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On Behalf of the Financial Marketers Coalition

January 9, 2018

The Honorable Fred Upton, Chairman
Committee on Energy and Commerce
Subcommittee on Energy
2125 Rayburn House Office Building
Washington, D.C. 20515-6115

Re: November 29, 2017 Hearing, Response to Additional Questions for the Record

Dear Chairman Upton:

Thank you for the opportunity to testify before the Subcommittee on Energy of the Committee on Energy and Commerce of the U.S. House of Representatives on Wednesday, November 29, 2017 at the hearing entitled, "Powering America: Examining the Role of Financial Trading in the Electricity Markets," and for the opportunity to address additional questions.

Attached are my responses to those additional questions per your letter dated December 19, 2017. Please accept my thanks to you, your fellow Subcommittee members, and your Staff for your time and consideration. Should you have any questions with regard to the attached, please do not hesitate to contact me.

Sincerely,

Wesley Allen

cc: The Honorable Bobby L. Rush, Ranking Member, Subcommittee on Energy

Attachment

Additional Questions for the Record

The Honorable Fred Upton

1) What potential market or regulatory reforms should Congress or FERC be considering in order to increase the market benefits associated with financial trading?

Answer:

- Development of a Real-time congestion hedge in all markets
- Restructuring of the stakeholder process in the ISO/RTO markets to better protect minority interests
- Require data provided by ISOs and market monitors to stakeholders and FERC to be peer-reviewed
- Expedited completion of FERC's Notice of Proposed Rulemaking on Uplift Cost Allocation and Transparency

Product development. Wholesale markets benefit from a diverse toolbox of financial products available for all market participants to assist them in efficiently managing their positions. Financial products in ISO/RTO markets include virtual energy products, consisting of the Incremental Offer (INC) and the Decremental Bid (DEC), and virtual transmission products such as the Financial Transmission Right (FTR) and the Real-time Congestion Hedge.[1] Virtual products allow market participants to reflect in the Day-ahead market the conditions expected in Real-time, identifying system conditions so that market operators can make more efficient decisions. Forecasting system conditions with virtual products can help produce price outcomes that are closely aligned between the Day-ahead and Real-time markets, converging prices as well as unit commitment and dispatch. In other words, financial products assist with more accurate and granular price formation. Ultimately, price convergence and improved overall price formation in the wholesale markets produces lower prices to ultimate consumers.

Virtual transmission products are congestion hedging tools that can be utilized by any market participant to manage risk associated with forward contracting. Having this financial product available would particularly assist in hedging variable retail load. Congestion hedging products create benefits for both the market participant holding the forward contract and the market operator, by providing incentives to participate in the Day-ahead market, providing price transparency and efficiently pricing congestion, and signaling to the ISO/RTO when transmission capacity investments are needed. Congestion hedging mechanisms include the Up-to Congestion transaction and the Financial Transmission Right in PJM, as well as FTR equivalent products in MISO, NYISO and CAISO, and products similar to the UTC, including the Point-to-Point Product in ERCOT and products under development in MISO and NYISO. The purpose of long-term and short-term congestion products is to provide a hedge against real-

[1] We use the term "Real-time Congestion Hedge" to represent the name of the product in the Day-Ahead market which is a spread between two specified locations. In PJM, that product is called the Up-To Congestion ("UTC") product. In ERCOT, it is called the Point-to-Point ("P2P") product. In MISO, it is under development as the Virtual Spread Bid, and in NYISO it is under development as the Linked Virtual Transaction. Some also refer to the product as an Hourly Financial Transmission Right ("FTR").

time congestion. This product brings value to any entity purchasing transmission and potentially being subject to real-time congestion, providing a means by which to mitigate real-time congestion exposure. In turn, financial market participants serve as counter-parties to such entities, injecting competition, risk mitigation and liquidity.

