

Maintaining the Integrity of the FTR/ARR Product

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Technical Conference on PJM's FTR/ARR Allocation

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Financial Transmission Rights (FTRs)

- FTRs are used to hedge basis risk resulting from congestion – an FTR provides the FTR holder a revenue stream that equals the quantity of the FTR multiplied by the hourly price difference (day-ahead) between the source and sink locations specified in the FTR
- An FTR can be used by a Load Serving Entity (LSE) to hedge congestion risk between a load zone and a supply location such as a generator or hub
- FTRs serve as a the financial equivalent of firm transmission service in LMP markets
- The aggregate volume of FTRs needs to be limited to the size of the transmission grid (*simultaneous feasibility*) to ensure that there are sufficient revenues to pay FTR holders
- Unlike most other RTOs, PJM assigns real-time balancing congestion to FTRs that if negative can contribute to underfunding
- FTRs can also be traded for speculative purposes
- FTRs can be used as instruments for facilitating merchant and investor funded transmission projects/upgrades in organized markets (see Attachment S and Attachment EE of PJM Tariff)
- FTRs do not impact prices in physical markets

Background on PJM FTRs

- PJM experienced several years of significant “FTR underfunding” with recent improvements
- FTR funding in current planning year (2015-16) and the prior planning year (2014-15) has been hundred percent (including a net surplus of ~\$111 million for the 2014-2015 planning year and ~\$48 million for June-Dec 2015)¹
- FTR funding in the prior four planning years (June 2010 – May 2014) had a shortfall of \$1.41 billion²
- Negative Balancing Congestion (allocated to FTRs) during this period constituted ~90 percent or ~\$1.28 billion of this shortfall³
- Separating balancing congestion from PJM FTRs has proven difficult causing PJM to account for it in ARR/FTR allocations
- The recent FTR funding improvement has occurred despite the persistence of significant balancing congestion – balancing congestion in 2014-15 was ~\$233 million^{1,3}

1 – Markets Report, PJM Markets Committee webinar, (Jan 25, 2016) available at

<http://www.pjm.com/~media/committees-groups/committees/mc/20160125-webinar/20160125-item-09a-markets-report.ashx>

2 - FTR/ARR Funding and Education, PJM FTRSTF, Aug 4, 2014

<http://www.pjm.com/~media/committees-groups/task-forces/ftstf/20140804/20140804-updated-education-presentation.ashx>

3 – Balancing Congestion, PJM FTRSTF Apr 29, 2015

<http://www.pjm.com/~media/committees-groups/task-forces/ftstf/20150429/20150429-2014-2015-balancing-congestion.ashx>

The Intent of FTRs

- While FTRs were designed as a mechanism to hedge congestion risk in LMP markets¹, a recent market design debate in PJM revisited this question
 - should FTRs be a hedge for day-ahead congestion² or should they serve as a mechanism to distribute “total congestion” that includes “day-ahead congestion” + “balancing congestion” ?
 - it may not be possible to meet both objectives at the same time
- In a poll³ conducted by PJM on whether FTRs should be defined as (1) a hedge against day-ahead congestion, or (2) as a mechanism for allocating “total congestion” that is defined as the sum of day-ahead and balancing congestion, 73.39 percent of the responses by PJM participants understood the definition to be (1)
- However, getting consensus on how to change the current definition of PJM FTRs has proven difficult
- FERC Order on Rehearing in EL13-47 (June 8, 2015) - *“we continue to view the associated underfunding of FTRs as affecting the value of FTRs, and as previously discussed, FTR holders are in the best position to reflect this valuation.”*

1. Contract Networks for Electric Power Transmission: Technical Reference, William Hogan, Kennedy School of Government, Harvard University, September 1990 (revised February 1992) <http://hks.harvard.edu/fs/whogan/acnetref.pdf>

Background on FTR Development, Scott Harvey, Aug 27, 2014, PJM FTR/ARR Senior Task Force, Valley Forge, PA

<https://www.pjm.com/~media/committees-groups/task-forces/ftstf/20140827/20140827-background-on-ftr-development-presentation.ashx>

