Financial Transmission and Auction Revenue Rights

In an LMP market, the lowest cost generation is dispatched to meet the load, subject to the ability of the transmission system to deliver that energy. When the lowest cost generation is remote from load centers, the physical transmission system permits that lowest cost generation to be delivered to load, subject to transmission limits. This was true prior to the introduction of LMP markets and continues to be true in LMP markets. Prior to the introduction of LMP markets, payment for the delivery of low cost generation to load was based both on intrazonal generation and intrazonal transmission under cost of service rates, and on contracts with specific remote generation outside the local zone and the associated point to point transmission contracts. In both cases, customers paid for the physical rights associated with the transmission system used to provide for the delivery of low cost generation to load. There was no congestion revenue because customers paid only the actual cost of the low cost generation. Most generation was intrazonal and the transmission system used to deliver the related energy was also intrazonal.

After the introduction of LMP markets, financial transmission rights (FTRs) were introduced, effective April 1, 1999, for the real-time market and June 1, 2000, for the day-ahead and balancing markets, to permit the loads which pay for the transmission system to continue to receive the benefits of access to either local or remote low cost generation in the form of FTR revenues which return congestion to the load.[1] FTRs and the associated congestion revenues were directly provided to load in recognition of the fact that, as a result of LMP, load pays more for low cost generation than is paid to low cost generation. Under LMP, load pays and generation is paid locational prices which result in load payments in excess of generation revenues. The excess payments are congestion. The origin of FTRs was the recognition that the way to hold load harmless from making these excess payments created by the LMP system was to return the excess payments to load through the mechanism of FTRs. The rights to congestion belong to load.

1 See 81 FERC ¶ 61,257 at 62,241 (1997).

In an LMP system, the only way to ensure that load receives the benefits associated with the use of the transmission system to deliver low cost energy is to use FTRs, or an equivalent mechanism, to pay back to load the difference between the total load payments and the total generation revenues. FTRs were the mechanism selected in PJM to offset the congestion costs that load pays in an LMP market. Congestion revenues are the source of the funds to pay FTRs. Congestion revenues are assigned to the load that paid them through FTRs.[2] The only way to ensure that load receives the benefits associated with the use of the transmission system to deliver low cost energy is to ensure that all congestion revenues are returned to load.

Effective April 1, 1999, FTRs were introduced with the LMP market, there was a real-time market but no day-ahead market, and FTRs returned real-time congestion revenue to load. Effective June 1, 2000, the day-ahead market was introduced and FTRs returned total congestion including day-ahead and balancing congestion to load. Effective June 1, 2003, PJM replaced the direct allocation of FTRs to load with an allocation of Auction Revenue Rights (ARRs). Under the ARR construct, the load still owns the rights to congestion revenue, but the ARR construct allows load to either claim the FTRs directly (through a process called self scheduling), or to sell the rights to congestion revenue in the FTR auction in exchange for a revenue stream based on the auction clearing prices of the FTRs. Under the ARR construct, the right to all congestion revenues should belong to load. All congestion surplus should be assigned to load.

The current ARR/FTR design does not serve as an efficient way to ensure that load receives all the congestion revenues, and has the ability to receive the auction revenues associated with rights to all the potential congestion revenues. The cumulative offset would have been 67.8 percent if the current rules had been in place for the entire period. The cumulative offset was 75.8 percent based on the rules that were in place for each planning year. Total ARR and self scheduled FTR revenue offset only 74.5 percent of total congestion costs including congestion in the day-ahead energy market and the balancing energy market, for the 2011/2012 planning period through the 2016/2017

2 See *id.* at 62, 259–62,260 & n. 123.

planning period, before the FERC decision to allocate balancing congestion and M2M payments to load.[3] For the 2017/2018 planning period, after the implementation of the FERC decision to reallocate balancing congestion and M2M payments to load, ARR and self scheduled FTR revenue offset 50.0 percent of total congestion.

On May 31, 2018, a rule change was implemented to offset the more egregious effects of the allocation of balancing congestion to load.[4] Effective for the 2018/2019 planning period, surplus day-ahead congestion and surplus FTR auction revenue were allocated to ARR holders.[5]

Surplus congestion revenue should be allocated to ARR holders because surplus day-ahead congestion and surplus FTR auction revenue are associated with system capability that was, inappropriately, never assigned to ARRs. This residual capacity is unallocated in part as a result of PJM's conservative modeling designed to improve FTR funding and in part due to not assigning to ARRs the capability sold in the long term FTR auctions. In addition, FTR Auction revenue results from the prices paid by willing FTR buyers and should not be returned to FTR buyers for any reason. Had this surplus allocation been implemented in the 2017/2018 planning period, the percent of congestion offset by ARRs and FTRs would have increased from 50.0 percent to 74.3 percent. For the 2019/2020 planning period, 138.8 percent of total congestion was offset by ARR credit allocations to ARR holders including FTR auction revenues, self scheduled FTR revenue, surplus from the FTR auction, and day-ahead congestion in excess of target allocations. This offset level is primarily a result of FTR buyers paying more for FTRs than actual congestion in the planning period.

The ARR/FTR design does not serve as an efficient mechanism for returning congestion to load as a result of an FTR design that was flawed from its introduction and as a result of various distortions added to the design since its introduction. The distortions include the definition of target allocations based on day-ahead congestion only, the failure to assign all FTR auction revenues to ARR holders, differences between modeled and actual system capability and numerous cross subsidies among participants. One of the key flaws in the original design was the assignment of the rights to congestion revenue based on specific generation to load transmission paths. This approach retained the contract path based view of congestion rooted in physical transmission rights and inconsistent with the role of FTRs in a nodal, network system with locational marginal pricing.

If the original PJM FTR approach had been designed to return congestion revenues to load without use of the generation to load paths, and if the distortions subsequently introduced into the FTR design not been added, many of the subsequent issues with the FTR design would have been avoided. The design should simply have provided for the return of all congestion revenues to load. Now is a good time to address the issues of the FTR design and to return the design to its original purpose. This would eliminate much of the complexity associated with ARRs and FTRs and eliminate unnecessary controversy about the appropriate recipients of congestion revenues.

Ironically, PJM does not actually use a complete path based FTR approach. FTR revenues are socialized so that FTRs on paths with lower congestion are paid the same proportion of target allocations as paths with higher congestion. This persistent use of cross subsidies provides significantly inaccurate incentives to FTR buyers. In a truly path based system, profits and losses would be attributed to individual paths.

To address the issues with the current path based ARR/FTR market construct, the MMU is proposing that the current construct be replaced with a network construct in which the rights to actual congestion are assigned directly to load by node. The assigned right is to the actual congestion collected, both day-ahead and balancing, between the load at a bus and the generation used to serve that load. The load can retain the right to the network congestion or sell the right through auctions with the desired frequency.

3 On September 15, 2016, FERC ordered PJM to allocate balancing congestion to load, rather than to FTRs, to modify PJM's Stage 1A ARR allocation process and to continue to use portfolio netting. 153 FERC ¶ 61,180.
4 On May 31, 2018, FERC issued an order accepting PJM's proposal to allocate surplus day-ahead congestion charges and surplus FTR auction revenue that remain at the end of the Planning Period to ARR holders, rather than to FTR holders. 163 FERC ¶ 61,165.
5 163 FERC ¶61,165 (2018).

The network assignment of actual congestion has a number of advantages over the current path based approach. There are no cross subsidies among rights holders and no over or under allocation of rights relative to actual network market solutions. There are no revenue shortfalls as congestion payments equal congestion collected. The risk of default is isolated to the buyer and seller of the right, and any default is not socialized to other right holders. In the case of a defaulting buyer, the rights to the congestion revenues revert to the load. There is no risk of a network right flipping in value from positive to negative because congestion is always the positive difference between what load pays for energy and generation is paid for energy that results from transmission constraints

The *2020 Quarterly State of the Market Report for PJM: January through June* focuses on the 2020/2023 Long Term Auction, the 2020/2021 Annual FTR Auction and the 2019/2020 Monthly Balance of Planning Period FTR Auctions, specifically covering January 1, 2020, through June 30, 2020.

Table 13-1 The FTR auction markets results were competitive

Market Element	Evaluation	Market Design
Market Structure	Competitive	
Participant Behavior	Partially Competitive	
Market Performance	Competitive	Flawed

- Market structure was evaluated as competitive. The ownership of FTR obligations is unconcentrated for the individual years of the 20/23 Long Term FTR Auction and the 20/21 Annual FTR Auction. The ownership of FTR options is moderately or highly concentrated for every Monthly FTR Auction period and moderately concentrated for the 20/21 Annual FTR Auction. Ownership of FTRs is disproportionately (73.6 percent) by financial participants.
- Participant behavior was evaluated as partially competitive as a result of the behavior of GreenHat Energy, LLC.
- Market performance was evaluated as competitive because it reflected the interaction between participant demand behavior and the expected system capability that PJM made available for sale as FTRs. It is not clear, in a competitive market, why FTR purchases by financial entities remain persistently profitable. The fact that load is not able to define its willingness to sell FTRs or the prices at which it is willing to sell FTRs also raises questions about the market structure, the market performance and the market design.
- Market design was evaluated as flawed because there are significant and fundamental flaws with the basic ARR/FTR design. The market design is not an efficient or effective way to ensure that all congestion revenues are returned to load. ARR holders' rights to congestion revenues are not defined clearly enough. The path based assignment of congestion rights is inadequate and incorrect. ARR holders cannot determine the price at which they are willing to sell rights to congestion revenue. Ongoing PJM subjective intervention in the FTR market that affects market fundamentals is also an issue.

Overview

Auction Revenue Rights

Market Structure

- **Residual ARRs.** Residual ARRs are only available on paths prorated in Stage 1 of the annual ARR allocation, are only effective for single, whole months and cannot be self scheduled. Residual ARR clearing prices are based on monthly FTR auction clearing prices. Residual ARRs with negative target allocations are not allocated to participants. Instead they are removed and the model is rerun.

  In the 2019/2020 planning period, PJM allocated a total of 27,233.2 MW of residual ARRs with a total target allocation of $12.4 million, down from 31,554.6 MW in the 2018/2019 planning period, with a total target allocation of $15.3 million.
- **ARR Reassignment for Retail Load Switching.** There were 31,683 MW of ARRs associated with $657,300 of revenue that were reassigned in the 2019/2020 planning period. There were 35,571 MW of ARRs associated

with $423,100 of revenue that were reassigned for the same time frame of the 2018/2019 planning period.

Market Performance

- **Revenue Adequacy.** For the 2019/2020 planning period, the ARR target allocations, which are based on the nodal price differences from the Annual FTR Auction, were $752.2 million, while PJM collected $982.0 million from the combined Long Term, Annual and Monthly Balance of Planning Period FTR Auctions, making ARRs revenue adequate. The new allocation of surplus congestion revenue provides for revenue adequacy for FTRs first, and any remaining revenues at the end of the planning period are allocated to ARR holders. For the 2018/2019 planning period, the ARR target allocations were $726.8 million while PJM collected $907.6 million from the combined Annual and Monthly Balance of Planning Period FTR Auctions.
- **ARRs as an Offset to Congestion.** ARRs have historically not served as an effective way to return all congestion revenues to load. For the 2019/2020 planning period, 138.8 percent of total congestion was offset by ARR credit allocations to ARR holders. Congestion payments by load in some zones were more than offset and congestion payments in some zones were less than offset. The goal of the ARR/FTR market design should be to ensure that load has the rights to 100 percent of the congestion revenues. The cumulative offset would have been 67.8 percent if the current rules had been in place for the 2011/2012 planning period through the 2019/2020 planning period. The cumulative offset was 75.8 percent based on the rules that were in place for each planning year.

Financial Transmission Rights

Market Structure

- **Sell Offers.** In a given auction, market participants can sell FTRs that they have acquired in preceding auctions or preceding rounds of auctions. In the 2020/2023 Long Term FTR Auction, total participant FTR sell offers were 284,186 MW. In the 2019/2020 Annual FTR Auction, total participant FTR sell offers were 359,871 MW. In the Monthly Balance of Planning Period FTR Auctions for the 2019/2020 planning period, total participant FTR sell offers were 9,365,946 MW, up 8.6 percent from 8,626,195 MW for the 2018/2019 planning period.
- **Buy Bids.** In the 2020/2023 Long Term FTR auction, total FTR buy bids were 2,213,927 MW, up 13.6 percent from 1,949,546 MW the previous long term auction. There were 2,364,145 MW of buy and self scheduled bids in the 2020/2021 Annual FTR Auction, up 16.1 percent from 2,816,861 MW the previous planning period. The total FTR buy bids from the Monthly Balance of Planning Period FTR Auctions for the 2019/2020 planning period increased 9.3 percent from 21,196,546 MW for the same time period of the prior planning period, to 23,175,457 MW.
- **Patterns of Ownership.** For the 2020/2023 Long Term FTR Auction, financial entities purchased 73.5 percent of prevailing flow FTRs and 83.9 percent of counter flow FTRs. For the 2020/2021 Annual FTR Auction, financial participants purchased 71.2 percent of prevailing flow FTRs and 83.6 percent of counter flow FTRs. For the Monthly Balance of Planning Period Auctions, financial entities purchased 82.6 percent of prevailing flow and 87.7 percent of counter flow FTRs for January through June, 2020. Financial entities owned 73.6 percent of all prevailing and counter flow FTRs, including 66.4 percent of all prevailing flow FTRs and 83.9 percent of all counter flow FTRs during the period from January through June 2020.

Market Behavior

- **FTR Forfeitures.** Under the modified FTR forfeiture rules, total FTR forfeitures were $20.9 million for the period January 19, 2017, through June 30, 2020.
- **Credit.** There were no collateral defaults in the first six months of 2020. There were 20 payment defaults in the first six months of 2020 not involving GreenHat Energy, LLC for a total of $12,644. GreenHat Energy continued to accrue payment defaults of $15.1 million in the first six months of 2020 for a total of $162.1 million in defaults to date,

which will continue to accrue through May 2021, including the auction liquidation costs.[6] In addition, PJM added the settlement fee and claimant payee funds to the default allocation, resulting in allocations of $12.5 million and $5.0 million for a total of $179.6 million.