To facilitate congestion hedging in a price sensitive manner, FERC and Congress should focus on the development of additional products, such as a Real-time congestion hedge, which would allow market participants to move congestion risk from the Real-time to the Day-ahead market when appropriate for managing risk. In addition to implementing longer-term FTRs, such as a ten year FTR auction, the addition of an hourly FTR, or Real-time congestion hedge, would allow market participants to hedge congestion in Real-time conditions.

I attach hereto a white paper prepared by XO Energy, LLC advocating for the development of an Hourly FTR in all markets. That white paper demonstrates that the expansion of virtual products in all ISO/RTOs to include an Hourly FTR, or Real-Time Congestion Hedge, would cost less than $1 million per ISO/RTO to implement and would yield tens of millions of dollars per ISO annually in increased market efficiency.

Stakeholder process. The primary issue that minority market participants, including financial market participants, face in the stakeholder process is the voting power of utilities. Entrenched utility interests have enormous strength in the stakeholder process because ISO/RTO rules employ weighted voting procedures, which distribute the number of votes based the number of subsidiaries within an organization. Further, stakeholders are broken into sectors with financial market participants grouped into large sectors, such as PJM's Other Supplier sector, where their votes are diluted by the sheer volume of organizations.[2] As such, vertically integrated utilities are able to exert a large amount of influence on stakeholder proposals because the number of votes per organization, and the number of organizations per sector in sectors other than the Other Suppliers sector, vastly outweigh the voting power of smaller companies. ISOs/RTOs must be cognizant of the power and influence of utilities in the stakeholder process, in conjunction with each stakeholder's duty to vote with their company's financial interests in mind. Many smaller companies do not have the staff to dedicate to closely monitoring multiple ISO/RTO stakeholder proceedings, whereas larger entities utilize teams of individuals to drive the process. While the Financial Marketers Coalition has sought to bridge this gap through stakeholder representation, the process is still challenging.

This combination can have the intended and unintended consequence of forcing proposals through the stakeholder process that may provide benefits for large utilities but are extremely adverse to market design. In a paper on electricity markets and virtual trading, two economists perfectly summed up the uplift debate in the PJM markets:

> The motivation for this paper arose from a vigorous policy debate about the merits of organized market designs in electricity markets. This debate reflects

[2] For example, there are 53 companies in PJM's Transmission Owners Sector, 40 companies in PJM's End User Customer Sector and 564 companies in PJM's Other Supplier Sector. This means one Transmission Owner's vote represents 0.025 % of the sector, while one Other Supplier's vote represents 0.0018 % of the sector.

> two distinct, but related difficulties that frequently confront policy makers. First, the potential for a more efficient market design to reallocate production from high-cost firms to lower-cost competitors will create a political incentive for market participants that stand to lose to oppose it.[3]

Weighted voting procedures allow utilities to set the course of stakeholder proceedings, which results in market reforms catered to utility interests with little regard for market outcomes, and as such, are often counter to consumers' best interests. PJM, for example, is required to implement market reforms arising from stakeholder proceedings, even if those reforms only benefit one sector, or are roundly opposed by one or two sectors. During the last Powering America hearing, Ranking Member Bobby Rush (D-IL) welcomed discussion on the market issues associated with ISO/RTOs beholden to incumbent utilities:

> As we will soon hear, Mr. Chairman, many consumer advocacy groups believe that the RTOs are too beholden to the utilities than they are trying to administrate. And consumers do not have a large enough seat at the table to make their voices heard. Many of these advocates argue that the whole process for reforming energy markets have become more and more complex, while at the same time consumer voices have been diluted to the point of being completely shut out. There also seems to be, a new consensus, Mr. Chairman, among today's witnesses, that FERC and DOE have become too tolerant of the RTOs' ability to shut out public interests, and participation, and policymakers must act to address this challenge.[4]

Congress and FERC should support ISO/RTO reforms that prevent market participants, particularly entire sectors of market participants, from being effectively shut out of the stakeholder process. Particular attention should be given to increasing protections for minority interests, and a review of each ISO/RTO's rules pertaining to sector-weighted voting.

