January 9, 2018

Ms. Allie Bury
Legislative Clerk
Committee on Energy and Commerce
2125 Rayburn House Office Building
Washington, D.C. 20515
Allie.Bury@mail.house.gov

Dear Ms. Bury:

I appreciated the opportunity to appear before the Subcommittee on Energy on November 29, 2017 to testify at the hearing entitled "Powering America: Examining the Role of Financial Trading in the Electricity Markets."

Attached are responses to the additional questions provided in writing by the Honorable Fred Upton via letter dated December 19, 2017.

Sincerely,

[redacted]

Eric Hildebrandt, Ph.D.
Director of Market Monitoring
Department of Market Monitoring
California Independent System Operator
[redacted]

Attachment

Response to Additional Questions for the Record

Eric Hildebrandt, Ph.D.
Director, Department of Market Monitoring
California Independent System Operator Corporation

Committee on Energy and Commerce
Subcommittee on Energy
United States House of Representatives
January 9, 2018

The Honorable Fred Upton

1. In your testimony, you state that market design flaws associated with Financial Transmission Rights (FTRs) is costing ratepayers over $400 million a year. Why does every RTO and ISO have this flaw and what is your proposed solution?

A review of congressional legislation and related proposals and decisions by the Federal Energy Regulatory Commission (FERC) clearly shows that FTRs were created for the express purpose of benefiting customers by allowing load serving entities (LSEs) to hedge power purchases made by LSEs on behalf of their customers. All ISOs/RTOs do this by allocating FTRs directly to load serving entities (LSEs).[1] Moreover, prior proposed rules and orders by FERC clearly indicate that auctions for FTRs were initially developed and envisioned only as a means for providing a secondary market in which LSEs could choose to sell any FTRs they were allocated *if they felt this was economic to do so*. However, all ISOs/RTOs have gone beyond the initial intent and requirements for FTRs established by Congress and the FERC by establishing auctions in which

[1] Some ISOs/RTOs allocate LSEs auction revenue rights (ARRs), which can be directly converted into FTRs and are essentially equivalent to FTRs.

ISO/RTOs auction off additional FTRs backed by congestion revenues that would otherwise be refunded to transmission ratepayers.

The Commission addressed FTRs in 2002 as part of its initial Standard Market Design (SMD) proposal, which stated:

> To provide the price signals needed to manage congestion, the Independent Transmission Provider will be required to operate a day-ahead and real-time market for energy. To provide customers with a mechanism for achieving price certainty under the new congestion management system, we also propose to require that customers be given Congestion Revenue Rights for their historical uses that protect against congestion costs when specific receipt and delivery points are used.[2]

FERC's initial SMD proposal included a requirement for ISOs/RTOs "to offer Congestion Revenue Rights for all of the transmission transfer capability on the grid," [3] and included a "preference for the auction of Congestion Revenue Rights," but would have allowed "regional flexibility for a four-year transition period in determining whether to allocate Congestion Revenue Rights to existing customers or auction rights such that revenues are allocated to existing customers to hold them financially harmless [to the financial consequences of congestion in markets based on locational marginal pricing]. [4] FERC's initial 2002 proposal also indicated that the Commission believed it is important that ISOs/RTOs facilitate an active secondary market for CRRs by holding an auction in which "buyers and sellers would submit bids that specify the type of Congestion Revenue Rights desired to be bought or sold .." [5]

---

[2] Remedying Undue Discrimination, Through Open Access Transmission Service and Standard Electricity Market Design, July 21, 20012, Notice of Proposed Rulemaking, Docket No. RM01–12–000, (2002 Standard Market Design Proposal) ¶ 111.

