Energy LLC, et al. v. PJM Interconnection LLC*, Docket No.

EL08-14-000, at 19 (issued Jan. 10, 2008) (noting that "it is undoubtedly true that virtual transactions can alter dispatch patterns").

Until a tariff change in September 2010, PJM required UTC transactions to be associated with a transmission reservation. Financial traders typically used the cheapest option: non-firm point-to-point transmission, which in 2010 cost up to 67 cents per MWh to reserve on the Open Access Same Time Information System (OASIS), although exports to MISO were not assessed a transmission fee.[53] UTC traders also had to pay certain PJM market charges (such as reactive power, black start, and market monitor fees) amounting to 17 – 25 cents for each MWh successfully scheduled.[54]

D. Marginal Loss Surplus Allocations and How They Came to Be

When electricity travels through the grid, a certain amount of energy is lost to heating of the transmission lines. This is called "line loss." The farther energy travels on power lines, the greater the line loss.[55] To ensure that the market price at each pricing node reflects the actual costs of providing energy to that particular location, charges for line losses are one of the three components of Locational Marginal Prices in PJM and other RTOs and ISOs.

To promote market efficiency, the Commission has directed PJM to set the price for line losses at marginal, rather than average, cost.[56] Because marginal costs of line losses are higher than average costs, PJM collects more in line loss payments than the

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[53] *See* Monitoring Analytics' *PJM Marginal Loss Surplus Allocation and Market Participant Transaction Activity: May 15, 2010 through September 17, 2010* at 7 (Jan. 6, 2011) (IMM Referral). The transmission cost may sometimes receive a congestion adjustment reducing the effective cost of the transmission.

[54] *See* IMM Referral at 7-10. For his trades, Chen typically paid $0.20 - $0.22 per MWh in market charges.

[55] *Atlantic City Elec. Co. et al. v. PJM Interconnection, L.L.C.*, 115 FERC ¶ 61,132, at P 3 (2006) (2006 MLSA Order) ("As in the case of all electric transmission, there is some loss of the scheduled megawatts as the power is transmitted from the point of generation to the point of delivery. That is, the total megawatt-hours of energy received by customers is less than the total megawatt-hours of energy produced by generators. Such loss results in a cost PJM incurs to maintain the level of the scheduled power and to deliver it under conditions of system reliability.")

[56] *Id.* P 4 ("the actual cost of meeting load would be reduced by using the marginal loss method"); *id.* P 22 ("Billing on the basis of marginal costs ensures that each customer pays the proper marginal cost price for the power it is purchasing").

total amount of actual line losses. This results in a "marginal loss surplus."[57] Marginal loss surpluses increase with increased volumes of power placed on the grid.[58]

When the Commission directed PJM to set prices for line losses at marginal cost in 2006, it recognized that "a method needs to be determined for disbursing the over collected amounts."[59] The procedure for distributing the extra line loss payments is called "Marginal Loss Surplus Allocation," or MLSA.

At the outset, the Commission ruled out only one method for distributing MLSA: reimbursing market participants for the amount they actually paid for line losses. That approach was unacceptable, because it would undo the economic benefit of pricing line losses at marginal cost, which is to have prices reflect as nearly as possible the actual costs to the system.[60] PJM therefore needed to find a different way to distribute the marginal loss surplus. The particulars of PJM's MLSA distribution methodology were litigated in what came to be known as the "*Black Oak*" proceeding,[61] but in September 2009, the Commission ruled that MLSA was to be paid on a pro rata basis to market participants, including virtual traders, who reserved paid transmission on OASIS.[62] Although the litigation continued, it is this September 2009 Order that sets the stage for the conduct at issue in this investigation, because it is this order that approved the distribution of MLSA based on, among other factors, "the total MWh of cleared Up-To Congestion transactions (that paid for transmission service during such hour)."[63]

III. Chen's UTC Trading

A. Chen's Initial UTC Trading & Strategy Development

Chen first gained exposure to PJM's UTC market as an analyst at Merrill Lynch Commodities between 2005 and 2007. Chen was tasked with developing models to enable Merrill Lynch make a profitable foray into UTC trading.[64] Chen quickly grasped

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[57] *Id*. P 5 ("Use of the marginal loss method will result in PJM over recovering its expenditures… .").

[58] *See id*. P 5 ("It is a characteristic of the electric grid that marginal losses increase as the number of megawatts of power moved on the grid increases.").

[59] *Id*. P 24.

[60] *Id*.

[61] The first-named plaintiff was Black Oak Energy, LLC.

[62] *Black Oak Energy, LLC et al. v. PJM Interconnection, L.L.C.*, 128 FERC ¶ 61,262, at P 25 (2009). This litigation is discussed in detail infra at Section IV.B.4.a.

[63] *Id.* P 29.

[64] Chen Test. Vol. I Tr. 27:14 – 29:8, 30:15 – 31:10, 55:24 – 56:8.

the essence of UTC trading as a tool for both physical and financial transactions. For physical transactions, the UTC "provides a mechanism to hedge in [the] day-ahead market the price spread between source node and sink node by specifying the maximum price you are willing to pay for the congestion."[65] For financial transactions, Chen understood that:

> [t]he up-to congestion is like one type of financial trades [*sic*]. You're just trying to improve day-ahead and real-time price spreads. You're actually trying to make them converge, and so that the goal is to improve market efficiency.[66]

From his in-depth examination of the market, Chen developed a model to forecast conditions under which UTC trading was likely to be profitable or unprofitable.[67] Based on historical spreads, Chen identified the most profitable nodes for both import and export.[68] He also developed what he called a "similar day" model, which enabled him to anticipate prices based on similar historical circumstances.[69] Test trades using Chen's model yielded promising results, but Merrill Lynch opted not to pursue a UTC trading strategy at that time, so Chen struck out on his own.[70]

Chen founded HEEP Fund in August 2007 and began trading in PJM the next month.[71] Since its inception, nearly all of Chen's trading for HEEP Fund has been in UTCs.[72] As he testified, Chen's initial UTC trading in HEEP Fund was highly cautious, involving few locations and small volumes.[73]

In the spring of 2008, Larry Eiben and Kevin Gates were seeking opportunities to gain exposure to the energy markets. Eiben heard about Chen, and soon reached out to him.[74] On May 1, 2008, after Gates had vetted Chen, they executed an advisory agreement between HEEP and TFS Capital in which Chen agreed to trade power in

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65 Chen Test. Vol. I Tr. 31:18-21.

66 Chen Test. Vol. I Tr. 31:14-18.

67 Chen Test. Vol. I Tr. 28:10-18, 31:2-10.

68 Chen Test. Vol. I Tr. 73:19 – 74:20.

69 Chen Test. Vol. I Tr. 74:24 – 75:5.

70 Chen Test. Vol. I Tr. 27:21 – 28:4, 37:4-14, 70:20 – 71:4.

71 Chen Test. Vol. I Tr. 37:1-2, 38:10-16, 78:1-4; Chen Submission at 13.

72 Chen Test. Vol. I Tr. 76:6-24.

73 Chen Test. Vol. I Tr. 77:4-17.

74 Chen Test. Vol. I Tr. 39:15-21.

Commission-jurisdictional energy markets on behalf of TFS Capital.[75] As Chen's Submission described it:

> Under the terms of this agreement, he traded for Heep Fund and for TFS (later through a separate TFS fund known as Huntrise). The megawatt volumes of trades that he put on for TFS/Huntrise were determined by the volume of his own trading for Heep Fund and by ratios that varied over time. For example, if Dr. Chen reserved 1 MW of transmission for Heep Fund, he might reserve (depending on the instructions he received from TFS) 4 MW of transmission for TFS/Huntrise (a 1 to 4 ratio). The TFS/Huntrise transactions were put on the same transmission paths Dr. Chen was using for Heep Fund.[76]

Through the end of 2009, Chen's trading was limited to UTC transactions placed in PJM on behalf of HEEP Fund and Huntrise/TFS. Throughout the time of his trading relationship with Gates, Chen provided Gates with daily and monthly trading reports listing UTC nodes traded, hours and volumes traded, hourly prices, and other such information.[77] In October 2008, Gates and his partner, Chao Chen (no relation to Alan Chen), met with Chen to discuss his UTC transactions and gain a deeper understanding of the mechanics of the UTC transactions and Chen's strategy in selecting nodes for trading.[78] Later, in July 2009, HEEP and Huntrise executed a Non-Disclosure Agreement allowing Gates and Chao Chen access to HEEP Fund's confidential business and proprietary trading strategy.[79]

Throughout this time, Chen's approach to UTC trading continued to be careful and highly risk-averse,[80] as he pursued a "low-risk, low-reward" trading strategy.[81] This

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[75] Advisory Agreement between HEEP Fund and TFS Capital (May 1, 2008) (POW00000071); *see also* Chen Submission at 13.

[76] Chen Submission at 13; *see also* Advisory Agreement between HEEP Fund and TFS Capital (May 1, 2008) (POW00000071).

[77] *See, e.g.*, POW00000488-91; POW0014142-46; POW00013949-53; POW00013998-14003; POW00000557 (K. Gates Test. Vol. II Ex. 4).

[78] *See, e.g.*, POW0017336, POW00015175, K. Gates Test. Vol. I Tr. 19:13.

[79] K. Gates Test. Vol. II Tr. 189:14-15.

[80] For example, Chen was highly averse to taking large counterflow positions, which are essentially bets that there would be less congestion in the Real-Time than in the Day-Ahead. *See* Email from Alan Chen to Kevin Gates (Jul. 22, 2008, 2:00 PM) (POW0001553) ("I'd not bet anything big for counter-flow positions: never, period. No matter how enticing some of the quite-looking [*sic*] days, to me the counter-flow position is the only way to bankruptcy.")

involved what Chen called "directional bets" whose profitability depended on favorable changes in congestion price between the Day-Ahead and Real-Time markets.[82] In July 2008, responding to an inquiry from Gates, Chen explained his strategy:

> Majority of my trades (>90%) are betting for prevailing-flow congestions. I pay the premium beforehand and collect the congestions whenever occurred. So generally speaking the risk is very limited. These types of trades are for volatility. As long as there are congestions, very likely they are going to make money. In very rare occasions I do put in very small positions for counter-flow positions. There [*sic*] types of trades are against volatility. As long as the congestions are not significant enough, they are going to make money.
>
> Another theme is that I pick a group of trades to counter balance each other a little bit. Even if one of the trades goes totally against you, there are some other trades would pick up some gains to offset some of the losses.
>
> So on a very hot day, I would pay the maximum of $50/MW to hold the prevailing-flow congestion position. In most cases the maximum losses would be $50/MW. Only very very rarely you could end up losing more than the premium of $50/MW you paid for.[83]

Chen tried to reduce his risk by placing trades in small volumes – nearly all of his bids were under 100 MWhs – and selecting what he called "correlated pairs" for his transactions.[84] The prices of these "correlated pairs" typically moved in similar ways, because of their geographic proximity.[85] For example, Chen would export to the MISO interface from one node and import from the MISO interface to a different node, creating a transmission pattern of A-to-B / B-to-C. The B portion of the trades neutralized one

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[81] Chen Test. Vol. I Tr. 51:3-6.

[82] *See* Chen Submission at 14.

[83] Email from Alan Chen to Kevin Gates (Jul. 22, 2008, 1:31 PM) (POW00008996).

[84] Chen Test. Vol. I Tr. 78:5-19. Ninety-nine percent of Chen's UTC trades during 2008 – 2009 were under 100 MW.

[85] *See* Affidavit of Craig Pirrong ¶ 17 (Pirrong Aff.). Much of this trading used nodes in the western area of PJM and the MISO interface. Chen Test. Vol. I Tr. 105:3 – 106:7. Through his analysis, he developed expectations at these nodes in terms of price changes between the Day-Ahead and Real-Time markets, and could design import or export UTC transactions at selected node pairs consistent with the anticipated price fluctuations. The PJM internal nodes Chen chose for his trades would typically move in the same direction and fluctuate with the LMPs at the MISO interface. Chen Test. Vol. I Tr. 78:21 – 79:4; 105:3 – 106:7.

another and the trade was effectively between A and C. Chen expected this strategy to reliably produce low but consistent positive returns over time. Chen's correlated pair trading was predicated on the assumption that the transactions would rarely, if ever, experience an unexpected asymmetric price change – i.e., a spike affecting only one half of the correlated pair – that could expose Chen to substantial losses. In other words, Chen expected the Day-Ahead and Real-Time prices at the interface node to be eliminated, resulting in a directional spread bet between two internal nodes that co-vary, or move together, because they would generally be subject to near-identical conditions.[86]

B. Chen Adapts His UTC Trading Strategy Based on MLSA Payments

1. Chen's Discovery and Initial Analysis of MLSA

Reviewing his account statements from PJM in October 2009, Chen noticed that he had begun receiving a new credit: the MLSA, or "transmission loss credit."[87] This prompted him to look into the matter, and he learned that "there's some kind of refunds [that] go back to 2007."[88] Chen also learned that these credits were being awarded pursuant to the Commission order in *Black Oak* approving PJM's proposal to distribute over-collected transmission losses to UTC traders reserving paid-for transmission in OASIS.[89]

Armed with data on the retroactive credit distributions, Chen began analyzing his prior trades for their eligibility for and receipt of MLSA, and told Gates what he had learned. In December 2009, Gates told his partners that although Chen's UTC trades for Huntrise had lost approximately $30,000 in November 2009, retroactive application of the MLSA credit meant that Huntrise actually wound up with a gain of over $400,000. Underscoring the artificiality of the profits, Gates used quotation marks to describe that month's gains: "net-net, we 'made' $410,000 last month."[90] But Gates was also enthusiastic about this new source of apparent revenue, telling his colleagues, "I want to scale-up and try to become rich."[91]

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[86] During the time period at issue in this investigation, UTC transactions internal to PJM were not permitted. In other words, every UTC transaction had to source or sink with an interface, such as MISO or NYISO.

[87] Chen Test. Vol. I Tr. 44:17 – 45:24, 90:10-12; Chen Submission at 14.

[88] Chen Test. Vol. I Tr. 45: 6-10, 14-15.

[89] Chen Test. Vol. I Tr. 45:18 – 46:8.

[90] Email from Kevin Gates to Richard Gates et al. (Dec. 8, 2009, 09:16:07 PM) (POW00008242).

[91] Email from Kevin Gates to Richard Gates et al. (Feb. 26, 2010, 08:20:52 AM) (POW00007907).

By the time he received the February 2010 statement, Chen had reviewed and analyzed "a couple years of history" regarding the application of MLSA to his UTC transactions, and believed that he "ha[d] a pretty good handle" on how the MLSA affected the return on certain UTC transactions.[92] What he learned was that the MLSA would be larger in "the colder winter, hot summer"[93] and that during such periods, "the transmission loss credit [would] cover all the [transaction] charges."[94] During periods of milder weather, by contrast, "you could lose money if you do paired trades."[95] As Chen testified, "in those shoulder month[s], the transmission loading or the demand tend to be lower. The transmission loss is lower. So you collected less money, and the surplus is lower."[96] In other words, based on his analysis, he expected that the MLSA would be much smaller in milder weather – too small to cover the transmission reservation fees, market charges, and ancillary service charges incurred in scheduling the transactions. Chen shared these conclusions with Kevin Gates in a series of emails exchanged in March and April of 2010.

2. Chen Adapts His Trading Strategy in Light of the MLSA (Spring 2010)

In February 2010, shortly after performing his analysis on the retroactive MLSA payments, Chen began changing his UTC trading strategy.[97] He also increased the volume of the UTC transactions he placed on behalf of HEEP Fund and Huntrise.[98]

Chen began to experiment with a variation of his old correlated pairs strategy, which involved looking for two pairs of nodes which resulted in an internal transaction with nodal prices moving in tandem. The difference between the new and old correlated pairs strategies (A to B / B to C) is that the old strategy sought to capture small but reliable gains from price movements (e.g., between A and C), whereas the new MLSA-oriented strategy was based on trading high volumes and sprang from his attempt to

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92 Chen Test. Vol. I Tr. 90:14 – 91:11, 93:15-18.

93 Chen Test. Vol. I Tr. 94:10-11.

94 Chen Test. Vol. I Tr. 94:11-12.

95 Chen Test. Vol. I Tr. 94:9-10. Chen's "paired trades" are discussed extensively below.

96 Chen Test. Vol. I Tr. 94:5-8.

97 Chen Submission at 14.

98 *Id.*

negate price spreads as nearly as possible (e.g., A ≈ C) to capture a small but reliable per MWh gain from MLSA, rather than from price spreads.[99]

Chen testified that, by selecting A and C nodes whose prices historically had moved in tandem between the Day-Ahead and Real-Time markets he sought to reduce what he called in his testimony "the spread risk" – i.e., the risk that the difference between each of the internal nodes would not move in synch. For example, Chen scheduled a large volume of UTC transactions at the node pairs Mt. Storm-to-MISO and MISO-to-Greenland Gap for an internal spread bet between Mt. Storm and Greenland Gap. Because the Mt. Storm (A) and Greenland Gap (C) nodes are geographically proximate and electrically similar, their LMPs typically moved in tandem, and this meant that the Day-Ahead and Real-Time LMP spread of the Mt. Storm-to-Greenland Gap transaction was typically very small. Because of this, Chen expected that the changes in the LMP spreads experienced by the two UTC transactions would reliably net to near-zero. By creating these paired transactions, Chen sought to avoid significant exposure to, and thus profit or loss from, price changes in the market. In other words, Chen's purpose was to minimize or eliminate his exposure to market fundamentals in order to ramp up trading volumes and profit from MLSA alone. What made all of this possible was that MLSA also allowed Chen to increase volume and profits without increasing risk.[100] And Chen found he could predict, with considerable success, the hours when the MLSA exceeded his transaction costs.

3. Gates and His Colleagues Understood Chen's New Trading Strategy and Partnered with Chen to Profit from It

Chen outlined this new trading strategy for the principals of Huntrise early in 2010. On March 5, Chen sent Gates the profit-and-loss (P&L) statement of his February 2010 UTC trading.[101] The report separated the returns for the UTC transactions, as offset by ancillary service charges and transmission reservation fees (Huntrise lost $382,853 during the month), from the MLSA that PJM subsequently distributed to Huntrise (a credit of $646,993). This report demonstrated that Chen's trades on behalf of Huntrise lost a significant amount of money from spreads, but that Huntrise nevertheless enjoyed a net "profit" of $264,141 after PJM allocated them a pro rata share of MLSA. The report similarly showed that, despite losing $113,093 on the underlying trades, HEEP Fund

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[99] This effectively is the strategy warned of by the PJM Power Producers Group in the *Black Oak* case. *See* PJM PPG Comments, Docket No. EL08-14-000, at 14 (filed Dec. 26, 2007).

[100] Chen markedly increased both the volumes of his trades and his total profits, even though his profits on a per MW basis sharply declined.

[101] Email from Alan Chen to Kevin Gates (Mar. 5, 2010, 11:28:46 AM) (POW00011676 - 683).

nonetheless realized a net gain of $62,869. In his cover email, Chen explained (referring to MLSA as "TLC" (short for "Transmission Loss Credits"):[102] "As you can see from the reports, without TLC, we would have lost money in February 2010 and it is not a small amount either."[103] Gates and the other principals of Huntrise/TFS thus were put on notice that their apparent profits from Chen's trading derived not from his fundamentals-based trading acumen – and not by arbitraging the Day-Ahead and Real-Time markets—but from his effort to collect MLSA.

Chen also told Gates that he should expect that their profits from targeting MLSA would increase in the future. "February 2010 [was] the first month I really started taking advantage of the TLC," he wrote, and then added that "we are still a long way to go to fully take advantage of the TLC."[104] He reported that, "I'm now using about 50% of the TLC advantage in March 2010," and proposed "gradually lower[ing] it for April 2010 and May 2010 and then move it back up (or even higher)" for the summer months because, as he explained, "TLC advantage tends to shrink a lot during shoulder months."[105] But Chen was still their agent, and he wanted to make sure they concurred with this MLSA-based strategy:

> I'd like to seek opinion about this from you guys about this strategy, basically three options: 1) trade very conservatively and treat TLC [as if it] doesn't exist; 2) trade at current level to take advantage of TLC, but don't be too aggressive since it is March and weather is mild; 3) trade aggressively and add more volume to fully take advantage of TLC.[106]

In response, Gates was surprised at the extent to which the volume of trading had increased: "Wow. Before looking at this data, I didn't realize you scaled up so much recently."[107] He asked whether the increase was "largely the result of the TLC."[108] Chen responded that it was:

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[102] Though they typically referred to MLSA as TLC, Respondents sometimes used the term "UTC" as another way to refer to their MLSA-collection strategy. *See, e.g.*, Email from Kevin Gates to Kevin Byrnes (Jul. 26, 2010, 05:01:02 PM) (POW00001846-47); Email from Chao Chen to Richard Gates (Jun. 25, 2010, 20:48:49) (POW00002438).

[103] Email from Alan Chen to Kevin Gates (Mar. 5, 2010, 11:28:46 AM) (POW00011676).

[104] *Id*. (noting that he had used "only 25%" of the "TLC advantage" in February 2010, up from 0% in January 2010).

[105] *Id*.

[106] *Id*.

[107] Email from Kevin Gates to Alan Chen (Mar. 5, 2010, 7:54 PM) (POW00016599).

[108] *Id*.

> Before and in January 2010, I didn't specifically target for TLC. Starting in February 2010, I kicked up a notch targeting for TLC. In March 2010, I added some more. Without TLC, I would not touch some of the trades and/or would not put in large volumes for some of the trades. *But with TLC as is, they are suddenly becoming risk-free (almost to the point) trades.* I'll take down a little bit starting tomorrow knowing that we are leaving a lot of money on the table.[109]

Gates directed Chen not to "'take down' tomorrow for my sake. I don't want to leave money on the table. But, I would like to talk with you."[110] Gates was concerned that "it seems that our exposure has ramped-up significantly recently,"[111] to which Chen responded as follows:

> The volumes have been increased pretty significantly, *but the risks associated with the trades are actually lower than before*. Most of the added volumes came from correlated pairs that produce a few cents or tens of cents up-side with almost no down-side risk. Without TLC, the transaction costs would absorb them and deem them unprofitable.[112]

Chen further explained that "[f]or the first 5 days" of March, the funds lost "around $180,000.00" in "estimated transaction costs" but nevertheless, "[w]ith TLC, we are probably making $45,000.00."[113]

Despite the profitability of Chen's new strategy, Chen recognized that his new strategy depended entirely on collecting MLSA, and he expressed concerns to Gates about their ability to hold onto the money should PJM discover their conduct:

> It is a good thing that we are making money, and I'm pretty sure about it if TLC refund continues as it is. The bad thing is it really concerns me if PJM ever reverts back to those days without TLC or the TLC calculation was/is incorrect and we have to pay back all or some of the TLC refunds, we are

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[109] Email from Alan Chen to Kevin Gates (Mar. 5, 2010, 9:37 PM) (POW00016599) (emphasis supplied). Because Chen lived in the Houston area and Gates resided in the Philadelphia area the difference in time zones sometimes creates apparent discrepancies in the time stamps associated with their email correspondence.

[110] Email from Kevin Gates to Alan Chen (Mar. 5, 2010, 09:40:46 PM) (POW00016599).

[111] Email from Kevin Gates to Alan Chen (Mar. 5, 2010, 8:33 PM) (POW00012124).

[112] Email from Alan Chen to Kevin Gates (Mar. 5, 2010, 8:52 PM) (POW00012123) (emphasis supplied).

[113] Email from Alan Chen to Kevin Gates (Mar. 5, 2010, 10:04:36 PM) (POW00012123).

> going to be in big trouble. I have not heard anything about this at all, but just the thought nags me a lot.[114]

Gates agreed, saying "[i]f you're really concerned, then I'm really, really concerned," and proposed that Chen "contact a law firm, the FERC, or PJM to try to get more insight into this issue."[115] Neither Chen nor Gates nor anyone else associated with their funds did so.[116]

Gates discussed these same concerns with the other Huntrise investors. One such investor, Chao Chen, testified that he shared the concern that "we are getting paid a lot of TLCs and it might not last forever" because "it was too big of an opportunity."[117] He believed that when PJM "realized that there was a loophole" – which he defined as "an anomaly, something that nature shouldn't allow" – "the concern was they would retroactively try to close the loophole."[118]

Thus, by early March 2010, Gates plainly understood that Chen was "actively altering his trading to profit from the TLC."[119] In a March 5, 2010 email, Gates informed Huntrise's other managers and investors "that $2.1 [million] of the $3.6 million that Alan made was in the form of the Transmission Loss Credits."[120] Gates suggested to his partners, "I'm game for closing down [Huntrise] soon, and opening up a new entity and scaling-up. Also, maybe, we could have an attorney, or someone, really dig into the TLCs on the UTC trade."[121] Despite Gates' acknowledgement that "we need to stay on top of this," he and his fellow investors elected not to have an energy law attorney – or

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[114] Email from Alan Chen to Kevin Gates (Mar. 5, 2010 at 11:28 AM) (POW00016981).

[115] Email from Kevin Gates to Alan Chen (Mar. 5, 2010 at 03:59:47 PM) (POW00016981).

[116] *See* K. Gates Test. II Tr. 228:18-22 ("Q: Did you talk to an attorney . . . to get some assessment from a lawyer as to whether there was some reasonable likelihood that FERC might change its mind about these payments? A: No.") and 232:21 – 233:5 (no recollection of discussing transmission loss credits with an attorney). Respondents' lack of consultation with counsel is confirmed by the absence of any privilege log in which the existence of such communications must be noted.

[117] Testimony of Chao Chen (Chao Chen Test.) Tr. 43:11-12, 50:9-10.

[118] Chao Chen Test. Tr. 99:20-21, 96:16.

[119] POW00008005; K. Gates Test. Vol. II Tr. 196:16 – 197:16.

[120] Email from Kevin Gates to Richard Gates et al. (Mar. 5, 2010, 05:34:51 PM) (POW00007936).

[121] *Id*.

for that matter, anyone – "really dig into the TLCs" as proposed,[122] despite the fact that, in Gates' words, "[t]he problem with the power markets is we didn't understand them."[123]

Instead of seeking legal advice or reaching out to FERC or PJM, Gates decided to "scale up". On March 19, 2010, Gates sent an email to tell his partners that the opportunity to make money from Chen's strategy was "too exciting and we need to have a lot of exposure this Summer."[124] For Gates, "[t]he big thing about scaling up was the opportunity of the transmission loss credits. There was a tremendous opportunity that existed then. It was a more attractive trade."[125] He attached to this email a seven-page document entitled, "Rampin' up with Alan Chen," which stated that Chen was "participating more heavily in the TLC trade which he describes as almost a risk-free way to make money."[126] The presentation advocated that the investors "scale up" their investment in this trading activity of Chen's notwithstanding Chen's reported worry that "it's just too easy for him to make money now."[127]

Gates was enthusiastic about getting even deeper into the trades. In Spring 2010, Gates and his partners formed a new fund called Powhatan Energy Fund, LLC (Powhatan), which became the new vehicle for the TFS/Huntrise partners' trading in PJM through Chen.[128] Gates negotiated an agreement with Chen to increase the multiple of HEEP Fund trades from four to twenty, although he had to overcome Chen's misgivings

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[122] *Id*. As of March 23, 2010, Gates remained concerned about the issue, and proposed meeting with Chen "at least one more time to discuss the TLC trade and learn more about PJM's views on it." Email from Kevin Gates to Alan Chen and Chao Chen (Mar. 23, 2010 12:04 PM) (POW00012103).

[123] K. Gates Test. Vol. II Tr. at 243:12-13; *see also*, R. Gates Test. Vol. I Tr. 71:18 – 73:11 (testifying that the wholesale energy markets were "exotic" markets about which they understood "very close to zero" when they began).

[124] Email from Kevin Gates to Richard Gates et al. (Mar. 19, 2010, 05:07:40 PM) (POW00008000).

[125] K. Gates Test. Vol. II Tr. 231:5-8.

[126] POW00008003.

[127] POW00008002.

[128] One explicit purpose of the Powhatan fund was to protect Gates and the other investors in case PJM sought to claw back MLSA. Gates explained that, if this occurred, Chen "could bankrupt his company so that he doesn't pay us. If so, we'd bankrupt our company and not pay PJM." Email from Kevin Gates to Richard Gates (Mar. 21, 2010 at 7:55 AM) (POW00007990).

about committing to such a large multiple.[129] The decision to ramp up reflected a high degree of comfort on at least Gates' part that he understood Chen's UTC trading strategies.[130] Chen began trading for Powhatan on May 28, 2010.

4. Chen Learns His Initial Scheme Is Not Foolproof

Chen experienced an unexpected major trading loss on May 30, 2010. Because of the five-fold increase in the volume of trades placed on behalf of the Powhatan investors relative to that of HEEP, Chen's overall trading volume for May 30, 2010 – his second day of trading for Powhatan[131] – was significantly larger than before. One leg of Chen's correlated pair UTC transactions – the leg between the MISO interface and the Greenland Gap node in PJM – experienced a congestion price spike that Chen had not expected. But the other leg of the correlated transaction – between the Mt. Storm node in PJM and the MISO interface – did not experience the same price spike. In conjunction with his heavy trading volume, this unexpected price differential meant that HEEP Fund and Powhatan lost almost $180,000 on the change in price spreads, plus more than $18,000 in costs to schedule the transactions.[132] Because those trades earned just under $22,000 in MLSA, this one set of transactions collectively lost more than $176,000 on that day.[133] Chen's volume-based correlated pairs strategy had failed.

Chen told Gates that his trades may have been to blame, stating that the large volume of his trades may have "exacerbated the day-ahead spreads and I suspect the trades we put on affected the day-ahead model runs so much that some of the spreads are looking abnormal to me."[134] Gates in turn apparently was worried that this strategy may

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[129] *See* Email from Alan Chen to Kevin Gates (Mar. 23, 2010, 12:27:24 PM) (POW00012111) (responding to Gates' proposal to increase the multiple traded to 20x, Chen replied, "[a]t this stage, going from 4x to 10x might be a better option . . . [a]nd I'd also be more comfortable with the lowered volume"), *see also* Chen Test. Vol. II Tr. 189:6 – 191:1 (describing reservations about the 20:1 ratio) *and see* Advisory Agreement between HEEP Fund and Powhatan (May 18, 2010) (POW00000067) (establishing 20:1 ratio).

[130] Gates had previously insisted that Powhatan would "definitely never really ramp up . . . without knowing the strategy intimately." Email from Kevin Gates to Alan Chen (Jun. 9, 2009, 04:08:10 PM) (POW00017242).

[131] *See* Chen Test. Vol. I Tr. 79:4-7.

[132] *See* Email from Alan Chen to Kevin Gates (May 30, 2010, 11:33:12 AM) (POW00004268-69) (noting that the spread between Mt. Storm and Greenland Gap, which averages $0.17 spiked above $50.00).

[133] Email from Alan Chen to Kevin Gates (May 30, 2010, 11:33:12) (POW00004268-69).

[134] *Id*.

not be quite as profitable as they had come to believe, and advised his partners that "[t]he big concern are Alan's comments about high volume. It seems the market isn't as scalable as Alan thought."[135] Chao Chen agreed, stating, "I'm disappointed that he told us capacity wasn't a problem but now he says it is. Seems a little reckless to me to find out this way."[136]

5. Chen Revises His Strategy and Increases His Trading Volume

Following the loss on May 30, 2010, Chen stopped trading for a few days to consider why his volume-based correlated pairs strategy had not worked as anticipated.[137] Of course, the enormous trading volumes associated with his volume-based strategy made it necessary to minimize his exposure to price movements to the maximum extent possible. As discussed above, he thought he had achieved that with the correlated pairs strategy – a strategy he had described to Gates as virtually "risk free" – but the events of May 30 proved him wrong.

Chen's solution was to "reduce the spread risk" all the way to zero by "shrink[ing] the two nodes into one."[138] As Chen subsequently explained to Gates, "[o]n 5/30 we lost a lot of money on the one pair of trades and I tried to find a better hedged paired [*sic*] of trades. That's when I thought of using fully hedged paired trades."[139]

Chen decided to alter his spring trading strategy from the correlated pair strategy (A-to-B/B-to-C), the failure of which caused the May 30 loss, to a matched pair strategy in which he scheduled offsetting volumes of UTC transactions between one interface and the same location in PJM (i.e., an A-to-B trade paired with a B-to-A trade).[140] Thus, any profit (or loss) from the UTC transaction scheduled at the A-to-B node pair would be exactly offset to zero by the equal loss (or profit) from the UTC transaction scheduled at the B-to-A node pair. This was as far from the Day-Ahead/Real-Time price arbitrage as one could go.

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[135] Email from Kevin Gates to Richard Gates et al. (May 30, 2010, 12:47 PM) (POW00005758).

[136] Email from Chao Chen to Kevin Gates (May 30, 2010, 05:20:37 PM) (POW00004268).

[137] Chen Test. Vol. I Tr. 79:10-11, 20-25.

[138] Chen Test. Vol. I Tr. 40:17-18.

[139] Email from Alan Chen to Kevin Gates (Aug. 24, 2010, 06:20:38 PM) (POW00004874).

[140] Overwhelmingly, MISO was the interface Chen selected, though a tiny fraction of Chen's A-to-B/B-to-A trades were made with the NYISO interface, rather than with MISO.

Gates and the other investors in Powhatan readily comprehended Chen's newest strategy and its implications. As Gates testified: "I remember [Chen] saying . . . very early on during Powhatan's trading, that he was very clearly trying to eliminate that [congestion spread], and he was going from A to B – B to A."[141]

This new, identical matched pair strategy eliminated the risk that any price spread could occasion either profits or losses as long as both legs of the matched pair cleared, because the two matched transactions' spread changes offset each other perfectly and washed one another out of the trade. Executing such round trips guaranteed that Chen would net zero on the spread and would necessarily lose money after paying transaction costs. This reflected a complete reversal from price arbitrage to pure volume-based trading that depended entirely on the subsequent receipt of loss credits. The only way the trades had any potential to profit was if the MLSA exceeded the transaction costs, as it would predictably do in the "colder winter, hot summer."[142] When Chen used these matched trade pairs and both cleared, the possibility of profit depended entirely on whether the amount of MLSA distributed afterwards exceeded the fixed charges associated with the transactions.[143]

The Powhatan principals readily grasped both the change in Chen's trading strategy and the reason for it. Gates testified that Chen's original UTC trading before those transactions received MLSA had been "specific to his ability to model congestion, his ability to model the day-ahead versus the real-time spread."[144] The new strategy, however, was more like "a monkey . . . throwing darts."[145] Gates clearly expressed the new purpose of the matched-pair strategy: Chen "was trying to *remove* the day-ahead/real-time spread."[146] Gates testified:

> Without a doubt at some point during the summer . . . I knew that that was one way that he was introducing risk into the portfolio, was trying to drive that term, the day-ahead versus real-time, to zero and isolate the bet to his ability to model the marginal loss credit and these other revenue streams, that that would exceed the fixed costs associated with fixed trade.[147]

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141 K. Gates Test. Vol. II Tr. 178:12-15.

142 Chen Test. Vol. II Tr. 94:10-11.

143 Chen Test. Vol. I Tr. 66:9-15.

144 K. Gates Test. Vol. II Tr. 172:25 – 173:2.

145 K. Gates Test. Vol. II Tr. 216:13 – 217:3.

146 K. Gates Test. Vol. II Tr. 309:20-21 (emphasis supplied).

147 K. Gates Test. Vol. II Tr. 172:3-9.

Gates acknowledged that, absent the MLSA, losing money on these trades "wasn't merely highly likely. It was guaranteed. You were going to absolutely lose money on that trade."[148] Gates understood that, by eliminating Day-Ahead/Real-Time price arbitrage (and thus the possibility of profit or loss from arbitrage), the only risk in Chen's UTC trades was "a new risk that the [MLSA] revenues would exceed the costs associated with the trade."[149] Gates believed that Chen "had some sort of model that I wasn't privy to where he was able to model the expected transmission loss credits."[150]

The volume-based UTC round trip strategy yielded immediate results. On June 7, 2010, Chen informed Gates that "we are losing quite a bit of money and for the whole day it is probably approaching -$60K. But we are still making more than $40K up to date (due to the updated TLC data of 6/2: making $63 instead of losing $56,742). I think optimistically we could have made more than $100K once the TLC data are published."[151] A few days later, on June 9, 2010, Gates informed his partners that

> Alan estimates that we're up $78,000 for the month of June so far. But, I've learned that Alan persistently provides low estimates (he has to assume a Transmission Loss Credit, until it's posted about a week after the fact), so I'm really guessing that MTD we are up over $100,000. . . . Not sure of the exact dollars, but rough-rough: I think that everyone should expect to have the ability to double their investment in Powhatan.[152]

By June 17, 2010, the new strategy was performing so well that, as Gates informed his partners, "Alan currently estimates that he's made as much money in Powhatan MTD as he lost at the end of May."[153]

On June 25, 2010, Gates met with Chen to discuss the round trip trading strategy.[154] At the meeting, Chen explained that one of the reasons for the magnitude of

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[148] K. Gates Test. Vol. II Tr. 175:2-4.

[149] K. Gates Test. Vol. II Tr. 169:24-25. "I understood his trades," Gates testified, "that if he moved electricity from point A to point B and point B back – not moved it, but he bet on those spreads, that the objective – with the objective of his ability to model the transmission loss credit and other revenues would exceed" the transaction costs. K. Gates Test. Vol. II Tr. 177:7-11.

[150] K. Gates Test. Vol. II Tr. 167:20-22.

[151] Email from Alan Chen to Kevin Gates (Jun. 7, 2010, 9:57 PM) (POW00003761).

[152] Email from Kevin Gates to Richard Gates, et al. (Jun. 9, 2010, 3:04:45 PM) (POW00004350). "MTD" is a common abbreviation for "month to date".

[153] Email from Kevin Gates to Richard Gates (Jun. 17, 2010 at 12:46 PM) (POW00004394).

the loss on May 30 was that his large trading volume magnified the impact of a relatively small price movement.[155] Questioned about the risks of the new, matched-pair trading strategy, he identified two risks: that one leg would not clear and thereby expose the trader to the spread risk of the other half of the matched pair, and that the MLSA payment would not cover the UTC transaction costs.[156] As to the former, he saw failure of one leg to clear as a risk that could not be absolutely eliminated when trading UTCs, and not as a positive opportunity.[157] Indeed, Gates came away from that meeting with the understanding that it could be "catastrophic" if one leg failed to clear.[158]

Within hours after this meeting, Gates, Chao Chen, and other Powhatan investors had begun speaking openly about their trades as a exploiting a "loophole," and exchanged emails about whether to meet with a different group of energy traders who specialized in UTC transactions. Having reviewed those traders' summary presentations, Chao Chen was "not that excited about it."[159] Chao Chen explained that "UTC is just a loophole that anyone who knows about it can exploit. There is very little skill. I wouldn't hire any of these guys to work for TFS, including Alan."[160] In response, Gates stated, "I agree that UTC is a loophole that probably a dummy can exploit. But, why rule these guys off? . . . . They should drive a truck through that loophole . . . . That's what I'd do."[161] Gates subsequently elaborated on this view:

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[154] *See* Chen Test. Vol. I Tr. 98:17-11; Chen Test. Vol. II Tr. 155:12-21. Chao Chen described "the impetus" of that meeting being "that we are ramping up with him [Alan], that we are thinking about putting more money with him."

[155] K. Gates Test. Vol. II Tr. 61:7-18.

[156] K. Gates Test. Vol. I Tr. 12:17 – 14:9, 74:12-19, 92:12 – 93:13.

[157] As discussed in Section IV.B.1.e., below, Chen's view of this potential risk was completely inconsistent with the risky, counterflow-reliant "home run" strategy attributed to him by Respondents' consultants.

[158] Powhatan Dec. 17, 2010 Supplemental Response to Data Request #10.

[159] Email from Chao Chen to Richard Gates (Jun. 25, 2010, 20:48:49) (POW00002438).

[160] Email from Chao Chen to Richard Gates (Jun. 25, 2010, 20:48:49) (POW00002438). Chao Chen later testified that Chen's UTC trading reflected a "[p]oorly designed market," noting that it was "allowed under the rules, but it is not . . . a properly designed set of rules." Chao Chen Test. Tr. 96:19, 95:25 – 96:2 and 95:11-14 ("The UTC trading, the UTC market in general . . . appears to not be a well designed market because it seems that it requires very little skill to make money.")

[161] Email from Kevin Gates to Chao Chen et al. (Jun. 25, 2010, 09:09:23 PM) (POW00002438).

> I believe, from what I know about the structure, that a monkey could have made trades in the market and randomly picked nodes to move electricity to and nodes to move electricity from and taken the bet that the marginal loss credit plus the other revenues would have exceeded it during the summer months. . . . . Alan modeled transmission loss credits and figured that they are they were higher during high/low periods and during those high/low periods, I believe a monkey or throwing darts at a dart board would have been net profitable for this type of trading during this time period.[162]

The effortless profits raised questions for both Chao Chen and Gates. Chao Chen later recalled that Gates "expressed concern about the wisdom of the PJM for allowing the trade."[163] Gates himself testified that

> I think [Alan Chen] realized from a policy standpoint the transmission loss credit was a bad policy. If he was the one designing the marketplace and he had the responsibility to the marketplace – to create it and his ideal marketplace, I don't think he would have instituted this TLC. I think he would say rebates or transmission loss credits are rebates and they're intended to encourage certain behavior, and these rebates are encouraging the wrong behavior.[164]

Despite Gates' or Chen's beliefs about whether MLSA was "encouraging the wrong behavior," or whether their trading should have been allowed, neither of them – nor any of the other highly sophisticated investors at Powhatan – sought legal advice about whether this sort of trading was unlawful. Gates and the other Powhatan investors had entered the highly regulated energy market in which Congress had recently given the Commission powerful new weapons to combat market manipulation in the wake of the Enron scandals,[165] and yet they apparently undertook little or no effort to educate themselves about the legal and regulatory environment.

Gates may not have attempted to learn the legal and regulatory context for Chen's trading, but he certainly understood that Chen's UTC round trips were the source of the large sums that Powhatan received from PJM. In mid-July, Gates told a colleague at TFS

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[162] K. Gates Test. Vol. II Tr. 216:13 – 217:3.

[163] Chao Chen Test. Tr. 75:5-6.

[164] K. Gates Test. Vol. II Tr. 215:17-25.

[165] Richard Gates at least was aware of the Enron scandals, because that is how he came to learn of the existence of the wholesale energy markets. *See* R. Gates Test. Vol. I Tr. 72:22 – 73:2.

to "please keep it strictly confidential when talking with others that we're engaging the 'UTC' trade. Really just knowing about this inefficiency is our only edge."[166]

Chen's pure volume-based strategy succeeded in capturing enormous amounts of loss credits. The entities for which he traded received so much money from PJM that Chen decided he wanted to capture an even larger share for himself. Because his trades for HEEP were contractually tied to those of Powhatan, Chen's best chance to increase his share of MLSA was to trade for a company not linked to Powhatan. That is what he did: on July 17, 2010, Chen established a separate entity under the name CU Fund.[167] This fund, unlike HEEP, was untethered to the trades Chen placed on behalf of Powhatan, which enabled him to place larger volume trades for his own account.[168] Chen scheduled some of the same round trip trades on behalf of CU Fund that he scheduled for HEEP and Powhatan, and entered as much as 10,200 MWh of volume per hour for CU Fund.[169] Chen successfully scheduled 100% of the volume of the more than 2.6 million MWh of UTC transactions that he bid on behalf of CU Fund.[170] Chen did not inform Gates or anyone associated with Powhatan of his trading on behalf of CU Fund until after this investigation had commenced.[171]

6. Chen's Volume Trading Scheme Unravels

Despite Respondents' desire to keep their trading conduct secret, it eventually attracted attention. Because OASIS reservations are public, other traders could see that Chen was reserving huge volumes of transmission, and these other traders developed theories about what Chen was doing. Several traders from other firms deduced that Chen must be doing volume trades to collect MLSA. A very few tried to copy the technique; others sought to put a stop to it.

In late July 2010, PJM was contacted by two market participants complaining about unusual activity that caused available transmission capacity to disappear, thus

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[166] Email from Kevin Gates to Kevin Byrnes (Jul. 26, 2010, 05:01:02 PM) (POW00001849).

[167] Chen Test. Vol. I Tr. 41:18-22; Chen Dec. 13, 2010 Response to Data Request #15a.

[168] Chen Test. Vol. II Tr. 139:9-12.

[169] Chen Test. Vol. II Tr. 139:13-19.

[170] Chen Test. Vol. II Tr. 13:7-10.

[171] K. Gates Test. Vol. I Tr. 37:5-10. Gates testified that Chen's failure to disclose the existence of CU Fund "created a conflict of interest" that caused him to question Chen's integrity. K. Gates Test. Vol. II Tr. 210:24 – 211:6.

preventing them from executing their own transactions.[172] PJM began investigating and requested that its IMM "communicate immediately with the relevant market participants regarding their unusual market activity."[173]

On August 2, 2010, Dr. Joe Bowring of Monitoring Analytics, the Independent Market Monitor (IMM) for PJM, telephoned Chen and expressed concern about Chen's large volume UTC transactions. As a result of that call, Chen agreed to cease executing such trades.[174] Chen promptly informed Gates.[175] Gates immediately grasped the significance of this discussion, and informed his partners that this development "doesn't bode well for the longevity of this degree of profitability. So, please make sure to enjoy it now, while you can."[176]

On August 5, 2010, the IMM made a presentation to the PJM Markets and Reliability Committee, in which it contended that improper UTC trading had cost PJM a total of $17 million in July 2010 – $8 million of which was associated with what the IMM referred to as "equal and opposite" transactions, i.e., UTC round trip trades such as Chen's.[177] That same day, Chen informed Gates that their trading would be a topic of discussion at a meeting of the PJM Members Committee (MC): "From what I'm hearing now we are going to see drastic changes to UTC trades very shortly. Also, TLC and UTC issues (uneconomic large volume UTC trades taking advantage of TLC) and resolutions are going to be on the 8/12 MC meeting."[178] Gates responded with questions for Chen:

> If PJM files the amendment next week, when do you think that the change will take place? And, I'm correct in believing that you'll still be able to profitably trade, but won't be able to keep the TLC? (*You just won't be able to make money by moving electricity around in a circle*.) If so, it's

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[172] Aug. 16, 2010 Confidential Referral of Potential Violations of FERC Market Rule (PJM Referral) at 1.

[173] *Id*. at 3.

[174] *See* Email from Alan Chen to Joe Bowring (Aug. 2, 2010, 4:20 PM) (HF-00284).

[175] Email from Alan Chen to Kevin Gates (Aug. 2, 2010, 1:04 PM) (POW00004041).

[176] Email from Kevin Gates to Richard Gates, et al. (Aug. 2, 2010, 01:12:36 PM) (POW00004041).

[177] *See* Monitoring Analytics, LLC, Virtual Transactions and Marginal Loss Surplus Allocations at 5-9 (Aug. 5, 2010).

[178] Email from Alan Chen to Kevin Gates (Aug. 5, 2010, 2:35 PM) (POW00004686).

> like how life was back in 2008 before they started reimbursing us for TLC?[179]

At the PJM Membership Committee Meeting on August 12, 2010, the IMM proposed a revision to the PJM Operating Agreement Schedule 1 § 5.5 (Sheet No. 399C) that would resolve the explosion of volume trading by preventing non-firm transmission customers from receiving an MLSA distribution in excess of the amount they paid for their non-firm transmission service.[180] The IMM explained that the "proposal is intended to provide a short term solution to the market manipulation issue that has arisen as a result of the fact that non-firm transmission customers may receive an allocation of the marginal losses surplus which exceeds the cost of transmission service and thus exceeds the contribution of such customers to the fixed costs of the transmission grid."[181] In short, by mechanically eliminating their profitability, the IMM's proposal would have extinguished any financial incentive to engage in manipulative volume-based trading schemes.

One of the observers at that meeting was Robert Steele, an energy trader who had spent the summer in discussions with Gates about possibly bringing his team of UTC traders to work for Powhatan or TFS. After the meeting, Gates asked Steele what he thought of the IMM's proposal and the volume-based schemes that had been discovered and Steele – evidently unaware that Gates' company was one of those implicated in the scheme – candidly summarized his observations in an email to Gates:

> In the PJM committee proceedings last week, the membership voted in favor of PJM's proposal to eliminate the "gaming" practices going on in the UTC market. . . . . This action will close the loop-hole that allowed the few participants in question to "game" the no-risk arb between the cost of non-firm transmission ($0.67) and the reimbursement for marginal losses on certain trades (~$1.80). The other hidden benefit to this action is that "copy-cat" trading will be eliminated. Since the purchase of transmission is of public record, some market participants would monitor the key traders and attempt to mimic their trading strategies. With the elimination of the transmission leg of the UTC transaction, this transparency will be gone.

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[179] Email from Kevin Gates to Alan Chen (Aug. 12, 2010, 4:18 PM) (POW00004685) (emphasis supplied).

[180] *See* Monitoring Analytics, LLC, Impacts of Proposed Solutions to Manipulation Arising from the Allocation of Marginal Loss Surplus at 3 (Aug. 12, 2010) (August 12, 2010 IMM Presentation). Available at http://www.monitoringanalytics.com/reports/Presentations/2010/IMM_MC_Loss_Surplus_Allocation_20100812.pdf (visited Jul. 8, 2014).

[181] August 12, 2010 IMM Presentation at 2.

> All-in-all, I feel this rule change should be beneficial for us top-tier traders in the UTC market.
>
> . . . How did this all get started? The following outline is my understanding, not necessarily absolute truth. One market participant (perhaps Mr. Chen) figured out the "free arb" via the transmission loophole. Most UTC participants (myself and Connectiv included) perceived this as rank manipulation of the intended market function and had enough sense not to participate in this activity…. don't kill the goose that layed the golden egg. Based on the transparency that exists via the purchase of transmission, two other UTC traders figured out the gaming trade and couldn't resist from hitting it hard. This got the attention of PJM and the market monitor and they started to investigate, finally realizing the magnitude of what was going on ($19MM out of their pockets to these few "rogue" traders).[182]

PJM ultimately decided on a different approach to mechanically block the volume-based trading scheme. By ending the obligation to reserve paid-for transmission for UTCs, PJM's proposal also eliminated the volume-based trading scheme's profitability, and thus – like the IMM's proposal – did away with the remaining financial incentives to trade in this manner.

PJM filed its proposed tariff revisions on August 18, 2010.[183] Gates forwarded a copy to his colleagues, describing it as "a filing that PJM recently did with the FERC regarding changing the rules *to close the loophole that Alan was exploiting*."[184] The Commission approved the proposed tariff change on September 17, 2010, thus ending Respondents' manipulative scheme.[185] In just three months of "moving electricity around in a circle," Chen had been able to enrich himself, Gates, and the other Powhatan investors by many millions of dollars. Chen's round trip trades alone captured approximately $10.1 million in MLSA – $7,975,403 for Powhatan, $398,770 for HEEP, and another $1,784,145 for CU Fund – money that, in the absence of Chen's

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[182] Email from Bob Steele to Kevin Gates (Aug. 20, 2010, 9:25 AM) (POW00001866) (emphasis supplied).

[183] *PJM Interconnection, L.L.C.*, Submission of Schedule 1 of the Amended and Restated Operating Agreement, Docket No. ER10-2280-000 (filed Aug. 18, 2010).

[184] Email from Kevin Gates to Larry Eiben, et al. (Aug. 19, 2010, 06:41:54 PM) (POW00006665) (emphasis supplied). Despite this and other evidence, Chen now claims that "[t]his case . . . is not about . . . 'exploiting a loophole.'" Chen 1b.19 Response at 5.

[185] Order Accepting Tariff Revisions, *PJM Interconnection, L.L.C.*, 132 FERC ¶ 61,244 (2010).

manipulation, would have been distributed to market participants engaged in bona fide transactions.

C. Referral and Investigation

1. Referral

After being informed in late July 2010 of the unusually large non-firm point-to-point transmission reservations occurring that summer, PJM examined the July transmission reservations by each market participant and determined that 42 of 110 market participants reserved more than the average amount of MWhs of transmission.[186] On further review of the trading activity of those 42 market participants, PJM identified seven entities, including HEEP, CU, and Powhatan, that had purchased "a large MW quantity of transmission service" and that these participants had "submitted large quantities of Up-To-Congestion bids tied to the transmission service reservations beginning June 1[, 2010]" in the Day-Ahead Market.[187] Following its review of the summer's UTC transactions, PJM advised staff that the average hourly transmission reservation request from all companies was 94 MW for every hour in each of the 31 days in July 2010, and 203,302 MWh on average in that month per company. But Chen's requests were not average. Far from it: Chen requested almost *9 million* MWhs, that is, 44 times the size of the average monthly and 6 times the average hourly requested volume.[188]

One of the two forms of UTC bids that particularly troubled PJM "involved Up-To Congestion transactions with sources and sinks at points which were not the same, but ones where transactions were submitted in both directions between the same two points."[189] PJM concluded that traders structured these UTC trades "solely to inflate transaction volumes in order to receive an improper allocation of marginal loss surplus allocation revenue."[190] The IMM agreed with that assessment.[191]

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186 *See* PJM's Jan. 11, 2011 Response to Office of Enforcement's Second Data Request to PJM, Response Nos. 1-4, 6.

187 PJM Referral at 1.

188 PJM's Jan. 11, 2011 Response to Office of Enforcement's Second Data Request to PJM, Response No. 6.

189 PJM's Jan. 11, 2011 Response to Office of Enforcement's Second Data Request to PJM, Response No. 6.

190 PJM Referral at 4.

191 "The only rationale for [a UTC transaction that results in "net zero settlement"] is that the loss surplus allocation is greater than the cost of transmission." Monitoring Analytics, "IMM Marginal Allocation Methodology Recommendation" at 9 (Presentation to PJM Transactions Issue Task Force) (Oct. 26, 2010). The IMM pointed out that at the

In support of its determination that the high-volume trades it saw in the period of June and July 2010 had been "inflate[d] ... in order to receive an improper allocation of marginal loss surplus allocation," PJM pointed out that UTC transactions first became eligible for MLSA by order of the Commission issued September 17, 2009 and affirmed in its order of April 15, 2010, shortly before the trades on which the referral focused.[192] Accordingly, PJM inferred that these trades "were undertaken with the intent of manipulating PJM market rules."[193]

2. Investigation

On receiving these referrals, the Office of Enforcement launched a non-public, preliminary investigation into these matters, including an inquiry into Respondents' trading. Shortly thereafter, on August 25, 2010, the Commission issued an order making the investigation formal.[194] Over the course of its investigation, Enforcement staff sought, received, and analyzed extensive transactional, settlement and financial data, in addition to reviewing documentary evidence and taking testimony from several witnesses.

During the investigation, Respondents provided several written submissions to Enforcement staff, presenting legal and factual arguments that their conduct had not been manipulative; they also submitted affidavits from a number of consultants.[195] In their

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time of these transactions, the average MLSA was ≈$1.32/MWh (ranging from ≈$1.85 for "on-peak" to ≈$0.67 "off-peak") compared to the cost of non-firm transmission at $0.67/MWh.

[192] PJM Referral at 4, *citing, Black Oak Energy, L.L.C., et al. v. PJM Interconnection, L.L.C.*, 126 FERC ¶ 61,164 (2009) and *Black Oak Energy, L.L.C., et al. v. PJM Interconnection, L.L.C.*, 131 FERC ¶ 61,024 (2010).

[193] *Id*.

[194] *PJM Up-To Congestion Transactions*, 132 FERC ¶ 61,169 (2010).

[195] *See* "Written Submission to Commission Investigation Staff on Behalf of Powhatan Energy Fund LLC" (submitted Oct. 21, 2011) (Powhatan Submission) and "Written Submission to Commission Investigation Staff on Behalf of Dr. Houlian Chen," (submitted Dec. 13, 2010) (Chen Submission). The Powhatan Submission was supported by affidavits from Richard G. Wallace, a partner at the law firm Foley & Lardner, and Richard D. Tabors, a Vice President at Charles River Associates. The Chen Submission was supported by the affidavit of S. Craig Pirrong, a professor at the University of Houston. Respondents also provided supplemental submissions. *See*, "Supplemental Submission on Behalf of Dr. Alan Chen" (Mar. 16, 2012) (Chen Supplemental Submission) and Letter from William M. McSwain, attorney for Kevin Gates and Powhatan, to Steven C. Tabackman, Enforcement staff (Aug. 24, 2012) (Powhatan Supplemental Submission).

submissions, Respondents did not dispute that they had undertaken the transactions at the heart of this investigation. Rather, Respondents essentially contended that those transactions had been executed for a non-manipulative purpose and that, in any event, volume-based trading for the purpose of collecting MLSA would not have violated the Commission's Anti-Manipulation Rule.

After giving careful consideration to Respondents' submissions, Enforcement staff preliminarily concluded that certain of the UTC transactions executed by or on behalf of Respondents constituted market manipulation in violation of Part 1c of the Commission's Regulations. On August 9, 2013, Enforcement staff issued non-public letters to Respondents explaining the factual and legal bases for these preliminary findings.[196] Chen provided a substantive response.[197] Powhatan declined the opportunity to provide a substantive response and instead submitted a terse, one-paragraph letter asserting that the "preliminary findings make no sense."[198]

On August 5, 2014, the Office of the Secretary issued a Notice of Alleged Violations (NAV), identifying Respondents and summarizing the allegations against them. After settlement discussions proved unavailing, staff on August 7 and 15, 2014 provided notice, pursuant to the Commission's regulations,[199] of its intention to recommend that the Commission initiate a public proceeding against Respondents. Respondents responded to these notices on September 24, 2014.[200] Staff has carefully

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[196] *See* Letter from S. Tabackman, Enforcement staff, to J. Estes, III, counsel for Chen (Aug. 9, 2013) (Chen Findings Letter) and Letter from S. Tabackman to W. McSwain, counsel for Powhatan Respondents (Aug. 9, 2013) (Powhatan Findings Letter). Due to a minor technical issue, a corrected version of these letters was sent out later that afternoon.

[197] *See* Letter from J. Estes, III, counsel for Chen to S. Tabackman, Enforcement staff (Oct. 9, 2013) (Chen Response).

[198] *See* Letter from W. McSwain, counsel for Powhatan, to S. Tabackman, Enforcement staff (Oct. 8, 2013) (Powhatan Response). This letter followed a 25-day extension of time to reply requested by Powhatan. *See* Email from W. McSwain to S. Tabackman (Aug. 22, 2013, 1:13PM); Email from W. McSwain to S. Tabackman (Aug. 30, 12:26 PM).

[199] 18 C.F.R. § 1b.19 (2013).

[200] On September 24, 2014, Chen provided an additional substantive response (Chen 1b.19 Response) to which he also attached his prior submissions. Also on that date, Powhatan provided a non-substantive 2-page cover letter (Powhatan 1b.19 Response), to which it attached its prior submissions along with the prepared statements of 9 paid consultants.

considered the Respondents' 1b.19 Responses and now submits this report recommending the issuance of an Order to Show Cause and Notice of Proposed Penalty.

IV. Legal Analysis & Conclusions

As discussed below, Enforcement staff finds that Respondents manipulated the nation's largest RTO by entering into enormous volumes of transactions, lacking any legitimate business purpose, with the effect and intent of "moving electricity in a circle" in order to fraudulently collect transmission loss credits. These deceptive and manipulative transactions resulted in the improper allocation of millions of dollars. In so doing, Respondents intended to affect, and recklessly did affect, matters within the Commission's jurisdiction.

A. Elements of a Manipulation Claim

In 2005, Congress amended the Federal Power Act (FPA) in relevant part by adding section 222, which states:

> It shall be unlawful for any entity . . . directly or indirectly, to use or employ, in connection with the purchase or sale of electric energy . . . subject to the jurisdiction of the Commission, any manipulative or deceptive device or contrivance . . . in contravention of such rules and regulations as the Commission may prescribe as necessary or appropriate in the public interest or for the protection of electric ratepayers.[201]

Pursuant to this statutory mandate, the Commission promulgated the Anti-Manipulation Rule:

> It shall be unlawful for any entity, directly or indirectly, in connection with the purchase or sale of electric energy or the purchase or sale of transmission services subject to the jurisdiction of the Commission . . . to use or employ any device, scheme or artifice to defraud . . . or . . . to engage in any act, practice, or course of business that operates or would operate as a fraud or deceit upon any entity.[202]

It is unlawful to violate section 222(a) of the FPA, or the Anti-Manipulation Rule, and under section 316A of the FPA violators "shall be subject to a civil penalty of not more than $1,000,000 for each day that such violation continues."[203]

The elements of market manipulation are (1) using a fraudulent device, scheme or artifice, or making a material misrepresentation, or engaging in any act, practice, or

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[201] 16 U.S.C. § 824v(a) (2012).

[202] 18 C.F.R. § 1c.2 (2014) (Anti-Manipulation Rule).

[203] FPA section 316A, 16 U.S.C. § 825*o*-1.

course of business that operates or would operate as a fraud or deceit upon any entity; (2) with the requisite scienter; and (3) in connection with the purchase or sale of electric energy or the transmission of electric energy subject to the jurisdiction of the Commission.[204] Each of these elements is required for an entity's conduct to violate the law.

As discussed in detail below, each of the elements of market manipulation are present here. Consequently, Staff concludes that Respondents violated the Anti-Manipulation Rule by devising and executing the round trip (A-to-B/B-to-A) UTC trading strategy described above. Their round trip UTC trades created the false appearance of arbitraging price differentials in order to deceptively collect MLSA. The evidence shows that Chen, acting on his own behalf and on behalf of (and with the knowledge and agreement of) Powhatan, arranged these trades with the intention and purpose of washing out the spread component of the UTC transaction and profiting instead on MLSA. It is fair to infer from the factual record that Respondents knew that this round trip UTC trading strategy was antithetical to legitimate price arbitrage that promotes price convergence; they knew that the Commission and PJM would have considered the strategy inappropriate or manipulative; and that they intentionally executed their scheme despite knowing that their round trip UTC trades had no legitimate purpose and could impair, obstruct, or defeat a well-functioning market.[205]

B. Scheme, Device, or Artifice: "to make money by moving electricity around in a circle"[206]

The first element of an Anti-Manipulation offense is using a fraudulent device, scheme or artifice, or making a material misrepresentation, or engaging in any act, practice, or course of business that operates or would operate as a fraud or deceit upon any entity. Fraud is a question of fact that must be determined based on the particular circumstances of each case.[207] The Commission "defines fraud generally, that is, to include any action, transaction, or conspiracy for the purpose of impairing, obstructing or defeating a well-functioning market."[208] As discussed below, the evidence demonstrates that the UTC trading strategy Chen implemented on his own behalf and on behalf of Powhatan operated as a fraud or deceit upon PJM. Chen created a trading strategy that

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[204] *Prohibition of Energy Market Manipulation*, Order No. 670, FERC Stats. & Regs. ¶ 31,202, at P 49 (Order No. 670), *order denying reh'g*, 114 FERC ¶ 61,300 (2006).

[205] *See generally*, Section III.B.5., above (quoting emails and testimony from Respondents).

[206] Email from Kevin Gates to Alan Chen (Aug. 12, 2010, 4:18 PM) (POW00004685).

[207] Order No. 670, FERC Stats. & Regs. ¶ 31,202 at P 60.

[208] Order No. 670, FERC Stats. & Regs. ¶ 31,202 at P 50.

gave the false appearance that he was accepting the spread risk inherent in and essential to a UTC trade, when in fact the strategy was designed to negate that risk. As such, the trades were simply designed to collect a reward (the MLSA distribution) that had no relation to the success or failure of the trades themselves. That Chen believed he had succeeded in negating that risk is reflected in the dramatic increase in volumes of his UTC trading (discussed below). Chen's transactions deceived PJM into awarding Respondents marginal loss surplus allocations that were intended to be distributed to market participants with bona fide transmission reservations.

The round-trip UTC trades constituted a manipulative scheme, device, or artifice. First, they have all of the characteristics that the Commission has recently identified as hallmarks or indicia of manipulative trading. Second, the round-trip trades are closely analogous to – indeed, are simply variations of – specific trading practices that the Commission has previously identified and proscribed as manipulation in the past, including congestion-related schemes executed by Enron and others and wash trading. Finally, Respondents' explanations for, and defenses of, their conduct are unpersuasive.

1. Indicia of Manipulation Present in Chen's Trading

Chen's UTC transactions bear all the hallmarks of manipulation as clarified by recent Commission precedent. In the order assessing penalties against Barclays Bank PLC and certain of its traders for violating the Anti-Manipulation Rule, the Commission stated that certain facts could be indicative of a scheme to manipulate.[209] These indicia include, among others, (1) trading behavior inconsistent with supply and demand; (2) a marked difference in the trader's non-manipulative trading behavior versus the trading patterns of the manipulative scheme; (3) speaking documents that indicate the trader's intent; (4) whether the trades are uneconomic; and (5) failure to give plausible or credible explanations for the uneconomic nature of the trades.[210]

Although all of these indicia need not be present to find market manipulation, they are all present here.

a. Trading Inconsistent with Supply and Demand: *"I believe a monkey . . . would have been net profitable for this type of trading . . ."*[211]

First, the round trip UTC trades did not have the legitimate purpose to arbitrage changes in price differences between the Day-Ahead and Real-Time markets. The round trip UTC trades had no purpose at all other than to create a claim for MLSA. The trades were executed "not in an attempt to profit from the relationship between the market

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209 *See generally Barclays Bank PLC, et al.*, 144 FERC ¶ 61,041 (2013) (*Barclays*).

210 *Barclays*, 144 FERC ¶ 61,041 at P 32.

211 K. Gates Test. Vol. II Tr. 216:13 – 217:3.

fundamentals of supply and demand"[212] – *i.e.*, from the anticipated change in prices between the Day-Ahead and Real-Time markets – but rather to secure claims on MLSA and make a reliable profit by reducing price differentials to zero. Indeed, it was literally impossible to profit from the relationship between the market fundamentals of supply and demand, because the round-trip UTC trades were designed for the express purpose of eliminating their exposure to such forces.[213] Moreover, so long as the clearing price remained below the bid cap – as Chen correctly expected it to do – the price was otherwise irrelevant, because the amount paid for prevailing flows were perfectly offset when paired with counterflows, and the gains from divergence between the Day-Ahead and Real-Time prices on one leg of the transaction therefore were exactly offset by the losses from the other leg. In other words, Chen's trading was undisciplined by the competitive forces of the market.[214] This sort of trading would not occur in the absence of some ulterior purpose – as was present here.

b. Marked Difference between Manipulative and Non-Manipulative Trades: *"Without TLC, I would not touch some of the trades, but with TLC as it is, they are suddenly becoming risk-free . . ."*[215]

Chen was not a novice to UTC trading. In fact, Chen had traded successfully in PJM's UTC market for years before devising and implementing his sham UTC trading strategy. His prior trading was marked by careful analysis of market fundamentals and historical prices; his trades involved modest volumes and displayed significant risk aversion. Whereas 99% of Chen's UTC trades in the 2008 – 2009 period were at or below 100 MW, fewer than 1% of his round trip UTC trades for CU Fund and Powhatan in the summer of 2010 were below 100 MW. In fact, more than 90% of Chen's round trip UTC trades for those funds were at least *200 MW*.[216]

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[212] *Barclays*, 144 FERC ¶ 61,041 at P 2.