Market Performance

- **Volume.** The 2020/2023 Long Term FTR Auction cleared 275,655 MW (12.5 percent) of FTR buy bids, down 32.5 percent from 408,237 (20.9 percent) in the 2019/2022 Long Term FTR Auction. The Long Term FTR Auction also cleared 49,411 MW (17.4 percent) of FTR sell offers, compared to 35,412 (11.1 percent), a 6.3 percent increase.
- In the Annual FTR Auction for the 2020/2021 planning period 583,629 MW (24.7 percent) of buy and self schedule bids cleared, down 9.0 percent from 641,023 MW (22.8 percent) for the previous planning period. In the 2019/2020 planning period, Monthly Balance of Planning Period FTR Auctions cleared 4,124,903 MW (17.8 percent) of FTR buy bids and 1,995,514 MW (21.3 percent) of FTR sell offers. For the 2018/2019 planning period, Monthly Balance of Planning Period FTR Auctions cleared 3,157,852 MW (15.9 percent) of FTR buy bids and 1,703,548 MW (20.1 percent) of FTR sell offers.
- **Price.** The weighted average buy bid FTR price in the 2020/2023 Long Term FTR Auction was $0.08 per MW, down from $0.10 per MW for the 2019/2022 planning period. The weighted average buy bid FTR price in the Annual FTR Auction for the 2020/2021 planning period was $0.45 per MW, down from $0.66 per MW in the 2019/2020 planning period. The weighted average buy bid cleared FTR price in the Monthly Balance of Planning Period FTR Auctions for the 2019/2020 planning period was $0.15, down from $0.21 per MW for the same period in the 2018/2019 planning period.
- **Revenue.** The 2020/2023 Long Term FTR Auction generated $37.1 million of net revenue for all FTRs, down 77.1 percent from $161.7 million for the 2018/2022 Long Term FTR Auction. The 2020/2021 Annual FTR Auction generated $577.0 million in net revenue, down from $844.6 million for the 2019/2020 Annual FTR Auction. The Monthly Balance of Planning Period FTR Auctions generated $52.9 million in net revenue for all FTRs of the 2019/2020 planning period, down from $59.7 million for the same time period in the 2018/2019 planning period.
- **Revenue Adequacy.** FTRs were paid at 100.0 percent of the target allocation level for the 2019/2020 planning period, including the distribution of the current surplus revenue.
- **Profitability.** FTR profitability is the difference between the revenue received directly from holding an FTR plus any revenue from the sale of an FTR, and the cost of the FTR. In the 2019/2020 planning period, physical entities lost $92.5 million on FTRs purchased directly (not self scheduled) and financial entities lost $21.1 million including GreenHat's losses.

6 See the *2019 Quarterly State of the Market Report for PJM: January through June* for a more complete explanation of credit issues that occurred in 2019.

Markets Timeline

Any PJM member can participate in the Long Term FTR Auction, the Annual FTR Auction and the Monthly Balance of Planning Period FTR Auctions.

Table 13-2 shows the date of first availability and final closing date for all annual ARR and FTR products.

Table 13-2 Annual FTR product dates

Auction	Initial Open Date	Final Close Date
2021/2024 Long Term	6/2/2020	3/2021
2019/2020 ARR	3/2/2020	4/3/2020
2019/2020 Annual	4/7/2020	5/4/2020

Recommendations

- The MMU recommends that the ARR/FTR design be modified to ensure that the rights to all congestion revenues are assigned to load. (Priority: High. First reported 2015. Status: Not adopted.)
- The MMU recommends that all historical generation to load paths be eliminated as a basis for assigning ARRs. (Priority: High. First reported 2015. Status: Partially adopted.)
- The MMU recommends that the Long Term FTR product be eliminated. (Priority: High. First reported 2018. Status: Not adopted.)
- The MMU recommends that, if the Long Term FTR product is not eliminated, the Long Term FTR Market be modified so that the supply of prevailing flow FTRs in the Long Term FTR Market is based solely on counter flow offers in the Long Term FTR Market. (Priority: High. First reported 2017. Status: Not adopted.)
- The MMU recommends that, under the current FTR design, the full capability of the transmission system be allocated as ARRs prior to sale as FTRs. Reductions for outages and increased system capability should be reserved for ARRs rather than sold in the Long Term FTR Auction. (Priority: High. First reported 2017. Status: Not adopted.)
- The MMU recommends that all FTR auction revenue be distributed to ARR holders monthly, regardless of FTR funding levels. (Priority: High. First reported 2015. Status: Not adopted.)
- The MMU recommends that, under the current FTR design, all congestion revenue in excess of FTR target allocations be distributed to ARR holders on a monthly basis. (Priority: High. First reported 2018. Status: Not adopted.)
- The MMU recommends that FTR auction revenues not be used by PJM to buy counter flow FTRs for the purpose of improving FTR payout ratios.[7] (Priority: High. First reported 2015. Status: Not adopted.)
- The MMU recommends that PJM eliminate portfolio netting to eliminate cross subsidies among FTR market participants. (Priority: High. First reported 2012. Status: Not adopted. Rejected by FERC.)
- The MMU recommends that PJM eliminate subsidies to counter flow FTRs by applying the payout ratio to counter flow FTRs in the same way the payout ratio is applied to prevailing flow FTRs. (Priority: High. First reported 2012. Status: Not adopted.)
- The MMU recommends that PJM eliminate geographic cross subsidies. (Priority: High. First reported 2013. Status: Not adopted.)
- The MMU recommends that PJM examine the mechanism by which self scheduled FTRs are allocated when load switching among LSEs occurs throughout the planning period. (Priority: Low. First reported 2011. Status: Not adopted.)
- The MMU recommends that PJM improve transmission outage modeling in the FTR auction models, including the use of probabilistic outage modeling. (Priority: Low. First reported 2013. Status: Not adopted.)
- The MMU recommends that PJM reduce FTR sales on paths with persistent overallocation of FTRs, including a clear definition of persistent overallocation and how the reduction will be applied. (Priority: High. First reported 2013. Status: Partially adopted, 2014/2015 planning period.)
- The MMU recommends that the FTR portfolio of a defaulted member be canceled rather than liquidated or allowed to settle as a default cost on the membership. (Priority: High. First reported 2018. Status: Not adopted.)
- The MMU recommends that PJM continue to evaluate the bilateral indemnification rules and any asymmetries they may create. (Priority: Low. First reported 2018. Status: Not adopted.)
- The MMU recommends that PJM examine the source and sink node combinations available in the FTR market and eliminate generation to generation paths and all other paths that do not represent the delivery of power to load. (Priority: High. First reported 2018. Status: Not adopted.)
- The MMU recommends that the forfeiture amount from the FTR forfeiture rule be based on the correct hourly cost of an FTR, rather than a simple

7 See "PJM Manual 6: Financial Transmission Rights," Rev. 24 (April 15, 2020).

daily price divided by 24. (Priority: High. First reported 2018. Status: Adopted, 2019. Pending at FERC.)

- The MMU recommends that IARRs be eliminated from PJM's tariff, but that if IARRs are not eliminated, IARRs should be subject to the same proration rules that apply to all other ARR rights. (Priority: Low. First reported 2018. Status: Not adopted.)
- The MMU recommends a requirement that the details of all bilateral transactions be reported to PJM. (Priority: High. New recommendation. Status: Not adopted.)

Conclusion

The annual ARR allocation should be designed to ensure that the rights to all congestion revenues are assigned to firm transmission service customers, without requiring contract path physical transmission rights that are inconsistent with the network based delivery of power and the actual way congestion is generated in security constrained LMP markets. When there are binding transmission constraints and locational price differences, load pays more for energy than generation is paid to produce that energy. The difference is congestion. As a result, congestion belongs to load and should be returned to load.

Revenue adequacy is misunderstood and generally incorrectly defined. Revenue adequacy has received a lot of attention in the PJM FTR Market and conclusions based on the incorrect definition have led to significant changes in the design of the ARR/FTR market that have distorted the function and purpose of ARRs and FTRs as a means of allocating congestion and congestion rights. Correctly defined, revenue adequacy for ARRs means that load has the rights to 100 percent of congestion revenue. FTR holders, with the creation of ARRs, do not have a right to receive revenues equal to CLMP differentials on individual FTR paths.

The current ARR/FTR design does not serve as an efficient way to ensure that load receives the rights to all the congestion revenues and has the ability to receive the auction revenues associated with all the potential congestion revenues. The cumulative offset from the 2011/2012 planning period through the 2019/2020 planning period would have been 67.8 percent if the current rules had been in effect. The cumulative offset was 75.8 percent based on the rules that were in place for each planning year. Total ARR and self scheduled FTR revenue offset 65.3, 90.3, 103.6, 50.0 and 92.1 percent of total congestion costs including congestion in the day-ahead energy market and the balancing energy market for the 2014/2015, 2015/2016, 2016/2017, 2017/2018, and 2018/2019 planning periods in aggregate. The aggregate offset is highly dependent on the valuation of ARRs compared to day-ahead target allocations. Within the planning period, surplus monthly revenue is distributed to FTRs to achieve revenue adequacy for the planning year to date, but at the end of the planning period any remaining surplus revenue left after paying FTR target allocations is assigned to ARR holders. Distributing surplus to FTR holders first does not preserve ARR's rights to congestion revenue. If the surplus revenue available through May 2020 were distributed to ARR holders, total ARR and self scheduled FTR revenue would offset 138.8 percent, and 11.2 percent without distribution of surplus revenue, of total congestion costs for the 2019/2020 planning period.

The inconsistency between actual network use and generation to load paths used to assign ARRs results in an underassignment of congestion to ARRs. In addition, this inconsistency has very different results by zone. Load in some zones receives congestion revenues well in excess of the congestion they pay. The reverse is true for other zones. For the 2019/2020 planning period, BGE offset 461.9 percent of their congestion costs while JCPL offset only 29.8 percent. These disparities indicate that the path based construct is not functioning properly on a zonal basis.

PJM has persistently and subjectively intervened in the FTR market in order to affect the payments to FTR holders. These interventions are not appropriate. For example, in the 2014/2015, 2015/2016 and 2016/2017 planning periods, PJM significantly reduced the allocation of ARR capacity, and FTRs, in order to guarantee full FTR funding. PJM reduced system capability in the FTR auction model by including more outages, reducing line limits and including additional constraints. PJM's modeling changes resulted in significant reductions in Stage 1B and Stage 2 ARR allocations, a corresponding reduction in the available quantity of FTRs, a reduction in congestion revenues assigned to ARRs, and an associated surplus of congestion revenue relative to FTR target allocations. This also resulted in a significant redistribution of ARRs among ARR holders based on differences in allocations between Stage 1A and Stage 1B ARRs. Starting in the 2017/2018 planning period, with the allocation of balancing congestion and M2M payments to load rather than FTRs, PJM increased system capability allocated to Stage 1B and Stage 2 ARRs, but continued to conservatively select outages to manage FTR funding levels.

PJM has intervened aggressively in the FTR market since its inception in order to meet various subjective objectives. PJM should not intervene in the FTR market to subjectively manage FTR funding. PJM should fix the FTR/ARR design and then should let the market work to return congestion to load and to let FTR values reflect actual congestion.

Load should never be required to subsidize payments to FTR holders, regardless of the reason. Such subsidies have been suggested repeatedly.[8] The FERC order of September 15, 2016, introduced a subsidy to FTR holders at the expense of ARR holders.[9] The order requires PJM to ignore balancing congestion when calculating total congestion dollars available to fund FTRs. As of the 2017/2018 planning period, as a result of the FERC order, balancing congestion and M2M payments are assigned to load, rather than to FTR holders. The Commission's order shifts substantial revenue from load to the holders of FTRs and reduces the ability of load to offset congestion. This approach ignores the fact that loads must pay both day-ahead and balancing congestion, and that congestion is defined, in an accounting sense, to equal the sum of day-ahead and balancing congestion. Eliminating balancing congestion from the FTR revenue calculation requires load to pay twice for congestion. Load pays for the physical transmission system, pays in excess of generator revenues and pays negative balancing congestion again. The result is that load gets back less than total congestion. Based on a recent rule change, balancing congestion is allocated to load on a load ratio share, rather than on the basis of location or source of the balancing congestion. This rule creates inappropriate cross subsidies among loads.

These changes were made in order to increase the payout to holders of FTRs who are not loads. Load will continue to be the source of all the funding for FTRs, while payments to FTR holders who did not receive ARRs exceed total congestion on their FTR paths and result in profits to FTR holders. Increasing the payout to FTR holders at the expense of the load is not a supportable market objective. Under the current FTR design, FTR holders should receive actual congestion on the relevant FTR paths and paths should be limited to actual physical source and sink points to align congestion rights with the paths that generate congestion and to limit cross subsidies. But PJM should implement an FTR design that calculates and assigns congestion rights to load rather than continuing to modify the current design.

Load was made significantly worse off as a result of the changes made to the FTR/ARR process by PJM based on the FERC order of September 15, 2016. ARR revenues were significantly reduced for the 2017/2018 FTR Auction, the first auction under the new rules. ARRs and self scheduled FTRs offset 50.0 percent of total congestion costs for the 2017/2018 planning period rather than the 60.5 percent offset that would have occurred under the prior rules, a difference of $125.8 million. There was a significant amount of congestion in January 2018 which adversely affected the congestion offset value of ARRs. ARR revenue is fixed at annual auction prices, but congestion revenue varies with market conditions. If these allocation rules had been in place beginning with the 2011/2012 planning period, ARR holders would have received a total of $1,160.0 million less in congestion offsets from the 2011/2012 through the 2017/2018 planning period. The total overpayment to FTR holders for the 2011/2012 through 2018/2019 planning period would have been $1,427.4 million.

The actual underpayment to load and the overpayment to FTR holders was a result of several rules, all of which mean the transfer of revenues to FTR holders and the shifting of costs to load. Load is not assigned rights to all congestion as a result of using generation to load paths. Load is required

8 See FERC Dockets Nos. EL13-47-000 and EL12-19-000.
9 See 156 FERC ¶ 61,180 (2016), *reh'g denied*, 156 FERC ¶ 61,093 (2017).

to pay for balancing congestion, which significantly increases costs to load and significantly increases revenues paid to FTR holders while degrading the ability of ARRs to provide a predictable offset to congestion costs. Under the prior rules, both surplus day-ahead congestion and surplus FTR auction revenues were assigned directly to FTR holders.