[3] 2002 Standard Market Design Proposal, ¶237

[4] 2002 Standard Market Design Proposal, ¶15

[5] 2002 Standard Market Design Proposal, ¶252

In 2003 FERC issued a Standard Market Design White Paper in response to comments and concerns submitted on its initial SMD NOPR. This paper again indicated that "RTOs and ISOs that use locational pricing to manage congestion would be required to make Firm Transmission Rights (FTRs) available to customers ….[to] protect customers from the costs of congestion",[6] but went on to clarify that ISOs would not be required to auction FTRs:

> The Final Rule will eliminate any requirement that FTRs be auctioned. We will, instead, look to regional state committees to determine how such rights should be allocated to current customers based on current uses of the grid. Varying approaches to FTR allocation need not create "seams" with neighboring regions.[7]

FERC's 2003 whitepaper also clarified that rather than requiring ISOs to auction off additional FTRs, ISOs would be required to operate a secondary market for the purpose of allowing load serving entities that were allocated FTRs to voluntarily sell their FTRs if they so choose:

> There would be no requirement to auction these FTRs either initially or after a transition period ….. Once the initial allocation of FTRs is completed, the RTO or ISO must operate a secondary market for holders of FTRs to voluntarily sell their FTRs to others.[8]

Although FERC's standard market design rulemaking proposal was terminated and never adopted, the Energy Policy Act of 2005 added a new section to the Federal Power Act which again clarified that requirements placed on ISOs/RTOs relating to FTRs were intended to pertain only to the service obligations and power contracting needs of load serving entities' – and were not required for the benefit of financial traders or hedging by power producers:

---

[6] White Paper on Wholesale Power Market Platform, April 28, 2003, p.10.

[7] White Paper on Wholesale Power Market Platform, p.5

[8] White Paper on Wholesale Power Market Platform, Appendix A. p.9

> The Commission shall exercise the authority of the Commission under this Act in a manner that facilitates the planning and expansion of transmission facilities to meet the reasonable needs of load-serving entities to satisfy the service obligations of the load-serving entities, and enables load-serving entities to secure firm transmission rights (or equivalent tradable or financial rights) on a long-term basis for long-term power supply arrangements made, or planned, to meet such needs.[9]

In Order 681 the Commission clarified once again that FTRs were intended to provide a way for load serving entities who purchase electricity (rather than entities that sell electricity) to hedge congestion costs.

> The primary objective of guideline (1), consistent with section 217(b)(4), is to allow a load serving entity to obtain a long-term firm transmission right for purposes of hedging congestion charges associated with delivery of power from a long-term power supply arrangement to its load. We will adopt guideline (1) without modification. [10]

Order 681 also made it abundantly clear that requirements relating to FTRs established through the Energy Policy Act of 2005 applied only to the allocation of FTRs to load serving entities – and does not require the sales of additional FTRs by an ISO through an auction.[11]

As illustrated above, all requirements in Federal legislation and related to FERC decisions concerning FTRs are designed to provide hedges to load serving entities who purchase energy. These requirements were not established to meet the desires of financial entities or generation owners. Thus, even if some FTRs are used by generation owners as hedges for sales of power, it is unjust and unreasonable to ask customers of load serving entities who pay for the cost of the nation's transmission system to continue to lose $400 million to $600 million per year to subsidize any such

---

[9] Pub. L. No. 109-58, § 1233, 119 Stat. 594, 958

[10] Order No. 681, Final Rule, July 20, 2006, ¶116 at p. 66.

[11] e.g. see Order No. 681, Final Rule, July 20, 2006, ¶361 to ¶393 at pp.172-190.

hedges. Moreover, analysis shows that the bulk of FTRs purchased in auction are purchased by financial entities rather than by generation owners that might use these as hedges.

ISOs/RTOs do not need to auction FTRs for generation owners or energy traders to gain access to physical transmission or to hedge price risks associated with wholesale energy contracts and trading. As with other commodities, market participants and financial entities are free to develop and trade price swap contracts. In fact, this type of free market – with trades between willing buyers and sellers – is what is needed to price such price swaps most efficiently and fairly. If policy makers believe it is beneficial to wholesale electricity markets and consumers for ISO's to facilitate such financial price swaps, then ISO's should do this through a market for FTRs that is cleared and settled based on bids and offers from willing buyers and sellers.