[213] *See, e.g.*, K. Gates Test. Vol. II Tr. 175:2-4 ("You were going to absolutely lose money on that trade"); Email from Alan Chen to Kevin Gates (Apr. 7, 2010, 12:58 PM) (POW00016642) ("if I didn't have those extra trades in just for TLC, I'd have made some money. For every single TLC trade, we would lose money on PnL [profit and loss] and make money on TLC").

[214] *See Investigation of Terms and Conditions of Public Utility Market-Based Rate Authorizations*, 105 FERC ¶ 61,218, at P 42 (2003).

[215] Email from Alan Chen to Kevin Gates (Mar. 5, 2010, 9:37 PM) (POW00016599).

[216] Volumes for HEEP Fund were constrained by the 20:1 multiplier in the Advisory Agreement and therefore are less indicative of Chen's intended volumes than CU Fund and Powhatan. Nonetheless, and despite the multiplier, half of Chen's manipulative round trip trades for HEEP were in volumes of at least 100 MW.

Respondents contend that "Chen's original up-to congestion strategy is irrelevant because PJM changed the rules in September 2009."[217] While PJM did change the rules for MLSA eligibility, it did not change the fundamental nature of UTC trading, which was to hedge physical transmission costs or to arbitrage price differences between the Day-Ahead and Real-Time markets. In sharp contrast to his legitimate UTC arbitrage transactions (which he continued after September 2009), Chen's round-trip UTC trades turned the UTC product on its head by negating, rather than seeking, price spreads between those two markets.

The evidence shows that Chen executed round trip UTC trades only for the purpose of capturing MLSA. He never executed such trades in the absence of MLSA, and would not have done so.[218] "Without TLC, I would not touch some of the trades and/or would not put in large volumes for some of the trades. But with TLC as is, they are suddenly becoming risk-free (almost to the point) trades."[219] As he later explained, "before 6/1[/2010], we didn't have any fully hedged paired trades. We did have paired trades on almost from the beginning (not intended for TLC, but for the spreads since we didn't even have TLC at the time.)"[220]

Gates was aware and understood that they were doing something fundamentally different in the summer of 2010 than previously. In June 2010, Gates and Chen met to discuss UTC trading in detail. Powhatan explained that,

> [d]uring this meeting, Kevin Gates recalls Alan Chen mentioning that he was generally doing two types of trades: (i) those where he was taking a significant directional bet, and the spread between two nodes introduced a lot of risk/return to the trade, and (ii) those where he tried to remove the directional risk, and isolate the bet that the transmission loss credit would exceed transaction costs.[221]

In August, as PJM moved to change the rules to make Chen's scheme impossible, Gates ruefully noted the difference between "be[ing] able to make money by moving

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[217] Chen Response to Preliminary Findings at 7.

[218] *See* Chen Test. Vol. I Tr. 50:18-24 ("Q: Prior to learning about the transmission loss credit, did you engage in paired trading . . .? A: No. Q: Was it the transmission loss credit that caused you to begin to get involved in paired trading? A: I think that's a fair assessment, yes.").

[219] Email from Alan Chen to Kevin Gates (Mar. 5, 2010, 9:37 PM) (POW00016599).

[220] Email from Alan Chen to Kevin Gates (Aug. 24, 2010, 06:20:38 PM) (POW00004722).

[221] Powhatan Dec. 17, 2010 Supplemental Response to Data Request #10.

electricity around in a circle" and "how life was back in 2008 before they started reimbursing us for TLC."[222]

c. Evidence of Intent: *"Without a doubt . . . I knew that . . . [Chen] was trying to drive that term, the day-ahead versus real-time, to zero and isolate the bet to his ability to model the marginal loss credit . . ."*[223]

Respondents' intent is not reasonably in dispute. The evidence demonstrates that Chen intended to execute UTC transaction pairs whose spread risk had been reduced to zero and which would clear virtually without fail.[224] The evidence further demonstrates that Gates understood and approved this purpose.[225] Indeed, Gates would never have authorized Chen to ramp up volumes as dramatically as he did unless he understood Chen's trading strategy "intimately".[226] Respondents' state of mind has been discussed throughout this report and is discussed further below, particularly in Section V.C.

d. Uneconomic Trades: *"You were absolutely going to lose money on that trade."*[227]

There is no question that the sham UTC trades were uneconomic on their own merits, because the essence of the UTC trade – the spread component – was washed out. UTC trade pairs flowing A-to-B and B-to-A in the same hours and volumes will never yield a profit on the congestion spread and will always incur transaction costs. So the only way the trades could generate a profit was by collecting more in MLSA than they would have to pay in transaction costs. Respondents understood this. As early as April 2010, Chen explained that, "if I didn't have those extra trades in just for TLC, I'd have made some money. For every single TLC trade, we would lose money on PnL [profit and loss] and make money on TLC so it is just shifted. If you want to talk, please let me know."[228] Gates responded, "I'm sorry. I get it now. No need to talk later."[229] In fact,

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[222] Email from Kevin Gates to Alan Chen (Aug. 12, 2010, 4:18 PM) (POW00004685).

[223] K. Gates Test. Vol. II Tr. 127:3-9.

[224] *See, e.g.*, Chen Test. Vol. I Tr. 40:17-18, Powhatan December 17, 2010 Supplemental Response to Data Request #10 *and see*, *infra*, nn.291-292 and accompanying text.

[225] *See, e.g.*, K. Gates Test. Vol. II Tr. 178:12-15.

[226] Email from Kevin Gates to Alan Chen (Jun. 9, 2009, 04:08:10 PM) (POW00017242).

[227] K. Gates Test. Vol. II Tr. 175:2-4.

[228] Email from Alan Chen to Kevin Gates (Apr. 7, 2010, 12:58 PM) (POW00016642).

after PJM discovered the scheme, Chen recognized that PJM's taking action against "*uneconomic* large volume UTC trades taking advantage of TLC" was going to entail "drastic changes" for his UTC trading.[230] Gates understood as well that the only economic rationale for executing such trades was to capture MLSA. As he acknowledged in testimony, losing money on the trades "wasn't merely highly likely. It was guaranteed. You were going to absolutely lose money on that trade."[231]

e. Implausible Explanations: Chen was not pursuing the "home run" strategy.

At the outset of the investigation, Respondents seemed to concede that Chen's trading was indeed as it appeared to be: a strategy for exploiting the then-existing rules by placing circular, wash-like trades that cancelled each other out to capture millions of dollars in MLSA without being exposed to any meaningful price risk. After the trading had stopped, however, and after Chen and others had provided significant testimony about the round trip trades, Respondents and the experts they hired offered an alternative explanation for Chen's trading. But, as discussed at length below, this strategy, developed after the fact by Respondents' experts, is fatally flawed because it is incompatible with the evidence.

This novel explanation, alternately styled the "black swan"[232] or "home run"[233] theory, contends that Chen's true purpose in putting on the round trip UTC trades was not to collect MLSA on each UTC trade pair, but rather was a bet on counterflow positions to

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[229] Email from Kevin Gates to Alan Chen (Apr. 7, 2010, 01:04:09 PM) (POW00016642).

[230] Email from Alan Chen to Kevin Gates (Aug. 5, 2010, 2:35 PM) (POW00004686) (emphasis supplied).

[231] K. Gates Test. Vol. II Tr. 175:2-4.

[232] *See* Chen Response to Preliminary Findings at 4. The "black swan" descriptor is a reference to *The Black Swan*, by Nassim Nicholas Taleb. *Id*. and n.21. As Taleb summarized his theory, it involves an event "outside the realm of regular expectations, because *nothing in the past can convincingly point to its possibility*." *See*, "The Black Swan: The Impact of the Highly Improbable" available at http://www.nytimes.com/2007/04/22/books/chapters/0422-1st-tale.html (visited Jul. 11, 2014) (emphasis supplied). In other words, Chen purports to have been expecting something "outside the realm of regular expectations," when in fact his goal was to profit from the highly-predictable receipt of large amounts of MLSA from self-cancelling transactions. *But see* Chen 1b.19 Response at 12 (denying that it was a "Black Swan" strategy).

[233] *See* Powhatan Submission, Affidavit of Richard Tabors at 9 (Tabors Aff.).

capture a windfall in the event that one of the two "legs" of the transaction pair fails to clear.[234] As Tabors explains it:

> By placing UTC bids in both directions between two points with the same positive cap, the trader could guarantee that one bid will fail to clear the market while the other bid clears in the unlikely event that congestion exceeds the cap.[[235]] Receiving a credit from transmission losses – independent of the size of that credit – reduces the fixed cost per MWh per trade, thus making it possible for a trader to place more trades at the same cost to the trader – increasing the volume of trades undertaken. In short, transactional costs are reduced. At the same time, reducing this transactional friction allows UTC traders to identify additional trading strategies where volumetric increase could provide a higher payoff from low probability events. Because transactional friction is reduced, it is economically rational to pursue such low probability, but high payoff, events more aggressively. The pre-specified condition would occur when transmission congestion in the day-ahead market exceeded the cap set by the trader. This might have been a cap at $50/MW, the maximum that was allowed by PJM rules . . . With transaction costs reduced or even eliminated, the trader could put on larger volumes more often in the hope of "hitting the home run."[236]

Respondents invest a great deal of effort constructing and presenting this "home run" theory to support their claim that Chen was doing something other than simply churning out UTC trades to capture MLSA credits.[237] The home run theory, however, suffers from a fatal flaw: it is entirely unsupported by the facts and directly contradicted by the contemporaneous evidence.

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[234] Tabors Aff. at 8.

[235] This formulation is incorrect. The only way to guarantee that one leg failed to clear would be to bid at a level that was guaranteed not to clear. But of course, under those circumstances, a trader might just as well refrain from placing a bid on the leg he hopes will break.

[236] Tabors Aff. at 9-10.

[237] *See* Chen Submission at 8-9; Pirrong Aff.; Powhatan Submission at 12-13; Tabors Aff.; Chen Response at 4-7; Chen 1b.19 Response at 9-14; Comments of Roy J. Shanker (unsworn statement submitted with Powhatan's 1b.19 Response) (Shanker Comments) at ¶¶ 38 – 45; Affidavit of Stewart Mayhew (executed Nov. 6, 2013) (Mayhew Aff.) (submitted with Powhatan's 1b.19 Response); Statement of Larry Harris (unsworn statement submitted with Powhatan's 1b.19 Response) (Larry Harris Statement).

Although there are many emails and other evidence of communications between Chen and Gates about trading strategy, none of them provides any support for the idea that Chen was pursuing a "home run" strategy, rather than the MLSA-targeting scheme the generated millions of dollars in profits for Chen and Powhatan. On the contrary, the record shows that Chen sought to *avoid* risk as much as possible, and that he did not propose and Gates did not accede to the "home run" strategy or anything like it.

In fact, Tabors – who offers the most developed version of the "home run" theory[238] – appears to be deeply uninformed about the actual facts of the case.[239] Notably, Tabors decided that Chen had employed a "home run" theory without reviewing Chen's contemporaneous emails with Gates and without reading Chen's deposition, which provide no support for – and in fact contradict – that theory.[240]

The various consultants hired by Respondents attempt to emphasize the risks that undertaking such a "home run" strategy would entail.[241] The home run theory is predicated in no small part on the hypothesis articulated by Tabors that Chen was a "real sort of gambler in the trading business" who would not have been interested in the sort of "nickel-and-dime" type of profits trading for MLSA yielded.[242] This characterization of Chen is impossible to square with the facts.[243] The evidence demonstrates that Chen had no appetite for the sort of reckless risk-seeking the home run theory imputes to him.

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[238] Tabors testified that he reviewed the Chen Submission to which the Pirrong Aff. was attached and learned "[v]ery little" from it. Testimony of Richard Tabors (May 14, 2012) (Tabors Test.) Tr. 20:6-13. "I was interested in understanding the trades and what the trade structure and logic was. That document was not very helpful to me in doing that." Tabors Test. Tr. 20:16-18.

[239] *See, e.g.*, Tabors Test. Tr. 10:18, 13:20-24, 15:2, 21:10-12, 24:9-22, 25:20, 28:6-15, 29:12 – 30:3-9, 31:15-16, 34:6-22. Respondents' other consultants likewise seem generally not to have relied on contemporaneous evidence. *See* Appendix B to Statement of Terrence Hendershott (Hendershott Statement); Appendix B to Aff. of Stewart Mayhew; Statement of David Hunger (Hunger Statement) at 2. Respondents' other consultants do not identify the material that forms the basis for their opinions.

[240] Tabors Test. Tr. 24:9-17 (Tabors did not read Chen's deposition transcript); *id.* at 25:20-26:1 (Tabors did not review Chen's emails with Powhatan).

[241] *See* Tabors Aff., Hunger Statement, Shanker Comments.

[242] *See* Tabors Test. Tr. 46:1-16 and Tabors Aff. at 20. Tabors elaborated that, "I know an awful lot of traders, and I don't think Alan's any different from any of the other ones that sat on the floor at Enron." Tabors Test. Tr. 46:15-17.

[243] Gates seemed similarly risk-averse. *See*, *e.g.*, Email from Kevin Gates to Alan Chen (Mar. 19, 2010, 4:57 PM) (POW00016931) ("We'd like to increase our exposure, but are concerned about the risks.")

Chen testified repeatedly as to his risk aversion in trading.[244] A week and a half *after* he began implementing the round trip UTC trading strategy, Chen explained to Gates that, "we increased volumes but decreased risk. If we rate the risk on 5/30 at 1.0, we now have probably 0.5."[245] Chen added that, "I'd like to be very conservative and get the lost money back and then some. After that I'll gradually increase the risk."[246] Gates – who was nervous all along about whether Chen's trading would involve significant risk – concurred with that approach.[247]

Despite their emphasis on the theoretical risks of the supposed "home run" strategy, Respondents effectively ignore the risk that Chen would *lose* large amounts of money if one of the legs of Chen's identically-paired trades did not clear. Because the trades were paired to achieve a wash or round trip between two nodes, each of the round trip UTC transaction pairs had one prevailing flow leg and one counterflow leg.[248] If both legs were bid at the maximum positive cap of $50/MW and the Day-Ahead price settled higher than $50/MW, the prevailing flow leg would "break" but the counterflow leg would clear. Respondents would then receive the Day-Ahead settlement price, but would be forced to pay back the Real-Time settlement price. Their financial upside would be limited to the amount by which the Day-Ahead settlement price exceeded the Real-Time settlement price. In other words, the only way this strategy could "hit the home run" is if there was a major Day-Ahead price spike, followed by a cratering of prices in Real-Time.[249] If Real-Time prices stayed high or increased relative to Day-

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[244] *See, e.g.*, Chen Test. Vol. I Tr. 52:7 ("I'm not taking a high-risk, high-reward trade"); 52:16-17 ("it's not like I'm trying to take on high-risk, high reward"); 66:3-8 (stating that he traded to minimize risk).

[245] Email from Alan Chen to Kevin Gates (Jun. 10, 2010, 5:28 PM) (POW00004837).

[246] Email from Alan Chen to Kevin Gates (Jun. 10, 2010, 5:28 PM) (POW00004837).

[247] Email from Kevin Gates to Alan Chen (Jun. 14, 2010, 05:52:46 PM) (POW00004837) ("Yes, I'd like to make more money before we ramp up risk.").

[248] "Prevailing flow" refers to the direction in which congestion is expected. Counterflow is the opposite. So if congestion is expected A-to-B, then A-to-B is the prevailing flow path and B-to-A is the counterflow path. As PJM has explained, "forward flow [i.e., prevailing flow] UTCs are profitable when they increase Day Ahead congestion such that it is closer to the congestion observed in real-time. In the counterflow direction, UTCs are profitable when they relieve Day Ahead congestion on a path that is less constrained in real time." Report on the Impact of Virtual Transactions, Docket No. ER13-1654-000, at 3 (filed Feb. 7, 2014).

[249] Chen described this scenario – which never occurred – in his testimony. *See* Chen Test. Vol. I Tr. 64:7-17.

Ahead prices, the strategy would produce minimal gains or potentially large losses. Chen understood this.[250]

Chen himself was adamant that he would never adopt a risky counterflow-reliant strategy like the home run approach. Early on in their business relationship, he told Gates, "I'd not bet anything big for counter-flow positions: never, period. No matter how enticing some of the quite-looking [*sic*] days, to me the counter-flow position is the only way to bankruptcy."[251] He also admitted at deposition that he did whatever he could to *decrease* the likelihood that one of the two legs of his identically-paired UTC trades would break.[252] In fact, the bids Chen placed to implement his scheme were far higher than the highest recent historical Day-Ahead congestion prices on those paths – typically, his bids were at least one standard deviation greater than the historically widest spread on the selected path.[253] Moreover, while Chen briefed Gates in detail about his actual strategies and communicated regularly with him,[254] he said nothing to Gates about anything resembling the home run strategy, even though he would have been implementing it on Powhatan's behalf.[255] At their June 25, 2010 strategy meeting, Chen and Gates discussed two UTC trading strategies: "(i) those where [Chen] was taking a significant directional bet, and the spread between two nodes introduced a lot of risk/return to the trade, and (ii) *those where he tried to remove the directional risk*, and

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[250] *See* Chen Test. Vol. I Tr. 101:4-7 ("you could be making a lot of money, accumulating among 29 days you're making money. If one day happened one of the legs rejected, you could lose all the money you make").

[251] *See* Email from Alan Chen to Kevin Gates (Jul. 22, 2008, 2:00 PM) (POW0001553). Gates, for his part, was relieved that Chen "doesn't seem that he's writing insurance against congestion. [I.e., taking counterflow positions] Makes me want to give him more money." Email from Kevin Gates to Chao Chen (Jul. 22, 2008, 01:34:18 PM) (POW00008996).

[252] Chen Test. Vol. II Tr. 66:10 – 68:1.

[253] *See infra*, at n.297.

[254] *See, e.g.*, Email from Alan Chen to Kevin Gates (Mar. 5, 2010, 11:28:46 AM) (POW00011676).

[255] Chen contends that, by informing Gates and the other Powhatan investors in June 2010 of the potential risks associated with his round trip UTC trades, he "*implicitly* advised Powhatan of the profits that could be made from the trades." Chen Nov. 17, 2011 Response to Data Request #17(h-i) (emphasis supplied). That is, Chen contends that warning his risk-averse clients of a potentially "catastrophic" risk was the same thing as alerting them to a major profit opportunity. This post hoc explanation is not credible.

isolate the bet that the transmission loss credit would exceed transaction costs."[256] Absent from this list is the home run strategy.

Perhaps most significantly of all, the record shows that both Chen and Gates were very concerned about one leg failing to clear and wanted to take strong measures to avoid that risk. In fact, at their June 25, 2010 meeting Chen committed to alert Gates if he had "any concerns" that one leg of a set of paired UTC trades might not clear, because they both understood that if that, "*while it does not occur often, when it does occur, it could be catastrophic*."[257] Chen himself testified that his round trip UTC trading strategy was an attempt to eliminate risk, not to embrace it.[258]

In sum, the alternative explanation proffered by Respondents for the round trip UTC trades is not merely implausible, it is flatly contradicted by the facts.

2. The Round-Trip UTC Trading Strategy Was Similar to Enron's Manipulative Death Star Strategy

Contrary to Respondents' assertions, the type of behavior evident in Chen's scheme is at the heartland of conduct that the Commission (and, by analogy, the securities laws) have long found unlawful. Although the use of UTCs in this particular scheme is unprecedented, schemes similar to Respondents' are not.

During (and to some extent precipitating) the Western Energy Crisis of 2000 – 2001, traders for Enron and other entities devised and engaged in an array of trading schemes designed to game the markets.[259] Among these unlawful schemes were a number of "congestion-related practices," including "Circular Scheduling" (i.e., "Death Star").[260] The effect of these schemes was to deceive the California ISO into awarding

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[256] Powhatan Dec. 17, 2010 Supplemental Response to Data Request #10 (emphasis supplied).

[257] Powhatan Dec. 17, 2010 Supplemental Response to Data Request #10 (emphasis supplied). This data response is among the materials not reviewed by Tabors or Respondents' other hired consultants prior to offering their views about Chen's strategy.

[258] Chen Test. Vol. I Tr. 79:20-25. In his testimony, Gates misleadingly described this reduction of risk as "introducing risk into the portfolio." K. Gates Test. Vol. II Tr. 172:3-9.

[259] *See generally*, Memorandum from Christian Yoder and Stephen Hall to Richard Sanders Re: Traders' Strategies in the California Wholesale Power Markets'/ISO Sanctions (Dec. 6, 2000) (Enron Gaming Memo) available at http://www.ferc.gov/industries/electric/indus-act/wec/enron/12-06-00.pdf (visited Oct. 27, 2014).

[260] *See American Electric Power Service Corporation, et al*., 103 FERC ¶ 61,345, at P 41 (2003).

the traders congestion relief payments for trades that did not relieve congestion.[261] The Commission condemned as unlawfully manipulative those "gaming practices" even though the trades were not explicitly proscribed by the terms of the applicable tariff, and were executed without affirmative concealment or overt false statements. In so doing, the Commission rejected claims that such practices were legal and that market participants were not adequately on notice that the Commission would deem them illegal. The Commission thus made clear – long before Chen entered into the trades at issue in this investigation – that analogous practices would be unlawful.

In the Circular Scheduling practice, better known as Death Star, traders scheduled a counterflow to receive a congestion relief payment, but also scheduled offsetting transactions. Death Star involved A-to-B and B-to-A schedule pairs, e.g., Lake Mead to California-Oregon Border (COB), paired with COB to Lake Mead.[262] Hence, "[w]ith the same amount of power scheduled back to the point of origin . . . power did not actually flow and congestion was not relieved. Circular Scheduling was profitable as long as the congestion relief payments were greater than the cost of scheduled transmission."[263] Other congestion-related practices similarly profited from deceiving the California ISO's congestion management software into awarding congestion-relief payments even though the net effect of such schedules was a nullity.[264]

These congestion-related practices were fraudulent and involved deception even though they did not violate any express terms of the then-existing tariff.[265] As the Final Staff Report on Price Manipulation in Western Markets noted, the congestion-related gaming practices were "designed to generate payments for relieving transmission congestion by 'fooling' the Cal ISO's computerized congestion management system."[266]

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[261] "According to the [California] ISO rules, market participants received congestion relief payments for relieving flows in the direction of congestion and increasing counterflows in the opposite direction." *American Electric Power Service Corporation, et al*., 103 FERC ¶ 61,345, at P 41 (2003); *see also*, Enron Gaming Memo at 3.

[262] Enron Gaming Memo at 4.

[263] *American Electric Power Service Corporation, et al.*, 103 FERC ¶ 61,345, at P 43 (2003). Similarly, Respondents' round-trip UTC trades were profitable as long as the MLSA payments were greater than the cost of scheduled transmission.

[264] *See id.* PP 42-44, and Final Staff Report on Price Manipulation in Western Markets, *Fact-Finding Investigation of Potential Manipulation of Electric and Natural Gas Price*s, Docket No. PA02-2-000, at VI-27 (Mar. 2003) (Final Staff Report).

[265] The Commission's current Anti-Manipulation Rule bars conduct "that *operates* or *would operate* as a fraud or deceit upon any entity." 18 C.F.R. § 1c.2 (2014) (emphases supplied).

[266] Final Staff Report at VI-26.

For instance, the return leg of the Death Star transactions was scheduled on paths outside of the California ISO's control area, rendering them invisible to the ISO as a practical matter, even though the counterflow schedule involved in the Death Star transactions was visible to the CAISO and Enron made no affirmative misrepresentation or false statement in connection with the circular schedule. [267]

The only tariff provisions the congestion-related practices were found to violate were certain Market Monitoring and Information Protocols (MMIPs) prohibiting "gaming" and "anomalous market behavior." Each concept was very generally defined.[268] Nevertheless, the Commission found that the tariff incorporated those general provisions and that they, in turn, proscribed the schemes. The Commission also rejected challenges that the relevant tariff provisions were impermissibly vague with respect to what conduct was prohibited. In this vein, the Commission noted that

> The Enron memoranda [describing the congestion-related practices, among others] cited in the Staff Final Report illustrate the creativity of the various trading strategies it employed to the economic detriment of the market, other market participants and, ultimately, customers. Enron (and others) would demand that a regulatory agency have the prescience to include in a rate schedule *all* specific misconduct in which a particular market participant could conceivably engage. That standard is unrealistic and would render regulatory agencies impotent to address newly conceived misconduct and allow them only to pursue, to phrase it simply, last year's misconduct – essentially, to continually fight the *last* war and deny the capability to fight the present or next one.
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[267] *See* Memorandum from Christian Yoder and Stephen Hall to Richard Sanders Re: Traders' Strategies in the California Wholesale Power Markets'/ISO Sanctions at 5 (Dec. 6, 2000) ("The ISO probably cannot readily detect this [Death Star] practice because the ISO only sees what is happening inside its control area, so it only sees half the picture"), available at http://www.ferc.gov/industries/electric/indus-act/wec/enron/12-06-00.pdf (visited Jul. 14, 2014).

[268] "Gaming" was defined, in part, as "taking unfair advantage of the rules and procedures set forth in the . . . [t]ariffs . . . to the detriment of the efficiency of, and of consumers in, the ISO markets." *American Electric Power Service Corporation, et al*., 103 FERC ¶ 61,345, at P 17 (2003) (quoting California ISO MMIP 2.1.3). "Anomalous market behavior," in turn, was defined in part as "behavior that departs significantly from the normal behavior in competitive markets" including, explicitly, "unusual trades or transactions" and "pricing and bidding patterns that are inconsistent with prevailing supply and demand conditions." *Id*. P 18 (quoting California ISO MMIP 2.1.1).

> [T]he MMIP provided adequate notice to market participants of what conduct was prohibited. The mere fact that the MMIP does not expressly prohibit in so many words specific trading strategies . . . simply means that the Commission did not (as, indeed, it could not) foresee all the myriad means that certain market participants could employ to the detriment of competition; it does not mean that market participants determined to have engaged in Gaming Practices and Partnership Gaming may escape disgorgement of the unjust profits that they gained by their conduct. . . . . It is . . . clear that Enron, the author of these trading strategies, recognized that its trading strategies could have been prohibited by the MMIP and that Enron could be severely sanctioned for the trading strategies, if it were caught. Given this, Enron's (and others') current position that the language of the MMIP does not allow market participants to know what conduct is prohibited is not credible.[269]

Respondents' scheme is similarly proscribed by the Anti-Manipulation Rule. Like Death Star, Respondents' round-trip UTC trades were designed to falsely appear to the RTO to be bona fide transactions (and on that basis to capture a benefit) while in fact they were substantively nullities. Like Death Star, Respondents' round-trip UTC trades were deceptive and manipulative even though they did not involve any false statements, active concealment, or other explicit tariff violations. And in light of the Commission's unambiguous condemnation of, and enforcement action against Death Star and the other congestion-related practices (even aside from the long-standing prohibition of wash trades and other sham transactions, discussed below), Respondents were on notice that like another scheme to "make money by moving electricity around in a circle"[270] – Death Star – their strategy was improper.

3. The Round Trip UTC Trades Are Functionally Equivalent to Wash Trades

a. Wash Trades and Wash-Like Trades Have Long Been Explicitly Prohibited

Respondents' round trip UTC trades were also manipulative because they were functionally equivalent to wash trades, which have long been condemned by the Commission, including when firms engaged in similar schemes during the Western Energy Crisis.

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[269] *American Electric Power Service Corporation, et al.*, 106 FERC ¶ 61,020, at PP 45, 48 (2004) (emphases in original, citations omitted).

[270] Email from Kevin Gates to Alan Chen (Aug. 12, 2010, 4:18 PM) (POW00004685).

At the time the Western Energy Crisis occurred in 2000-2001, the Commission had not promulgated any regulations explicitly prohibiting market manipulation. Accordingly, as discussed above, the Commission was able to take action against such manipulative practices, by, among other things, enforcing the broad anti-manipulation provisions of the CAISO and Cal PX tariffs, which prohibited "gaming," and "anomalous market behavior." In the wake of the crisis, the Commission promulgated the Market Behavior Rules to more explicitly prohibit similar misconduct in other markets.[271]

Market Behavior Rule 2 prohibited "[a]ctions or transactions that are without a legitimate business purpose and that are intended to or foreseeably could manipulate market prices, market conditions, or market rules for electric energy or electricity products."[272] Among the schemes that the Commission explicitly proscribed was wash trading – a species of sham trading that the Commission described as "pre-arranged offsetting trades of the same product among the same parties, which involve no economic risk and no net change in beneficial ownership."[273] But this description was not rigid or formalistic; the Commission established that this description of wash trading merely furnished an example of a prohibited practice, and it noted that the description was intended to capture the "key elements" of a wash trade, rather than to define the practice narrowly.[274]

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[271] The Commission's first effort in this regard was its Order Establishing Refund Effective Date and Proposing to Revise Market-Based Rate Tariffs and Authorizations, *Investigation of Terms and Conditions of Public Utility Market-Based Rate Authorization*, 97 FERC ¶ 61,220 (2001), issued on November 20, 2001. The Commission subsequently modified those proposed revisions in view of information brought to light both by comments from industry and from its own investigation of the Western Energy Crisis. In June 2003, the Commission issued an order seeking comment on a new version of those proposed revisions. *Investigation of Terms and Conditions of Public Utility Market-Based Rate Authorization*, 103 FERC ¶ 61,349 (2003). The Market Behavior Rules were ultimately adopted in November 2003. *Investigation of Terms and Conditions of Public Utility Market-Based Rate Authorizations*, 105 FERC ¶ 61,218 (2003) (Order Adopting Market Behavior Rules).

[272] Market Behavior Rule 2, Order Adopting Market Behavior Rules at P 35 and Appendix A.

[273] Order Adopting Market Behavior Rules, 105 FERC ¶ 61,218 at P 35 and Appendix A.

[274] *See* Order Adopting Market Behavior Rules, 105 FERC ¶ 61,218 at P 35 and Appendix A ("Prohibited actions and transactions *include, but are not limited to* pre-arranged offsetting trades of the same product among the same parties, which involve no economic risk and no net change in beneficial ownership (sometimes called 'wash trades').") (emphasis supplied); and *id*. P 53 (identifying the two "key elements" of wash

The Commission expressly rejected arguments that the rule should be construed narrowly to proscribe only specifically identified forms of conduct:

> We will reject commenters' argument that Market Behavior Rule 2 should identify and prohibit only expressly-defined acts of manipulation. For all the reasons discussed above, it is essential and appropriate that we have a prohibition designed to prohibit all forms of manipulative conduct.[275]

The Commission clarified that, with respect to "transactions with economic substance," where "value is exchanged for value," sellers would have the opportunity to demonstrate "that their actions were not designed to distort prices or otherwise manipulate the market."[276] In this context, it noted, however, that the "rates, terms and conditions" of such a transaction must be "disciplined by the competitive forces of the market."[277] Finally, although the rule was intentionally broad in scope, it was understood that market participants had been given sufficient and appropriate notice of the type of conduct that had been proscribed. As the Commission stated, "sellers can recognize the difference between actions and strategies that are in furtherance of legitimate profit opportunities," and those that are not.[278]

In direct response to the Western Energy Crisis and the "gaming practices" that came to light as a result, Congress passed the Energy Policy Act (EPAct 2005).[279] In relevant part, this statute included provisions that conferred on the Commission specific and broad anti-manipulation authority. In adopting the Anti-Manipulation Rule in Order No. 670, the Commission clarified that the conduct prohibited by Market Behavior Rule 2 would also be equally prohibited under the Anti-Manipulation Rule.[280] When the Commission rescinded Market Behavior Rule 2 it reiterated that the Anti-Manipulation

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trading as being prearranged to cancel each other out and involving no economic risk). This approach is consonant with how the CFTC has viewed wash trades: "A wash sale is a transaction made without an intent to take a genuine, bona fide position in the market, such as a simultaneous purchase and sale designed to negate each other so that there is no change in financial position." *In re San Diego Gas & Elec. Co*., Comm. Fut. L. Rep. (CCH) ¶ 31,549, 2010 WL 1638992 (CFTC Apr. 22, 2010) *citing Reddy v. CFTC*, 191 F.3d 109, 115 (2d Cir. 1999).

[275] *Id*. P 41.

[276] *Id*. P 37.

[277] *Id*. P 42.

[278] *Id*. P 44.

[279] Energy Policy Act of 2005, Pub. L. No. 109-58, 119 Stat. 594 (2005).

[280] *Prohibition of Energy Market Manipulation*, Order No. 670, FERC Stats. & Regs. ¶ 31,202, *order denying reh'g*, 114 FERC ¶ 61,300, at P 59 (2006).

Rule proscribed, among other things, all of the conduct prohibited under Market Behavior Rule 2.[281] In that same order, it again emphasized that its anti-manipulation authority was broad in scope and could not be defined narrowly because doing so would only reward clever manipulators who invented novel and unforeseen schemes to defeat otherwise well-functioning markets: "fraud is a very fact-specific violation, the permutations of which are limited only by the imagination of the perpetrator. Therefore, no list of prohibited activities could be all-inclusive. The absence of a list of specific prohibited activities does not lessen the reach of the new anti-manipulation rule . . ."[282]

In short, the Commission's current anti-manipulation authority stems from Congress' decision to arm it with tools adequate to combat the sort of manipulative gaming practices that came to light in the Western Energy Crisis. Those gaming practices, and schemes that are functionally equivalent to those practices, are prohibited under Part 1c.

The evidence shows that Chen's round trip UTC trades were functionally equivalent to expressly prohibited practices such as wash trades. Specifically, they met the two "key elements" of wash trading: they were "prearranged to cancel each other out" and they involved almost "no economic risk."[283] Put another way, they were intended to create the false appearance of bona fide market activity without actually taking a bona fide position in the market. As courts have found, "[t]he essential and identifying characteristic of a 'wash sale' seems to be the intent not to make genuine, bona fide trading transactions."[284] This characterization squarely applies to Respondents' round-trip UTC trades.

In seeking to distance Chen's round-trip trades from the universally condemned practice of wash trading, Respondents advance a highly restrictive definition of wash trading and contend that three features of Chen's round trip UTC trades place them outside that definition. They contend, first, that Chen's round trip UTC trades were

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[281] *Investigation of Terms and Conditions of Public Utility Market-Based Rate Authorizations*, 114 FERC ¶ 61,165, at P 24 (2006) (MBR Rescission Order), citing Order No. 670, FERC Stats. & Regs. ¶ 31,202 at P 59.

[282] MBR Rescission Order at P 24. Courts have similarly found that the purpose of the 1934 Exchange Act's anti-manipulation provisions to be to give effect "to the realization that an honest securities market depended on more than the exclusion of the cruder forms of lying, such as wash sales, matched orders, and the like." *Rosenberg v. Hano*, 121 F.2d 818, 820 (3d Cir. 1941).

[283] Order Adopting Market Behavior Rules, 105 FERC ¶ 61,218 at P 53.

[284] *Sundheimer v. CFTC*, 688 F.2d 150, 151 (2d Cir. 1982), *citing CFTC v. Savage*, 611 F.2d 270, 284 (9th Cir. 1979) (quoting *In re Jean Goldwurm*, 7 Agric. Dec. 265, 274 (1948)).

profitable;[285] second, that they were not "intended . . . to move prices in the market in order to benefit some 'other' position or achieve some 'external' purpose, characteristic of 'wash trade' type behavior,"[286] and third, that Chen's round trip UTC trades were not risk-free.

Respondents' arguments are unpersuasive, not least because the Commission's Anti-Manipulation Rule is not limited to a narrow set of specifically enumerated, technically defined schemes. Moreover, Respondents' proposed technical definition is at odds with prior Commission pronouncements.

As to "profitability," the only way Respondents' self-cancelling trades were profitable was because they triggered MLSA payments intended for legitimate spread trades. This type of "profitability," far from being a defense, is simply the trader's reward for engaging in manipulative trades.

In any event, the Commission has never indicated that it is essential to a wash trade that the transaction not be profitable, nor has the Commission ever insisted that wash trades be executed to move prices. Quite the contrary: the Commission has made clear that "profitability is not determinative on the question of manipulation and does not inoculate trading from any potential manipulation claim,"[287] and that trades need not have been executed for the purpose of moving market prices to constitute wash trades.[288]

As for the risk associated with the round trip UTC trades, Respondents argue that their trades still incurred risk because there was a non-zero chance that one of the legs of a transaction pair would not clear, thereby exposing them to Day-Ahead and Real-Time prices. But Respondents do not and could not contend that any wash or wash-like trade

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[285] Chen Submission at 7; Powhatan Submission at 15.

[286] Powhatan Submission at 16.

[287] *Deutsche Bank Energy Trading, LLC*, 142 FERC ¶ 61,056, at P 20 (2013), quoted at *Barclays*, 144 FERC ¶ 61,041 at P 43; *see also*, *Intertie Bidding in the California Independent System Operator's Supplemental Energy Market*, 112 FERC ¶ 61,333, at 62,481 (2005) ("profit maximization alone does not constitute a legitimate business purpose"); *accord*, *Investigation of Terms and Conditions of Public Utility Market-Based Rate Authorizations*, 105 FERC ¶ 61,218, at P 37-38 (2003).

[288] *See* Order Adopting Market Behavior Rules, 105 FERC ¶ 61,218 at P 53 (declining to require that wash trades be executed for a specific purpose and declaring instead that, "we know of no legitimate business purpose attributable to such behavior."). The Commodity Futures Trading Commission has similarly recognized that impermissible wash trades may be executed for purposes other than moving market prices. *See Wilson v. CFTC*, 322 F.2d 555 (8th Cir. 2003) (wash trades executed to shift profits and losses for accounting purposes); *Sundheimer v. CFTC*, 688 F.2d 150 (2d Cir. 1982) (wash trades employed to obtain illegal tax benefits).

must be absolutely free from all risk whatsoever.[289] Mere theoretical risk is not enough to evade the prohibition against "wash" trades.[290] Moreover, the type of risk they point to is irrelevant because it is not the kind of risk (namely, arbitrage between Day Ahead and Real Time prices) that UTC trades are designed to incur.

In addition, any such risk was minimal at best, reflecting only the irreducible risk to which all UTC trades were subject because all UTC trades were subject to a +/- $50 price cap at the time – a price cap that was rarely even approximated in the trades under investigation. Treating the existence of ineliminable risks as a defense would effectively eradicate liability for wash and wash-like trades.

As with any manipulative scheme, there is a chance that the device or scheme will fail, and Respondents' scheme was no different. But the mere possibility that a scheme might fail does not make it lawful. There was indeed a very small theoretical possibility that, despite Chen's best efforts to prevent that result, one leg of his trade might clear while the other did not, leading either to unexpected (and potentially large) losses or gains. That is simply an irreducible risk common to all UTC trades. Moreover, notwithstanding the ineliminable risk of one of Chen's round trip UTC trades failing to clear the Day-Ahead market, both legs of the round trip trades were accepted without fail. Chen's view of the risk of not clearing is reflected in his comment to Gates, "[w]e don't have this kind of trades [*sic*] rejected."[291]

Indeed, the bids for Respondents' round trip trades were virtually guaranteed to clear. On the principal paths Chen selected for his wash-type UTC trades, his bids vastly exceeded historical congestion spreads 99% of the time, and were more than twice their highest historical Day-Ahead spreads.[292] This was no accident. Chen understood price

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[289] For example, matched stock trades intended to cancel one another out might not do so if prices changed between the time the first and the second order were executed.

[290] Precedent from both CFTC and SEC supports this. *See*, *e.g.*, *Piasio v. CFTC*, 54 Fed. App'x 702, 705 (2d Cir. 2002) ("Under the CFTC's precedent, a wash sale is one in which market risk is reduced 'to a level that has no practical impact on the transaction at issue," and in which the customer has 'the intent not to make a genuine bona fide trading transaction.'"). The SEC has expressed similar views. *See* Short Sales, 69 Fed. Reg. 48008-01, 48021 (characterizing a species of "sham transactions" as involving "no legitimate economic purpose or substance to the contemporaneous purchase and sale, no genuine change in beneficial ownership, *and/or little or no market risk*") (emphasis supplied) (internal citation omitted).

[291] Email from Alan Chen to Kevin Gates (Aug. 24, 2010, 06:20:38 PM) (POW00004722).

[292] The vast bulk of Chen's wash-type offsetting UTC trades were placed on five paths: MISO-DAY, MISO-COMED, MISO-COOK, MISO-ROCKPORT and MISO-

correlations and selected his paths for the purpose of limiting congestion volatility. Moreover, unlike some longer-term products,[293] UTC trades are daily bid (or not bid) into the Day-Ahead market, which enables a trader like Chen to have up-to-date information about what conditions are likely to be like before he even places those bids. If Chen saw conditions suggesting a potential spike in Day-Ahead congestion prices he could (and would) have simply declined to bid the trade.[294]

In sum, Chen's round trip UTC trades were the functional equivalent of wash trades. Placed in the same volumes, in the same hours, in opposite directions on the same paths, they were prearranged to cancel one another out. They involved only notional risk, and were executed to ramp up volumes without actually taking a position in the market, for the purpose of creating the illusion of greater bona fide market activity and thereby capturing an extrinsic benefit, i.e., the MLSA.

Use of UTCs to effectuate wash trades is relatively novel, but wash and wash-like trades themselves are not. PJM originally created UTCs as a mechanism for hedging physical transactions;[295] although they eventually evolved into a product primarily used for financial arbitrage, by the summer of 2010 the rules governing MLSA rendered UTCs susceptible to abuse in a wash-like scheme. To address novel schemes and novel variations of known schemes, the Commission gave itself flexibility in defining prohibited manipulative behavior under the Anti-Manipulation Rule. The Commission has long understood that it "oversee[s] a dynamic and evolving market where addressing

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AEP. During the period January 2008 through December 2010, in 99% of all hours during the period, the maximum Day-Ahead congestion spreads on these paths were below $11.69 (MISO-DAY), $12.40 (MISO-COMED), $11.52 (MISO-COOK), $8.75 (MISO-ROCKPORT), and $14.40 (MISO-AEP) respectively. Chen's bids on these paths typically ranged from $35 - $50, far in excess of these historical spreads. In other words, the low end of Chen's bidding was more than twice the historical congestion spreads on these paths in over 99% of hours.

[293] Financial Transmission Rights (a/k/a FTRs), for example, are bid at auction on an annual, quarterly, or monthly basis.

[294] *See* Powhatan Dec. 17, 2010 Supplemental Response to Data Request #10 (explaining that Chen committed to warn Gates ahead of time if he ever anticipated that one leg of a pair of matched trades might fail to clear).

[295] *See Atlantic City Elec. Co., et al.*, 86 FERC ¶ 61,147, at 61,528 (1999) (directing establishment of two-settlement system to facilitate price certainty); PJM Compliance Filing, *PJM Interconnection, L.L.C.*, Docket No. ER00-1849-000 (Mar. 10, 2000) (proposing two-settlement system including UTCs), and *PJM Interconnection, L.L.C.*, 91 FERC ¶ 61,148 (2000) (accepting compliance filing).

yesterday's concerns may not address tomorrow's,"[296] so to effectively deter manipulative conduct, it must be "able to address newly conceived misconduct," or else it will be forced "to continually fight the *last* war . . . [without] the capability to fight the present or next one."[297]

Even if the notional risk associated with Chen's round trip trades sufficed to distinguish them in some way from the more traditional forms of wash trading, that distinction would not change the fact that they were executed for the same purpose and to the same effect as wash trades have traditionally been executed. In sum, whether described as wash trading or not, Respondents' scheme to capture MLSA by creating the false appearance of bona fide market activity through prearranged offsetting round trip UTC trades is unlawful and is prohibited by the Commission's current Anti-Manipulation Rule.

b. Chen Was Not Implementing the Risky Counterflow Strategy Respondents' Consultants Impute to Him: *"I'd not bet anything big for counterflow positions: never, period."*[298]

Respondents' main argument against staff's determination that Chen's A-to-B and B-to-A trade pairs were unlawful is that they entailed some measure of economic risk. Indeed, Respondents contend that, far from being contrived to eliminate the risks associated with UTC trading, Chen's scheme was actually an ingenious risk-*seeking* counterflow strategy intended to capitalize on unforeseeable and extremely improbable but theoretically possible Day-Ahead price spikes.

As discussed in detail above, this argument is simply a post hoc invention. Taken at face value, the home run strategy would have been too risky for either Chen or Gates. Contemporaneous documents demonstrate that Chen was adamant that he would "not bet anything big for counterflow positions: never, period."[299] There is no evidence that Chen ever changed his mind about the danger of counterflow strategies, that he ever even analyzed such strategies, or that he ever discussed anything resembling the home run strategy with Gates. On the contrary, the evidence demonstrates that Chen intended to remove risk from his trades and that he did so successfully. The evidence also shows that both Chen and Gates were risk-averse, and that both viewed the failure of one leg to clear

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[296] Order Adopting Market Behavior Rules, 105 FERC ¶ 61,218 at P 38.

[297] *American Electric Power Service Corporation, et al.*, 106 FERC ¶ 61,020, at P 45 (2004) (emphasis in original); *accord*, Order Adopting Market Behavior Rules, 105 FERC ¶ 61,218 (2003); Order No. 670, FERC Stats. & Regs. ¶ 31,202 (2006).

[298] Email from Alan Chen to Kevin Gates (Jul. 22, 2008, 2:00 PM) (POW0001553).

[299] Email from Alan Chen to Kevin Gates (Jul. 22, 2008, 2:00 PM) (POW0001553).

– the event that could theoretically trigger a "home run" – as a potentially "catastrophic" risk to be avoided, not an opportunity to be pursued.

In short, the fact that it was not possible for Chen to eliminate all theoretical risk from the UTC trades he used to effect his manipulative wash trading scheme does not alter the fact that the round trip UTC trades were intended to – and did – achieve the same results as wash trading using more traditional products.

4. Defenses

Respondents' defenses generally do not address Chen's actual trading or trading strategy. With respect to their substantive defenses, Respondents advance several arguments to obscure the true nature of their manipulative scheme. Most of these arguments – that Chen was not seeking to collect MLSA but was instead implementing a high risk "home run" strategy with an extremely low likelihood of success;[300] that Chen's UTC trades were not "sham" or "wash" trades because they entailed non-zero economic risk;[301] that the trades were placed for legitimate business purposes;[302] that they involved no deception;[303] and that Respondents lacked scienter[304] – are not supported by contemporaneous evidence.[305] Only three principal arguments remain: (1) That their conduct was specifically authorized by the Commission's approval of PJM's proposed MLSA distribution methodology; (2) that they lacked fair notice that their scheme would be regarded by the Commission as manipulative; and (3) that the scheme might have been lawful in markets regulated by the Securities Exchange Commission (SEC), which, they argue, precludes a finding of manipulation in the power markets. None of these arguments has merit.

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[300] *See* Tabors Aff.; Pirrong Aff.; Hunger Statement.

[301] *See* Consulting Report of Jeffrey H. Harris (Jeffrey Harris Report); Larry Harris Statement; Mayhew Aff.

[302] *See* Mayhew Aff.; Hunger Statement.

[303] *See* Mayhew Aff.; Hunger Statement.

[304] Chen Submission at 23-26; Powhatan Submission at 9.

[305] *See* Sections III.B, IV.B.2, and IV.B.3, *and see* Section IV.C, below.

a. The Commission Never Approved of Round-Trip UTC Trading: *"If arbitrageurs can profit from the volume of their trades, they are not reacting only to perceived price differentials in LMP or congestion, and may make trades that would not be profitable based solely on price differentials alone."*[306]

As noted above, PJM's efforts at creating an appropriate methodology for distributing MLSA was heavily shaped by litigation.[307] Respondents contend that the *Black Oak* proceeding, and the Commission orders issued therein, means that "the Commission arguably *encouraged* traders to do the very thing that Dr. Chen did."[308] A careful review of that litigation and those orders, however, refutes that contention: at no time did the Commission express approval of schemes in which financial market participants artificially inflate their trading volumes to capture a larger share of MLSA. On the contrary, as discussed below, the Commission's orders consistently described the proper role of financial trading as arbitraging differences between the Day-Ahead and Real-Time prices.

In November 2006, the Commission approved PJM's proposed method for handling excess loss payments: distribute the money to wholesale purchasers of energy in PJM, sometimes referred to as "load."[309] In response, a group of virtual traders calling themselves the "Financial Marketers" filed a complaint in December 2007 asking the Commission to direct PJM to allow financial traders to share in the marginal loss surplus, and proposing a particular method for doing so.[310] In the ensuing proceeding – known as the *Black Oak* proceeding – the Financial Marketers were the principal voice of virtual traders.[311]

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[306] *Black Oak Energy LLC et al. v. PJM Interconnection, L.L.C.*, 122 FERC ¶ 61,208, at P 44 (2008).

[307] *See*, *supra*, Section II.D.

[308] Powhatan Supplemental Submission at 3 (emphasis supplied).

[309] *Atlantic City Electric Co. v. PJM Interconnection, L.L.C.*, 117 FERC ¶ 61,169, *order on reh'g*, 115 FERC ¶ 61,132 (2006).

[310] Notice of Black Oak Energy LLC's et al. Dec. 3, 2007 Complaint, *Black Oak Energy, LLC, et al. v. PJM Interconnection, Inc.*, Docket No. EL08-14-000 (issued Dec. 4, 2007).

[311] The Financial Marketers' coalition included (for some or all of the filings discussed here) Black Oak Energy, LLC, EPIC Merchant Energy NJ/PA, SESCO Enterprises, LLC, Energy Endeavors, LP, Coaltrain Energy LP, and Solios Power, LLC. Chen and his entities did not make any filings in the *Black Oak* proceeding, nor did Powhatan.

In December 2007, four market participants filed briefs opposing Financial Marketers' proposal and warned that the method proposed by the Financial Marketers for distributing loss payments could create perverse incentives for virtual traders to engage in volume trading not for arbitrage purposes, but simply to collect loss payments. A coalition calling itself the PJM Power Providers Group, for example, warned that the method proposed by the Financial Marketers would create incentives for "perverse market transactions," such as trades between "electrically similar points" that "would create a minimal price risk, yet make the financial marketer eligible for a share of the marginal loss over-collection allocations."[312]

Consolidated Edison similarly warned that the MLSA distribution method proposed by the Financial Marketers could "have perverse impacts and result in clearing transactions for purposes of receiving refunds rather than for arbitraging differences in Day Ahead and Real Time prices."[313] Two other commenters gave similar warnings.[314]

In a January 2008 answer, the Financial Marketers responded to these arguments by denying that "virtual Market Participants would engage in large numbers of virtual transactions in order to artificially inflate the number of cleared virtual transactions, and thus any pro rata MW-share reimbursement of marginal losses."[315] With specific

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[312] PJM Power Providers Group Motion to Intervene and Comments, *Black Oak Energy, LLC, et al. v. PJM Interconnection, Inc.*, Docket No. EL08-14-000, at 14 (filed Dec. 26, 2007) (PJM PPG Comments).

[313] Consolidated Edison Energy, Inc. and Consolidated Edison Solutions, Inc**.** Motion to Intervene and Comments**,** *Black Oak Energy, LLC, et al. v. PJM Interconnection ,Inc.*, Docket No. EL08-14-000, at 4 (filed Dec. 26, 2006).

[314] Old Dominion Electric Cooperative's Motion To Intervene, Protest and Request for Rejection, *Black Oak Energy, LLC, et al. v. PJM Interconnection, Inc.*, Docket No. EL08-14-000, at 9 n.12 (filed Dec. 27, 2006) ("If the Complainants were granted an allocation of revenue of marginal loss over-collection based on when they 'pay' marginal losses, then a perverse incentive could be created where it makes sense to create offsetting positions that become profitable solely based on one side of the trade being allocated revenue to which they should never have been entitled"); Duke Energy Ohio, Inc.'s Motion to Intervene and Comments in Opposition to Complaint, *Black Oak Energy, LLC, et al. v. PJM Interconnection, Inc.*, Docket No. EL08-14-000, at 8 (filed Dec. 26, 2007) ("Financial Marketers can increase their gross volumes nearly limitlessly," and by doing large volumes of transactions with minimal expectation of spread gains, "Financial Marketers' expected overcharge refunds would continue to grow").

[315] Financial Marketers' Motion for Leave to Answer and Answer to Comments in Opposition to Complaint, *Black Oak Energy, LLC, et al. v. PJM Interconnection, Inc.*, Docket No. EL08-14-000, at 11 (filed Jan. 10, 2008) (January 2008 Answer).

reference to UTC trades, the Financial Marketers assured the Commission that this would not happen, because the unavoidable fixed costs of doing virtual transactions would make a strategy of volume trading to collect MLSA "highly unprofitable, as well as exceptionally risky. . . . the potential return of marginal losses would *never* justify the risks and costs involved."[316]

In its March 6, 2008 Order denying the *Black Oak* complaint, the Commission explained the role financial traders are intended to play: "the purpose of arbitrage [by financial traders] is to try to take advantage of profitable price differences between the Day-Ahead and Real-Time markets."[317] That is, "[t]he benefits of arbitrage are supposed to result from trading acumen in being able to spot divergences between markets."[318] The Commission therefore sought "to create proper pricing signals *so that arbitrage is profitable only when it reflects real price differentials between Day-Ahead and Real-Time markets*."[319]

That objective, the Commission wrote, was inconsistent with enabling virtual traders (of whom UTC traders are a subset) to collect MLSA from sheer transaction volume: "If arbitrageurs can profit from the volume of their trades, they are not reacting only to perceived price differentials in LMP or congestion, and may make trades that would not be profitable based solely on price differentials alone."[320]

After the Commission denied their Complaint in the March 2008 Order, the Financial Marketers sought rehearing in April 2008.[321] In this filing, the Financial

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[316] January 2008 Answer at 11 (emphasis supplied). They also dismissed as "entirely speculative" any suggestion that such abuses had ever actually occurred. January 2008 Answer at 12. The abuses in question would naturally not have occurred, since there was, as yet, no way for unscrupulous market participants to use them to capture MLSA.

[317] Order Denying Complaint, *Black Oak Energy, LLC, et al. v. PJM Interconnection, L.L.C.*, 122 FERC ¶ 61,208, at P 44 (2008). As discussed above, the Commission allows virtual transactions in ISOs and RTOs because, if done legitimately, they may provide benefits such as price convergence. *ISO New England, Inc*., 113 FERC ¶ 61,055, at P 30 (2005). Volume trading aimed not at arbitrage but at MLSA provides none of these benefits.

[318] Order Denying Complaint at P 51.

[319] *Id*. (emphasis supplied).

[320] *Id*. At this point in the *Black Oak* proceeding, the Commission was addressing concerns about volume trading of virtual trades generally. UTCs, along with INCs and DECs, are a species of virtual trades.

[321] Request for Rehearing, *Black Oak Energy, LLC, et al. v. PJM Interconnection, Inc.*, Docket No. EL08-14-001 (filed April 7, 2008).

Marketers renewed their request that the Commission allow them to share in MLSA payments for their arbitrage trading.[322] The Financial Marketers reminded the Commission that it had repeatedly determined that "the trading activities engaged in by arbitrageurs" are valuable to the overall marketplace, and they further argued that "price convergence" provided by arbitrage transactions would provide a major benefit to the PJM marketplace.[323]

In October 2008, in light of the fact that PJM was proposing to allocate marginal loss surpluses to transactions supporting the transmission grid, the Commission granted the Financial Marketers' request for reconsideration in part, directing PJM to consider whether it was just and reasonable to deny MLSA payments to virtual traders for their arbitrage transactions.[324] In particular, the Commission told PJM to consider whether to allocate MLSA to all market participants that "contribute to the fixed costs of the transmission grid."[325] In this order, the Commission again expressed its view that legitimate arbitrage transactions "reduce price divergence between the Day-Ahead and Real-Time markets."[326]

In its October 2008 Order, the Commission reiterated its concerns about volume trading of virtuals to collect MLSA. In response to Financial Marketers' proposal that MLSA be distributed based on total transaction volume (or "load ratio share"), the Commission stated:

> We also are concerned that since arbitrageurs, unlike load, control their load ratio share by virtue of the number of transactions into which they enter, using a pure load ratio share calculation would provide an incentive for the arbitrageurs to conduct trades simply to receive a larger credit.[327]

The Commission returned to this theme later in the same order:

> Indeed, payment of the surplus to arbitrageurs that is unrelated to the transmission costs could distort arbitrage decisions and reduce the value of arbitrage by creating an incentive for arbitrageurs to engage in purchase

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322 *Id*. at 29 n.78.

323 *Id*. at 28.

324 Order Denying Rehearing in Part and Granting Rehearing in Part, *Black Oak Energy, LLC, et al. v. PJM Interconnection, L.L.C.*, 125 FERC ¶ 61,042 (2008) (emphasis supplied) (October 2008 Order).

325 *Id*. P 36.

326 *Id*. P 43.

327 *Id*. P 38 n.46 (emphasis supplied).

> decisions, not because of price divergence, but simply to increase marginal line loss payments.[328]

PJM sought clarification of the Commission's October 2008 Order.[329] In response to that filing, the Financial Marketers for a second time assured the Commission that virtual traders would never do volume trading aimed at capturing MLSA:

> There is no merit to the claim that updating the allocation percentage will give Market Participants perverse incentives to engage in virtual transactions in order to capture a larger share of the surplus. *As always, Market Participants will conduct virtual transactions when they think they can profit from the difference between the day ahead LMP and the real-time LMP they expect*. The fact that a trader will share in distributions of transmission line loss surpluses based on the volume of transactions it conducts in the day-ahead market should not significantly alter this calculus, given that transmission line losses are just one component of the LMP.[330]

In February 2009, the Commission clarified its October 2008 Order, explaining that in directing PJM to consider expanding the universe of MLSA participants, it "did not intend to exclude virtual traders to the extent that those traders make transmission payments that contribute to the fixed costs of the transmission grid."[331] But the Commission did not suggest any change in its view of volume trading aimed at collecting MLSA, a practice it had twice condemned and that the Financial Marketers had twice disavowed.

Shortly thereafter, PJM proposed changing the tariff to conform to the Commission's February 2009 Order by authorizing MLSA distribution to virtual transactions that paid to reserve transmission on OASIS.[332] The Financial Marketers

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[328] *Id*. P 43.

[329] Specifically, PJM sought clarification as to "whether PJM is to credit those who support the fixed costs of the transmission grid through payments or whether allocation is to proceed relative to load as it is currently stated in the PJM Tariff." PJM Interconnection, L.L.C. Request for Clarification, *Black Oak Energy, LLC, et al. v. PJM Interconnection, Inc.*, Docket No. EL08-14-001, at 7 (filed Nov. 17, 2008).

[330] Financial Marketers' Answer to Request of PJM Interconnection, LLC for Clarification, *Black Oak Energy, LLC, et al. v. PJM Interconnection, Inc.*, Docket No. EL08-14-001, at 6 n.5 (filed Dec. 2, 2008) (emphasis supplied).

[331] *Black Oak Energy, LLC, et al. v. PJM Interconnection, L.L.C.*, 126 FERC ¶ 61,164, at P 15 (2009).

[332] PJM Compliance Filing, *Black Oak Energy, LLC, et al. v. PJM Interconnection, L.L.C.*, Docket No. EL08-14-002 (filed Mar. 26, 2009).

filed another protest, arguing that *all* virtual transactions ought to receive a share of MLSA based on the virtual transactions' proportional share by volume of all Day-Ahead transactions, whether physical or virtual.[333] In their protest, the Financial Marketers for the third time stated that virtual traders would not engage in volume trading to collect MLSA, repeating the same unequivocal assurances they had given previously.[334]

On September 17, 2009, the Commission rejected Financial Marketers' April 2009 Protest and accepted PJM's March 2009 Compliance Filing.[335] Under the procedure proposed by PJM and approved by the Commission, MLSA was to be paid on a pro rata basis to market participants, including virtual traders, who reserved paid transmission on OASIS.[336] No commenter suggested to the Commission that this method would allow financial traders to profitably engage in volume trading to collect MLSA, and (as just discussed) the Financial Marketers had by then three times assured the Commission that virtual traders would not engage in that practice. In this order, the Commission reiterated that "[t]he key point" is that whatever mechanism for distributing the marginal loss surplus PJM selects, it must be "equitably applied" and must "ensure that marginal cost pricing sends customers the correct price signal."[337] As noted previously, this September 2009 order set the stage for the trading at issue in this case.

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333 *Black Oak Energy, LLC et al. v. PJM Interconnection, L.L.C.*, 128 FERC ¶ 61,262, at P 13 (2009), *citing* Black Oak Energy, LLC, et al.'s Protest, and Energy Endeavors LP and Solios Power, LLC's Motion for Leave to Intervene of, *Black Oak Energy, LLC, et al. v. PJM Interconnection, L.L.C.*, Docket No. EL08-14-002, at 14 (filed April 16, 2009) (April 2009 Protest).

334 April 2009 Protest at 14 n.5:

> There is no merit to the claim that updating the allocation percentage will give Market Participants perverse incentives to engage in virtual transactions in order to capture a larger share of the surplus. As always, Market Participants will conduct virtual transactions when they think they can profit from the difference between the day-ahead LMP and the real-time LMP they expect. The fact that a trader will share in distributions of transmission line loss surpluses based on the volume of transactions it conducts in the day-ahead market should not significantly alter this calculus, given that transmission line losses are just one component of the LMP.

335 *Black Oak Energy, LLC et al. v. PJM Interconnection, L.L.C.*, 128 FERC ¶ 61,262 (2009).

336 *Id.* PP 23-26 (2009).

337 *Id.* P 29 (2009).

The Financial Marketers requested rehearing of the September 2009 Order, and in so doing pledged once again that virtual traders would not do volume trading aimed at collecting MLSA, and repeated their assertion that there was "no merit" to the notion that they would do so.[338] The Financial Marketers also filed a new Complaint about MLSA payments in February 2010 in which they again promised that virtual traders would not do volume trading to collect MLSA.[339]

The Commission denied the Financial Marketers' October 2009 Rehearing Petition in April 2010, [340] and their February 2010 Complaint the next month.[341] In June 2010, the same month in which Chen began the trading that is the subject of this Report, the Financial Marketers requested rehearing of the Commission's denial of the February 2010 complaint and, in so doing, for the sixth time assured the Commission that virtual traders would not do volume trading to collect MLSA.[342] In a brief filed with the

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338 Black Oak Energy, LLC, Epic Merchant Energy, LP, Sesco Enterprises LLC, Energy Endeavors LP, and Solios Power, LLC's Request for Rehearing, *Black Oak Energy, LLC, et al. v. PJM Interconnection, L.L.C.*, Docket No. EL08-14-002, at 17 n.4 (filed Oct. 19, 2009) ("There is no merit to the claim that updating the allocation percentage will give Market Participants perverse incentives to engage in virtual transactions in order to capture a larger share of the surplus. As always, Market Participants will conduct virtual transactions when they think they can profit from the difference between the day-ahead LMP and the real-time LMP they expect.").

339 Financial Marketers' Complaint, *Black Oak Energy, LLC, et al. v. PJM Interconnection, L.L.C.*, Docket Nos. Docket Nos. EL08-14-003, EL08-14-004, EL08-14-005, at p.15, n.20 (filed Feb. 2, 2010) (February 2010 Complaint) ("There is no merit to the claim that updating the allocation percentage will give Market Participants perverse incentives to engage in virtual transactions in order to capture a larger share of the surplus. As always, Market Participants will conduct virtual transactions when they think they can profit from the difference between the day-ahead LMP and the real-time LMP they expect.").

340 *Black Oak Energy LLC et al. v. PJM Interconnection, L.L.C.*, 131 FERC ¶ 61,024 (2010).

341 *EPIC Merchant Energy NJ/PA, L.P. et al. v. PJM Interconnection, L.L.C.*, 131 FERC ¶ 61,130 (2010).

342 Epic Merchant Energy NJ/PA, LP, Sesco Enterprises, LLC, Coaltrain Energy LP, and Black Oak Energy, LLC Request For Rehearing, *Epic Merchant Energy NJ/PA, L.P., et al. v. PJM Interconnection, Inc.*, Docket No. EL10-40-001, at 20, n.23 (filed June 9, 2010) ("There is no merit to the claim that updating the allocation percentage will give Market Participants perverse incentives to engage in virtual transactions in order to capture a larger share of the surplus. As always, Market Participants will conduct virtual

Commission in September 2010 (after the trading at issue here), the Financial Marketers characterized trading such as Chen's as "improperly profit[ing] on the transmission reservation component of an Up-To Congestion transaction."[343]

In the *Black Oak* proceeding, the Commission made clear that its "determination here is based *solely on the record in this case* and the justification PJM has given for its allocation method."[344] As a result of the *Black Oak* proceeding, PJM proposed, and the Commission approved, a mechanism for distributing MLSA on the basis of, among other things, the volume of virtual trades – including UTC trades – that cleared and were associated with paid-for transmission reservations. Throughout the proceeding, the Commission repeatedly criticized volume-based virtual trading, i.e., trading increased volumes of virtuals in order to profit from greater MLSA distributions rather than from the "trading acumen" essential to profitable arbitrage. And throughout the proceeding, the Commission was repeatedly assured by the Financial Marketers that traders would only engage in virtual trades for price arbitrage and not for volume-based MLSA collection schemes. Although the Commission did not have occasion to address this issue again when it adopted the specific MLSA distribution procedure at issue here, its concern about volume trading necessarily applies equally to the subset of virtual trades that later became eligible for MLSA, namely UTC trades with paid transmission.

b. Fair Notice: *"Most UTC participants . . . perceived this as rank manipulation of the intended market function . . ."*[345]

As just discussed, Respondents claim that the Commission knowingly created incentives that formed the basis of their trading, and that they reasonably believed that their trading would be unobjectionable because the Commission intended to create these incentives. But the evidence demonstrates that Respondents knew that their trading subverted and undermined the Commission's purposes and that as soon as PJM or the Commission discovered their UTC trading strategy, they would immediately move to fix it and possibly require Respondents to pay back the revenues they received as a result of their strategy. Moreover, a minimum of due diligence would have disclosed that the Commission not only disapproved of this trading strategy in its particulars, but had previously disapproved of similar strategies in the past.

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transactions when they think they can profit from the difference between the day-ahead LMP and the real-time LMP they expect.").