In general, we question whether the stakeholder process should be the ultimate arbitrator of market design issues. It may not be in the best interests of consumers to have industry stakeholders holding the ability to change market design. The current practice places enormous pressure onto FERC as it must closely consider the actual impacts of a proposal, and not simply defer to the outcome of the stakeholder process. At the very least, best practices should guide market design issues, ideally aligning the ISO/RTO markets to some degree. After 20 years, we still have vastly different market structures across the United States. Interestingly, ERCOT, which is not regulated by FERC, has the most competitive market of all of the ISO/RTOs, even though it is the market which most recently moved from zonal to nodal pricing. Most

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[3] Mansur, E. and White, M., Market Organization and Efficiency in Electricity Markets at 41 (2012), *available at* http://www.dartmouth.edu/~mansur/papers/mansur_white_pjmaep.pdf (analyzing the benefits that PJM's expansion into the Midwest brought to regions previously not part of an organized market).

[4] Transcript of Powering America: Consumer-Oriented Perspectives on Improving the Nation's Electricity Markets at 3-4 (Oct. 7, 2017), *available at* http://docs.house.gov/meetings/IF/IF03/20171005/106470/HHRG-115-IF03-Transcript-20171005.pdf

importantly, the end goal of electricity markets should not be a market design that benefits stakeholders, but a design which facilitates and encourages competition.

Data and analysis. ISOs/RTOs, along with their market monitors, are currently able to provide data, analysis and conclusions to the public and to FERC without independent review from third parties. FERC relies on this data as a primary source of information to rule on proposed market reforms. In the past several years, ISOs/RTOs and their market monitors have questioned the value that financial marketers bring to the market, and have released data to FERC which can be construed as biased against financial market participants.[5] In contrast, several economists and market experts have performed studies and analysis which reflect the exact opposite, that financial market participants and virtual products bring benefits to the market significantly in excess of the cost of their participation. Even independent market monitors' opinions on financial market participation vary wildly among ISOs/RTOs, further highlighting the disparity between data and opinion. In order to preserve neutrality, FERC and Congress should require that data, opinions and conclusions released by an ISO/RTO or its market monitor should undergo a peer review process by independent market experts.

Uplift NOPR. In January 2017 FERC issued a Notice of Proposed Rulemaking on Uplift Allocation and Transparency in ISO/RTO markets. The Uplift NOPR is the culmination of years of work from FERC and market participants, including through FERC's price formation initiative, and if implemented, will significantly increase market efficiency, distribute market costs in an appropriate and equitable manner, and eliminate penalties that currently exist across many markets which disproportionately penalize efficient market behavior. Financial market participants strongly support the NOPR and believe that its reforms on uplift allocation and improved transparency in market operations and procedures will benefit all market participants. Now that FERC has a full quorum, it should focus on implementing this important rulemaking in all ISOs/RTOs as soon as possible.

2) In your testimony, you stated that competitive markets should be allowed to operate with minimal government intervention, such as out-of-market subsidies. If such intervention occurs, how is financial trading affected? Do you have any recent examples?

Answer:

- Subsidies based on fuel source and out-of-market credits distort price formation, preventing markets from functioning efficiently
- Congestion hedging products can produce cost savings by correctly identifying when transmission facility upgrades are necessary for reliability

When subsidies and other out-of-market credits are given to certain market participants or certain classes of market participants, those out-of-market actions distort market outcomes by decreasing the recipients' price responsiveness and price sensitivity. Out-of-market subsidies threaten competitive markets by suppressing prices, in both the capacity and electricity markets, sending

[5] At times, ISOs/RTOs, particularly PJM, have made significant market redesign proposals without any supporting data, or with only limited and questionable data. This is another issue to which FERC should be attuned.

signals to investors that there is little or no opportunity to enter the market and receive sustainable economic rents. Existing resources which are not receiving subsidies will experience eroding profit margins, leading to those resources exiting the market or requesting cost-of-service compensation. Subsidies threaten, and have the potential to irreversibly harm, competitive electricity markets and run counter to FERC's commitment to those markets.