In financial terms, all FTR auctions involve the sale of financial hedging contracts that are backed by transmission ratepayers which are auctioned off by ISOs/RTOs at a $0 offer price. This market design essentially forces transmission ratepayers to sell these financial contracts as "price takers" in the auction. This basic market design flaw can only be completely and effectively addressed by replacing these auctions with a market for financial hedging contracts that is based entirely on bids submitted by willing buyers and sellers.

A report posted on our website provides a discussion of market-based options through which energy generators, traders and financial entities can buy and sell financial instruments that allow hedging of congestion costs – without requiring the nation's transmission ratepayers to incur the enormous financial losses they are

incurring as a result of FTR auctions currently operated by the nation's largest ISO's/RTOs.[12]

The Honorable Fred Upton

2. I understand that sometimes the revenue paid out to Financial Transmission Right (FTR) holders is greater than the revenue generated by FTRs, resulting in a revenue shortfall. When this occurs, where does the money come from to cover the shortfall?

In the nation's largest ISO/RTOs, the revenue paid out to entities that purchase FTRs in auction is consistently and systematically greater than the revenue generated by the sale of FTRs in these auctions. FTRs are paid out of congestion revenues collected by the ISOs/RTOs. Any congestion revenues not paid out to FTR holders are refunded to LSEs. Therefore, the difference between auction revenues and congestion revenue paid out to FTRs purchased in the auction represents a direct loss to load serving entities. While the LSEs get the auction revenue, they consistently give up much more in congestion revenue in return.

In her testimony on behalf of the Power Trading Institute, Ms. Noha Sidhom notes that a "good analogy" of transmission congestion charges is the higher tolls collected for use of a highway during rush hour.[13] Using this analogy, FTR auctions are analogous to a state government auctioning off the rights to the tolls collected on public

---

[12] *Market alternatives to the congestion revenue rights auction,* Department of Market Monitoring, California Independent System Operator, November 27, 2017. http://www.caiso.com/Documents/Market_Alternatives_CongestionRevenueRightsAuction-Nov27_2017.pdf

[13] Noha Sidhom, CEO of TPC Energy, LLC on behalf of the Power Trading Institute Subcommittee on Energy Committee on Energy and Commerce U.S. House of Representatives Hearing: Examining the Role of Financial Trading in the Electricity Markets November 29, 2017, p.2. http://docs.house.gov/meetings/IF/IF03/20171129/106663/HHRG-115-IF03-Wstate-SidhomN-20171129.pdf

highways by the state for a future time period to the highest bidder. However, in this analogy, the revenues received by the state from this auction are consistently far below the tolls collected by the state. Thus, without such an auction, the toll revenues collected by the government would offset a much greater part of the cost to the state's taxpayers who paid the full cost of building the highway.

In response to the question of where the money to pay FTRs comes from, Ms. Sidhom also stated that "the value of allocated rights [to LSEs] is determined in the FTR auction," and that FTR auctions save money for consumers since "they provide an accurate price for the contracts that are allocated to transmission customers representing consumers." [14] This is simply not the case in any ISO/RTO. FERC originally envisioned that ISOs could conduct FTR auctions as one way for LSEs to voluntarily sell any allocated FTRs if they felt this was economically advantageous for them to do so. However, there is no link whatsoever between the economic value received by LSEs from allocated FTRs that they retain and the price of the additional FTRs sold by an ISO in an auction. On the contrary, LSEs retain their allocated FTRs and receive FTR payments that are much greater than the price of FTRs sold in the auction.