[343] Mot. for Leave to Answ. and Answ. of Financial Marketers, *PJM Interconnection, L.L.C.*, Docket No. ER10-2280-000, at 3 (filed Sep. 14, 2010).

[344] *Black Oak Energy, LLC, et al. v. PJM Interconnection, L.L.C.*, 131 FERC ¶ 61,024, at P 41 (2010). (emphasis supplied).

[345] Email from Bob Steele to Kevin Gates (Aug. 20, 2010, 09:25 AM) (POW00001866).

Respondents contend that "[n]o express tariff provision, PJM pronouncement, or Commission order ever alerted Dr. Chen that it was unlawful to trade with the intent of profiting from transmission loss credits."[346] Consequently, Respondents argue that they lacked fair notice that the Commission would regard the scheme as manipulative and that enforcement action would therefore violate the Due Process clause of the United States Constitution.[347]

The fair notice doctrine generally prohibits the government from imposing civil penalties or sanctions without first providing fair notice to the regulatory public of what conduct is proscribed.[348] The Commission has previously explained that, with respect to fair notice, "regulations will be found to satisfy due process as long as they are 'sufficiently specific that a reasonably prudent person, familiar with the conditions the regulations are meant to address and the objectives the regulations are meant to achieve, has fair warning of what the regulations require.'"[349] As discussed in greater detail above,[350] a reasonably prudent person, familiar with the conditions the Commission's Anti-Manipulation Rule was meant to address and the objectives it is meant to achieve, received "fair warning of what the regulations require" in light of the Commission's long history of viewing similar trading schemes and practices as manipulative. In fact, the behavior of market participants demonstrates this: market participants like Bob Steele and others refrained from attempting such schemes, and denounced them when they came to light. "Most UTC participants . . . perceived this as rank manipulation of the intended

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[346] Chen Submission at 6; Powhatan Submission at 27.

[347] *See* Chen Submission at 6-7; Powhatan Submission at 27; Chen 1b.19 Response at 1-6.

[348] *See generally* Albert C. Lin, *Refining Fair Notice Doctrine: What Notice Is Required of Civil Regulations?*, 55 BAYLOR L. REV. 991 (2003). It is unclear whether the fair notice doctrine, in the regulatory context, derives from the Constitution or from the Administrative Procedures Act. *Id*. at 998-1001.

[349] *Moussa I. Korouma, d/b/a Quntum Energy LLC*, 135 FERC ¶ 61,245, at P 34 (2011), quoting *Freeman United Coal Mining Co. v. Fed. Mine Safety & Health Review Comm'n*, 108 F.3d 358, 362 (D.C. Cir. 1997); *see also*, *Rock of Ages Corp. v. Sec'y of Labor*, 170 F.3d 148, 156 (2d Cir. 1999), *citing Walker Stone Co. v. Sec'y of Labor*, 156 F.3d 1076, 1083-84 (10th Cir. 1998) and *Stillwater Mining Co. v. Fed. Mine Safety & Health Review Comm'n*, 142 F.3d 1179, 1182 (9th Cir. 1998).

[350] *See* Section IV.B.2. (discussing similarities between Respondents' A-to-B/B-to-A credit collection strategy and Enron's A-to-B/B-to-A "Death Star" credit collection strategy) and Section IV.B.3. (explaining that Respondents' round trip UTC trades were – and were intended to be – functionally equivalent to wash trades, which the Commission has explicitly prohibited for years).

market function and had enough sense not to participate in this activity."[351] Of approximately 110 market participants involved in trading UTC in PJM during this period, only nine were investigated; three of these investigations were closed with no further action. Chen traded for three of the remaining six.

Respondents alternatively claim that they reasonably believed that the Commission actually granted its imprimatur to practices such as Respondents' scheme when it approved the PJM tariff change that rendered non-physical traders such as Respondents eligible for MLSA.[352] In essence, the argument contends that the Commission knew that there was a risk that traders would behave the way in which Chen did behave, and because the Commission approved the tariff change anyway, it follows that "the Commission arguably encouraged traders to do the very thing that Dr. Chen did."[353] That is not the case, as demonstrated by the fact that PJM, its IMM, and the Commission all acted immediately once they became aware of the conduct, and by the fact that Respondents expected this result.[354]

As discussed in detail above, PJM's mechanism for distributing MLSA was litigated in the *Black Oak* proceeding.[355] In that proceeding, the Commission provided PJM with broad guidelines and repeatedly and clearly emphasized both the goals to be achieved and the pitfalls to be avoided. The Commission repeatedly voiced its disapproval of precisely the sort of volume-based trading intended to capture MLSA that Respondents deployed, and insisted instead that profits from arbitrage must be based on "trading acumen in being able to spot price divergences between markets" rather than

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[351] Email from Bob Steele to Kevin Gates (Aug. 20, 2010, 9:25 AM) (POW00001866) *see also*, Testimony of Robert Steele (Apr. 7, 2011) Tr. 145:23-25 ("In my opinion, it was well outside the bounds of what was intended by PJM. I didn't care for it; I wouldn't engage in it; and we didn't").

[352] *See* Powhatan Supplemental Submission; Chen Response at 2-3; Powhatan Submission at 28.

[353] Powhatan Supplemental Response at 3.

[354] *See, e.g.*, Chao Chen Test. Tr. 96:24 – 97:3 ("Q: But you are concerned that it is a loophole and it is a poorly designed market and once PJM got up to speed on it, it would close that loophole and potentially retroactively claw back the credits? A: Yeah"), 100:3-5 ("we thought UTC was an opportunity that may go away soon because it is such a nice opportunity"); Email from Kevin Gates to Chao Chen et al. (Jun. 25, 2010, 09:09:23 PM) (POW00002438) ("I agree that UTC is a loophole that probably a dummy can exploit"); Email from Kevin Gates to Kevin Byrnes (Jul. 26, 2010, 05:01:02 PM) ("please keep it strictly confidential when talking with others that we're engaging the 'UTC' trade. Really just knowing about this inefficiency is our only edge.").

[355] *See* Section II.D.

from "the volume of their trades."[356] The Commission also emphasized that PJM's chosen distribution mechanism was only one of a variety of possibly just and reasonable approaches to addressing the marginal loss surplus.[357] Moreover, the administrative record contained no fewer than six assurances from the Financial Marketers coalition that virtual traders would "never" engage in volume-based trading to capture MLSA but would instead engage exclusively in legitimate Day-Ahead/Real-Time arbitrage based on trading acumen.[358] No party contradicted these assertions in any filing with the Commission, nor did any party defend volume-based MLSA capture strategies as legitimate. Throughout the proceeding, the Commission never wavered from the core principles it had announced, and Respondents cannot substantiate their suggestion that it did.

In hindsight, it is clear that the method PJM ultimately proposed did not mechanically eliminate the ability of unscrupulous financial traders to profitably target MLSA distributions with volume-based trading while insulating themselves from the price divergences between markets that are essential to bona fide arbitrage. Contrary to Respondents' suggestion, this is not because the Commission reversed its views. On the contrary, it is because the record provided the Commission with false comfort that such concerns were no longer germane.

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[356] *Black Oak Energy, LLC, et al. v. PJM Interconnection, L.L.C.*, 122 FERC ¶ 61,208, at P 51 (2008) *and see* October 2008 Order at P 38, n.46 (expressing concern that, under the wrong structure, financial traders might "conduct trades simply to receive a larger credit"). PJM's view was quite similar:

> Financial Marketers only incentive to participate in PJM markets is to make money based on their analysis of whether there may be differences in the prices, however derived, in the Day-Ahead and Real-Time markets. *If there is no difference*, or adverse differences, *expected between the day-ahead and real-time price for a particular trade, then participants on a purely financial basis should not make that trade*.

Mot. for Leave to Answ. and Answ. of PJM, *Black Oak Energy, LLC, et al. v. PJM Interconnection, L.L.C.*, EL08-14-000 (filed Mar. 4, 2008) (emphasis supplied).

[357] *See, e.g.*, *Black Oak Energy, LLC et al. v. PJM Interconnection, L.L.C.*, 125 FERC ¶ 61,042, at P 49 (2008).

[358] The Commission was clear that it was basing its approval of PJM's proposal "solely on the record" before it. *Black Oak Energy, LLC, et al. v. PJM Interconnection, L.L.C.*, 131 FERC ¶ 61,024, at P 41 (2010).

It is unpersuasive to claim, as Respondents do,[359] that the Commission indicated its approval of schemes like Chen's simply because the Commission understood that a flawed MLSA distribution mechanism might incentivize traders to implement such schemes. Within the broad guidelines established by the Commission, PJM worked assiduously if unsuccessfully to craft an MLSA distribution mechanism that would prevent a scheme like Chen's from ever getting off the ground. The scheme that Respondents developed was not apparent to anyone when the Commission approved PJM's tariff change. Even an experienced UTC trader like Chen took several months of detailed analysis and experimentation to figure out how to exploit the MLSA distribution mechanism. And when PJM discovered the abuse and reported it to the Commission, it immediately took action to stop it.

As discussed in greater detail above, the scope of the Commission's anti-manipulation authority is not limited to those activities that are mechanically or otherwise proscribed by the express terms of a tariff. "An entity need not violate a tariff, rule, or regulation to commit fraud. Nor does a finding of fraud require advance notice specifically prohibiting the conduct concerned."[360] Failing to eliminate all opportunities to manipulate, or failing to mechanically prevent all manipulative trading schemes, does not mean that traders have *carte blanche* to devise and execute manipulative schemes not explicitly addressed by the existing tariff provisions.[361]

Finally, Respondents' arguments are contradicted by the facts unearthed in the investigation. The record is replete with evidence demonstrating that Respondents knew that they were exploiting a distribution mechanism "that nature shouldn't allow," and that they feared that when their scheme was discovered, they would be forced to disgorge the revenues they received from it.[362] The record also demonstrates that they deliberately

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[359] *See* Powhatan Supplemental Submission; Chen Response at 2-3; Powhatan Submission at 28.

[360] *Richard Silkman*, 144 FERC ¶ 61,164, at P 50 (2013) (citations omitted).

[361] *Richard Silkman*, 144 FERC ¶ 61,164, at P 48 (2013) ("even assuming, *arguendo*, that certain features of DALRP . . . left the DALRP vulnerable to certain manipulation, that does not excuse the manipulation itself.") *and see*, *In re Make Whole Bidding Payments and Related Strategies*, 144 FERC ¶ 61,068 (2013) (imposing civil penalties by settlement for conduct not specifically proscribed or mechanically prevented by tariff).

[362] *See* Email from Kevin Gates to Kevin Byrnes (Jul. 26, 2010, 05:01:02 PM) ("please keep it strictly confidential when talking with others that we're engaging the 'UTC' trade. Really just knowing about this inefficiency is our only edge."); Email from Kevin Gates to Larry Eiben, et al. (Aug. 19, 2010, 06:41:54 PM) (POW00006665) (describing Chen's trading as exploiting a loophole); Email from Kevin Gates to Alan Chen (Mar. 5, 2010 at 03:59:47 PM) (POW00016981) (recognizing that they could be forced to pay back their MLSA revenues).

chose not to consult with PJM or Commission staff.[363] This reflects a failure of due diligence, not a failure of due process.

c. SEC Precedent

Respondents argue that their scheme is legal because, they claim, it would not have been unlawful under the securities laws.[364] This is incorrect. UTCs do not exist in the securities markets, nor do Respondents identify any products in those markets that are equivalent in relevant respects. Unable to identify any equivalent product in securities markets, Respondents also cannot point to any SEC precedent approving conduct that is similar to their own. And even if there were such an SEC precedent, it would not necessarily be controlling here.

Although the anti-manipulation provision of EPAct 2005 points to section 10(b) of the Securities Exchange Act in certain respects, securities law precedent cannot be incorporated wholesale or without regard to FERC precedent and the important differences between the securities markets and the markets regulated by this Commission; instead securities precedent must often be adapted to apply to the energy markets.[365] The Commission has long recognized this. As stated in Order No. 670, consistent with the statute's reference to section 10(b) of the Securities Exchange Act, the Commission will "adapt analogous securities precedent as appropriate to specific facts, circumstances, and situations that arise in the energy industry."[366] Thus, in the *Barclays* order, the Commission noted that it "need not automatically apply" such precedent "completely or in part, but rather must look to our industry to determine what is

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[363] Email from Kevin Gates to Alan Chen (Mar. 5, 2010 at 3:59:47 PM) (POW00016981) ("why not contact a law firm, the FERC or PJM to try to get more insight into this issue") *and see*, n.116, *supra*.

[364] *See* Powhatan Submission, Wallace Aff.; Powhatan 1b.19 Response, Larry Harris Statement, Jeffrey H. Harris Report, Hendershott Statement, Aff. of Stewart Mayhew, Report of Chester S. Spatt (Spatt Report).

[365] The wholesale energy markets are substantially different from the securities markets. The primary duty of the SEC – to ensure full and accurate public disclosure of company information so that all market participants trade as equals – is far different from the Commission's statutory responsibility to ensure that rates for electric energy are just and reasonable. Moreover, the types of manipulative schemes seen in the securities markets are sometimes very different than those seen in the power markets. Insider trading is an important issue in securities markets, for example, but is rarely if ever a significant issue in energy markets. Conversely, the complex tariff provisions that govern trading in organized energy markets such as PJM do not appear to have any direct analog in securities markets.

[366] Order No. 670, FERC Stats. & Regs. ¶ 31,202 at P 30.

appropriate."[367] There the Commission explained the role of SEC precedent in analyzing alleged violations of the Anti-Manipulation Rule:

> In Order No. 670 we recognized that we would not be rote in our application of securities law to the energy markets and would apply such precedent on a case-by-case basis as "appropriate under the specific facts, circumstances, and situations in the energy industry." . . . . The energy industry is not in all ways equivalent to the securities industry. Moreover . . . our statutory mandate, unlike that of the SEC, is to ensure that rates for jurisdictional transactions are just and reasonable.[368]

Order No. 670 noted that principles already applied by the SEC would "provide useful guidance as the Commission develops its own body of precedent to follow."[369] But the Commission has developed its own body of precedent over the past several years, and it is necessary to look at that precedent first. Of course, securities precedent continues to be instructive on a case-by-case basis to the extent the salient features of that precedent are truly analogous.[370]

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[367] *Barclays*, 144 FERC ¶ 61,041at P 58.

[368] *Id.* (citations omitted). *See also*, *BP America Inc., et al*., 147 FERC ¶ 61,130, at P 37 (2014) (noting that the Commission is not "limited to pursuing only claims based on legal theories explicitly 'adopted' by the Securities and Exchange Commission, or on fact patterns already round in pre-existing securities precedent to violate Rule 10b-5 or the Securities Exchange Act of 1934 . . . . The Commission's enforcement mandate also extends to novel schemes and manipulative devices that effect prices in, or otherwise interfere with, well-functioning markets, and not just the tried-and-true schemes and devices that have already been the subject of securities fraud actions.")

[369] Order No. 670, FERC Stats. & Regs. ¶ 31,202 at P 28 *and see* P 31 (same).

[370] Respondents' other arguments about practices in SEC-regulated markets are unpersuasive because they fail to establish that the pertinent features of those practices are analogous to their own conduct. They contend, for example, that based on a "Concept Release" issued by the SEC in 2010, the Commission is bound to approve their round trip trades, in which they diverted to themselves millions of dollars that would otherwise have gone to other PJM market participants. *See* Powhatan Submission at 6-7, *citing Concept Release on Equity Mkt. Structure*, 75 Fed. Reg. 3594 (Jan. 21, 2010). But even in the completely different factual context discussed in that Release, the SEC did not endorse any specific high frequency trading practices, much less any that are analogous to Respondents' round trip trades. In fact, the *Concept Release* is simply a request for comments about an array of practices, not a determination that any of them are lawful. In any event, this Commission's statutory obligation to prevent manipulation of the wholesale energy markets is not constrained by the views of a different agency

One analogous SEC precedent is *In re Amanat*,[371] which the Commission has cited in prior orders.[372] In *Amanat*, the SEC, affirmed by the Third Circuit, determined that it is manipulative under Rule 10b-5 to execute sham trades designed to avoid the effects of price changes due to market forces. *Amanat* involved a trader seeking to capitalize on a program in which a market data firm paid NASDAQ and its market participants who engaged in high-volume trading. In order to ensure he satisfied the minimum volume of trading required to be paid by the market data firm, Amanat conducted thousands of sham trades within a few days employing a computer program that automatically bought and sold the same securities within a very short time period. These trades netted to zero sales and acquisitions, but NASDAQ paid Amanat based on the trade volume. The SEC held that Amanat had committed fraud within the meaning of Rule 10b-5 through this conduct.[373]

Similar in relevant ways to *Amanat*, Chen designed his sham UTC transactions to create the false appearance of bona fide trades but in fact were designed to neutralize his exposure to market prices and profit simply from ramped-up trading volume. In *Amanat*, the trader received a monetary payment for his inauthentic trades that lacked independent value. The SEC found deceptive conduct based on an implicit representation that the transactions were bona fide.[374]

Like the trader in *Amanat*, Chen paired his round trip UTC transactions in order to "wash" returns or losses due to changes in the price spread of each UTC transaction in the pair. By making the trades, Chen implicitly signaled to the market that he did so for the sake of its potential profit from market price movements, but his real purpose was the opposite: to insulate his trades from the effects of price changes. And, as in *Amanat*, Chen had an ulterior purpose for his manipulative trades: just as the trader in *Amanat*

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charged with enforcing a different set of laws and regulations in a fundamentally different factual context.

[371] *In re Amanat*, 89 S.E.C. Docket 672, Admin. Proc. File No. 3-11813, 2006 WL 3199181, at *1-7 (SEC Nov. 3, 2006), *aff'd mem. sub nom. Amanat v. SEC*, 269 Fed. App'x 217 (3d Cir. 2008) (footnotes omitted).

[372] *See In re PJM Up-To Congestion Transactions*, 142 FERC ¶ 61,088, at n.1 (2013); *see also In re Make Whole Payments and Related Bidding Strategies*, 144 FERC ¶ 61,068, at P 84 (2013).

[373] *Amanat,* 2006 WL 3199181, at *7-10.

[374] *Amanat,* 2006 WL 3199181, at *7. *See also Stoneridge Investment Partners v. Scientific-Atlanta, Inc*., 552 U.S. 148, 158 (2008) ("If [the appellate court's] conclusion were read to suggest there must be a specific oral or written statement before there could be liability under § 10(b) or Rule 10b-5, it would be erroneous. Conduct itself can be deceptive, as respondents concede.").

increased his trade volume in order to reap payments from the exchange, Chen traded large volumes of deceptive UTC transactions to reap large MLSA payments.

Respondents' attempts to distinguish *Amanat* or diminish its relevance are not persuasive.[375] They contend that Amanat's trades were more deceptive than Chen's,[376] and that the "rebates" for the purpose of which Amanat executed his trades were more remote from and extrinsic to the trades than Chen's.[377] Neither proffered distinction is persuasive. They also contend that the Commission's approval of PJM's proposal to distribute MLSA to UTC transactions associated with paid-for transmission implied to Respondents that such trades were perfectly permissible. For the reasons discussed at length above, that argument also has no merit.[378]

In sum, Respondents have failed to identify any SEC precedent in which transactions similar in relevant respects to Respondents' round trip UTC trades were blessed by the SEC. As discussed above, however, there is Commission precedent in which transactions similar to Respondents' round trip trades were executed in a similar manner, in a similar context, for similar purposes, and were explicitly condemned by this Commission.

5. Conclusion: Respondents' Round-Trip UTC Trades Were a Manipulative Scheme.

Respondents' round-trip UTC strategy was a manipulative scheme. It bears all the indicia of a manipulative scheme: The trades were uneconomic on their own merits; they were insulated from and undisciplined by market forces; and they differed sharply from Chen's non-manipulative UTC trades. They were intended to deceive – and did deceive – PJM. Like Enron's "Death Star" and other notorious trading strategies, the trades captured millions of dollars through that deception. Finally, the round-trip UTC trades were functionally equivalent to wash trades – they are simply a variation of that practice employing a novel product – and the Commission long ago identified wash trading as a prohibited manipulative strategy.

Respondents' defenses are implausible and unpersuasive. Their proffered "home run" strategy cannot be squared with the facts, nor can their suggestion that the Commission approved of the round-trip UTC strategy be squared with what actually happened in the *Black Oak* proceeding. Finally, the Commission's disapproval of

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[375] *See, e.g.*, Powhatan Submission at 22-26; Chen Response to Preliminary Findings at 6-7.

[376] Chen Response to Preliminary Findings at 7; Jeffrey H. Harris Report at 5-6; Mayhew Aff. ¶¶ 102-119.

[377] Chen Response to Preliminary Findings at 7; Powhatan Submission at 24.

[378] *See* Sections IV.B.4.a. and IV.B.4.b.

schemes like the round-trip UTC strategy is so well-established by precedent that there is little question that – had they done the legal digging that Gates urged and then abandoned – they would have learned what other market participants seemed overwhelmingly to know, namely, that this conduct was prohibited.

C. Scienter: "these rebates are encouraging the wrong behavior"[379]

Scienter is an element of manipulation. The Commission recently explained that, "[f]or purposes of establishing a violation, scienter requires knowing, intentional, or reckless misconduct, as opposed to mere negligence."[380] The scienter element is satisfied here, because, as the evidence demonstrates, Chen (and hence HEEP and CU Fund) knew that the scheme manipulated PJM's rules; intentionally implemented the scheme for the pecuniary benefit of himself and the other Respondents; knew that there was a substantial risk that all of the scheme's profits would be clawed back when it was discovered; and he communicated the essential details of his scheme to Gates. Gates and Powhatan understood the essential details of the scheme; endorsed and approved it; understood (but chose not to look into) the legal risks associated with it; reaped millions of dollars in unjust profits from it; and expected those outsized profits would come to an end as soon as their scheme was discovered. The scienter element, therefore, is satisfied.[381]

Respondents argue that they did not have scienter because "to have specific intent to manipulate the market, the participant must design his actions to deceive or defraud the market."[382] Respondents contend that Chen "accurately entered the information necessary to effect the transactions, which were carried out openly: he did not attempt to hide, conceal or misrepresent anything to anyone."[383] According to this argument, Chen's trades represented a rational response to price signals, and thus Respondents "had no way of knowing that responding to the incentives created by the TLCs could be considered prohibited conduct."[384] Respondents thus conclude, "[t]hat is the beginning and the end of the scienter analysis: because Powhatan and Dr. Chen had a legitimate

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379 K. Gates Test. Vol. II Tr. 215:17-25.

380 *Barclays*, 144 FERC ¶ 61,041 at P 62.

381 *See, SEC v. U.S. Environmental, Inc.*, 155 F.3d 107, 111 (2d Cir. 1998) (noting that, in the SEC context, "[i]t is well-settled that knowledge of the proscribed activity is sufficient scienter under § 10(b).") (citations omitted).

382 Chen Submission at 24, citing *Blumenthal v. ISO New England*, 132 FERC ¶ 63,017, at P 108 (2010); Powhatan Submission at 7-8, quoting *Ernst & Ernst v. Hochfelder*, 425 U.S. 185, 193 n.12 (1976).

383 Powhatan Submission at 13.

384 Powhatan Supplemental Response at 7-8.

economic purpose for their [t]rades, there is no way that the Commission could ever meet its burden of proving scienter."[385] Respondents are wrong.

Before they implemented their manipulative strategy, Chen and Gates knew that the purpose of UTC trading was to arbitrage price differentials. They also knew that targeting MLSA was legally risky.[386] They expected that as soon as it was discovered, they would likely have to repay their ill-gotten gains.[387] They knew that they should "contact a law firm, the FERC, or PJM to try to get more insight into this issue."[388] Yet they decided not to do so – presumably for fear that they would learn something that might prevent them from making "ridiculous money"[389] and "becom[ing] rich" from the round trip trading.[390] Chen developed his UTC wash trading strategy for the purpose of eliminating real price risk from his UTC transactions to reliably collect MLSA in large volumes.[391] Early in the relationship, Gates made clear that "we could definitely never really ramp up . . . without knowing the strategy intimately."[392] They did ramp up.[393]

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[385] Powhatan Submission at 9.

[386] *See, e.g.*, Email from Kevin Gates to Alan Chen (Mar. 5, 2010 at 3:59:47 PM) (POW00016981) ("why not contact a law firm, the FERC or PJM to try to get more insight into this issue"); Email from Kevin Gates to Richard Gates, et al. (Mar. 5, 2010, 5:34:51 PM) (POW00007936) (proposing to have "an attorney, or someone, really dig into the TLCs on the UTC trade"), *and see Indianapolis Power & Light Co., Op. No. 328*, 48 FERC ¶ 61,040, *reh'g granted on other grounds*, 48 FERC ¶ 61,328 (1989). In *Indianapolis Power & Light*, IP&L relied upon its own interpretation of the Commission's accounting rules with which the Commission ultimately disagreed. The Commission noted that IP&L could have sought clarification and, in declining to do so, "accept[ed] the risk" of subsequent Commission disapproval and therefore "cannot . . . escape the consequences of its decision." *Id*. at 61,202.

[387] *See, e.g.*, Email from Alan Chen to Kevin Gates (Mar. 5, 2010, 11:28 AM) (POW00016981) (noting they could be "in big trouble").

[388] Email from Kevin Gates to Alan Chen (Mar. 5, 03:59:47 PM) (POW00016981) *see also*, Email from Kevin Gates to Richard Gates et al. (Mar. 5, 2010, 05:34:51 PM) (POW00007396).

[389] Email from Kevin Gates to Alan Chen (Jun. 9, 2009, 03:08:10 PM) (POW00017242).

[390] Email from Kevin Gates to Richard Gates, et al. (Feb. 26, 2010, 08:20:52 AM) (POW00007907).

[391] Chen Test. Vol. I Tr. 40:17-18 (purpose to eliminate spread risk).

[392] Email from Kevin Gates to Alan Chen (Jun. 9, 2009, 04:08:10 PM) (POW00017242). The email references a possible trading multiplier of 30:1 as the ultimate outer bound of potential multipliers. They never reached that, but the 20:1

Gates knew that Chen was attempting to "eliminate" risk from his trades by "going from A to B – B to A."[394] Both understood that the strategy was to "make money by moving electricity around in a circle."[395] Both knew that the trade "was just a loophole that anyone who knows about it can exploit"[396] and that Chen was, in fact, "exploiting" it[397] with Gates' enthusiastic support[398] by engaging in trades they thought probably should not have been allowed[399] and that constituted what they knew was "the wrong behavior."[400]

D. Jurisdiction

Chen's round-trip UTC transactions are within the Commission's FPA jurisdiction for at least two reasons. First, the Commission has well-established authority to regulate non-physical transactions that have the potential to affect the price of physical electricity, such as Chen's UTC trades in PJM.[401] Second, the Commission has jurisdiction over

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multiplier reflected in the Powhatan Advisory Agreement is much closer to 30:1 than it is to the original 4:1 multiplier of the TFS/Huntrise Advisory Agreement.

[393] *See* "Rampin' Up with Alan Chen" (POW00008003).

[394] K. Gates Test. Vol. II Tr. 178:12-15. *See In re San Diego Gas & Elec. Co.*, Comm. Fut. L. Rep. (CCH) ¶ 31,549, 2010 WL 1638992 (CFTC Apr. 22, 2010) (finding the scienter requirement for wash trades to be satisfied where "the customer intended to negate market risk or price competition").

[395] Email from Kevin Gates to Alan Chen (Aug. 12, 2010, 4:18 PM) (POW00004685).

[396] Email from Chao Chen to Richard Gates (Jun. 25, 2010, 20:48:49) (POW00002438); *and see* Email from Kevin Gates to Kevin Byrnes (Jul. 26, 2010, 05:01:02 PM) ("just knowing about this inefficiency is our only edge").

[397] Email from Kevin Gates to Larry Eiben, et al. (Aug. 19, 2010, 06:41:54 PM) (POW00006665).

[398] *See* Email from Kevin Gates to Larry Eiben, Chao Chen et al. (Jun. 25, 2010, 09:09:23 PM) (POW00002438) (stating his intention to "drive a truck thru that loophole").

[399] Chao Chen Test. Tr. 75:5-6.

[400] K. Gates Test. Vol. II Tr. 215:17-25.

[401] *E.g.*, *Black Oak Energy, LLC v. FERC*, 725 F.3d 230, 239 (D.C. Cir. 2013) ("[virtual trades] *contribute to the fluctuation of the market price*, which in turn influences whether load-serving entities (the technical name for market participants who actually traffic in electricity) will purchase electricity at a given time."); *California Independent System Operator Corp.*, 110 FERC ¶ 61,041, at P 31 (2005) ("since

Chen's UTC trades based on his reservation and purchase of transmission on the OASIS system.

In his 1b.19 Response, Chen challenges the Commission's jurisdiction over UTC trading. Chen contends that "[t]he up-to congestion trades at issue here were purely financial transactions, and thus are not jurisdictional sales of physical power."[402] Therefore, Chen, concludes, because the UTC transactions did not result in the physical delivery or transmission of power, they cannot be jurisdictional.[403]

The Commission has explicitly stated that virtual trading of INCs and DECs are "integral" to the sound operation of the wholesale markets.[404] In rejecting a direct challenge to the Commission's jurisdiction over convergence bidding, (the California ISO's term for virtual trading), the Commission explained:

> Section 205 of the Federal Power Act gives the Commission the authority and responsibility to ensure that rates for jurisdictional power sales are just and reasonable. The Commission also has jurisdiction over practices that affect those rates. Since convergence bidding affects the market clearing price for wholesale power by determining, in conjunction with other bids, the unit that sets the market clearing price, the Commission has statutory authority over this type of bidding to ensure that the rates it produces are just and reasonable.[405]

Even if UTCs were not themselves jurisdictional (which they are, as discussed above), the Commission would have jurisdiction over them, because they are "in connection with" jurisdictional transactions within the meaning of Section 222 of the FPA.[406] In that vein, the Commission has explained that its anti-manipulation authority reaches even non-jurisdictional transactions:

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convergence [i.e., virtual] bidding affects the market clearing price for wholesale power by determining, in conjunction with other bids, the unit that sets the market clearing price, the Commission has statutory authority over this type of bidding to ensure that the rates it produces are just and reasonable").

[402] Chen 1b.19 Response at 17.

[403] *Id*. at 17-18.

[404] *California Independent System Operator Corp*., 108 FERC ¶ 61,254, at P 74 (2004).

[405] *California Independent System Operator Corp*., 110 FERC ¶ 61,041, at P 31 (2005) (footnote omitted).

[406] *See* 16 U.S.C. § 824v(a) ("It shall be unlawful for any entity . . . directly or indirectly, to use or employ, *in connection with* the purchase or sale of electric energy or the purchase or sale of transmission services subject to the jurisdiction of the

> [A]ny entity engaging in a non-jurisdictional transaction through a Commission-regulated RTO/ISO market, that acts with intent or with recklessness to affect the single price auction clearing price (which sets the price of both non-jurisdictional and jurisdictional transactions), would be engaging in fraudulent conduct in connection with a jurisdictional transaction and, therefore, would be in violation of the Final Rule [adopting Part 1c].[407]

Since UTCs are created by a Commission-approved tariff and traded through a Commission-regulated RTO market, and since they affect the price of jurisdictional transactions, the Commission has anti-manipulation authority with respect to the trading of UTCs.

In addition, the transmission reservation component of UTC transactions alone is enough to bring UTCs themselves within the ambit of Commission jurisdiction. The Commission's jurisdiction over transmission is extremely broad.[408] At the time of the transactions at issue in this proceeding, all UTCs were required by the PJM Operating Agreement to be associated with a reservation for transmission service.[409] PJM explained that "this transmission service requirement . . . served as the physical link between the Day-ahead Energy Market and the Real-time Energy Market transactions."[410] This "physical link," had consequences for physical transmission even if the market participant reserving it elected ultimately not to use that transmission reservation to flow electric energy, in that it reduced (albeit temporarily) the amount of transmission capacity available for all transactions, including physical ones. In light of the Commission's expansive jurisdiction over transmission, the impact of Chen's trading on transmission brings UTCs within that jurisdiction.

In sum, the UTC trading at issue in this case is jurisdictional: it involved the reservation of jurisdictional transmission services; it was integral to the settlement of PJM's jurisdictional Day-Ahead market and hence to the pricing and dispatch of physical energy; the Commission's exercise of jurisdictional authority to regulate such trading has

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Commission, any manipulative or deceptive device or contrivance . . .") (emphasis supplied).

[407] Order No. 670, FERC Stats. & Regs. ¶ 31,202 at P 22.

[408] *See New York v. FERC*, 535 U.S. 1 (2002) (FERC has jurisdiction over the entire transmission grid, not merely transmissions at wholesale in interstate commerce.)

[409] PJM Operating Agreement Schedule 1, Section 1.10.1(b), Fourth Revised Sheet No. 335 (superseded, Sept. 17, 2010).

[410] Submission of Proposed Revisions to PJM Operating Agreement and Attachment K – Appendix to PJM OATT, *PJM Interconnection, L.L.C.*, Docket No. ER10-2280-000, at 8 (filed Aug. 18, 2010) (PJM Proposed Revisions).

long been established; and the trading involved the reservation of transmission, over which the Commission has broad authority, and which provided the "physical link" between the Day-Ahead and Real-Time markets.

V. Liability

The Commission has two means of imposing monetary remedies in response to a violation of the Anti-Manipulation Rule. The Commission can – and generally does – order disgorgement of unjust profits pursuant to its plenary authority in Section 309 of the FPA, and it can order the imposition of civil penalties pursuant to its civil penalty authority in Section 316A of the FPA. Both approaches are appropriate here, as Respondents were unjustly enriched by their scheme and because "civil penalties are an important tool to achieve compliance."[411]

The penalties recommended below are well within the Commission's statutory authority to impose penalties of up to $1,000,000 per day per violation.[412] The Commission's longstanding practice in assessing penalties is to focus on the two statutorily-mandated factors: (1) efforts to remedy the violation and (2) seriousness of the violation.[413] The first factor is easily addressed: Respondents made no effort whatsoever to remedy the violation and indeed persisted in their conduct until PJM and its Market Monitor moved to stop it.[414] As for the second factor, the violations were

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[411] *Enforcement of Statutes, Orders, Rules, and Regulations*, 132 FERC ¶ 61,216, at P 112 (2010) (Revised Policy Statement on Penalty Guidelines) *and see id.* P 216 ("The Commission has always required disgorgement in addition to the assessment of civil penalties.")

[412] FPA Section 316A, 16 U.S.C. § 825*o*-1(b). Courts will uphold even "severe" sanctions within statutory limits. *See Sundheimer v. CFTC*, 688 F.2d 150, 153 (2d Cir. 1982). Given that HEEP and Powhatan executed manipulative round trip UTC trades on 64 days and CU Fund on 16, at $1 million per day of violations (to say nothing of the number of specific violations on those days), the statutory limits for civil penalties are vastly greater than those proposed here.

[413] Revised Policy Statement on Penalty Guidelines, 132 FERC ¶ 61,216, at P 16 (2010); *Enforcement of Statutes, Regulations, and Orders*, 123 FERC ¶61,156, at P 51 (2008) (Revised Policy Statement on Enforcement).

[414] In fact, the evidence indicates that Gates wished to continue the conduct even after he learned it had brought them under scrutiny. *See* Email from Kevin Gates to Richard Gates, et al. (Aug. 2, 2010, 01:12:36 PM) (POW00004041), and Email from Kevin Gates to Alan Chen (Aug. 12, 2010, 4:18 PM) (POW00004685).

extremely serious.[415] Respondents not only siphoned millions of dollars out of the PJM market, where the money would have been allocated to bona fide transactions, but also created risks to the integrity of the Day-Ahead market because the scheme had the potential both to affect Day-Ahead prices and dispatch and to crowd out the efforts of other market participants to schedule transmission for their legitimate transactions.

One measure of the seriousness of Respondents' scheme was the fact that their manipulative trades constituted a disproportionate share of volume in the nation's largest RTO. Respondents' scheme to intentionally defraud the PJM market persisted for months, involved the reservation of more than 16.5 *million* MWh of transmission, and resulted in the misallocation of over $10 million of MLSA. As detailed above, Respondents' scheme was manipulative and deceitful. They perpetrated a fraud on the nation's largest organized wholesale energy market in violation of section 1c.2 of the Commission's regulations. Respondents' scheme was designed to deceive PJM, it was willful, it was executed with the full knowledge and support of both Chen and Gates, and it was not inadvertent or merely erroneous. Far from being isolated occurrences, Respondents' violations were central to their business plan, and resulted from deliberate, systematic, and persistent wrongdoing.

Mitigating factors are minimal. Although Respondents have cooperated adequately with the investigation, they have not accepted responsibility for their actions, did not self-report the violations, were not relying on advice from PJM or Commission staff, and had no compliance program in place at the time of the violations. In fact, as discussed above, despite knowing that their scheme was highly questionable, Respondents declined to seek counsel that would have informed them conclusively that their scheme was improper and illegal.

In sum, Enforcement staff believes that Respondents' conduct warrants the imposition of significant financial penalties to create appropriate deterrence for other market participants who might otherwise consider embarking on similarly manipulative gaming of RTO markets.

A. Chen and the Chen Entities

1. Disgorgement.

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[415] *See* Section IV.B.2-3 (noting the role similar manipulative activities played in exacerbating the market dysfunctions precipitating the Western Energy Crisis) *see also*, *In re San Diego Gas & Elec. Co.*, Comm. Fut. L. Rep. (CCH) ¶ 31,549, 2010 WL 1638992 (CFTC Apr. 22, 2010) ("[w]ash sales are 'grave' violations, even in the absence of customer harm or appreciable market effect") (*citing In re Piasio*, Comm. Fut. L. Rep. (CCH) ¶ 28,276 at 50,691 (CFTC Sep. 29, 2000), *aff'd sub nom. Wilson v. CFTC*, 322 F.3d 555, 559 (8th Cir. 2003).

Where an entity has committed a violation resulting in pecuniary gain, the Commission directs disgorgement of the full amount of the gain plus interest.[416] Through Chen's manipulative UTC wash trading scheme, CU Fund and HEEP Fund received approximately $1,784,145 and $398,770 respectively, in MLSA. Netting out the transaction costs of these fraudulent trades, CU Fund and HEEP received approximately $1,080,576 and $173,100 in unjust profits, respectively, for wash-type round trip UTC trades between June 1 and August 18, 2010. Staff recommends that these entities be ordered to disgorge those amounts, with interest. Staff believes that it is appropriate to hold Chen, CU Fund, and HEEP Fund jointly and severally liable for disgorgement of unjust profits accruing to HEEP and CU Fund.

2. Civil Penalty.

Section 2B1.1 of the Commission's Penalty Guidelines apply to HEEP and CU Fund. Manipulative trades executed on behalf of HEEP Fund exceeded 100,000 MWh and yielded $173,100 in unjust profits. Manipulative trades executed on behalf of CU Fund exceeded 100,000 MWh and yielded $1,080,576 in unjust profits. Both entities cooperated with the investigation. Applying the Penalty Guidelines, therefore, staff recommends a penalty of $1,920,000 for HEEP Fund and $10,080,000 for CU Fund. In light of the collusion between them, staff believes it is appropriate to hold Powhatan and HEEP jointly and severally liable for the penalties against HEEP.

The Penalty Guidelines do not apply to individuals. Consistent with Commission precedent, staff recommends that the Commission impose a civil penalty of $500,000 on Chen for his acts on behalf of HEEP and Powhatan and another $500,000 for his acts on behalf of CU Fund. Chen knowingly devised and implemented the manipulative scheme designed to deceive PJM into awarding MLSA to the entities on behalf of which Chen traded. The violations were not isolated, but persisted over months and ceased only after PJM's IMM requested that they be discontinued. Chen's actions harmed the integrity of the regulatory process and PJM's market; they were designed to deceive PJM, without regard for the possible deleterious impacts on the market; and they were undertaken deliberately. Chen cooperated with the investigation, but did not self-report his manipulative trading and undertook no efforts to mitigate the harm from his violations. Taken as a whole, therefore, staff believes that the recommended penalty is appropriate.

In his 1b.19 Response, Chen argues that the Commission lacks statutory authority to penalize individuals like him.[417] This is not only incorrect, it amounts to an

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[416] *See* Revised Penalty Guidelines at §1B.1(a); Revised Policy Statement on Enforcement, 123 FERC ¶61,156, at P 43 (2008) ("Requiring disgorgement is consistent with long-standing Commission practice and the practice of other enforcement agencies . . .") (citations omitted).

[417] Chen 1b.19 Response at 18-19.

impermissible collateral attack on prior Commission orders. The Commission has already found that its statutory anti-manipulation authority extends to individuals such as Chen. In Order No. 670, the Commission explained:

> "Any entity" is a deliberately inclusive term. Congress could have used the existing defined terms in the NGA and FPA of "person," "natural gas company," or "electric utility," but instead chose to use a broader term without providing a specific definition. Thus the Commission interprets "any entity" to include any person or form of organization, regardless of its legal status, function, or activities.[418]

The Commission has subsequently affirmed this interpretation, finding that it has jurisdiction to seek civil penalties from individuals. Just last year, the Commission held:

> We find that 18 C.F.R. § 1c.2 reaches Dr. Silkman's conduct in this case and that the Commission has jurisdiction over Dr. Silkman [an individual] for purposes of enforcing 1c.2. Section 1c.2 makes it unlawful for "any entity, directly or indirectly" to engage in fraudulent activities "in connection with" a transaction subject to the Commission's jurisdiction. The phrase "any entity" is broad, and applies to any person such as Dr. Silkman who had both direct and indirect involvement in, and profited in connection with [manipulative jurisdictional transactions].[419]

The Commission has already determined that it has authority to impose civil penalties on individuals such as Chen. Where, as here, it is appropriate to impose a civil penalty on an individual, the Commission should do so.

B. Powhatan

1. Disgorgement

Through Chen's manipulative wash-type round trip UTC trading scheme during June 1 to August 18, 2010, Powhatan received approximately $7,975,403 in MLSA. Netting out the costs of these fraudulent transactions, Powhatan yielded approximately $3,465,108 in unjust profits. Staff recommends that Powhatan be ordered to disgorge this sum, with interest. Staff believes that it is appropriate to hold Powhatan, HEEP, and Chen jointly and severally liable for disgorgement of unjust profits accruing to Powhatan.

2. Civil Penalty

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[418] Order No. 670, FERC Stats. & Regs. ¶ 31,202 at P 18 (citations omitted) *see also*, *City of Abilene v. FCC*, 164 F.3d 49, 52 (D.C. Cir. 1999) ("any entity . . . may include a natural person").

[419] *Richard Silkman*, 144 FERC ¶ 61,164, at P 73 (2013) (internal citations omitted). Review of this Civil Penalty Assessment order is pending in federal district court for the District of Massachusetts in No. 13-CV-13054.

Section 2B1.1 of the Commission's Penalty Guidelines applies to Powhatan. Manipulative trades executed on behalf of Powhatan exceeded 100,000 MWh and yielded $3,465,108 in unjust profits. Powhatan cooperated with the investigation. Applying the Penalty Guidelines, therefore, staff requests a penalty of $16,800,000. In light of the collusion between them, Enforcement staff believes that it is appropriate to hold Powhatan and HEEP jointly and severally liable for the penalties against Powhatan.

VI. Conclusion

For the reasons discussed above, Enforcement staff recommends that the Commission direct Respondents to show cause why they have not violated section 1c.2 of the Commission's regulations, which prohibits the manipulation of markets in wholesale electricity. Enforcement staff further recommends the Commission direct CU Fund, and Alan Chen to show cause why, for these violations, they should not be assessed civil penalties of $10,080,000 and $500,000, respectively, and be required to disgorge $1,080,576 plus interest in unjust profits. Finally, Enforcement staff recommends that the Commission direct Powhatan and HEEP Fund to show cause why, for these violations, they should not, jointly and severally, be assessed civil penalties in the amounts of $16,800,000 to Powhatan, $1,920,000 to HEEP Fund, and an additional $500,000 civil penalty to Chen, and to be required to disgorge profits, plus interest, of $3,465,108 from Powhatan, and $173,100 from HEEP Fund.

EXHIBIT 3

FERC Energy Primer: A Handbook of Energy Market Basics

Energy Primer

A Handbook of Energy Market Basics

A staff report of The Division of Energy Market Oversight
Office of Enforcement | Federal Energy Regulatory Commission

July 2012

Energy Primer

A Handbook of Energy Market Basics

Table of Contents

The Energy Primer is a staff product and does not necessarily reflect the views of the Commission or any Commissioner.

1 Introduction

Natural gas and electricity are two forms of energy that are of particular interest to the Federal Energy Regulatory Commission. This primer explores the workings of the wholesale markets for these two forms of energy, as well as energy-related financial markets.

Natural gas is the second largest primary source of energy consumed in the United States, exceeded only by petroleum. A primary energy source is an energy source that can be consumed directly or converted into something else, like electricity. Roughly a third of the natural gas consumed in the United States goes into power plants for the production of electricity.

Electricity, a secondary energy source, results from the conversion of primary fuels such as fossil fuels, uranium or wind, into a flow of electrons used to power modern life.

Natural gas and electric markets involve both physical and financial elements. The physical markets contain the natural resources, infrastructure, institutions and market participants involved in producing natural gas and electricity and delivering it to consumers. They also include the trading of and payment for the physical commodity, natural gas. The financial markets include the buying and selling of financial products derived from physical natural gas and electricity. These financial markets also include market structures and institutions, market participants, products and trading, and have their own drivers of demand and supply. In general, physical and financial markets can be distinguished by the products and by the intentions of the market participants involved. Physical products are those whose contracts involve the physical delivery of natural gas or electricity. Physical market participants are those who are in the market to make or take delivery of the commodity. Financial products do not involve the delivery of gas or electricity; instead, they involve the exchange of money.

Physical markets can be further differentiated by:

- **Location:** regions, nodes, zones or hubs;
- **Timeframes:** hourly, daily, monthly, quarterly or yearly;
- **Types of products:** natural gas molecules or electrons, pipeline or transmission capacity and storage; and
- **Nature of sales:** retail sales involve most sales to end-use customers; wholesale sales involve everything else.

Physical Fundamentals

Much of the wholesale natural gas and electric industry in the United States trades competitively; some markets are established through administrative processes based on the cost of providing service. In competitive markets, prices are largely driven by the economic concepts of supply and demand. Underlying the supply and demand for natural gas or electricity are physical fundamentals - the physi-

cal realities of how markets produce and deliver energy to consumers and how they form prices. These physical fundamentals will be covered in Chapter 2, on natural gas, and Chapter 3, on electricity.

Wholesale natural gas and electric markets differ from other competitive markets, however, in critical ways. While this primer focuses on wholesale markets, demand is ultimately determined at the retail level. Retail use is relatively inelastic in the short-term, although this may be less so with some larger customers. Retail use of gas or electricity exhibits some unique characteristics:

Limited customer storage options: Retail consumers have few options for storing natural gas and electricity. For natural gas, large consumers and entities that sell to retail consumers may be able to store gas, but smaller consumers do not have this option. For electricity, smaller consumers may have batteries, but nothing adequate to ensure refrigeration, for example. Without storage, consumers cannot buy when prices are low and use their stored product when prices rise. This limits consumers' response to changes in prices.

Substitutes: Retail consumers have few substitutes for natural gas or electricity, certainly in the short-term. If natural gas or electric prices go up, consumers cannot quickly switch to a different product. Longer term, they may be able to switch to gas from electricity for heating, or they may be able to insulate or install new windows or take other steps to reduce their consumption of energy. In addition, demand-response programs can provide benefits to those who would reduce their energy needs at certain times; this might include turning off air conditioning during the hottest part of a day in order to help reduce electric load.

Necessity: Unlike most other products, natural gas and electric service are necessities today, and a lack of service can mean customers without heat, the ability to cook or refrigerate food or the ability to run their businesses. Blackouts and other service disruptions create operating problems and hazards as well. Consumers cannot postpone the purchase of electricity or natural gas. They may be able to turn down their thermostats, but cannot eliminate consumption altogether for an extended period of time.

Because consumers have limited ability to reduce demand, supply must match demand instantaneously, in all locations.

For natural gas, this means production, pipelines and storage need to be sized to meet the greatest potential demand, and deliveries need to move up and down to match changes in consumption. Natural gas has underground and above-ground storage options and linepack, which involves raising the pressure in a pipeline to pack more molecules into the same space. Gas flows through a pipeline at about 15 mph, so new supply can take hours or days to reach its destination. That increases the value of market-area storage, which vastly reduces the distance and time needed for gas to reach consumers.

For electricity, storage is more limited, although technology – involving batteries and flywheels – is being developed. Hydroelectric pumped storage is available in a few locations; this involves pumping water to high reservoirs during times of slack electricity demand, then letting the water flow downhill through electricity-generating turbines when demand for power rises. Generating plants, transmission and distribution lines, substations and other equipment must be sized to meet the maximum amount needed by consumers at any time, in all locations. For all practical purposes, electricity use is contemporaneous with electricity generation; the power to run a lightbulb is produced at the moment of illumination.

Natural gas and electric industries are capital intensive, requiring access to financial markets to support daily operations, trading and investment programs. Access to financial markets requires maintaining an investment grade credit rating to support activities ranging from daily transactions to long-term development of infrastructure.

Financial Markets and Trading

Financial markets are where companies and individuals go if they need to raise or invest money. They are important to natural gas and electric markets in two key ways. First, they provide access to the capital needed for operations. Second, some natural gas- or electricity-related products may trade in commodity markets or, as derivative products (see below), in financial markets.

Natural gas and electricity are traded like commodities, just like metals, corn, wheat or oil. They may not be visible, but you can turn them on and off, and measure them. Commodity markets began as ways for farmers to sell their products, or even a portion of their production before it was harvested, providing them with capital to continue operations.

Commodity markets evolved to provide other tools for farmers (and other commodity producers) to manage their risk, notably the risk of adverse changes in price. These financial products were derived from the physical natural gas and electric products, and are known as derivatives. Since their inception, trading in physical commodities and derivatives has attracted others to the market, such as speculators hoping to make a profit from changes in price.

The market for natural gas derivatives has grown enormously within the past decade, as competitive natural gas and electric markets matured and investors came to see energy commodities as investments, not just a source of power. This trading affects the physical markets in a number of ways, and is discussed in Chapter 4, Financial Markets and Trading .

Market Manipulation

Where there are markets, there will be those who attempt to manipulate the markets for their own benefit. These practices undermine the market's ability to operate efficiently, reduce other market participants' confidence in the markets and distort market outcomes, including prices. These practices are discussed in Chapter 5, Market Manipulation.

Addition Information

This primer is written to be used either as a traditional text – read front to back – or as a reference guide. Consequently, some material is repeated in different sections and references are provided to other parts of the primer where a concept is addressed in greater detail.

Further information about various aspects of energy markets and FERC regulation can be found at www.ferc.gov; then click on Market Oversight. If you are reading this Energy Primer electronically, you can find the market oversight pages here: http://www.ferc.gov/market-oversight/market-oversight.asp

Google search also provides a quick path to information on specific FERC orders or to more general subjects (e.g., FERC regulation of natural gas pipelines).

2 Wholesale Natural Gas Markets

Overview

Natural gas markets have a significant impact on the economy and on the individuals who rely on the fuel for electric generation, manufacturing, heating, cooking and other purposes. The Department of Energy's Energy Information Administration (EIA) estimates that natural gas supplies 25 percent of the energy used in the United States, or about 24 trillion cubic feet (Tcf) of gas a year.

Under the Natural Gas Act (NGA), the Federal Energy Regulatory Commission (FERC) has jurisdiction over the transportation and sale of natural gas and the companies engaged in those activities.

The natural gas market is an amalgamation of a number of subsidiary markets. There is a physical market, in which natural gas is produced, transported, stored and consumed. There is also a financial market in which physical natural gas is bought and sold as a financial product derived from physical natural gas. Natural gas markets are also regional, with prices for natural gas varying with the demand characteristics of the market, the region's access to different supply basins, pipelines and storage facilities.

Natural Gas

Natural gas is primarily methane, and is colorless and odorless in its natural condition. It is also highly combustible, giving off a great deal of energy and fewer emissions than fuels such as coal and oil. Natural gas occurs in geological formations in different ways: as a gas phase associated with crude oil, dissolved in the crude oil, or as a gas phase not associated with any significant crude oil. Natural gas is rich or wet if it contains significant natural gas liquids (NGL); by contrast, natural gas is lean or dry if it does not contain these liquids. Processors remove water, liquefiable hydrocarbons and other impurities from the natural gas stream to make the natural gas suitable for sale. Natural gas liquids may be processed out and sold separately.

Natural gas is mostly methane, which is made of one carbon atom and four hydrogen atoms (CH_4) and is among the materials known as hydrocarbons.

Other gases such as ethane, butane, propane and pentane may be mixed in with the methane. These may be processed out and sold separately. Gas containing significant amounts of natural gas liquids is known as wet gas. The

gas that flows through pipelines to natural gas consumers typically has these liquids removed, and is known as dry gas.

While natural gas is typically a gas, it can be cooled to a liquid and transported in trucks or ships. In this form, it is referred to as liquefied natural gas, or LNG.

Natural Gas Markets

As noted, natural gas markets are both physical and financial. This chapter focuses on the physical natural gas markets, but it should be noted that financial markets can have significant impacts on the physical natural gas market.

For this discussion, the natural gas industry has three segments. The first is the supply segment, which includes exploration and development of natural gas resources and reserves, and production, which includes drilling, extraction and gas gathering. The second segment is the midstream sector, in which small-diameter gathering pipeline systems transport the gas from the wellhead to natural gas processing facilities, where impurities and other hydrocarbons are removed from the gas to create pipeline-quality dry natural gas. The third segment is transportation, which includes intrastate and interstate pipeline systems that move natural gas through large-diameter pipelines to storage facilities and a variety of consumers, including power plants, industrial facilities and local distribution companies (LDCs), which deliver the gas to retail consumers.

Each component of the supply chain is critical in serving customers. The quantity of reserves and production can affect market participants' expectations about current and future supply, and thus can affect prices. Similarly, the availability of pipeline and storage capacity determines which supply basins are used and the amount of gas that can be transported from producers to consumers. All of these factors affect the supply chain, but they also affect the supply-demand balance, both nationally and regionally.

Natural gas markets are generally divided into the West, Midwest, Gulf Coast, Northeast and Southeast regions. These regions have differing supply, transportation and demand characteristics, resulting in different prices.

Within these regions are hubs – the interconnection of two or more pipelines – that also become market hubs for buying and selling gas. The key hub used to reflect the U.S. natural gas market as a whole is the Henry Hub, in Louisiana. Prices at other locations are frequently shown as Henry Hub plus or minus some amount.

These regional differences in supply and demand result in different prices for natural gas at various locations. Prices are lowest in areas with low-cost production, ample infrastructure and limited demand – the Opal Hub in Wyoming, for example – and highest where production or transportation is limited and demand is high – Algonquin citygate, in Massachusetts, for example.

Current Trends in Physical Natural Gas Markets

Natural gas markets in the United States are undergoing a period of transition. Within the last decade, various factors have shifted the dynamics of supply and demand. These include, but are not limited to, the following:

1. Development of technology, like hydraulic fracturing and horizontal drilling, enables producers to access unconventional resources such as those in shale formations. This has vastly expanded supply and is increasing the amount of natural gas produced, which has reached levels not seen in more than 35 years. It also has moderated prices across the country. Notably, some of these resources are located close to eastern population centers, providing access to low-cost gas supplies with lower transportation costs.

2. Natural gas has become an investment opportunity as it is a traded commodity. As noted above, there are physical and financial investment markets. There are two distinct markets for physical natural gas: (1) a cash market, which is a daily market where natural gas is bought and sold for immediate delivery; and (2) a forward market, where natural gas is bought and sold under contract for one month or more in the future. The financial gas market is directly linked to the physical natural gas market.

3. Natural gas demand for power generation is rising and is expected to increase significantly in the coming years. Power plant demand for natural gas reflects the environmental benefits of the fuel, the operating flexibility of natural gas-fired generators, and lower natural gas prices. Natural gas-fired power plants emit less air pollution than generators using coal or oil. These plants are also relatively easier to site, can be built in a range of sizes and can increase or decrease output more flexibly than large baseload generators, such as nuclear or coal. This ability to change output quickly aids electric system operators in matching generation to customer loads, and enables operators to offset rapid changes in output from wind and other intermittent generators.

4. Pipeline expansion has changed the relationships between prices in various regions. New interstate pipelines have enabled regions such as the Northeast and Mid-Atlantic to access new supply sources, expanded the amount of natural gas that can flow from traditional supply sources and enhanced the amount that can flow overall. This has reduced prices and tempered extreme price movements during periods of peak demand.

Natural Gas Demand

Natural gas already is the fuel of choice for many sectors of the U.S. economy. Natural gas demand, however, can fluctuate dramatically, but it generally provides about 25 percent of U.S. energy needs.

Demand Drivers

Over the long term, natural gas use is driven by overall economic and population growth, environmental policy, energy efficiency, technological changes and prices for natural gas and substitute energy sources such as oil, coal and electricity. In the short-term, demand stems from weather, economic activity and changing relationships between coal and natural gas prices.

Weather

Weather is the most significant factor affecting natural gas demand, which has historically been seasonal and weather-driven. Natural gas demand can also swing considerably within a given day, especially during periods of extreme temperatures. Short-term changes in weather, such as heat waves and winter storms, can send demand and prices soar-

ing – or dropping – within the course of a day, sometimes unexpectedly. This unpredictability challenges suppliers and pipelines, especially when pipelines are already full.

Economic Activity and Growth

Economic growth can increase the amount of natural gas used by industry, power plants and commercial entities as consumers want more of their products and services. During a recession, gas use usually declines.

On the other hand, economic growth may raise personal incomes and consumption of electric-powered consumer goods.

Structural changes in the economy can also affect natural gas demand. Declining manufacturing and growing service sectors result in changes in gas use, as does increased global competition. New markets for products and services may require additional natural gas; movement of operations offshore may reduce it.

Daily and weekly economic activity creates cyclical demand patterns. During the work day, demand rises as people get up and go to work or school. Similarly, it declines as they go to sleep. On the weekend, demand tends to vary less over the course of the day.

Prices of Natural Gas and Coal

To use natural gas for heat, a home needs to have an appropriate furnace and piping in place. To burn it in a power plant, the generator needs to make long-term investments in gas-fired generators. These are decisions requiring long-term capital investments, and are cheapest and easiest to make at the time a home or power plant is being built, and are more complicated to change later. Thus, over the long term, demand for natural gas can be affected by the expected costs of alternative energy sources: the cost of a natural gas furnace versus an electric one; the cost of a coal-fired generating plant versus one fueled by natural gas.

In the short-term, the opportunity for fuel switching has been significant in power generation. Electric grid operators have a choice as to which power plant to dispatch to meet increased electric demand. Dispatch is often based on the marginal cost of generation at each available plant in the generation fleet. Plants with lower marginal costs, such as nuclear, typically dispatch before plants with higher marginal costs, such as natural gas.

As natural gas prices drop relative to coal prices, natural gas-fired generation can get dispatched earlier than coal-fired generation, increasing natural gas demand from the power sector.

Demographics and Social Trends

Long-term demand can also be affected by shifting demographics and social trends. Population growth in warmer climates and declines in the older industrial areas of the

North have affected natural gas use. So has the trend toward larger houses.

Today, most households have a proliferation of electronic appliances and gadgets. Even as appliances become more energy efficient, people find more appliances to use. Thus, the result of greater efficiency is not necessarily less use of

electricity. But one thing for sure is that a greater share of the electricity that is generated is fueled by natural gas.

Environmental Concerns and Energy Efficiency

Natural gas has relatively fewer environmental problems compared with other fossil fuels, and, consequently, it is being increasingly used for power generation. In addition to helping urban areas meet air quality goals, natural gas generation has not experienced as much negative public sentiment as have nuclear and coal-fired generators, making it feasible to site gas-fired generators closer to load centers. Growth in wind and other intermittent generation technologies benefit when coupled with natural gas generation, which is able to ramp up and down quickly to complement variable output by wind.

The natural gas emissions profile has also encouraged some urban mass transit bus systems, West Coast port operations and other vehicle fleets to shift to natural gas from gasoline or diesel fuel.

Customer Sectors and Demand

In 2007, natural gas used for electric generation overtook gas-for-industrial load to become the largest customer class for natural gas. In 2010, according to the EIA, power generation used 7.4 Tcf of the natural gas delivered to consumers; industrial, 6.6 Tcf; residential, 4.8 Tcf; and commercial, 3.2 Tcf.

Demand is seasonal. It rises and falls during a year as the seasons bring changing temperatures. Demand usually peaks in winter to meet heating load, with a second, smaller peak in summer to meet power generator load. The low months for gas consumption are during spring and fall, known as shoulder months. Natural gas use also varies with the time of day. The difference between peak winter and off-peak demand varies regionally, due to differences in winter temperatures and customer composition.

Each customer sector contributes differently to overall demand, both in terms of the amount that demand varies over a cycle and whether its peak demand coincides with the overall system peak. Residential demand, for example, can be highly variable in colder climates, and its peak coincides with the overall system peak. Power generation's peak does not coincide with the winter gas-demand peak, but in fact its growing use of natural gas to produce electricity for air conditioning has created robust summer demand, which competes with gas supply that traditionally would flow into underground storage for later use in the winter. Industrial demand stays relatively constant year-round.

In the short term, residential and commercial natural gas use tends to be inelastic – consumers use what they need regardless of the price. Power plant demand, on the other hand, is more price-responsive as natural gas competes with other fuels, especially coal, in the production of electricity. Price inelasticity implies that a potential for price spikes exists during periods of supply constraint.

Consequently, the mix of customers in a region can affect system operations and costs. Pipelines and other equipment need to be sized to account for peak demand. Demand that stays fairly constant presents fewer operational challenges and usually enjoys lower prices. Highly variable demand will result in pipelines and equipment being used at less than full capacity for much of the year, and prices for service may be more expensive, both because the pipelines may become constrained during peak times and because the capacity is not fully used throughout the year.

Power Generation

Generation demand can soar at any time; gas-fired generators can change their output quickly, and are frequently called on to change their output due to changes in de-

mand or when problems occur elsewhere in the power grid. United States natural gas demand for power generation increased from 5.5 Tcf in 2004 to 7.4 Tcf in 2010, according to the EIA. Generating plants tend to consume more natural gas in the summer to meet air conditioning loads, but power demand can also climb in the winter to provide electric heating and lighting. Generation demand can also be influenced by the relative prices for natural gas and other fuels, especially coal. Since late 2008, natural gas-fired generators generally have been dispatched before some coal plants because of the decrease in natural gas prices.

Industrial

Natural gas as a fuel is used to produce items such as steel, glass, paper, clothing and brick. It also is an essential raw material for paints, fertilizer, plastics, antifreeze, dyes, photographic film, medicines and explosives. Industrial load tends to show the least seasonal variation of natural gas use, but the industry is sensitive to economic pressures. Gas use has been declining slowly due to efficiency improvements and economic factors, such as the movement of manufacturing overseas. Still, EIA data show that industrial customers remain the second-largest consuming segment, using 6.6 Tcf in 2010, down from 7.2 Tcf in 2004. This decline stemmed from both fewer customers and lower average use.

Residential

Despite population growth, natural gas used in the residential sector for home furnaces, water heaters, clothes dryers and stoves has remained fairly flat over the past decade as appliances and homes have become more energy efficient. Residential customers consumed 4.8 Tcf in 2010, compared to 4.9 in 2004. Much of the year-to-year demand variation in this sector can be attributed to the weather during a particular year. A year with a long, cold winter and hot summer will see higher gas demand than a year with a mild winter and summer. Demographics may also support this trend, as customers have moved from northern industrial centers to warmer parts of the country. Slightly more than half of the homes in the United States use natural gas as their main heating fuel. Residential customers typically show the greatest seasonal variability, especially in cold-winter regions where demand soars during winter months as consumers turn on their furnaces.

Quick Facts: Resources and Proved Reserves

- **Resources** - Total gas estimated to exist in a particular area. The Potential Gas Committee's latest biennial estimate showed 2,170 Tcf of future gas supply in the United States as of Dec. 31, 2010; that figure included 273 Tcf of proved dry gas reserves and 1,898 Tcf of total potential resources.

- **Proved reserves** - Estimated amount of natural gas that, based on analysis of geologic and engineering data gathered though drilling and testing, can be reasonably projected to be recoverable under existing economic and operating conditions. According to the EIA, as of Dec. 31, 2009, dry natural gas proved reserves totaled 273 Tcf. Proved reserves have been growing every year since 1999.

Commercial

Commercial demand has remained fairly constant at 3.2 Tcf in 2010 as well as in 2004, and like the residential sector will see some year-to-year variation based on weather. Commercial consumers include hotels, restaurants, wholesale and retail stores and government agencies, which use natural gas primarily for heat. Consequently, its demand cycles over the seasons, weeks and days.

Natural Gas Supply

Natural Gas Resources, Reserves and Production

The amount of natural gas in the ground is estimated by a variety of techniques, and it takes into account the technology available to extract the gas. According to the EIA, estimating the technically recoverable oil and natural gas resource base in the United States is an evolving process. Analysts use different methods and systems to make natural gas estimates. As detailed in the table below, natural gas supplies are characterized as resources, proved reserves and production.

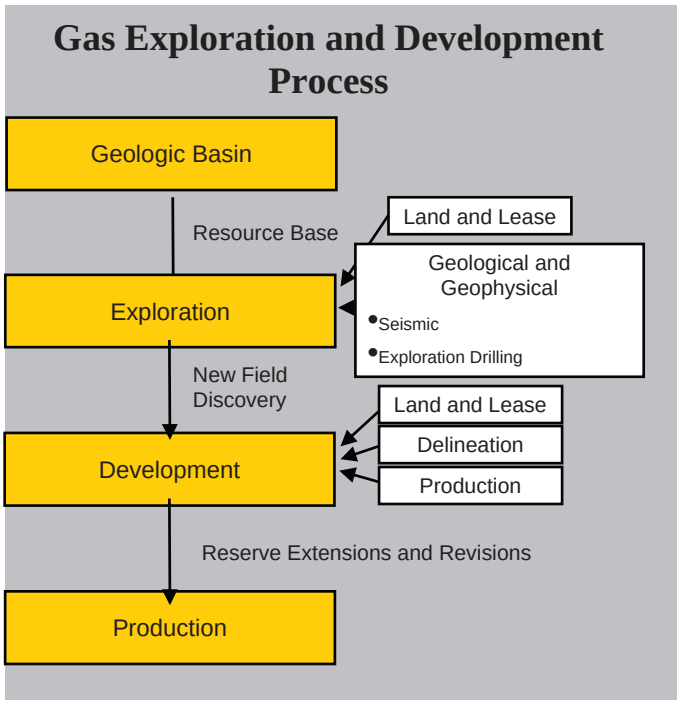
Resources is the largest category, which describes the total potential of natural gas supply. Proved reserves consider the feasibility and economics of extracting the natural gas. Lastly, production describes the amount of natural gas removed from the ground.