Subsidies Based on Fuel Type: Any subsidy which allows one particular class of market participant to compete with an advantage vis-à-vis other market participants will provide preferential treatment and skew market outcomes. When subsidies are given to a class of market participants based on the fuel source that participant is utilizing, the subsidy impacts the market clearing price and the individual LMPs throughout the grid. The subsidy payments lead to otherwise uneconomic generation remaining in the market or the early retirement of otherwise economic generation. This leads to price distortions in both the energy and capacity markets, which ultimately leads to increased costs to consumers.

A recent report prepared by the Staff of the Department of Energy warned against the market distortions that could result from subsidies designed for limited types of resources.[6] The Staff Report cautioned that

> Interventions to promote specific fuel types—such as bailouts for coal and nuclear or mandates and subsidies for renewables—skew investment risk and can undermine incentives for reliability- enhancing behavior (e.g., a public intervention to finance pipeline expansion removes incentives for the private sector to invest in fuel security). Fuel-specific subsidies and mandates replace individual choice with collective choice. This one-size-fits-all approach to risk mitigation ignores variances in individuals' risk tolerances, results in high-cost risk mitigation, and creates perverse incentives for market participants by transferring risk and costs from the private to the public sector.[7]

As DOE Staff acknowledges, subsidies based on fuel type have the potential to result in the retention of thousands of megawatts of uneconomic generation, ultimately crowding out efficient generation resources that are then forced to compete on a skewed playing field. This is dangerous for competitive markets because it forces resource owners to focus on gaining subsidies rather than maximizing the efficiency of their units. As Joseph Bowring, the independent market monitor for PJM has observed, "[s]ubsidies are contagious," and these types of programs will mean that "[c]ompetition in the markets could be replaced by competition to receive subsidies."[8]

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[6] *See* Department of Energy, Staff Report to the Secretary on Electricity Markets and Reliability (Aug. 2017) ("DOE Staff Report"), https://energy.gov/downloads/download-staff-report-secretary-electricity-markets-and-reliability.

[7] *Id*. at 90-91.

[8] Statement of Joseph Bowring at 3, State Policies and Wholesale Markets Operated by ISO New England, Inc., New York Independent System Operator, Inc., and PJM Interconnection, L.L.C.,

Impact of Subsidies on Financial Trading: When placing transactions, financial participants are looking at the market signals that are sent from the ISO/RTO along with other factors. Taking a simplified example, if a generation unit's marginal cost to produce electricity is $30/MWh then we would expect that when the price is under that cost, the unit would either shut down or at the very least back down to minimum. Now assume that the same generator receives an out-of-market payment of $20/MWh. The impact of the out of market payment will result in the asset being able to produce electricity when prices are as low as $10/MWh, since the out-of-market payment will depress its marginal cost. This depression of wholesale prices will have a cascading impact across the footprint further distorting pricing and therefore distorting market outcomes. The electricity market does not recognize state borders. So the out of market actions of one state can have a drastic impact on the participants in another state.

3) In theory, the benefits associated with financial transactions appear to make the markets more efficient. However, quantifying these benefits versus the costs is not easy because there are so many variables in the markets. What is your best argument to convince me that the value you bring to the market is more than the value that you extract from it?

Answer:

- Noted economists have performed studies quantifying the benefits of financial transactions
- To effectively quantify the benefit of financial transactions all analysis must include a re-running of the Real-time market

Virtual trading brings specific benefits to wholesale markets, including convergence between the Day-ahead and Real-time markets, which helps to better preposition the Day-ahead market in preparation for the Real-time market. Convergence between the Day-ahead and Real-time markets is important because converged markets yield lower prices to consumers. By nature, energy markets are inherently volatile and risky because it can be hard for market participants to predict, in the Day-ahead market, what the Real-time market will look like. Financial market participants shoulder this risk on behalf of other market participants, allowing market participants to hedge the prices they will pay against the trades placed by a financial market participant. Financial marketers also bring needed liquidity and competition to markets, and introduce competition where otherwise none (or little) may exist.