Ms. Sidhom also contends that "basically, this is a public auction of excess capacity."[15] Again, this is simply not the case. As Ms. Sidhom acknowledged, FTRs are purely financial price swap contracts, and provide no physical access or rights to the transmission grid. Congestion revenues are only generated when congestion occurs on

[14] Noha Sidhom, p.7-8

[15] Noha Sidhom, p.7.

the transmission system when there is not excess capacity. And if additional FTRs were not auctioned off by the ISO, all of these congestion revenues would be allocated back to LSEs which pay for the full cost of the transmission system through the Transmission Access Charge (TAC).

In the CAISO, the financial impact of FTRs auctioned off by ISOs on transmission ratepayers occurs through the Congestion Revenue Rights balancing account.[16] Table 1 below shows totals for this settlement account for 2017. As shown in Table 1, total congestion revenues in the CAISO totaled $357 million in 2017. A net total of about $279 million in CRR payments were made to LSEs receiving CRRs through the allocation process.[17] The CAISO's CRR auction generated about $83 million in revenues from non-LSEs, but resulted in CRR payments of about $184 million to these non-LSEs – resulting in a loss of about $100 million to LSE's.

Table 1. CAISO Congestion Revenue Rights Account, 2017
(Millions of dollars)

	With CRR auction	Without CRR auction
Day-ahead market congestion rent	$357	$357
Net CRR payments to LSEs*	($279)	($279)
Net CRR auction revenues from non-LSEs	$83	
Net payments to non-LSE auction CRRs	($184)	
Account surplus/deficit	($22.6)	$78

As shown in Table 1, this resulted in a deficit in the CRR balancing account of about $22 million, which is charged to LSEs based on their pro rata share of load and

[16] As noted in my November 29 testimony, FTRs are called Congestion Revenue Rights (CRRs) in the CAISO.

[17] This net total includes payments to allocated CRRs, net payments to LSE auction CRRs, and net auction revenues paid by LSEs

exports. However, if no additional CRRs were auctioned off by the CAISO, a total of $78 million would be credited back to LSEs. Thus, as a result of the auction, LSEs received an additional charge of $22 million rather than receiving a credit back of $78 million. This represents a loss of about $100 million to LSEs in the CAISO in 2017 as a result of additional FTRs auctioned off by the CAISO.

2a. How often does this occur and on what scale?

The $400 million per year cited in my testimony represents our estimate of the lower end of the costs being imposed on the nation's electric transmission ratepayers through FTR auctions. Analysis from Stanford University's Economics Department places this figure at $600 million per year.[18] These analyses show that ratepayer losses from sales of FTRs by ISOs represent a very systematic and consistent long term trend, and have now occurred each year for over almost a decade.

In the CAISO, transmission ratepayers have lost money on FTRs sold in the CAISO's auction every year since the auction began in 2009. Losses have totaled over $756 million or an average of $80 million per year. [19] In 2017 losses to transmission ratepayers from FTRs sold at auction totaled over $100 million. Similar results have been consistently reported based on data from the nation's other three largest ISOs and RTOs:

[18] paper

[19] These data have been updated since my November 29 testimony to include results through the end of 2017.

- Research from the Stanford University Economics Department shows that in the New York ISO ratepayer losses were $938 million from 1999 to 2016, or almost $60 million per year.[20]
- In PJM, ratepayers have lost over $1.18 billion from 2011 through September 2017 according to PJM's Independent Market Monitor. Financial entities have received about $170 million per year in FTR profits.[21]
- In the Midcontinent ISO (MISO) for the 2010-2011 through 2016-2017 planning periods, on average only about 80 percent of the day-ahead market congestion rent was received by transmission ratepayers.[22] As explained in earlier DMM reports, this implies that transmission ratepayer losses in the FTR auction were equal to about 20 percent of day-ahead congestion rents for the period.[23] Day-ahead congestion rent averaged about $790 million from 2011 through 2016.[24]

---

[20] Leslie, Gordon "Why do transmission congestion contract auctions cost ratepayers money? Evidence from New York" November 14, 2017, downloaded 11/17/2017: http://www.web.stanford.edu/~gwleslie/index_new_files/Leslie_JMP20171114.pdf