Natural gas is located underneath the surface of the earth. Natural gas is characterized by the type of basin or rock formation in which it lies. Conventional natural gas is found in porous rock formations, and in the United States is the traditional source of natural gas.

Unconventional natural gas, on the other hand, is found in shale, coal seams and tight, low-permeability rock formations. In 2007, the National Petroleum Council (NPC) defined unconventional gas as "natural gas that cannot be produced at economic flow rates or in economic volumes of natural gas unless the well is stimulated by a large hydraulic fracture treatment, a horizontal wellbore or by using multilateral wellbores or some other technique to expose more of the reservoir to the wellbore."

In the past few years, improvements in drilling technology have enabled producers to access unconventional supplies, notably shale, yielding significant increases in production and raising the estimate of proved reserves. Estimates of resources in 2011 amounted to approximately 2,170 Tcf (which included reserves).

This domestic growth in resources and reserves has translated into greater natural gas production, which has grown 22 percent since 2005, to more than 60 billion cubic feet per day (Bcfd) in 2011. Most of the growth came from shale gas, which now accounts for 32 percent of natural gas resources.



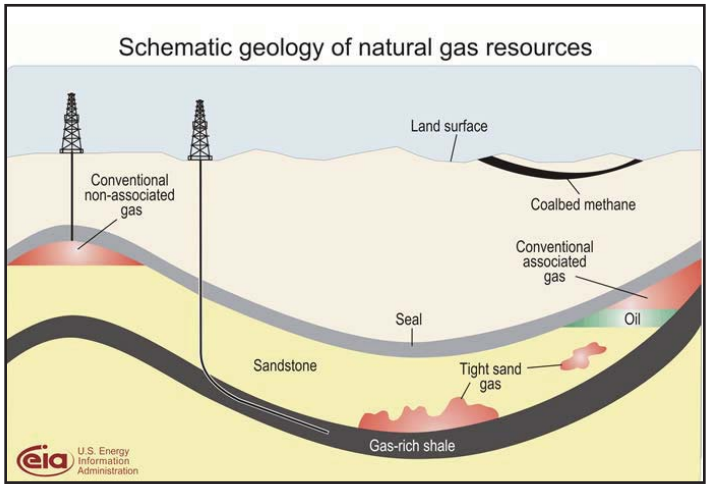
Worldwide, the United States accounts for one-third of global natural gas resources. Most of the natural gas resources are in the Middle East – Iran, Qatar and Saudi Arabia – followed by the United States and Russia.

Rig Count and Rig Productivity

A measure of exploration, the rig count measures the number of rotary drilling rigs actually drilling for oil and gas. These measures are done by several companies active in drilling operations. Rig counts are often used as a rough predictor of future production. The oil and gas rig count peaked at 4,530 on Dec. 28, 1981. More recently, in September 2008, the rig counted reached 2,500, before plunging to 1,200 in April 2009, according to Baker Hughes Inc. Rig counts recently have hovered around 1,900.

Within the total rig count, the use of horizontal drilling rigs, capable of accessing natural gas and oil in shale formations, grew prior to the recession that began in 2008. Traditional vertical rigs remain well below their prerecession highs.

The adoption of horizontal drilling has significantly increased production per rig, making comparison of rig counts over time problematic because horizontal rigs are considerably more productive than vertical rigs.



Conventional and Unconventional Natural Gas

Natural gas is a fossil fuel. Natural gas historically has been found in underground reservoirs made when organic material was buried and pressurized. The remains of that organic material were trapped in the surrounding rock as oil or natural gas. Natural gas and oil are often found together. The depth of the organic materials and the temperatures at which they are buried often determine whether the organic matter turns into oil or natural gas. Generally, oil is found at depths of 3,000 to 9,000 feet; organic materials at greater depths and higher temperatures result in natural gas.

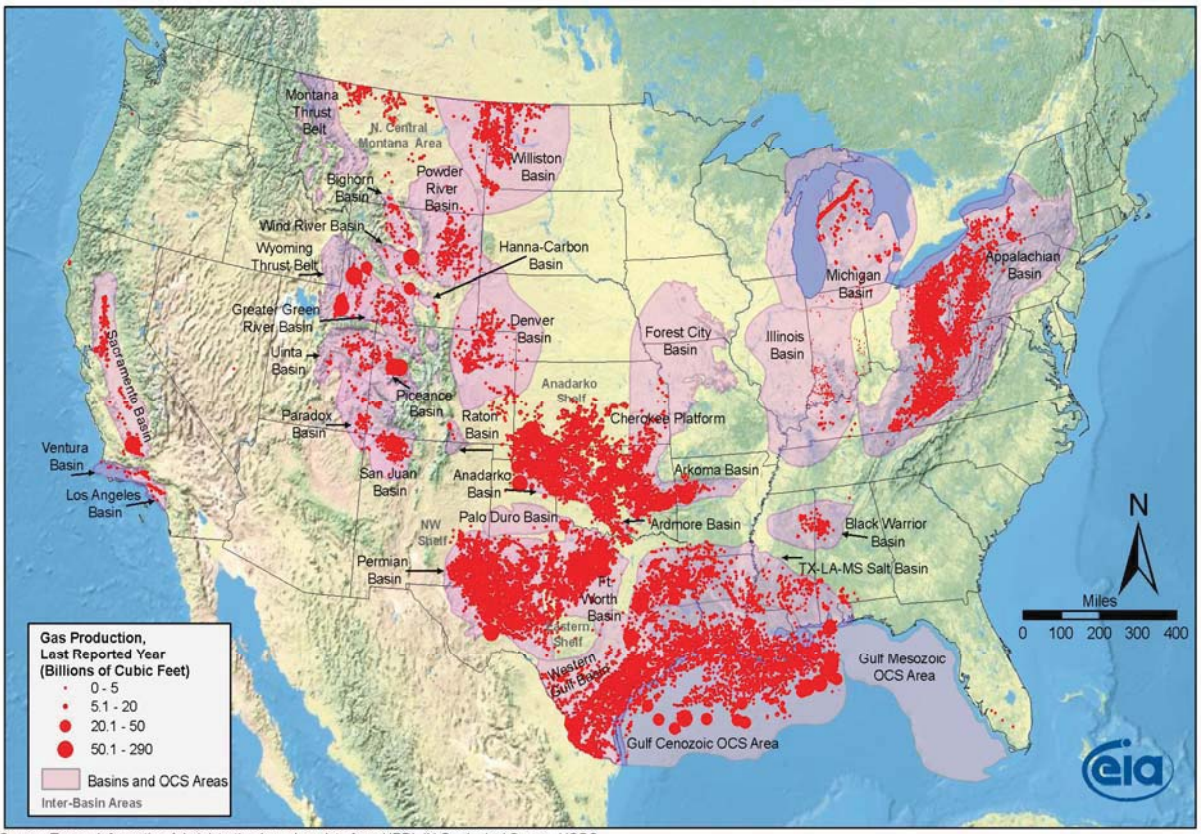
Natural gas basins are frequently referred to as conventional or unconventional basins or plays. These basins differ in the geology of the basin and the depth at which gas can be found. The schematic at left illustrates differing geologic formations in which natural gas can be found.

Conventional Natural Gas

Natural gas historically has been produced from what is traditionally known as conventional natural gas resources, which provided most of the country's supply needs for more than a century. Conventional gas is found in geological basins or reservoirs made of porous and permeable rocks, holding significant amounts of natural gas in the spaces in the rocks.

Conventional resources have been found both on land and offshore (see map of conventional fields, on next page), with the major fields in an arc from the Rocky Mountains to the Gulf of Mexico to Appalachia. The largest conventional fields reside in Texas, Wyoming, Oklahoma, New Mexico and the federal offshore area of the Gulf of Mexico. In 2000, offshore natural gas production represented 24 percent percent of total U.S. production; by 2010 that amount had fallen to 10 percent.

Gas Production in Conventional Fields, Lower 48 States

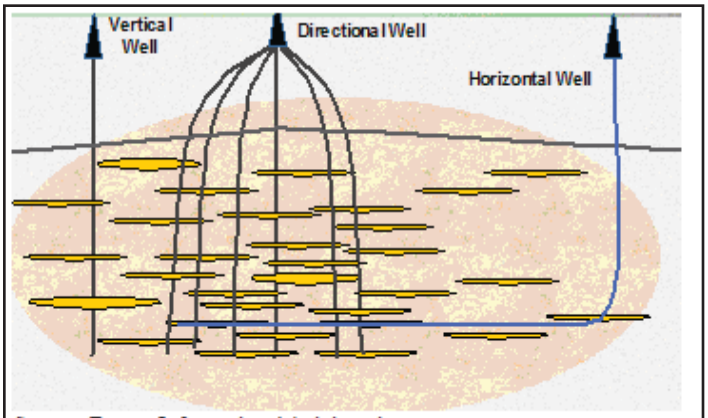


Source: Energy Information Administration based on data from HPDI, IN Geological Survey, USGS
Updated: April 8, 2009

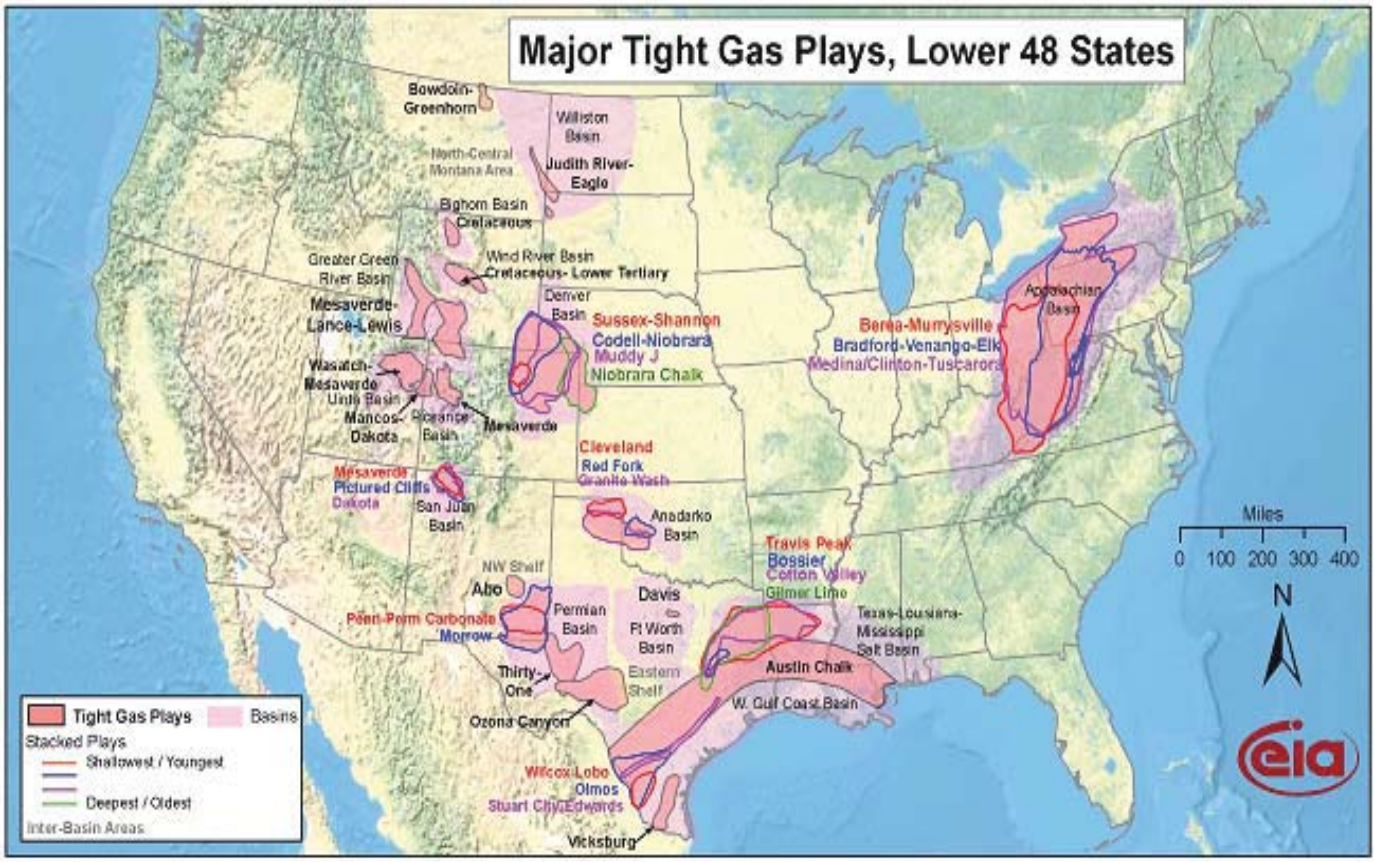
Federal offshore natural gas wells are drilled into the ocean floor off the coast of the United States in waters that are jurisdictional to the federal government. Most states have jurisdiction over natural resources within three nautical miles of their coastlines; Florida and Texas claim nine nautical miles of jurisdiction.

Roughly 4,000 oil and gas platforms are producing in federal waters at water depths approaching 7,500 feet (at total well depths of 25,000-30,000 feet) and at distances as far as 200 miles from shore, EIA reports. Most of these offshore wells are in the Gulf of Mexico.

Offshore production has been going on for decades. As the easy pickings – close-in, shallow-water wells – became less economic to produce, companies looked to reserves at greater water depth. Technological improvements contributed to continuing production from deep offshore wells.



Source: Energy Information Administration



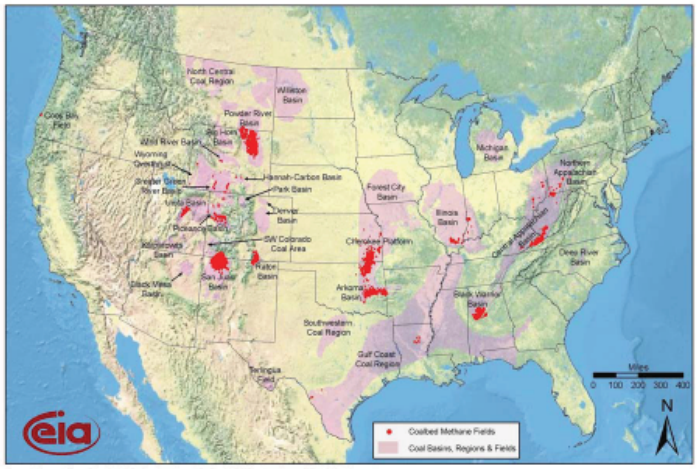
Source: Energy Information Administration based on data from various published studies. Updated: June 6, 2010

Unconventional Natural Gas

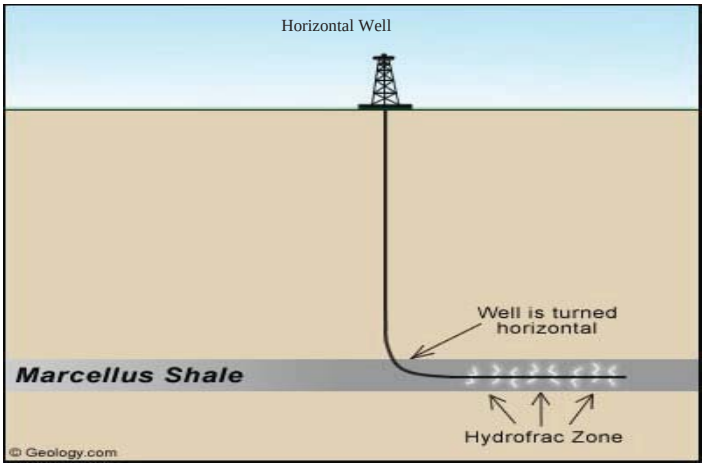
In recent years, innovations in exploration and drilling technology have led to rapid growth in the production of unconventional natural gas. This term refers to three major types of formations where gas is not found in distinct basins, but is trapped in shale, tight sands or coal seam formations over large areas.

The presence of natural gas in these unconventional plays has been common knowledge for decades, but it was not until the early 1990s, when after years of experimenting in the Barnett Shale in Texas, George Mitchell and Mitchell Energy Co. developed a new drilling technique that made production in these types of formations economically feasible. The new technology included horizontal and directional wells, which allow a producer to penetrate diverse targets and increase the productivity of a well. As shown below, directional wells allow the producer to tap these resources through multiple bores. The horizontal wells have a vertical bore, but then move horizontally through the rock to access more supply. These new drilling technologies greatly improved the likelihood of a successful well and the productivity of that well.

Coalbed Methane Fields, Lower 48 States



Source: Energy Information Administration based on data from USGS and various published studies
Updated: April 6, 2009



As of 2012, production from unconventional reserves supplied more than half of U.S. gas needs.

Tight sands gas is natural gas contained in sandstone, siltstone and carbonate reservoirs of such low permeability that it will not naturally flow when a well is drilled. To extract tight sands gas, the rock has to be fractured to stimulate production. There are about 20 tight sands basins in the United States (see map); as of 2009, annual production was about 6 Tcf, or about one-third of U.S. domestic production.

Coalbed methane (CBM) is natural gas trapped in coal seams. Fractures, or cleats, that permeate coalbeds are usually filled with water; the deeper the coalbed, the less water is present. To release the gas from the coal, pressure in the fractures is created by removing water from the coalbed.

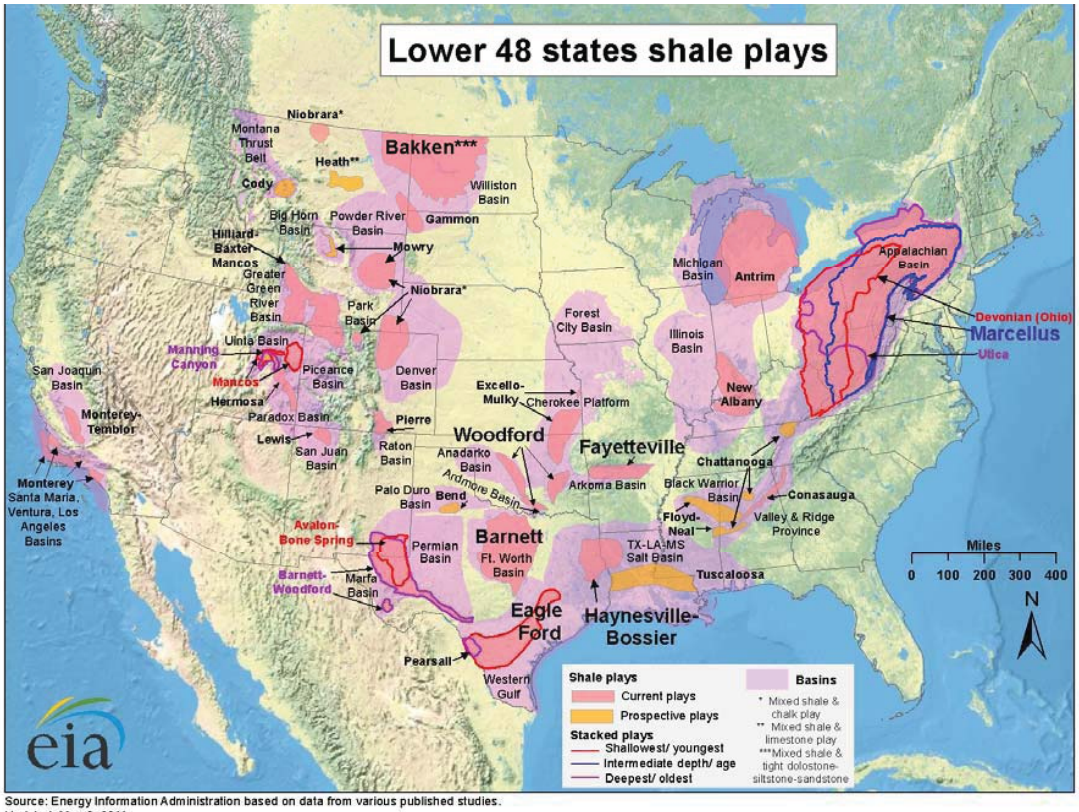
The in-place coalbed methane resource of the United States is estimated to be more than 700 Tcf, but less than 100 Tcf of that may be economically recoverable, according to the U.S. Geological Survey. Most CBM production in the United States is concentrated in the Rocky Mountain area, although there is significant activity in the Midcontinent and the Appalachian area.

Shale gas is found in fine-grained sedimentary rock with low permeability and porosity, including mudstone, clay stone and what is commonly known as shale. These rock conditions require a special technique known as hydraulic fracturing (fracking) to release the natural gas. This technique involves fracturing the rock in the horizontal shaft using a series of radial explosions and water pressure (see graphic).

In the past decade the processes for finding geological formations rich in shale gas, or shale plays, have improved to the point that new wells almost always result in natural gas production. Improved exploration techniques coupled with improved drilling and production methods have lowered the cost of finding and producing shale gas, and have resulted in a significant increase in production. In 2011, shale gas accounted for about 25 percent of total gas production, with expectations of significant increases in the future.

The five major shale plays in the United States include Barnett, Fayetteville, Woodford, Haynesville and Marcellus (see map on next page). Together, they hold an estimated 3,420 Tcf of shale gas resources, according to Bentek Energy. Other shale formations, such as Eagle Ford, are seeing heavy exploration activity and are expected to become major contributors of natural gas supply in the near future. The shale plays are widely distributed through the country, which has the added advantage of putting production closer to demand centers, thus reducing transportation bottlenecks and costs.

Many shale reservoirs contain natural gas liquids (NGL), which can be sold separately, and which augment the economics of producing natural gas. Natural gas is rich or wet if it contains significant liquids; lean or dry if is does not.



Source: Energy Information Administration based on data from various published studies.
Updated: May 9, 2011

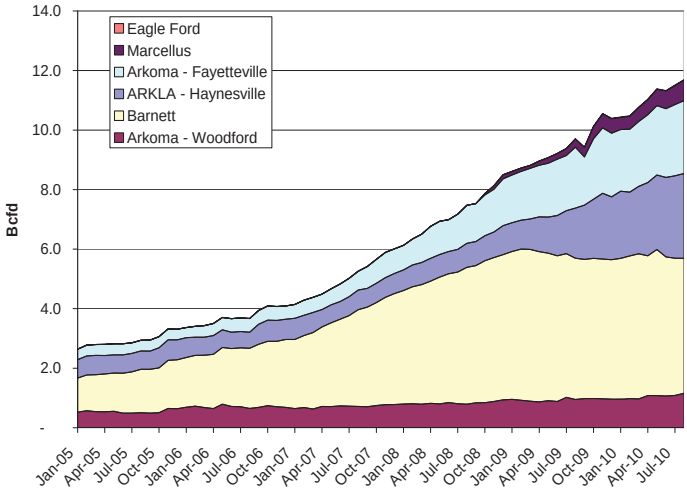
The Shale Revolution

The estimated resources, proven reserves and production of shale gas have risen rapidly since 2005, and shale is transforming gas production in the United States. In 2009, according to EIA, shale gas made up 13 percent of gross production of natural gas, and is expected to become the dominant source of domestically produced gas. By comparison, coalbed methane accounted for 8 percent of production, while 22 percent of the natural gas came from oil wells and 57 percent was produced from natural gas wells.

New shale plays have increased dry shale gas production from 1 Tcf in 2006 to 4.8 Tcf, or 2 percent of total United States natural gas production, in 2010. Wet shale gas reserves account for about 21 percent of the overall United States natural gas reserves. According to the EIA, shale gas will account for about 48 percent of United States natural gas production in 2035.

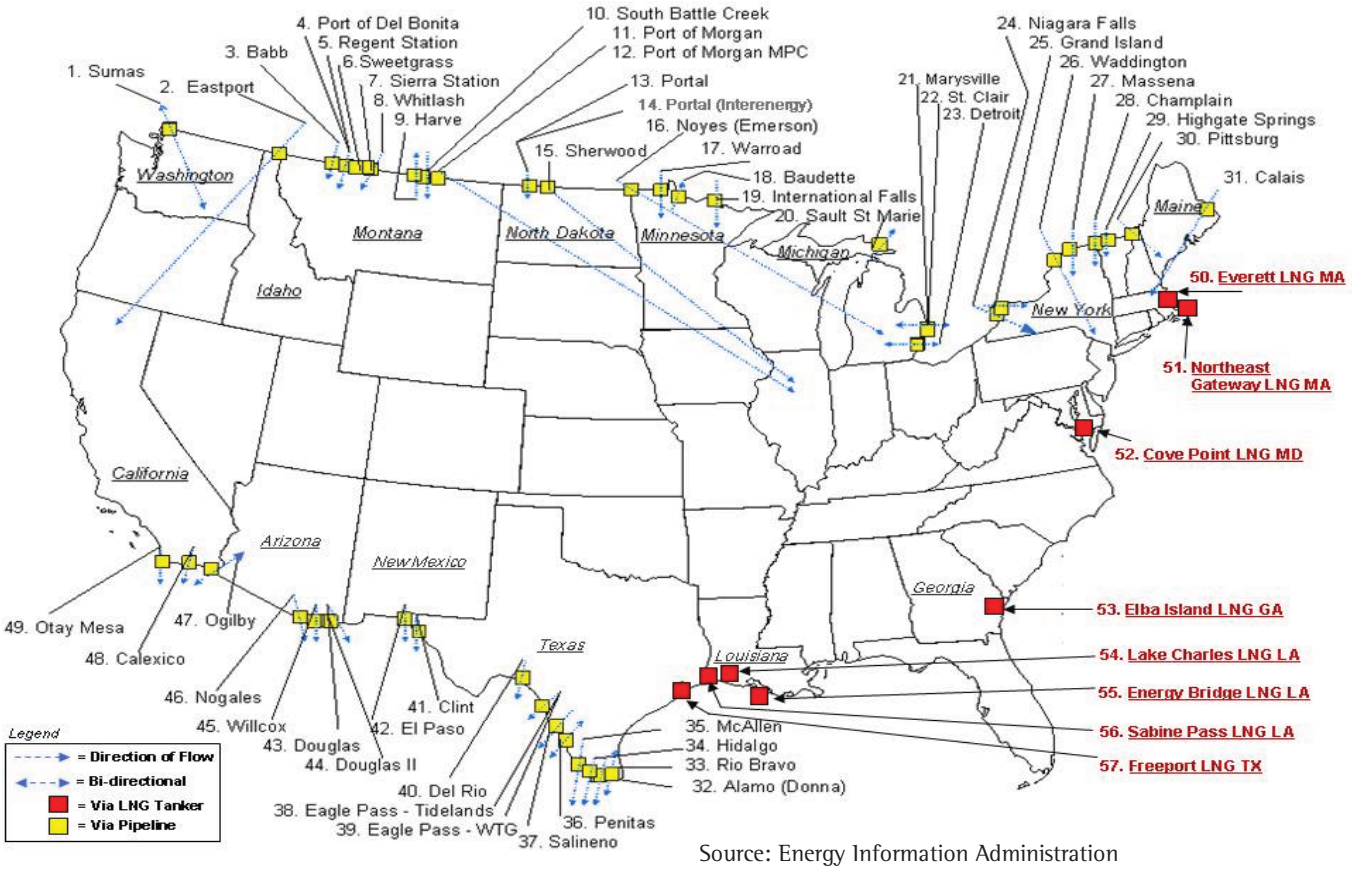
Shale gas can be produced at much lower costs, overall, than gas from conventional fields. Breakeven prices – the price that equals production cost – are below recent natural gas prices, making production of shale gas potentially profitable. The natural gas liquids add to the value of production.

Shale Gas Production by Region



Source: Derived from Bentek Energy data.

Natural Gas Import Entry Points



Source: Energy Information Administration

Shale Wet Gas Breakeven Prices

Natural gas liquids are priced more like oil than natural gas, making them lucrative. A typical barrel of NGL might contain 40-45 percent ethane, 25-30 percent propane, 5-10 percent butane and 10-15 percent natural gasoline.

As a result, the higher value of the liquids coming up the well offset the lower market prices for the dry gas portion of the wellstream.

In addition to having lower finding and production costs, shale gas production is more flexible than traditional production. Unless the well is plugged, a vertical well is always producing. Shale gas production, however, allows the producer to essentially turn off the well without endangering the well by slowing the pace of hydraulic fracturing along the horizontal bore hole. Therefore, producers are able to tailor shale production to market conditions.

The Marcellus Shale formation in Appalachia is of particular note because of its location, size and resource potential, according to the Potentail Gas Committiee at the Colorado School of Mines. Marcellus Shale has estimated gas resources reaching 549 Tcf, and it extends from West Virginia to New York, near the high population centers of the Northeast and Mid-Atlantic. Although Marcellus Shale has been producing significant amounts of gas only since 2008, production has been prolific with high initial well pressures and high production rates.

Growing gas production in Marcellus has already made an impact on U.S. gas transportation. As more gas has flowed out of Marcellus, less gas has been needed from the Rock-

ies or the Gulf to serve the eastern United States. This new production has contributed to a reduction in natural gas prices and the long-standing price differentials between the Northeast and other parts of the United States. It has also caused imports from Canada to decrease.

Environmental concerns present the greatest potential challenge to continued shale development. One issue involves the amount of water used for hydraulic fracturing and the disposal of the effluent used – chemicals and sand are combined with water to create a fracturing solution, which is then pumped into deep formations. Some companies recycle the returned water, which allows them to reuse such water. Concerns have also been raised regarding the potential risks and health hazards associated with wastewater (especially when stored at ground level in holding ponds) seeping into drinking water.

FERC Jurisdiction

Section 1(b) of the NGA exempts production and gathering facilities from FERC jurisdiction. Moreover, the Wellhead Decontrol Act of 1989, Pub. L. No. 101-60 (1989); 15 U.S.C. § 3431(b)(1)(A), completely removed federal controls on new natural gas, except sales for resale of domestic gas by interstate pipelines, LDCs or their affiliates. In Order No. 636, FERC required interstate pipelines to separate, or unbundle, their sales of gas from their transportation service, and to provide comparable transportation service to all shippers whether they purchase gas from the pipeline or another gas seller.

Imports and Exports

Natural gas imports play an important role in regional U.S. markets, accounting for about 3,800 Bcf, or 11 percent, of the natural gas used in the United States in 2011. The natural gas pipeline systems of the United States and Canada are integrated, and about 90 percent of imports came from Canada, according to the EIA, while 10 percent was imported as liquefied natural gas (LNG).

Imported natural gas flows into the United States via pipelines at numerous points along the U.S. border with Canada. Imports from Canada have been of strategic importance in the Northeast and the West, which were traditionally far from the major domestic production centers. However, Canadian exports to the United States have been declining as U.S. shale production has increased. Net U.S. gas imports have declined from a recent high of 3,785 Bcf in 2007 to 1,948 Bcf in 2011. EIA estimates that imports will continue to decrease as shale-gas production increases.

The United States also exports natural gas to Canada and Mexico, and it still occasionally exports LNG to Japan.

Liquefied Natural Gas

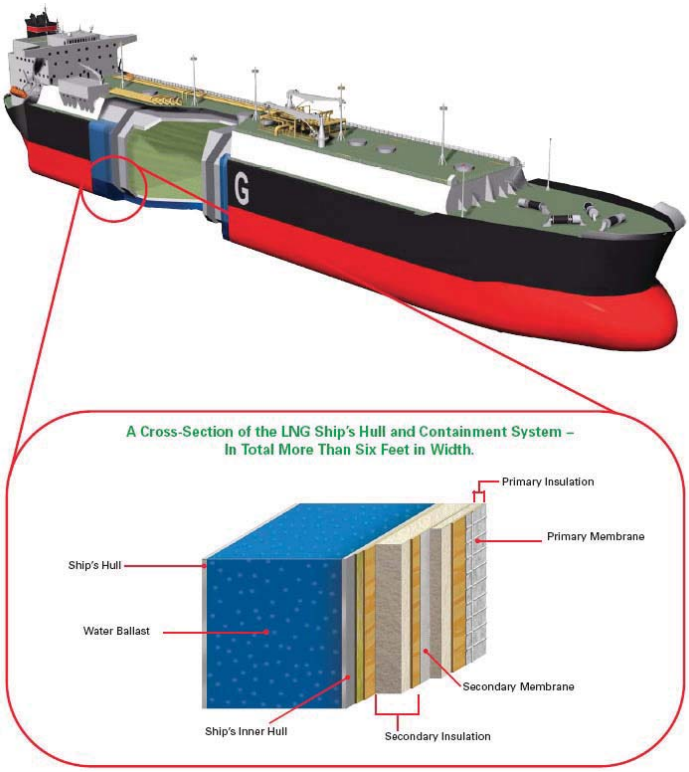
Liquefied natural gas (LNG) is natural gas cooled to minus 260 degrees Fahrenheit to liquefy it, which reduces its volume by 600 times. LNG may be transported in ships and trucks to locations not connected by a pipeline network.

FERC Jurisdiction

The FERC has exclusive authority under the NGA to authorize the siting of facilities for imports or exports of LNG. This authorization, however, is conditioned on the applicant's satisfaction of other statutory requirements for various aspects of the project. In addition, the Department of Energy has authority over permits to import and export.

The LNG Supply Chain

Natural gas is sent to liquefaction facilities for conversion to LNG. These facilities are major industrial complexes, typically costing $2 billion, with some costing as much as $20 billion.

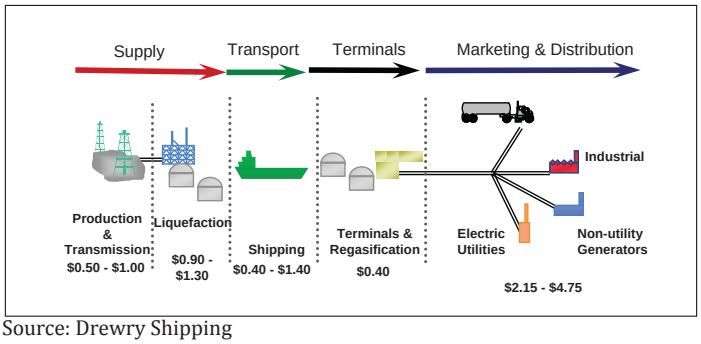


Once liquefied, the LNG is typically transported by specialized ships with cryogenic, or insulated, tanks.

Once LNG reaches an import (regasification) terminal, it is unloaded and stored as a liquid until ready for sendout. To send out gas, the regasification terminal warms the LNG to return it to a gaseous state and then sends it into the pipeline transportation network for delivery to consumers. Currently, more than 80 Bcfd of regasification capacity exists globally, more than double the amount of liquefaction capacity. Excess regasification capacity provides greater flexibility to LNG suppliers, enabling them to land cargoes in the highest-priced markets. This flexibility has fostered a growing spot market for LNG.

The cost of the LNG process is $2-$4 per million British thermal units (MMBtu), depending on the costs of natural gas production and liquefaction and the distance over which the LNG is shipped. Liquefaction and shipping form the largest portion of the costs. Regasification contributes the least cost of any component in the LNG supply chain. The cost of a regasification facility varies considerably; however, the majority of these costs arise from the development of the port facilities and the storage tanks. A 700-MMcfd terminal may cost in the range of $500 million to $800 million.

The various components of the LNG process are broken out below.

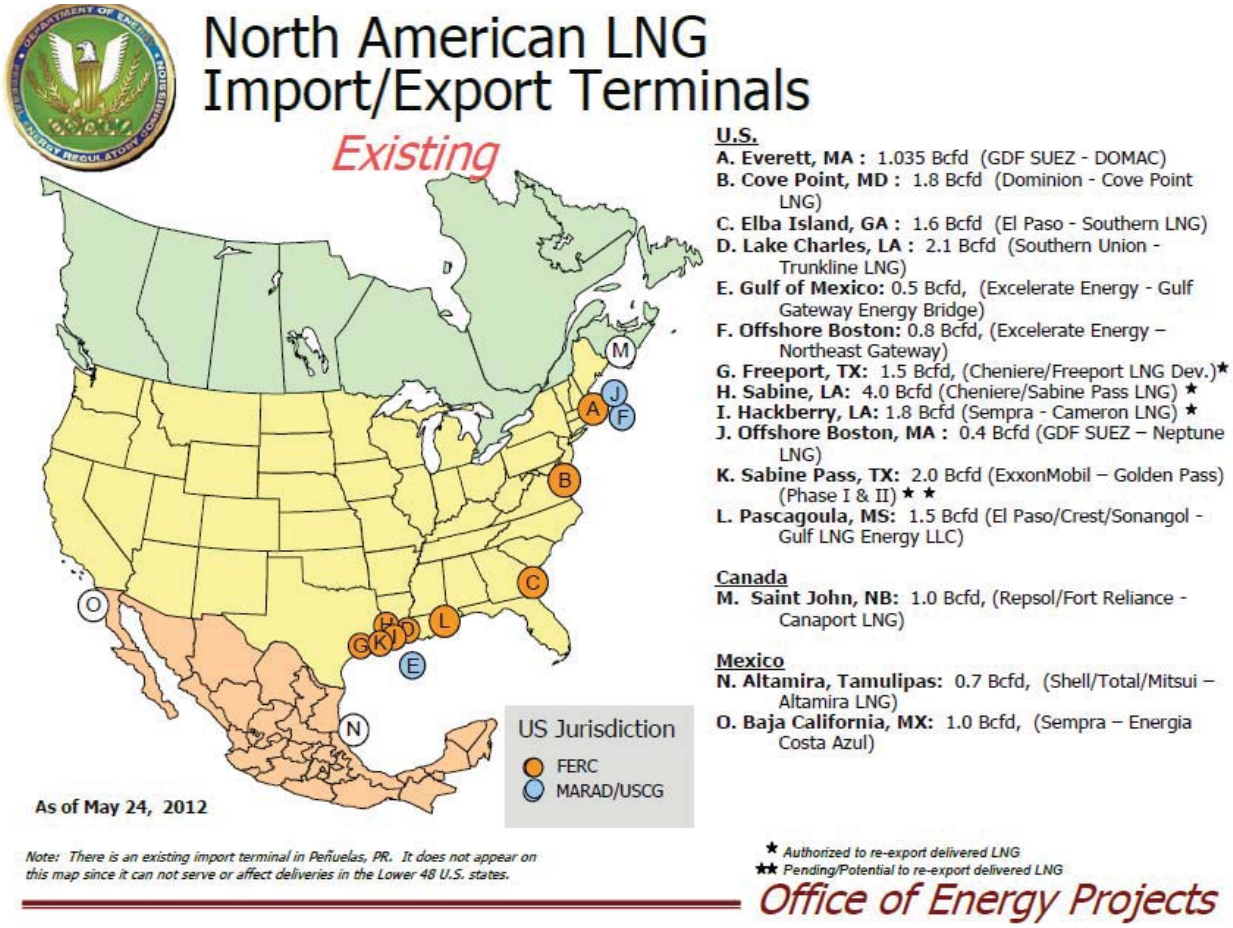


Source: Drewry Shipping

LNG in the United States

The United States is second to Japan in LNG regasification capacity. As of 2011, there were 11 LNG receiving or regasification terminals in the continental United States, with approximately 13 Bcfd of import capacity and 79 Bcf of storage capacity. All of these facilities are on the Gulf or East coasts, or just offshore. In addition, the United States imports regasified LNG into New England from the Canaport LNG terminal in New Brunswick, Canada, and into Southern California from the Costa Azul LNG terminal in Mexico's Baja California.

Between 2003 and 2008, the United States met 1-3 percent of its natural gas demand through LNG imports, according to the EIA. LNG imports peaked at about 100 Bcf/month in summer 2007. Growth in relatively low-cost U.S. shale gas production has trimmed U.S LNG imports, affecting Gulf Coast terminals the most. Today, most LNG enters



the United States under long-term contracts (about half of the total) coming through the Everett (Boston) and Elba Island (Georgia) LNG terminals. The remainder of the LNG enters the United States under short-term contracts or as spot cargoes. LNG prices in the United States generally link to the prevailing price at the closest trading point to the import terminal. During 2011-12, the growth in shale gas production led to proposals to export significant volumes of domestically produced LNG. Since 1969, small quantities of LNG have been shipped from Alaska to Pacific Rim countries.

Natural Gas Processing and Transportation

Most domestic natural gas production in the United States occurs in regions well away from major population centers. To get gas from wellhead to consumers requires a vast network of processing facilities and 2.4 million miles of pipelines. In 2010, this network delivered more than 22 Tcf of natural gas to millions of customers. The U.S. natural gas system can get natural gas to and from almost any location in the Lower 48 states.

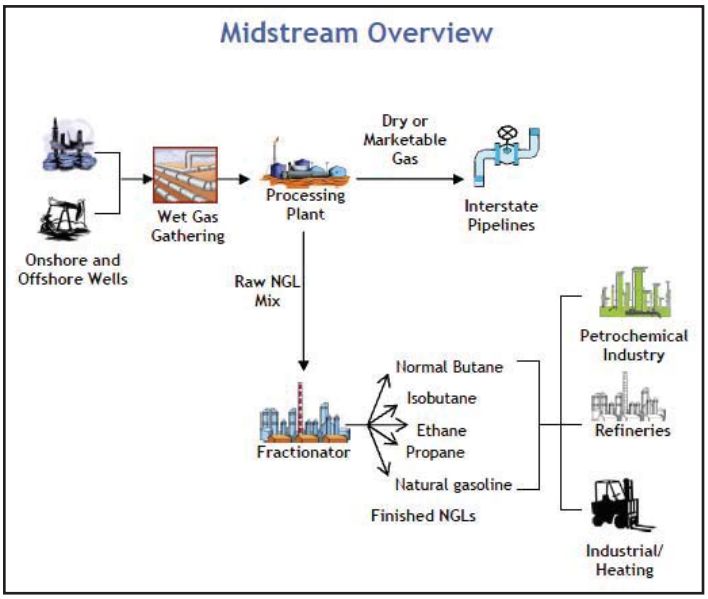
Efficient markets require that this network be robust and allow consumers access to gas from more than one production center. Supply diversity tends to improve reliability and moderate prices, while constraints increase prices.

Processing

The midstream segment of the natural gas industry between the wellhead and pipelines is shown in the graphic

below. This segment involves gathering the gas from the wellhead, processing the gas to remove liquids and impurities and moving the processed (dry) natural gas to pipelines and the extracted liquids to a fractionator that separates the liquids into individual components. The liquids are used by the petrochemical industry, refineries and other industrial consumers. There were about 500 gas processing plants operating in the United States in 2009.

The composition of raw, or wellhead, natural gas differs by region. Consequently, processing will differ depending on the quality of the natural gas. Natural gas may be dissolved in oil underground but separated out from the oil as



it comes to the surface due to reduced pressure. In these instances, the oil and gas are sent to separate processing facilities. Where it does not separate naturally, processing is required.

Untreated natural gas usually contains liquids and is generally known as wet gas. Wet gas may contain water, water vapor, hydrogen, propane, butane, natural gasoline and other components, many of them valuable in other consumer and industrial applications. Gas varies widely in the amounts of these liquids it contains.

Once a well is completed and gas is flowing, the gas moves into gathering pipelines, which typically are small-diameter lines that move the gas from the wellhead to either a processing plant or a larger pipeline.

Processing is required when the natural gas and oil do not separate naturally. At the processing plant, wet natural gas is dehydrated, and additional products and contaminants (such as sulfur and carbon dioxide) are extracted. The hydrocarbon liquids extracted are known as natural gas liquids (NGL). Many of these are high-value products used in petrochemical applications. Once processing extracts the NGL, the stream is separated into individual components by fractionation, which uses the different boiling points of the various hydrocarbons to separate them. Once processing is completed, the gas is of pipeline quality and is ready to be moved by intrastate and interstate pipelines.

FERC Jurisdiction

The Natural Gas Act (NGA), 15 U.S.C. § 717 et. seq., gives the FERC comprehensive regulatory authority over companies that engage in either the sale of natural gas for resale or its interstate transportation. The Commission regulates market entry through Section 7 of the NGA, 15 U.S.C. § 717f, by issuing certificates of public convenience and necessity, subject to such conditions as the Commission deems appropriate, authorizing natural gas companies to transport or sell natural gas. To this end, the FERC reviews applications for the construction and operation of interstate natural gas pipelines. In its application review, the FERC ensures that the applicant has certified that it will comply with Department of Transportation safety standards. The FERC has no jurisdiction over pipeline safety or security, but actively works with other agencies with safety and security responsibilities. The Commission regulates market exit through its authority to abandon certificated service, 15 U.S.C. § 717f(b).

Natural Gas Transportation

Interstate pipelines account for 71 percent of the natural gas pipeline miles in the United States and carry natural gas across state boundaries. Intrastate pipelines account for the remaining 29 percent, and have similar operating and market characteristics.

The interstate network moves dry natural gas from producing areas to local distribution companies (LDCs), large industrial customers, electric power plants and natural gas storage facilities. The pipelines, which range in diameter from 16 inches to as large as 48 inches, move gas between major hubs to lateral lines. Laterals, which range in diameter from 6 inches to 16 inches, distribute gas to retail customers.

The large pipelines are known as mainline transmission pipelines. The line pipe used for major pipelines typically consists of strong carbon steel sufficient to meet standards set by the American Petroleum Institute. Line pipe is coated to reduce corrosion. Smaller distribution lines, which operate under much lower pressures, may be made of plastic materials, which provide flexibility and ease of replacement.

Nearly one-fifth of all natural gas transmission pipelines, by mileage, are located in Texas. More than half are located in nine states: Texas, Louisiana, Kansas, Oklahoma, California, Illinois, Michigan, Mississippi and Pennsylvania.

Compressor stations, located every 50-100 miles along the pipe, add to or maintain the pressure of the natural gas, propelling it down the pipeline. Natural gas travels through pipelines at high pressures, from 200 pounds per square inch (psi) to 1,500 psi.

The gas is compressed by turbines, motors or engines. Turbines and reciprocating natural gas engines use some of the gas from the line to fuel their operations; electric motors rely on electricity.

Metering stations are placed along the pipelines to measure the flow of natural gas as it moves through its system.

Movement of natural gas along a pipeline is controlled in part by a series of valves, which can be opened to allow the gas to move freely or closed to stop gas flow along a section of pipe. Large valves may be placed every 5 to 20 miles along the pipeline.

Pipeline operators use supervisory control and data acquisition (SCADA) systems, to track the natural gas as it travels

Natural Gas Infrastructure

The United States natural gas market is accommodated by extensive infrastructure:

- **Roughly 306,000 miles of wide-diameter, high pressure inter- and intrastate pipelines make up the mainline pipeline transportation network, run by more than 210 companies.**
- **More than 1,400 compressor stations maintain pressure on the natural gas pipeline network.**
- **More than 5,000 receipt points, 11,000 delivery points and 1,400 interconnection points implement the flow of gas across the United States.**
- **Nearly three dozen hubs or market centers provide addition interconnections.**
- **400 underground natural gas storage facilities increase the flexibility of the system.**
- **49 locations enable natural gas to be imported or exported via pipelines.**
- **There are 11 LNG import facilities and100 LNG peaking facilities (stored gas held for peak demand periods).**
- **More than 1,300 local distribution companies deliver natural gas to retail customers.**

Source: EIA

through their systems. SCADA is a centralized communication system that collects, assimilates and manages the meter and compressor station data. SCADA also conveys this information to the centralized control station, allowing pipeline engineers to know what is happening on the system at all times.

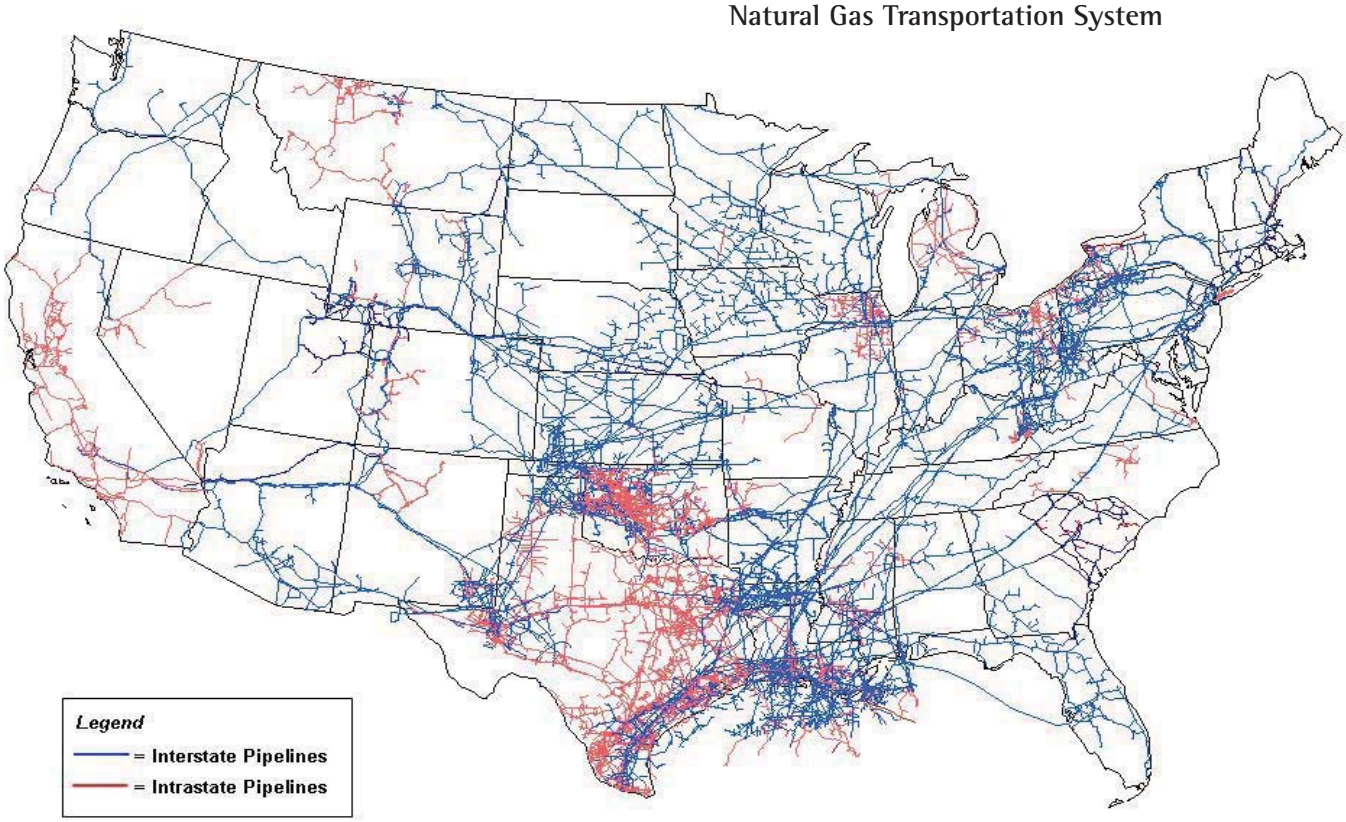
As the product moves closer to the consumption areas, it may be stored in underground facilities. Plentiful storage capacity adds flexibility to the pipeline and distribution systems and helps moderate prices by providing an outlet for excess gas during periods of low demand, and readily accessible supply in periods of high demand. Some natural gas can also be stored in the pipelines as linepack, in which more molecules of gas are held in a segment of pipeline under greater-than-normal pressure.

Hubs

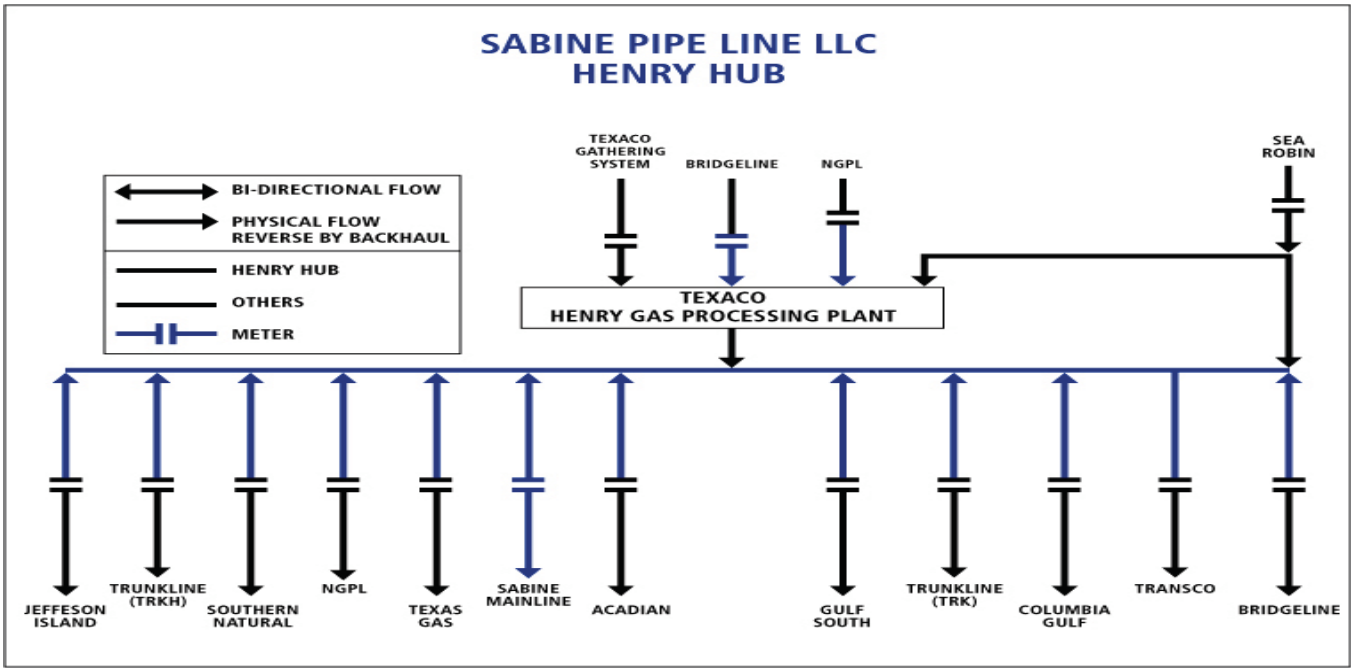
A key part of the pipeline distribution network is the natural gas hub. Typically, a hub is a specific point where pipeline interconnections allow the transfer of gas from one pipeline to another.

There are dozens of natural gas hubs in the country, with about 20 considered major hubs. Henry Hub is the dominant benchmark point in the physical natural gas market because of its strategic location in the Gulf Coast's producing area and the number of pipeline connections to the East Coast and Midwest consumption centers. It sits in southcentral Louisiana, in the town of Erath, where more than a dozen major natural gas pipelines converge and exchange gas. The Henry Hub has 12 delivery points and 4 major receipt points.

Natural Gas Transportation System



Source: Energy Information Administration, Office of Oil & Gas, Natural Gas Division, Gas Transportation Information System



Gas as a physical product can be bought and sold at Henry Hub or other hubs around the country in daily and monthly markets. In addition, the New York Mercantile Exchange (Nymex) established a futures contract centered at the Henry Hub in 1990 that gained widespread acceptance and is generally used as the reference price for natural gas in the United States.

Distribution lines typically take natural gas from the large transportation pipelines and deliver the gas to retail customers. While some large consumers – industrial and electric generation, for example – may take service directly off a transmission pipeline, most receive their gas through their local gas utility, or local distribution company (LDC). These companies typically purchase natural gas and ship it on behalf of their customers, taking possession of the gas from the pipelines at local citygates and delivering it to customers at their meters. This distribution involves a network of smaller pipelines – more than two million miles, according to the U.S. Department of Transportation.

FERC Jurisdiction

The NGA, 15 U.S.C. § 717, et seq., requires that natural gas companies charge just and reasonable rates for the transportation and sale of natural gas. To promote compliance with this mandate, the NGA requires gas pipelines to file rate schedules with the FERC and to notify the FERC of any subsequent changes in rates and charges. On submission of a tariff revision, the FERC may hold a hearing to determine whether the pipeline has met its burden to show that the amended rates and charges are just and reasonable.

Under Sections 4 and 5 of the NGA, 15 U.S.C. §§ 717c and 717d, the Commission regulates the rates and other terms of jurisdictional sales and transportation, ensuring that rates and charges for such service, as well as all rules, regulations, practices, and contracts affecting those rates and charges, are just and reasonable and not the product of undue discrimination. 15 U.S.C. §§ 717c(a) and (b).

Pipeline Services

Customers or shippers have a choice between two general types of service on interstate pipelines. The first is firm transportation capacity, or primary market service, in which an agreement is executed directly between the pipeline and a customer for a year or more, relying on primary receipt and delivery points. Firm transportation service is not bumped for other classes of service, and it receives the same priority as any other class of firm service.

The second type of transportation service a shipper can contract for is interruptible transportation service. Interruptible transportation service is offered to customers under schedules or contracts on an as-available basis. This service can be interrupted on a short notice for a specified number of days or hours during times of peak demand or in the event of system emergencies. In exchange for interruptible service, customers pay lower prices.

A secondary market for firm transportation rights enables shippers to sell their pipeline capacity to a third party through the FERC's capacity release program. Services offered in the primary market can be offered in the secondary market by the holder of the primary service. Released capacity offers market participants the opportunity to buy and sell from each other as well as from the pipeline. This can be broken down into segments: holders of primary capacity can release segments rather than their full holdings, provided segmentation is operationally feasible on the interstate pipeline's system.

Interstate pipelines also provide "no-notice service" under which firm shippers may receive delivery up to their firm entitlements on a daily basis without penalty. If a shipper has firm storage and transportation service, that shipper can schedule in the day-ahead market and yet have the ability and the right to physically take a different quantity than what was scheduled without incurring imbalance penalties. No-notice service is particularly valuable during periods of high demand when transportation capacity may be completely used. This service is especially helpful to LDCs that must serve their load without knowing their exact load level each day. No-notice service is generally priced at a premium to firm transportation service. Shippers may temporarily release this service to other parties, using FERC-approved capacity release guidelines.

Interstate Transportation Rates

Pipeline transportation rates can be priced on zones or miles, or be a fixed postage stamp rate. In zonal pricing, the price of transportation varies by the location of the receipt and delivery points, across a series of zones.

Under postage stamp rates, shippers pay the same rate for transportation regardless of how far the gas is moved, similar to the way a postage stamp costs the same amount regardless of whether a letter is sent to New York or California. Pipelines using postage stamp rates include Northwest Pipeline, Colorado Interstate Gas and Columbia Gas Transmission.

With mileage-based rates, shippers pay based on the distance between where the gas enters the pipeline and where it is taken out of the pipeline. The rate is designed to reflect the distance involved in transporting the gas. Gas Transmission Northwest (GTN) uses mileage-based rates.

Other pipelines use hybrid or mixed-rate systems. Northern Natural Gas, for example, uses a combination zonal rate for upstream receipts and a postage stamp rate for market area deliveries.

Scheduling

Pipelines have rigorous schedules that shippers must follow. Typically, shippers nominate gas in the day-ahead market,

and may update their nominations at various points during the day in which the natural gas flows (see Pipeline Capacity Scheduling graphic below).

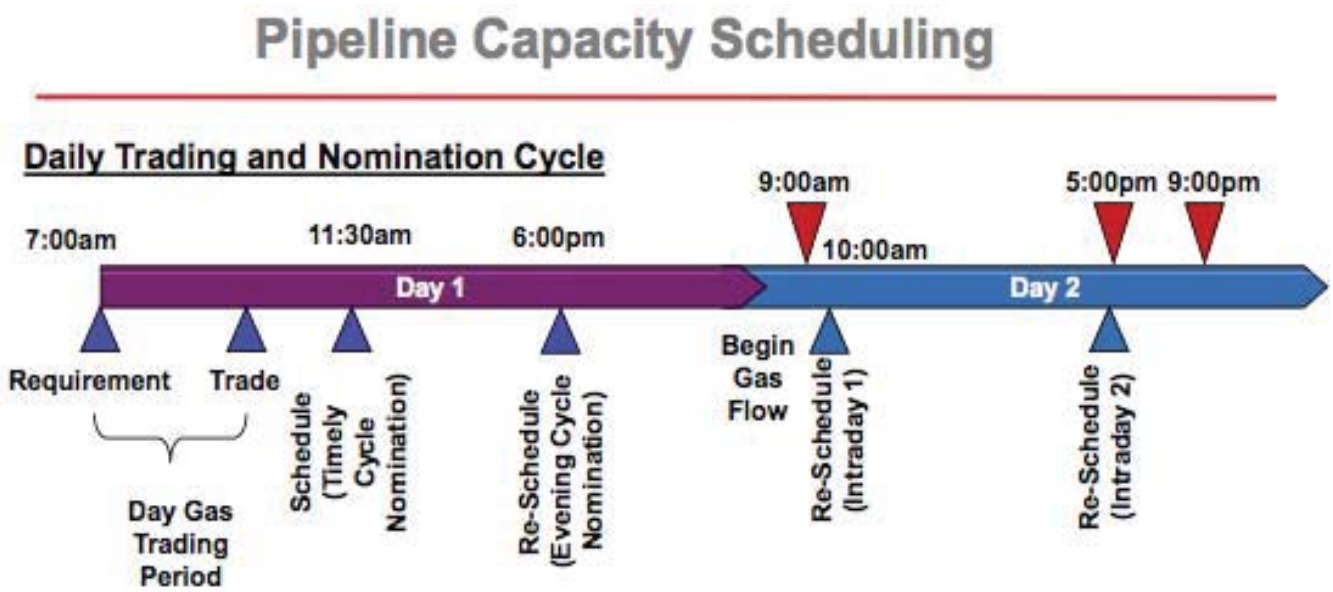
Pipeline Usage or Load Factor

Load factor measures the use of a pipeline network. It is the average capacity used at a given point or segment relative to a measurement of maximum or peak available capacity. Customers with a 100 percent load factor use their maximum capacity every day; one with a 50 percent load factor uses its capacity only half the time. Different types of customers use pipeline capacity differently. Historically, industrial customers have exhibited high load factors and residential customers that primarily rely upon seasonal gas to heat homes have had lower load factors.

Pipelines are accustomed to serving different demands, which can affect how much of their capacity is used at various times. For example, Kern River Gas Transmission has operated at around 93 percent of capacity since 2005, while Algonquin Gas Transmission's capacity factor is considerably less. Algonquin's pipeline is used more seasonally than Kern River's, reflecting the seasonal demand in the Northeast.

Park and Loan Service

Park and loan service (PAL) is a way for shippers to balance their takes of gas with their supply, by providing a short-term load-balancing service to help shippers meet their load. Using the PAL service, shippers can take less gas than scheduled, thus parking their excess supply in the pipeline



Cycle	Cycle Description
T	Timely Nominations sent by 11:30 AM and to the Pipeline by 11:45 AM to be effective at 9 AM next gas day
E	Evening Nominations sent by 6 PM and to the Pipeline by 6:15 PM to be effective 9 AM the next day. This is the cycle used for reporting on today's flow before the I2 cycle data is available.
I1	Intraday 1 nominations sent by 10 AM and to the Pipeline by 10:15 AM to be effective at 5PM the same day
I2	Intraday 2 nominations sent by 5 PM and to the Pipeline by 5:15 PM to be effective at 9 PM the same day. This is the cycle used for most Pipe2Pipe reporting purposes.

at times when the demand is lower than anticipated. If demand is higher than expected, shippers can adjust their take upward, in effect borrowing gas from the pipeline.

PAL characteristics include:

- Park and loan services typically generate low revenue and are offered with the lowest service level priority among all pipeline services.
- Rates are based on costs associated with providing the services, such as plant costs if the services are offered.
- Market centers, or hubs, routinely offer these services.
- Charges are usually commensurate with interruptible service rates.
- Pipelines earn minimal revenue from park and loan.

Pipeline Constraints and Capacity Growth

Pipeline capacity limits the supply that can be delivered to a specific region and is, therefore, a key factor in regional prices.

In recent years, the natural gas pipeline network has expanded significantly, removing bottlenecks and providing access to previously unreached supply areas.

A considerable amount of new pipeline capacity has been added in recent years to the Northeast. In 2008 and 2009, the region added 5.6 Bcfd in pipeline capacity. In 2010, it added another 1.2 Bcfd. Much of this new capacity was targeted at improving access to shale gas.

One of the largest additions to the natural gas infrastructure came with the completion of the 1.8-Bcfd Rockies Express Pipeline (REX) that moves natural gas from Wyoming to eastern Ohio. REX serves the dual role of relieving pipeline constraints that bottled up production in the Rockies and depressed prices there, while at the same time relieving constraints that increased prices in the East. Increased gas flows from the Rockies over REX, coupled with new shale supplies, have reduced prices in the Midcontinent and Northeast.

Meanwhile, Rockies producers saw a rise in prices. The Rockies gas flowing eastward displaced gas from the Permian Basin. The Permian gas, in turn, began moving to the Southern California market. Consequently, regional price differences moderated.

Other smaller projects had similar effects. New pipelines to increase the flow of Barnett Shale gas into the interstate network have had a secondary effect of reducing congestion across the Texas-Louisiana border.

The Florida Panhandle and Northern California used to be some of the most frequently constrained regions of the country, but each has received significant new pipeline capacity. Expansion of Florida Gas Transmission in 2011 added about 800 MMcfd, a boost of 33 percent, of gas transmission capacity to peninsular Florida. The 680-mile, 42-inch-diameter Ruby Pipeline, which began operations in 2011, now flows Rockies gas from Opal, Wyo., to Malin, Ore.

Local Distribution

Distribution lines typically take natural gas from the large interstate pipelines and deliver the gas to retail customers. While some large consumers – industrial and electric generators, for example – may take service directly off an interstate pipeline, most receive their natural gas through their LDC. LDCs typically purchase natural gas and ship it on behalf of their customers. They take possession of the natural gas from interstate pipelines at local citygates and deliver the natural gas to their customers at the customer's meter. According to the United States Department of Transportation's Pipeline and Hazardous Materials Safety Administration, this distribution involves a network of

smaller pipelines totaling more than two million miles, as well as smaller scale compressors and meters.

Some states allow competition in natural gas service at the local level. In these circumstances, natural gas marketers purchase the natural gas and arrange for it to be shipped over both the interstate pipeline network and the local distribution pipeline system.

Storage

Natural gas production remains relatively unchanged day-to-day throughout the year, and recently has been around 60 Bcfd. Demand, however, changes considerably with the seasons. Natural gas storage enables producers and purchasers to store gas during periods of relatively low demand – and low prices – then withdraw the gas during periods of relatively higher demand and prices.