The benefits of virtual trading have been touted by premier market experts and ISO/RTO market monitors. Dr. William Hogan has written extensively on the issue, summarizing the benefits that virtual transactions bring to the market as follows: "This virtual bidding promotes price discovery, allows market-based redistribution of risk, and offers an opportunity to price risk in the electricity market."[9] Similarly, Dr. David Patton, the market monitor for several ISO/RTOs,

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Docket No. AD17-11-000 (filed Apr. 25, 2017). *See also* DOE Staff Report at 14 (stating that economists have referred to the phrase "subsidies beget subsidies").

[9] HOGAN, W., *Electricity Market Design: Financial Transmission Rights, Up To Congestion Transactions and Multi-Settlement Systems* (July 16, 2012) ("2012 Hogan Study"), *available at* http://www.hks.harvard.edu/fs/whogan/Hogan_UTC_071612.pdf.

has argued for increased virtual bidding in MISO, including recommending the development of the virtual spread bid or real-time congestion hedge product,[10] because of the value that such trading brings to the market:

> [A]ctive virtual trading in the day-ahead market promotes price convergence with the real-time market, which facilitates an efficient commitment of generating resources. In addition, active virtual supply protects the market against attempts to raise day-ahead prices by economically withholding physical generation or making excess load or virtual load purchases.[11]

In terms of quantifying benefits, Dr. Frank Wolak and Dr. Akshaya Jhu looked at the CAISO market, both before and after the introduction of Convergence Bidding.[12] The study found that savings specifically came in three areas. First, the annual total cost of fossil fuel energy decreased by about roughly $70 million dollars per year in the year following the introduction of Convergence Bidding, through more efficient unit commitment. Second, the study found, Convergence Bidding resulted in a reduction of greenhouse gas emissions of approximately 2.8%, or between 537,000 and 650,000 pounds of emissions annually, again through better underlying unit commitment.[13] At the same time that year, the profits extracted from the market by entities trading Convergence Bidding was approximately $13 million in 2011 and $18 million in 2012.[14] While this study was done in the smaller CAISO market, it shows profound savings – with Convergence Bidding bringing value ***over four times greater*** than the cost of such trading in fuel costs alone, not including the value of avoided carbon emissions, and the longer term value of better pricing in the forward market to all market participants.

Another economist has performed analysis which accounts for many different variables in the markets, and his conclusions found that the benefit of virtual transactions far outweighed the

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[10] *See, e.g.*, 2012 State of the Markets Report for the MISO Electricity Markets at 25 (June 2013).

[11] 2008 State of the Market Report for the Midwest ISO at 41.

[12] JHA, A AND WOLAK, F, *Testing for Market Efficiency with Transaction Costs: An Application to Convergence Bidding in Wholesale Electricity Markets* (May 7, 2013) (emphasis added), *available at* http://web.stanford.edu/group/fwolak/cgibin/sites/default/files/files/CAISO_VB_draft_V8.pdf ("Wolak Study").

[13] This occurred through the pre-positioning of the Day-Ahead market, allowing more efficient units to run instead of the system operator calling on less-efficient units in the Real-Time market. Note that the dollar value of reduced greenhouse gas emissions is not included in the $70 million savings.