[21] Monitoring Analytics, *2016 State of the Market Report for PJM* p. 553: http://www.monitoringanalytics.com/reports/PJM_State_of_the_Market/2016/2016-som-pjm-sec13.pdf

Monitoring Analytics, *2017 Quarterly State of the Market Report for PJM: January through December* p. 559: http://www.monitoringanalytics.com/reports/PJM_State_of_the_Market/2016/2016-som-pjm-sec13.pdf

[22] Midcontinent ISO *ARR/FTR Transmission Customer Metric May 11, 2017*: https://www.misoenergy.org/Library/Repository/Meeting%20Material/Stakeholder/MSC/2017/20170511/20170511%20MSC%20Item%20XX%20ARR%20FTR%20Transmission%20Customer%20Metric%20April%202017%20Update.pdf

[23] Department of Market Monitoring *Shortcomings in the Congestion Revenue Right Auction Design* p.6: https://www.caiso.com/Documents/DMM-WhitePaper-Shortcomings-CongestionRevenueRightAuctionDesign.pdf

[24] MISO day-ahead congestion rent data from Potomac Economics *2016 State of the Market Report for the MISO Electricity Market* p.50; Potomac Economics *2014 State of the Market Report for the MISO Electricity Market* p.52; Potomac Economics *2012 State of the Market Report for the MISO Electricity Market* p.46. Reports available at: https://www.misoenergy.org/MARKETSOPERATIONS/INDEPENDENTMARKETMONITOR/Pages/IndependentMarketMonitor.aspx

This data indicates that transmission ratepayers in MISO have consistently suffered large losses from the FTR auctions, between $100 million and $200 million per year.

The Honorable Fred Upton

3. You testified that financial instruments are essentially price swap contracts and that unlike such contracts for other commodities, FTRs sold in electricity markets are not cleared and settled based on bids from willing buyers and sellers, but instead auctioned off by market operators. Can you explain in further detail why this is the case?

As explained in response to Question 1, a review of congressional legislation and related proposals and decisions by the FERC shows that FTRs were originally meant to provide a way for LSEs to hedge their electricity purchases. This can be accomplished by allocation of FTRs to LSEs and does not require an auction of additional FTRs by the ISO.

We do not know exactly why all ISOs and RTOs adopted FTR auctions. Dr. William W. Hogan developed the theory of using FTRs (which he originally called network contracts) to allocate congestion rents in 1992.[25] In this paper, Dr. Hogan expresses the belief that FTRs define rights that are amenable to market trading. Dr. Hogan writes that "… the contract network framework can support the allocation of transmission capacity rights through a competitive bidding system." Dr. Hogan's paper also seems to assume the auction would be competitive with prices equaling the expected spot market congestion prices.[26] The policy that subsequently established

[25] Hogan, William W. *Contract Networks for Electric Power Transmission: Technical Reference*, 1992, https://sites.hks.harvard.edu/fs/whogan/acnetref.pdf

[26] Hogan, pp.38 and 42.

FTR auctions appears to have been influenced by this narrative initiated by Dr. Hogan — if the ISO can get the FTR transmission model exactly right and if the auction market is competitive, then auction revenues should equal the expected payouts.

However, the literature and policy proceedings on FTRs reflect very little recognition of the fact that the auction obligates transmission ratepayers to sell financial swaps regardless of the sale price. Similarly, the risk that this creates for ratepayers to suffer large losses from FTR auctions does not appear to have been widely recognized. In the MISO and NYISO, neither the ISO nor its market monitor have reported the information necessary to directly quantify these losses. But the financial risk and obligations placed on ratepayers by FTR auctions and the discrepancy between FTR auction prices and payments is now very evident.