Typically, the amount stored or withdrawn is the difference between demand and production. This differs from storage capacity – the maximum amount that can be stored at any point in time. Working gas storage capacity, as tracked by EIA, is more than 4,100 Bcf. Gas may be stored in underground facilities. Storage capacity adds flexibility to pipeline and distribution systems and helps moderate prices by providing an outlet for excess gas during periods of low demand. Storage facilities also provide a readily accessible supply in periods of high demand. Some natural gas can also be stored in the pipelines as linepack, in which more molecules of gas are held in a segment of pipeline under greater-than-normal pressure.

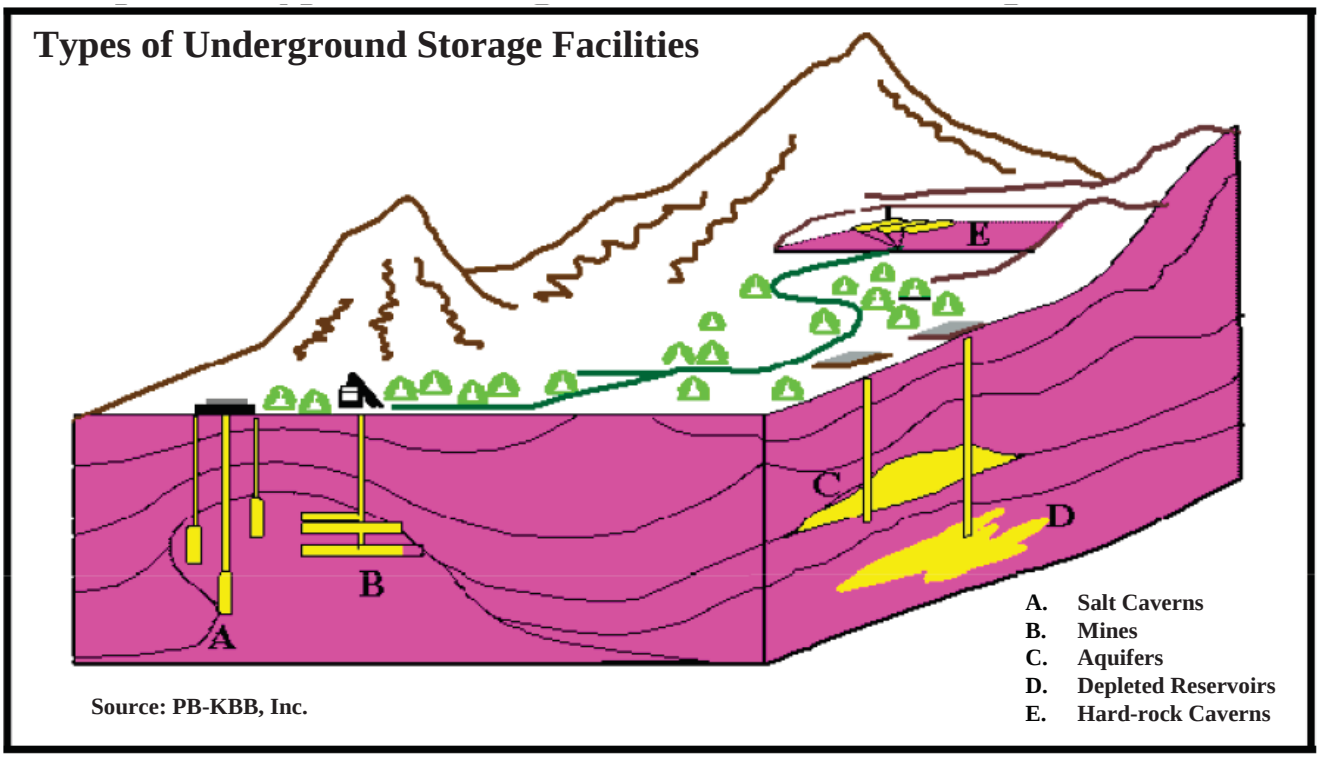
EIA's weekly storage report provides a low-resolution snapshot of the natural gas supply and demand balance. EIA releases its storage report at 10:30 a.m. on Thursdays. The price for natural gas futures can change dramatically within seconds when the report comes out. If the reported injection or withdrawal significantly differs from market expectations, the price for natural gas futures may rise or fall.

Storage Facilities

The bulk of the storage capacity in the United States is below ground; differing cost and operational characteristics affect how each facility is used:

- Deliverability rate is the rate at which inventory can be withdrawn. The faster the natural gas can be removed from storage, the more suitable the storage facility is to helping serve rapidly changing demand.
- Cycling capability is the ability of the resource to quickly allow injections and withdrawals, which is useful for balancing supply and demand. Salt caverns tend to have high withdrawal and injection rates, enabling them to handle as many as a dozen withdrawal and injection cycles each year. LNG storage also demonstrates these capabilities.

Natural gas in an underground storage facility is divided into two general categories, working gas and base gas. Base gas is the volume of natural gas, including native gas, needed as a permanent inventory in a storage reservoir to maintain adequate reservoir pressure and deliverability rates throughout the withdrawal season. Working gas is the volume of gas in the reservoir above the designed level



of base gas and that can be extracted during the normal operation of the storage facility.

Most of the nation's gas storage is in depleted reservoirs (former oil and gas fields). These facilities reuse the infrastructure – wells, gathering systems and pipeline connections – originally created to support the field when it was producing. About 50 percent of total capacity goes to base gas used to maintain operating pressure at the facility, and inventory usually turns over once or twice a year.

Other storage facilities reside in aquifers that have been transformed into gas storage facilities. These are mostly in the Midwest. These aquifers consist of water-bearing sedimentary rock overlaid by an impermeable cap rock. Aquifers are the most expensive type of natural gas facility because they do not have the same retention capability as depleted reservoirs. Therefore, base gas can be well over 50 percent of the total gas volume. This makes the facility more sensitive to withdrawal and injection patterns, so inventory usually turns over just once a year.

Salt cavern formations exist primarily in the Gulf Coast region. These air- and water-tight caverns are created by removing salt through solution-mining, leaving a cavern that acts as a pressurized vessel. Little base gas is required, which allows inventory to turn over as many as a dozen times during the year, and results in high injection and withdrawal rates. This flexibility has attracted new development, resulting in salt cavern storage growth over the past decade. Salt caverns generally hold smaller volumes than do depleted-reservoir or aquifer gas storage facilities.

Natural gas may also be stored in above-ground tanks as LNG. There is LNG storage at all of the onshore LNG-receiving terminals, and there are about a hundred stand-alone LNG storage facilities in the United States, as well. Occasionally, LNG ships also provide storage. LNG storage

is highly flexible, allowing multiple inventory turns per year with high injection and withdrawal rates.

Regional Storage

For storage purposes, the EIA has divided the United States into three regions: producing, East and West. Just over half of the underground storage in the United States, 2,200 Bcf, sits in the East, near population centers. Much of this is in aquifers and depleted fields. Almost 1,300 Bcf sits in the producing region, which has not only depleted fields but also the greatest concentration of more-flexible salt cavern storage. The remaining 550 Bcf is in the West, primarily in depleted fields. Of this total working gas capacity of more than 4,100 Bcf, at the begining of winter there will be 3,900 Bcf or more of gas injected into storage, making it about 95 percent full as the winter heating season begins.

Storage Service and Uses

Approximately 120 entities – including interstate and intrastate pipeline companies, LDCs and independent storage service providers – operate the nearly 400 underground storage facilities active in the continental United States, the EIA says. Facilities operated by interstate pipelines and many others are operated on an open-access basis, with much of the working gas capacity available for lease on a nondiscriminatory basis.

The ability to store large quantities of natural gas improves reliability and usually has a moderating influence on natural gas prices. Storage inventory augments gas supply during the winter, but acts as an additional demand component during the summer injection season. The storage injection season typically starts April 1 and continues through Oct. 31, when demand for gas heating is lowest. Storage withdrawals generally start in November and last throughout the winter.

The ability to use storage to provide for winter peaks creates an intrinsic storage value. This is the value from buying during cheaper periods of the year for use during higher-cost seasons. Depleted reservoirs or aquifers – with limited ability to turn over inventory – support this type of use. Local distribution companies or pipelines store their gas in these facilities to ensure adequate supplies for peak seasons, balance load and diversify their resources.

Storage may be priced at cost-based or market-based rates. Pricing mechanisms for low-cycling depleted fields and aquifers may use a traditional cost-of-service structure, including:

- capacity charges for firm contract rights to physical storage capacity;
- deliverability charges for transportation to and from the storage facility;

- withdrawal charges for the removal of gas from storage; and
- injection charges for the injection of gas into storage.

A salt cavern, with its ability to turn over inventory frequently and quickly, allows for additional uses, enabling users to capture extrinsic value. Many salt dome facilities can cycle between injection and withdrawal at almost a moment's notice, giving users greater flexibility. Entities leasing storage capacity may move gas in and out of storage as prices change in attempts to maximize profits or minimize costs. Storage may be a component in producer or consumer hedging strategies, helping them to manage the risk of price movements. Further, storage helps shippers avoid system imbalances and associated penalties, and supports swing gas supply services, which are short-term contracts that provide flexibility when either the supply of gas from the seller, or the demand for gas from the buyer, are unpredictable. Storage also facilitates title transfers and parking and lending services – interruptible service by which the customer injects or withdraws gas for a short period of time, usually a month. This helps shippers balance daily receipts and deliveries, manage their overall supply portfolio or take advantage of price movements. Consequently, storage operators have begun offering a more varied menu of services, and users have begun using storage as a commercial tool and as part of a comprehensive supply portfolio strategy.

Merchant storage, frequently using salt caverns, uses market-based prices, recognizing the dynamics affecting value at any given point in time. Prices often take into account the prices at which the Nymex futures contracts are trading. They may also reflect the storage volume, the number of times the gas will be cycled, the length of the contract and the timeframe it covers and the maximum daily quantity that may be injected or withdrawn. Energy marketers have increasingly used these facilities as they try to profit from price volatility. It is also attractive to shippers, industrial consumers with uncertain loads and gas-fired generators whose needs change rapidly.

Pipelines also offer storage service, both firm and interruptible, as part of their open access transportation service under FERC rules. Rates are rarely market-based. Instead, prices are based on cost of service, with rates containing reservation and usage components for firm service and a usage component for interruptible.

Market Effects

Storage can mitigate large seasonal price swings by absorbing natural gas during low demand periods and making it available when demand rises.

Further, storage levels can affect the market's expectations about prices during the coming winter high-demand season. The amount of gas in storage in November is a key benchmark of the gas industry's ability to respond to changes in winter weather. Higher storage levels tend to reduce forward prices; lower storage levels tend to increase them, all other market conditions being equal.

FERC Jurisdiction

The underground storage of natural gas has historically been critical in assuring that the needs of natural gas customers are met. The Energy Policy Act of 2005 added a new section to the Natural Gas Act stating that the Commission may authorize natural gas companies to provide storage and storage-related services at market-based rates for new storage capacity, even though the company cannot demonstrate it lacks market power. To make this authorization, the FERC must determine that market-based rates are in the public interest and are needed to encourage the construction of the capacity and that customers are adequately protected.

Natural Gas Pricing and Trading

The natural gas industry in the United States is highly competitive, with thousands of producers, consumers and intermediate marketers. Some producers have the ability to market their natural gas and may sell it directly to local distribution companies (LDCs), to large industrial buyers and to power plants. Other producers sell their gas to marketers who aggregate natural gas into quantities that fit the needs of different types of buyers and then transport the gas to their buyers.

Most residential and commercial customers purchase natural gas from a LDC. In contrast, many industrial customers and most power plants have the option to purchase natural gas from a marketer or producer instead of from the LDC, thereby avoiding any LDC charges.

Interstate pipelines do not buy and sell natural gas and are limited to providing transportation services only, including storage. As noted, interstate pipelines transport natural gas at rates approved by the FERC.

Natural Gas Marketers

Most gas trading in the United States is performed by natural gas marketers. Any party engaging in the sale of natural gas can be termed a marketer; however, marketers are usually specialized business entities dedicated solely to transacting in the physical and financial energy markets. It is commonplace for natural gas marketers to be active in a number of energy markets, taking advantage of their knowledge of these markets to diversify their business.

Marketers can be producers of natural gas, pipeline marketing affiliates, LDC marketing affiliates, independent marketers or large-volume users of natural gas. Some marketing companies may offer a full range of services, marketing numerous forms of energy and financial products, while others may be more limited in their scope. For instance, most marketing firms affiliated with producers do not sell natural gas from third parties; they are more concerned with selling their own production and hedging to protect their profit margin from these sales.

There are five classifications of marketing companies: major nationally integrated marketers, producer marketers, small geographically focused marketers, aggregators and brokers.

The major nationally integrated marketers offer a full range of services, and market numerous different products. They operate on a nationwide basis, and have large amounts of capital to support their trading and marketing operations. Producer marketers are those entities generally concerned with selling their own natural gas production or the production of their affiliated natural gas production company. Smaller marketers target particular geographic areas and specific natural gas markets. Many marketing entities affiliated with LDCs are of this type, focusing on marketing gas for the geographic area in which their affiliated distributor operates. Aggregators generally gather small volumes from various sources, combine them and sell the larger volumes for more favorable prices and terms than would be possible selling the smaller volumes separately. Brokers are a unique class of marketers in that they never take ownership of natural gas themselves. They simply act as facilitators, bringing buyers and sellers of natural gas together.

All marketing companies must have, in addition to the core trading group, significant backroom operations. These support staff are responsible for coordinating everything related to the sale and purchase of physical and financial natural gas, including arranging transportation and storage, posting completed transactions, billing, accounting and any other activity that is required to complete the purchases and sales arranged by the traders.

In addition to the traders and backroom staff, marketing companies typically have extensive risk-management operations. The risk-management team is responsible for ensuring that the traders do not expose the marketing company to excessive risk.

Market Hubs

Natural gas is priced and traded at different locations throughout the country. These locations, referred to as market hubs, exist across the country and are located at the intersection of major pipeline systems. There are more than 30 major market hubs in the United States, the principal one of which is known as the Henry Hub, located at Erath, in southern Louisiana. The price at which natural gas trades differs across the major hubs, depending on the supply and demand for natural gas at that particular point. The difference between the Henry Hub price and another hub is called the location differential, or basis. In addition to market hubs, other major pricing locations include citygates. Citygates are the locations at which distribution companies receive gas from a pipeline. Citygates at major metropolitan centers can offer another point at which natural gas is priced.

The most important market hub and pricing point in the United States is the Henry Hub, which is run by Sabine Pipe Line LLC and is a major intersection of pipelines. It has 12 delivery points and 4 major receipt points, all at that one hub, making it a crossroads for significant amounts of gas moving to locations across the country. The Henry Hub is also the delivery point for the New York Mercantile Exchange (Nymex) natural gas futures contract. Changes in price at Henry Hub provide a good indicator of how prices are generally changing across the country.

Basis usually reflects the variable cost to transport gas between Henry and another hub. Basis can change, sometimes dramatically, depending on local market conditions, and can widen considerably when pipelines between two points are congested. Basis in excess of transportation costs results from pipeline constraints and lack of pipeline competition. The gas price at a hub in Florida, for example, would be the price at Henry Hub and the basis to the Florida hub.

Physical Trading

Physical trading contracts are negotiated between buyers and sellers. There are many types of physical trading contracts, but most share some standard specifications, including specifying the buyer and seller, the price, the amount of natural gas to be sold (usually expressed in a volume per day), the receipt and delivery point, the tenure of the contract (usually expressed in number of days beginning on a specified day) and other terms and conditions. The special terms and conditions usually outline such things as the payment dates, quality specifications for the natural gas to be sold and any other specifications agreed to by both parties.

Physical contracts are negotiated between buyers and sellers over the phone or executed on electronic bulletin boards and e-commerce trading sites.

There are three main types of physical trading contracts: swing contracts, baseload contracts and firm contracts:

- Swing (or interruptible) contracts are usually short-term contracts, and can be as short as one day and are usually not longer than a month. These contracts are the most flexible, and are usually put in place when either the supply of gas from the seller, or the demand for gas from the buyer, are unreliable.
- Baseload contracts are similar to swing contracts. Neither the buyer nor seller is obligated to deliver or receive the exact volume specified. However, it is agreed that both parties will attempt to deliver or receive the specified volume, on a best-efforts basis.
- Firm contracts are different from swing and baseload contracts in that both parties are legally obligated to either receive or deliver the amount of gas specified in the contract. These contracts are used primarily when both the supply and demand for the specified amount of natural gas are unlikely to change.

Price Discovery

Spot (Cash) Market

The U.S. natural gas marketplace has a highly competitive spot, or cash, market where brokers and others buy and sell natural gas daily. The daily spot market for natural gas is active, and trading can occur 24 hours a day, seven days a week. The map on the next page shows some of the points where natural gas for next-day physical delivery is actively traded on the IntercontinentalExchange (ICE). Some of these points are market centers, where brokers actively trade and prices are established. In addition to these market centers, natural gas is actively traded at many other locations, including segments of individual pipelines and locations where pipelines interconnect with LDCs.

Spot market transactions are normally conducted on electronic exchanges or by telephone, with the buyer agreeing to pay a negotiated price for the natural gas to be delivered by the seller at a specified delivery point. Natural gas spot prices reflect daily supply and demand balances and can be volatile.

Bidweek

The largest volume of trading occurs in the last five business days of a month, known as bidweek. This is the week when producers are trying to sell their core production and consumers are trying to buy for their core natural gas needs for the upcoming month. The core natural gas supply or demand is not expected to change; producers know they will have that much natural gas over the next month, and consumers know that they will require that much natural gas over the next month. The average prices set during bidweek are commonly the prices used in physical contracts.

Index Prices

Frequently the prices in longer-term contracts are indexed to prices that are regularly published in the trade press. Several publications, such as *Gas Daily, Natural Gas Intelligence* and *Natural Gas Week*, survey the market for daily transaction prices that are used to form and publish a daily index that is made available the night before or the morning of the next business day. Many market participants also report their bidweek prices to publications, which convert these prices into monthly locational price indexes that are available on the first business day following the last day of bidweek. These daily and monthly indexes, in turn, are used as the basis for pricing for those firms that do not choose to enter into fixed-price contracts (or are prohibited from using them by state or local regulators).

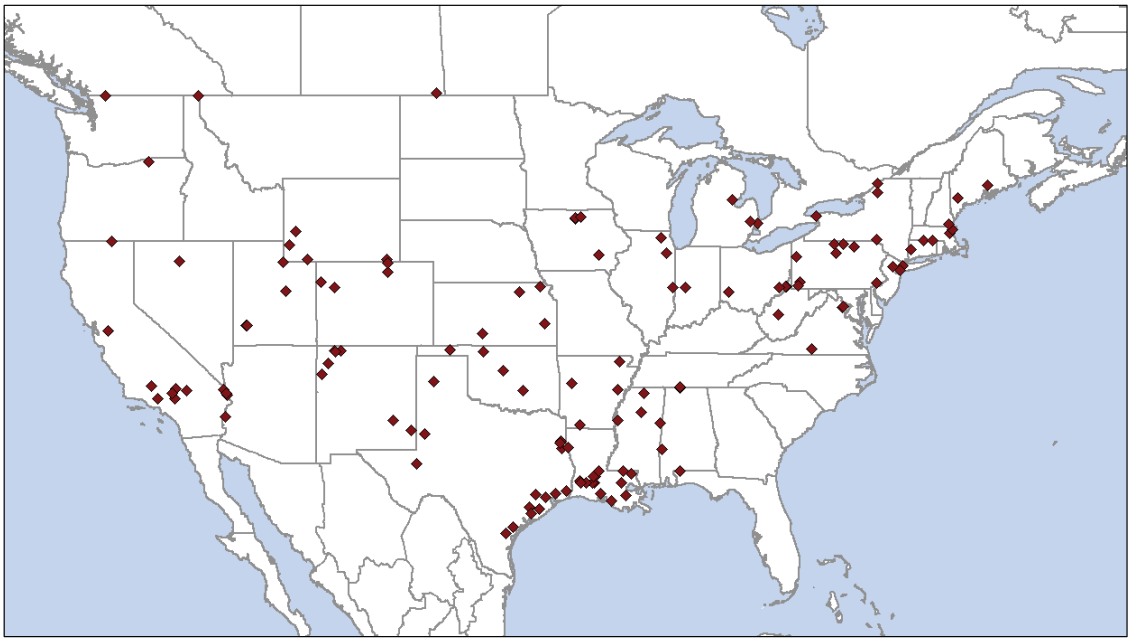
The Financial Market

In addition to trading physical natural gas, there is a significant market for natural gas derivatives and financial instruments in the United States. In the financial market, market participants are interested in profiting from the movement of the price of natural gas rather than delivering or receiving natural gas. The pricing and settlement of these financial products are tied to physical natural gas. It is estimated that the value of trading that occurs on the financial market is at least a dozen times greater than the value of physical natural gas trading.

Derivatives are financial instruments that derive their value from an underlying fundamental – in this case, the price of natural gas. Derivatives can range from being quite simple to being exceedingly complex. Traditionally, most derivatives are traded on the over-the-counter (OTC) market, which is essentially a group of market players interested in exchanging certain derivatives among themselves.

More information on financial markets appears in Chapter 4.

130 Hubs for Physical Trading on ICE



Source: IntercontinentalExchange

3 Wholesale Electric Markets

Overview

Electricity is a physical product – the flow of electrons. It is a secondary energy source in that it results from the conversion of other energy forms such as natural gas, coal or uranium, or the energy inherent in wind, sunshine or the flow of water in a river. It may not be visible, but it can be turned on and off and measured.

Quick Facts: Measuring Electricity

Electricity is measured in terms of watts, typically in kilowatts (1,000 watts) or megawatts (1,000 kilowatts).

A kilowatt (or watt or megawatt) is the amount of energy used, generated or transmitted at a point in time. The aggregation of kilowatts possible at a point in time for a power plant, for example, is its capacity. The aggregation of kilowatts used at a point of time is the demand at that point.

The number of kilowatts used in an hour (kilowatt-hour or kWh) is the amount of electricity a customer uses or a power plant generates over a period of time. Kilowatt-hours are used to bill customers.

Electric markets have retail and wholesale components. Retail markets involve the sales of electricity to consumers; wholesale markets typically involve the sales of electricity among electric utilities and electricity traders before it is eventually sold to consumers. This paper focuses on wholesale markets, although it addresses retail demand and other instances where retail markets strongly influence wholesale markets.

Much of the wholesale market and certain retail markets are competitive, with prices set competitively. Other prices are set based on the service provider's cost of service. For wholesale markets, FERC either authorizes jurisdictional entities to sell at market-based rates or reviews and authorizes cost-based rates.

In competitive markets, prices reflect the factors driving supply and demand – the physical fundamentals. In markets where rates are set based on costs, these fundamentals matter as well. Supply incorporates generation and transmission, which must be adequate to meet all customers demand simultaneously, instantaneously and reliably.

Consequently, key supply factors affecting prices include fuel prices, capital costs, transmission capacity and constraints and the operating characteristics of power plants. Sharp changes in demand, as well as extremely high levels of demand, affect prices as well, especially if less-efficient, more-expensive power plants must be turned on to serve load.

Background

Electricity on Demand

In the United States and other developed countries, consumers expect electricity to be available whenever they need it. Electricity use has grown enormously as consumers now consider not only refrigerators, TVs and hair dryers but also computers, iPods and other electronic devices as necessities. Consumers also expect to pay reasonable prices for the electricity they use.

Meeting these customer expectations is challenging. With few exceptions, electricity cannot be stored, in any appreciable quantities, and thus must be produced as needed. Further, unlike most other markets, electricity's historical inelastic demand does not move with prices. To provide electricity on demand, electric system operations have to be planned and conducted with that goal in mind. Lacking storage and responsive demand, operators must plan and operate power plants and the transmission grid so that demand and supply exactly match, every moment of the day, every day of the year, in every location.

The Drive for Enhanced Value

The electric industry has met this growing demand with increasing efficiency. Between 1929 and 1967, the national average cost of electricity for residential customers plummeted from about 60¢/kWh to 10¢/kWh (in 2005 dollars), and remains around there today. How did the industry achieve such tremendous cost savings and then keep the real price of electricity flat over the past 40 years? Part can be explained by greater efficiency – power plants use less fuel, and new techniques make it cheaper to extract the coal and natural gas that fuels generators. Another part of the answer, though, stems from changes in the way the industry is organized and operated.

Economies of Scale

Electric power is one of the most capital intensive industries. Generation alone can account for roughly 65% of a customer's electric bill. Spreading these relatively fixed costs over more customers helps bring down the cost that each customer pays.

Thomas Edison's first street lighting project in the 1880s grew to electrifying whole neighborhoods, towns and cities. Providing service over larger areas allowed utilities economies of scale in generating technology. The cost per unit of production dropped as power plants grew larger and larger. The companies building these facilities were basically self-contained – they owned and operated the generation, transmission and distribution facilities. Power lines were built from their generation to their population, or load, centers. These companies were vertically integrated.

One downside of larger generating units is that they are difficult to replace if they experience unexpected shutdowns. For a single utility building a new and larger unit, the only way to ensure reliable service is to build two units – creating a capacity reserve. When coal and nuclear unit sizes grew to 500 or 1,000 MW, building two units became very expensive for any individual company.

Reserve Sharing, Interconnection and Power Pools

The solution to high reserve costs was to share reserves with adjacent utilities. Instead of building two large units, utilities could buy from their neighbors in times of need, and cut their costs significantly. To facilitate reserve sharing, utilities built major interconnecting transmission lines large enough to deliver power in case of a major generator outage. Today's bulk power grid began as a way to maintain reliable service while lowering costs.

As more utilities share reserves, the smaller the reserves each

must carry, and the lower the costs. The value of reserve-sharing agreements led to the formation of power pools, the forerunners of today's regional transmission organizations (RTOs).

Coordinating reserves also led to closer coordination of other utility functions, such as the process of determining which generating units to use, called unit commitment. Operators want to commit just enough capacity for the next day to ensure reliability but no more than needed, to minimize costs. This began a new phase of using economies of scale in system operations encompassing whole regions of the country.

Regional coordination also was spurred by special circumstances, particularly in the West. Large federally owned dams on the Columbia and Colorado rivers generate power from the spring runoff of melting mountain snow. When the reservoirs are full and the turbines are spinning, there is not enough local demand to use the power. Since the hydropower was cheaper than any alternative, long distance transmission lines were built to deliver the excess power from the Northwest and Southwest to load centers in California.

With the transmission interconnections in place, northwestern utilities found that they could get cheaper power from southern power generation at other times of the year. These seasonal and regional disparities in availability and price provide for a lively bilateral trading market.

In the 1960s, the electric industry created an informal, voluntary organization of operating staff to aid in coordinating the bulk power system. Then, in 1965, the largest power blackout until that time hit the northeastern United States – including New York – and southeastern Ontario, Canada, affecting 30 million people. The blackout led to the development in 1968 of the National Electric Reliability Council (NERC), shortly thereafter renamed the North American Electric Reliability Council. and nine regional reliability councils. Rather than serving as a pool or other entity for sharing resources, NERC focused on reliability. In 2006, using authority granted in the U.S. Energy Policy Act of 2005, FERC certified NERC as the electric reliability organization for the United States, and reliability standards became mandatory and enforceable.

Optimizing Unit Commitment and Economic Dispatch

The industry also reduced costs by using computers and communication technology to optimize system operations. Utilities use algorithms for optimizing the commitment of their generating units, while RTOs' day-ahead market software does this for suppliers bidding into their markets.

In real time, demand is changing all the time. Without storage and responsive demand, the output of some generators must change to follow constantly changing demand. This

is known as load following. Utilities use economic dispatch to optimize the use of these units and minimize real-time costs.

Economy Energy Trade

Since transmission interconnections were built primarily for the rare need to deliver reserves in emergencies, the industry had excess transmission capacity. This allowed utilities to use the lines to trade power. Major utilities generally owned sufficient capacity to meet their own peak power needs. However, sometimes the cost of operating their marginal generation was higher or lower than that of their neighbors. Transmission availability provided opportunities for utilities to save money by buying energy when it was cheaper than generating and selling energy to utilities with higher costs. This is called economy energy trading.

Evolving Public Policies

Different public policy theories have shaped the electric power industry over its history. All of these public policies are still in play to some extent today. Five concepts that helped shape the electricity industry and markets are outlined below.

Not-for-Profit Utilities

One of the first approaches to ensuring customer value was to depend on nonprofit electric providers. In the early days of the industry, electrification started in towns and cities. In many places, this utility service was provided by the municipal government. The federal government stepped in to develop and market the nation's significant hydroelectric resources. The Depression-era rural electrification program relied on customer-owned rural electric cooperatives and low-interest government loans. There are currently more than 1,700 municipal and almost 900 cooperative utilities in the United States.

Regulated Natural Monopolies

A second model for operating power systems was investor-owned regulated monopolies. In the early days of the industry, while many cities went the municipal route, many investor-owned utilities were also starting up. These private utilities are regulated, typically by a state agency. Initially, they agreed to be regulated to overcome a lack of retail competition, and were granted exclusive service territories (franchise). Today, regulation focuses on mitigating market power, among other things, because many utility functions are seen as natural monopolies.

State regulators approve a utility's investments in generation and distribution facilities, either in advance of construction or afterwards when the utility seeks to include a facility's costs in retail rates. Some states eventually developed elaborate integrated resource planning (IRP) processes to determine what facilities should be built.

Power Pools

Power pools are multilateral arrangements with members ceding operational control over their generating units and transmission facilities to a common operator. Members provided incremental cost data about their units and system status data to the operator. The operator ran an energy management system that used the unit cost data to optimize on a multilateral basis unit commitment and economic dispatch.

PJM began in 1927 for utilities to share their generating resources, forming the world's first power pool. The New York Power Pool was formed in 1966 and the New England Power Pool in 1971 in response to the 1965 Northeast blackout. The Electric Reliability Council of Texas (ERCOT) and the Southwest Power Pool (SPP) formed in 1941 to pool resources for the war effort.

Competition, Part 1: Competitive Generation and Open Access

The environmental movement and initiatives to open the airline and trucking industries to competition also helped shape the energy industry in the 1970s. A provision in President Carter's energy plan led to passage of the Public Utility Regulatory Policies Act of 1978 (PURPA), which ushered in the next era.

PURPA established a program implemented by states and overseen by the FERC to encourage the use of efficient cogeneration (using the heat from industrial or other processes to generate electricity) and small scale renewable generation. FERC's role was to issue regulations for the program and certify that qualifying facilities (QFs) met statutory requirements. States administratively set the price to be paid to these generators at the cost the utilities would avoid by purchasing the power rather than generating it themselves.

Most states set their avoided cost rate so low that they got little QF capacity. However, California, Texas and Massachusetts set very generous avoided cost rates and were overwhelmed with QF capacity, much of which received prices that turned out to be higher than the actual costs avoided by the purchasing utility. The rapid growth and size of the QF industry surprised many policymakers and entrepreneurs, and got them thinking about the viability of generation independent of regulated monopolies.

In 1988, FERC proposed rules to allow states to set their avoided-cost rate based on an auction. Instead of taking all capacity at a set rate, states could set the rate based on bids to supply a certain amount of needed capacity. The Commission also proposed to open the avoided-cost auction up to independent power producers (IPPs) that did not qualify as QFs. In this way, a regulatory program was transformed into a competitive initiative.

Under the regulated monopoly model, utilities owning and operating transmission lines had no obligation to allow others to use them. This posed a significant barrier to the development of an independent power industry. The Commission started conditioning approval in merger cases with the voluntary provision of open transmission access. The Energy Policy Act of 1992 gave the Commission authority to grant transmission access on request. These approaches to open access resulted in patchwork transmission access.

By the mid-1990s, support for opening the transmission grid to all users encouraged the Commission to pursue a generic solution. Order 888 required mandatory open transmission access by all transmitting utilities and a reciprocity provision successfully extended open access to nonjurisdictional entities (municipal, cooperative and federal utilities).

Order 889 addressed matters needed to implement open access. The rule established the Internet-based Open Access Same-Time Information System (OASIS) for posting available transmission capacity and reserving transmission capacity. These rules required significant changes to utility control room operations and limited the ability of companies to share transmission-related information with their own power marketing operating units.

Competition, Part 2: Integrating Markets and Operations – RTOs

Order Nos. 888 and 889 were designed for an industry of bilateral energy markets, in which parties negotiated transactions among themselves. The open-access transmission tariff and rules did not work well for multilateral power pools open to independent power producers. This led to the development of independent system operators (ISO) and, subsequently, regional transmission organizations (RTO). This primer uses RTO to stand for both RTOs and ISOs.

RTOs did more than operate the transmission system and dispatch generation, however. They developed markets in which buyers and sellers could bid for or offer generation. The RTOs used the bid-based markets to determine economic dispatch.

Major parts of the country operate under more traditional market structures, notably the West (excluding California) and the Southeast. Notably, two-thirds of the nation's electricity load is served in RTO regions.

Electricity Demand

Americans use electricity for heat and light, to run machinery and to power a growing number of products such as televisions, radios, computers, hair dryers, cell phones and iPods. This use has been increasing, reaching 3,865 gigawatt-hours (GWh) of electricity in 2008. Demand dropped in 2009 with the recession, but has since regained its upward trend.

Quick Facts: Measuring Electricity

Electric use is described in terms of quantity and time.

The unit of measure of the quantity used is the kilowatt (kW), or 1,000 watts. The maximum number of all the kilowatts used by consumers on an electrical system at a point of time is peak demand.

The amount of electricity a consumer uses over a period of time is described as the number of the kilowatt-hour (kWh) - 1,000 watts working for one hour. Consumers pay based on the number of kWh they consume in a billing period, typically a month.

Source: EIA

The bulk of the electricity generated is sold to consumers, known as end-users or retail customers. Some consumers generate some or all of the power they consume. Some of the electricity sold to retail consumers is generated by integrated investor-owned utilities, federal entities, municipally owned and co-operatively owned utilities that sell the power directly to consumers. The rest of the electricity ultimately consumed by retail customers is bought and sold through wholesale electric markets.

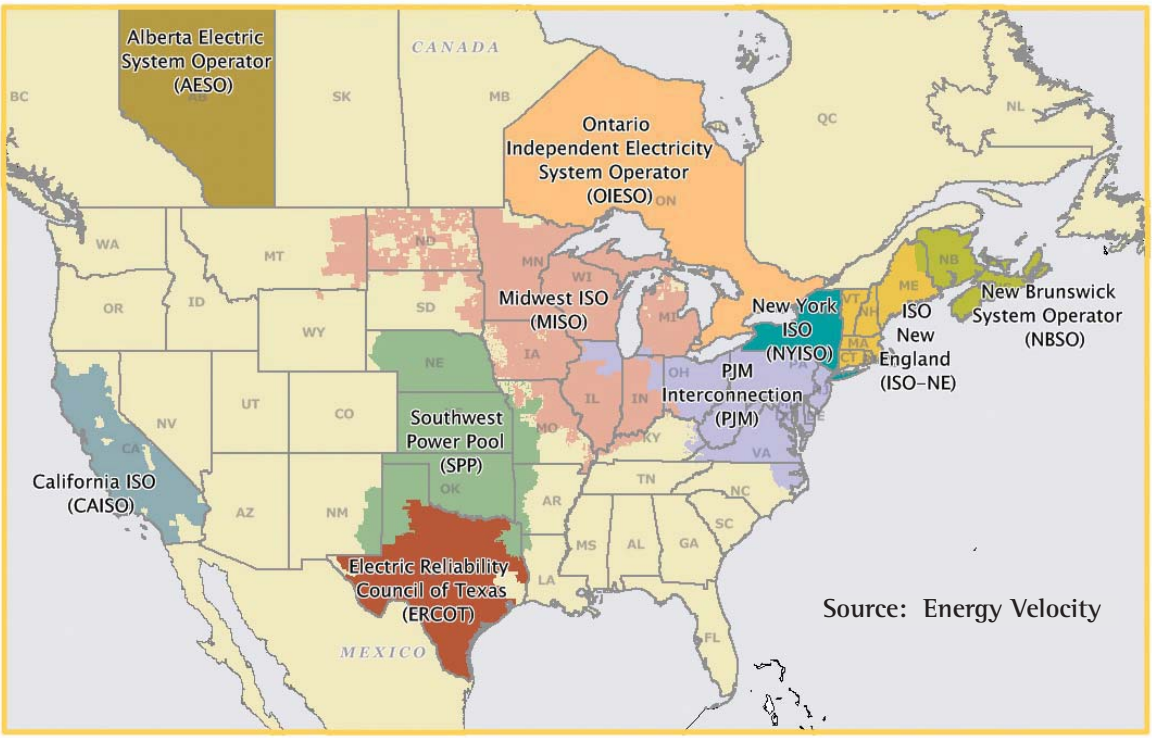
This primer focuses on wholesale markets, which generally involve the sale of electricity to entities that resell the power to retail customers. However, retail consumers' electric use shapes demand and, therefore, the wholesale markets.

Demand Characteristics

Demand is often characterized as baseload or peak. Baseload is demand that occurs throughout the day or throughout the year. Refrigerators, for example, may create baseload demand. Peak load is demand that shows up during part of the day or year, all at the same time – heating or air conditioning, for example.

Demand for electricity follows cycles, throughout the day and year. Regionally, electric demand may peak in either the summer or the winter. Spring and fall are typically shoulder months, with lower peak demand. Seasonal peaks vary regionally, although the highest levels of power load in almost all regions of the United States occur during heat waves and are most acute during the daily peak load hours reached in the late afternoon. However, a minority of regions reach their peak load when the weather is extremely cold. These are primarily areas with significant space-heating requirements and little summer air conditioning load. A majority of these systems are in the far northern areas of

North American Regional Transmission Organizations



the United States, where air conditioning load is not significant. South Florida's seasonal peak also occurs during the winter, when the population and tourism surges and uses more power than native Floridians do in the summer.

Daily demand typically peaks in the late afternoon, as commercial and domestic activities peak, and, in the winter, when lighting needs grow.

Electricity use also varies between weekdays and weekends. Commercial and industrial activities are lower on weekends and peoples' noncommercial activities change with their personal schedules. The load on different weekdays also can behave differently. For example, Mondays and Fridays, being adjacent to weekends, may have different loads than Tuesday through Thursday. This is particularly true in the summer.

Because demand historically has not varied with price and because storage options are limited, generation must rise and fall to provide exactly the amount of electricity customers need. The cost of providing power typically rises as demand grows, and falls as demand declines, so wholesale power prices are typically highest during peaks. Consequently, system planners, power marketers and traders all carefully track weather trends, economic growth and other factors to forecast power demand.

Demand Drivers

In general, the amount of electricity demanded is relatively insensitive to the price of electricity in the short-term (inelastic). One reason for this is that many customers – especially smaller customers – do not get price signals to which they can respond. Most residential customers are billed monthly on a preset rate structure. Large industrial

customers, on the other hand, may receive real-time price signals.

Further, electricity is a necessity to most people and businesses. While they may be able to reduce their demand in the short-term – by turning down the thermostat or turning off lights, for example – electric consumers find it difficult to do without electricity altogether. There is little storage for electricity now and few realistic substitutes. Consequently, demand tends to drive price, especially when the system is stressed.

In the longer-term, options for reducing electricity use include switching to natural gas, installing insulation and implementing other energy efficiency measures. Larger consumers may consider building their own generation facilities.

Governments and businesses are also developing demand-response programs, which provide plans in which customers agree to reduce load in exchange for compensation.

Factors driving demand include demographics, climate and weather, economic activity and policies and regulations.

Demographics

Population levels affect demand, with greater population levels tending to increase electric consumption. Shifts in population also affect regional demand. Population flight in the 1980s from northern industrial regions – the Rust Belt – to warmer climates in the South affected residential consumption patterns. In the 1990s, consumption in the South surpassed that in the Midwest, making it the region with the greatest electric use.

Climate and Weather

Weather is the biggest factor driving demand. General climatic trends drive consumption patterns and therefore the infrastructure needed to ensure reliable service. Cold weather and short days drive winter demand in northern regions. Southern regions rely more on electric space heating, and, thus, see demand rise in the winter, although demand typically peaks in the summer with air conditioning load. In the winter, lighting contributes to the occurrence of peaks during the seasonally dark early morning and early evening hours.

Weather also can have extreme short-term effects on electricity usage. A sudden cold snap can drive heating use up quickly and a heat wave can push air conditioning loads. Other, less obvious weather patterns affect demand – rain and wind, for example, may result in sudden cooling, affecting heating or air conditioning.

Economic Activity

The pattern of socioeconomic life affects the cycle of electric use, with weekends and holidays showing a different pattern than weekdays. Demand typically rises as people wake up and go to work, peaking in the afternoon.

The health of the United States and regional economies also affects power demand. During periods of robust ac-

Quick Facts:
Heating and Cooling Degree Days

In the United States, engineers developed the concept of heating and cooling degree days to measure the effects of temperature on demand. Average daily temperatures are compared to a 65° F standard - those in excess of 65° yield cooling degree days; those below 65° yield heating degree days. A day with an average temperature of 66° would yield one cooling degree day.

tivity, loads increase. Similarly, loads drop during recessions. These changes are most evident in the industrial sector, where business and plants may close, downsize or eliminate factory shifts. In addition to reducing overall demand, these changes may affect the pattern of demand; for example, a factory may eliminate a night shift, cutting baseload use but continuing its use during peak hours. In some cases these effects can be significant.

Energy Policies and Regulations

State regulatory agencies set prices and policies affecting retail customer service. Some states are considering changes that would enable customers to receive more accurate price signals. They include, among other things, changing rate structures so that the rate varies with the time of day, or is even linked to the cost of providing electricity.

Efforts to reduce overall demand by improving energy efficiency are underway through several governmental and utility venues.

Retail Customer Mix

Most electric utilities serve different types of customers: residential, commercial and industrial. Each class uses electricity differently, resulting in a differing load profile, or the amount that each customer class uses and the daily shape of the load. If a consumer uses electricity consistently throughout the day and seasons, his load shape is flat, and the load will be baseload. Another consumer may use more at some times than others, resulting in baseload and peaks. Greater variability in demand is typically more expensive to serve, especially if the peak occurs at the same time other customers' use peaks. Consequently, the mix of customer types affects a region's overall demand.

Residential consumers form the largest customer segment in the United States at approximately 38 percent of electricty demand. Residential consumers use electricity for air conditioning, refrigerators, space and water hearing, lighting, washers and dryers, computers, televisions, cell phones and other appliances. Prices for residential service are typically highest, reflecting both their variable load shape and their service from lower-voltage distribution facilities, meaning that more power lines are needed to provide service to them.

Commercial use is the next largest customer segment at approximately 36 percent, and includes hotels and motels, restaurants, street lighting, retail stores and wholesale businesses and medical religious, educational and social facilities. More than half of commercial consumers' electric use is for heating and lighting.

Industrial consumers use about 26 percent of of the nation's electricity. This sector includes, for example, manufacturing, construction, mining, agriculture and forestry operations. Industrial customers often see the lowest rates, reflecting their relatively flat load structure and their ability to take service at higher voltage levels.

Transportation demand for electricity stems primarily from trains and urban transportation systems. This is less then 1 percent of electricty demand.

Load Forecasting

Demand is constantly changing, challenging grid operators and suppliers responsible for ensuring that supply will meet demand. Consequently, they expend considerable resources to forecast demand. Missed forecasts, where actual demand differs significantly from the forecast, can cause wholesale prices to be higher than they otherwise might have been.

Forecasts are necessary as well for the variety of actions that must occur if sufficient supply is to be available in

the immediate or long term: planning the long-term infrastructure needs of the system, purchasing fuel and other supplies and staffing, for example. Load forecasts are also extremely important for suppliers, financial institutions and other participants in electric energy generation, transmission, distribution and trading.

Load forecasting uses mathematical models to predict demand across a region, such as a utility service territory or RTO footprint. Forecasts can be divided into three categories: short-term forecasts, which range from one hour to one week ahead; medium forecasts, usually a week to a year ahead; and long-term forecasts, which are longer than a year. It is possible to predict the next-day load with an accuracy of approximately 1%-3% of what actually happens. The accuracy of these forecasts is limited by the accuracy of the weather forecasts used in their preparation and the uncertainties of human behavior. Similarly, it is impossible to predict the next year peak load with the similar accuracy because accurate long-term weather forecasts are not available.

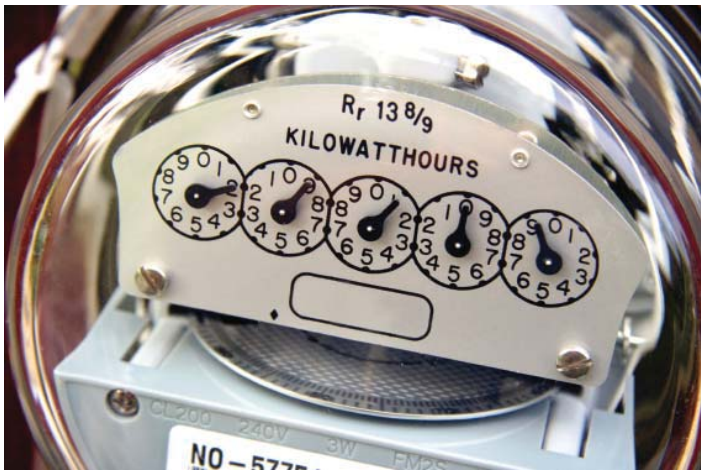
The forecasts for different time horizons are important for different operations within a utility company. Short-term load forecasting can help to estimate transmission system power flows and to make decisions that can prevent overloading of transmission systems. Timely implementation of such decisions leads to the improvement of network reliability and to the reduced occurrences of equipment failures and blackouts. Forecasted weather parameters are the most important factors in short-term load forecasts; temperature and humidity are the most commonly used load predictors.

The medium- and long-term forecasts, while not precise, take into account historical load and weather data, the number of customers in different customer classes, appliances used in the area and their characteristics, economic and demographic data, and other factors. For the next-year peak forecast, it is possible to provide an estimated load based on historical weather observations. Long-term forecasts are used for system infrastructure planning and are meant to ensure that there are sufficient resources available to meet the needs of the expected future peak demand. These forecasts are made for periods extending 10 to 20 years into the future.

Demand Response

Electric demand is generally insensitive to price, meaning that demand does not typically fall significantly when wholesale prices rise. However, some utilities and grid operators are developing ways to stimulate a response from consumers through demand-response programs.

Demand response (DR) is the ability of customers to respond to either reliability or price triggers by forgoing



power use for short periods, by shifting some high energy use activities to other times or by using onsite generation. The programs may use price signals or incentives to prompt customers to reduce their loads. The signals to respond to electric power system needs or high market prices may come from a utility or other load-serving entity, a regional transmission organization (RTO) or an independent DR provider. These programs are administered by both retail and wholesale entities.

DR has the potential to lower systemwide power costs and assist in maintaining reliability. It can be used instead of running power plants or to relieve transmission congestion There can also be environmental benefits because peaking units tend to be costly - and dirty - to run.

Demand response rewards consumers for reducing load during certain market conditions and at specific times. However, it is difficult to measure and quantify this reduction. Measuring and verifying the reduction requires development of consumers' baseline usage, against which their actual use is measured to determine the reduction in the event they are called to lessen their load. An accurate measure of their typical usage is important to prevent (or detect) gaming by participants.

Demand-Response Programs

Programs generally fall into three categories: curtailing, shifting or on-site generation.

Curtailing, or forgoing, involves reducing power use (load) during times of high prices or threats to reliability without making up the use later. For example, residential customers might turn off lights or raise thermostats during hot weather. Commercial facilities may turn off office equipment, lower building lighting or change thermostat settings by a few degrees.

Shifting involves moving or rescheduling high energy-use activities in response to high prices or DR program events to off-peak periods – evenings, nights or weekends. Industrial customers might reschedule batch production processes to evening hours or the next day. Commercial establishments may delay high-energy operations. Residential customers may wait until evening or night to use high-energy consuming appliances, such as clothes dryers or dishwashers. In shifting, the lost amenity or service is made up at a subsequent time.

On-site generation is when some customers may respond by turning on an on-site or backup emergency generator to supply some or all of their electricity needs. Although customers may have little or no interruption to their electrical usage, their net load and requirements from the power system are reduced. The ability to use on-site generation is most common for institutional customers, such as hospitals, large schools or data centers.

DR programs can be further distinguished by whether they are controlled by the system operator (dispatchable) or the customer (nondispatchable). Dispatchable demand response refers to programs that reduce customer energy use, such as direct load control of residential appliances or directed reductions to industrial customers. Dispatchable DR is used for reliability or economic reasons. Nondispatchable demand response lets the retail customer decide whether and when to reduce consumption in response to the price of power. It includes time-sensitive pricing programs based on rates that charge higher prices during high-demand hours and lower prices at other times.

As a result of technology innovations and policy directions, new types and applications of DR are emerging that encompass the use of smart appliances that respond in near real-time to price or other signals. These models may allow customers to respond more easily as they require little customer monitoring or interaction.

Demand Response in Retail Markets

Many states require utilities to use energy efficiency, DR or renewable resources. Energy Efficiency Resource Standards (EERS) in more than half of the states (plus Washington, D.C.) require utilities to achieve electric energy savings; many of these standards include peak load reduction targets. These mandates provide incentives for utilities to reduce customers' energy consumption, such as mechanisms that decouple profits from the amount of electricity sold,

or performance bonuses for utilities that meet or exceed reduction targets.

Some states are implementing dynamic pricing, in which retail rates change frequently to better reflect system costs. Time-based rates depend on advanced meters at customer premises that can record usage. In time-of-use programs, customers are charged different prices at different times, with hours of peak demand costing more than off-peak hours.

In real-time pricing (RTP) programs, customers are charged prices reflecting the immediate cost of power. Industrial or very large commercial customers are often on RTP tariffs.

Critical peak pricing (CPP) uses real-time prices at times of extreme system peak, and is restricted to a small number of hours annually but features prices higher than time-of-use prices during the critical peak. Consumers do not know in advance when a critical peak might be called. A CPP program for residential customers uses a carrot without the stick: critical-peak rebates. Participating customers get rebates on their bills for responding to utility price-signals, but are not penalized if they do not lower use in those hours.

Wholesale Market Programs

Retail programs may aid RTOs, although the RTO may not be able to invoke them or even see specifically the amount of response that occurs. Wholesale-level DR occurs in the RTOs, which differ in how demand-response resources (DRR) may participate in their markets. Some RTOs permit DRR to participate in their markets as voluntary reliability resources. For example, NYISO has an emergency demand-response program, which permits DRR to participate through an aggregator or other interface party, and receive energy payments for providing curtailments when called.

DRR also can participate in wholesale markets as capacity resources and receive advance reservation payments in return for their commitment to participate when called. Resources that fail to perform when called are penalized.

Finally, DRR can bid into RTO day-ahead (DA) markets as energy resources, specifying the hours, number of megawatts and price at which they are willing to curtail. ISOs set minimum bid values – NYISO's program has a $75/MWh floor. In New York, a resource scheduled in the DA market is obligated to curtail, and failure to perform results in a penalty.

Some of the RTO DR comes from individual entities; the rest is accumulated through third-party aggregators, or curtailment service providers (CSPs), who recruit customers too small to participate on their own, such as schools, commercial chains or groups of residential customers. In aggregating small customers, CSPs have increased customer participation in many wholesale reliability and emergency programs. In NYISO's two incentive-based programs, CSPs increased their share of subscribed DRR to 77 percent in 2008 from 44 percent in 2003. CSPs were responsible for more than 60 percent of total DRR capacity, and 70 percent of new DRR in ISO-NE.

Demand-Response Use in Planning and Operations

Different DR programs can be used at various times to support planning and operations (see graphic, page 50). Energy efficiency programs that reduce baseload or peak demand over the long-term are incorporated into system planning. Dispatchable programs that are quickly implemented and targeted for short-term peak reductions – such as direct load control – lie on the other end of the spectrum, and are used in the moment of operation.

Electricity Supply and Delivery

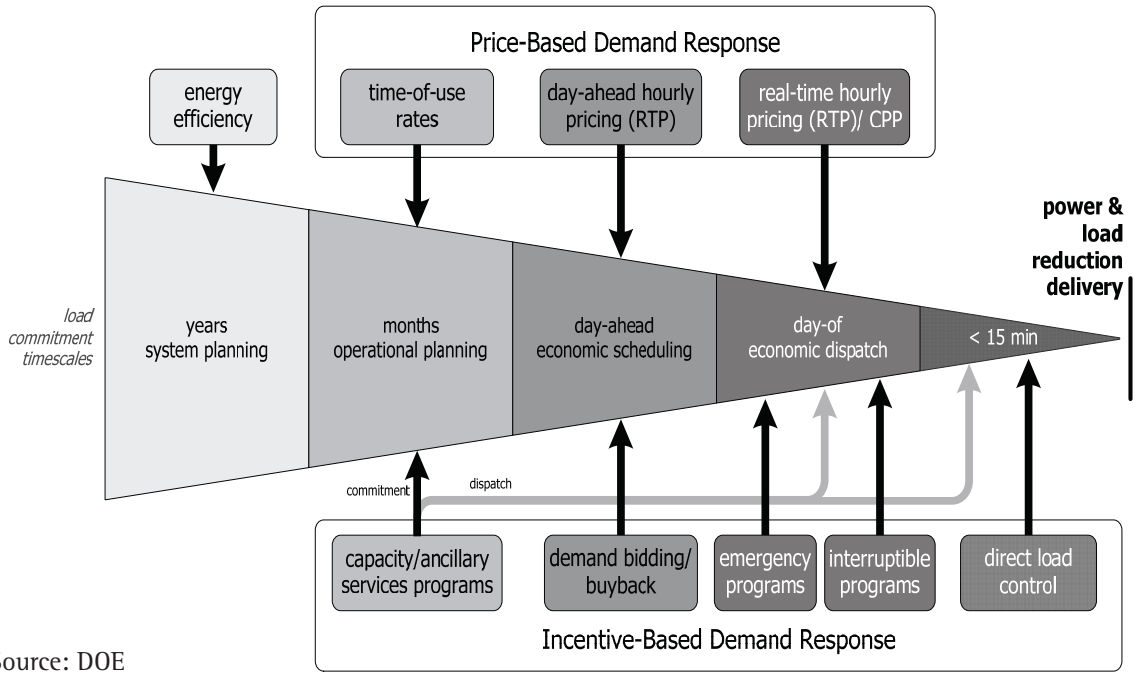
Unlike many other products, electricity cannot be stored in any appreciable quantities. Further, electricity is a necessity for most consumers, whose use responds little to price changes. Finally, electric equipment and appliances are tuned to a very specific standard of power, measured as voltage. Deviations in voltage can cause devices to operate poorly or may even damage them. Consequently, the supply side of the electric market must provide and deliver exactly the amount of power customers want at all times, at all locations. This requires constant monitoring of the grid and close coordination among industry participants.

Electricity service relies on a complex system of infrastructure that falls into two general categories: generation and the delivery services of transmission and distribution. Together, the power generation and high-voltage transmission lines that deliver power to distribution facilities constitute the bulk power system. Transmission and distribution facilities are also referred to as the power grid. These are coordinated and at times operated by a grid coordinator.

Nationally, the grid is split into three main sections – the Western, Eastern and Texas Interconnections. These sections operate independently and have limited interconnections between them.

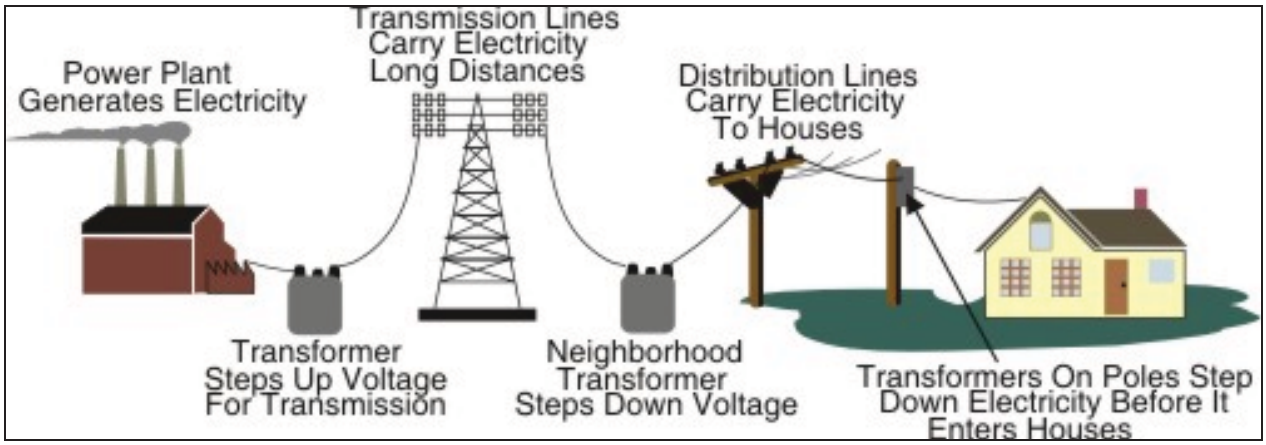
The nation, along with Canada and a small part of Mexico, is also divided into regional entities, (see map, page 51). The regional reliability entities fall under the purview of the North American Electric Reliability Corp. (NERC), which was designated by FERC as the nation's energy reliability organization and which develops standards, among other things, to ensure the grid's reliability. The standards, once issued by FERC, must be met by all industry participants – the standards are mandatory and enforceable. Consequently, the grid is designed and operated to meet these standards.

Demand-Response Program Use in Electric System Planning and Operations



Source: DOE

Electricity Service Schematic



Source: National Energy Education Development Project

NERC's regions include:

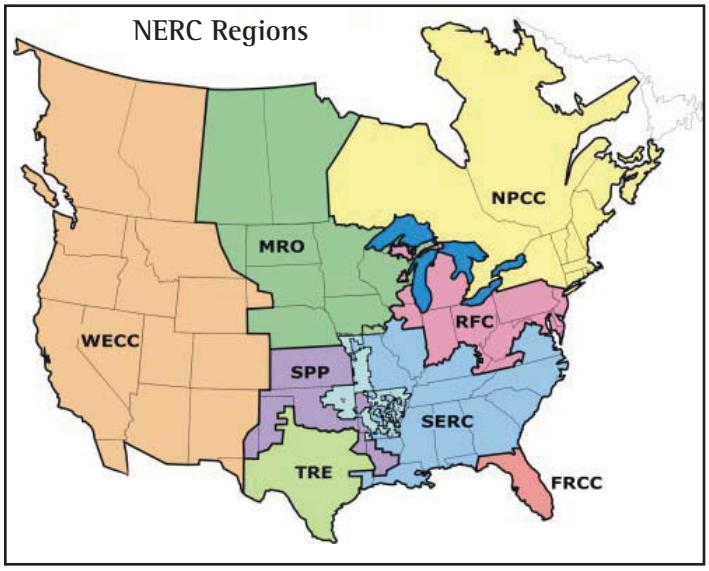
- Florida Reliability Coordinating Council (FRCC),
- Midwest Reliability Organization (MRO),
- Northeast Power Coordinating Council (NPCC),
- Reliability First Corporation (RFC),
- SERC Reliability Corp. (SERC),
- Southwest Power Pool (SPP),
- Texas Reliability Entity (TRE) and
- Western Electricity Coordinating Council (WECC)

Generation

Power generators are typically categorized by the fuel they use and subcategorized by their specific operating technology. The United States has more than 1,000 gigawatts (GW) of total generating capacity. Coal, natural gas and nuclear dominate the power generation market.

Power plants each have differing costs and operational characteristics, both of which determine when, where and how plants will be built and operated.

Plant costs fall into two general categories: capital investment costs, which are amounts spent to build the plant, and operational costs, the amounts spent to maintain and run the plant. In general, there is a trade-off between these expenses: the most capital intensive plants are the cheapest to run – they have the lowest variable costs – and, conversely, the least capital intensive are more expensive to run – they have the highest variable cost. For example, nuclear plants produce vast amounts of power at low variable costs, but are quite expensive to build. Natural gas-fired combustion turbines are far less expensive to build, but are more expensive to run.



Grid operators dispatch plants – or, call them into service – with the simultaneous goals of providing reliable power at the lowest reasonable cost. Because various generation technologies have differing variable costs, plants are dispatched only when they are part of the most economic combination of plants needed to supply the customers on the grid. For plants operating in RTOs, this cost is determined by the price that generators offer. In other areas, it is determined by the marginal cost of the available generating plants.

Construction of different generating technologies is subject to a number of issues, including community concerns, regional emission restrictions and the availability of fuels or other necessary resources:

- Wind plants are generally built in areas with the appropriate meteorological conditions. In most cases, these sites are located in rural areas with limited transmission access. For example, in West Texas, the transmission lines connecting wind farms with consumer centers in Dallas and Houston can become overloaded, requiring generators to curtail production.
- Coal plants have environmental characteristics that limit both their siting and operations. Specifically, they emit NO_x, SO_x, particulates, mercury and substantially higher levels of CO_2 than gas-fired plants. This has made financing these plants and siting them near urban centers difficult.
- There have been virtually no new nuclear plants built in the United States in the past 30 years. The technology of older plant designs became a source of concern following the accident at the Three Mile Island plant in the United States in 1977, the Chernobyl plant meltdown in Ukraine in 1986 and the Japanese earthquake, tsunami and nuclear plant destruction in 2011. New plant designs have been put forward over the past few years and are expected to be very expensive and controversial to build. Further, the disposition of high-level radioactive waste remains an unresolved problem, and the waste remains at plant locations.

Conventional Generation

Natural gas power plants: These feature three major technologies, each with its distinct set of market advantages and limitations. They are steam boilers, gas turbines and combined cycle generators. Natural gas fuels nearly a third of electricity generation.

Steam boiler technology is an older design that burns gas in a large boiler furnace to generate steam at both high pressure and a high temperature. The steam is then run through a turbine that is attached to a generator, which spins and produces electricity. Typical plant size ranges from 300 MW to 1,000 MW. Because of their size and the limited flexibility that is inherent in the centralized boiler design, these plants require fairly long start-up times to become operational and are limited in their flexibility to produce power output beyond a certain range. Furthermore, these plants are not as economical or easy to site as newer designs – which explains why none has been built in recent years.

Gas turbines (GT) are small, quick-start units similar to an aircraft jet engine. These plants are also called simple cycle turbines or combustion turbines (CT). GTs are relatively inexpensive to build, but are expensive to operate because they are relatively inefficient, providing low power output for the amount of gas burned, and have high maintenance costs. They are not designed to run on a continuous basis and are used to serve the highest demand during peak periods, such as hot summer afternoons. GTs also run when there are systemwide shortages, such as when a power line or generator trips offline. GTs typically have a short operational life due to the wear-and-tear caused by cycling. The typical capacity of a GT is 10-50 MW and they are usually installed in banks of multiple units.

Combined cycle power plants (CCPPs) are a hybrid of the GT and steam boiler technologies. Specifically, this design incorporates a gas-combustion turbine unit along with an associated generator, and a heat recovery steam generator along with its own steam turbine. The result is a highly efficient power plant. They produce negligible amounts of SO_2 and particulate emissions and their NO_x and CO_2 emissions are significantly lower than a conventional coal plant. CCPPs, on average, require 80 percent less land than a coal-fired plant, typically 100 acres for a CCPP versus 500 acres for comparable coal plant, and CCPPs also use modest amounts of water, compared to other technologies.

Coal plants: These generate more than one-third of the electricity in the United States. These facilities tend to be large, baseload units that run continuously. They have high initial capital costs and are also somewhat complex in their design and operations. However, coal plants have low marginal costs and can produce substantial amounts of power. Most of the coal-fired plants in the United States are owned by traditional utility companies and located in the Southeast and Midwest.

Oil-fired plants: These play a minor role in U.S. power markets. These facilities are expensive to run and also emit more pollutants than gas plants. These plants are frequently uneconomic and typically run at low capacity factors. Like gas-fired generators, there are several types of units that burn oil; primarily, these are steam boilers and combustion turbines.

Generally, two types of oil are used for power generation: number 2 and number 6 (bunker) fuel oil. Number 2 is a lighter and cleaner fuel. It is more expensive, but because it produces fewer pollutants when burned, it is better for locations with stringent environmental regulations such as major metropolitan areas. Conversely, number 6 fuel oil is cheaper, but considered dirty because of its higher emissions. It is highly viscous (thick and heavy) and it comes from the bottom of the barrel in the refining process.

Nuclear plants. These provide roughly 20 percent of the nation's electricity; there are 104 operating plants with a total capacity of 100 GW. These plants are used as baseload units, meaning that they run continuously and are not especially flexible in raising or lowering their power output. Nuclear plants have high capital and fixed costs, but low variable costs, which includes fuel cost. They typically run at full power for 18 month, which is the duration of a unit's fuel cycle. At that point, they are taken off-line for refueling and maintenance. Outages typically last from 20 days to significantly longer, depending on the work needed.

Following the Three Mile Island plant accident in 1977, there was a cessation in the development of new plants. Most projects under construction in 1977 were finished, albeit with tremendous cost overruns. The last unit built in the United States came online in 1996.

Renewable Generation

Renewable resources use fuels that are not reduced or used

up in the process of making electricity. They generally include biomass, geothermal, hydropower, solar, onshore and offshore wind, hydrokinetic projects, fuel cells using renewables and biogas.

Renewable generation provides a small percent of total U.S. capacity and generation. Even in 2009, when total U.S. electric output fell, average renewable generation grew 12% and wind output grew 28%, spurred by state regulations and federal tax credits. As renewable generation becomes a larger percentage of generation resources, integrating them into the operating power grid has presented challenges.

Capacity: Wind and solar capacity have grown faster than other renewable resources in recent years. Geothermal has more installed capacity than solar, but is growing more slowly. Wind added the second highest amount of capacity after gas-fired generation in 2009 and 2010.

Additions are usually reported in megawatts of nameplate capacity. Actual capability varies from the nameplate for any unit type due to age, wear, maintenance or ambient conditions. But as renewable resources are often weather-dependent, their capacity factors – the ratio of average generation to the nameplate capacity for a specific period – have been much lower (as low as 30 percent) than for fossil-fuel-fired generation. Markets care about the difference between nameplate and capacity factor values when they evaluate capacity available to cover expected load. Prior to sufficient operating experience with a renewable technology, markets usually estimate capacity value conservatively.

Average capacity factors for new renewable resources in early 2010 were 34-35 percent for large wind projects, 74 percent for geothermal, 15-21 percent for commercial solar photovoltaic (PV), 35 percent for concentrating solar power (CSP) without storage (or 43-45 percent with storage technology) and 63 percent for biomass. Capacity factors have risen with technological innovation and improved manufacturing processes.

Characteristics: Wind power is the fastest-growing renewable resource, in part due to earlier cost declines and technology improvements as well as earlier receipt of federal tax credits. A 1.5-MW wind turbine was the most frequently installed size in 2009, although 2.3-MW turbines later became more common. Wind is largely pollution-free and can be located on farms and ranches.