[14] California Independent System Operator, *Market Issues and Performance: 2011 Annual Report* at 87 (2011), http://www.caiso.com/Documents/2011AnnualReport-MarketIssues-Performance.pdf; California Independent System Operator, *Market Issues and Performance: 2012 Annual Report* at 109 (2012), http://www.caiso.com/Documents/2012AnnualReport-MarketIssue-Performance.pdf. We note that we refer only to the profits associated with internal Convergence Bidding, and do not include values associated with Convergence Bidding at the interties or in imports/exports.

costs. Dr. Scott Holladay, an economist with Yes Energy, studied the impacts on convergence in the PJM market from a decrease in UTC volumes. He found that convergence in PJM was reduced by approximately $1.52/MWh from September 8, 2014 through November 6, 2014.[15]

Quantifying the benefits of virtual transactions is challenging. To accurately capture the numerous market variables impacting the analysis, it is essential that all post-analysis must include data re-running the Real-time market. However, the only entities which have sufficient information to either re-run the market or simulate a market re-run are the ISO/RTOs themselves, and FERC's Division of Analytics and Surveillance ("DAS"). Neither has been willing to share data with third party economists. As such, an independent study, performed by FERC or the Congressional Budget Office utilizing the ISO/RTO data provided to FERC's DAS, would be very helpful.

The primary paper arguing against virtual transactions was published by Dr. John E. Parsons who, in conjunction with the FERC Office of Enforcement, performed an analysis of convergence bidding in the CAISO markets, questioning the value of virtual transactions and referencing certain virtual bidding as "purely parasitic."[16] Dr. Parsons' paper was highly skewed against virtual trading, seeking to find examples to prove that such transactions are not beneficial to competitive wholesale electricity markets. Dr. Parsons' analysis focused on ramping events in CAISO where virtual traders were consistently buying Day-Ahead energy and profiting from the ramping and scarcity pricing that occurs during the peak hours in California when load is rising quickly and renewables are simultaneously ramping offline. One of the primary fatal flaws of Dr. Parson's analysis was in not re-running the Real-Time results. As such, Dr. Parsons failed to answer the critical question of whether the virtual transactions that were committing additional resources were lessening the frequency and severity of the shortage pricing events. He also failed to quantify how frequently his asserted "parasitic" results were occurring, which is highly relevant because "parasitic" results in 1% of hours would be far less of a concern than "parasitic" results in 35-50% of hours. Regardless, virtuals were committing additional generation in the Day-ahead and making CAISO more reliable during scarcity events.

4) In your testimony you mentioned that Financial Market Participants are the only stakeholders working to ensure that electricity markets provide useful price signaling for short-term and long-term decision making.

Answer:

- Financial market participants profit when their transactions help converge the Day-Ahead and Real-Time markets
- Financial market participants help with prepositioning the Day-ahead market, risk mitigation and hedging, therefore reducing risk premiums which helps forward price formation.

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[15] Speaker Materials of Holladay, S., *Measures of Convergence In Up To Congestion Markets* at 8, Docket No. EL14-37-000 (issued Jan. 7, 2015).

[16] Parsons, J.E., *Financial Arbitrage and Efficient Dispatch in Wholesale Electricity Markets* (Feb. 2015), *available at* http://www.mit.edu/~jparsons/publications/20150300_Financial_Arbitrage_and_Efficient_Dispatch.pdf

- Long-term prices are derivative of short term prices. Financial participation helps get short-term prices right while reducing premiums.

Financial market participants profit from activity that converges Day-ahead and Real-time prices and reduces out-of-market actions that produce uplift, an extraneous cost which ultimately increases prices for customers. By converging prices financial participants help improve the commitment and dispatch of assets, making the electric grid more efficient and reliable. Ultimately all market participants are seeking to perform profit-driven actions because all market participants are driven by individual financial obligations and fiduciary duties.

Financial market participants are incentivized to produce efficient market outcomes because when they appropriately transact in a manner which brings Day-ahead and Real-time prices closer to one another, they profit. On the other hand, if they drive Day-ahead and Real-time prices further apart, they lose money. The market self-polices financial participants by rewarding those that enhance market efficiency and driving out of business those that don't.