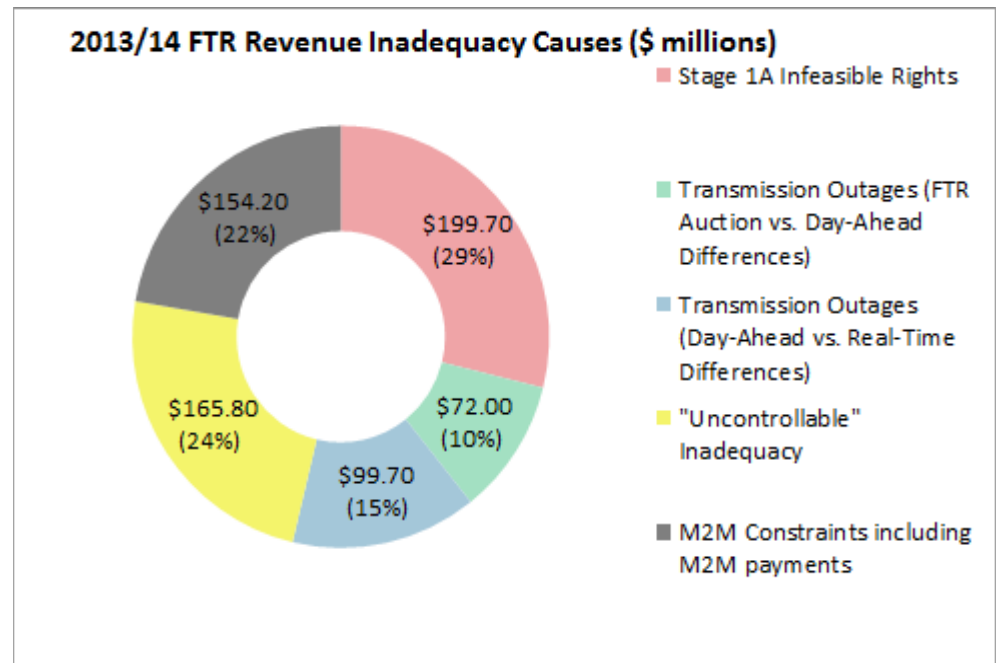
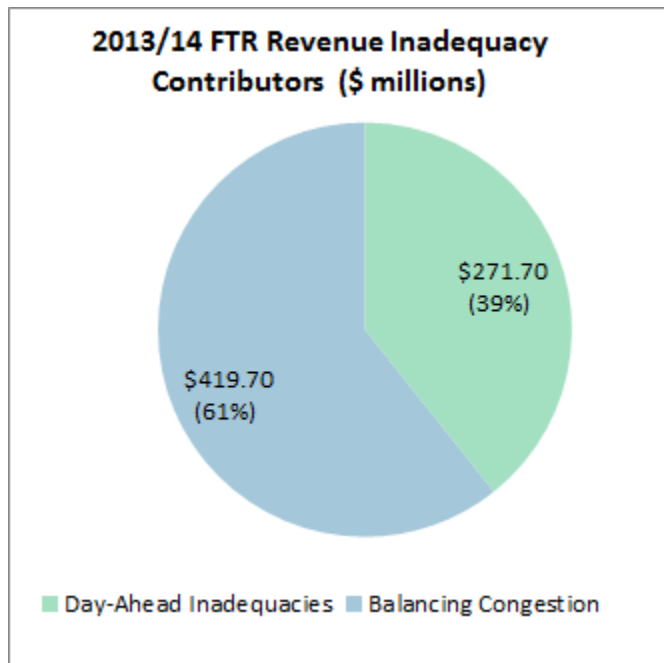
2. A day-ahead congestion hedge can be converted to a real-time congestion hedge using virtual transactions