Because the best wind resources are often far from load centers, insufficient transmission presents a challenge to delivering its output. Other market challenges for future wind development include its variable output, which is often inversely correlated to demand (seasonally and daily); system operators' inability to dispatch wind resources to meet load increases; difficulties related to accurately forecasting its ramping; and the need for companion generation (usually fossil-fueled) to be available to balance wind generation when the wind is not blowing.

Geothermal energy taps into reservoirs of steam and hot water deep beneath the earth's surface to produce power. The best resources are in the intermountain West. Geothermal potential is determined by thermal conductivity, thickness of sedimentary rock, geothermal gradient, heat flow and surface temperature. While geothermal power was less than 0.4 percent of U.S. generation in 2009, it was 11 percent of nonhydro renewable output in April 2010. California hosts more than 80 percent of U.S. operating capacity. The five states with the most geothermal capacity in development are California, Nevada, Oregon, Utah and Idaho.

Solar energy transforms sunlight into electricity using one

of two technologies: photovoltaic (PV) or concentrating solar power (CSP). PV modules, or panels, transform sunlight directly into power using silicon wafers or nonsilicon thin-film technologies. They can be installed on roofs of buildings or at ground-level PV farms. CSP plants use a two-step process to transform the sun's energy. First, mirrors direct sunlight towards a receiver that captures the heat. CSP then employs a thermal process to create steam, driving an engine or turbine to produce electricity. CSP plants, which are dispatchable, can include low-cost energy storage that extends their availability later in peak hours.

PV growth has been highly concentrated as a result of state policy incentives: 10 states have 95% of PV capacity; California alone has more than 50 percent. Annual PV additions rose to more than 100 MW beginning in 2006, spurred by tax incentives in the Energy Policy Act of 2005. More recent growth was spurred by falling costs, technology innovation, expanded federal tax benefits and an increase in state policies promoting investment.

In 2010, 432 MW of CSP was operational and 81 MW was under construction. Seven western and southwestern states have extensive CSP potential: Utah, New Mexico, Arizona, Nevada, Texas, California and Colorado. Developing that potential will require overcoming challenges of siting, transmission and the need for extensive water supplies to clean mirrors.

Hydroelectric power is created when the kinetic energy of falling water drives turbine generators, which convert the energy into electricity. There are two types of hydroelectric projects: conventional and pumped storage. Conventional projects, which use a dam in a waterway, can operate in a run-of-river mode, in which water outflow from the project approximates inflow, or in a peaking mode, in which the reservoir is mostly drained to generate power during peak periods when energy is more valuable. Pumped storage

projects use bodies of water at two different elevations. Water is pumped into elevated storage reservoirs during off-peak periods when pumping energy is cheaper; the water is then used to generate power during peak periods as it flows back to the lower elevation reservoir. Pumped storage is the only significant commercially deployed electricity storage technology available today.

Biomass includes many waste byproducts, such as agricultural residues, landfill gas, municipal solid waste and wood resources. The largest biomass category is wood waste, burned for heat and power in the lumber, pulp and paper industries. Challenges to biomass production include impacts on food supplies (for example, converting corn into ethanol), conserving natural resources and minimizing water pollution. State policies on renewable generation differ on eligibility of biomass technologies.

Biogas energy is created through the anaerobic (without oxygen) bacterial decomposition of manure, which is turned into a gas containing 60-70 percent methane. Biogas recovery can be installed at farms anywhere, used to run farm operations and reduce methane emissions from natural manure decomposition.

Renewable Energy Policies

Renewable development is frequently tied to policies promoting their use because of their higher cost relative to other technologies. Financial incentives include tax credits, low-cost loans, rebates or production incentives. Federal funding of research and development (R&D) has played an important role in lowering costs or reducing the time it takes for renewable technologies to become commercially viable.

Congress has passed tax incentives to spur renewable resource investments. Wind, biomass, geothermal, marine and hydrokinetic project developers can receive federal production tax credits (PTC) based on a facility's production. It is an inflation-adjusted credit that runs for 10 years from the date a facility goes online. Initially set at 1.5¢/kilowatt hour (kWh), its value in 2010 was 2.1¢/kWh. To qualify, a facility has to be operational before the PTC expires.

Unlike other renewables projects, solar projects are eligible for a federal investment tax credit (ITC), worth 30 percent of a project's equipment and construction costs. The ITC begins the year a project starts commercial operation and depreciates over five years. The Emergency Economic Stabilization Act (2008), the legislation enacted to help shore up the U.S. financial system, extended the solar ITC for eight years, through 2016. It also expanded both the PTC and ITC to include utilities, which were previously ineligible for these credits. This change created the impetus for a model of utility owned and operated renewable generation, and led to a flurry of project announcements.

Provisions of the American Reinvestment and Recovery Act (ARRA) of 2009 extended the PTC and gave developers new options. It extended the credit for wind to 2012 and for other eligible technologies to 2013, and gave PTC-qualified developers the option to claim the 30 percent ITC on a project-by-project basis for the PTC's current duration.

Due to the economic crisis, ARRA gave developers another option for projects that began construction by the end of 2010 – they could apply for Treasury-administered cash grants, which monetized the ITC's value up front. ARRA funds helped support renewable energy research and development and aided capacity growth in 2009, despite the economic downturn.

State renewable portfolio standards (RPS) and renewable energy standards (RES) have been significant drivers in the growth of investment in renewable generation. An RPS requires a certain percentage of energy sales (MWh) to come from renewable resources. Percentages usually increase incrementally from a base year to an ultimate target. Currently, 29 states plus Washington, D.C., have an RPS and six states have renewable goals without financial penal-

ties for nonachievement. As utilities build more renewable-powered generation, the markets in which they participate continue to address the integration of renewable output into their day-ahead and real-time operations and model expected growth as part of their long-term transmission-planning processes.

To encourage the development of distributed generation (DG), or the production of electricity at the site of consumption, and solar power, 16 states plus Washington, D.C., created RPS carve-outs or set-asides to give an extra boost to these resources, which are not yet cost-competitive with other renewables.

Renewable energy certificates (RECs) allow state regulators to track compliance with mandatory RPS targets or verify progress in voluntary state renewable programs. They also allow compliance entities to purchase credits – subject to state imposed limits on amount and price - if they have not generated or bought enough renewable energy to meet their annual requirements. Each reported megawatt-hour (MWh) of eligible generation results in a system-issued REC with a unique identification number to prevent double-counting. Each REC includes attributes such as generator location, capacity, fuel-type and source, owner and the date when operations began.

States and local utilities offer a variety of financial incentives for renewable energy to complement policy mandates. These include tax credits for in-state manufacture of renewable energy equipment, consumer rebates for purchase and installation of renewable generation or production incentives. Production incentives include extra credits for solar output based on RPS solar set-asides and feed-in tariffs.

Five states, two municipal utilities and Ontario, Canada, adopted or expanded feed-in tariffs (FITs) in 2009 to support their energy and environmental goals. Also called feed-in rates or advanced renewable incentives, these programs typically are designed to encourage development of new small- and medium-sized renewable generation projects by residential and independent commercial developers.

FITs require utilities to buy the renewable generation at a fixed rate that is higher than that provided to other generators, under multiyear contracts. This enables smaller distributed renewable generators to avoid having to participate in renewable portfolio standard (RPS) auctions or other competitive procurements and compensates them for more expensive technologies. The utility passes the costs of the program to its customers.

Transmission

The alternating current (AC) power grid operates like an interconnected web, where, with a few exceptions, the flow of power is not specifically controlled by the operators on a line-by-line basis. Instead, power flows from sources of generation to consumers across any number of lines simultaneously, following the path of least resistance. There are a limited number of direct current (DC) lines, which are set up as specific paths with definite beginning and end points for scheduling and moving power. These lines are controllable by operators and have other characteristics that make them attractive to grid planners and operators, such as providing greater grid stability and lower line losses. However, DC lines cost significantly more than AC lines to construct. Consequently, DC lines are typically built for certain specialized applications involving moving large amounts of power over long distances, such as the Pacific Intertie, which extends between the Northwest and California.

Transmission lines provide a certain amount of resistance to the flow of power as electricity travels through them. This resistance is not unlike the wind resistance that a car must overcome as it travels along a highway. The resistance in power lines creates losses: the amount of power injected

into a power line diminishes as it travels through the line. The amount of these losses is contingent on many factors, but typically equals several percent of the amount put into the system.

Transmission Service

FERC requires that public utilities that own transmission lines used in interstate commerce offer transmission service on a nondiscriminatory basis to all eligible customers. The rates and terms of service are published in each utility's Open Access Transmission Tariff (OATT). One type of service is point-to-point service. This service involves paying for and reserving a fixed quantity of transmission capacity and moving power up to the reservation amount from one location, the point of receipt (POR), to another location, the point of delivery (POD). Depending on availability, customers may purchase point-to-point service for durations of one hour to multiple years. The price for the service is cost-based and published in the OATT. In cases where there are multiple parties desiring transmission, it is allocated to the party willing to purchase it for the longest period of time. Capacity reassignment is the term for the resale of point-to-point transmission capacity in the secondary market.

Transmission holders may want to sell capacity in the secondary market because it is unneeded, or to make a profit. Capacity reassignment has been permitted since 1996. Beginning in 2007, resellers have been permitted to charge market-based prices for capacity reassignments, as opposed to the original cost-based price at which they purchased the capacity. The number of capacity reassignments increased from around 200 in 2007 to almost 32,000 in 2009. Most of the transactions were hourly, although capacity can also be reassigned on a daily, monthly or yearly basis.

If the market price of energy is greater at the POD than at the POR, the transmission has value. The transmission holder can capture this value by using the transmission – buying energy at the POR, moving it to the POD and selling it. Alternatively, the transmission holder can sell the transmission through a capacity reassignment. Thus, the price of a capacity reassignment should be equal to the expected price differential between the POD and the POR.

Grid Operations

Grid operators dispatch their systems using the least costly generation consistent with the constraints of the transmission system and reliability requirements. The dispatch process occurs in two stages: day-ahead unit commitment, or planning for the next day's dispatch, and economic dispatch, or dispatching the system in real time.

Day-Ahead Unit Commitment

In the unit commitment stage, operators decide which generating units should be committed to be online for each hour, typically for the next 24-hour period. This is done in advance of real-time operations because some generating units require several hours lead time before they are brought online. In selecting the most economic generators to commit, operators take into account forecast load requirements and each unit's physical operating characteristics, such as how quickly output can be changed, maximum and minimum output levels and the minimum time a generator must run once it is started. Operators must also take into account generating unit cost factors, such as fuel and nonfuel operating costs and the cost of environmental compliance.

Also, forecast conditions that can affect the transmission grid must be taken into account to ensure that the optimal dispatch can meet load reliably. This is the security aspect of commitment analysis. Factors that can affect grid capabilities include generation and transmission facility outages, line capacities as affected by loading levels

and flow direction and weather conditions. If the security analysis indicates that the optimal economic dispatch cannot be carried out reliably, relatively expensive generators may have to replace less-expensive units.

System and Unit Dispatch

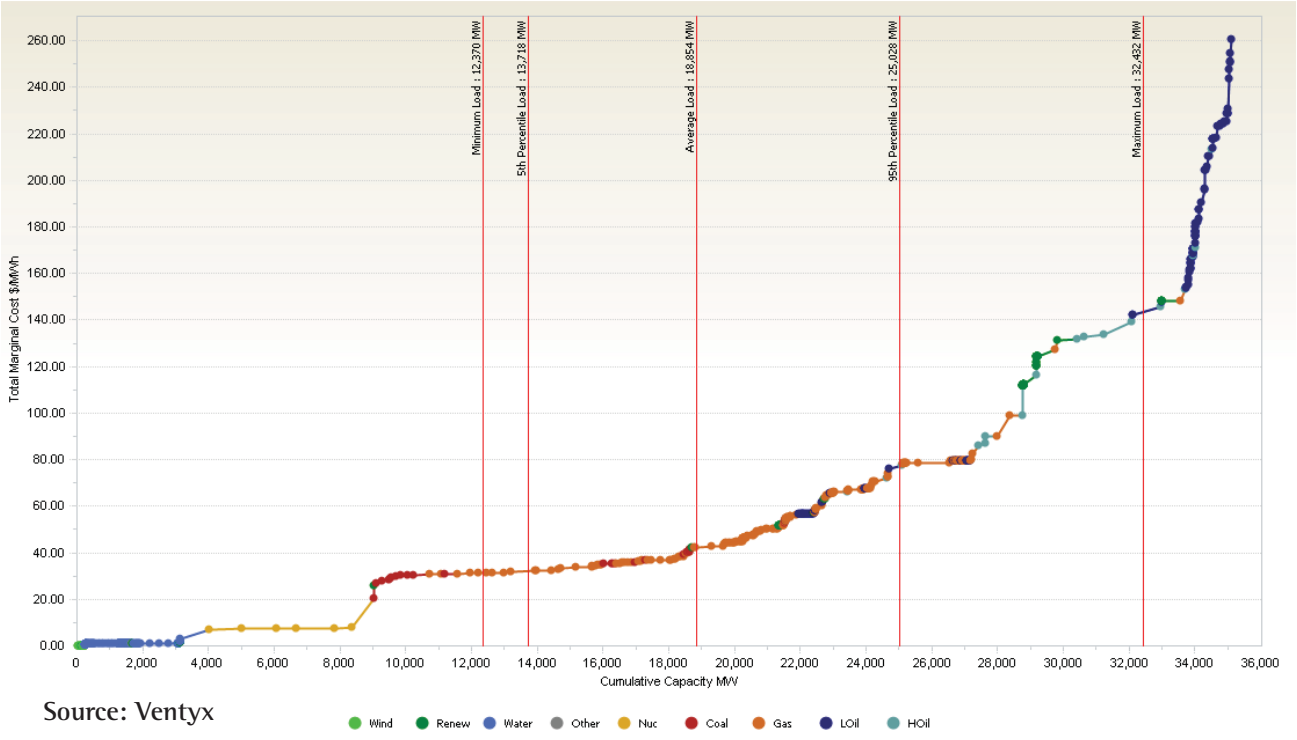
In the system dispatch stage, operators must decide in real time the level at which each available resource from the unit commitment stage should be operated, given the actual load and grid conditions, so that overall production costs are minimized. Actual conditions will vary from those forecast in the day-ahead commitment, and operators must adjust the dispatch accordingly. As part of real-time operations, demand, generation and interchange (imports and exports) must be kept in balance to maintain a system frequency of 60 hertz. This is typically done by automatic generation control (AGC) to change the generation dispatch as needed.

The chart below is a depiction of the supply curve of the power plants for the New York ISO (NYISO). This is also commonly called the supply stack. In it, all of the plants in the NYISO system are shown sorted according to their marginal cost of production. Their cost of production is shown on the vertical axis. The cheapest ones to run are to the left and the most expensive to the right.

Dispatch in the NYISO, for example, first calls on wind plants, followed successively by hydro, nuclear and coal-, gas- and oil-fired generators. This assumes that the plants have sufficient resources – enough wind for the wind powered generators or enough river flow for the hydroelectric plants, for example – and that sufficient transmission capability exists to deliver plant output and meet reliability needs.

In addition, transmission flows must be monitored to ensure that flows stay within voltage and reliability limits.

New York ISO Supply Stack



Source: Ventyx

If transmission flows exceed accepted limits, the operator must take corrective action, which could involve curtailing schedules, changing the dispatch or shedding load. Operators may check conditions and issue adjusted dispatch instructions as often as every five minutes.

Ancillary Services

Ancillary services maintain electric reliability and support the transmission of electricity. These services are produced and consumed in real-time, or in the very near term. NERC and regional entities establish the minimum amount of each ancillary service that is required for maintaining grid reliability.

Regulation matches generation with very short-term changes in load by moving the output of selected resources up and down via an automatic control signal, typically every few seconds. The changes are designed to maintain system frequency at 60 hertz. Failure to maintain a 60-hertz frequency can result in collapse of an electric grid.

Operating reserves are needed to restore load and generation balance when a generating unit trips off line. Operating reserves are provided by generating units and demand resources that can act quickly, by increasing output or reducing demand, to make up a generation deficiency. There are three types:

1. ***Spinning reserves*** are primary. To provide spinning reserve a generator must be on line (synchronized to the system frequency) with some unloaded (spare) capacity and be capable of increasing its electricity output within 10 minutes. During normal operation these reserves are provided by increasing output on electrically synchronized equipment or by reducing load on pumped storage hydroelectric facilities. Synchronized reserve can also be provided by demand-side resources.

2. ***Nonspinning reserves*** come from generating units that can be brought online in 10 minutes. Nonspinning reserve can also be provided by demand-side resources.

3. ***Supplemental reserves*** come from generating units that can be made available in 30 minutes and are not necessarily synchronized with the system frequency. Supplemental reserves are usually scheduled in the day-ahead market, allowing generators to offer their reserve energy at a price, thus compensating cleared supply at a single market clearing price. This only applies to ISO/RTOs, and not all reliability regions have a supplemental reserve requirement.

Black start generating units have the ability to go from a shutdown condition to an operating condition and start delivering power without any outside assistance from the electric grid. Hydroelectric facilities and diesel generators have this capability. These are the first facilities to be started up in the event of a system collapse or blackout to restore the rest of the grid.

Reactive power. Electricity consists of current, the flow of electrons, and voltage, the force that pushes the current through the wire. Reactive power is the portion of power that establishes and maintains electric and magnetic fields in AC equipment. It is necessary for transporting AC power over transmission lines, and for operating magnetic equipment, including rotating machinery and transformers. It is consumed by current as it flows. As the amount of

electricity flowing on a line increases, so does the amount of reactive power needed to maintain voltage and move current. Power plants can produce both real and reactive power, and can be adjusted to change the output of both. Special equipment installed on the transmission grid is also capable of injecting reactive power to maintain voltage.

Weather

Weather is the single greatest driver of electric demand and, thus, is a major factor in grid operations. System operators therefore rely heavily on weather forecasts to ensure they have the right generation in the right locations to run the grid reliably.

Weather affects grid operations in other ways, as well. Primary among these is on the productivity of certain types of power generators: wind and hydroelectric. Wind turbines' power output changes with wind availability and speed, which affects cost of wholesale power.

Hydroelectric plants rely on rain and snowfall to provide the river flow needed for their output. Geographically, this is most important in the Pacific Northwest, where seasonal hydro plant output is a critical source of power. Rain and the melting of winter snowpack feed the Columbia and Snake river systems. Surplus power from these generators is typically exported to California to help meet summer peak demand and provide a combination of increased reliability and lower prices.

Temperature can also affect the output of other power plants and capacity of transmission lines. Specifically, thermal plants that use a turbine – coal, gas, oil and nuclear plants – become less efficient at higher temperatures. Additionally, the capacity of transmission lines is limited by heat because the conductive material used in fabrication becomes more electrically resistant as they heat up, limiting their throughput.

Markets and Trading

Overview

Markets for delivering power to consumers in the United States are split into two systems: traditional regulated markets and market-regulated markets run by regional transmission organizations (RTOs), which include independent system operators (ISOs).

In general, RTOs use their markets to make operational decisions, such as generator dispatch. Traditional systems rely on management to make those decisions, usually based on the cost of using the various generation options.

Trading for power is also split into over-the-counter (OTC) or bilateral transactions, and RTO transactions. Bilateral transactions occur in both traditional systems and in RTO regions, but in different ways.

Pricing in both RTO and traditional regions incorporate both cost-of-service and market-based rates.

Bilateral Transactions

Bilateral or OTC transactions between two parties do not occur through an RTO. In bilateral transactions, buyers and sellers know the identity of the party with whom they are doing business.

Bilateral deals can occur through direct contact and negotiation, through a voice broker or through an electronic brokerage platform, such as the IntercontinentalExchange (ICE). The deals can range from standardized contract packages, such as those traded on ICE, to customized, complex contracts known as structured transactions.

Whether the trade is done on ICE, directly between parties or through another type of broker, the trading of standard

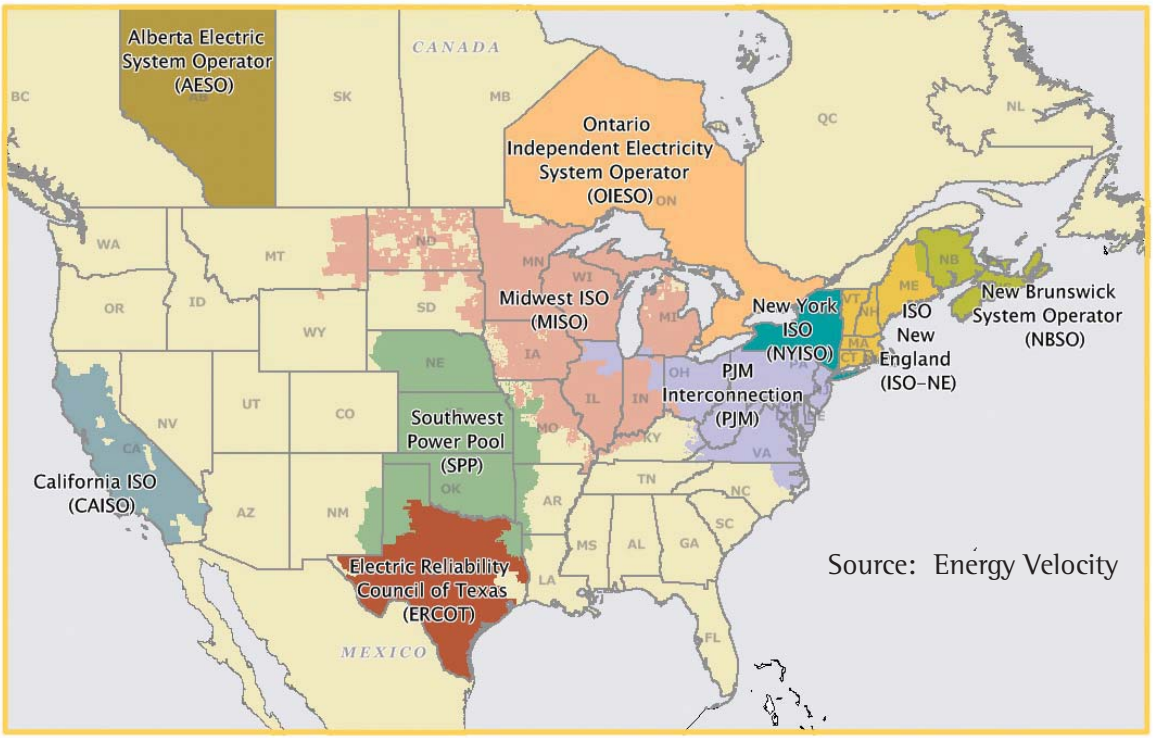
physical and financial products, such as next-day on-peak firm or swaps, allows index providers to survey traders and publish price indexes. These indexes provide price transparency.

Physical bilateral trades involving the movement of the energy from one point to another require that the parties reserve transmission capacity to move the power over the transmission grid. Transmitting utilities are required to post the availability of transmission capacity and offer service on an Open Access Same-Time Information System (OASIS) website. Traders usually reserve transmission capacity on OASIS at the same time they arrange the power contract.

When it comes time to use the reservation to transfer power between balancing authorities, one of the parties to the transaction submits an eTag electronically to Open Access Technology International (OATI), NERC's eTag contractor. OATI will process the tag and send it to all parties named on the eTag. This ensures the orderly transfer of energy and provides transmission system operators the information they need to institute curtailments as needed. Curtailments may be needed when a change in system conditions reduces the capability of the transmission system to move power and requires some transactions to be cut or reduced.

Bilateral physical transactions conducted in RTOs are settled financially. Generators offer their power into the RTO markets, and load is served through the power dispatched by the RTO. The RTO then settles bilateral transactions based on the prices in the contracts and the prices that occurred in the RTO markets.

North American Regional Transmission Organizations



Cost-Based Rates

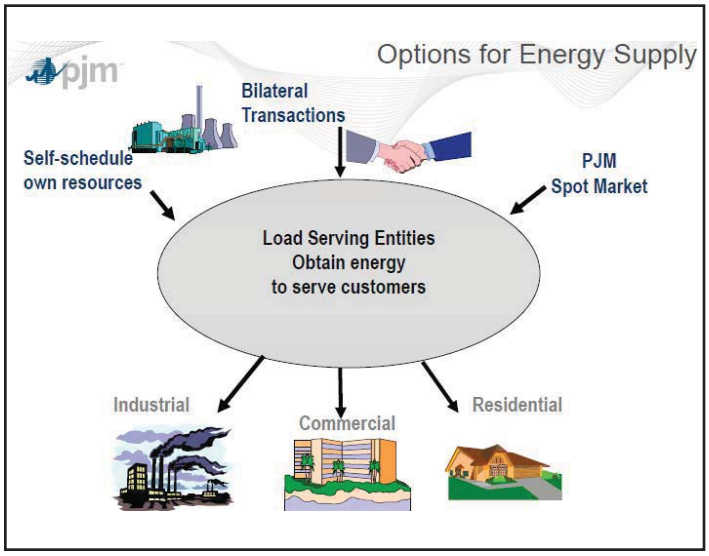
Cost-based rates are used to price most transmission services and some electricity when the Commission determines that market-based rates are not appropriate, or when an entity does not seek market-based rate authority. Cost-based rates are set to recover costs associated with providing service and give a fair return on capital. Cost-based rates are typically listed in a published tariff.

The following are major inputs to setting cost-based electricity rates:

- Determining used-and-useful electricity plants. This may include generation facilities, transmission facilities, distribution plants and office and related administration facilities.
- Determining expenses from the production, transmission and distribution of electricity, including fuel and purchased power, taxes and administrative expenses.
- Establishing a fair return on capital, known as the cost of capital. This includes determining the cost of debt, common equity, preferred stock and commercial paper and other forms of short-term borrowing such as lines of credit used to finance projects and provide cash for day-to-day operations.
- Allocating electric plant and other expenses among various customer classes and setting the rate structure and rate levels.

Market-Based Rates

Under market-based rates, the terms of an electric transaction are negotiated by the sellers and buyers in bilateral markets or through RTO market operations. The Commission grants market-based rate authority to electricity sellers that demonstrate that they and their affiliates lack or have adequately mitigated horizontal market power (percent of generation owned relative to total generation available in a market), and vertical market power (the ability to influence the cost of production for competitive electricity suppliers). Wholesale sellers who have market-based rate authority and who sell into day-ahead or real-time markets administered by a RTO do so subject to the specific RTO market rules approved by the Commission and applicable to all market participants. Thus, a seller in such markets not only must have an authorization based on analysis of that individual seller's market power, but it must abide by additional rules contained in the RTO tariff.



Supplying Load

Suppliers serve customer load through a combination of self-supply, bilateral market purchases and spot purchases. In addition to serving load themselves, load-serving entities (LSEs) can contract with others to do so. The choices are:

- Self-supply means that the supplying company generates power from plants it owns to meet demand.
- Supply from bilateral purchases means that the load-serving entity buys power from a supplier.
- Supply from spot RTO market purchases means the supplying company purchases power from the RTO.

LSEs' sources of energy vary considerably. In ISO-NE, NY-ISO and CAISO, the load-serving entities divested much or all of their generation. In these circumstances, LSEs supply their customers' requirements through bilateral and RTO market purchases. In PJM, MISO and SPP, load-serving entities may own significant amounts of generation either directly or through affiliates and therefore use self-supply as well as bilateral and RTO market purchases.

Traditional Power Markets

Traditional wholesale electric markets exist primarily in the Southeast, Southwest and Northwest. About 40 percent of all retail customers are in traditional wholesale markets where utilities are responsible for system operations and management, and, typically, for providing power to retail consumers. Utilities in these markets are frequently vertically integrated – they own the generation, transmission and distribution systems used to serve electric consumers. They may also include federal systems, such as the Bonneville Power Administration, the Tennessee Valley Authority and the Western Area Power Administration. Utilities in traditional regions have the following responsibilities:

- Generating or obtaining the power needed to serve customers (this varies by state);
- ensuring the reliability of its transmission grid;
- balancing supply and demand instantaneously;
- dispatching its system resources as economically as possible;
- coordinating system dispatch with neighboring balancing authorities;
- planning for transmission requirements within the utility's footprint; and
- coordinating its system development with neighboring systems.

Wholesale physical power transactions occur through bilateral markets.

Regional Markets

Introduction

Two-thirds of the population of the United States and more than one-half of Canada's population are served by electricity markets run by regional transmission organizations or independent system operators (RTOs/ISOs). There is little practical distinction between a RTO and an ISO. The main distinction between RTO/ISO markets and their predecessors (such as vertically integrated utilities, municipal utilities and co-ops) is that RTO/ISO markets deliver reliable electricity through competitive market mechanisms.

The basic functions of a RTO or ISO include the following:

- Ensure the reliability of the transmission grid;
- operate the grid in a defined geographic footprint;
- balance supply and demand instantaneously;
- operate competitive nondiscriminatory electricity markets;
- provide nondiscriminatory interconnection service to generators; and
- plan for transmission expansion on a regional basis.

In performing these functions, RTOs have operational control of the transmission system, are independent of their members, coordinate the maintenance of generation and transmission system, and oversee a transmission planning process to identify needed upgrades in both the near- and long-term.

RTOs/ISOs do not own transmission or generation assets; perform the actual maintenance on generation or transmission equipment; or directly serve end use customers.

Currently, seven RTOs/ISOs operate in the United States,

listed below in order of the size of their peak load:

- PJM Interconnection (PJM); 145 GW (summer)
- Midwest ISO (MISO); 137 GW (summer)
- Electric Reliability Council of Texas (ERCOT); 63 GW (summer)
- California ISO (CAISO); 50 GW (summer)
- Southwest Power Pool (SPP); 47 GW (summer)
- New York ISO (NYISO); 34 GW (summer)
- New England ISO (ISO-NE); 27 GW (summer)

Market Operations

RTO operations encompass multiple services that are needed to provide reliable and economically efficient electric service to customers. Each of these services has its own parameters and pricing. The RTOs use markets to determine the provider(s) and prices for many of these services. These markets include the day-ahead energy market (sometimes called a Day 2 market), real-time energy market (sometimes called a Day 1 or balancing market), capacity markets (designed to ensure enough generation is available to reliably meet peak power demands), ancillary services markets, financial transmission rights (contracts for hedging the cost of limited transmission capability) and virtual trading (financial instruments to create price convergence in the day-ahead and real-time markets).

RTO Energy Markets

All but one RTO (i.e., SPP) electricity market has day-ahead and real-time markets. The day-ahead market schedules electricity production and consumption before the operating day, whereas the real-time market (also called the balancing market) reconciles any differences between the schedule in the day-ahead market and the real-time load while observing reliability criteria, forced or unplanned outages and the electricity flow limits on transmission lines.

The day-ahead energy market produces financially binding schedules for the production and consumption of electricity one day before its production and use (the operating day). The purpose of the day-ahead market is to give generators and load-serving entities a means for scheduling their activities sufficiently prior to their operations, based on a forecast of their needs and consistent with their business strategies.

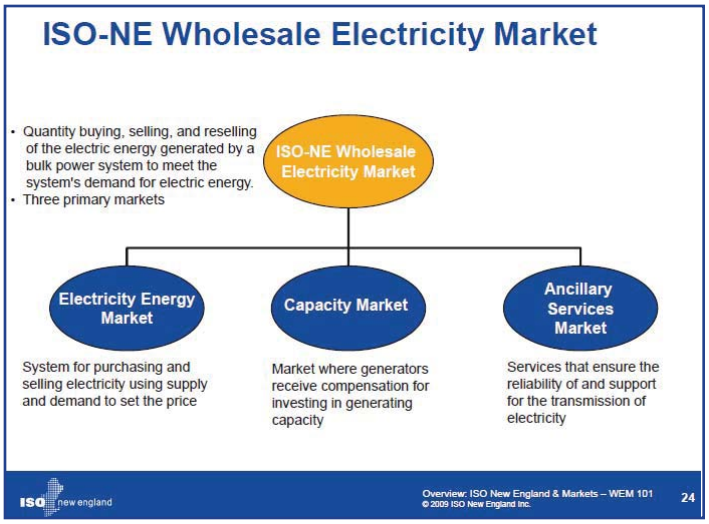
In day-ahead markets, the schedules for supply and usage of energy are compiled hours ahead of the beginning of the operating day. The RTO then runs a computerized market model that matches buyers and sellers throughout the geographic market footprint for each hour throughout the day. The model then evaluates the bids and offers of the participants, based on the power flows needed to move the electricity throughout the grid from generators to consumers. Additionally, the model must account for changing system capabilities that occur based on weather and equipment outages, plus rules and procedures that are used to ensure system reliability. The market rules dictate that generators submit supply offers and loads submit demand bids to the RTO by a deadline that is typically in the morning of the day-ahead scheduling. Typically, 95 percent of all energy transactions are scheduled in the day-ahead market, and the rest scheduled in real-time.

Generation and demand bids that are scheduled by the day-ahead market are settled at the day-ahead market prices. Inputs into setting a day-ahead market schedule include:

- Generator offers to sell electricity each hour;
- bids to buy electricity for each hour submitted by load-serving utilities;
- demand-response offers by customers to curtail usage of electricity;
- virtual demand and supply offers; and
- operational information about the transmission grid and generating resources, including planned or known

transmission and generator outage, the physical characteristics of generating resources including minimum and maximum output levels and minimum run time and the status of interconnections to external markets.

The real-time market is used to balance the differences between the day-ahead scheduled amounts of electricity based on day-ahead forecast and the actual real-time load. The real-time market is run hourly and in 5-minute intervals and clears a much smaller volume of energy and ancillary services than the day-ahead market, typically accounting for only 5 percent of scheduled energy. For generators,



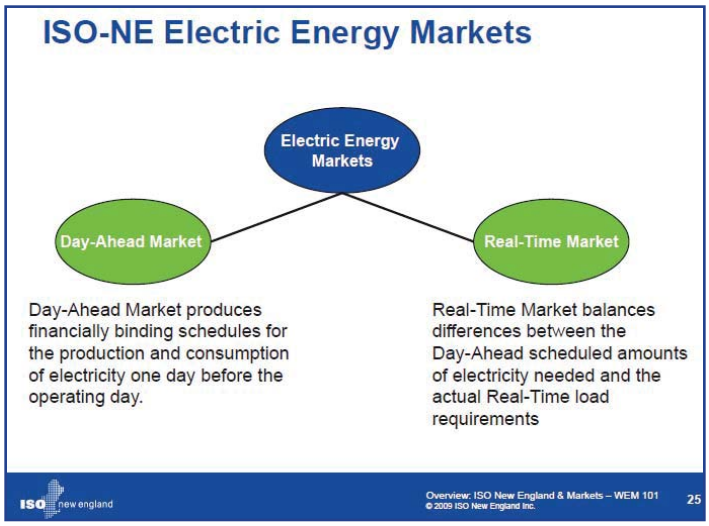
the real-time market provides additional opportunities for offering energy into the market. Megawatts over- or under-produced relative to the day-ahead commitments are settled at real-time prices.

Real-time market prices are significantly more volatile than the day-ahead market prices. This stems from demand uncertainty, transmission and generator forced outages and other unforeseen events. Because the day-ahead market generally is not presented with these events, it produces more stable prices than in real-time. Also, because the volumes in the real-time market are much smaller, there is an increased likelihood of supply and demand imbalances, which lead to both positive and negative price movements.

RTOs use markets to deal with transmission constraints through locational marginal pricing (LMP).

The RTO markets calculate a LMP at each location on the power grid. The LMP reflects the marginal cost of serving load at the specific location, given the set of generators that are being dispatched and the limitations of the transmission system. LMP has three elements: an energy charge, a congestion charge and a charge for transmission system energy losses.

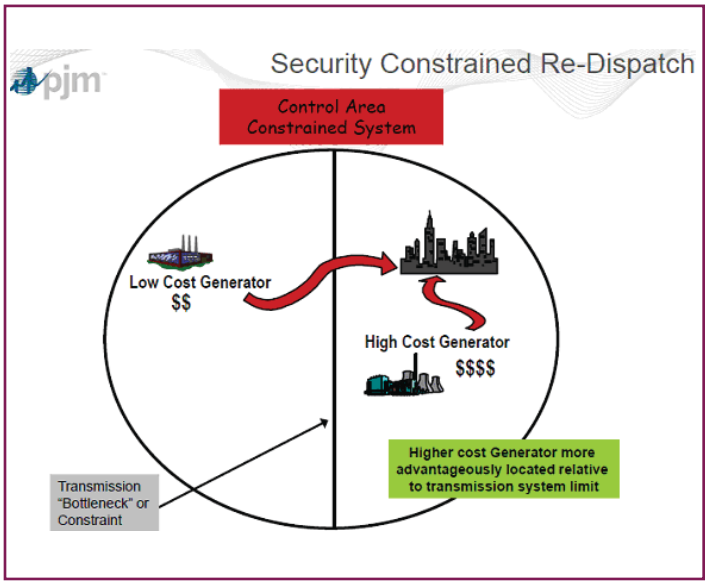
If there are no transmission constraints, or congestion, LMPs will not vary significantly across the RTO footprint. Transmission congestion occurs when there is not enough transmission capacity for all of the least-cost generators to be selected. The result is that some more expensive generation must be dispatched to meet demand, units that might not otherwise run if more transmission capacity were available.



When there are transmission constraints, the highest variable cost unit that must be dispatched to meet load within transmission-constrained boundaries will set the LMP in that area. All sellers receive the LMP for their location and all buyers pay the market clearing price for their location.

The primary means used for relieving transmission congestion constraints is by changing the output of generation at different locations on the grid. The market-based LMP sends price signals that reflect congestions costs to market participants. That is, LMPs take into account both the impact of specific generators on the constrained facility and the cost to change (redispatch) the generation output to serve load. This change in dispatch to is known as security constrained redispatch (see chart).

This redispatch could be implemented by using nonmarket procedures such as transmission loading relief (TLR). North American Electric Reliability Corp. (NERC) established the TLR process for dealing with reliability concerns when the transmission network becomes overloaded and power flows must be reduced to protect the network. A TLR is used to ration transmission capacity when the demand for transmission is greater than the available transmission capacity



(ATC). The rationing is a priority system that cuts power flows based on size, contractual terms and scheduling.

Scarcity pricing is a mechanism used by RTOs and ISOs to send price signals in the real-time market when there is a systemwide shortage of power reserves. These events occur when there is a shortage of power to meet system requirements to meet load and provide sufficient backup reserves. This can be caused by unexpectedly high power loads, supply disruptions or both.

RTOs follow one of four approaches to ensure that the market price for energy accurately reflects the value of energy during shortage periods:

- Increase the allowed bidding price of energy supply above normal levels during an emergency;
- Increase bid caps above the current level during an emergency for demand bids, while keeping generation offer caps in place;
- Establish a pricing structure for operating reserves that would raise prices as operating reserves grow short (demand curve); and
- Set the market-clearing price during an emergency for all supply and demand response resources dispatched equal to the payment made to participants in an emergency demand-response program.

Reliability must-run (RMR) units are generating plants that would otherwise retire but the RTO has determined they are needed to ensure reliability. They could also be units that have market power due to their location on the grid. RTO/ISOs enter into cost-based contracts with these generating units and allocate the cost of the contract to transmission customers. In return for payment, the RTO may call on the owner of an RMR generating unit to run the unit for grid reliability. The payment must be sufficient to pay for the cost of owning and maintaining the unit even if it does not operate.

The reason for developing capacity markets (described below) is in part to compensate generation owners for keeping these units in service where necessary, in addition to prompting the construction of new generation and use of demand response by consumers. Transmission upgrades can also reduce the need for RMR units by increasing generation deliverability throughout the RTO.

RTO Capacity Markets

RTOs, like other electric systems, are required to maintain adequate generation reserves to ensure that sufficient generation and demand-resource capacity are available to meet load and reliability requirements. LSEs have typically satisfied their reserve obligations with owned generation or bilateral contracts with other suppliers. Some RTOs have mechanisms to obtain capacity commitments, such as capacity auctions and capacity payments.

Most RTOs run a capacity market to allow LSEs a way to satisfy their reserve obligation. These markets cover short-term capacity, such as a month, season or year. PJM and ISO-NE run capacity auctions up to three years prior to when the capacity is needed. The near-term focus is consistent with providing payments to existing generation, or generation such as combustion turbines that can be sited and built within three years.

Financial Transmission Rights

Financial transmission rights (FTRs) are contracts that give market participants an offset, or hedge, against transmission congestion costs in the day-ahead market. They protect the holder from costs arising from transmission congestion over a specific path on the grid.

FTRs were originally developed in part to give native load-serving entities in the nascent RTOs price certainty similar to that available to traditional vertically integrated utilities operating in non-RTO/ISO markets. This practice continues, as FTRs are allocated to load-serving entities, transmission owners or firm transmission right holders in RTOs based on historical usage, and to entities that fund the construction of specific new transmission facilities. The details of the programs vary by RTO.

FTRs allow customers to protect against the risk of congestion-driven price increases in the day-ahead market in the RTOs and ISOs. Congestion costs occur as the demand for scheduled power over a transmission path exceeds that path's flow capabilities. For example, if the transmission capacity going from Point A (the source) to Point B (the sink) is 500 MW, but the RTO seeks to send 600 MW of power from Point A to Point B when calling on the least-cost generators to serve load, the path will be congested. This will cause the price at the source to decline or the price at sink to increase, or both, causing the congestion cost of serving point B from Point A to increase. By buying an FTR over the path from Point A to Point B, the FTR holder is paid the difference of the congestion prices at the sink and source, thus allowing it to hedge against the congestion costs incurred in the day-ahead market.

FTRs are acquired through allocations and purchases. FTRs can be purchased in the RTO-administered auctions or in the secondary market.

Allocations may stem from a related product, auction revenue right (ARR). ARRs provide the firm transmission capacity holders, transmission owners or LSEs with a portion of the money raised in the FTR auctions. In general, they are allocated based on historic load served and, in some RTOs, can be converted to FTRs. As with FTRs, ARRs, too, give eligible members an offset or hedge against transmission congestion costs in the day-ahead market. If converted to FTRs, the holder gets revenue from congestion. If kept as ARRs, the holder gets revenue from the FTR auction.

The main method for procuring FTRs is through an auction, which typically includes an annual (or multiyear) auction of one-year FTRs and monthly (or semiannually) auctions of shorter-term FTRs provided by existing FTR holders or made available by the RTO. The auctions are scheduled and run by the RTO, which requires bidding parties to post credit to cover the positions taken. FTR auction revenues are used to pay the holders of ARRs and assist the funding of future congestion payments to FTR holders. There is also a secondary market for FTRs (such as PJM's eFTR), but only a small number of transactions have been reported.

The quantity of FTRs made available by the RTO is bounded by the physical limits of the grid, as determined by a simultaneous feasibility test across all potential flowgates. This test is performed by the RTO prior to making FTRs available at auction, and takes into account existing FTR positions and system constraints. The resulting portfolio of FTRs allocated or offered at auction represents an absolute constraint on the size of the net positions that can be held by the market. Participants in FTR auctions can procure counterflow FTRs, which directly offset prevailing flow FTR capacity, thereby allowing the value at risk on a given path to exceed the physical limits of the line. However, such bids are physically constrained, as the net position held on the path must always conform to the simultaneous feasibility test.

Although FTRs are used by transmission providers and load-serving entities as a hedge, they can be purchased by any creditworthy entity seeking their financial attributes either as a hedge or as a speculative investment. In this regard, FTRs are similar to financial swaps that are executed as a contract for differences between two day-ahead LMPs (swaps are explained in the chapter on financial markets). However, FTRs are substantially different from swaps in that the quantity of FTRs is linked to physical constraints in the transmission grid, while the quantity of swaps is not. Further, FTRs are procured by allocation or FTR auction, while swaps are procured through financial over-the-counter markets or exchanges.

Variation in RTO FTRs

Five of the six FERC-jurisdictional RTOs trade FTRs or FTR equivalent products, with SPP planning to use FTRs in its future market design. However, the types and qualities of the rights traded across the organized markets vary, as do differences in the methods used to allocate, auction and transfer these rights. These attributes of the FTR markets are discussed below.

Flow Type: Prevailing Flow and Counterflow. A prevailing flow FTR generally has a source in an historic generation-rich location and a sink that is in a historic load-heavy location. Alternatively, the source of a prevailing flow FTR is on the unconstrained side of a transmission interface and the sink on the constrained side. Auction clearing prices for prevailing flow FTRs are positive. Conversely, a counterflow FTR often has a source in an historic load-heavy location and a sink that in an historic generation-rich location. As a result, auction clearing prices for counterflow FTRs are negative.

Peak Type: On-peak, Off-peak, 24-hour. FTRs can be purchased for either 16-hour on-peak blocks, 8-hour off-peak blocks or around-the-clock. Only PJM offers all three peak type products, whereas ISO-NE, MISO and CAISO offer on-peak and off-peak products. NYISO offers only the 24-hour product.

Allocated Rights. The five RTOs allocate transmission rights to transmission owners or load-serving entities within their markets. In PJM, MISO and ISO-NE, these are allocated as auction revenue rights (ARRs), which give their holders the right to receive a share of the funds raised during the FTR auctions. The CAISO allocates congestion revenue rights (CRR), which provide their holders a stream of pay-

ments based on the actual congestion occurring on associated paths. Finally, NYISO allocates both auction-based and congestion-based rights through multiple instruments. PJM and MISO allow ARR holders to convert all of these rights to FTRs; NYISO allows only a portion of ARR-equivalent instruments to be converted to its version of FTRs, called transmission congestion credits (TCCs). ISO-NE does not allow such conversions, while the CAISO's allocation is already in a form equivalent to an FTR. Converted ARRs are fully fungible in PJM, the MISO and NYISO; CAISO only allows the sale of allocated CRRs in its secondary market, and ISO-NE has no converted instruments to sell.

Auctioned Rights. All RTOs provide FTRs (or equivalent CRRs or TCCs) for sale to the public through two or more auctions held at various times of the year. The products sold vary by market and by auction, with some products made available only at specific auctions.

Secondary Markets. With the exception of the NYISO, each of the markets that auction FTRs also operates a bulletin board or similar venue designed to enable a secondary trading platform for FTRs. However, none of these platforms has had significant volume. NYISO offered to create a bulletin board for its participants if requested, but received no requests. The CAISO is the only market that requires the reporting of secondary FTR transactions; such transactions have not occurred despite the inability of CRR holders to resell their positions through the auction process.

Virtual Transactions

Virtual bids and offers (collectively, virtuals) are used by traders participating in the RTO markets to profit from differences between day-ahead and real-time prices. The quantity of megawatts (MW) purchased or sold by the trader in the day-ahead market is exactly offset by a sale or purchase of an identical quantity of MW in the real-time, so that the net effect on the market quantity traded is zero. Virtual trading is allowed in the five RTOs with day-ahead and real-time markets.

Although a trader does not have to deliver power, the transaction is not strictly financial. Virtual transaction can physically set the LMPs, the basis for payments to generators or from load.

For each hour, net virtual trades are added to the demand forecast for load if virtual demand is greater than virtual supply. This has the effect of raising the price in the day-ahead market and, more importantly, increasing the amount of generation resources procured by the RTO/ISO. Since these resources will be available to the real-time market, the failure of the virtual load to materialize will decrease the real-time demand below forecast, thus placing downward pressure on real-time prices. The placement of virtuals affects the dispatch of physical capacity.

The primary benefits of virtual transactions are achieved through their financial impact on the markets. Virtuals sometimes are referred to as convergence bidding, as a competitive virtual market should consistently cause the day-ahead and real time prices to converge in each hour.

The convergence of day-ahead and real-time prices within the RTOs is is intended to mitigate market power and improve the efficiency of serving load. Thus, virtuals have a physical impact upon the operations of the RTO, as well as on market participants that physically transact at the LMPs set in the day-ahead and real-time markets.

Transmission Operations

Each RTO's Open Access Transmission Tariff (OATT) specifies the transmission services that are available to eligible customers. Customers submit requests for transmission service through the Open Access Same-Time Information System (OASIS). RTOs evaluate each transmission-service

Transmission Rights by Transmission Grid

	PJM	MISO	ISO-NE	NYISO	CAISO
Name for Allocated Transmission Rights	***ARR***s	***ARR***s	***ARR***s	Multiple	CRR
Convertible to Congestion Rights?	Yes	Yes	No	Some	-
Name for Auctioned Congestion Rights	***FTR***s	***FTR***s	***FTR***	*TCCs*	*CRRs*
Congestion Right Auction Format					
Annual	Yes	Yes	Yes	No	Yes
Semiannual	No	No	No	Yes	No
Monthly	Yes	Yes	Yes	Yes	Yes
Congestion Right Auction Products:					
Multiyear	Yes	No	No	No	No
Annual	Yes	No	Yes	Yes	No
Semiannual	No	No	No	Yes	No
Quarterly	Yes	Yes	No	No	Yes
Monthly	Yes	Yes	Yes	Yes	Yes
Auction Allows Participant Resale?	Yes	Yes	Yes	Yes	No
Congestion Right Options	Yes	No	No	No	No
Formal Secondary ***FTR*** Market?	Yes	Yes	Yes	No	Yes

request using a model of the grid called a state estimator. Based on the model's estimation of the effects on the system, the request for transmission service is either approved or denied.

Transmission operators, including RTOs, offer two major types of transmission service: point-to-point service and network service. Network service generally has priority over point-to-point service. RTOs work with transmission owners to plan and coordinate the operation, maintenance and expansion of transmission facilities in order to provide network and point-to-point customers with transmission service.

Network transmission service is used for the transmission of energy from network generating resources to an RTO's network loads.

- Network transmission service enables network customers to use their generation resources to serve their network loads in a RTO.
- Network customers also can use the service to deliver economy energy purchases to their network loads.

Point-to-point transmission service uses an RTO's system for the transmission of energy between a point of receipt and a point of delivery, which can be into, out of, or through the RTO's Control Area. RTOs offer firm and nonfirm point-to-point transmission service for various lengths of time.

- Firm service has reservation priority over nonfirm point-to-point service.
- Nonfirm point-to-point transmission service is provided

from the available transmission capability beyond network and firm point-to-point transmission service.

Transmission Planning

RTOs have systemwide or regional planning processes that identify transmission system additions and improvements needed to keep electricity flowing. Studies are conducted that test the transmission system against mandatory national reliability standards as well as regional reliability standards. The North American Electric Reliability Corp. (NERC) is the organization responsible for setting national reliability standards.

RTO transmission planning studies may look 10-15 years into the future to identify transmission overloads, voltage limitations and other reliability problems. RTOs then develop transmission plans in collaboration with transmission owners to resolve potential problems that could otherwise lead to overloads and blackouts. This process culminates in one recommended plan for the entire RTO footprint.

Financial Policies

Financial settlement is the process through which payments due from customers and to generators are calculated. Market settlements depend on day-ahead schedules, real-time metering, interchange schedules, internal energy schedules, ancillary service obligations, transmission reservations, energy prices, FTR positions and capacity positions. For each market participant a customer invoice of charges and credits includes the costs of services used to serve load.

Generally, customers receive weekly or monthly invoices stating their charges and credits. Weekly invoices must be settled within a few days of being issued, while monthly invoices must be paid within either one or two weeks depending on the policies of each RTO. All payments are made electronically. Disbursements are made within several days of the date payments are due.

Credit Policies

Defaults by market participants in RTOs have generally been socialized, meaning that the cost is spread across the market. To minimize this risk, RTOs have credit policies in their tariffs, which contain provisions related to credit evaluations, credit limits, forms of collateral and the consequences of violations or defaults.

Regions

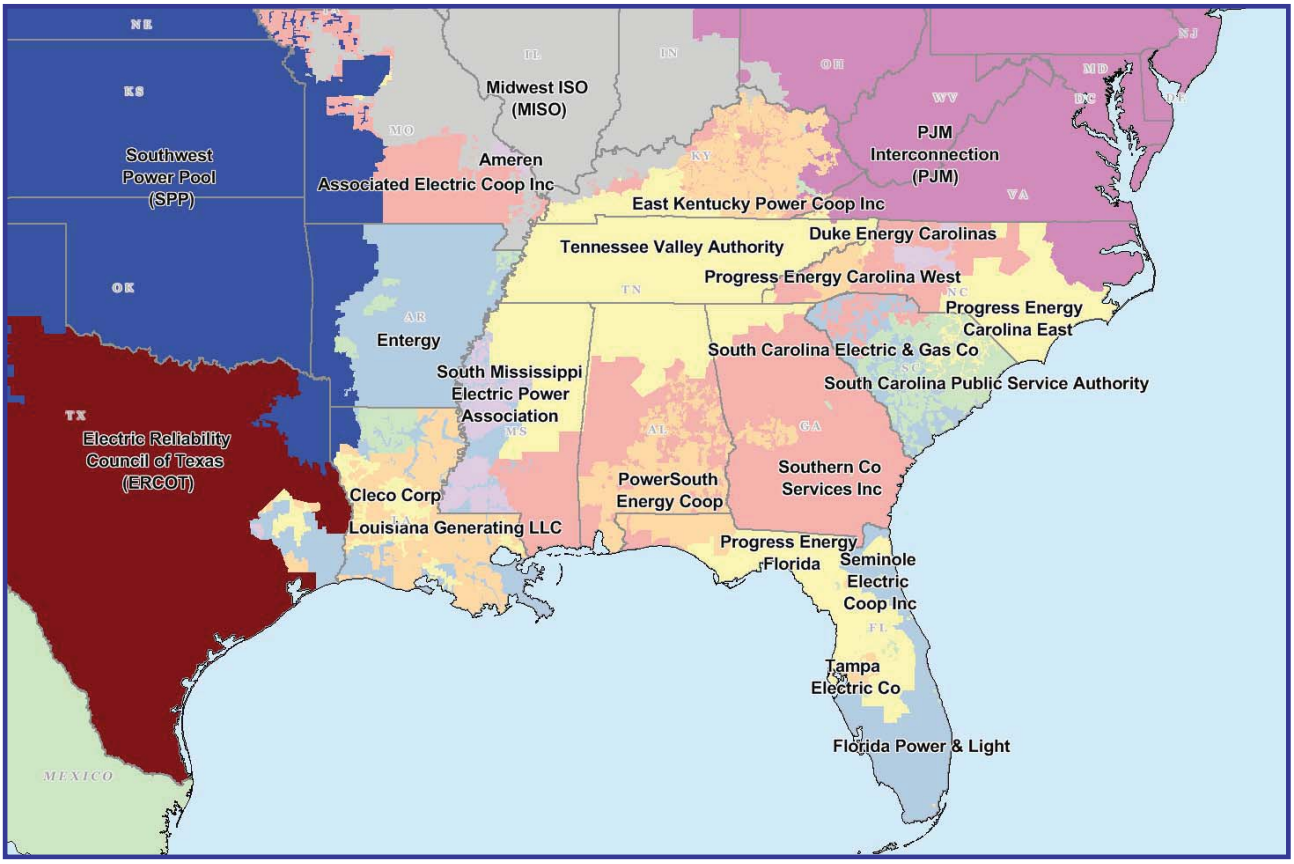
Markets vary around the United States by market type – traditional or RTO – generation types, customer use, climate, fuel costs, political and regulatory conditions, and other factors. Consequently, prices vary, driven by these market factors.

Southeast Wholesale Market

The Southeast electric market is a bilateral market that includes all or parts of Florida, Georgia, Alabama, Mississippi, Louisiana, Arkansas, Tennessee, North Carolina, South Carolina, Texas, Missouri and Tennessee. It encompasses all or part of two NERC regions: the Florida Reliability Coordinating Council (FRCC) and the Southeastern Electric Reliability Council (SERC). Major hubs include Entergy, Southern and TVA.

Southeastern power markets have their roots in the 1960s. In the wake of the Northeast Blackout of 1967, the Southeast began to build out its electric transmission grid; there now are several large transmission lines connecting large power plants to the grid. This was primarily to ensure reliability, but it also had economic consequences. Increased integration allowed utilities to more effectively share reserves, as well as the costs and risks of new plant construction.

Southeast Electric Regions



If a utility were building a large nuclear or coal- fired generating facility, it would be cost-effective to have reserve sharing agreements with neighboring systems that provided the backup or capacity reserves, rather than building reserves individually. In addition, a stronger grid allowed the output of large power plants to be deliverable throughout the region, thus allowing more than one utility to share in the ownership and the costs of building large new plants. This reduced the financial risks associated with ownership of large new generating facilities to any single utility, thus making ownership of large base-load coal and nuclear units more affordable to the utilities and less risky.

A stronger transmission system also allowed for more economic transactions, including both spot transactions and long-term firm power deliveries. External sales resulted in more efficient use of grid resources and reduced costs to both buyers and sellers.

Resource Base

Within the Southeast, the resource mix varies between the two NERC subregions. The FRCC uses more gas- and oil-fired generation than the rest of the Southeast, and it is the only area where oil is significantly employed. Gas is the marginal fuel in almost all hours in the FRCC. Within SERC, the Southern subregion has historically generated as much as 85 percent of its electricity from baseload coal and nuclear plants. In recent years, natural gas used for generating electricity has become increasingly popular. The

pattern began to change as gas supplies increased and prices fell and natural gas-fired power plants began to displace older, less-efficient coal-fired generation.

The Entergy subregion uses gas to a much greater extent than the regional average; it is the marginal fuel more than 70 percent of the time. The TVA subregion has a significant amount of hydro and nuclear capacity and output, and very little dependence on gas. The VACAR subregion has the highest utilization of nuclear generation in the Southeast; 94 percent of this subregion's output is from baseload coal and nuclear facilities.

Trading and Markets

Physical and financial electricity products are traded using Entergy, Southern, TVA, VACAR and Florida price points. Volumes for these products remain low, especially in Florida, where merchant power plant development is restricted by a state statute.

Virtually all the physical sales in the Southeast are done bilaterally. Long-term energy transactions appear to be a hallmark of the Southeast; wholesale electricity transactions for a year or more outweigh spot transactions. Many long-term agreements involve full-requirements contracts or long-term purchase power agreements. Spot transactions accounted for less than one percent of overall supply and tend to occur during periods of system stress, usually summer heat waves or winter cold snaps. Even for a large company such as Southern Co., spot transactions occurred less than 30 percent of the time.

Wholesale spot power markets in the Southeast have little spot trading and lack transparency. The relative lack of spot trades yields little data on which to base price reporting. ICE reports no electric power price for Florida. And while another publisher reports one spot electric power price for Florida, on most days, there are no reported volumes. Given the bilateral nature of wholesale power transactions in the Southeast, and the small spot market, interest in financial power products in the Southeast is weak. As a result, ICE does not provide a financial swap product in the Southeast.

Despite the bilateral nature of the wholesale trade and the small size of the spot market, marketers do have some presence in the Southeast. For example, Constellation Energy Commodities Group contributes to the trading in the Southern region, being a participant in 41 percent of total marketer related sales. While Constellation does not own generation in Southern, it does have several multiyear agreements with generating units.

Unique Market Features

Southern Co. Auction

Since April 23, 2009, Southern Co. has been holding daily and hourly auctions for power within its balancing area. This balancing area encompasses the service territories of Southern Co. utilities: Georgia Power, Alabama Power, Mississippi Power and Gulf Power.

According to the auction rules, Southern must offer all of its available excess generation capacity into the auction, after regulation and contingency reserves are met. The

offer prices are capped because the auction is intended to mitigate any potential ability of Southern to withhold its generation resources within its balancing area.

The products auctioned are day-ahead power and real-time power (an auction takes place an hour ahead of when the energy is scheduled to flow).

Offers to sell energy and bids to purchase energy are evaluated using the simple method of sorting offers in ascending order and bids in descending order.

The auction matches parties to facilitate a bilateral transaction that is ultimately independent of the auction. Thus, there is no collateral requirement necessary to participate in the auction. However, credit screening rules dictate that matches are made only between entities willing and able to do business with one another. The selection process is based on information that each entity submits to the auction administrator.

When the auction began in 2009, Southern Co. was the only participant that could sell into it. On Jan. 3, 2010, other entities were allowed to sell into the auction, and Southern became eligible to make purchases in the auction as well as sales. However, activity in the auction has been sparse since its inception.

Entergy Independent Coordinator of Transmission

Southwest Power Pool (SPP) serves as the independent coordinator of transmission (ICT) for Entergy Services. In this role, SPP oversees the operations of the Entergy transmission system and produces regional planning assessments.

Florida IPP rule

The Florida Public Service Commission's (PSC) competitive bidding rules require investor-owned utilities (IOUs) to issue requests for proposals for any new generating project of 75 MW or greater, exclusive of single-cycle combustion-turbines. The bidding requirement can be waived by the PSC if the IOU can demonstrate that it is not in the best interests of its ratepayers.

Western Regions

The power markets in the western United States are bilateral markets except in most of California. The West includes the Northwest Power Pool (NWPP), the Rocky Mountain Power Area (RMPA) and the Arizona, New Mexico, Southern Nevada Power Area (AZ/NM/SNV) within the Western Electricity Coordinating Council (WECC), a regional entity. These areas contain many balancing authorities (BAs) responsible for dispatching generation, procuring power, operating the transmission grid reliably and maintaining adequate reserves. Although the BAs operate autonomously, some have joint transmission-planning and reserve-sharing agreements.

Physical sales in western states are almost entirely bilateral sales, with a small amount sold into the California ISO's market. Trading in the western states differs from the rest of the country because financial players are active in the physical markets, as well as having a robust financial electricity market.

The volume of financial sales on ICE is roughly as large as physical sales. Physical sales in WECC are dominated by financial and marketing companies.

The NWPP is composed of all or major portions of the states of Washington, Oregon, Idaho, Wyoming, Montana, Nevada and Utah, a small portion of Northern California and the Canadian provinces of British Columbia and Alberta. This vast area covers 1.2 million square miles. It is made up of 20 BAs. The peak demand is 54.5 GW in summer and

63 GW in winter. There is 80 GW of generation capacity, including 43 GW of hydroelectric generation.

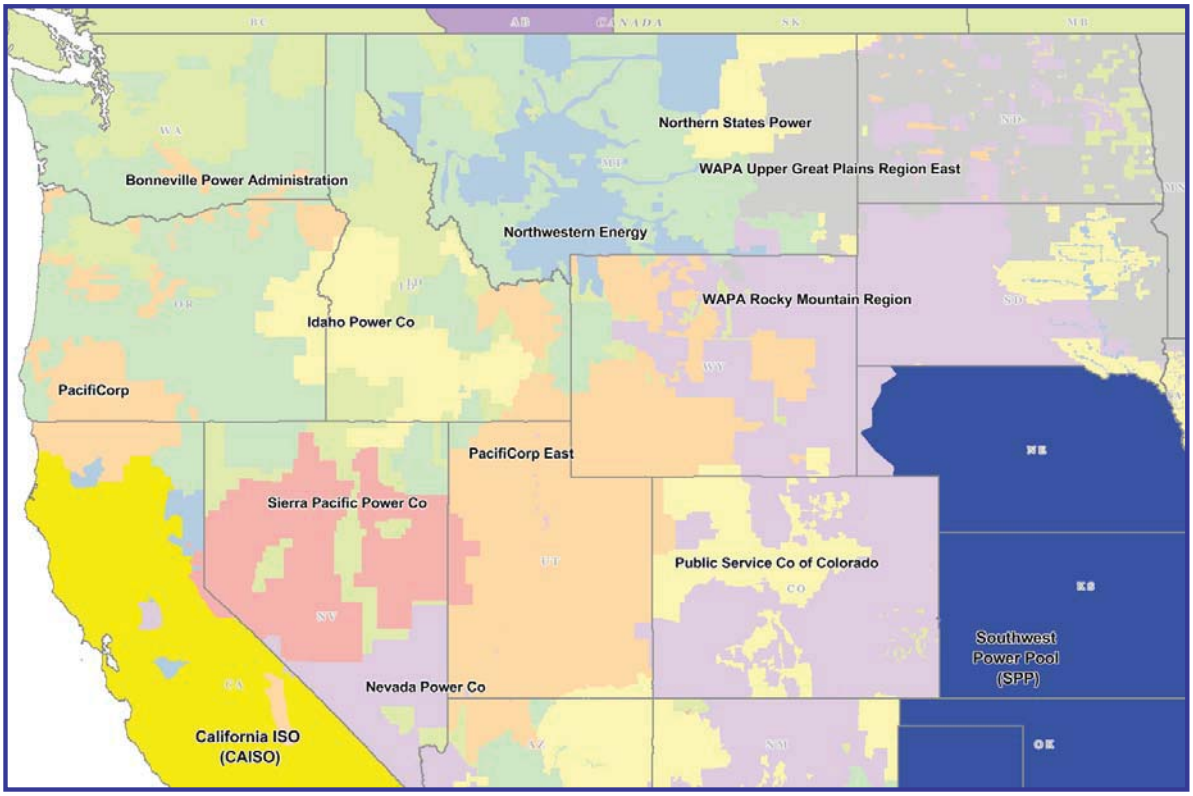
Resources

The NWPP has a unique resource mix. Hydro generation is more than 50 percent of power supply, compared to the U.S. average of only 6 percent of power supply. The hydro generation is centered around many dams, mostly on the Columbia River. The largest dam, the Grand Coulee, can produce as much power as six nuclear plants. Due to the large amount of hydroelectric generation, the Northwest typically has cheap power and exports power to neighboring regions, especially California, to the extent that there is transmission capacity to carry the power to more expensive markets.

The amount of hydropower produced depends on a number of factors, some natural and some controllable. On a seasonal basis, the intensity and duration of the water flow is driven by snowpack upriver in the mountains, the fullness of the reservoirs and rainfall. On a short-term basis, the power generation is influenced by decisions to release water locally and upstream to generate power, as well as local water-use decisions that have nothing to do with the economics of power generation, but are made for recreation, irrigation and wildlife considerations. The peak generation begins in the spring, when the snow melts, and may last into early summer.

When there is less water available, the Northwest may rely more on its coal and natural gas generation. It will

Northwest Electric Market



occasionally import power from neighboring regions when loads are high.