A rule change was implemented by PJM that offset the more egregious effects of the allocation of balancing congestion to load. Beginning with the 2018/2019 planning period, surplus day-ahead congestion and surplus FTR auction revenue are assigned to FTR holders only up to the point of revenue adequacy, and then distributed to ARR holders. This is consistent with a recognition that PJM's modeling does not assign the full capacity of the system to ARR holders.[10]

All congestion revenue belongs to ARR holders, and PJM's new surplus congestion allocation rule is consistent with that goal. However, under the rules, ARR holders will only be allocated this surplus after full funding of FTRs is accomplished. The new rules do not fully recognize ARR holders' primary rights to surplus congestion revenue. With this rule in effect for the 2019/2020 planning period, ARRs and FTRs offset 138.8 percent of total congestion rather than 111.2 percent.

The overallocation of Stage 1A ARRs results in FTR overallocations on the same facilities. While Stage 1A overallocation has been reduced, Stage 1A ARR overallocation is a source of reduced revenue and cross subsidy.

The MMU recommends that the basis for the Stage 1A assignments be reviewed and made explicit and that the role of out of date generation to load paths be reviewed beyond the replacement of retired generation that was implemented. There is a reason that transmission is not built to address the Stage 1A overallocation issue. PJM's transmission planning process (RTEP) does not identify a need for new transmission because many of the over allocations are due to outages in the FTR model, or are not actual system limitations. Capacity issues do not persist if the modeled outages are removed, so there is no need to expand the transmission system to support them. The Stage 1A overallocation issue is a fiction based on the use of outdated and irrelevant generation to load paths to assign Stage 1A rights that have nothing to do with actual power flows.

In addition to addressing these issues, the approach to the question of FTR funding should also examine the fundamental reasons that there has been a significant and persistent difference between day-ahead and balancing congestion. The MMU recommends that transmission modeling in the FTR auction and persistent FTR path overallocation issues be reviewed and addressed. In addition the role of UTCs in taking advantage of these modeling differences and creating negative balancing congestion that must be paid for by load should be addressed. Regardless of how these issues are addressed, funding issues that persist as a result of modeling differences and flaws in the design of the FTR market should be borne by FTR holders operating in the voluntary FTR market and not imposed on load through the mechanism of balancing congestion.

Another issue with the current market design is that there is no effective way for the market to result in price discovery in the annual auctions because the sellers of congestion rights, ARR holders, cannot set a reserve price or otherwise actually participate in what is called the FTR market. ARR holders cannot claim the capability of all of the network that serves their load, cannot choose how much of the system they want to sell and cannot set a reserve price on what is made available in the market. PJM, as the system administrator, chooses what is available to sell, including system capability that cannot be claimed by load, and then offers that market model capability as a price taker in the FTR auction. Due to this design, FTR prices are consistently below the value of congestion. When FTR prices begin to converge towards expected congestion levels in near term monthly auctions it is the result of the active participation as sellers by entities who have purchased FTRs in the long term and annual auctions, who set explicit reserve prices reflecting the expected value of congestion.

The MMU recommends that the Long Term FTR product be eliminated. If the Long Term FTR product is not eliminated, the MMU recommends that long

10 163 FERC ¶61,165 (2018).

term FTR market be modified so that the supply of prevailing flow FTRs in the long-term FTR market is based solely on counter flow offers in the long term FTR market. This would ensure ARR holders' rights to congestion while maintaining the ability for participants to purchase congestion offsets for future planning periods.

Auction Revenue Rights

ARRs

Auction Revenue Rights (ARRs) are the mechanism used to assign the rights to congestion revenues to load. ARRs define the rights to congestion. ARRs are assigned to load using an archaic path based approach. Congestion rights represented by ARRs are sold to FTR buyers in FTR Auctions. ARR values are based on nodal price differences established by cleared FTR bids in the Annual FTR Auction. ARR sellers have no opportunity to define a price at which they are willing to sell. ARR holders must accept the prices as defined by FTR buyers. ARR revenues are a function of FTR auction participants' expectations of congestion, risk, competition and available system capability. PJM has significant discretion over the level of system capability made available to FTR buyers. The appropriate goals of that discretion need to be significantly limited and defined clearly in the tariff.

ARRs are available only as obligations (not options) and only as a 24 hour product. ARRs are available to the nearest 0.1 MW. The ARR target allocation is equal to the product of the ARR MW and the price difference between the ARR sink and source from the Annual FTR Auction.[11] An ARR's target allocation, or value, which is established from the Annual FTR Auction, can be a benefit or liability depending on the price difference between sink and source. If the combined net revenues from the Long Term, Annual and Monthly Balance of Planning Period FTR Auctions are greater than the sum of all ARR target allocations, ARRs are fully funded, otherwise, available revenue is proportionally allocated among all ARR holders. If auction revenues are greater than ARR target allocations, the revenue is first used to fully fund ARRs in previous months, then fully fund FTRs, and then provided to ARR holders at the end of the planning period.

The goal of the ARR/FTR design should be to provide an efficient mechanism to ensure that load receives the rights to all congestion revenues, and that ARR holders receive the auction revenues associated with all potential congestion revenues whether through self scheduling or selling the rights to FTR holders. Given that ARR holders have rights to all congestion revenue and the FTR auction is the way in which ARR holders exchange rights to congestion for fixed payments, then 100 percent of the FTR auction revenue should be assigned to ARR holders. The MMU recommends that all FTR auction revenues be allocated to ARR holders.

When a new control zone is integrated into PJM, firm transmission customers in that control zone may choose to receive either an FTR allocation or an ARR allocation before the start of the Annual FTR Auction for two consecutive planning periods following their integration date. After the transition period, such participants receive ARRs from the annual allocation process and are not eligible for directly allocated FTRs. Network service users and firm transmission customers cannot choose to receive both an FTR allocation and an ARR allocation. This selection applies to the participant's entire portfolio of ARRs that sink into the new control zone. During this transitional period, the directly allocated FTRs are reallocated, as load shifts between LSEs within the transmission zone.

IARRs

Incremental Auction Revenue Rights (IARRs) are ARRs made available by physical transmission system upgrades from customer funded transmission projects or from merchant transmission or generation interconnection requests. In order for a transmission project to result in IARRs, the project must create simultaneously feasible incremental market flow capability in PJM's ARR market model, over and above all system capability being used by existing allocated ARRs and/or would be used by granting any prorated outstanding ARR requests, in the ARR market model.[12]

11 These nodal prices are a function of the market participants' annual FTR bids and binding transmission constraints. An optimization algorithm selects the set of feasible FTR bids that produces the most net revenue.

12 See PJM Incremental Auction Revenue Rights Model Development and Analysis, PJM June 12, 2017. <https://www.pjm.com/~/media/markets-ops/ftr/pjm-iarr-model-development-and-analysis.ashx>.

There are three approaches to the creation and assigning of IARRs: IARRs can be requested based on specific transmission investment; IARRs can be the granted based on merchant transmission or generation interconnection projects; and IARRs can be the result of RTEP upgrades. In each case, the participants paying for the upgrades are allocated the IARR that are created. There have been 13 successful IARR requests totaling 2,990.1 MW of IARRs. One IARR path of 64.5 MW was terminated early (June 1, 2012), leaving 12 unique source and sink combinations of 2,925.6 MW of IARRs active in PJM's current ARR/FTR market. Of the 12 unique paths, 6 paths consisting of 1,047.4 MW, were from merchant transmission requests, 3 paths consisting of 1,200.0 MW were from generation interconnection requests and three paths consisting of 678.6 MW were from customer funded transmission projects.

IARRs are allocated to customers that have been assigned cost responsibility for certain upgrades included in PJM's RTEP. These customers as defined in Schedule 12 of the Tariff are network service customers and/or merchant transmission facility owners that are assigned the cost responsibility for upgrades included in the PJM RTEP. PJM calculates IARRs for each regionally assigned facility and allocates the IARRs, if any are created by the upgrade, to eligible customers based on their share of cost responsibility. The customers may choose to decline the IARR allocation during the annual ARR allocation process.[13] Each network service customer within a zone is allocated a share of the IARRs in the zone based on their share of the network service peak load of the zone.

The MMU recommends that IARRs be eliminated from the PJM tariff. The MMU supports increased competition to provide transmission using market mechanisms. The IARR process is not a viable mechanism for facilitating competitive transmission investments. Continuing to pretend that the IARR process is viable may impede the search for real solutions. PJM's process for using IARRs is fundamentally flawed and cannot be made consistent with the requirements of Order No. 681 which established IARRs.[14]

Order No. 681 requires that long-term firm transmission rights made feasible by transmission upgrades or expansions must be available upon request to the party that pays for such upgrades or expansions.[15] Order No. 681 also requires that the rights granted by upgrades/expansions cannot come at the expense of transmission rights held by others. IARRs are treated as Stage 1A rights. Granting Stage 1A status to IARRs is preferential treatment of IARR rights relative to the ARR rights belonging to load. Only a subset of the ARR rights are treated as Stage 1A rights. Stage 1A rights are given first and absolute priority in PJM's annual allocation process. If the annual market model used to assign existing ARR rights in a given year cannot simultaneously support all Stage 1A ARR requests, the system model is modified so as to make the Stage 1A ARR requests feasible. The result is an over allocation of congestion rights relative to expected congestion. To avoid having FTR target allocations exceed expected congestion, PJM reduces annual market model system capability available to non-Stage 1A rights through selective line outages and line rating reductions. The resulting market model artificially supports all the Stage 1A ARR requests and artificially reduces the amount of remaining later tier ARRs from other rights holders. Stage 1A ARRs, including IARRs, are artificially approved at the expense of other preexisting congestion rights. In the case of IARRs, this is in violation of Order No. 681.

If IARRs are not eliminated, the MMU recommends that IARRs be subject to the same proration rules that apply to all other ARR rights.

Market Structure

ARRs have been available to network service and firm, point to point transmission service customers since June 1, 2003, when the annual ARR allocation was first implemented for the 2003/2004 planning period. The initial allocation covered the Mid-Atlantic Region and the APS Control Zone. For the 2006/2007 planning period, the choice of ARRs or direct allocation FTRs was available to eligible market participants in the AEP, DAY, DLCO and Dominion Control Zones. For the 2007/2008 and subsequent planning periods through the present, all eligible market participants were allocated ARRs.

13 "*PJM Manual 6: Financial Transmission Rights*," Rev. 24 (April 15, 2020); "IARRs for RTEP Upgrades Allocated for 2016/2017 Planning Period," <http://www.pjm.com/~/media/markets-ops/ftr/annual-arr-allocation/2018-2019/2018-2019-iarrs-for-rtep-upgrades-allocated.ashx>.

14 See November 7, 2019 Comments on TranSource, LLC v. PJM, 168 FERC ¶ 61,119 (2019) ("Opinion No. 566").

15 Long-Term Firm Transmission Rights in Organized Electricity Markets, Order No. 681, 116 FERC ¶61,077 (2006) ("Order No. 681"), order on reh'g, Order No. 618-A, 117 FERC ¶ 61,201 (2006), order on reh'g, Order No. 681-A, 126 FERC ¶ 61,254 (2009).

Supply and Demand

System capability available to ARR holders is limited by the system capability made available in PJM's annual FTR transmission system market model. PJM's annual FTR transmission market model represents annual, expected system capability, modified by PJM to achieve PJM's goal of guaranteeing revenue equal to target allocations for FTRs, and subject to the requirement that all Stage1A ARR requests must be allocated. Stage 1A ARR right requests are guaranteed and system capability necessary to accommodate the rights must be included in PJM's annual FTR transmission system market model.

ARR Allocation

For the 2007/2008 planning period, the annual ARR allocation process was revised to include Long Term ARRs that would be in effect for 10 consecutive planning periods.[16] Stage 1A ARRs can give LSEs the ability to offset at least some of their congestion costs, through the return of congestion revenues, on a long-term basis. Stage 1B and Stage 2 ARRs provide a method for ARR holders to have additional congestion revenues returned to them in the planning period over their Stage 1A allocation, but may be prorated. ARR holders can self schedule ARRs as FTRs during the Annual FTR Auction.[17]

Each March, PJM allocates annual ARRs to eligible customers in a three stage process:

- **Stage 1A.** In the first stage of the allocation, network transmission service customers can obtain ARRs, up to their share of Zonal Base Load, which is the lowest daily peak load in the prior twelve month period increased by load growth projections. The amount of Stage 1A ARRs a participant can request is based on generation to load paths that reflect generation resources that had historically served load, or their qualified replacements if the resource has retired, in the historical reference year for the zone. The historical reference year is the year prior to the creation of PJM markets, which is 1999 for the original zones, or the year in which a zone joined PJM. Firm, point to point transmission service customers can obtain Stage 1A ARRs, up to 50 percent of the MW of firm, point to point transmission service provided between the receipt and delivery points for the historical reference year. Stage 1A ARRs cannot be prorated. If Stage 1A ARRs are found to be infeasible, transmission system upgrades must be undertaken to maintain feasibility.[18]
- **Stage 1B.** Transmission capacity unallocated in Stage 1A is available in the Stage 1B allocation for the planning period. Network transmission service customers can obtain ARRs up to their share of zonal peak load, which is the highest daily peak load in the prior twelve month period increased by load growth projections, based on generation to load paths and up to the difference between their share of zonal peak load and Stage 1A allocations. Firm, point to point transmission service customers can obtain ARRs based on the MW of long-term, firm, point to point service provided between the receipt and delivery points for the historical reference year.
- **Stage 2.** Stage 2 of the annual ARR allocation allocates the remaining system capability equally in three steps. Network transmission service customers can obtain ARRs from any hub, control zone, generator bus or interface pricing point to any part of their aggregate load in the control zone or load aggregation zone up to their total peak network load in that zone. Firm, point to point transmission service customers can obtain ARRs consistent with their transmission service as in Stage 1A and Stage 1B.