For example, a financial participant might forecast that the peak hour prices should be at least $50/MWh on a particularly constrained day. When the Day-ahead market clears at $40/MWh, the financial participant will have cleared their bid. In the Real-time market, if the financial participant forecasted correctly and the price comes in at $60/MWh, the financial participant will have earned a profit. On the other hand, if the financial participant offered $30/MWh on the same constrained day, that participant has contributed to lower-cost supply offers, causing the Day-ahead to clear at $35/MWh. Incorrect forecasting in the Day-ahead could prevent generation from being committed in the forward market, causing prices in Real-time to spike as high as $80/MWh. The financial participant would sustain a significant loss, and the market would be made less efficient and more volatile.

The converse is true for other market participants who can derive profits from inefficiencies in the market, such as uplift payments for out-of-market dispatch.

a. Will you explain how financial market participants improve price signals and the effect that this has on industry investment decisions?

Financial market participants, and other types of market participants engaging in virtual transactions, send pricing signals through their activity. With virtual energy products such as INCs and DECs, they can send signals about where power may be priced too high in the Day-ahead market, such that more generation may be needed. With FTRs and Real-time congestion hedging products such as the UTC, financial market participants send pricing signals about congestion in the Real-time: where it is likely to be found, how frequently it occurs and what pricing results from high congestion. As noted in the staff memo in advance of the hearing, congestion typically occurs if there is not enough capacity on a given transmission line, if the line is out of service for maintenance or if an unplanned outage occurs. Persistent congestion demonstrates a potential issue which may need to be addressed with some level of investment. In other words, these signals show where and when transmission upgrade investments may be necessary, by signaling when existing facilities are no longer able to accommodate the congestion in a particular area. Financial products are another tool in the toolbox for the regional transmission planning process.

WHOLESALE ELECTRICITY MARKET REFORM

ENSURE THE AVAILABILITY OF A FINANCIAL DAY-AHEAD TRANSMISSION MARKET THAT WILL BE ALIGNED WITH THE EXISTING MONTHLY TRANSMISSION MARKET ACROSS ALL OF THE ISOS, RESULTING IN:

- **BILLIONS OF DOLLARS IN INCREASED EFFICIENCES;**
- **IMPROVED GRID RELIABILITY;**
- **FACILITATE COMPETITION ACROSS THE FERC-REGULATED ISOs;**
- **CONSUMER COST SAVINGS.**

January 2018

I. A Call for the Modernization of the Electric Grid.

Over the next two decades, it is anticipated that billions of dollars will be funneled into transmission and distribution investments in order to replace aging infrastructure and, in turn, enhance the resilience, reliability, safety and asset security of the electric grid. This is the primary focus of the Quadrennial Energy Review (QER): Energy Transmission, Storage, and Distribution Infrastructure, April 2015.

II. Deregulation Facilitates the Creation of Energy and Transmission Products.

Nearly twenty years ago, FERC commenced the deregulation of the wholesale electricity markets, allowing the unbundling of energy transactions. Unlocking access to the transmission system, while promoting competition, exposed market design challenges that required the creation of both a framework and operational capability to transact between generation and load.

Prior to deregulation, vertically integrated utilities owned generation and entered into long-term, price-inflated agreements on behalf of the load that they served. The competitive model required the replacement of the vertically integrated system with an efficient market design whereby generated energy and transmission could be independently transacted.

III. Energy and Transmission Products in the Forward Markets.

The right to acquire energy and transmission can be transacted years or months in advance. The acquisition of energy and transmission in the forward markets ensures that generated resources together with the right to transmit those resources from generation to load will be available years or months before they are needed to meet grid demand, safeguarding grid reliability and creating long-term price signals.

In the real-time market, the price of both energy and transmission can be far more volatile than expected in the forward markets. To address this volatility, economists recognized that the creation of

a day-ahead market would facilitate a more economic dispatch of electricity in real time. By pre-positioning market operations on a day-ahead basis (versus months or years in advance), real-time generation and load could be more accurately predicted, resulting in greater price certainty and stabilization.