3. FTR Polling Results, October 2014,

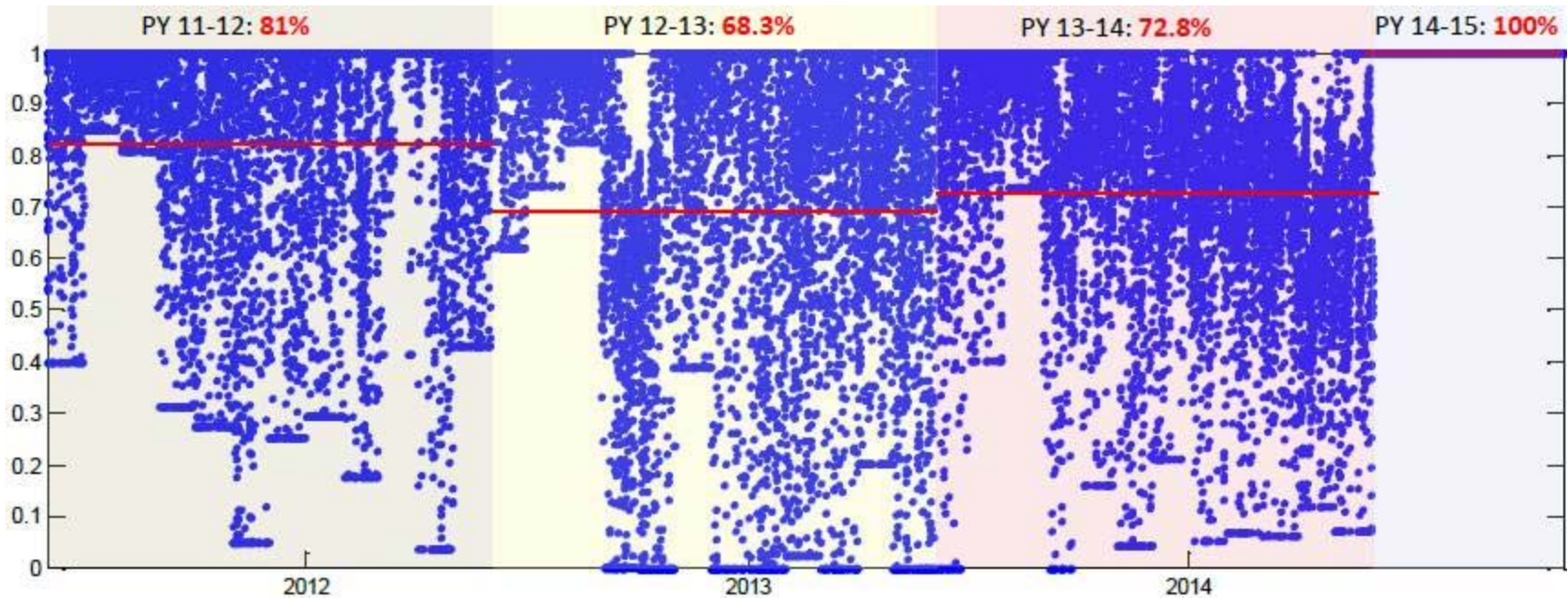
<http://www.pjm.com/~media/committees-groups/task-forces/ftstf/20141002/20141002-ftr-expectation-polling-results.ashx>

FTR Revenue Inadequacy – Contributors and Causes

- The fundamental cause of FTR revenue inadequacy is that the aggregate volume of FTRs exceeds the transmission capacity of the grid, i.e., the “simultaneous feasibility” condition is not satisfied
- This can be broken down further into several components as illustrated in the chart below
- In 2013/14, the largest contributor was infeasible Stage 1A ARR, followed by un-modelled Transmission Outages (Auction vs DA and DA vs RT), a category that PJM characterized as “uncontrollable” that includes the impact of “closed loop interfaces” and market to market constraints at the PJM borders



The Integrity of PJM FTRs as Congestion Hedges – An Hourly View

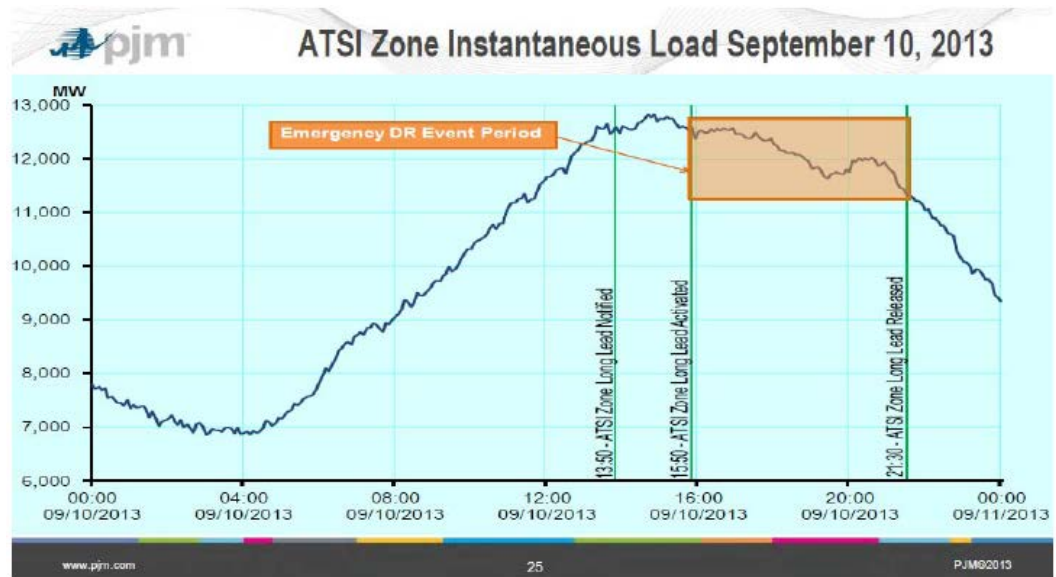


- Hourly FTR funding levels from June 1, 2011 – Nov 5, 2014
- Hourly funding level can vary significantly hedge exposure to congestion
- Significant improvement in FTR performance starting June 2014 after PJM reduced the aggregate volume of FTRs (based on a more rigorous enforcement of Section 7.5 of the PJM Tariff - Attachment K Appendix)