Prior to the start of the Stage 2 annual ARR allocation process, ARR holders can relinquish any portion of their ARRs resulting from the Stage 1A or Stage 1B allocation process, provided that all remaining outstanding ARRs are simultaneously feasible following the return of such ARRs.[19] Participants may seek additional ARRs in the Stage 2 allocation.

Effective for the 2015/2016 planning period, when residual zonal pricing was introduced, an ARR will default to sinking at the load settlement point if

16 See *2006 State of the Market Report* (March 8, 2007) for the rules of the annual ARR allocation process for the 2006 to 2007 and prior planning periods.
17 OATT Attachment K 7.1.1.(b).
18 See "PJM Manual 6: Financial Transmission Rights," Rev. 24 (April 15, 2020).
19 *Id.* at 21.

different than the zone, but the ARR holder may elect to sink their ARR at the zone instead.[20]

ARRs can be traded between LSEs prior to the first round of the Annual FTR Auction. Traded ARRs are effective for the full 12 month planning period.

When ARRs are allocated after Stage 1A, all ARRs must be simultaneously feasible, meaning that the modeled transmission system can support the approved set of ARRs. In making simultaneous feasibility determinations, PJM uses a power flow model of security constrained dispatch based on assumptions about generation and transmission outages.[21] If the requested set of ARRs is not simultaneously feasible, customers are allocated prorated shares in direct proportion to their requested MW and in inverse proportion to their impact on binding constraints, except Stage 1A ARRs:

Equation 13-1 Calculation of prorated ARRs[22]

$$MW = Constraint\ Capability\ x\ \left(\frac{Individual\ Requested\ MW}{Total\ Requested\ MW}\right) x \left(\frac{1}{MW\ impact\ on\ line}\right)$$

The effect of an ARR request on a binding constraint is measured using the ARR's power flow distribution factor. An ARR's distribution factor is the percent of each requested ARR MW that would have a power flow on the binding constraint. The PJM method prorates ARR requests in proportion to their MW value and impact on the binding constraint. The PJM method prorates only ARRs that cause the greatest flows on the binding constraint. Were all ARR requests prorated equally, regardless of their impact on the binding constraints, the result would reduce allocated ARRs below actually available ARRs.

FERC Order EL16-121: Stage 1A ARR Allocation

FERC ordered PJM to remove retired resources from the generation to load paths used to allocate Stage 1A ARRs.[23] PJM replaced retired units with operating generators, termed qualified replacement resources (QRRs).[24]

The method PJM implemented continues to rely on a contract path based approach. Existing Stage 1A resources are given their current allocations, while ARR allocations to QRRs that replace retired Stage 1A resources are prorated based on the feasibility of these ARRs after existing resources are allocated. As a result of this proration, ARRs for QRRs have lower priority than ARRs from generators that existed in 1998.

Generation to load paths, even from active generators, are based on a contract path model rather than a network model. Generation to load paths should not be used as a basis for assigning ARR capability. Contract paths are not an accurate representation of the reasons that congestion is created or that load is served in a network and will, by definition, not accurately measure the exposure of load to congestion, especially by location.

20 *See* "Residual Zone Pricing," PJM Presentation to the Members Committee (February 23, 2012) <http://www.pjm.com/~/media/committees-groups/committees/mc/20120223/20120223-item-03-residual-zone-pricing-presentation.ashx>.
21 "PJM Manual 6: Financial Transmission Rights," Rev. 24 (April 15, 2020).
22 See the *MMU Technical Reference for PJM Markets*, at "Financial Transmission Rights and Auction Revenue Rights," for an illustration explaining this calculation in greater detail. <http://www.monitoringanalytics.com/reports/Technical_References/references.shtml>.

23 156 FERC ¶ 61,180 (2016).
24 See FERC Docket No. EL16-6-003.

Market Performance

Volume

Table 13-3 shows the MW of ARR allocations for each round of the 2019/2020 and 2020/2021 planning periods.

Table 13-3 Annual ARR allocation volume: 2019/2020 and 2020/2021 planning periods

Planning Period	Stage	Round	Requested Count	Requested Volume (MW)	Cleared Volume (MW)	Cleared Volume	Uncleared Volume (MW)	Uncleared Volume
2019/2020	1A	0	30,932	77,268	77,268	100.0%	0	0.0%
	1B	1	15,261	34,567	23,620	68.3%	10,947	31.7%
	2	2	7,238	21,418	1,745	8.1%	19,673	91.9%
		3	4,557	20,863	3,432	16.5%	17,431	83.5%
		4	3,593	20,776	3,992	19.2%	16,784	80.8%
		Total	15,388	63,057	9,169	14.5%	53,888	85.5%
	Total		61,581	174,892	110,057	62.9%	64,835	37.1%
2020/2021	1A	0	30,444	76,360	76,345	100.0%	15	0.0%
	1B	1	16,832	30,820	21,916	71.1%	8,904	28.9%
	2	2	5,760	22,061	2,593	11.8%	19,468	88.2%
		3	4,634	21,690	3,832	17.7%	17,858	82.3%
		4	3,233	21,279	4,001	18.8%	17,278	81.2%
		Total	13,627	65,030	10,426	16.0%	54,604	84.0%
	Total		60,903	172,210	108,687	63.1%	63,523	36.9%

Stage 1A Infeasibility

Stage 1A ARRs are allocated for a 10 year period, with the ability for a participant to opt out of any planning period. PJM conducts a simultaneous feasibility analysis to determine the transmission upgrades required to ensure that the long term ARRs can remain feasible. The rules provide that if a simultaneous feasibility test violation occurs in any year, PJM will identify or accelerate any transmission upgrades to resolve the violation and these upgrades will be recommended for inclusion in the PJM RTEP process.[25] But such transmission upgrades must pass PJM's RTEP process.

PJM's transmission planning process (RTEP) does not identify a need for new transmission associated with Stage 1A overallocations because there is, in fact, no need for new transmission associated with Stage 1A ARRs. The Stage 1A overallocation issue is a fiction based on the use of outdated and irrelevant generation to load paths to assign Stage 1A rights that have nothing to do with actual power flows. This continues to be true even with the replacement of retired generating units.

25 See "PJM Manual 6: Financial Transmission Rights," Rev. 25 (July 23, 2020) at 23.

For the 2018/2019 planning period, Stage 1A of the Annual ARR Allocation was infeasible, resulting in an over allocation of ARRs on the affected facilities. As a result, modeled system capability, in excess of actual system capability, was provided to the Stage 1A ARRs and added to the FTR auction. According to Section 7.4.2 (i) of the OATT, the capability limits of the binding constraints rendering these ARRs infeasible must be increased in the model and these increased limits must be used in subsequent ARR and FTR allocations and auctions for the entire planning period, except in the case of extraordinary circumstances.

Table 13-4 shows the MW quantity and count of overloaded facilities and the reasons for the modeled overload. In order to eliminate the infeasibilities for the requested Stage 1A ARR allocations, PJM was required to raise the modeled capacity limits on 86 facility/contingency pairs, 53 of which were internal to PJM and the rest were in MISO, a total of 10,024 MW.[26]

Table 13-4 Stage 1A overloaded facility reasons and MW

Reason	Type	MW	Count
Network Load	M2M Flowgate	1,925	17
Network Load	Pseudo Tie Flowgate	50	1
Transmission Outage	Internal PJM	6,665	53
Transmission Outage	M2M Flowgate	1,381	14
Transmission Outage	Pseudo Tie Flowgate	3	1

Figure 13-1 shows the predicted and estimated impact of Stage 1A infeasibilities on funding for the 2012/2013 through 2019/2020 planning periods, as well as the predicted impact on funding for the 2020/2021 planning period. The predicted funding is based on the infeasible ARR MW and the nodal price of the source and sink in the Annual FTR Auction. The estimated funding is calculated assuming every infeasible ARR MW is self

26 *PJM 2020/2021 Stage 1A Over allocation notice*, PJM FTRs, <http://www.pjm.com/-/media/markets-ops/ftr/annual-arr-allocation/2020-2021/2020-2021-stage-1a-over-allocation-notice.ashx?la=en> (July 1, 2020).

scheduled, and uses the hourly congestion LMP values of the applicable day-ahead hours. In the 2016/2017 planning period, Stage 1A ARR infeasibilities accounted for $293.5 million in estimated over allocation. Predicted funding impacts are lower in the 2017/2018, 2018/2019 and 2019/2020 planning periods from the previous two planning periods, likely as a result of PJM relaxing model constraints. PJM's newly implemented Qualified Replacement Resource rules may slightly reduce revenue inadequacy from Stage 1A ARRs, but do not eliminate the actual issues with historical Stage 1A resources.

Figure 13-1 Stage 1A Infeasibility funding impact

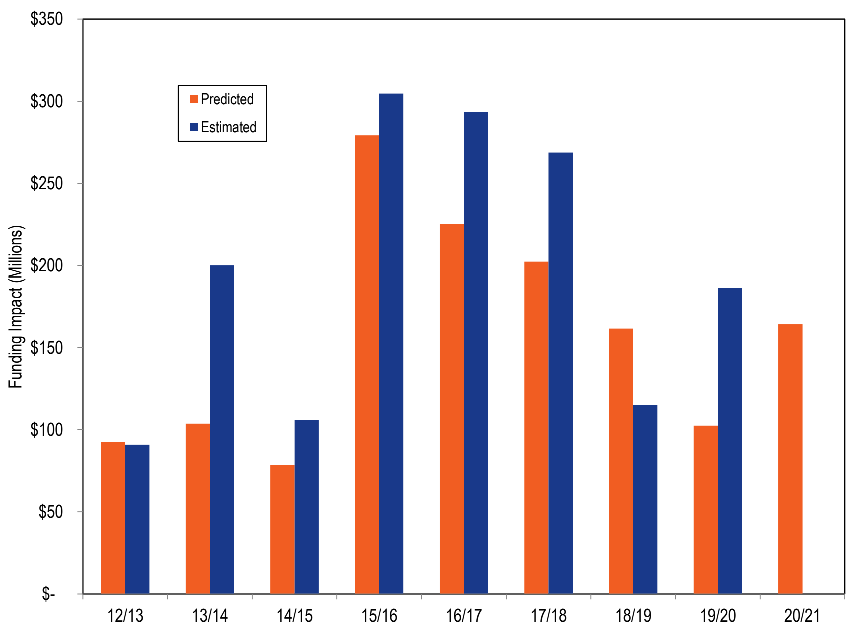


Table 13-5 shows the MW of retired generation sources for Stage 1A ARRs, the QRR MW assigned by PJM for all resources and the replacement MW that were considered rate based. A rate based unit is a replacement generator that is owned by the ARR holder, or subject to firm energy and capacity supply contracts. PJM created the synthetic zone Midatlantic for the QRR assignment although it is not clear why.

Table 13-5 Qualified Replacement Resource results: 2020/2021

Zone	Historical Retired	Replacement (All)	Replacement (Rate-based)
AEP/DAY	9,576.3	7,513.4	1,838.3
ATSI	4,857.3	3,059.0	50.4
ComEd	5,646.8	4,440.5	4.5
DEOK	2,318.0	1,729.2	57.6
Dominion	3,186.6	4,210.7	4,159.7
DLCO	834.0	211.7	0.0
EKPC	198.1	229.3	0.0
Midatlantic	17,838.8	14,956.1	375.9
OVEC	0.0	459.2	1,854.0
Total	44,455.9	36,809.1	8,340.4

Revenue

ARRs are allocated to qualifying customers rather than sold, so ARR revenue (target allocation) is different from the revenue that results from the FTR auctions which generally exceeds the sum of the ARR target allocations.

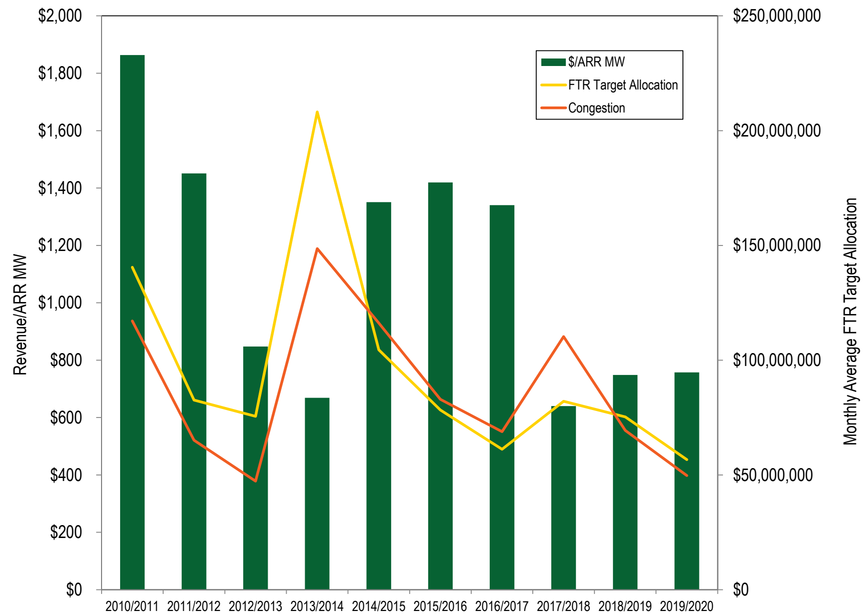
Figure 13-2 shows the revenue per ARR MW held for each month of the 2010/2011 planning period through the 2019/2020 planning period. The revenue per ARR MW held do not include target allocation related payouts for self scheduled FTRs, but do include Residual ARRs starting in August 2012.

FTR prices increased in the 2014/2015 Annual FTR Auction in part as a result of reduced supply caused by PJM's assumption of more outages in the model used to allocate Stage 1B and Stage 2 ARRs. The increased FTR prices resulted in an increase in revenue per ARR MW, but fewer ARR MW. For the 2014/2015 planning period, the total dollars per MW of ARR allocation was $11,279, while the previous planning period resulted in revenue per MW of $6,692, a 68.5 percent increase in revenue per allocated ARR MW. Some of the ARR MW lost from proration were provided in the Residual ARR process, but the residual allocations are not comparable to the ARRs awarded in the annual process because residual ARR allocations change each month and cannot be self scheduled as FTRs. For the 2015/2016 and 2016/2017 planning periods, the revenue per MW of ARR allocation was $10,641.54 and $10,411. During these planning periods PJM chose more restrictive modeling criteria, which did not release the full capacity of the FTR model to account for revenue inadequacies. Beginning in the 2017/2018 planning period, when balancing congestion was removed from FTR funding, PJM reinstated less restrictive modeling criteria, and the revenue per MW of ARR decreased. For the 2017/2018 and 2018/2019 planning periods the revenue per MW of ARR was $5,168 and $6,841.