One factor underlying the flawed nature of auctioning FTRs backed by transmission ratepayers is the complexity of FTRs as a financial product. As explained in a 2014 expose on FTRs in the *New York Times*:

> Across the nation, investment funds and major banks are wagering billions on [transmission congestion contracts], as they chase profits in an arcane arena that rarely attracts attention... The utilities and power companies suggest they cannot win against trading outfits that employ math specialists, often called `quants,' to spot lucrative opportunities. With transmission contracts, there are tens of thousands of tradable combinations.[27]

As explained in academic research from Stanford University, the complexity of FTRs as a product creates a major barrier to entry and competition in the FTR auction:

> Anecdotes suggest a major barrier to eroding total trading profits could be the cost for new entrants to develop a technology that can identify successful trading strategies in these auctions. The auctions are notoriously complex, where TCC

[27] "Traders Profit as Power Grid is Overworked" *The New York Times* August 14, 2014: https://www.nytimes.com/2014/08/15/business/energy-environment/traders-profit-as-power-grid-is-overworked.html

> payouts and the auction allocations are determined in part by physical transmission constraints in the electric network. Successful firms consistently update their models and aggressively enforce non-disclosure agreements with ex-employees. The persistence of total trading profits over 16 years and the protection firms place on their trading technologies suggest that if regulators wish to reduce the transfers of wealth from electricity customers to TCC holders, waiting for future trader entry may not achieve this goal. Policy modifications may be required … such as eliminating the markets or restricting the set of products offered.[28]

This research also makes the important point that the large number of potential products and product combinations in the FTR auction can dissipate effective market liquidity.

A detailed discussion of the fundamental economic flaws underlying the auctioning of FTRs are provided in a recent report by the California ISO's Department of Market Monitoring.[29] This report identifies a variety of factors that are likely to help explain the very poor performance of the CRR auction from the perspective of ratepayers. These include:

- FTRs are not consistently defined products in both the auction and day-ahead market. A substantial body of economic literature exists that explains how this condition leads to underpricing in auctions for a variety of commodities.[30]

---

[28] Leslie, Gordon "Why do transmission congestion contract auctions cost ratepayers money? Evidence from New York" November 14, 2017, p. 4. http://www.web.stanford.edu/~gwleslie/index_new_files/Leslie_JMP20171114.pdf

[29] *Problems in the performance and design of the congestion revenue right auction*, Department of Market Monitoring, California Independent System Operator, November 27, 2017. http://www.caiso.com/Documents/DMMWhitePaper-Problems_Performance_Design_CongestionRevenueRightAuction-Nov27_2017.pdf

[30] For example, see: Athey, Susan, and Jonathan Levin. 2001. "Information and competition in US Forest timber auctions." Journal of Political Economy, p. 377 at http://web.stanford.edu/~jdlevin/Papers/Skewing.pdf; and Agarwal, Nikhil, Susan Athey, and David Yang. 2009. "Skewed Bidding in Pay Per Action Auctions for Online Advertising" The American Economic Review at http://economics.mit.edu/files/10630.

- FTR auction participants can profit from better information on differences in the way CRRs are defined in the auction versus the day-ahead market – without increasing efficiency or adding any value to ratepayers or other market participants.

- LSEs representing transmission ratepayers face significant limitations to bidding in FTR auctions.

- Buyers do not have an incentive to bid auctioned FTRs up to their expected value.

These represent fundamental flaws that cannot be eliminated under the current FTR market design. These flaws cannot be removed or fixed by simply improving the accuracy of the transmission network model used in the FTR auction, as some suggest. These flaws can only be entirely and effectively addressed by replacing the current auction design with either a bilateral market or centralized market for price swaps or a voluntary market for price swaps between willing buyers and sellers. However, the option of a centrally run market administered by ISOs/RTOs should only be pursued if policymakers believe that the benefits of facilitating price swaps warrant or require intervention by the ISOs/RTOs, rather than allowing price swaps to occur through private mechanisms as occurs with other commodities.