The Integrity of the PJM FTR Product During Hot Weather

- Sept 10-11, 2013 hot weather event with prices in PJM's ATSI zone set at 1,800 \$/MWh through application of a "closed loop interface" to align prices with operator actions
- Impact of closed loop interface was to create ~\$23 million of negative balancing congestion allocated to FTRs
- FTR funding levels at zero for several hours at precisely the time when FTRs would have been a useful hedging tool
- Problem would not occur if balancing congestion were separate from FTR settlement

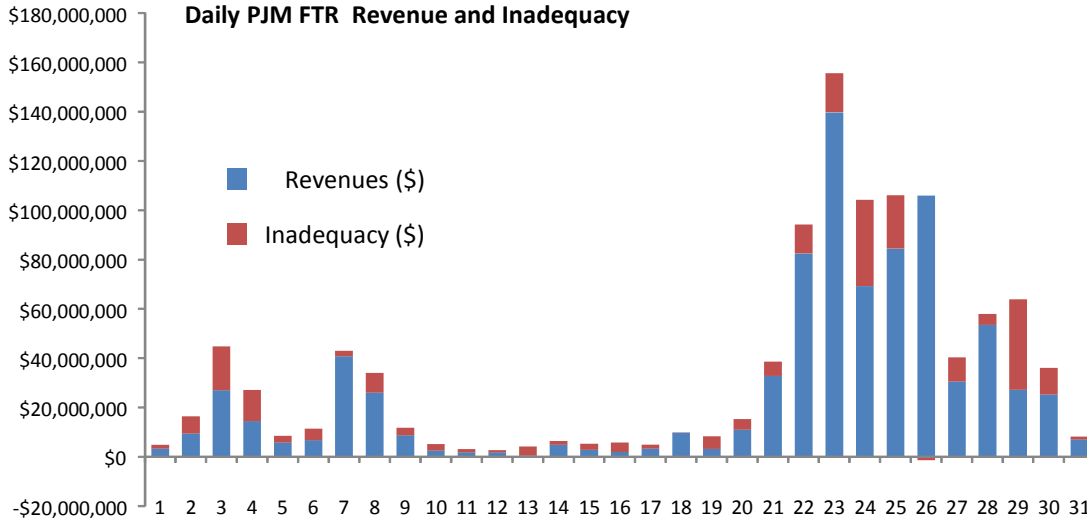
A "closed loop interface" involves limiting the flow on tie lines into a zone below a dynamically selected limit in order to help resources deployed within the zone to set price for the zone



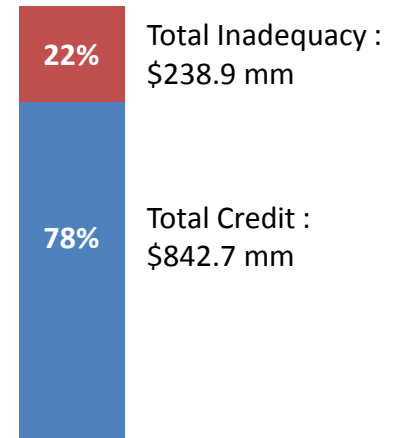
Source: PJM Markets Committee, Analysis of the September 9-11 Hot Weather Review (Sep. 23, 2013) ("PJM Analysis of the September 9-11 Hot Weather Review"), available at <http://pjm.com/~media/committees-groups/committees/mc/20130923-webinar/20130923-item-01-september-2013-hot-weather-operations-review.ashx>