Trading and Markets

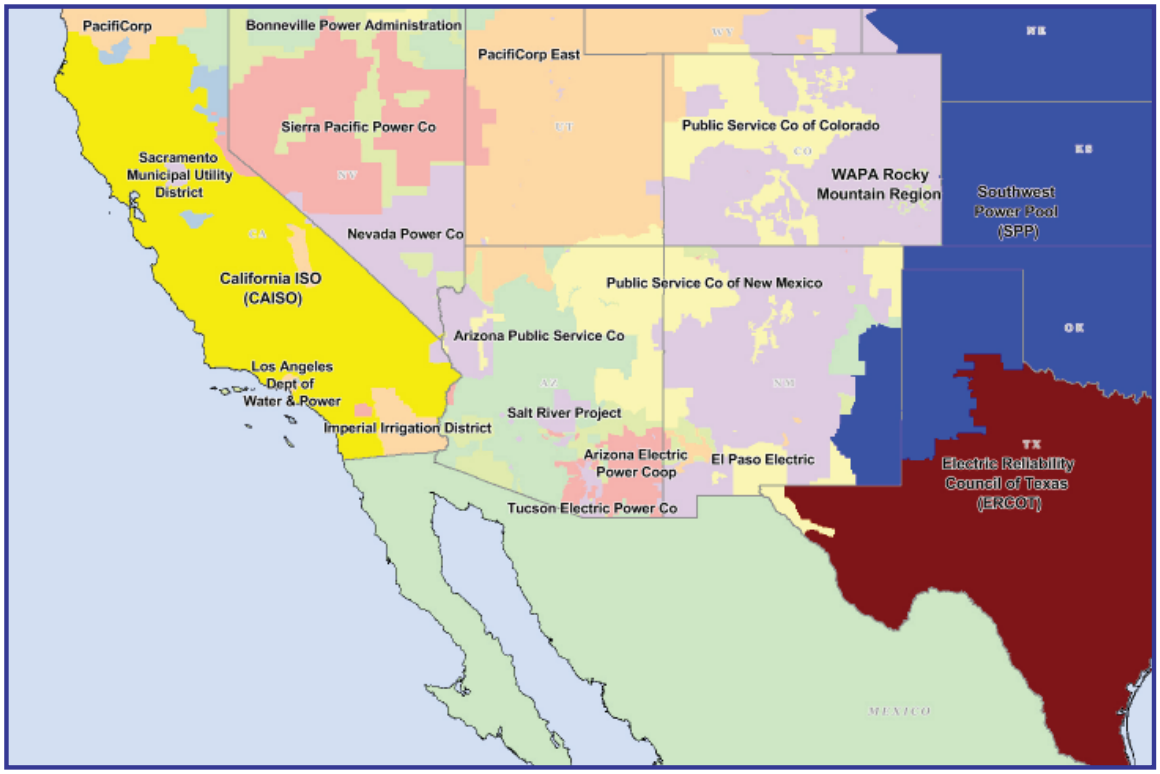
The water forecast affects the forward market for electricity in the Northwest. The daily water flow as well as weather conditions influence the prices in the daily physical market. When there is an abundance of hydro generation, the Northwest will export as much as possible on the transmission lines leading into California. Sometimes in off-peak hours there is so much generation that power prices are negative because the transmission lines are full and there is not enough local load to take all of the power.

The largest seller of wholesale power is the Bonneville Power Administration (BPA), a federal agency that markets the output from federally owned hydroelectric facilities and owns 75% of the region's high-voltage transmission. It meets approximately one-third of the region's firm energy supply, mostly with power sold at cost. BPA gives preference to municipal and other publicly owned electric systems in allocating its output.

Both the Alberta IESO and British Columbia Hydro are members of the NWPP. Net interchange between these two BAs and the United States tends to result in net exports from the United States into Canada. Net interchange between U.S. and Canadian balancing authorities represents about one percent of total NWPP load.

The IntercontinentalExchange (ICE) has four trading points

Southwest Electric Regions



in the Northwest: Mid-Columbia (Mid-C), California-Oregon Border (COB), Nevada-Oregon Border (NOB) and Mona (Utah). Mid-C has the most traded volume by far, averaging more than 6,700 MW of daily on-peak physical trades in 2009. COB had almost 600 MW, NOB had 100 MW and Mona had 32 MW. Mid-C also has a fairly active physical forward market.

The Southwest electric market encompasses the Arizona, New Mexico, southern Nevada (AZ/NM/SNV) and the Rocky Mountain Power Area (RMPA) subregions of the Western Electric Coordinating Council (WECC). Peak demand is approximately 41 GW in summer and 29 GW in winter. There is 52 GW of generation capacity, composed mostly of gas and coal units.

The Southwest relies on nuclear and coal generators for baseload electricity, with gas units used as peaking resources. The coal generators are generally located in close

proximity to coal mines, resulting in low delivered fuel costs. Some generation is jointly owned among multiple nearby utilities, including the Palo Verde nuclear plant, a 4,000-MW unit, which has owners in California and the Southwest.

The AZ/NM/SNV region is summer-peaking and experiences high loads due to air conditioning demand. The daily high temperatures average above 100 degrees in June through August in Phoenix. However, power prices tend to be the highest when there is also hot weather in Southern California, creating competition for the generation resources.

CAISO

California Independent System Operator

Market Profile

Geographic Scope

CAISO is a California nonprofit public benefit corporation started in 1998 when the state restructured its electric industry. The CAISO manages wholesale electricity markets, centrally dispatching electricity generation and facilities. In managing the grid, CAISO provides open access to the transmission system and performs long-term transmission planning. It manages energy and ancillary markets in day-ahead and real-time markets and is responsible for regional reliability.

Peak Demand

CAISO's all-time peak load was 50 GW in summer 2006.

Import and Exports

About 25 percent of CAISO's energy is supplied by imports, principally from two primary sources: the Southwest (Arizona, Nevada and New Mexico) and the Pacific Northwest (Oregon, Washington and British Columbia). Imports from the Pacific Northwest generally increase in the late spring when hydroelectric production peaks from increases in winter snowmelt and runoff.

Market Participants

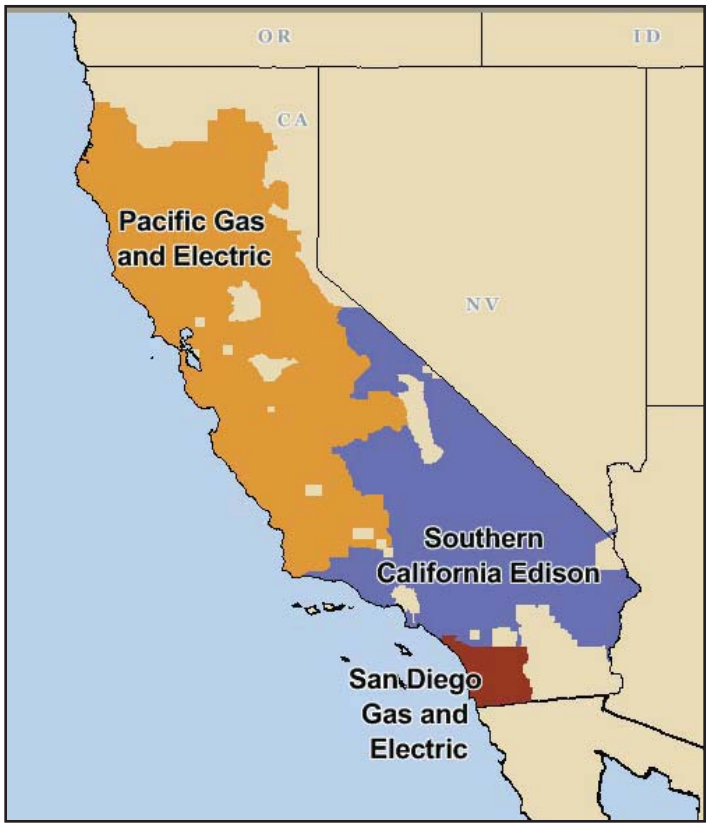
CAISO's market participants include generators, retail marketers and utility customers, ranging from the three big investor-owned utilities (IOUs), which include Pacific Gas & Electric (PG&E), Southern California Edison (SCE) and San Diego Gas &Electric (SDG&E), to municipalities and financial participants.

Membership and Governance

The CAISO has a board of governors that consists of five members appointed by the governor and confirmed by the California Senate. The board's role is to provide corporate direction, review and approve management's annual strategic plans and approve CAISO's operating and capital budgets.

CAISO uses an informal stakeholder process to propose solutions to problems that may ultimately require a filing at FERC. Unlike other RTOs, which have a formal committee structure, CAISO's stakeholder process generally consists of rounds of dialogue with stakeholders on major policy issues.

California Independent System Operator (CAISO)



Transmission

Owners

The Participating Transmission Owners (PTOs) in the CAISO control area include:

- Pacific Gas and Electric Co.,
- Southern California Edison,
- San Diego Gas and Electric, and
- Municipalities such as Vernon, Anaheim and Riverside.

Chronic Constraints

Areas of the system that are chronically constrained include the Humboldt region in the northwest corner of the state, import lines from the Southwest and Southern California (including San Diego).

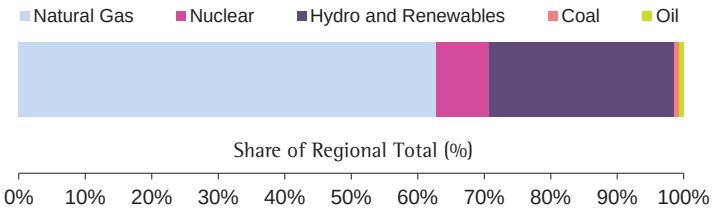
Transmission Planning

CAISO conducts an annual transmission planning process with stakeholders that includes both short-term and long-term projects.

Supply Resources

Generating Mix

By plant capacity, the generating mix includes these sources:



Demand Response

Demand-resource participation in the wholesale energy market is currently limited to a small amount of demand associated with water pumping loads. However, the market allows end-use loads that can be curtailed when directly dispatched in the real-time market to participate in the real-time energy and ancillary service (nonspinning reserve) markets. The California Public Utilities Commission is considering rules for allowing more retail demand-resource participation in the CAISO market.

Other demand response in California consists of programs for managing peak summer demands developed by the state's three major investor owned utilities. These demand-response programs are triggered based on criteria that are internal to the utility and not necessarily tied to market prices, although in early 2012 CAISO had a proposal pending at the Commission to integrate these reliability-based retail programs into its wholesale market.

Market Features and Functions

Energy Markets

Day-Ahead Market

The day-ahead market allows participants to secure prices for electric energy the day before the operating day and hedge against price fluctuations that can occur in real time. One day ahead of actual dispatch, participants submit supply offers and demand bids for energy. These bids are applied to each hour of the day and for each pricing location on the system.

From the offers and bids, CAISO constructs aggregate supply and demand curves for each location. The intersection of these curves identifies the market-clearing price at each location for every hour. Supply offers below and demand bids above the identified price are said to clear, meaning they are scheduled for dispatch. Offers and bids that clear are entered into a pricing software system along with binding transmission constraints to produce the locational marginal prices (LMP) for all locations.

Generator offers scheduled in the day-ahead settlement are paid the day-ahead LMP for the megawatts accepted. Scheduled suppliers must produce the committed quantity during real-time or buy power from the real-time market to replace what was not produced.

Likewise, wholesale buyers of electricity whose bids clear in the day-ahead market settlement pay for and lock in their right to consume the cleared quantity at the day-ahead LMP. Electricity use in real time that exceeds the day-ahead purchase is paid for at the real-time LMP.

Hour-Ahead Market

CAISO has an hour-ahead market for buying and selling imports and exports that it calls the hour-ahead scheduling process (HASP). HASP is designed to allow the ISO to re-optimize the market, given changes to internal supply and demand after the close of the day-ahead market.

In HASP, imports and exports between the ISO and neighboring regions are pre-dispatched 45 minutes before the start of each operating hour. These imports and exports are scheduled at a fixed level for the entire hour. However, resources within the CAISO and dynamic resources in neighboring regions (or balancing authority areas) can be dispatched every five minutes within each operating hour to meet real-time loads. A dynamic resource is a resource that is physically located in a neighboring region or balancing authority areas, yet is controllable by the CAISO market.

Real-Time Market

CAISO must coordinate the dispatch of generation and demand resources to meet the instantaneous demand for electricity. While the day-ahead energy market produces the schedule and financial terms of energy production and use for the operating day, a number of factors can change that schedule. Thus, to meet energy needs within each hour of the current day the CAISO operates a spot market for energy called the real-time market,

The real-time market uses final day-ahead schedules for resources within the ISO and final hour-ahead schedules for imports and exports as a starting point. It then re-dispatches resources every five minutes to balance generation and loads.

Prices resulting from the real-time market are only applicable to incremental adjustments to each resource's day-ahead schedule. Real-time bids can be submitted up to 75 minutes before the start of the operating hour.

Ancillary and Other Services

Ancillary services are those functions performed by electric generating, transmission, and system-control equipment to support the reliability of the transmission system. RTOs procure or direct the supply of ancillary services.

CAISO procures four ancillary services in the day-ahead and real-time markets:

- Regulation up: Units providing regulation up must be able to move quickly above their scheduled operating point in response to automated signals from the ISO to maintain the frequency on the system by balancing generation and demand.
- Regulation down: Units providing regulation down must be able to move quickly below their scheduled operating point in response to automated signals from the ISO.
- Spinning reserve: Resources providing spinning reserves must be synchronized with the grid (online, or spinning) and be able to respond within 10 minutes. This is more reliable than nonspinning reserves because it is already online and sychronized.
- Nonspinning reserve: Resources providing nonspinning reserves must be able to synchronize with the grid and respond within 10 minutes.

Regulation up and regulation down are used continually to maintain system frequency by balancing generation and demand. Spinning and nonspinning resources are used to maintain system frequency and stability during emergency operating conditions (such as unplanned outage of generation or transmission facilities) and major unexpected variations in load. Spinning and nonspinning resources are often referred to collectively as operating reserves.

Capacity Markets

Capacity markets provide a means for load-serving entities (LSEs) to procure capacity needed to meet forecast load, or resource adequacy (RA) requirements, and to allow generators to recover a portion of their fixed costs. They also provide economic incentives to attract investment in new and existing supply-side and demand-side capacity resources needed to maintain bulk power system reliability requirements.

The CAISO does not operate a formal capacity market, but it does have a mandatory RA requirement. The program requires that LSEs procure 115 percent of their aggregate system load on a monthly basis, unless a different reserve margin is mandated by the LSE's local regulatory authority. The program provides deliverability criteria each LSE must meet, as well as system and local capacity requirements.

Resources counted for RA purposes must make themselves available to the CAISO day-ahead and real-time markets for the capacity for which they were counted.

Market Power Mitigation

In electric power markets, mainly because of the largely non-storable nature of electricity and the existence of transmission constraints that can limit the availability of multiple suppliers to discipline market prices, some sellers from time to time have the ability to raise market prices. Market power mitigation is a market design mechanism to ensure competitive offers even when competitive conditions are not present.

Market power may need to be mitigated systemwide or locally when the exercise of market power may be particularly a concern for a local area. For example, when a transmission constraint creates the potential for local market power, the RTO may apply a set of behavioral and market outcome tests to determine if the local market is competitive and if generator offers should be adjusted to approximate price levels that would be seen in a competitive market – close to short-run marginal costs.

Reliability Must-Run

A reliability must-run (RMR) contract acts as an insurance policy, assuring that the CAISO has dispatch rights in order to reliably serve load in local import constrained areas. RMR contracts also help to mitigate any local market power that one or more units may have. The amount of generation capacity under RMR contracts dropped when local RA requirements were introduced. With more local resources being procured through RA contracts, the CAISO was able to significantly decrease its RMR designations in much of the system. Remaining generators with RMR contracts are located primarily in San Francisco and San Diego.

Financial Transmission Rights

As mentioned above, financial transmission rights (FTRs) give market participants an offset or hedge against transmission congestion costs in the day-ahead market. An FTR is a financial contract protecting the holder from costs arising from transmission congestion over a path or a source-and-sink pair of locations on the grid. An FTR provides the holder with revenue, or charges, equal to the difference in congestion prices in the day-ahead market across the specific FTR transmission path. FTRs were originally formulated to protect LSEs from price uncertainty while redistributing excess congestion charges due to constrained conditions.

A related product is an auction revenue right (ARR). ARRs provide the holders with an upfront portion of the money raised in the FTR auctions. In general, they are allocated based on historical load served and, in some RTOs, can be converted to FTRs. As with FTRs, ARRs give transmission owners and eligible transmission service customers an offset or hedge against transmission congestion costs in the day-ahead market.

FTRs in California are referred to as congestion revenue rights (CRRs). Other than the name, the products are identical. CRRs are monthly or quarterly products. CRRs can be

bought at auction or allocated by CAISO. Allocated CRRs receive the congestion value for a specific path, similar to a converted FTR. CAISO also allocates open market CRR auction revenue to LSEs based on their physical participation in the market, similar to an ARR in other markets. Given that both allocated CRRs and allocated auction revenues are based on physical market presences, LSEs often receive both. Finally, CRR revenue insufficiency is not possible as LSEs will be charged uplift if any shortfall is present.

Virtual Transactions

CAISO implemented convergence bidding, or virtual bidding, on Feb. 1, 2011. With the virtual bidding market feature, market participants can take financial positions in the day-ahead market that are liquidated in the real-time market. Virtual bidding is unique in CAISO because virtual positions taken on the export and import interties settle against the hour-ahead price, while internal virtual positions settle against the real-time dispatch price. Market participants can engage in either virtual demand or virtual supply transactions. A virtual demand transaction is a bid to buy at the day-ahead price and offer to sell at the real-time price. A virtual supply transaction is a bid to sell at the day-ahead price and buy at the real-time price.

Virtual supply and virtual demand may be submitted at any eligible pricing node in the CAISO system and there is no requirement for physical generation or load. The financial outcome for a particular participant is determined by the difference between the hourly day-ahead and real-time LMPs at the location at which the offer or bid clears. Thus, through this financial arbitrage opportunity, virtual transactions in theory help to narrow the difference between the day-ahead and real-time prices.

Credit Requirements

Credit requirements are important in organized electricity markets in which RTOs must balance the need for market liquidity against corresponding risk of default. Defaults within these markets are particularly troubling because losses due to default are spread among all market participants. Thus, each RTO's tariff specifies credit rules needed to participate in the markets. These requirements provide for credit evaluations, credit limits, allowed forms of collateral and the consequences of violations or defaults.

Settlements

RTOs must invoice market participants for their involvement in their markets. Settlements is the process by which the RTO determines the amounts to be paid associated with buying and selling energy, capacity and ancillary services, and paying administrative charges.

The CAISO calculates, accounts for and settles all charges and payments based on received settlement quality meter data. The CAISO settles the following charges: grid management charge, bid cost recovery, energy and ancillary services, CRR charges and payments, among others. The CAISO settles for three periods: the day-ahead market, the HASP and the real-time markets.

ISO-NE

New England Independent System Operator

Market Profile

Geographic Scope

As the RTO for New England, ISO-NE is responsible for operating wholesale power markets that trade electricity, capacity, transmission congestion contracts and related products, in addition to administering auctions for the sale of capacity.

ISO-NE operates New England's high-voltage transmission

network and performs long-term planning for the New England system. ISO-NE serves six New England states: Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island and Vermont.

Peak Demand

New England's all-time peak load was 28 GW in 2006.

Import and Exports

ISO-NE is interconnected with the New York Independent System Operator (NYISO), TransEnergie (Québec) and the New Brunswick System Operator.

ISO-NE imports 12 percent of its annual energy needs from Québec. ISO-NE imports energy from and exports energy to NYISO.

New England receives imports from Québec and New Brunswick in most hours. Between New England and New York, power flows in alternate directions depending on market conditions.

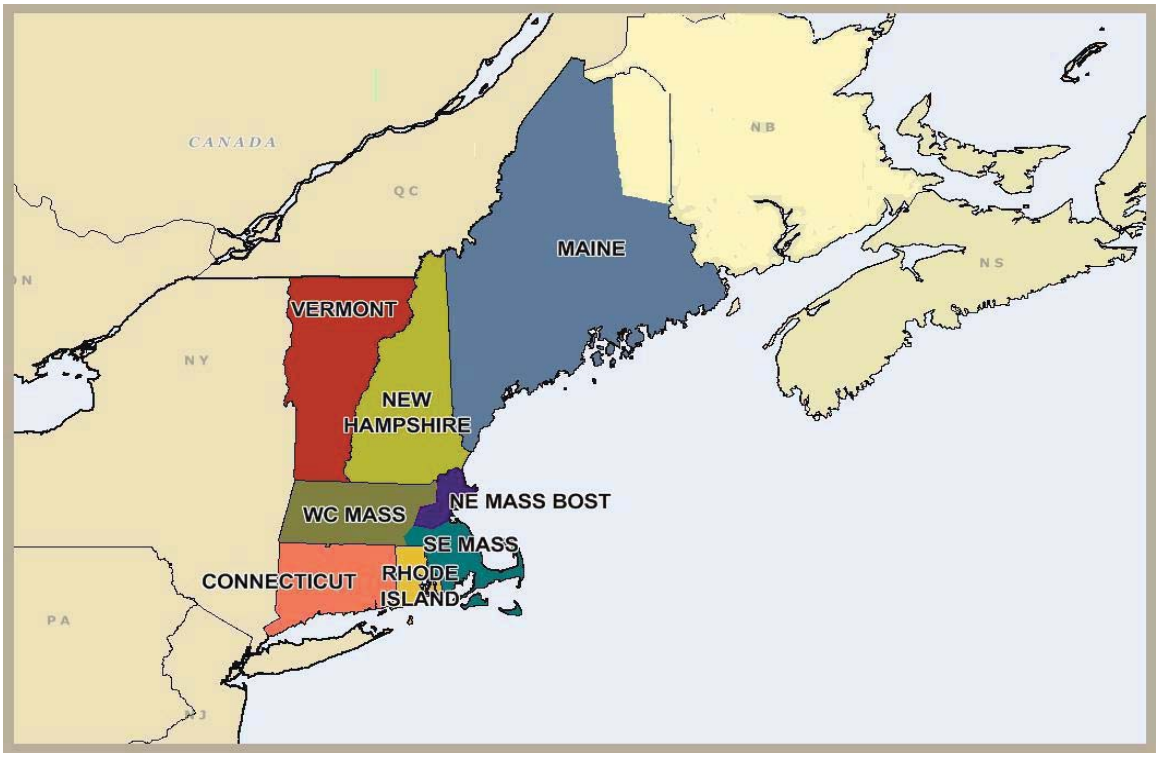
Market Participants

The New England Power Pool (NEPOOL) consists of six sectors: (1) end-user sector; (2) publicly owned entities; (3) supplier sector; (4) transmission sector; (5) generation sector; and (6) alternative resources.

Membership and Governance

ISO-NE is a not-for-profit entity governed by a 10-member, independent, nonstakeholder board of directors. The sitting members of the board elect people to fill board vacancies.

Independent System Operator of New England (ISO-NE)



Transmission

Owners

ISO-NE's transmission owners include:

- Bangor Hydro-Electric Co.,
- Central Maine Power Co.,
- New England Power Co.,
- Northeast Utilities System Cos.,
- NSTAR Electric Co.,
- Transmission Sector Provisional Group Member,
- The United Illuminating Co., and
- Vermont Electric Power Co. Inc.

Chronic Constraints

In 2009, New England completed a series of major transmission projects to improve reliability, including projects serving Boston, southwestern Connecticut and southeastern Massachusetts.

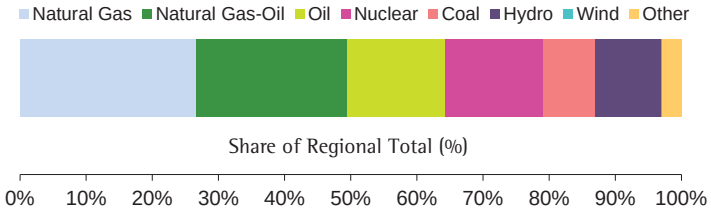
Transmission Planning

Each year, ISO-NE prepares a comprehensive 10-year regional system plan (RSP) that reports on the results of ISO system planning processes. Each plan includes forecasts of future loads (i.e., the demand for electricity measured in megawatts) and addresses how this demand may be satisfied by adding supply resources; demand resources, including demand response and energy efficiency; and new or upgraded transmission facilities. Each year's plan summarizes New England needs, as well as the needs in specific areas, and includes solutions and processes required to ensure the reliable and economic performance of the New England power system.

Supply Resources

Generating Mix

By plant capacity, the generating mix includes these sources:



Demand Response

Currently, ISO-NE administers five load-response programs for the New England wholesale electricity market. These include:

- **Real-Time 30-Minute Demand-Response Program:** These resources are required to respond within 30 minutes of the ISO's instructions.
- **Real-Time 2-Hour Demand Response Program:** This program requires demand resources to respond within two hours of the ISO's instructions.
- **Real-Time Profiled-Response Program:** These resources may be interrupted for anticipated capacity deficiencies within a specified time period and receive payment for a minimum of two hours.
- **Real-Time Price-Response Program:** These resources may interrupt (but are not required to do so) when they receive notice on the previous day. If they interrupt, they receive payment for the eligibility period.
- **Day-Ahead Load-Response Program:** An optional program that allows a participant in any of the real-time programs to offer interruptions concurrent with the day-ahead energy market. The participant is paid the day-ahead LMP for the cleared interruptions, and real-time deviations are charged or credited at the real-time LMP.

Market Features and Functions

Energy Markets

Day-Ahead

The day-ahead energy market allows market participants to secure prices for electric energy the day before the operating day and hedge against price fluctuations that can occur in real time. One day ahead of actual dispatch, participants submit supply offers and demand bids for energy. These bids are applied to each hour of the day and for each pricing location on the system.

In the day-ahead energy market, incremental offers and decremental bids (virtual supply offers and demand bids) can also be submitted, which indicate prices at which supply or demand are willing to increase or decrease their injection or withdrawal on the system. These INCs and DECs are tools market participants can use to hedge their positions in the day-ahead energy market.

From the offers and bids, the RTO constructs aggregate supply and demand curves for each location. The intersection of these curves identifies the market-clearing price at each location for every hour. Supply offers below and demand bids above the identified price are cleared and are scheduled. Offers and bids that clear are entered into a pricing software system along with binding transmission constraints to produce the locational marginal prices (LMPs) for all locations.

Hour-Ahead

None.

Real-Time

ISO-NE must coordinate the dispatch of generation and demand resources to meet the instantaneous demand for electricity. Supply or demand for the operating day can change for a variety of reasons, including unforeseen generator or transmission outages, transmission constraints or changes from the expected demand. While the day-ahead energy market produces the schedule and financial terms of energy production and use for the operating day, a number of factors can change that schedule. Thus, ISO-NE operates a spot market for energy, the real-time energy market, to meet energy needs within each hour of the current day.

ISO-NE clears the real-time energy market using supply offers, real-time load and offers and bids to sell or buy energy over the external interfaces. For generators, the market provides additional opportunities to offer supply to help meet incremental supply needs. Load-serving entities (LSEs) whose actual demand comes in higher than that scheduled in the day-ahead energy market may secure additional energy from the real-time energy market.

The real-time energy market financially settles the differences between the day-ahead scheduled amounts of load and generation and the actual real-time load and generation. Differences from the day-ahead quantities cleared are settled at the real-time LMP.

In real time, ISO-NE will issue dispatch rates and dispatch targets. These are five-minute price and megawatt signals based on the aggregate offers of generators, which will produce the required energy production. Market participants are, throughout the day, allowed to offer imports or request exports of electricity from neighboring control areas with at least one hour's notice.

Must-Offer Requirements

Market rules in RTOs include must-offer requirements for certain categories of resources for which withholding, a form of the exercise of market power, may be a concern. Where such rules apply, sellers must commit, or offer, the

generators, and schedule and operate the facilities, into the applicable market.

Ancillary and Other Services

Ancillary services are those functions performed by electric generating, transmission and system-control equipment to support the transmission of electric power from generating resources to load while maintaining the reliability of the transmission system. RTOs procure or direct the supply of ancillary services.

ISO-NE procures ancillary services via the forward reserve market and its regulation market. The forward reserve market compensates generators for making available their unloaded operating capacity that can be converted into electric energy within 10 or 30 minutes when needed to meet system contingencies, such as unexpected outages. The Regulation Market compensates resources that ISO-NE instructs to increase or decrease output moment by moment to balance the variations in demand and system frequency to meet industry standards. The specific ancillary services ISO-NE procures in its markets include the following:

- Ten-Minute Spinning Reserves: provided by resources already synchronized to the grid and able to generate electricity within 10 minutes.
- Ten-Minute Nonspinning Reserves: provided by resources not currently synchronized to the grid but capable of starting and providing output within 10 minutes.
- Thirty-Minute Nonspinning Reserves: provided by resources not currently synchronized to the grid but capable of starting and providing output within 30 minutes.
- Regulation: provided by specially equipped resources with the capability to increase or decrease their generation output every four seconds in response to signals they receive from ISO-NE to control slight changes on the system.

Specialized ancillary services that are not bought and sold in these ancillary service markets include voltage support and black-start capability. Voltage support allows the New England control area to maintain transmission voltages. Black-start capability is the ability of a generating unit to go from a shutdown condition to an operating condition and start delivering power without assistance from a power system. ISO-NE procures these services via cost-based rates.

Capacity Markets

In ISO-NE's annual forward capacity auctions (FCA), both generator and demand resources offer capacity three years in advance of the period for which capacity will be supplied. The three-year lead time is intended to encourage participation by new resources and allow the market to adapt to resources leaving the market. Resources whose capacity clears the FCA acquire capacity supply obligations (CSOs). ISO-NE held its first two FCAs in 2008 for the 2010-11 and 2011-12 delivery years. The first full year of capacity market commitments began on June 1, 2010. A third auction was held in December 2009 for the 2011-13 delivery years. The FCA process includes the modeling of transmission constraints to determine if load zones will be import- or export-constrained.

Market Power Mitigation

In ISO-NE, mitigation may be applied for physical withholding, economic withholding, uneconomic production, virtual transactions or other conduct if the conduct has a material effect on prices or uplift payments. The market monitor uses defined thresholds to identify physical and economic withholding and uneconomic generation, as well

as defined thresholds to determine whether bids and offers would, if not mitigated, cause a material effect on LMPs or uplift charges.

Reliability Must-Run

None.

Financial Transmission Rights

New England FTRs are monthly and annual products. ISO-NE holds FTR auctions and then allocates the auction revenue to LSEs based on historical load. ISO-NE is the only RTO to settle accounts weekly but revenue insufficiency is possible. Month-to-month surplus is carried over and used to fund any deficiencies, and the true-up period for accounts occurs once a year.

Virtual Transactions

In ISO-NE, any market participant may submit INCs or DECs into the day-ahead market.

MISO

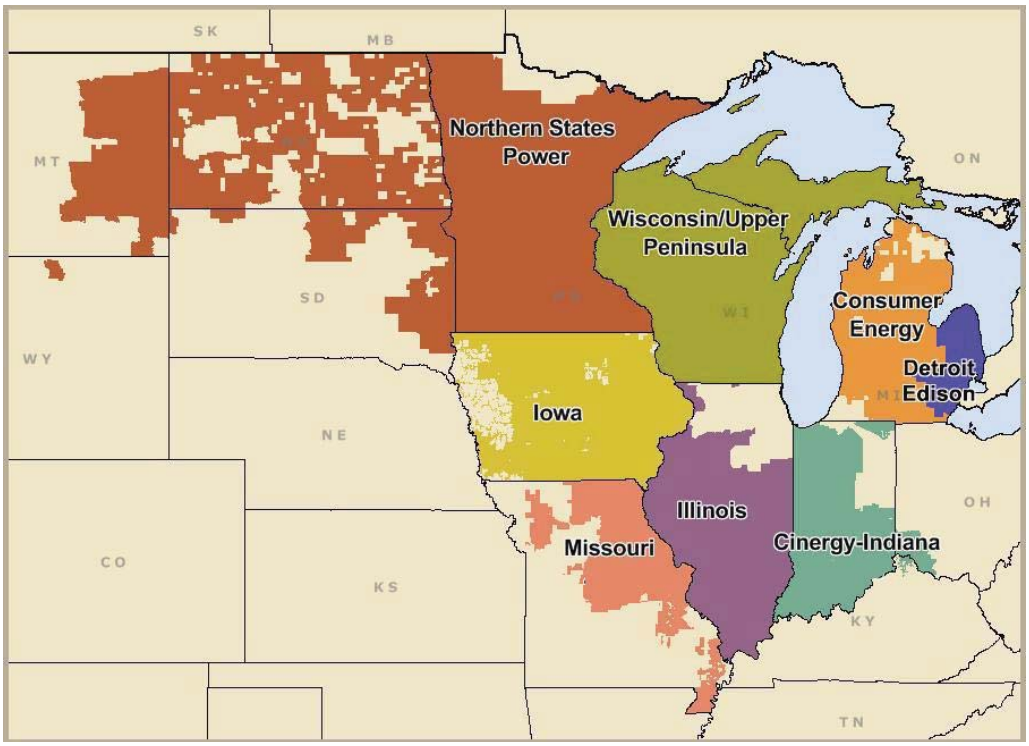
Midwest Independent System Operator

Market Profile

Geographic Scope

MISO operates the transmission system and a centrally dispatched market in portions of 13 states in the Midwest, extending from western Pennsylvania to eastern Montana and from the Canadian border to the southern extremes of

Midwest Independent System Operator (MISO)



Illinois and Missouri. The system is operated from a primary control center in Carmel, Ind., and a second control center in St. Paul, Minn., for the western region. MISO also serves as the reliability coordinator for additional systems outside of its market area, primarily to the north and northwest of the market footprint.

MISO was not a power pool before organizing as an ISO in December 2001. It began market operations in April 2005. In January 2009, MISO started operating an ancillary services market and combined its 24 separate balancing areas into a single balancing area.

Demand

MISO's peak demand was 116 GW in 2006.

Import and Exports

MISO has interconnections with the PJM and Southwest Power Pool (SPP) RTOs. It is also directly connected to TVA, the Western Area Power Administration and the electric systems of Manitoba and Ontario, plus several smaller systems. MISO is a net importer of power overall, but the interchange with some areas can flow in either direction, depending on the relative loads and prices in the adjoining regions. Manitoba Hydro supplies a large part of MISO's load with its excess capacity, particularly in the summer.

Market Participants

MISO includes 34 transmission owners, whose assets define the MISO market area. MISO's market participants include generators, power marketers, transmission-dependent utilities and load-serving entities.

Membership and Governance

An independent board of directors of eight members, including the president, governs MISO. Directors are elected by the MISO membership from candidates provided by the board.

An advisory committee of the membership provides advice to the board and information to the MISO stakeholders. Membership includes entities with an interest in MISO's operation, such as state regulators and consumer advocates, as well as transmission owners, independent power producers, power marketers and brokers, municipal and cooperative utilities and large-volume customers.

Transmission

Owners

The transmission owners in MISO include:

- Alliant Energy
- American Transmission Co.
- Ameren (Missouri and Illinois)
- American Transmission Systems
- Cinergy Services (Duke)
- Indianapolis Power and Light
- ITC
- Michigan Public Power Agency
- NSP Companies (Xcel)
- Northern Indiana Public Service Co.
- Otter Tail Power
- MidAmerican Energy

Chronic Constraints

MISO has certain pathways that are more likely to become congested, but the likelihood and pattern of congestion in any area is subject to weather patterns, wind production and interchange with external regions. When load is high in the eastern part of MISO and to the east in PJM, constraints occur on pathways from the Minnesota and Wisconsin areas through Chicago and across Indiana and Ohio. A particular congestion point with this pattern is northern Indiana. When colder weather hits Minnesota and the Dakotas, there is often congestion in the northern direction, particularly in Iowa. Higher wind production can cause localized constraints in some areas and can

cause congestion in pathways from southern Minnesota and western Iowa moving eastward.

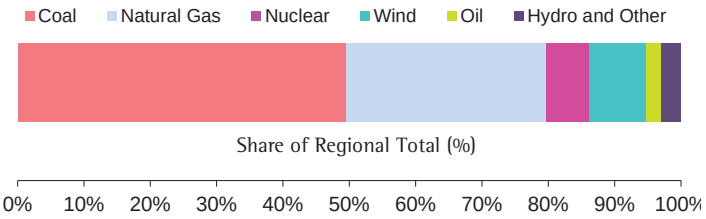
Transmission Planning

The main vehicle MISO uses for transmission planning is the Midwest ISO Transmission Expansion Plan developed by the MISO planning department in collaboration with transmission owners and other stakeholders who form the planning advisory committee. The plan is for two years. Once approved by the board, the plan becomes the responsibility of the transmission owners.

Supply Resources

Generating Mix

By plant capacity, the generating mix includes these sources:



Demand Response

Demand-side resources are able to participate in MISO's markets in providing capacity, energy in both the day-ahead and real-time markets and ancillary services.

Market Features and Functions

Energy Markets

Day-Ahead Market

The day-ahead market allows market participants to secure prices for electric energy the day before the operating day and hedge against price fluctuations that can occur in real time. One day ahead of actual dispatch, participants submit supply offers and demand bids for energy. These bids are applied to each hour of the day and for each pricing location on the system.

In the day-ahead market, incremental offers and decremental bids (virtual supply offers and demand bids) can also be submitted, although they are not associated with physical resources or actual load. These INCs and DECs are tools market participants can use to hedge their real time commitments or to arbitrage the day-ahead to real-time price spread.

From the offers and bids, the RTO constructs aggregate supply and demand curves for each location. The intersection of these curves identifies the market-clearing price at each location for every hour. Supply offers below and demand bids above the identified price are scheduled. Offers and bids that clear are entered into a pricing software system along with binding transmission constraints to produce the locational marginal prices (LMPs) for all locations.

Generators and offers scheduled in the day-ahead settlement are paid the day-ahead LMP for the megawatts accepted. Scheduled suppliers must produce the committed quantity during real-time or buy power from the real-time marketplace to replace what was not produced.

Likewise, wholesale buyers of electricity and virtual demand whose bids to buy clear in the day-ahead market

settlement pay for and lock in their right to consume the cleared quantity at the day-ahead LMP. Electricity use in real-time that exceeds the day-ahead purchase is paid for at the real-time LMP.

Hour-Ahead Market

Not applicable for MISO.

Real-Time Market

MISO must coordinate the dispatch of generation and demand resources to meet the instantaneous demand for electricity. Supply or demand for the operating day can change for a variety of reasons, including unforeseen generator or transmission outages, transmission constraints or changes from the expected demand. While the day-ahead energy market produces the schedule and financial terms for the bulk of the physical transactions, a number of factors usually change the day-ahead result. Thus, MISO operates a spot market for energy, the real-time energy market, to meet actual energy needs within each hour of the operating day.

The real-time market is prepared for at the conclusion of the day-ahead market on the day before the operating day. MISO clears the real-time energy market using supply offers, real-time load and external offers. For generators, the market provides additional opportunities to offer supply to help meet incremental needs. LSEs whose actual demand comes in higher than what was scheduled in the day-ahead market may secure additional energy from the real-time market.

The real-time energy market financially settles the differences between the day-ahead scheduled amounts of load and generation and the actual real-time load and generation. Participants either pay or are paid the real-time LMP for the amount of load or generation in megawatt-hours that deviates from their day-ahead schedule.

In real-time, MISO issues dispatch rates and dispatch targets. These are five-minute price and megawatt signals based on the aggregate offers of generators, which will produce the required energy production. Market participants are, throughout the day, allowed to offer imports or request exports of electricity from neighboring control areas by submitting transmission schedules into or out of MISO.

In real-time, generators can also deviate from the day-ahead clearing schedule by self-scheduling, which means that MISO will run a given unit without regard to the unit's economics unless running the unit presents a reliability concern.

During the operating day, the real-time market acts as a balancing market for load with physical resources used to meet that load. A market price for energy and for each of the ancillary services is calculated for each five-minute dispatch interval and the resulting five-minute prices are rolled into hourly prices for billing and payment. Differences in the real-time operation from the day-ahead clearing, including all virtual transactions, are settled at the real-time price.

Must-Offer Requirements

Market rules in RTOs include must-offer requirements for certain categories of resources for which withholding, which could be an exercise of market power, may be a concern. Where such rules apply, sellers must commit, or offer, the generators, and schedule and operate the facilities, in the applicable market.

In MISO, generators who supply capacity to meet the RTO resource adequacy requirement for load are required to offer into the day-ahead and real-time markets for energy and the ancillary services for which they are qualified.

Ancillary and Other Services

Ancillary services are those functions performed by electric generating, transmission and system-control equipment to support the transmission of electric power from generating resources to load while maintaining the reliability of the transmission system. RTOs procure or direct the supply of ancillary services.

MISO procures ancillary services via the co-optimized energy and ancillary services market and includes the following services:

- Spinning Reserves: provided by resources already synchronized to the grid and able to provide output within 10 minutes.
- Supplemental (nonspinning) Reserves: provided by resources not currently synchronized to the grid but capable of starting and providing output within 10 minutes.
- Regulation: provided by specially equipped resources with the capability to increase or decrease their generation output every four seconds in response to signals they receive to control slight changes on the system.

Capacity Markets

Capacity markets are a construct to provide assurance to government entities and to NERC a means for load-serving entities (LSEs) to prove they have procured capacity needed to meet forecast load and to allow generators to recover a portion of their fixed costs. They also provide economic incentives to attract investment in new and existing supply-side and demand-side capacity resources.

MISO maintains a monthly capacity requirement on all LSEs based on the load forecast plus reserves. LSEs are required to specify to MISO what physical capacity, including demand resources, they have designated to meet their load forecast. This capacity can be acquired either through bilateral purchase or self-supply. Additionally, MISO conducts a monthly auction to provide an opportunity for load that has not arranged all of its capacity to procure its needs from uncommitted resources.

Market Power Mitigation

In electric power markets, mainly because of the largely nonstorable nature of electricity and the existence of transmission constraints that can limit the availability of multiple suppliers to discipline market prices, some sellers from time to time have the ability to raise market prices. Market power mitigation is a market design mechanism to ensure competitive offers even when competitive conditions are not present.

Reliability Must-Run

None.

Financial Transmission Rights

Financial transmission rights (FTRs) give market participants an offset or hedge against transmission congestion costs in the day-ahead market. An FTR is a financial contract protecting the holder from costs arising from transmission congestion over a path or a source-and-sink pair of locations on the grid. An FTR provides the holder with revenue, or charges, equal to the difference in congestion prices in the day-ahead market across the specific FTR transmission path. FTRs were originally formulated to protect LSEs from price uncertainty while redistributing excess congestion charges due to constrained conditions. Other market participants such as financial-only participants may purchase FTRs through the RTO's auctions or through secondary market purchases.

MISO FTRs are monthly and annual products.

Virtual Transactions

A virtual transaction allows a participant to buy or sell power in the day-ahead market without requiring physical generation or load. Cleared virtual supply (increment or virtual offers, or INCs) in the day-ahead energy market at a particular location in a certain hour creates a financial obligation for the participant to buy back the bid quantity in the real-time market at that location in that hour. Cleared virtual demand (decrement or virtual bids, or DECs) in the day-ahead market creates a financial obligation to sell the bid quantity in the real-time market. The financial outcome for a particular participant is determined by the difference between the hourly day-ahead and real-time LMPs at the location at which the offer or bid clears. Thus, through this financial arbitrage opportunity, virtual transactions in theory help to narrow the difference between the day-ahead and real-time prices.

MISO allows virtual bids and offers into its day-ahead energy market where the bids and offers are included in the determination of the LMP along with physical resource offers and actual load bids. Market participants whose virtual transactions clear in the day-ahead market, have their positions cleared in the real-time market at the real-time price. Virtual bids and offers are allowed in MISO at any pricing node or aggregate of pricing nodes.

Credit Requirements

Credit requirements are important in markets in which RTOs must balance the need for market liquidity against corresponding risk of default. Defaults within these markets are particularly troubling because losses due to default are borne among all market participants. Thus, each RTO's tariff specifies credit rules needed to participate in the markets. These requirements provide for credit evaluations, credit limits, allowed forms of collateral and the consequences of violations or defaults.

Settlements

RTOs must invoice market participants for their involvement in their markets.

The RTO determines the amount owed associated with buying and selling energy, capacity and ancillary services and paying various administrative charges.

Settlements for market activity in MISO are finalized seven days after the operating day and payable after 14 days.

NYISO

New York Independent System Operator

Market Profile

Geographic Scope

Prior to restructuring of the electric industry in the 1990s, New York's private utilities and public power authorities owned and operated New York's electric system. Operation of the electric grid was coordinated by a voluntary collaboration of the utilities and power authorities as the New York Power Pool (NYPP). The creation of the New York Independent System Operator (NYISO) was authorized by FERC in 1998. The formal transfer of the NYPP's responsibilities to the NYISO took place on Dec. 1, 1999.

The NYISO footprint covers the entire state of New York. NYISO is responsible for operating wholesale power markets that trade electricity, capacity, transmission congestion contracts, and related products, in addition to administering auctions for the sale of capacity. NYISO operates New York's high-voltage transmission network and performs long-term planning.

Demand

NYISO's all-time peak load was 34 GW in 2006.

Imports and Exports

NYISO imports and exports energy through interconnections with ISO-NE, PJM, TransEnergie (Quebec) and Ontario.

Market Participants

NYISO's market participants include generators, transmission owners, financial institutions, traditional local utilities, electric co-ops and industrials.

Membership and Governance

NYISO is governed by an independent 10-member board of directors and management, business issues and operating committees. Each committee oversees its own set of working groups or subcommittees. These committees comprise transmission owners, generation owners and other suppliers, consumers, public power and environmental entities. Tariff revisions on market rules and operating procedures filed with the Commission are largely developed through consensus by these committees. The members of the board, as well as all employees, must not be directly associated with any market participant or stakeholder.

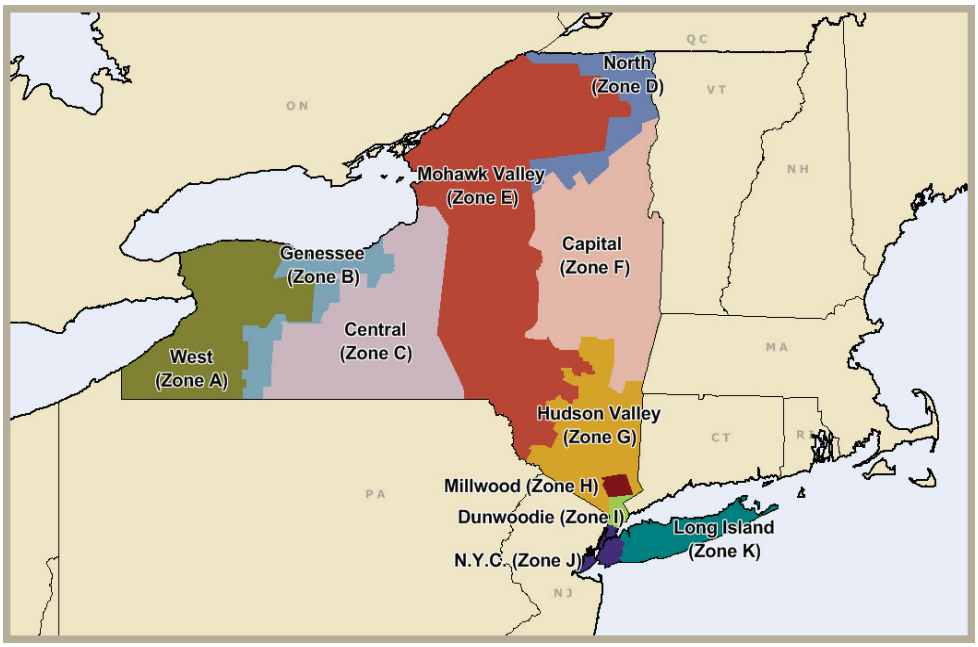
Transmission

Transmission Owners

NYISO's transmission owners include:

- Central Hudson Gas & Electric Corp.
- Consolidated Edison Co. of New York (ConEd)
- Long Island Power Authority (LIPA)
- New York Power Authority (NYPA)
- New York State Electric and Gas Corp. (NYSEG)
- National Grid
- Orange & Rockland Utilities
- Rochester Gas and Electric Corp.

New York Independent System Operator (NYISO)



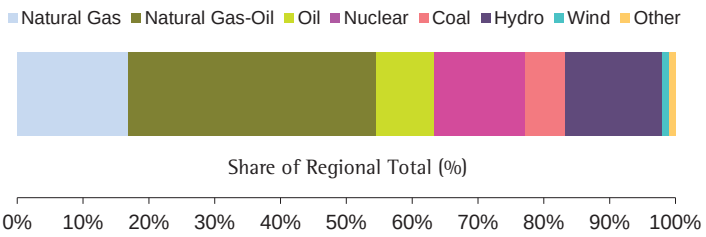
Chronic Constraints

The chronic transmission constraints in NYISO are in the southeastern portion of the state, leading into New York City and Long Island. As a result of their dense populations, New York City and Long Island are the largest consumers of electricity. Consequently, energy flows from the west and the north toward these two large markets, pushing transmission facilities near their operational limits. This results in transmission constraints in several key areas, often resulting in higher prices in the New York City and Long Island markets.

Supply Resources

Generating Mix

By plant capacity, the generating mix includes these sources:



Demand Response

NYISO has four demand-response (DR) programs: the emergency demand-response program (EDRP), the installed capacity (ICAP) special case resources program (SCR), the day-ahead demand-response program and the demand-side ancillary services program.

Both the emergency and special cases programs can be deployed in energy shortage situations to maintain the reliability of the bulk power grid. Both programs are designed to reduce power usage by shutting down businesses and large power users. Companies, mostly industrial and commercial, sign up to take part in the programs. The companies are paid by NYISO for reducing energy consumption when asked to do so. Reductions are voluntary for EDRP participants. SCR participants are required to reduce power usage and as part of their agreement are paid in advance for agreeing to cut power usage on request.

NYISO's day-ahead DR program allows energy users to bid their load reductions into the day-ahead market. Offers determined to be economic are paid at the market clearing price. Under day-ahead DR, flexible loads may effectively increase the amount of supply in the market and moderate prices.

The ancillary services program provides retail customers that can meet telemetry and other qualifications the ability to bid their load curtailment capability into the day-ahead market or real-time market to provide reserves and regulation service. Scheduled offers are paid the marketing clearing price for reserves or regulation.

Market Features and Functions

Energy Markets

Day-Ahead Market

The day-ahead market allows market participants to secure prices for electric energy the day before the operating day and hedge against price fluctuations that can occur in real time. One day ahead of actual dispatch, participants submit supply offers and demand bids for energy. These bids are applied to each hour of the day and for each pricing location on the system.

In the day-ahead market, virtual supply offers and demand bids can also be submitted. These are tools market participants can use to hedge their positions in the day-ahead market.

From the offers and bids, the RTO constructs aggregate supply and demand curves for each location. The intersection of these curves identifies the market-clearing price at each location for every hour. Supply offers below, and demand bids above, the identified price are scheduled. Offers and bids that clear are then entered into a pricing software system along with binding transmission constraints

to produce the locational marginal prices (LMPs) for all locations. The NYISO refers to these as locational based marginal prices, or LBMPs.

Generators and offers scheduled in the day-ahead settlement are paid the day-ahead LBMP for the megawatts accepted. Scheduled suppliers must produce the committed quantity during real-time or buy power from the real-time marketplace to replace what was not produced.

Likewise, wholesale buyers of electricity and virtual demand whose bids to buy are accepted in the day-ahead market pay for and lock in their right to consume the cleared quantity at the day-ahead LBMP. Electricity used in real-time that exceeds the day-ahead purchase is paid for at the real-time LBMP.

Hour-Ahead Market

The hour-ahead market allows buyers and sellers of electricity to balance unexpected increases or decreases of electricity use after the day-ahead market closes. Bids and offers are submitted an hour ahead of time. Prices are set based on those bids and offers, generally for use in matching generation and load requirements, but those prices are advisory only. Hour-ahead scheduling is completed at least 45 minutes prior to the beginning of the dispatch hour after NYISO reviews transmission outages, the load forecast, reserve requirements and hour-ahead generation and firm transaction bids, among other things.

Real-Time Market

NYISO must coordinate the dispatch of generation and demand resources to meet the instantaneous demand for electricity. Supply or demand for the operating day can change for a variety of reasons, including unforeseen generator or transmission outages, transmission constraints or changes from the expected demand. While the day-ahead market produces the schedule and financial terms of energy production and use for the operating day, a number of factors can change that schedule. Thus, NYISO operates a spot market for energy, the real-time energy market, to meet energy needs within each hour of the current day.

Real-time energy market outcomes are based on supply offers, real-time load and offers and bids to sell or buy energy. LSEs whose actual demand comes in higher than that scheduled in the day-ahead market may secure additional energy from the real-time market. For generators, the market provides additional opportunities to offer supply to help meet additional needs.

The real-time energy market financially settles the differences between the day-ahead scheduled amounts of load and generation and the actual real-time load and generation. Those who were committed to produce in the day-ahead are compensated at (or pay) the real-time LBMP for the megawatts under- or over-produced in relation to the cleared amount. Those who paid for day-ahead megawatts are paid (or pay) the real-time LBMP for megawatts under- or over-consumed in real-time.

Real-time dispatch of generators occurs every five minutes, as does the setting of the real-time prices used for settlement purposes. Market participants may participate in the day-ahead, hour-ahead, and the real-time market.

Must-Offer Requirements

Under the NYISO capacity auction rules, entities that offer capacity into an auction that is subsequently purchased by load are required to offer that amount of capacity into the day-ahead energy market. This rule ensures that capacity sold through the capacity auctions is actually delivered into the market.

Ancillary and Other Services

Ancillary services are those functions performed by electric generating, transmission and system-control equipment to support the transmission of electric power from generating resources to load while maintaining the reliability of the transmission system. RTOs procure or direct the supply of ancillary services.

NYISO administers competitive markets for ancillary services that are required to support the power system. The two most important types of ancillary services are operating reserves and regulation. Operating reserves and regulation are typically provided by generators, but NYISO allows demand-side providers to participate in these markets as well. Operating reserve resources can either be spinning (online with additional ramping ability) or nonspinning (off-line, but able to start and synchronize quickly). NYISO relies on regulating resources that can quickly adjust their output or consumption in response to constantly changing load conditions to maintain system balance.

The NYISO relies on the following types of ancillary services:

- Ten-Minute spinning reserves: provided by resources already synchronized to the grid and able to provide output within 10 minutes.
- Ten-Minute nonspinning reserves: provided by resources not currently synchronized to the grid but capable of starting and providing output within 10 minutes.
- Thirty-Minute nonspinning reserves: provided by resources not currently synchronized to the grid but capable of starting and providing output within 30 minutes.
- Regulation: provided by resources with the capability to increase or decrease their generation output within seconds in order to control changes on the system.

Capacity Markets

Capacity markets provide a means for load-serving entities (LSEs) to procure capacity needed to meet forecast load and to allow generators to recover a portion of their fixed costs. They also provide economic incentives to attract investment in new and existing supply-side and demand-side capacity resources in New York as needed to maintain bulk power system reliability requirements.

In NYISO's capacity market, LSEs procure capacity through installed-capacity (ICAP) auctions, self-supply and bilateral arrangements based on their forecasted peak load plus a margin. The NYISO conducts auctions for three different service durations: the capability period auction (covering six months), the monthly auction and the spot market auction.

New York has capacity requirements for three zones: New York City, Long Island and New York-Rest of State. The resource requirements do not change in the monthly auctions and ICAP spot market auctions relative to the capability period auction. The shorter monthly auctions are designed to account for incremental changes in LSE's load forecasts.

Market Power Mitigation

In electric power markets, mainly because of the largely nonstorable nature of electricity and the existence of transmission constraints that can limit the availability of multiple suppliers to discipline market prices, some sellers from time to time have the ability to raise market prices. Market power mitigation is a market design mechanism to ensure competitive offers even when competitive conditions are not present.

Market power may need to be mitigated on a systemwide basis or on a local basis. When a transmission constraint creates the potential for local market power, the RTO may

apply a set of behavioral and market outcome tests to determine if the local market is competitive and if generator offers should be adjusted to approximate price levels that would be seen in a competitive market.

The categories of conduct that may warrant mitigation by NYISO include physical withholding, economic withholding and uneconomic production by a generator or transmission facility to obtain benefits from a transmission constraint. Physical withholding is not offering to sell or schedule energy provided by a generator or transmission facility capable of serving a NYISO market. Physical withholding may include falsely declaring an outage, refusing to offer or schedule a generator or transmission facility; making an unjustifiable change to operating parameters of a generator that reduces its availability; or operating a generator in real-time at a lower output level than the generator would have been expected to produce had the generator followed NYISO's dispatch instructions. Economic withholding is submitting bids for a generator that are unjustifiably high so that the generator is not dispatched.

NYISO will not impose mitigation unless the conduct causes or contributes to a material change in prices, or substantially increases guarantee payments to participants.

Virtual bidding is subject to mitigation under certain circumstances as well. NYISO may limit the hourly quantities of virtual bids for supply or load that may be offered in a zone by a market participant whose virtual bidding practices are determined to contribute to an unwarranted divergence of LBMPs (location-based marginal prices) between the day-ahead and real-time markets. If the NYISO determines that the relationship between zonal LBMPs in a zone in the day-ahead market and the real-time market is not what would be expected under conditions of workable competition, and that the virtual bidding practices of one or more market participants has contributed to this divergence, then a mitigation measure may be imposed.

Price Caps

NYISO does not have price caps. It employs a bid cap of $1,000/MWh for its day-ahead and real-time markets.

ICAP for New York City is subject to offer caps and floors. Offer caps in New York City are based on reference levels or avoided costs. Capacity from generators within New York City must be offered in each ICAP spot market auction, unless that capacity has been exported out of New York or sold to meet ICAP requirements outside New York City.

Local Market Power Mitigation

Generators in New York City are subject to automated market power mitigation procedures because New York City is geographically separated from other parts of New York; plus, generators in New York City have been deemed to have market power.

These automated procedures determine whether any day-ahead or real-time energy bids, including start-up costs bids and minimum generation bids, but excluding ancillary services bids, exceed the tariff's thresholds for economic withholding, and, if so, determine whether such bids would cause material price effects or changes in guarantee payments. If these two tests are met, mitigation is imposed automatically.

For example, the threshold for economic withholding regarding energy and minimum generation bids is a 300 percent increase or an increase of $100/MWh over the applicable reference level, whichever is lower. Energy or minimum generation bids below $25/MWh are not considered economic withholding. Regarding operating reserves and regulation bids, a 300 percent increase or an increase of $50/MW over the applicable reference level, whichever is lower, is the threshold for determining whether economic

withholding has occurred. In this instance, bids below $5/MW are not considered economic withholding. If an entity's bids meet these thresholds, the applicable reference level is substituted for the entity's actual bid to determine the clearing price.

Reliability Must-Run

NYISO has no reliability must-run provisions.

Financial Transmission Rights

Financial transmission rights (FTRs) give market participants an offset, or hedge, against transmission congestion costs in the day-ahead market. The NYISO refers to FTRs as transmission congestion contracts (TCCs). Other than the name, FTRs and TCCs are essentially the same. An FTR is a financial contract protecting the holder from costs arising from transmission congestion over a path or a source-and-sink pair of locations (or nodes) on the grid. An FTR provides the holder with revenue, or charges, equal to the difference in congestion prices in the day-ahead market across the specific FTR transmission path. FTRs were originally formulated to protect LSEs from price uncertainty. Other market participants, including financial-only participants, may purchase FTRs through the RTO's auctions.

A related product is an auction revenue right (ARR), which provides the holders with an upfront portion of the money raised in the TCC auctions. In general, they are allocated based on historical load served. As with FTRs, ARRs give transmission owners and eligible transmission service customers an offset, or hedge, against transmission congestion costs in the day-ahead market.

Virtual Transactions

A virtual transaction is a specific kind of transaction that allows a participant to buy or sell power in the day-ahead market without requiring physical generation or load. Cleared virtual supply (virtual offers) in the day-ahead energy market at a particular location in a certain hour creates a financial obligation for the participant to buy back the bid quantity in the real-time market at that location in that hour. Cleared virtual demand (virtual bids) in the day-ahead market creates a financial obligation to sell the bid quantity in the real-time market. The financial outcome is determined by the difference between the hourly day-ahead and real-time LBMPs at the location at which the offer or bid clears. Thus, through this financial arbitrage opportunity, virtual transactions in theory help to narrow the difference between the day-ahead and real-time prices.

Virtual bidding in NYISO takes place on a zonal level, not a nodal level.

Credit Requirements

Credit requirements are important in organized electricity markets in which RTOs must balance the need for market liquidity against corresponding risk of default. Losses due to default are borne among all market participants. Thus, each RTO's tariff specifies credit rules needed to participate in the markets. These requirements provide for credit evaluations, credit limits, allowed forms of collateral and the consequences of violations or defaults.

Settlements

RTOs must invoice market participants for their involvement in their markets. Settlements is the process by which the RTO determines the amounts owed and to be paid associated with buying and selling energy, capacity, ancillary services and paying various administrative charges.

NYISO uses a two-settlement process for its energy markets. The first settlement is based on day-ahead bids and offers, which clear the market and are scheduled. The second settlement is based on the real-time bids and the corresponding real-time dispatch.

PJM

The PJM Interconnection

Market Profile

Geographic Scope

The PJM Interconnection operates a competitive wholesale electricity market and manages the reliability of its transmission grid. PJM provides open access to the transmission and performs long-term planning. In managing the grid, PJM centrally dispatches generation and coordinates the movement of wholesale electricity in all or part of 13 states (Delaware, Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia and West Virginia) and the District of Columbia. PJM's markets include energy (day-ahead and real-time), capacity and ancillary services.

PJM was founded in 1927 as a power pool of three utilities serving customers in Pennsylvania and New Jersey. In 1956, with the addition of two Maryland utilities, it became the Pennsylvania-New Jersey-Maryland Interconnection, or PJM. PJM became a fully functioning ISO in 1996 and, in 1997, it introduced markets with bid-based pricing and locational market pricing (LMP). PJM was designated an RTO in 2001.

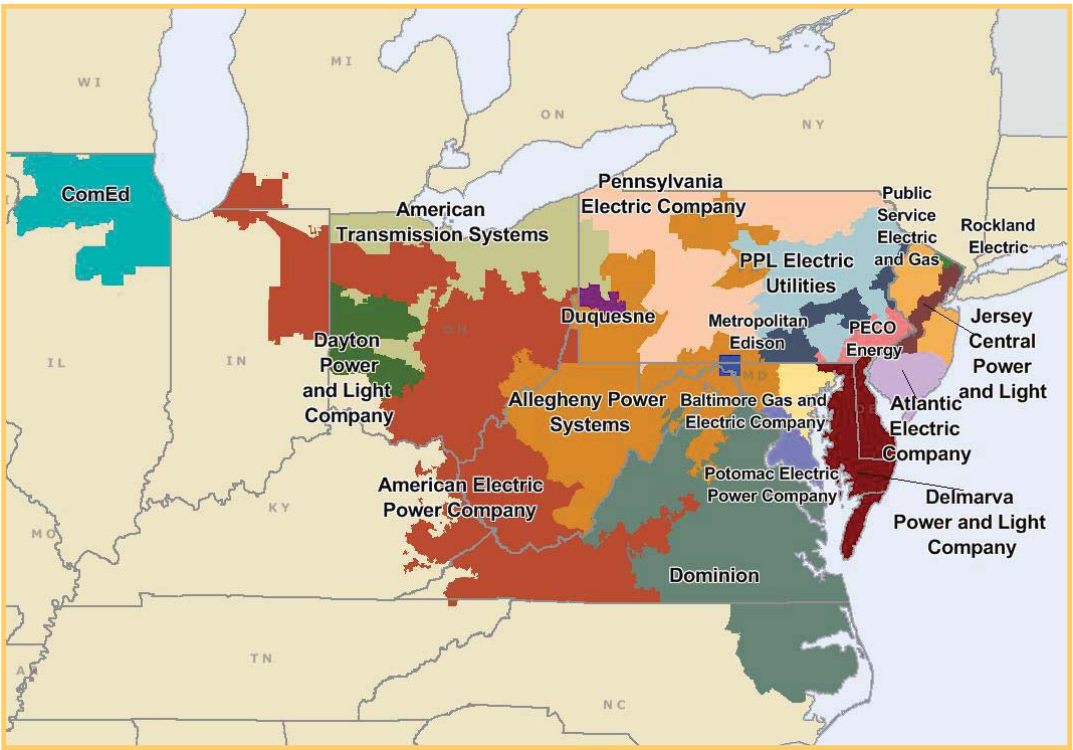
Demand

PJM's all-time peak load of 159 GW occurred in summer 2006.

Imports and Exports

PJM has interconnections with Midwest ISO and New York ISO. PJM also has direct interconnections with the Tennessee Valley Authority (TVA), Progress Energy Carolinas

PJM Regional Transmission Organization



and the Virginia and Carolinas Area (VACAR), among other systems. PJM market participants import energy from, and export energy to, external regions continuously. At times, PJM is a net importer of electricity and, at other times, PJM is a net exporter of electricity.

Market Participants

PJM's market participants include power generators, transmission owners, electric distributors, power marketers, electric distributors and large consumers.

Membership and Governance

PJM has a two-tiered governance model consisting of a board of managers and the members committee. PJM is governed by a 10-member board, nine of whom PJM members elect. The board appoints the tenth, the president and CEO, to supervise day-to-day operations. The board is generally responsible for oversight of system reliability, operating efficiency and short and long-term planning. The board ensures that no member or group of members exerts undue influence.

The members committee, which advises the board, is composed of five voting sectors representing power generators, transmission owners, electric distributors, power marketers and large consumers.

Transmission

Transmission Owners

The largest transmission owners in PJM include:

- AEP,
- First Energy,
- PSE&G,
- Dominion,
- Philadelphia Electric, and
- Commonwealth Edison.

Chronic Constraints

In general, transmission paths extending from generation sources in western PJM to load centers in eastern PJM tend to become constrained, particularly during peak load conditions. PJM's Mid-Atlantic markets rely on generation in the western part of PJM due to the retirements of eastern units and the location of new generation capacity in western areas, such as western Pennsylvania, West Virginia and eastern Ohio. Eastern PJM relies on transmission across Pennsylvania and up from southwestern PJM to import power from sources west and southwest. Eastern PJM relies on transmission capability to replace retired generation and to meet demand growth.

Congestion on the eastern interface also constrains power flows from the District of Columbia, Baltimore and Northern Virginia to New Jersey, Delmarva Peninsula and Philadelphia load centers. The high-voltage, bulk power transmission pathway within portions of the states of Pennsylvania, West Virginia, Virginia and Maryland serve the densely populated load centers of the metropolitan areas of Baltimore, the District of Columbia and Northern Virginia. The electricity needs of Washington-Baltimore-Northern Virginia are supplied not only by local generation but also by significant energy transfers to those areas.

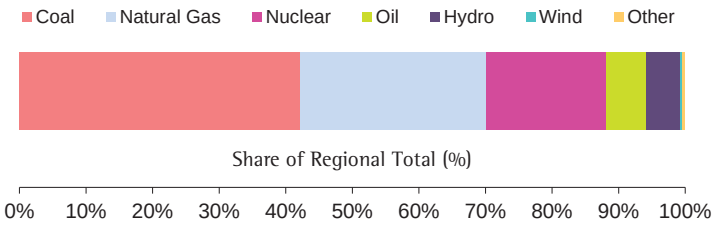
Transmission Planning

PJM's regional transmission expansion plan (RTEP) identifies transmission system additions and improvements needed to keep electricity flowing within PJM. Studies are conducted to test the transmission system against national and regional reliability standards. These studies look forward to identify future transmission overloads, voltage limitations and other reliability standards violations. PJM then develops transmission plans to resolve violations that could otherwise lead to overloads and blackouts.