The revenue per MW value of ARRs for the 2019/2020 planning period increased 2.6 percent from the previous planning period. Figure 13-2 shows that the total congestion and FTR target allocations increased from the 2018/2019 planning period, primarily from a very high congestion in January 2018, but that ARR value was significantly lower. ARR target allocations for the 2019/2020 planning period were approximately equal to the 2018/2019 planning period. However congestion, and therefore FTR target allocations, were much lower. This indicates that the FTR auction valued ARRs approximately equal to the previous planning period, but congestion was much lower. This explains the greater than 100 percent load offset, as well as diminished profits for the 2019/2020 planning period.

Load pays balancing congestion costs, not included in this figure, which reduce the revenue received by ARR holders. There is no evidence of the higher ARR value that proponents of requiring load to pay balancing congestion had predicted, in Figure 13-2.

Figure 13-2 Revenue per ARR MW paid to ARR holders compared to congestion and FTR target allocations: 2010/2011 through 2019/2020



ARR Reassignment for Retail Load Switching

PJM rules provide that when load switches between LSEs during the planning period, a proportional share of associated ARRs that sink in a given control or load aggregation zone is automatically reassigned to follow that load.[27] ARR reassignment occurs daily only if the LSE losing load has ARRs with a net positive economic value. An LSE gaining load in the same control zone is allocated a proportional share of positively valued ARRs within the control zone based on the shifted load. ARRs are reassigned to the nearest 0.001 MW and may be reassigned multiple times over a planning period. Residual ARRs are also subject to reassignment. This practice supports competition by ensuring that the offset to congestion follows load, thereby removing a barrier to competition among LSEs and, by ensuring that only ARRs with a positive

27 See "PJM Manual 6: Financial Transmission Rights," Rev. 24 (April 24, 2020))).

value are reassigned, preventing an LSE from assigning poor ARR choices to other LSEs. However, when ARRs are self scheduled as FTRs, the self scheduled FTRs do not follow load that shifts while the ARRs do follow load that shifts, and this may result in lower value of the ARRs for the receiving LSE compared to the total value held by the original ARR holder.

There were 35,571 MW of ARRs associated with $423,100 of revenue that were reassigned for the 2018/2019 planning period. There were 31,683 MW of ARRs associated with $657,300 of revenue that were reassigned in the 2019/2020 planning period.

Table 13-6 summarizes ARR MW and associated revenue reassigned for network load in each control zone where changes occurred between June 2018 and May 2020.

Table 13-6 ARRs and ARR revenue automatically reassigned for network load changes by control zone: June 2018 through May 2020

	ARRs Reassigned (MW-day)		ARR Revenue Reassigned [Dollars (Thousands) per MW-day]	
Control Zone	2018/2019 (12 months)	2019/2020 (12 months)	2018/2019 (12 months)	2019/2020 (12 months)
AECO	392	373	$2.1	$4.8
AEP	2,730	5,435	$35.0	$151.0
APS	945	1,383	$17.6	$39.4
ATSI	4,923	2,865	$49.9	$42.6
BGE	1,732	2,252	$46.1	$103.9
ComEd	3,261	2,583	$43.9	$27.1
DAY	718	765	$3.7	$9.3
DEOK	2,442	839	$60.3	$58.3
DLCO	4,576	1,622	$44.6	$5.8
Dominion	70	702	$0.6	$52.2
DPL	1,932	632	$43.3	$6.2
EKPC	0	0	$0.0	$0.0
JCPL	1,172	1,032	$1.6	$4.8
Met-Ed	604	540	$4.7	$5.6
OVEC	NA	0	NA	$0.0
PECO	2,997	3,196	$20.9	$24.8
PENELEC	716	570	$8.4	$15.7
Pepco	1,477	3,538	$18.1	$38.3
PPL	3,643	1,340	$8.0	$31.8
PSEG	1,195	1,947	$14.2	$35.4
RECO	46	69	$0.0	$0.2
Total	35,571	31,683	$423.1	$657.3

Residual ARRs

Introduced August 1, 2012, Residual ARRs are available for eligible ARR holders when a transmission outage was modeled in the Annual ARR Allocation, but the transmission facility returns to service during the planning period. If ARR allocations are reduced as the result of a modeled transmission outage and the transmission outage ends during the relevant planning year, the result is that residual ARRs may be available. These residual ARRs are automatically assigned to eligible participants the month before the effective date. Residual ARRs are effective for single months, and cannot be self scheduled. Residual ARR target allocations are based on the clearing prices from FTR obligations in the relevant monthly auction, may not exceed zonal network services peak load or firm transmission reservation levels and are only available up to the prorated ARR MW capacity as allocated in the Annual ARR Allocation. For the following planning period, these Residual ARRs are available as ARRs in the annual ARR allocation. Residual ARRs are a separate product from incremental ARRs. Beginning with the June 2017 monthly auction, Residual ARRs that would have cleared with a negative target allocation are not assigned to participants.[28]

Table 13-7 shows the Residual ARRs (cleared volume) allocated to participants, along with the target allocations (bid and requested) from the effective month. In the 2019/2020 planning period, PJM allocated a total of 24,233.2 MW of Residual ARRs with a target allocation of $12.4 million. In the same time period for the 2018/2019 planning period, PJM allocated a total of 31,554.6 MW of residual ARRs with a target allocation of $15.3 million. In the 2017/2018 planning period, PJM allocated a total of 39,597.4 MW of residual ARRs, up from 35,034.9 MW for the 2016/2017 planning period. Residual ARRs had a total target allocation of $17.5 million for the 2017/2018 planning period, up from $7.0 million for the 2016/2017 planning period. In prior planning years, PJM's modeling of excess outages resulted in the allocation of some ARRs that could have been allocated in Stage 1B being allocated as Residual ARRs on a month to month basis without the option to self schedule.

28 See FERC Letter Order, Docket No. ER17-1057 (April 5, 2017).

Table 13-7 Residual ARR allocation volume and target allocation: January through May, 2020

Month	Available Volume (MW)	Cleared Volume (MW)	Cleared Volume	Target Allocation
Jan-20	4,635.1	2,534.1	54.7%	$3,469,317
Feb-20	5,972.9	2,506.8	42.0%	$799,038
Mar-20	4,905.7	2,659.5	54.2%	$1,269,201
Apr-20	4,529.7	2,619.0	57.8%	$787,262
May-20	5,717.4	2,523.5	44.1%	$471,472
Total	25,760.8	12,842.9	49.9%	$6,796,289

Financial Transmission Rights

FTRs are financial instruments that entitle their holders to receive revenue or require them to pay charges based on locational congestion price differences in the day-ahead energy market across specific FTR transmission paths. The value of the day-ahead congestion price differences, termed the FTR target allocation, defines the maximum, but not guaranteed, payout for FTRs. The target allocation of an FTR reflects the difference in day-ahead congestion prices (CLMPs) rather than the difference in LMPs, which includes both congestion and marginal losses. The difference in day-ahead congestion prices is not congestion. Negative target allocations require the FTR holder to pay into the FTR market. After FERC's order assigning balancing congestion and M2M payments directly to load, available revenue to pay FTR holders' target allocations in a given month is based on the amount of day-ahead congestion, payments by holders of negatively valued FTRs, additional auction revenues available at the end of a month over ARR target allocations, any charges made to day-ahead operating reserves and any surplus revenue from preceding months in these categories. The target allocations are a cap on payments to FTR holders. At the end of the planning period, any surplus revenue above the target allocations is distributed proportionally to ARR holders.

FTR funding is not on a path specific basis or on an hour to hour basis and treats all FTRs the same. The result is widespread cross subsidies because assignment of path specific ARRs/FTRs may exceed system capability and affect the payments to FTRs on other paths. FTR auction revenues and excess revenues are carried forward from prior months and distributed back from later months within a planning period. At the end of a planning period, if some months remain not fully funded, an uplift charge is collected from any FTR market participants that hold FTRs for the planning period based on their pro rata share of total net positive FTR target allocations, excluding any charge to FTR holders with a net negative FTR position for the planning year.

Auction market participants are free to request FTRs between any eligible pricing nodes on the system, as released by PJM for each auction. For the Long Term FTR Auction there is a more restricted set of available hubs, control zones, aggregates, generator buses and interface pricing points available. For the Annual FTR Auction and FTRs bought for a quarterly period in the monthly auction, the available FTR source and sink points include hubs, control zones, aggregates, generator buses, load buses and interface pricing points. An FTR bought in the Monthly FTR Auction for any single calendar month following that auction may include any bus for which an LMP is calculated in the FTR model used. PJM does not allow FTR buy bids to clear with a price of zero unless there is at least one constraint in the auction which affects the FTR path. FTRs are available to the nearest 0.1 MW. The FTR target allocation is calculated hourly and is equal to the product of the FTR MW and the congestion price difference between sink and source that occurs in the day-ahead energy market.

Market Structure

FTRs are bought from system capability defined by PJM. There are no sellers of system FTR capability, although FTR buyers can resell FTRs. Load cannot determine the price at which PJM sells system FTR capability. PJM's objective in the auctions is to maximize auction revenue. The absence of sellers who can decide at what price to sell FTRs is a fundamental flaw in the FTR market.

Once bought from PJM, FTRs can be bought, sold and self scheduled. Buy bids are bids to buy FTRs in the auctions; sell offers are offers to sell existing FTRs in the auctions; and self scheduled bids are FTRs that have been directly converted from ARRs in the Annual FTR Auction. Self scheduled FTRs represent the choice by an ARR holder to be paid based on actual day-ahead congestion revenue rather than the fixed ARR value determined in the annual FTR auction.

There are two types of FTR products: obligations and options. An obligation provides a credit, positive or negative, equal to the product of the FTR MW and the congestion price difference between FTR sink (destination) and source (origin) that occurs in the day-ahead energy market. An option provides only positive credits and options are available for only a subset of the possible FTR transmission paths.

There are three classes of FTR products: 24 hour, on peak and off peak. The 24 hour products are effective 24 hours a day, seven days a week, while the on peak products are effective during on peak periods defined as the hours ending 0800 through 2300, Eastern Prevailing Time (EPT) Mondays through Fridays, excluding North American Electric Reliability Council (NERC) holidays. The off peak products are effective during hours ending 2400 through 0700, EPT, Mondays through Fridays, and during all hours on Saturdays, Sundays and NERC holidays.

PJM operates three types of auctions for FTRs. The objective function of all FTR auctions is to maximize the bid based value of FTRs awarded in each auction. PJM conducts an Annual FTR Auction, Monthly Balance of Planning Period FTR Auctions for the remaining months of the planning period and a Long Term FTR Auction for the following three consecutive planning years.[29] FTR options are not available in the Long Term FTR Auction.

A self scheduled FTR must have the same source and sink points as the ARR and be a 24 hour obligation product. Self scheduled FTRs exchange an ARR for a matching FTR without making a payment. From a settlements perspective, the self scheduling participant is paid the ARR target allocation, which is used to pay the price of the FTR. The participant then receives the hourly congestion LMP difference of their source and sink points as any other FTR would.

29 *See* "PJM Manual 6: Financial Transmission Rights," Rev. 24 (April 15, 2020).

A secondary bilateral market is also administered by PJM to allow participants to buy and sell existing FTRs. FTRs can also be exchanged bilaterally outside PJM markets. FTR self scheduled bids by ARR holders are available only as obligations for the 24 hour product and only in the Annual FTR Auction.

Supply and Demand

Total FTR supply in each auction is limited by the capability of the transmission system included in the PJM FTR market model as modified, for example, by PJM assumptions about outages, for which there are no clear rules. PJM may also limit available capability through subjective judgment exercised without any clear guidelines. PJM outage assumptions are a key factor in determining the supply of ARRs and the related supply of FTRs in the Annual FTR Auction. Long Term FTR Auction capability is determined by removing all outages and running an offline model of the previous Annual FTR Auction model with all ARR bids. Any ARR MW that clear are reserved for ARR holders in their effective planning periods, and are removed from the Long Term FTR Auction capability. This does not, and cannot, preserve all possible capacity for ARR holders before a long term auction due to changes in system topology and outage selection between planning periods. Total Monthly FTR Auction capacity is based on the residual capacity available after the Long Term and Annual FTR auctions are conducted and adjustments are made to outages to reflect anticipated system conditions for the time periods auctioned.

The MMU recommends that the full transmission capacity of the system be allocated as ARRs prior to sale as FTRs.

Depending on assumptions used in the auction transmission model, the total FTR supply can be greater than or less than system capability in aggregate and/or on a path basis. FTR supply greater than system capability contributes to FTR target allocations exceeding congestion revenue. FTR supply less than system capability contributes to congestion revenue in excess of target allocations.

PJM can also make further subjective adjustments to the auction model to manage FTR revenues. PJM can assume arbitrarily higher outage levels and

PJM can decide to include additional constraints (closed loop interfaces) both of which reduce system capability in the auction model. These PJM actions reduce the supply of available Stage 1B and Stage 2 ARRs, which in turn reduce the number of FTRs available for purchase. PJM made very significant adjustments starting in the 2014/2015 planning period auction model through the 2016/2017 planning period resulting in a drop of Stage 1B and Stage 2 ARR capacity of 86.1 percent from the 2013/2014 to the 2014/2015 planning periods. After balancing congestion was assigned to load and exports, beginning in the 2017/2018 planning period, PJM partially reversed their approach and ARR capacity increased to 2013/2014 planning period levels.

The auction process does not account for the fact that significant transmission outages, which have not been provided to PJM by transmission owners prior to the auction date, will occur during the periods covered by the auctions. Such transmission outages may or may not be planned in advance or may be emergency outages.[30] In addition, it is difficult to model in an annual auction two outages of similar significance and similar duration in different areas which do not overlap in time. The choice of which to model may have significant distributional consequences. The fact that outages are modeled at significantly lower than historical levels results in selling too many FTRs which creates downward pressure on revenues paid to each FTR. To address this issue, the MMU recommends that PJM use probabilistic outage modeling to better align the supply of ARRs and FTRs with actual system capabilities.