Integrity of the PJM FTR Product During Cold Weather Polar Vortex – Jan 2014

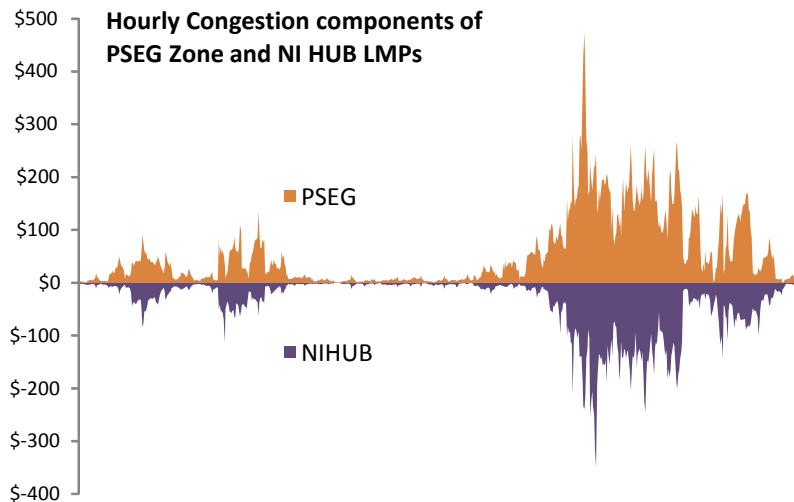
Daily PJM FTR Revenue and Inadequacy



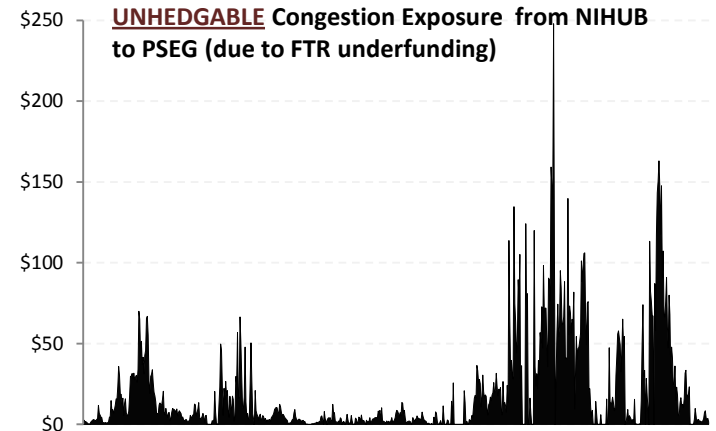
Total target :
\$1,081.6 mm



Hourly Congestion components of
PSEG Zone and NI HUB LMPs



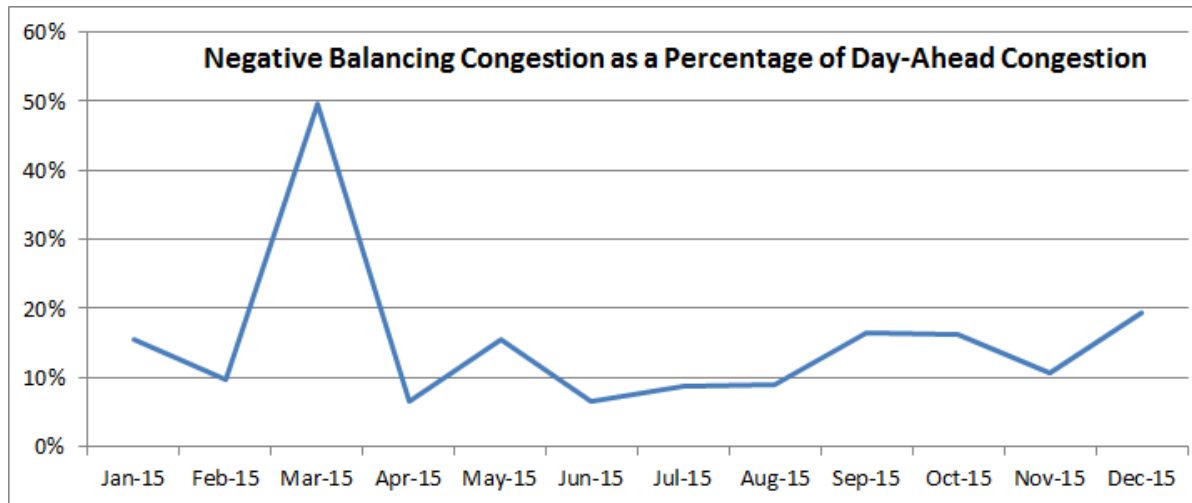
UNHEDGABLE Congestion Exposure from NIHUB
to PSEG (due to FTR underfunding)