Supply Resources

Generation Mix

By plant capacity, the generating mix includes these sources:



Demand Response

End-use customers providing demand response have the opportunity to participate in PJM's energy, capacity, synchronized reserve and regulation markets on an equal basis with generators. All demand-response programs can be grouped into emergency or economic programs. The emergency program compensates end-use customers who reduce their usage during emergency conditions on the PJM system. Participation in the emergency program may be voluntary or mandatory and payments may include energy payments, capacity payments or both. There are three options for emergency program registration and participation: energy only, capacity only and capacity-plus-energy.

The economic program allows end-use customers to reduce electricity consumption in the energy markets and receive a payment when LMPs are high. Under this program, all hours are eligible and all participation is voluntary. Participation in the program takes three forms: submitting a sell offer into the day-ahead market that clears; submitting a sell offer into the real-time market that is dispatched; and self-scheduling load reductions while providing notification to PJM. End-use customers participate in demand response in PJM through members called curtailment service providers, or CSPs, who act as agents for the customers. CSPs aggregate the demand of retail customers, register that demand with PJM, submit the verification of demand reductions for payment by PJM and receive the payment from PJM. The payment is divided among the CSP and its retail customers based on private agreements between them.

Market Features and Functions

Energy Markets

Day-Ahead Market

The day-ahead market allows market participants to secure prices for electric energy the day before the operating day and hedge against price fluctuations that can occur in real-time. One day ahead of actual dispatch, participants submit supply offers and demand bids for energy. These bids are applied to each hour of the day and for each pricing location on the system.

In the day-ahead market, incremental offers and decremental bids (virtual supply offers and demand bids) can also be submitted, which indicate prices at which supply or demand are willing to increase or decrease their injection or withdrawal on the system. These INCs and DECs are tools market participants can use to hedge their positions in the day-ahead market.

From the offers and bids, the RTO constructs aggregate supply and demand curves for each location. The intersection of these curves identifies the market-clearing price at each location for every hour. Supply offers below and demand bids above the identified price are said to clear, meaning they are scheduled. Offers and bids that clear are entered into a pricing software system along with binding transmission constraints to produce the locational marginal prices (LMPs) for all locations.

Generators and offers scheduled in the day-ahead settlement are paid the day-ahead LMP for the megawatts accepted. Scheduled suppliers must produce the committed

quantity during real-time or buy power from the real-time marketplace to replace what was not produced.

Likewise, wholesale buyers of electricity and virtual demand whose bids to buy clear in the day-ahead market settlement pay for and lock in their right to consume the cleared quantity at the day-ahead LMP. Electricity use in real-time that exceeds the day-ahead purchase is paid for at the real-time LMP.

Hour-Ahead Market

Not Applicable for PJM.

Real-Time Market

PJM must coordinate the dispatch of generation and demand resources to meet the instantaneous demand for electricity. Supply or demand for the operating day can change for a variety of reasons, including unforeseen generator or transmission outages, transmission constraints or changes from the expected demand. While the day-ahead energy market produces the schedule and financial terms of energy production and use for the operating day, a number of factors can change that schedule. Thus, PJM operates a spot market for energy, called the real-time energy market, to meet energy needs within each hour of the current day.

PJM clears the real-time energy market using supply offers, real-time load and offers and bids to sell or buy energy over the external interfaces. Real-time LMPs are calculated at five-minute intervals based on actual grid operating conditions as calculated in PJM's market systems. Generators that are available but not selected in the day-ahead scheduling may alter their bids for use in the real-time energy market during the generation rebidding period from 4 p.m. to 6 p.m.; otherwise, their original day-ahead market bids remain in effect for the real-time energy market.

Ancillary and Other Services

Ancillary services are those functions performed by electric generating, transmission and system-control equipment to support the transmission of electric power from generating resources to load while maintaining the reliability of the transmission system. RTO/ISOs procure or direct the supply of ancillary services.

PJM operates the following markets for ancillary services:

- Regulation: corrects for short-term changes in electricity use that might affect the stability of the power system.
- Synchronized reserves: supplies electricity if the grid has an unexpected need for more power on short notice.
- Day-ahead scheduling reserves (DASR): allows PJM to schedule sufficient generation to preserve reliability during unanticipated system conditions throughout the operating day.

Regulation service matches generation with very short-term changes in load by moving the output of selected resources up and down via an automatic control signal. In addition, PJM schedules operating reserves in the day-ahead market, and resources that provide this service are credited based on their offer prices. Reserve consists of 10-minute and 30-minute products.

Synchronized reserves are the equivalent of what is commonly referred to as spinning reserves, providing 10-minute reserves from a generator that is synchronized to the grid.

The DASR is the primary market mechanism for procuring the 30-minute reserves. A resource will only be assigned as amount of DASR corresponding to that amount of energy it could provide within 30 minutes of a request. If the DASR market does not result in procuring adequate

scheduling reserves, PJM is required to schedule additional operating reserves.

Futhermore, two ancillary services are provided on a cost basis: (1) blackstart service, which helps ensure the reliable restoration of the grid following a blackout; and (2) reactive power, which supports the voltages that must be controlled for system reliability, are provided at cost.

Capacity Markets

Capacity markets provide a means for load-serving entities (LSEs) to procure capacity needed to meet forecast load and to allow generators to recover a portion of their fixed costs. They also provide economic incentives to attract investment in new and existing supply-side and demand-side capacity resources in PJM as needed to maintain bulk power system reliability.

PJM's capacity market is called the reliability pricing model (RPM). The RPM market was implemented in 2007 and is designed to ensure the future availability of capacity resources, including demand-resources and energy-efficiency resources that will be needed to keep the regional power grid operating reliability. RPM market design is based on three-year, forward-looking annual obligations for locational capacity under which supply offers are cleared against a downward sloping demand curve, called the variable resource requirement (VRR) curve. The VRR curve establishes the amount of capacity that PJM requires its LSE customers to purchase, and the price for that capacity, in each capacity zone (locational delivery area). Under RPM, when a locational delivery area is transmission-constrained in the auction (i.e., limited in the amount of generation that can be imported into those areas), capacity prices generally rise in that area relative to the overall PJM footprint.

Annual auctions are referred to as base residual auctions (BRAs). LSEs that are able to fully supply their own capacity need can choose not to participate in the auctions. Most capacity is procured through self-supply and contracted (bilateral) resources and the auctions procure any remaining needed capacity. To mitigate the exercise of market power, the RPM market rules provide a test to determine whather each capacity seller has market power. If the seller fails that test, that seller's bid id capped so as to replicate that seller's avoidable or opportunity costs.

Market Power Mitigation

In electric power market, mainly because of the largely nonstorable nature of electricy and the existence of tranmission constraints that can limit the availability of multiple suppliers to discipline markets, some sellers have the ability to raise market prices. Market power mitigation is a market design mechanism to ensure competitive offers even when competitive conditions are not present.

Market power may need to be mitigated on a systemwide basis or on a local basis where the exercise of market power may be a concern for a local area. For example, when a transmission constraint creates the potential for local market power, the RTO may apply a set of behavioral and market outcome tests to determine if the local market is competitive and if generator offers should be adjusted to approximate price levels that would be seen in a competitive market – close to short-run marginal costs.

The structural test for implementing offer capping in PJM is called the three pivotal supplier test. Generation is subject to offer caps when transmission constraints occur such that generators are run out of merit order, which means that a higher-priced generator must be run due to a transmission constraint that prevents the use of available lower-priced generation. When units are dispatched out of merit, PJM imposes offer capping for any hour in which there are three or fewer generation suppliers available for redispatch

that are jointly pivotal, meaning they have the ability to increase the market price above the competitive level.

Price Caps

PJM has a $1,000/MWh offer cap in the energy markets.

Financial Transmission Rights

Financial transmission rights (FTRs) give market participants an offset or hedge against transmission congestion costs in the day-ahead market. An FTR is a financial contract protecting the holder from costs arising from transmission congestion over a path or a source-and-sink pair of locations on the grid. An FTR provides the holder with revenue, or charges, equal to the difference in congestion prices in the day-ahead market across the specific FTR transmission path. FTRs were originally formulated to protect LSEs from price uncertainty while redistributing excess congestion charges due to constrained conditions. Other market participants such as financial-only participants may purchase FTRs through the RTO's auctions or through secondary market purchases.

A related product is an auction revenue right (ARR). ARRs provide the holders with an upfront portion of the money raised in the FTR auctions. In general, they are allocated based on historical load served and can be converted to FTRs. As with FTRs, ARRs, too, give transmission owners (and eligible transmission service customers) an offset or hedge against transmission congestion costs in the day-ahead market.

Virtual Transactions

A virtual transaction allows a participant to buy or sell power in the day-ahead market without requiring physical generation or load. Cleared virtual supply (increment or virtual offers, or INCs) in the day-ahead energy market at a particular location in a certain hour creates a financial obligation for the participant to buy back the bid quantity in the real-time market at that location in that hour. Cleared virtual demand (decrement or virtual bids, or DECs) in the day-ahead market creates a financial obligation to sell the bid quantity in the real-time market. The financial outcome for a particular participant is determined by the difference between the hourly day-ahead and real-time LMPs at the location at which the offer or bid clears. Thus, through this financial arbitrage opportunity, virtual transactions in theory help to narrow the difference between the day-ahead and real-time prices.

Credit Requirements

Credit requirements balance the need for market liquidity against corresponding risk of default. Defaults within these markets are particularly troubling because losses due to default are borne by all market participants. PJM's tariff spells out the details for credit evaluations, credit limits, allowed forms of collateral and the consequences of violations or defaults.

To reduce financial risk, PJM's settlement cycle is seven days. The amount of unsecured credit allowed is $50 million for a member company and $150 million for an affiliated group. PJM does not allow unsecured credit in the FTR market.

Settlements

RTOs must invoice market participants for their involvement in their markets, including the amounts owed for buying and selling energy, capacity and ancillary services, and for paying administrative charges.

PJM has a two-settlement system, one each for the day-ahead and real-time energy markets.

SPP

Southwest Power Pool

Market Profile

Geographic Scope

The Southwest Power Pool Inc. (SPP) began operating in its real-time energy imbalance service (EIS) market on Feb. 1, 2007. Based in Little Rock, Ark., SPP manages transmission in nine states: Arkansas, Kansas, Louisiana, Mississippi, Missouri, Nebraska, New Mexico, Oklahoma and Texas.

In addition to operating its EIS market and managing open-access transmission facilities, SPP is the reliability coordinator for the NERC regional entity. As such, SPP enforces NERC-approved reliability standards for users, owners and operators of the bulk power system; coordinates reliability within and with neighboring areas; and ensures adequate reserves are procured within the SPP region. The reliability area is larger than the market area.

SPP's EIS market footprint includes 16 balancing authorities. Its members include investor-owned utilities, municipal systems, generation and transmission cooperatives, state authorities, independent power producers, power marketers and independent transmission companies.

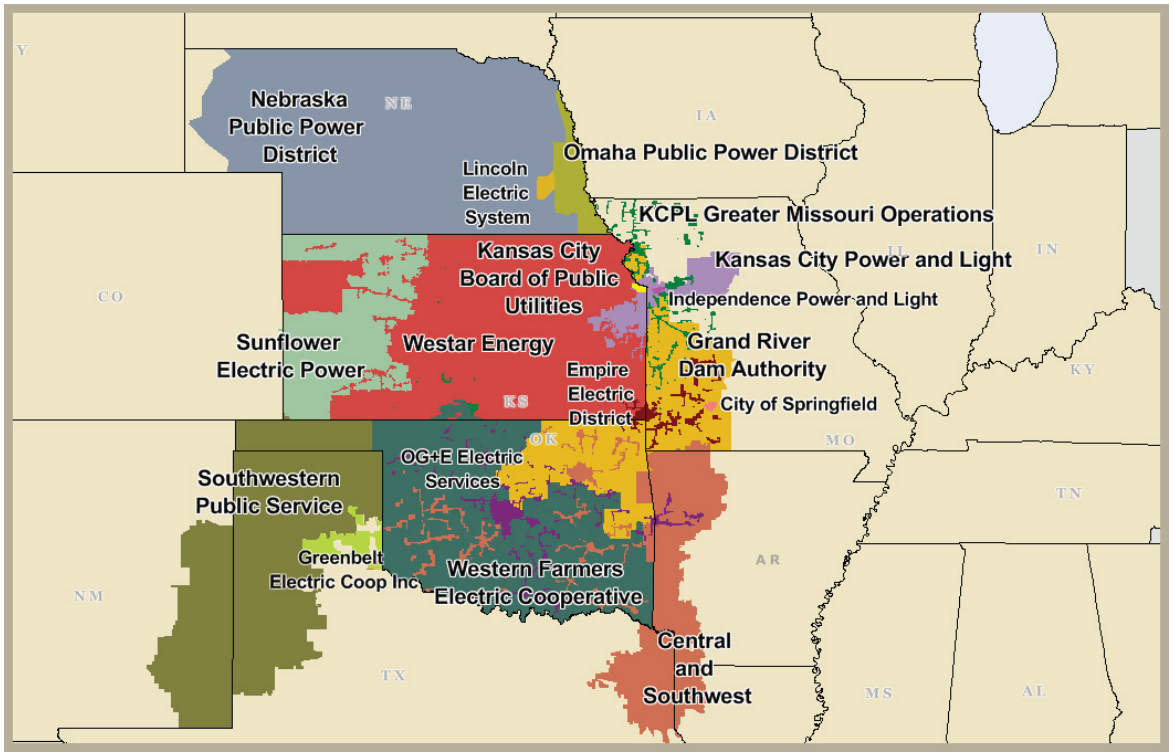
Demand

SPP's record peak demand of 48 GW occurred in August 2011.

Import and Exports

SPP has alternate-current (AC) interties with the Midwest

Southwest Power Pool (SPP)



ISO, PJM Interconnection, Tennessee Valley Authority and Entergy Inc., among other systems. Additionally, SPP has two direct-current (DC) interties with ERCOT and seven DC interties to the western interconnect through New Mexico, Kansas and Nebraska. At times, SPP is a net importer of electricity and, at other times, SPP is a net exporter of electricity.

Market Participants

SPP's market participants include cooperatives, independent power producers, investor-owned utilities, power marketers, municipals, state agencies and transmission owners. SPP considers a participant in the EIS market to be an entity that has a legal and financial obligation to SPP in the market. Market participants must have generation assets to participate in the EIS market, or must directly represent an asset owner. Asset owners include generation companies and load-serving entities.

Membership and Governance

SPP is governed by a seven-member board of directors, with six elected by the members to serve three-year terms, plus the SPP president, who is elected by the board.

Supporting the board is the members committee, which provides input to the board through straw votes on all actions pending before the board. The members committee is composed of up to 15 people, including four representatives from investor-owned utilities; four representatives of cooperatives; two representing municipal members; three representing independent power producers and marketers; and two representing state and federal power agencies. The board is required to consider the members committee's straw vote as an indication of the level of consensus among members in advance of taking any actions.

Transmission

Owners

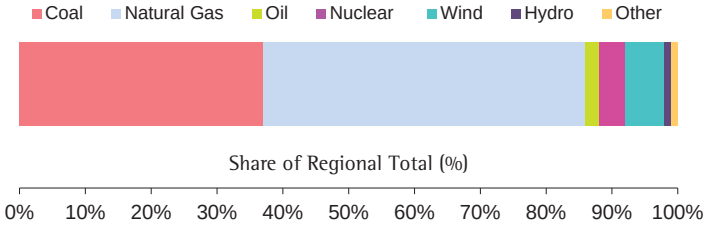
SPP transmission owners (TOs) are investor-owned utilities, municipals, cooperatives, state agencies and independent transmission companies. Some of the larger balancing authorities by installed capacity include:

- Southwestern Electric Power Co. (AEP West)
- OG&E Electric Services
- Westar Energy Inc.
- Southwestern Public Service Co. (Xcel Energy)
- Kansas City Power & Light Co. (Great Plains Energy)
- Omaha Public Power District
- Nebraska Public Power District
- KCP&L Greater Missouri Operations (Great Plains Energy)
- Empire District Electric Co.
- Western Farmers Electric Cooperative

Supply Resources

Generating Mix

By plant capacity, the generating mix includes these sources:



Market Features and Functions

Energy Markets

Day-Ahead

Not applicable.

Hour-Ahead

Not applicable.

Real-Time

SPP must coordinate the dispatch of generation and demand resources to meet the instantaneous demand for electricity.

SPP's EIS market provides market participants the opportunity to buy and sell wholesale electricity in real time. If a utility requires more energy than it scheduled, the market provides the utility another option to buy the additional energy at real-time prices to make up the difference and meet its demand. Thus, participants use the EIS market to obtain energy available and offered from other utilities. Entities wishing to provide energy will submit offers to the market.

SPP uses a security constrained economic dispatch (SCED) to determine the lowest cost increment of energy that can be delivered to each location, considering the submitted offers, transmission limitations and system topology. EIS market dispatch instructions are calculated for dispatchable resources, and locational imbalance prices (LIPs) are calculated for each settlement location (generation resource or load) on the system.

Resources are settled based on the LIP associated with their settlement location. Resources are only settled nodally. Load may choose to be settled either zonally or nodally. The LIPs are based on the resource offers and are locational.

Must-Offer Requirements

Not applicable.

Ancillary and Other Services

Ancillary services are those functions performed by electric generating, transmission and system-control equipment to support the transmission of electric power from generating resources to load while maintaining the reliability of the transmission system.

SPP does not offer an ancillary service market. However, it does require each transmission owner to provide or arrange for all of these services.

Capacity Markets

SPP does not offer a capacity market. However, it requires each market participant to have sufficient energy supply (capacity) to cover its energy obligations. SPP performs a supply adequacy analysis for each market participant based on a load forecast, resource plan, ancillary service plan and schedules received from market participants. This analysis is performed for each hour of the next operating day, with results available by 3 p.m. of the day prior to the operating day.

Market Power Mitigation

In electric power markets, mainly because of the largely nonstorable nature of electricity and the existence of transmission constraints that limit the availability of multiple suppliers to discipline market prices, some sellers have the ability to raise market prices. Market power mitigation is a market design mechanism to ensure competitive offers even when competitive conditions are not present.

Market power may need to be mitigated systemwide basis or locally.

Price Caps

Offers by market participants may not exceed $1,000/MW-hour. This limit remains in effect until such time as SPP demonstrates in a filing with the Commission that sufficient demand response exists in the EIS market to allow a higher offer curve price limit or removal of the safety-net price limit.

Local Market Power Mitigation

When any transmission constraint is binding in the EIS market, SPP will screen the offer curve associated with resources on the importing side of each constraint. If the resource's offer is greater than the offer cap, then SPP will substitute the resource's offer with its offer cap.

Additionally, there is no mitigation for physical withholding in the EIS market, as the market is voluntary. The market monitor monitors determines whether the decisions to participate in the EIS market have a significant adverse impact on market outcomes.

FTRs

Not applicable.

Virtual Transactions

Not applicable.

Credit Requirements

RTOs must balance the need for market liquidity against corresponding risk of default. Defaults within these markets are troubling because losses due to default are borne by all market participants. SPP's tariff specifies credit rules needed to participate in the markets. These requirements provide for credit evaluations, credit limits, allowed forms of collateral and the consequences of violations or defaults.

Settlements

RTOs must invoice market participants for their involvement in their markets. Settlement is the process by which the RTO determines the amounts owed associated with buying and selling energy, capacity and ancillary services, and paying administrative charges.

The SPP settlement process calculates the quantity of energy imbalance for each asset (generation resource or load), calculates invoice dollars for energy imbalances and allocates over-and under-collection of revenues to asset owners. Settlement statements are published for each operating day. The market is facilitated so that SPP remains revenue neutral.

4 Financial Markets & Trading

Introduction

Financial markets affect physical natural gas and electric markets in key ways. In the past decade, the commodity markets associated with natural gas and electricity expanded dramatically, both in terms of volumes traded and the types of products offered. One result from this expansion has been to revamp the traditional relationship between physical and financial markets. The traditional view was that physical markets affect financial; financial products derive their value from physical products. Today, this is no longer the case. Physical markets continue to affect financial markets, but now, financial markets can affect physical markets – including prices – as well.

This chapter explores natural gas and electric commodity and capital markets.

Markets and Mechanisms

Financial markets are amorphous. These markets are not physical locations like grocery stores, or sites on the Web such as Amazon.com, where one can go to experience the financial marketplace. Instead, they are an array of products, mechanisms and participants that together flesh out the marketplace.

As mentioned, financial markets differ from physical markets in that no physical delivery occurs. This does not mean financial markets contain only investors and speculators; physical market participants enter the financial market to hedge. Similarly, it does not mean that financial markets involve only contracts that contain financial payout instead of physical delivery. Financial traders may use longer term physical contracts, but in a way that ensures no delivery will be required. Physical and financial markets are often closely intertwined and use the same market mechanisms.

Consequently, the best way to understand financial markets is to look at the market participants, products, market mechanisms and trading that together constitute the market.

Market Mechanisms

Transactions in both physical and financial markets are conducted through exchanges or over-the-counter (OTC). In the power market, trades may also be conducted in regional transmission organizations (RTOs, addressed in Chapter 3).

Exchanges

Exchanges are standardized. Trading on exchanges is subject to the rules of the exchange as well as law and regulation. The products traded are established in advance by the exchange, with no room for modification. The contracts specify pre-set locations, product types, quantities and trading mechanisms. Exchange rules typically permit bidirectional trading, or the ability to buy or sell with equal ease.

Trading in exchanges is conducted through electronic

platforms, websites on which traders can buy and sell, or through trading pits where traders actively call out orders to buy and sell, known as open outcry.

On exchanges, buyers are not matched to specific sellers. Instead, exchanges are multilateral; buyers' needs may be met by a number of sellers, but the buyers and sellers do not interact or transact with each other.

Exchanges for gas and electricity are commodity exchanges, such as the New York Mercantile Exchange (Nymex), the world's largest physical commodity futures exchange. Nymex handles physical and financial natural gas products as well as financial power contracts.

Margin is the ability to trade without having to pay cash for the full value of the trade. Effectively, someone who trades on margin borrows much of the money used to buy or sell from the exchange or brokerage house. The trader posts collateral by putting down a certain amount of money or percentage of the trade value in cash or other items of value acceptable to the exchange.

Over-the-Counter (OTC) Markets

OTC markets are any markets that are not exchanges or RTOs. Transactions range from complicated individual negotiations for one-off structured contracts to standardized products traded through an electronic brokerage platform. The ability to tailor a contract to the exact needs of the counterparties is one of the chief benefits of OTC contracts.

OTC power transactions can occur in either traditional or RTO power markets.

OTC transactions are conducted through direct negotiations between parties or through brokers. Brokers range from voice brokers to electronic brokerage platforms such as that offered by the IntercontinentalExchange (ICE). Unlike an exchange, an electronic brokerage platform matches specific buyers and sellers, and is not anonymous.

Products may be negotiated individually or may be standardized. Many negotiations start with a standardized contract, such as that developed by the Edison Electric Institute (EEI) for power trading, and then modify it. Others start from scratch. Individually negotiated deals are called structured contracts

To be tradable, a contract must include terms and conditions that make it attractive to more than one entity. Consequently, complicated, one-off contracts negotiated to meet the need of an individual seller and buyer may have little or no resale value. Typically, the standardized contracts traded on exchanges or electronic brokerage platforms are designed to be of interest to many market participants.

In general, when referring to transactions for physical and financial natural gas and power products, bilateral and over-the-counter mean the same thing.

The IntercontinentalExchange Inc. (ICE) operates as a global, electronic marketplace for trading both futures and OTC energy contracts. ICE's markets offer access to a range of contracts based on crude oil and refined products, natural gas, power and emissions, as well as soft commodities including cocoa, coffee, cotton, ethanol, orange juice, wood pulp and sugar, in addition to currency and index futures and options.

Regional Transmission Organizations

Electricity is also bought and sold through RTOs. In general, RTOs operate their markets to support the physical operation of the electric grid under their control, including making decisions about what generation to dispatch

to meet customer demand. RTO markets are multilateral; buyers and sellers are not matched individually against each other. RTOs allow for bilateral physical transactions, although each RTO handles these differently. RTOs provide settlement, although this differs from the settlement offered by exchanges.

Also, RTOs use the word *clearing* to refer to the matching of supply and demand – to clear the market means the RTO accepts sufficient generation offers to meet demand. If a generator's offer in the day-ahead market clears, it means that generation was offered at or below the market clearing price and was chosen to generate the next day. RTOs do not take title to contracts and do not step into the middle of transactions, although they do maintain credit policies and allocate the costs of defaults or other performance failures across market participants.

RTO markets may have financial elements. One of these is virtual transactions. For example, a trader may offer generation in the day-ahead market, and the generation does not show up in the real time market. As a result, the trader is paid for his generation offer in the day-ahead market, based on day-ahead prices, but effectively has to pay to replace his power in the real-time market, paying the real-time price. Financial participants can be involved in virtuals; they use the physical product (generation offers or demand bids) in a way that results in no physical delivery. Virtuals are financial contracts, directly integrated into the RTO's operation of its physical market; they affect physical supply and demand, and prices. RTOs use them to add liquidity in an attempt to improve the efficiency of their physical markets.

RTOs may also offer financial transmission rights (FTRs) programs. Typically, a transmission owner that turns over operation of its transmission to the RTO wants certainty over its ability to flow electricity and about the cost of transmission. Because the RTOs operate using markets, this certainty cannot be provided directly. FTRs and similar instruments are designed to provide some degree of financial certainty to these transmission owners and firm rights holders. FTRs are linked to the physical operation of the RTO's system; transmission owners would be more reluctant to turn their transmission over to the RTO if they were going to experience significant costs due to transmission congestion resulting from other RTO members.

FTRs compensate the transmission owners or firm rights holders in a couple of ways. First, the RTOs auction off additional FTRs to others in the market, including financial participants who have no interest in buying, selling

or transmitting physical power. The proceeds of the auction are returned to some of transmission owners or firm rights holders. The auction also determines a value for any FTRs held by the transmission owners or firm rights holders. FTRs can be bought and sold; the auction price gives an indication of their value for price discovery.

Other Market Mechanisms and Concepts

Leverage is the use of a small position to control or benefit a larger position. It increases the potential return, but also increases risk. Leverage can occur when a trader uses margin to trade.

Leverage can be used in other ways. As discussed in Chapter 5, some traders may try to use leverage to manipulate the market. For example, traders may use a smaller position in the physical market to benefit a larger position in the financial market. They may buy a financial product whose price is derived from a physical product. Then, they may try to buy or sell or otherwise influence the price of the physical product. If they succeed, their financial position benefits.

Liquidity refers to the trading and volumes occurring in a market. A market is said to be liquid if trading and volumes are such that any trader can liquidate his position at any time, and do so without affecting the prices. A market is thin if it has little trading or volume; in these instances, trading may affect prices. The benefits of liquidity are often used to justify practices that increase trading or volumes. However, not all trading or volumes are uniformly beneficial to markets and other market dynamics need to be taken into account.

Markets may not be uniformly liquid. For example, the market for the Nymex natural gas futures contract (NG) is generally thought to be liquid. However, when the United States Natural Gas Fund (UNG) became extremely large, its monthly process of getting out of the current contract and into the next involved selling and buying an extremely large volume of contracts at one time. If these transactions affected prices, then the market was affected.

Open interest is the total number of futures contracts in a delivery month or market that has been entered into and not yet liquidated by an offsetting transaction or fulfilled by delivery. Thus, as the clock is winding down during the settlement period, the open interest contracts (both in terms of the total number of contracts and the number of counterparties) are rapidly decreasing, so that a given number of contracts will represent an increasing share of the outstanding prompt-month contracts.

Clearing is a process in which financial or physical transactions are brought to a single entity, the clearing house, which steps into the middle of the transaction and becomes the counterparty to each buyer and seller. The clearing house assumes the risk that either the buyer or seller will fail to perform its obligations. Generally, clearing is used to manage counterparty risk. Clearing houses maintain rules about the creditworthiness of traders, collateral that must be posted and, of course, fees that must be paid for the service.

Settlement occurs at the end of a trading period, when the contract expires. At this time, delivery is to be made for a physical contract (physically settled) or a financial payout made for a financial contract (financially settled). Settlement occurs both in exchanges and in OTC trades. In OTC transactions, settlement occurs under the terms agreed upon by the parties. On exchanges, settlement occurs in a documented process and timeframe established by the exchange.

For example, every day at the close of Nymex trading, the NG contracts for forward months settle. Also, three business days prior to the start of the month of delivery (the prompt month), the contract expires and the last-day settlement (LD settlement) occurs in the last half-hour of trading. LD settlement is the final price for that particular futures contract term. Thus, the final settlement of natural gas futures prices on Nymex occurs on the third business day before the end of the calendar month in the last half-hour.

Most market participants avoid trading during the settlement period. As the time to termination approaches, price risk and volatility may increase, while market liquidity and the remaining open positions (open interest) are decreas-

ing. For the Nymex natural gas futures contract (NG), most market participants either liquidate or roll their open long or short positions well before the settlement period. Rolling is the process of liquidating the current month's contract before it expires and purchasing a comparable position in the upcoming month. The trader holds the same number of contracts, but the contract month held changes as time passes and contracts expire.

Daily settlement prices are used to revalue traders' position to the current market price, for accounting and for margin calculations. Daily and LD settlement prices are also reported in publications and indexes, and are used for price discovery.

Mark-to-market (MTM) provides that at the end of each trading day, all trading positions are revalued to current market prices. This results in financial and accounting gains and losses. Traders can remove money resulting from gains from their accounts or use them for further trading; they do not have to liquidate their positions to get the money. Losses reduce the value of a trader's position, and may reduce the amount of collateral the trader needs to be able to trade on margin. If so, this may result in a margin call from the exchange or broker.

Mark-to-market is also an accounting transaction, in that a company's or trader's accounts are revalued daily to reflect changes in asset price. Losses can reduce the book value of a company or trader, and can affect its creditworthiness.

Trading is the buying and selling of contracts. Trades and transactions are virtually synonymous. Both refer to the buying and selling of power or natural gas.

Short selling is the selling of contracts a trader does not own, on the assumption that the trader will buy offsetting contracts prior to the contracts' expiration. This can be done on an exchange or other market that allows for bidirectional trading. Short selling has been of concern for potential market manipulation – traders sell a contract to drive the price down, and then buy when the price is low. Short selling is one of the ways market participants can trade futures financially – they sell the future, then buy it before the contract expires so the contracts net out and the trader faces no delivery obligation.

A **position** is the net holdings of a participant in a market. A trader's position in a specific instrument is combined purchases and sales of that contract. A trader's overall position is the combination of all positions in all contracts the trader owns. A trader's position is often referred to as the trader's commitment in the market.

Liquidating a position is the process of getting rid of a position. A trader who owns a contract will sell it to liquidate it. A trader who has sold a contract short will buy a contract to liquidate it. After liquidation, the trader holds no contracts.

Position limits have been imposed by ICE and Nymex, and are being developed for certain contracts by the CFTC. The position limits may restrict the number of shares a trader may hold in a particular investment at any point in time, during the month the contract expires, or during some period closer to settlement. For example, CME imposes accountability levels for any one month and for all months, and has limits for expiration-month positions. CME's limits for the Nymex NG contract are12,000 contracts for all months, 6,000 contracts for one month and 1,000 contracts in the expiration month. Trading entities can petition to have these waived or modified.

Volumes give an indication as to the nature of the activity occurring in the market at any point in time. Volume can be expressed in a number of ways. It can be the number of

transactions executed during a specified period of time or the volume of the product contained in the contracts.

Volumes give market participants information about what is going on in the market. For example, if many Nymex contracts are traded, and the number of trades is relatively few, market participants know that a relatively few traders are making high-volume trades. Conversely, if a high number of Nymex contracts are traded and the number of trades is also high, then at least some of the trading is being done in small volumes. This could result from broad interest in the market – lots of active traders – or it can result from relatively few traders making a lot of trades.

Market Participants

Financial markets are used by many types of participants. These markets represent an opportunity for physical players, producers and marketers to buy or sell some physical products or to hedge physical supplies and obligations with physical or financial products. Investors, speculators and investment funds also use these physical and financial products for financial gain.

Products

Products, for purposes of trading, are contracts — also known as securities or instruments — that can be bought and sold. Contracts for physical trading in natural gas or electric markets provide for the delivery of natural gas or electricity. The actual molecules of gas or electrons may be delivered as a result of the contract. Financial contracts do not provide for delivery of a product; instead, they provide a financial payout.

Consequently, what traders buy and sell are contracts giving them a right or obligation. For physical contracts, this is the obligation to deliver or take delivery of natural gas or electricity in exchange for payment. For financial contracts, it is the right to a payout in exchange for payment.

Other physical and financial products give traders rights to buy or sell a contract in the future at a given price – an option to buy or sell.

The word *derivative* is used for a category of contracts whose value is derived from some other physical or financial product or contract. Standardized derivative contracts trade on exchanges such as Nymex. Financial contracts are derivatives. A common financial derivative used in natural gas and electric markets is the swap.

The CFTC also considers futures contracts to be derivatives. As futures contracts approach expiration, their price should begin to mirror spot prices – to derive their price from spot prices. However, at other times, futures contracts are simply the price parties are willing to pay for natural gas at some point in the future and do not derive their value from any other product or contract. In fact, expiring futures contracts may affect spot prices, as well.

Instrument Basics

Each instrument is traded in its own market and is identified by the market name, such as spot or futures. Each market and instrument has characteristics such as timeframe, location, contract type, product conveyed by the contract and, for swaps, the mechanism for determining the payout.

Product conveyed: Each contract specifies what it is that is being bought and sold. For physical contracts, this would be natural gas or electricity. For derivatives, it may be a payout derived from natural gas or electricity. All contracts conveying or derived from natural gas, for example, would be in natural gas markets.

Time: Each contract has a number of time elements.

The trade date is the date on which the contract is written (typically the date the trade is executed).

The expiration day is the last day for a contract, after which it is no longer available to be bought and sold; it is often the same day as the settlement day. Exchanges and electronic brokerage platforms may also impose a termination date, the last date on which a contract may be traded.

Physical contracts also specify the delivery day(s) or month – the day(s) or month during which the product is to be delivered.

For physical products, begin and end dates are the dates for which a physical product (natural gas or electricity) is to be delivered. For financial products, these dates address the contracts whose prices are used to set the payout. For example, a next-day physical gas deal may have a trade date of Aug. 7, a begin date of Aug. 8 and an end date of Aug. 8. A monthly product may trade on Aug. 7, its trade date; the flow of natural gas would have a begin date of Sept. 1 and an end date of Sept. 30.

For the Nymex NG contract, the termination day and settlement day are the third-to-last business day of the month before the month in which the gas is to be delivered. The settlement period occurs from 2 p.m. to 2:30 p.m. on the termination day.

Short-term or spot contracts provide for delivery or payout during the current or next day; the price for these contracts is known as the spot price.

Daily physical contracts are for delivery on a given day or set of days.

Electric physical and financial contracts may also specify peak or off-peak delivery, with the peak or off-peak hours defined by the contract.

Contracts for delivery a month or more into the future are forward contracts, or if they are traded on exchanges, futures contracts. The Nymex NG contract, for example, provides for the delivery of 10,000 MMBtu of natural gas in the month specified by the contract. Contracts are offered for every month over the next 12 years.

Monthly contracts are referred to by how close they are to expiring. Spot month is the current month. Prompt month is the month after the spot month or current month – it is the next trading month. For trading in January, February is the prompt month.

Another time element is the delivery or payout period, such as daily, next day or monthly. Monthly contracts generally are for delivery in equal parts over a month at a specified price for gas and for the contracted amount in each hour for power.

Location: All physical contracts specify the location where the natural gas is to be delivered, such as the Henry Hub in Louisiana. Financial contracts also have a locational element, determined by the underlier. For example, if a financial derivative uses the Nymex gas contract as its underlier, the derivative's locational element is the Henry Hub.

For natural gas, the locations are referred to as market hubs, which are located at the intersection of major pipeline systems. For power, contracts are often based on locations known as nodes, zones or hubs. For gas, the principal hub and pricing point is the Henry Hub, which is used for all Nymex gas futures contracts and is the reference point for overall prices in the United States. Prices for other locations are often references as a difference from Henry Hub, known as basis.

Products traded on exchanges and preset products traded on OTC electronic brokerage platforms such as ICE use standardized locations or pricing points. Locations for

other OTC transactions use whatever location the counterparties to the contract desire. For physical contracts, the location must be physically viable. For financial products, it can be whatever the parties desire (although complicated locations make pricing more difficult due to the lack of reference points for price discovery).

Quantity: All physical contracts specify the amount of natural gas or electricity to be delivered. For contracts traded on an exchange or for preset contracts traded on an OTC electronic brokerage platform, the quantity is predetermined and specified in the contract. For bilateral contracts traded in OTC markets, the quantity contained in the contract can be anything the parties want it to be. For standardized products traded on electronic brokerage platforms, the quantity is fixed.

Price: The price paid for a contract is usually that set by the market and is usually known at the time the contract is bought or sold.

Fixed prices are known at the time the transaction is entered into – it is the price at which the seller agrees to sell and the buyer agrees to buy. Contracts sold at fixed prices are typically paid for at the time of purchase.

Floating prices are set by formulas pegged to something whose price is not currently known but which will be at the time the contract expires, such as an index. For example, a price may be tied to the average of the all of the daily prices at a location over the course of a month, typically as published in an index. An index contract is a commonly traded instrument based on major trading points, such as the Houston Ship Channel or the Henry Hub.

Spot price is a cash market price for a physical commodity that is available for immediate (next day) delivery, and may be reported to publishers for indexes.

Standardized forward contracts and futures contracts are traded for every month, years into the future; the NG contract is traded 12 years into the future. Each of those contracts for which trading has occurs has a price. Together, the prices for future contract months creates a trajectory of prices known as forward or futures curves.

The settlement price is effectively the final official reported price for certain contracts and is an average of prices for trades occurring during the settlement period. The settlement price forms the basis for payout in financial derivatives that use the contract as its underlier, for margin calls and for reporting to index publishers and other entities.

For example, the natural gas futures contract settlement price is the weighted average price of all sales made during the contract's 30-minute settlement period – the last 30 minutes of trading on the contract's termination day. The gas futures final settlement price sets, in whole or in part, the payout for financial derivatives that use the contract as its underlier.

Physical Products

Physical products involve physical delivery. Power products include energy, transmission (firm and nonfirm) and ancillary services. Electric energy products include spot transactions, full requirements sales and bundled services, among other things. Natural gas products include the natural gas molecules themselves, transportation and storage.

Forward products are contracts for delivery in future months traded through the OTC market (including electronic brokerage platforms). If the product is traded on an exchange, it is known as a futures contract.

A futures contract is a standardized forward contract traded on a regulated exchange. Each contract represents the same quantity and quality of the underlying physical com-

modity, valued in the same pricing format, to be delivered and received at the same delivery location. In addition, the date of delivery and receipt is the same for all contracts traded for a particular calendar month. The only element of futures contract that is subject to change when it is bought or sold is the price.

For the natural gas industry, the dominant futures contract is the Nymex NG contract. For the NG contract, the standard contract specifications are the delivery location – Sabine Pipeline Hub at the Henry Hub in Louisiana; the term – monthly; and the quantity – 10,000 MMBtu delivered equally over the course of the month. Not all forward contracts have fixed prices. Some involve trades executed now to buy or sell at some point in the future, at a price to be set in the future. One example of this is a forward physical index contract. This OTC contract obligates one party to buy the underlying commodity or security and the other party to sell it, for a delivery price to be determined when a specific index sets at some known date in the future. Many natural gas purchases are made under forward physical index contracts; among other things, it may provide state regulators with some assurance that the price paid is reasonable.

Forward and futures contracts with fixed prices can be used for price discovery, hedging or speculating. They may be traded by any of the participants listed earlier. Physical participants may use forwards or futures to obtain gas or electricity for delivery in some future month, or may use them to manage the risk of – or, hedge – their physical positions. Futures contracts that go to delivery lose their anonymity at settlement. However, only a small fraction – often, less than one percent – of futures contracts go to delivery.

Financial traders may buy or sell futures contracts for financial purposes, as exchanges have bidirectional trading – markets in which trader can buy and sell contracts with equal ease. Bidirectional trading allows the sale of contracts a trader does not own, known as short sales. A financial trade may buy a forward or future, then either sell the contract later or neutralize it by obtaining an offsetting contract. Because the two offset, the trader has no physical delivery obligation. Most Nymex natural gas futures contracts do not go to delivery.

Physical products can be combined to create different physical positions for use in physical and financial trading. A price spread can be created using forwards priced at indexes for two different hubs. The trader would buy physical natural gas at one index and sell at another. For example, the trader buys gas priced at the Houston Ship Channel index (and would have to take delivery of the gas there) and sells gas at the Texas East M-3 index (and would have to deliver it there). The trader earns the difference between the two contracts. A physical spread carries with it the obligation to make or take physical delivery of natural gas at both points, so pipeline capacity would be required to actually move gas between these points.

A financial trader could also execute this trade, but would have to unwind both positions before delivery.

Indexes are formally published for both natural gas and power using a methodology posted by the publisher. An index may be used to set the price for settlement of floating price contracts. Indexes are also used by a variety of market participants to inform their decisions in the many steps in the electric or natural gas supply chain or in trading, known as price discovery. Data used in indexes are submitted voluntarily by firms involved in trading.

Indexes are commonly formed using volume-weighted average prices.

Financial Products

Financial contracts do not provide for the delivery of a product, but instead provide a financial payout. This is often based on the value of some physical or financial product specified by the contract, called the underlier. The value of these financial contracts is derived from the value of the physical or financial instrument specified in the contract as the basis for payout; as such, they are derivatives.

A key benefit of financial products is that they have no physical delivery and they are self-liquidating. Speculators who trade futures have to undo their position to eliminate the delivery obligation. One who trades derivatives, on the other hand, does not bear the complications of unwinding positions; he can simply wait for expiration and receive or pay the contract's payout.

Swaps

A key financial contract structure used in natural gas and electric markets is the swap, or contract for differences. The CFTC defines a swap as an "exchange of one asset or liability for a similar asset or liability ... it may entail buying ... on the spot market and simultaneously selling it forward. Swaps may also involve exchanging income flows..." Effectively, a swap is the exchange of like for like. Consequently, physical instruments cannot be swaps because parties to physical goods pay or receive money in exchange for delivery of the physical good. However, the exchange of money in terms of payment and payout constitutes a swap.

Options

An options contract conveys a right (but not the obligation) to buy or sell something else. It comes in two forms: the right to buy or the right to sell something at a specified price at or before a specified date. The buyer buys the right – the option – to buy or sell in the future; the seller (or writer) sells the obligation to sell or buy if the buyer exercises his right.

An option to buy is known as a call option; an option to sell is a put option. The price paid to buy or sell the option is known simply as the option's price. The price at which the option may be exercised is the strike price. Electing to buy or sell the underlying commodity or security is known as exercising the option.

Options traded on exchange or electronic trading platforms may be traded up to their expiration. Consequently, the owner of an option may sell it rather than exercising the option or letting it expire.

Traders buy and sell options for a number of reasons. First, they provide a risk management tool akin to insurance. Second, traders may use options traded on exchanges or electronic trading platforms to speculate. For example, a speculator may trade an option and hope to gain from price movements, akin to how they might trade other contracts, such as futures. If a trader buys an option, he can sell it up to expiration and pocket the difference between the purchase price and the sales price. Further, as in futures, the seller of an option traded on an exchange can offset his obligation by purchasing the offsetting option, thereby

eliminating the risk of the contract going to delivery.

Finally, traders may use options to boost their trading income or to reduce the volatility of their returns. Options require less money up-front than a futures contract or swap, which can be a benefit to traders with limited funds.

Trading and Transacting

Trading Mechanics

Market prices are the collective result of individual trades. Open interest is the aggregation of traders' positions.

Trading is the buying and selling of contracts. A trade is a single purchase or sale. A position is the accumulated unexpired contracts purchased or sold, at a point in time. Traders may have positions in each contract, as well as an overall position reflecting all their contracts.

Trading requires a buyer and a seller, each willing to transact for a price. A buyer bids a price he is willing to pay to purchase a contract; this is the bid price. A seller offers his product for sale; the price at which he offers it is the offer price.

These prices may or may not be the same. When they differ, the distance between them is the bid-offer or bid-ask spread. This spread is the difference between the highest price at which buyers are currently willing to buy (the highest bid) versus the lowest price at which sellers are currently willing to sell (the lowest offer). For example, if a buyer bids $7 and the seller offers at $10, the bid-ask spread is $3.

Trading Concepts

Traders need to know how their trades and positions will be affected by market changes. One way this is done is by considering whether a trade or position benefits or loses when prices go up or down. A position is long if it benefits from increases in price. It is short if it benefits from falling prices. If it is neutral, benefitting from neither a rise nor a fall in prices, it is said to be flat.

For example, a trader who purchases an NG contract is going long; that contract will benefit from increases in price. A trader who sells the contract is going short; the trader will benefit from falling prices.

The concept of being long or short applies to other forms of transactions. Absent anything else, a generator is long electricity; a consumer short electricity. If the generator obtains a contract to sell electricity to the consumer at its cost of generating, the generator is flat.

The task of identifying long or short is not always easy. A trader may have a variety of positions in a number of contracts, some long and some short. How the overall position benefits from swings in prices depends on each of the components and how they interact with each other.

Trading Strategies

Traders decide what products to trade, how to trade them and in which combinations. Their strategies will depend on their objectives. Broadly, market participants trade to accomplish any of three objectives: to buy or sell physical products, such as natural gas or electricity; to manage the risk of their physical positions, or hedge; or to make money.

Hedging

Market participants who are in the market to buy and sell natural gas and electricity are interested in making money through their physical operations. These physical operations determine their individual risks and hedging needs. Thus, each physical market participant's risks depend on

his role in the physical delivery and consumption of natural gas and electricity. A natural gas producer has different risks and therefore different hedging objectives than an LDC that needs to purchase gas to resell to retail consumers.

An LDC, for example, is concerned with obtaining sufficient volumes to serve variable customer demand and in the price paid for those volumes. A producer may be concerned about selling all his output (unless he can store it), and about the price he will be paid for the gas. Physical market participants may have other concerns as well. Producers may need a predictable cash flow to support their financing. LDCs may be concerned with state regulators determining that their gas purchasing practices were imprudent.

Such concerns drive both procurement and sales decisions as well as risk management decisions. The two are often closely interconnected. For example, an LDC needs to buy enough gas to meet extremely variable retail demand, but not too much. He also wants a price that regulators and

consumers will see as reasonable. Consequently, this LDC develops a procurement and risk management – hedging – strategy taking these factors into account.

To purchase sufficient quantities, the LDC may create a portfolio of supplies, with a block of firm supply to meet minimum daily needs. He may also decide to buy in the spot market to meet demand peaks. He may diversify the sources of gas, both to improve reliability of supply but also to diversify its price.

He can also manage his risk financially. In the commodities and securities market, a hedge is a transaction entered into for the purpose of protecting the value of the commodity or security from adverse price movement by entering into an offsetting position in a related commodity or security. Hedging is used when describing the purpose of entering into a transaction with the intent of offsetting risk from another related transaction.

Speculation

Traders seeking to make money fall into a couple of categories: investors and speculators. These categories are distinguished by the strategies they use to profit from the market. Investors are relatively passive; they are in the market to benefit from long-term price movements and to diversify a broader portfolio. Speculators actively seek to gain from price movements.

Trading Analysis

In deciding whether to trade, both hedgers and speculators pay attention to what is going on in the market, and develop their own view of where the market is likely go. They may develop complicated forecasts as the basis for decisions on a number of transactions: whether, when and where to build a merchant power plant, how to hedge natural gas production, and of course, when to buy and sell in the markets.

Two general schools influence traders' thinking when analyzing markets for trading opportunities. The first is fundamental analysis, which takes into account physical demand and supply fundamentals including production,

pipeline and transmission capacity, planned and unplanned outages, weather and economic and demographic changes. Changes in information about fundamentals (or changes in perceptions of fundamentals) alters traders' view of the supply-demand balance, and therefore, of prices. Fundamental analysis is used often to determine the impacts of longer term trends in the physical market – the development of shale gas supplies, for example.

The second school of thought is technical analysis, which forecasts price movements based on patterns of price changes, rates of change, changes in trading volumes and open interest, without regard to the underlying fundamental conditions. Instead of looking at the market for a physical good, technical analysis looks at trading and price changes. These quantitative methods have become a dominant part of market analysis. Technical analysis is used most often to determine short-term movements and trends, helping traders time their buys and sells.

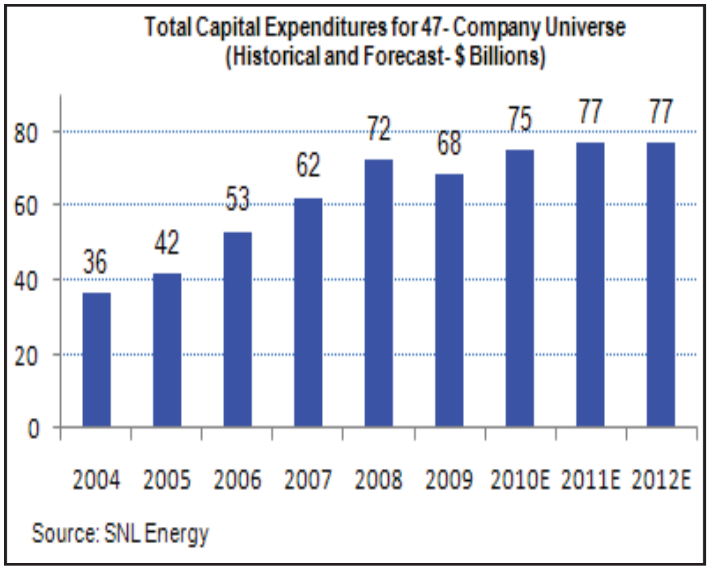
Capital Markets

Capital markets provide the money to make investments in infrastructure such as power plants or natural gas pipelines, to operate plants and companies and to trade or conduct transactions. Access to capital depends both on the health of capital markets and also on the perceived riskiness of the entity seeking the capital. To measure relative riskiness, many providers of capital look at different measures, including credit ratings assigned by the three major crediting rating firms: Standard and Poor's (S&P), Moody's and Fitch.

Capital Expenditures

One effect capital markets have on energy markets is in capital spending – undertaking work or investments that require capital. The recent recession and shake-up in capital markets took a toll on capital spending as financial commitments to infrastructure in 2009 fell for the first time in years but then rose again (see bar chart).

The electric industry makes up the bulk of the capital expenditures expected by the energy companies, as compiled by SNL between 2010 and 2012 (see pie chart, page 123). These capital additions lie primarily in generation, transmission and distribution. In the past couple of years, investment decisions on new big-dollar projects have been delayed.



Types of Capital

Capital comes from two general sources of financing – equity and debt.

Debt financing involves borrowing money to be repaid over time, along with interest at a fixed or variable interest rate. With debt, the investor does not become an owner of the company. Some common types of debt include bonds – securities that companies issue in financial markets with maturities (when the loan has to be repaid) of more than a year; shorter term debt issued by companies through

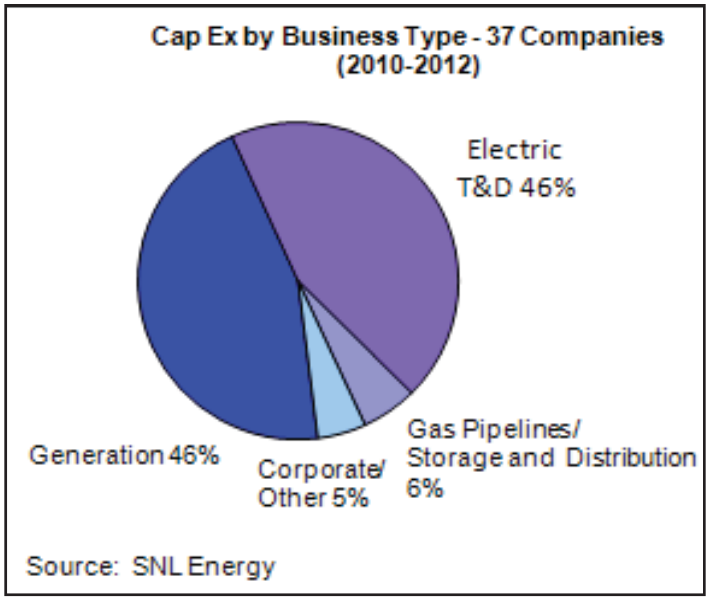
financial markets; and bank loans, such as lines of credit. A revolving line of credit is an assurance from a bank or other institution that a company may borrow and repay funds up to some limit at any time. Municipal and cooperative utilities typically use debt; they have no ownership to sell.

Characteristics of debt include:

- Capital obtained through debt must be repaid or refinanced.
- Debt may be short-term, such as lines of credit from banks or corporate paper, or it may be long-term.
- Companies must make their interest payments and repayment on schedule, or the debt holders can take action, including forcing the company into bankruptcy. A company must generate sufficient cash through its operations or through other financing to make these payments.
- Interest gets paid before equity dividends.
- Interest payments are tax deductible.
- Debt gives lenders little or no control of the company (unless it gets into financial trouble).
- Debt can leverage company profits; similarly, it can magnify losses.
- Lenders are typically conservative, wanting to minimize downside risks.
- Borrowers may be required to pay collateral to secure debt. Debt without collateral is known as unsecured debt.

Equity financing is money provided in exchange for a share in the ownership of the business. A company does not have to repay the capital received, and shareholders are entitled to benefit from the company's operations, perhaps through dividends.

- Equity capital can be kept by the company indefinitely.
- Companies can issue shares in the company – stock – through financial markets. They may also use private equity – money from venture capital firms or private investment companies that buy into a company and which may or may not take an active role in operating the company.
- The most common form of stock is common stock, which does not require regular payments, but it may receive dividends; investor-owned utilities typically pay dividends.
- Equity does not provide a tax deduction to the company; dividends and other payouts are not tax deductible.
- Stockholders and private equity investors get a say in how the company is operated and may impose restrictions.
- Equity investors may be more willing to assume higher risks in return for a higher potential returns. Utilities are typically considered fairly conservative investments. Natural gas producers attract a more risk-inclined investor.
- The return required to attract equity is higher than the interest paid to debt holders.
- Equity capital does not require collateral; it gets a share in the company.
- Additional equity capital infusions may dilute, or reduce, the value of existing shares.



Companies often try to match the type of financing with the investment they are making. Pipelines, power plants and transmission facilities are long-lived assets. They are typically financed using long-term capital, such as stock and long-term bonds, which can have 30-year maturities.

Other capital is needed to conduct day-to-day operations. Some of the cash needed to fund operations comes from a company's revenues. However, revenues do not always come in when payments are due. Consequently, companies also rely on working capital. This can include some long-term capital from stocks and medium- and long-term bonds. Short term investments and day-to-day operations also rely on commercial paper and bank loans to cover day-to-day cash needs. If a company faces significant problems, it may have to issue especially high-priced debt – junk bonds – to obtain financing. These are bonds issued by entities lacking investment grade credit ratings (see below).

In the past few years, private equity investors and hedge funds – individuals or funds seeking to take ownership positions in companies or even buy companies – have taken an interest in the energy industry, and have provided another source of equity financing. Private equity firms have bought energy companies, including Puget Sound Energy, Energy Transfer Partners and Mountaineer Gas Co. Two of the larger private equity firms interested in the energy sector include Kohlberg Kravis Roberts & Co. (KKR) and Macquarie Group.

Credit Ratings

Not all companies (or governments) present the same riskiness to investors. Investors, traders and others consider the risks their counterparty may present, including the risk of default. One standardized tool used to assess relative risk is the credit rating. Credit rating agencies, such as Standard and Poor's, Moody's and Fitch, assess a company's riskiness every time it wants to issue bonds. A credit rating represents the likelihood that an issuer will default on its financial obligations and the capacity and willingness of a borrower to pay principal and interest in accordance with the terms of the obligations. Many organizations, including RTOs, consider bond ratings, among other things, when setting their credit policies, which determine with whom companies may transact and whether the counterparty will need to post collateral. Each credit rating agency has its own way of assessing risk, reflected in the rating system they use.

Ratings by Industry Sector

Electric utilities largely are rated investment grade, with ratings of BBB or better.

Merchant generators include generating companies that are completely unaffiliated with integrated utilities (and are known as independent power producers, or IPPs) and those that are affiliated but which receive at least half their cash flow from competitive power sales. The affiliated companies typically have higher ratings; S&P views the integrated merchants' business profile scores as strong or satisfactory. S&P typically rates IPPs fair or weak.

The midstream sector of the natural gas industry, which contains pipelines, processing plants and storage facilities, is also typically rated investment grade. Midstream companies' ratings average BBB and are said by rating agencies to have a stable outlook.

5 Market Manipulation

Energy markets can be manipulated. Following the energy crisis in the western United States early last decade, Congress granted the Federal Energy Regulatory Commission new authority to address this threat to the integrity of its regulated markets. At Congress's direction, the Commission enacted a catch-all antifraud rule that is modeled on the Securities and Exchange Commission's (SEC's) decades-old rule protecting the securities markets. Recognizing that other regulators have long prohibited manipulation of other markets such as securities and commodities, the Commission draws from the experience of sister federal agencies in implementing the Commission's anti-manipulation authority.

Manipulation comes in many varieties. As a federal court of appeals has stated in the context of commodities manipulation, "We think the test of manipulation must largely be a practical one.... The methods and techniques of manipulation are limited only by the ingenuity of man." The Commission recognized this reality by framing its Anti-Manipulation Rule broadly, rather than articulating specific conduct that would violate its rules. While manipulative techniques may be "limited only by the ingenuity of man," the following are broad categories of manipulations that have surfaced in the securities and commodities markets (including the energy markets) over the years. The borders of these categories are not clearly defined and some can belong to multiple categories, such as wash trading (i.e., buying and selling identical stocks or commodities at the same time and price, or without economic risk). Traders may also combine elements of various schemes to effect a manipulation.

Withholding

Withholding is the removal of supply from the market and is one of the oldest forms of commodities manipulation. The classic manipulation of a market corner involves taking a long contract position in a deliverable commodity and stockpiling physical supply to force those who have taken a short position to buy back those positions at an inflated price.

Withholding played an important role in the western power crisis that engulfed California in 2000. Market participants, particularly Enron, exploited supply-demand imbalances and poor market design. Generation operators scheduled maintenance outages during peak demand periods, which is an example of physical withholding. In addition, transmission lines were overscheduled to create the appearance of congestion in an effort to reduce the supply of electricity. The result of these efforts in combination with economic withholding and information-based schemes discussed below was that wholesale electricity prices soared. Utilities such as Pacific Gas & Electric (PG&E) and Southern California Edison were unable to pass on these high prices to their retail customers because of state price caps. The crisis led to widespread blackouts, heavy losses to the state's economy and the bankruptcy, in April 2001, of PG&E.

Economic withholding, which also contributed to the western power crisis, is similar to physical withholding, but rather than turning off a generator or stockpiling a physical commodity, the manipulator sets an offer price for a

needed resource that is so high that the resource will not be selected in the market. For example, a generator in a constrained market such as New York City could purposely set its offer price high enough that it would not be called on to run. This scheme would create a shortage of generation and, thus, would raise prices for the benefit of the rest of its generation fleet or its financial positions. If done to benefit financial positions, this scheme would be a cross-product manipulation similar to the ones discussed later.

Information-Based Manipulations

Many manipulative schemes rely on spreading false information, which involves knowingly disseminating untrue information about an asset's value in order to move its price. A well-known scheme is the *pump and dump,* in which a participant spreads a rumor that drives the price up and then sells the shares after the price rises. In the energy markets, a common way to misrepresent a commodity's value is to misrepresent the price of the commodity or its level of trading activity. *False reporting* and *wash-trading* schemes were well-documented information-based manipulations that took place in the early 2000s and contributed to the western energy crisis. False reporting occurs when a market participant submits fictitious transactions to a price-index publisher to affect the index settlement price.

Similarly, wash trading involves actual but offsetting trades for the same (possibly nonmarket) price and volume between the same market participants such that no economic exchange takes place; however, it falsely inflates trading volumes at a price level and gives the impression of greater trading activity. False reporting and wash trading have resulted in a number of criminal prosecutions by the Department of Justice. A variation on these practices is *round-trip trading*, in which a trader sells an asset but agrees to buy it back at the same time.

Manipulative Trading Techniques

A number of manipulative trading techniques that have arisen in securities and commodities trading may be subject to the Commission's Anti-Manipulation Rule. Traders may seek to inflate trading volumes or trade at off-market prices to serve purposes such as maintaining market confidence in a company's securities or to move a security's price to trigger an option. *Marking the close* is a manipulative practice in which a trader executes a number of transactions near the close of a day's or contract's trading to affect the closing or settlement price. This may be done to obtain mark-to-market marks for valuation, to avoid margin calls or to benefit other positions in related instruments, the latter of which was done by both Brian Hunter and Constellation Energy Commodities Group (discussed in the next section). *Banging the open* is a similar practice in which a trader buys or sells a large quantity at the opening of trading to induce others to trade at that price level and to signal information on fundamentals. Other manipulative trading techniques exist, and previously discussed practices like wash and round-trip trading fit under this description as well.

FERC Investigation and Prosecution of Cross-Product Manipulations

Manipulators have grown more sophisticated with the expanded use of derivative products, whose value is set by the price of transactions in a related product.

Many of the manipulative schemes that staff has investigated and prosecuted are cross-product schemes in which an entity engages in price-making trades in the physical market, often at a loss, to affect the settlement price of price-taking derivative instruments.

Brian Hunter and Amaranth Advisors

In 2010, a FERC administrative law judge (ALJ) found that Brian Hunter, a trader with Amaranth Advisors LLC, manipulated the settlement price of the March, April and May 2006 New York Mercantile Exchange natural gas futures contracts (Nymex NG contract). Hunter bought large long positions in Nymex NG contracts, which he sold rapidly during the contract's final settlement period with the intent of pushing down the settlement price. He engaged in this behavior while he concurrently held larger short positions in financial look-alike contracts, principally on the IntercontinentalExchange (ICE), which benefited from a lower Nymex NG price.

The Commission affirmed the ALJ's findings and imposed a $30 million civil penalty on Hunter. His appeal of this decision was pending at the time of this printing. Other Amaranth parties had previously settled.

Energy Transfer Partners

In 2007, the Commission issued an order to Energy Transfer Partners LP (ETP), directing it to show cause why the Commission should not find that ETP violated the Commission's market behavior rule that prohibited manipulative practices. The order charged that ETP manipulated the Houston Ship Channel (HSC) market for natural gas. FERC charged that ETP entered into financial and physical positions at HSC that profited from a lower HSC index price. ETP's financial positions were mostly basis swaps that exchanged the Henry Hub price for the HSC index price with a differential. ETP's physical positions were mostly purchases of natural gas at the HSC index price.

The HSC index was set by physical fixed-price trades made during bidweek, which is trading during the last few days of one month for gas to be delivered every day of the following month. These trades were reported to Platts, a news and price-reporting service, and calculated according to Platts's methodology. The FERC order charged that ETP entered into bidweek physical trades at less than competitive prices with the intent to drive down the HSC index price. ETP's trading volumes were so great that it dominated the HSC index. On the eve of trial, ETP agreed to pay $30 million to settle the allegations.

Constellation Energy Commodities Group

In 2012, the Commission approved a settlement with Constellation Energy Commodities Group (CCG) in which CCG agreed to disgorge $110 million in unjust profits and pay a civil penalty of $135 million. FERC staff had alleged that CCG entered into significant loss-generating physical and virtual day-ahead transactions in electricity markets in and around New York state with the intent to move day-ahead price settlements to benefit financial swap positions that received their prices from those settlements.

Details of FERC Jurisdiction

The Energy Policy Act of 2005 added anti-manipulation provisions to the Federal Power Act, 16 U.S.C. § 824v (2006), and the Natural Gas Act, 15 U.S.C. § 717c-1 (2006), which the Commission implemented in Order No. 670. This rule has been codified as 18 C.F.R. § 1c (2011) (Anti-Manipulation Rule).

The Anti-Manipulation Rule prohibits anyone from (1) using a fraudulent device, scheme or artifice, or making any untrue statement of a material fact or omitting to state a material fact necessary to make a statement that was made not misleading, or engaging in any act, practice or course of business that operates or would operate as a fraud or deceit upon any entity; (2) with the requisite scienter (that is, an intentional or reckless state of mind) (3) in connection with a transaction subject to FERC jurisdiction. The Commission need not show reliance, loss causation or damages to prove a violation. The Anti-Manipulation Rule applies to any person, entity or form of organization, regardless of its legal status, function or activities.

The prohibition is intended to deter or punish fraud in wholesale energy markets.

The Commission defines fraud in general terms, meaning that fraud includes any action, transaction or conspiracy for the purpose of impairing, obstructing or defeating a well-functioning market. Fraud is a question of fact that is to be determined by all the circumstances of a case. In Order No. 670, the Commission found it appropriate to model its Anti-Manipulation Rule on Securities and Exchange Commission (SEC) Rule 10b-5 in an effort to prevent (and where appropriate, remedy) fraud and manipulation affecting the markets the Commission is entrusted to protect, while providing a level of certainty to market participants that is beyond that which the Commission would be otherwise required to provide. Like SEC Rule 10b-5, FERC's Anti-Manipulation Rule is intended to be a broad antifraud catch-all clause.

The Commission made clear in Order No. 670 that a duty to speak to avoid making untrue statements or material omissions would arise only as a result of a tariff or Commission order, rule or regulation. However, the Anti-Manipulation Rule extends to situations where an entity has either voluntarily or pursuant to a tariff or Commission directive provided information but then misrepresents or omits a material fact such that the information provided is materially misleading.

A fact is material if there is a substantial likelihood that a reasonable market participant would consider it in making its decision to buy or sell because the material fact significantly altered the total mix of information available.

To violate the Anti-Manipulation Rule, one must act with a sufficient state of mind, that is, level of intent. As with violations of SEC Rule 10b-5, intentional conduct or recklessness (known as scienter) are enough to satisfy the Rule.

The Commission also stated that for conduct to violate the "in connection with" element of the Rule, there must be a sufficient nexus between an entity's fraudulent conduct and a jurisdictional transaction. In committing fraud, the entity must have intended to affect, or have acted recklessly to affect, a jurisdictional transaction.

Energy Primer

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