Since the introduction of the day-ahead market model in each of the ISOs, energy has been available for trading on a day-ahead basis. In addition to acquiring energy months or years in advance, trading in the day-ahead market offers increased granularity – the ability to assess and hedge against energy market price fluctuations in discrete periodic increments closer to real-time (e.g., on an hourly basis one day in advance).

Within PJM, the first ISO that was established, it was recognized that energy and transmission were fundamentally intertwined. In order to serve load in a price sensitive manner, the cost of transmission had to be considered as well. This recognition resulted in the expansion of PJM's day-ahead market to include the transacting of not just energy rights, but transmission rights, in order to better address the price volatility that occurred within PJM's footprint. Significantly, PJM's day-ahead transmission rights are only available in 3% of the market and have not been geographically expanded since their introduction.

Unfortunately, the ability to transact transmission on a day-ahead basis was not uniformly implemented by the other FERC-regulated ISOs. ERCOT, which is not under FERC jurisdiction, implemented a day-ahead market for both energy and transmission that is available across ERCOT's entire footprint. It is critical that these day-ahead transmission rights are available to the fullest extent across all ISOs in order to lead to more accurate price formation and market efficiency.

IV. The Changing Landscape of the Grid Requires the Expansion of the Day-Ahead Markets in all ISOs to include Transmission.

The modernization of the grid has been made all the more urgent by our pervasive dependence on a reliable supply of electricity. The principal challenges facing the grid: (i) revitalizing the aging infrastructure, which will require billions if not trillions of dollars in capital investments, and (ii) integrating variable energy sources, while maintaining stability in supply and price.

The sources of energy generation on the grid have changed dramatically. According to the U.S. Energy Information Administration, variable energy systems, including solar, wind, and hydropower, generated an unprecedented 523 million megawatt-hours of electricity in the United States in 2013, with variable generation on the rise. Furthermore, the retirement of coal-fired generators and, to a lesser extent, nuclear power plants, has precipitated our reliance on natural gas-fueled generators for a source of fully-dispatchable supply.

With the changing landscape of the grid, it is imperative that the day-ahead markets of all ISOs are expanded to include transmission. The transformation of the U.S. energy generation portfolio, while providing other potential benefits, will trigger a resurgence of price volatility if market participants are unable to hedge against price fluctuations in both energy and transmission in a more granular manner – that is, in the day-ahead market.

In order to improve market design efficiencies as well as effectively respond to a more dynamic generation portfolio, it is critical that the day-ahead market accommodate the transaction of both energy and transmission. Ensuring the availability of a financial day-ahead transmission market that is aligned with the existing financial monthly transmission market will improve market efficiency, reliability and

price certainty by more effectively pre-positioning the markets on a day-ahead basis to support the economic dispatch of electricity in real-time.

V. Recommended Action.

Billions of dollars will be invested into the modernization of the electric grid, which will take decades to complete. In the near term, ensuring the availability of a financial day-ahead transmission market that is aligned with the existing financial monthly transmission market across all of the ISOs will facilitate market efficiency, reliability and the integration of a more diverse generation portfolio.

It is estimated that the implementation of a financial day-ahead transmission market, which can be included in the budgets of each of five ISOs for $500,000 - $1 million, respectively, with an estimated launch period of less than one year, will conservatively result in tens of millions of dollars per annum/ISO in increased market efficiencies.

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Accordingly, FERC should encourage the ISOs to implement a fully-functional, financial day-ahead transmission market that will be aligned with the existing financial monthly transmission market. The implementation of a financial day-ahead transmission market will encourage more accurate price formation, which will improve market efficiency and performance, foster reliability, lower electricity prices, and facilitate the integration of variable renewable energy sources.

Senate and House provisions that were pending in the 2016 energy bill conference offered an opportunity to move forward on a day-ahead market for transmission, however, we understand that the proposed bill was subsequently abandoned. We strongly support the implementation of a more intensive and comprehensive bill.