Source: PJM, J. Aron as of Sept 2014

Recent Levels of Balancing Congestion

- Balancing congestion was negative in each month of 2015 – the average level was ~15 percent of Day-Ahead congestion (a reduction from the ~25 percent level in 2014)
- Balancing congestion in some months e.g. March 2015 was a significant percentage of Day-Ahead congestion (~50 percent) and would have adversely impacted FTR funding if PJM did not have surplus revenues from prior months to offset the deficit in March
- Other markets (e.g. CAISO) have also experienced high levels of negative balancing congestion in the past



2014 Congestion Metrics	PJM (\$ millions)	CAISO (\$ millions)
Day-Ahead Congestion	\$ 1,220.00	\$ 484.92
Balancing Congestion	\$ (299.10)	\$ (105.00)
Percentage (RT/DA)	25%	22%

Source: PJM Markets Committee Webinar, Jan 25, 2016, Markets Report Data Appendix

<http://www.pjm.com/~media/committees-groups/committees/mc/20160125-webinar/20160125-item-09a-markets-report-data-appendix.ashx>

CAISO

Maintaining the Integrity of FTRs - CFTC Requirements for FTRs

Two Specific Requirements for the Exempted Product

- Requirement 1 – The definition of the exempted product requires that payments are solely based on the price difference between source and sink
- Requirement 2 – Aggregate volume of FTRs must be limited to physical capability of the transmission grid

Source: Final Order in Response to a Petition to Exempt Specified Transactions Authorized by a Tariff or Protocol, 19 Fed. Reg. 19,880, 19,913 (Apr. 2, 2013)
<http://www.cftc.gov/LawRegulation/FederalRegister/FinalRules/2013-07634>

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Maintaining the Integrity of FTRs - The PJM Tariff and Simultaneous Feasibility of FTRs

7.5 Simultaneous Feasibility

(a) The Office of the Interconnection shall make the simultaneous feasibility determinations specified herein using appropriate powerflow models of contingency-constrained dispatch. Such determinations shall take into account outages of both individual generation units and transmission facilities and shall be based on reasonable assumptions about the configuration and availability of transmission capability during the period covered by the auction *that are not inconsistent with the determination of the deliverability of Generation Capacity Resources under the Reliability Assurance Agreement.* **The goal of the simultaneous feasibility determination shall be to ensure that there are sufficient revenues from Transmission Congestion Charges to satisfy all Financial Transmission Rights Obligations for the auction period under expected conditions and to ensure that there are sufficient revenues from the annual Financial Transmission Right auction to satisfy all Auction Revenue Rights Obligations.**

- A more rigorous application of the above Tariff provision, recognizing the inclusion of balancing congestion in PJM FTRs, has been a major contributor to FTR funding improvement
- *Once balancing congestion is factored into ARR allocations, LSEs are effectively paying for balancing congestion through reduced ARR allocations - a direct allocation can be more efficient and equitable*

What are Auction Revenue Rights (ARRs)?

- A mechanism introduced in 2003 where LSEs were awarded ARRs instead of FTRs with the choice of converting the ARR into an FTR or selling the FTR in an annual auction and receiving the corresponding auction revenues

Excerpts from 2003 FERC Order approving ARRs

- “Specifically, under PJM's FTR revisions, there is no change in the allocation of FTRs to existing entities. Those entities entitled to an allocation of FTRs under PJM's existing procedures will be allocated the same rights, in the form of ARRs. These entities can then self-schedule FTRs to hedge against congestion costs. Thus, the existing congestion rights to which these parties are entitled (and the overall quantity of these rights as they exist system wide) will neither expand nor contract as a consequence of PJM's proposed revisions.”
- “The only change made in this filing is that PJM has instituted a once-a-year auction procedure by which FTRs can be sold. Such an auction will benefit the market by enabling both potential buyers and sellers of FTRs to obtain better information about the value of FTRs. But, as discussed above, transmission customers are not required to sell their FTRs in the auction, but can retain them under the right-of-first refusal procedure.”

Generation Retirements and Stage 1A ARR

- Several historical generation resources designated as the source for Stage 1A ARRs have retired causing PJM to ask whether there is now a mismatch between the physical use of transmission system and Stage 1A ARRs