Long Term FTR Auctions

In July 2006, FERC issued a Final Rule mandating the creation of long term firm transmission rights in transmission organizations with organized electricity markets (FERC Docket No. RM06-8-000; Order No. 681).[31] FERC's goal was that "load serving entities be able to request and obtain transmission rights up to a reasonable amount on a long-term firm basis, instead of being limited to obtaining exclusively annual rights." Despite that order and inconsistent with the directive in that order, LSEs are not able to request ARRs nor are LSEs guaranteed rights to the revenue from Long Term FTR Auctions in PJM's long term FTR auction market design. Excess system capability in years two and three of the long term FTR auction are never made available to load in the form of ARRs and are only made available to FTR buyers.

PJM conducts a Long Term FTR Auction for the next three consecutive planning periods. The capacity offered for sale in Long Term FTR Auctions is the residual system capability assuming that all allocated ARRs are self scheduled as FTRs. PJM expands the available transmission capacity for the Long Term FTR Auction by removing all the transmission outages included in the model when allocating ARRs.

Beginning with Round 2 of the 2019/2022 Long Term FTR Auction, PJM implemented revisions to the determination of residual system capability made available in the Long Term FTR Auctions, and eliminated the YRALL product, consistent with the MMU's recommendation. The revisions affect the determination of ARR rights reserved for ARR holders. Rather than simply preserving the ARR cleared capacity from the previous annual allocation, PJM reruns the simultaneous feasibility test for the ARR/FTR market model, without outages, using the previous year's ARR requests, prorated when necessary, and use the resulting ARRs as the basis for reserving capability for ARR holders in the Long Term FTR Auction. The ARR requests are greater than previously cleared ARRs. The difference between the requested ARRs and ARR/FTR market model's system capability, without outages, determines the residual capability offered in the Long Term FTR Auction. This method provides ARR holders with an improved representation of future system capability and preserves more congestion rights in the Long Term FTR Auction for ARR holders that will carry into the Annual FTR Auction than was preserved for ARR holders before this change. But this change does not address the system capability sold in years two and three of the Long Term FTR Auction which remains unavailable to ARRs. Capacity awarded in the Long Term FTR Auction is modeled as a fixed injection/withdrawal in the Annual FTR Auction, and is therefore unavailable in upcoming auctions. While the new rules will improve the allocation of congestion rights to ARR holders, a proportion of congestion revenues will still be assigned to the Long Term FTR Auction without ever having been made available to ARR holders. Due to the duration of long term

30 See the *2019 State of the Market Report for PJM*, Volume 2, Section 12: Transmission Facility Outages: Transmission Facility Outages Analysis for the FTR Market.
31 116 FERC ¶ 61,077 (2006).

FTRs and the variable nature of the ARR/FTR model's outage selections and system topology, reserving the previous year's ARR bids does not capture all of the capability that should be available to ARR holders. Any capability that is auctioned in the Long Term FTR Auction, and that should otherwise be available to ARR holders, results in lost revenue to ARR holders. That outcome is inconsistent with the basic logic of ARRs and inconsistent with the stated intent of the market design which is to return all congestion revenues to load.

The 2009/2012 and 2010/2013 Long Term FTR Auctions consisted of two rounds.[32] Subsequent Long Term FTR Auctions consist of three rounds. FTRs purchased in prior rounds may be offered for sale in subsequent rounds. FTRs obtained in the Long Term Auctions may have terms of any one of the next three. FTR products available in the Long Term Auction include 24 hour, on peak and off peak FTR obligations. FTR option products are not available in Long Term FTR Auctions.

- Round 1. The first round is conducted in the June prior to the start of the term covered by the Long Term FTR Auction and uses PJM's Summer Model build. Market participants make offers for FTRs between any source and sink.
- Round 2. The second round is conducted in September, uses the Summer Model build and follows the same rules as Round 1.
- Round 3. The third round is conducted in December, uses the Fall Model build and follows the same rules as Round 1.

Annual FTR Auctions

Annual FTRs are effective beginning June 1 of the planning period through May 31. Outages expected to last two or more months, as well as any outages of a shorter duration that PJM determines would cause FTR revenue inadequacy if not modeled, are included in the determination of the simultaneous feasibility for the Annual FTR Auction.[33] While the full list of outages selected is publicly posted, PJM exercises significant subjective judgment in selecting outages to accomplish FTR revenue adequacy goals and the process by which these outages are selected is not clear and is not documented. ARR holders who wish to self schedule must inform PJM prior to round one of the annual auction. Any self scheduled ARR requests clear 25 percent of the requested volume in each round of the Annual FTR Auction as price takers. This auction consists of four rounds that allow any transmission service customers or PJM members to bid for any FTR or to offer for sale any FTR that they currently hold. FTRs in this auction can be obligations or options for peak, off peak or 24 hour periods. FTRs purchased in one round of the Annual FTR Auction can be sold in later rounds or in the Monthly Balance of Planning Period FTR Auctions.

The FTRs sold in the Long Term FTR Auction for a future delivery year may conflict with the ARRs assigned to load in the ARR allocation process when that delivery year is effective. By not properly reserving all ARR capacity in the Long Term FTR Auction, it is possible that a SFT violation may occur between a long term FTR and a self scheduled ARR, resulting in revenue adequacy issues.

Monthly Balance of Planning Period FTR Auctions

The residual capability of the PJM transmission system, after the Long Term and Annual FTR Auctions are concluded, is offered in the Monthly Balance of Planning Period FTR Auctions. Outages expected to last five or more days are included in the determination of the simultaneous feasibility test for the Monthly Balance of Planning Period FTR Auction. These are single-round monthly auctions that allow any transmission service customer or PJM member to bid for any FTR or to offer for sale any FTR that they currently hold. Market participants can bid for or offer monthly FTRs for any of the next three months remaining in the planning period, or quarterly FTRs for any of the quarters remaining in the planning period. FTRs in the auctions include obligations and options and 24 hour, on peak and off peak products.[34] Beginning with the 2018/2019 planning period, to address performance issues in solving the Monthly Balance of Planning Period Auctions, participants may no longer place bids that overlap three available monthly periods.[35]

32 FERC approved, on December 7, 2009, the addition of a third round to the Long Term FTR Auction. FERC letter order accepting PJM Interconnection, L.L.C.'s revisions to Long-Term Financial Transmission Rights Auctions to its Amended and Restated Operating Agreement and Open Access Transmission Tariff, Docket No. ER10-82-000 (December 7, 2009).

33 See "PJM Manual 6: Financial Transmission Rights," Rev. 24 (April1 15, 2020).

34 "PJM Manual 6: Financial Transmission Rights," Rev. 24 (April 15, 2020).

35 "PJM Manual 6: Financial Transmission Rights," Rev. 24 (April 15, 2020).

Secondary Bilateral Market

Market participants can buy and sell existing FTRs through the PJM administered, bilateral market, or market participants can trade FTRs among themselves without PJM involvement. Bilateral transactions that are not done through PJM can involve parties that are not PJM members. PJM has no knowledge of bilateral transactions, or the terms and risks of bilateral transactions, that are done outside of PJM's bilateral market system.

For bilateral trades done through PJM, the FTR transmission path must remain the same, FTR obligations must remain obligations, and FTR options must remain options. However, an individual FTR may be split up into multiple, smaller FTRs, down to increments of 0.1 MW. FTRs can also be given more restrictive start and end times, meaning that the start time cannot be earlier than the original FTR start time and the end time cannot be later than the original FTR end time.

Patterns of Ownership

In order to evaluate the ownership of prevailing flow and counter flow FTRs, the MMU categorized all participants owning FTRs in PJM as either physical or financial. Physical entities include utilities and customers which primarily take physical positions in PJM markets. Financial entities include banks, trading firms and hedge funds which primarily take financial positions in PJM markets. International market participants that primarily take financial positions in PJM markets are generally considered to be financial entities even if they are utilities in their own countries.

Table 13-8 shows the 2020/2023 long term FTR auction market cleared FTRs by trade type, organization type and FTR direction. The results show that financial entities purchased 73.5 percent of prevailing flow buy bid FTRs and 83.9 percent of counter flow buy bid FTRs with the result that financial entities purchased 78.1 percent of all long term FTR auction cleared buy bids. Physical entities purchased 21.9 percent of all cleared long term FTRs in the 2020/2023 Long Term FTR Auction, down 9.0 percentage points from the previous Long Term FTR Auction.

Table 13-8 Long term FTR auction patterns of ownership by FTR direction: 2020/2023

		FTR Direction		
Trade Type	Organization Type	Prevailing Flow	Counter Flow	All
Buy Bids	Physical	26.5%	16.1%	21.9%
	Financial	73.5%	83.9%	78.1%
	Total	100.0%	100.0%	100.0%
Sell Offers	Physical	22.5%	29.2%	24.1%
	Financial	77.5%	70.8%	75.9%
	Total	100.0%	100.0%	100.0%

Table 13-9 shows the HHI for the periods in the 2017/2020 through 2020/2023 Long Term FTR Auctions. The YRALL auction was highly concentrated until its removal in the 2020/2023 Long Term Auction. The individual annual auctions are unconcentrated with the exception of years two and three of the 17/20 Auction.

Table 13-9 Long term HHIs by auction

Auction	YR1	YR2	YR3	YRALL
17/20 Long Term Auction	462	1696	1252	8533
18/21 Long Term Auction	586	850	577	8654
19/22 Long Term Auction	344	521	666	9954
20/23 Long Term Auction	328	446	527	NA

Table 13-10 shows the annual FTR auction cleared FTRs for the 2020/2021 planning period by trade type, organization type and FTR direction. In the Annual FTR Auction for the 2020/2021 planning period, financial entities purchased 71.2 percent of prevailing flow FTRs, up 6.4 percentage points, and 83.6 percent of counter flow FTRs, up 4.1 percentage points, with the results that financial entities purchased 75.6 percent, up 5.8 percentage points, of all annual FTR auction cleared buy bids for the 2020/2021 planning period.

Table 13-10 Annual FTR Auction patterns of ownership by FTR direction: 2020/2021

			FTR Direction		
Trade Type	Organization Type	Self-Scheduled FTRs	Prevailing Flow	Counter Flow	All
Buy Bids	Physical	Yes	7.2%	0.2%	4.7%
		No	21.6%	16.2%	19.7%
		Total	28.8%	16.4%	24.4%
	Financial	No	71.2%	83.6%	75.6%
	Total		100.0%	100.0%	100.0%
Sell Offers	Physical		33.0%	28.6%	31.3%
	Financial		67.0%	71.4%	68.7%
	Total		100.0%	100.0%	100.0%

Table 13-11 shows the HHI values for cleared buy and self scheduled bids for the 2016/2017 through 2020/2021 Annual FTR Auctions. Obligation buy bids are consistently unconcentrated, while Option buy bids are unconcentrated to moderately concentrated. Cleared self scheduled bids are always highly concentrated.

Table 13-11 Annual auction HHIs by auction

Auction	Offset Type	Trade Type	HHI
20/21 Annual Auction	Obligation	Buy	278
	Obligation	Self Scheduled	2970
	Option	Buy	1299
19/20 Annual Auction	Obligation	Buy	251
	Obligation	Self Scheduled	2661
	Option	Buy	978
18/19 Annual Auction	Obligation	Buy	357
	Obligation	Self Scheduled	2620
	Option	Buy	1213
17/18 Annual Auction	Obligation	Buy	303
	Obligation	Self Scheduled	2794
	Option	Buy	2099

Table 13-12 presents the monthly balance of planning period FTR auction cleared FTRs for the first six months of 2020 by trade type, organization type and FTR direction. Financial entities purchased 82.6 percent of prevailing flow FTRs, up 10.3 percentage points, and 87.7 percent of counter flow FTRs, up 6.2 percentage points, from last year, with the result that financial entities purchased 85.2 percent, up 8.8 percentage points, of all prevailing and counter flow FTR buy bids in the monthly balance of planning period FTR auction cleared FTRs for 2020.

Table 13-12 Monthly Balance of Planning Period FTR Auction patterns of ownership by FTR direction: January through June, 2020

		FTR Direction		
Trade Type	Organization Type	Prevailing Flow	Counter Flow	All
Buy Bids	Physical	17.4%	12.3%	14.8%
	Financial	82.6%	87.7%	85.2%
	Total	100.0%	100.0%	100.0%
Sell Offers	Physical	10.0%	12.6%	10.8%
	Financial	90.0%	87.4%	89.2%
	Total	100.0%	100.0%	100.0%

Table 13-13 shows the HHI values for cleared MW for the 2019/2020 planning period monthly auctions by period. Cleared obligation buy bids are Unconcentrated or Moderately Concentrated. Cleared option buy bids range from Unconcentrated to Highly Concentrated.[36]

Table 13-13 Monthly Balance of Planning Period FTR Auction HHIs by period

Auction	Hedge Type	Prompt Month	Prompt Month+1	Prompt Month+2	Q2	Q3	Q4
Jun-19	Obligation	254	386	411	552	525	552
	Option	1948	3973	3848	1728	3044	2224
Jul-19	Obligation	205	297	526	395	407	445
	Option	1962	2594	2837	2202	3114	3479
Aug-19	Obligation	256	558	689	708	443	552
	Option	1245	2415	2850	4100	2450	3418
Sep-19	Obligation	237	436	454		455	528
	Option	1070	2287	2085		2033	2770
Oct-19	Obligation	244	354	580		484	483
	Option	1582	2534	2503		3690	2253
Nov-19	Obligation	366	393	465		557	559
	Option	2490	5718	3583		2975	2293
Dec-19	Obligation	348	314	322			444
	Option	3403	3640	3428			2774
Jan-20	Obligation	363	357	795			523
	Option	1357	2147	3578			4073
Feb-20	Obligation	315	456	516			667
	Option	2477	2374	4307			3042
Mar-20	Obligation	314	340	374			
	Option	5255	3073	2525			
Apr-20	Obligation	291	430				
	Option	3627	4237				
May-20	Obligation	294					
	Option	1322					

Table 13-14 shows the average daily net position ownership for all FTRs for the first six months of 2020, by FTR direction.