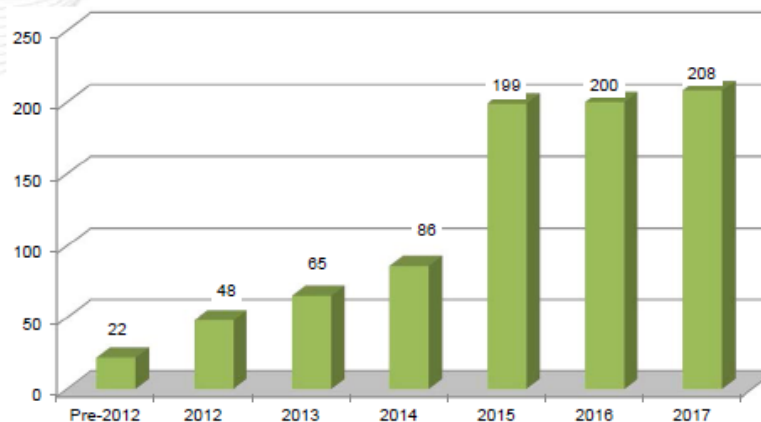


Stage 1 Allocation – Historical Resources

Generation Retirements

- Requires remapping historical resources to an equivalent generator or creating a dummy generator for ARR/pricing purposes only
 - Idea was to preserve the historical transmission system rights
 - May create mismatch between transmission system and Stage 1A entitlements
- Substantial amount of retirements not expected when Stage 1A process originally designed.

Historical Generation Retirements



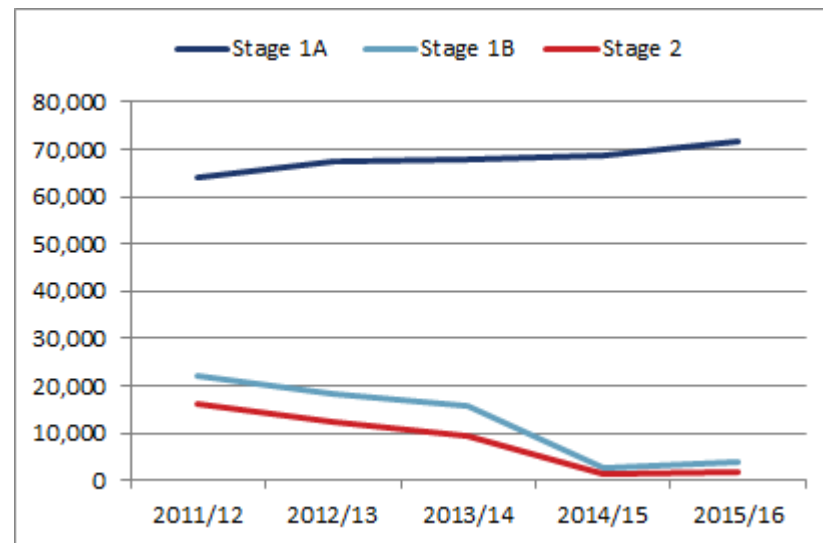
15.4% of Stage 1 historical generation has retired or submitted deactivation notices representing 25,543.7 MWs

PJM's Efforts to Address ARR Over Allocation

Reduction in Stage 1B ARRs

- If aggregate simultaneous feasibility is to be applied (as required by PJM Tariff as well as the CFTC exemption conditions) and infeasible Stage 1A ARRs must be allocated, other ARR allocations (e.g. Stage 1B) may be reduced disproportionately
- In 2014-15, only 7 percent of Stage 1B ARRs were cleared with unallocated Stage 1B ARRs valued at \$257.7 million¹ - this exceeds the level of balancing congestion during the same period
- While some Stage 1B ARR reduction may be required to offset the impacts of infeasible Stage 1A ARRs, this is just one component of the reduction with the rest offsetting the impacts of balancing congestion

Stage	2011/12	2012/13	2013/14	2014/15	2015/16
Stage 1A	64,159.9	67,299.6	67,861.4	68,837.7	71,874.0
Stage 1B	22,208.3	18,431.7	15,782.0	2,389.6	3,653.1
Stage 2-1	3,072.5	2,700.6	3,519.2	360.9	643.8
Stage 2-2	6,652.6	3,334.3	3,200.0	455.9	511.2
Stage 2-3	6,382.6	6,218.7	2,611.8	291.2	521.5
Total	102,475.9	97,984.9	92,974.4	72,335.3	77,203.6



Source: Historical ARR Allocations, PJM FTRSTF, Sept 17, 2014

<http://www.pjm.com/~media/committees-groups/task-forces/ftrstf/20140917/20140917-historic-arr-allocations.ashx>

PJM State of the Markets Report, Q2, 2015, Section 13, p463-464

http://monitoringanalytics.com/reports/PJM_State_of_the_Market/2015/2015q2-som-pjm-sec13.pdf