Table 13-14 Daily FTR net position ownership by FTR direction: January through June, 2020

	FTR Direction		
Organization Type	Prevailing Flow	Counter Flow	All
Physical	33.6%	17.1%	26.4%
Financial	66.4%	82.9%	73.6%
Total	100.0%	100.0%	100.0%

36 *See 2020 Quarterly State of the Market Report for PJM: January through June* Section 3: Energy Market, Competitive Assessment for HHI definitions.

Market Performance

Volume

PJM regularly intervenes in the FTR market based on subjective judgment which is not based on clear or documented guidelines. Such intervention in the FTR, or any market, is not appropriate and not consistent with the operation of competitive markets. In an apparent effort to manage FTR revenues, PJM may adjust normal transmission limits in the FTR auction model. If, in PJM's judgment, the normal capability limit is not consistent with revenue adequacy goals and simultaneous feasibility, then FTR Auction capability reductions are undertaken pro rata based on the MW of Stage 1A infeasibility and the availability of auction bids for counter flow FTRs.[37] PJM may also remove or reduce infeasibilities caused by transmission outages by clearing counter flow bids without being required to clear the corresponding prevailing flow bids.[38] The use of both of these procedures is contingent on PJM actions not affecting the revenue adequacy of allocated ARRs, all requested self scheduled FTRs clear and net FTR auction revenue is positive.

Long Term FTR Auction

In the 2020/2023 Long Term FTR Auction, 122,311 MW (19.8 percent of bid volume; 44.4 percent of total FTR volume) of counter flow FTR buy bids cleared, a decrease from 179,727 MW and 36.7 percent of total FTR volume. In the same auction, prevailing flow FTR buy bids cleared 275,655MW (12.5 percent of bid volume; 55.6 percent of total FTR volume) an increase from 228,510 MW and a decrease from 60.0 percent of total FTR volume. In the 2020/2023 Long Term FTR Auction, 11,942 MW (13.6 percent) of counter flow sell offers and 37,470 MW (19.1 percent) of prevailing flow sell offers cleared.

37 See "PJM Manual 6: Financial Transmission Rights," Rev. 24 (Apr. 15, 2020).
38 See *id.*

Table 13-15 Long Term FTR Auction market volume: 2020/2023

Trade Type	FTR Direction	Period Type	Bid and Requested Count	Bid and Requested Volume (MW)	Cleared Volume (MW)	Cleared Volume	Uncleared Volume (MW)	Uncleared Volume
Buy bids	Counter Flow	Year 1	103,035	267,336	55,453	20.7%	211,884	79.3%
		Year 2	75,309	193,890	34,883	18.0%	159,007	82.0%
		Year 3	61,250	156,584	31,975	20.4%	124,609	79.6%
		Total	239,594	617,810	122,311	19.8%	495,499	80.2%
	Prevailing Flow	Year 1	216,661	718,812	71,601	10.0%	647,211	90.0%
		Year 2	155,546	489,964	46,115	9.4%	443,849	90.6%
		Year 3	114,352	387,341	35,628	9.2%	351,713	90.8%
		Total	486,559	1,596,117	153,344	9.6%	1,442,773	90.4%
	Total		726,153	2,213,927	275,655	12.5%	1,938,272	87.5%
Sell offers	Counter Flow	Year 1	28,861	51,060	8,019	15.7%	43,041	84.3%
		Year 2	18,353	30,441	3,413	11.2%	27,028	88.8%
		Year 3	4,607	6,527	510	7.8%	6,017	92.2%
		Total	51,821	88,028	11,942	13.6%	76,086	86.4%
	Prevailing Flow	Year 1	54,026	108,781	22,034	20.3%	86,746	79.7%
		Year 2	42,189	78,357	14,150	18.1%	64,206	81.9%
		Year 3	5,546	9,021	1,285	14.2%	7,736	85.8%
		Total	101,761	196,158	37,470	19.1%	158,689	80.9%
	Total		153,582	284,186	49,411	17.4%	234,775	82.6%

Figure 13-3 shows the percent of FTR MW cleared, and bid and cleared volume, by direction, for each round of the Long Term FTR Auction from the 2015/2018 through the 2020/2023 auctions.

Figure 13-3 Long Term FTR Auction bid and cleared volume by round and direction

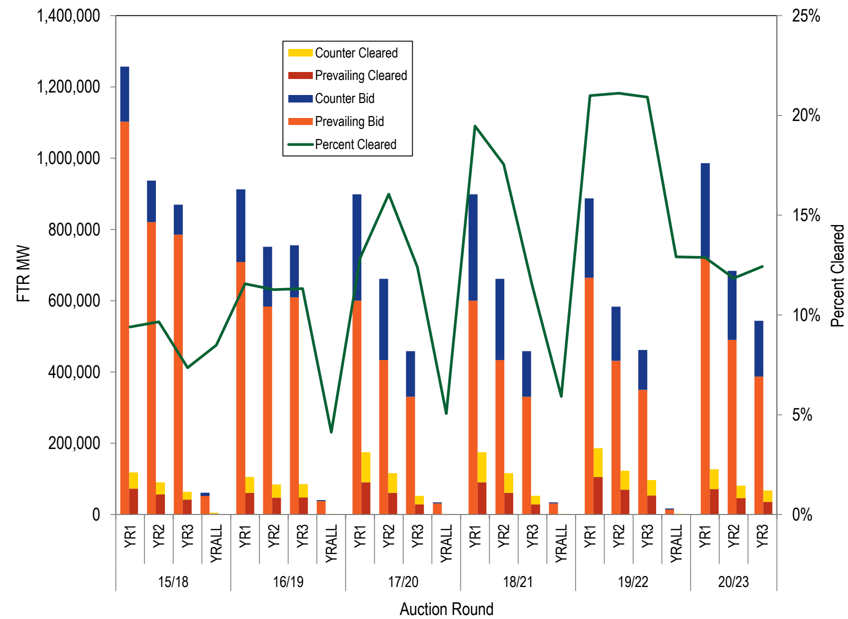


Table 13-16 compares cleared FTR obligations (not options) acquired in the Long Term FTR Auctions to the total cleared FTR obligations from the Annual FTR Auction, for FTRs in the 2014/2015 through 2020/2021 planning periods. A three year FTR is distributed to each individual planning period during its three year effective period. Long term FTRs that are effective in a single planning period were an average of 40.8 percent of total FTR volume in the 2014/2015 through 2020/2021 planning periods.

Table 13-16 Long Term and Annual Auction total cleared FTR MW

	Long Term FTR Product (Including YRALL)			Obligation Volume (MW)		
Effective Planning Period	YR3	YR2	YR1	Total Long Term	Annual (including self scheduled)	Long Term Percent of Total Cleared
2014/2015	81,666	86,754	131,911	300,330	356,522	45.7%
2015/2016	89,419	99,329	123,400	312,148	355,682	46.7%
2016/2017	97,837	95,637	107,182	300,656	397,258	43.1%
2017/2018	69,161	86,323	108,126	263,609	493,683	34.8%
2018/2019	87,232	109,827	176,998	374,057	549,669	40.5%
2019/2020	80,947	118,112	188,438	387,496	576,937	40.2%
2020/2021	54,451	125,330	127,054	306,835	525,550	36.9%

Annual FTR Auction

Table 13-17 shows the annual FTR auction market volume for the 2020/2021 planning period. Total FTR buy bids were 2,336,551 MW, down 16.2 percent from 2,787,716 MW for the previous planning period. For the 2020/2021 planning period 556,034 MW (23.8 percent) of buy bids cleared, down 9.0 percentage points from 611,878 MW for the previous planning period. There were 359,871 MW of sell offers with 67,302 MW (18.7 percent) clearing for the 2020/2021 planning period. The total volume of cleared buy and self scheduled bids was 583,629 MW, down 9.0 percent from 641,023 MW in the previous Annual FTR Auction.

Table 13-17 Annual FTR Auction market volume: 2020/2021

Trade Type	Type	FTR Direction	Bid and Requested Count	Bid and Requested Volume (MW)	Cleared Volume (MW)	Cleared Volume	Uncleared Volume (MW)	Uncleared Volume
Buy bids	Obligations	Counter Flow	210,675	708,205	206,475	29.2%	501,730	70.8%
		Prevailing Flow	318,709	1,324,412	291,481	22.0%	1,032,931	78.0%
		Total	529,384	2,032,617	497,956	24.5%	1,534,661	75.5%
	Options	Counter Flow	40	394	48	12.2%	346	87.8%
		Prevailing Flow	22,297	303,540	58,031	19.1%	245,510	80.9%
		Total	22,337	303,934	58,079	19.1%	245,856	80.9%
	Total	Counter Flow	210,715	708,598	206,523	29.1%	502,076	70.9%
		Prevailing Flow	341,006	1,627,952	349,512	21.5%	1,278,441	78.5%
		Total	551,721	2,336,551	556,034	23.8%	1,780,517	76.2%
Self-scheduled bids	Obligations	Counter Flow	131	365	365	100.0%	0	0.0%
		Prevailing Flow	3,173	27,229	27,229	100.0%	0	0.0%
		Total	3,304	27,594	27,594	100.0%	0	0.0%
Buy and self-scheduled bids	Obligations	Counter Flow	210,806	708,570	206,840	29.2%	501,730	70.8%
		Prevailing Flow	321,882	1,351,641	318,710	23.6%	1,032,931	76.4%
		Total	532,688	2,060,211	525,550	25.5%	1,534,661	74.5%
	Options	Counter Flow	40	394	48	12.2%	346	87.8%
		Prevailing Flow	22,297	303,540	58,031	19.1%	245,510	80.9%
		Total	22,337	303,934	58,079	19.1%	245,856	80.9%
	Total	Counter Flow	210,846	708,964	206,888	29.2%	502,076	70.8%
		Prevailing Flow	344,179	1,655,181	376,740	22.8%	1,278,441	77.2%
		Total	555,025	2,364,145	583,629	24.7%	1,780,517	75.3%
Sell offers	Obligations	Counter Flow	63,560	128,710	25,533	19.8%	103,177	80.2%
		Prevailing Flow	94,295	204,876	40,741	19.9%	164,135	80.1%
		Total	157,855	333,586	66,274	19.9%	267,312	80.1%
	Options	Counter Flow	0	0	0	NA	0	NA
		Prevailing Flow	3,210	26,285	1,028	3.9%	25,257	96.1%
		Total	3,210	26,285	1,028	3.9%	25,257	96.1%
	Total	Counter Flow	63,560	128,710	25,533	19.8%	103,177	80.2%
		Prevailing Flow	97,505	231,161	41,769	18.1%	189,392	81.9%
		Total	161,065	359,871	67,302	18.7%	292,569	81.3%

Figure 13-4 shows the percent of FTR MW cleared and bid and cleared volume, by direction, for each round of the Annual FTR Auction from the 2015/2016 planning period through the 2020/2021 planning period.

Figure 13-4 Annual FTR Auction bid and cleared volume by round and direction

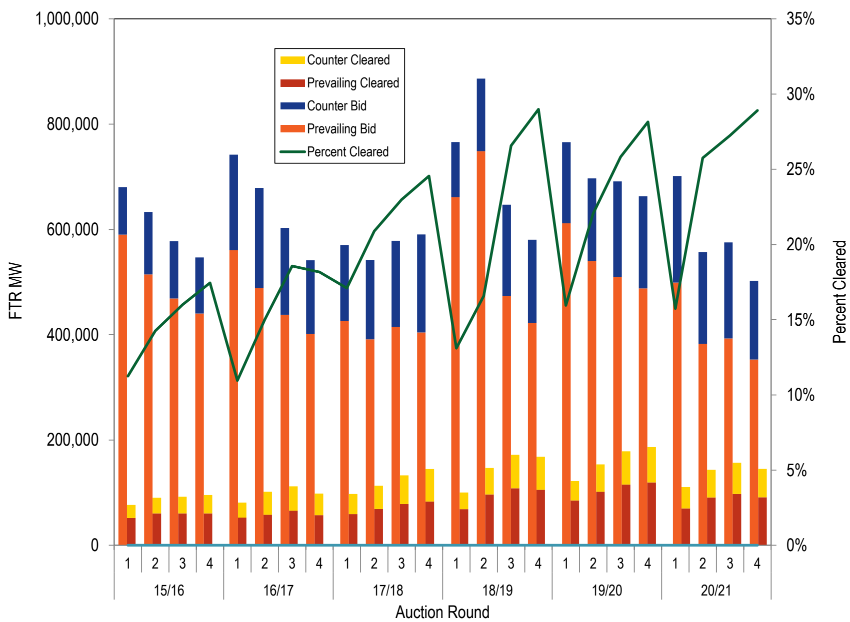


Figure 13-5 shows the proportion of ARRs self scheduled as FTRs for the last twelve planning periods. The maximum possible level of self scheduled FTRs is equal to total ARRs. Eligible participants self scheduled 27,594 MW (25.4 percent) of ARRs as FTRs for the 2020/2021 planning period, down from 29,146 MW (26.5 percent) in the previous planning period.

Figure 13-5 Comparison of self scheduled FTRs: 2009/2010 through 2020/2021

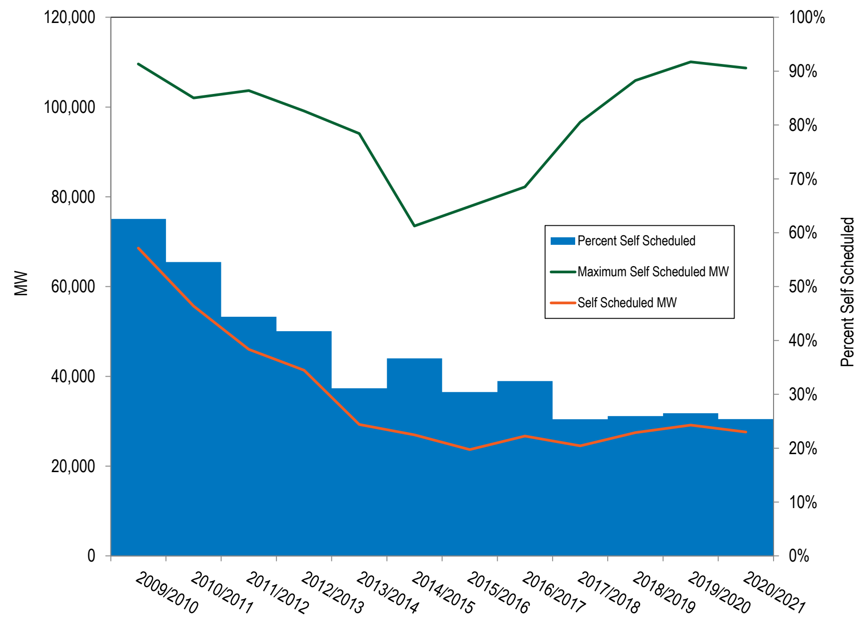


Table 13-18 shows the relationship between source and sink node type market share in the cleared buy and self scheduled bids for all FTRs in the 2020/2021 Annual FTR Auction.