1. PJM Section 206 Complaint in EL16-6, October 19, 2015

PJM Statements on current Tariff Provisions on FTR Funding

- While it is true that PJM is not under a legal obligation to fully fund FTRs and Auction Revenue Rights (“ARRs”), the Tariff states in relevant part:
 - The goal of the simultaneous feasibility determination *shall be to ensure that there are sufficient revenues* from Transmission Congestion Charges to satisfy all Financial Transmission Rights Obligations for the auction period under expected conditions and to ensure that there are sufficient revenues from the annual Financial Transmission Right auction to satisfy all Auction Revenue Rights Obligations.⁵
- Thus, while PJM does not always meet the goal of fully funding FTRs and ARR, the goal of fully funding FTRs and ARR is not optional for PJM. The italicized language in section 7.5(a) of Attachment K-Appendix of the Tariff makes clear that PJM is required to endeavor to meet this goal to the best of its ability.

PJM Statements on the Current Approach

- FTRs are not only currently fully funded, but there is a net surplus in FTR funding for the 2014/2015 Planning Year. The improvement in FTR funding has taken place notwithstanding the continued occurrence of significant negative balancing congestion revenue, which is a key component of FTR underfunding.
- While PJM has resolved FTR funding issues for the time being, such resolution has come at a price. Specifically, PJM has taken into account more transmission outages, market-to-market flowgates, and conservative loop flow into its annual model that predicts the condition of the transmission system serving PJM's footprint. This has resulted in a reduction of ARR allocated to Load Serving Entities ("LSEs") during Stage 1B of the ARR allocation process, which in turn has generated greater excess transmission congestion revenue because of the corresponding reduction in FTRs. This increased amount of excess transmission congestion revenue has been used to offset negative balancing congestion revenue, and in turn has resulted in a surplus in FTR funding for the 2014/2015 Planning Year.
- While the reduction in ARRs allocated during Stage 1B of the ARR allocation process has improved FTR funding, PJM believes that the resulting status quo is less equitable and desirable than it would prefer, and does not represent the best design for PJM's FTR products.
- More specifically, PJM agrees with J. Aron that as long as PJM needs to make assumptions based on factors for which it has imperfect information, such as real time (balancing) congestion, when initially allocating ARRs to LSEs, PJM will likely either under-allocate ARRs to LSEs (resulting in overfunding of FTRs) or underfund FTRs.

PJM's Recent FTR Complaint

“PJM seeks Commission acceptance of reforms that will include a 1.5% adder to the simultaneous feasibility analysis as well as to remove netting from determining allocation of Transmission Congestion Credits to holders of FTRs.” - PJM October 19, 2015 Section 206 Filing under EL16-6

- PJM's cites the hedging objective of ARRs/FTRs and mentions three problems
 - (1) PJM's restriction of ARRs and refund of surplus to FTR holders,
 - (2) over-allocation of Stage 1A ARRs and reduction of Stage 1B ARRs (cross subsidy among LSEs) and
 - (3) allocation of underfunding to FTRs by portfolio instead of individually
- To address the above problems, PJM proposes two changes
 - escalate current ARR results using a zonal load forecast growth rate of +1.5% in the Stage 1A 10-year simultaneous feasibility process;
 - eliminate negatively valued FTRs from netting against positively valued FTRs within an FTR holder's FTR portfolio

Some Considerations for Defining Alternative Solutions

- After several years of underfunding, PJM FTRs are currently fully funded as a result of reductions in ARR allocations (primarily Stage 1B ARRs) consistent with the PJM Tariff
- Some Stage 1B ARR reductions are required to offset the impact of infeasible Stage 1A ARRs – this can create a cross-subsidy between different sets of LSEs that should be addressed
- Other reductions in Stage 1B ARRs offset the impact of negative balancing congestion - this means LSEs are now indirectly paying for balancing congestion through reduced Stage 1B ARR allocations
- While balancing congestion may be triggered by transmission outages in one part of PJM, the reduction of Stage 1B ARRs that offsets it (by generating a surplus) can impact LSEs in a different part of PJM creating a geographical cross-subsidy across LSEs
- The Stage 1B ARR reduction that corresponds to balancing congestion could be avoided if balancing congestion were separated from FTRs – this is eventually a choice on what constitutes a better market design
- A market design that persistently under-allocates ARRs or underfunds FTRs does not appear to be efficient
- The integrity of FTRs should not be compromised through the application of “closed loop interfaces” that can render FTRs ineffective as congestion hedges when they are most needed – a separation of balancing congestion from FTRs would address this
- While PJM has had some success in reducing balancing congestion, it remains significant and PJM should make efforts to further reduce it by better aligning day-ahead and real-time transmission models

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