Generator to generator FTRs comprise 48.0 percent of all cleared FTR buy and self scheduled bids, down 1.2 percentage points from the previous planning period. It is not clear why generator to generator FTRs make up such a disproportionate share of total FTRs. Congestion results from load paying more for generation than generators receive. By definition, congestion is between generator sources and load sinks. Generator to generator paths do not represent the delivery of generation to load. FTRs between generators simply create a speculative opportunity because they can be a low cost or zero cost FTR in the current design with a significant payoff if there is a price difference between the two nodes.

The MMU recommends that PJM examine the source and sink node combinations available in the FTR market and eliminate generation to generation paths and all other paths that do not represent the delivery of power to load.

Table 13-18 Annual auction FTR node type matrix: 2020/2021

	Sink Type					
Source Type	Aggregate	Generator	Hub	Interface	Residual Metered Aggregate	Zone
Aggregate	2.0%	6.0%	0.1%	0.1%	0.3%	0.6%
Generator	12.0%	48.0%	5.0%	0.7%	5.3%	9.0%
Hub	0.4%	0.9%	1.0%	0.1%	0.3%	2.3%
Interface	0.1%	0.4%	0.2%	0.0%	0.1%	0.1%
Residual Metered Aggregate	0.1%	0.8%	0.0%	0.0%	0.2%	0.1%
Zone	0.4%	0.6%	0.9%	0.0%	0.5%	1.1%

Monthly Balance of Planning Period Auctions

Table 13-19 provides the monthly balance of planning period FTR auction market volume for the entire 2018/2019 and 2019/2020 planning periods. There were 20,396,353 MW of FTR obligation buy bids and 7,709,887 MW of FTR obligation sell offers for all bidding periods in the 2019/2020 planning period. The monthly balance of planning period FTR auction cleared 3,975,985 (19.5 percent) of FTR obligation buy bids and 1,586,486 MW (20.6 percent) of FTR obligation sell offers.

There were 2,779,104 MW of FTR option buy bids and 1,656,059 MW of FTR option sell offers for all bidding periods in the Monthly Balance of Planning Period FTR Auctions for the 2019/2020 planning period. The monthly auctions cleared 148,918 MW (5.4 percent) of FTR option buy bids, and 409,029 MW (24.7 percent) of FTR option sell offers.

Table 13-19 Monthly Balance of Planning Period FTR Auction market volume: January through May 2020

Monthly Auction	Type	Trade Type	Bid and Requested Count	Bid and Requested Volume (MW)	Cleared Volume (MW)	Cleared Volume	Uncleared Volume (MW)	Uncleared Volume
Jan-20	Obligations	Buy bids	466,394	1,632,289	306,659	18.8%	1,325,630	81.2%
		Sell offers	303,736	618,111	125,762	20.3%	492,349	79.7%
	Options	Buy bids	6,647	195,528	5,493	2.8%	190,035	97.2%
		Sell offers	12,782	109,543	21,508	19.6%	88,034	80.4%
Feb-20	Obligations	Buy bids	474,510	1,592,984	309,317	19.4%	1,283,667	80.6%
		Sell offers	185,838	470,656	102,698	21.8%	367,958	78.2%
	Options	Buy bids	5,425	162,253	8,471	5.2%	153,782	94.8%
		Sell offers	11,296	112,091	28,274	25.2%	83,817	74.8%
Mar-20	Obligations	Buy bids	494,921	1,719,197	362,450	21.1%	1,356,747	78.9%
		Sell offers	242,038	598,102	126,227	21.1%	471,875	78.9%
	Options	Buy bids	4,460	105,294	8,701	8.3%	96,594	91.7%
		Sell offers	12,688	143,455	33,009	23.0%	110,445	77.0%
Apr-20	Obligations	Buy bids	351,392	1,119,598	255,378	22.8%	864,220	77.2%
		Sell offers	135,345	391,710	83,809	21.4%	307,901	78.6%
	Options	Buy bids	2,168	79,078	4,892	6.2%	74,186	93.8%
		Sell offers	7,951	96,040	24,500	25.5%	71,540	74.5%
May-20	Obligations	Buy bids	257,961	776,159	172,022	22.2%	604,137	77.8%
		Sell offers	76,694	201,438	45,392	22.5%	156,046	77.5%
	Options	Buy bids	217	4,076	1,060	26.0%	3,017	74.0%
		Sell offers	4,091	50,564	14,164	28.0%	36,400	72.0%
2018/2019*	Obligations	Buy bids	4,329,182	15,659,008	2,966,810	18.9%	12,692,199	81.1%
		Sell offers	2,843,624	6,774,436	1,237,274	18.3%	5,537,162	81.7%
	Options	Buy bids	84,129	4,168,186	191,043	4.6%	3,977,143	95.4%
		Sell offers	195,333	1,708,827	466,274	27.3%	1,242,553	72.7%
2019/2020**	Obligations	Buy bids	5,926,122	20,396,353	3,975,985	19.5%	16,420,368	80.5%
		Sell offers	3,436,131	7,709,887	1,586,486	20.6%	6,123,402	79.4%
	Options	Buy bids	86,428	2,779,104	148,918	5.4%	2,630,186	94.6%
		Sell offers	179,301	1,656,059	409,029	24.7%	1,247,031	75.3%

* Shows 12 months for 2018/2019 ** Shows 12 months for 2019/2020

Table 13-20 presents the buy bid, bid and cleared volume of the Monthly Balance of Planning Period FTR Auction, and the effective periods for the volume. The average monthly cleared volume for 2020 was 286,889 MW. The average monthly cleared volume for 2019 was 327,106 MW.

Table 13-20 Monthly Balance of Planning Period FTR Auction buy bid, bid and cleared volume (MW per period): January through May 2020

Monthly Auction	MW Type	Prompt Month	Second Month	Third Month	Q1	Q2	Q3	Q4	Total
Jan-20	Bid	915,450	336,266	237,288				338,814	1,827,817
	Cleared	196,310	53,363	21,886				40,593	312,153
Feb-20	Bid	971,640	279,860	245,026				258,711	1,755,237
	Cleared	211,197	41,602	31,961				33,028	317,788
Mar-20	Bid	1,103,912	375,754	344,825					1,824,491
	Cleared	256,802	63,206	51,143					371,151
Apr-20	Bid	861,372	337,304						1,198,676
	Cleared	198,392	61,878						260,270
May-20	Bid	780,235							780,235
	Cleared	173,082							173,082

Secondary Bilateral Market

Table 13-21 provides the PJM registered secondary bilateral FTR market volume for the 2018/2019 and the 2019/2020 planning periods. Bilateral FTR transactions registered through PJM do not need to include an accurate price. Bilateral FTR transactions are not required to be registered through PJM.

Table 13-21 Secondary bilateral FTR market volume: 2018/2019 and 2019/2020[39]

Planning Period	Type	Class Type	Volume (MW)
2018/2019	Obligation	24-Hour	2,782.1
		On Peak	21,423.5
		Off Peak	21,636.9
		Total	45,842.5
	Option	24-Hour	0.0
		On Peak	0.0
		Off Peak	40.0
		Total	40.0
2019/2020	Obligation	24-Hour	5,032.9
		On Peak	1,996.1
		Off Peak	1,661.8
		Total	8,690.8
	Option	24-Hour	0.0
		On Peak	0.0
		Off Peak	0.0
		Total	0.0

39 The 2019/2020 planning period covers bilateral FTRs that are effective for any time between June 1, 2019 through May 31, 2020, which originally had been purchased in a Long Term FTR Auction, Annual FTR Auction or Monthly Balance of Planning Period FTR Auction.

Figure 13-6 shows the FTR bid, net bid and cleared volume from June 2003 through May 2020 for Long Term, Annual and Monthly Balance of Planning Period Auctions. Cleared volume includes FTR buy and sell offers that were accepted. The net bid volume includes the total buy, sell and self scheduled offers, counting sell offers as a negative volume. The bid volume is the total of all bid and self scheduled offers, excluding sell offers. The cleared volume in August 2018 was negative due to the liquidation of the GreenHat FTR portfolio, which resulted in a large quantity of FTRs selling in the monthly auction.

Figure 13-6 Long Term, Annual and Monthly FTR Auction bid and cleared volume: June 2003 through May 2020

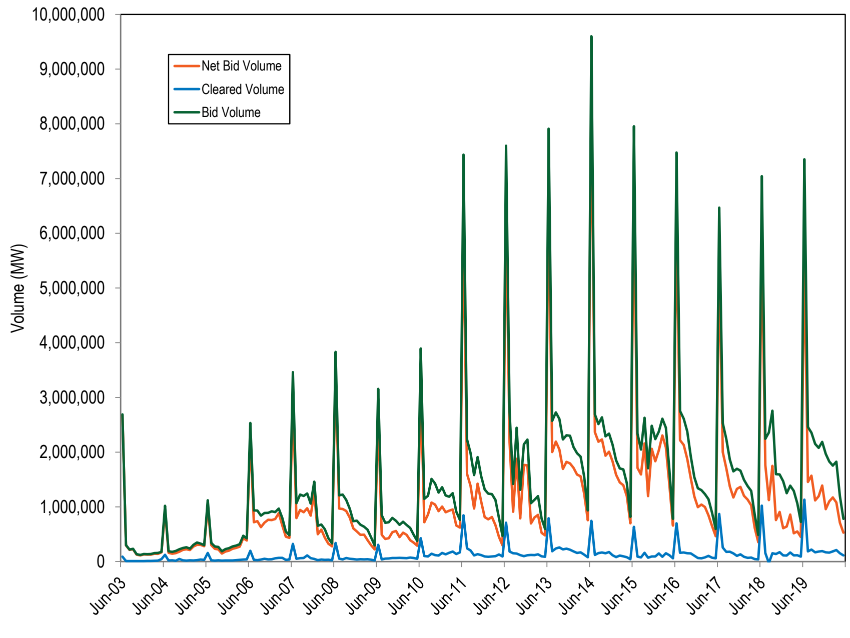
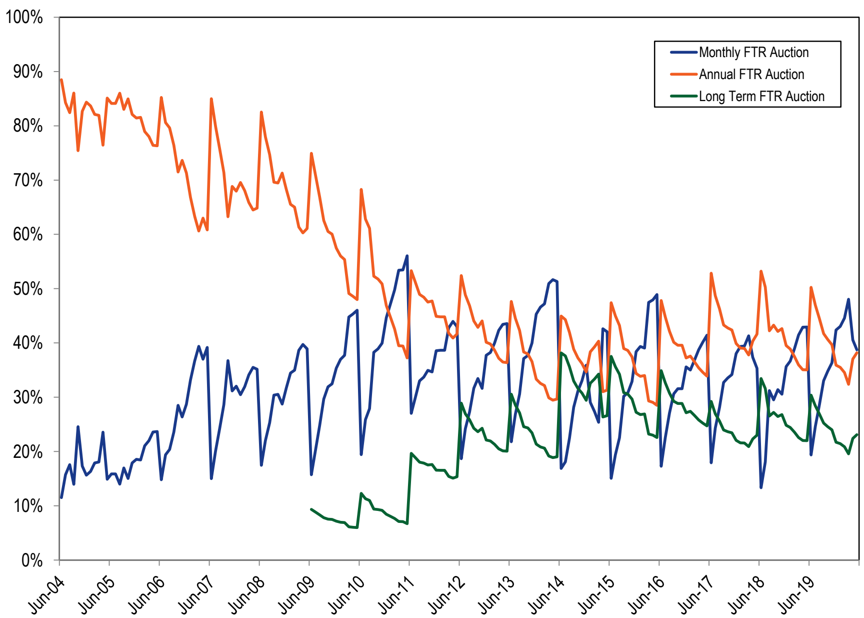


Figure 13-7 shows cleared auction volumes by auction type as a percent of the total FTR cleared volume by calendar months for June 2004 through May 2020. FTR volumes are included in the calendar month they are effective, with long term and annual FTR auction volumes spread equally to each month in the relevant planning period. Over the course of each planning period an increasing number of Monthly Balance of Planning Period FTRs are purchased, resulting in a greater share of total FTRs. When the Annual FTR Auction occurs, FTRs purchased in previous Monthly Balance of Planning Period Auctions, other than the current June auction, are no longer effective, resulting in a smaller share for monthly and a greater share for annual FTRs.

Figure 13-7 Cleared auction volume (MW) as a percent of total FTR cleared volume by calendar month: June 2004 through May 2020



Price

Table 13-22 shows the cleared, weighted-average prices by trade type, FTR direction, period type and class type for the 2020/2023 Long Term FTR Auction. Only FTR obligation products (no options) are available in the Long Term FTR Auctions. In this auction, weighted average buy bid counter flow and prevailing flow FTR prices were -$0.49 and $0.51, compared to -$0.36 and $0.46 from the 2019/2022 Long Term FTR Auction. Weighted average sell bid counter flow and prevailing flow FTR prices were -$0.32 and $0.45, compared to -$0.32 for counter flow FTRs and $0.45 for prevailing flow FTRs.

Table 13-22 Long Term FTR Auction weighted-average cleared prices (Dollars per MW): 2020/2023

			Class Type			
Trade Type	FTR Direction	Period Type	24-Hour	On Peak	Off Peak	All
Buy bids	Counter Flow	Year 1	($1.11)	($0.31)	($0.56)	($0.49)
		Year 2	($1.06)	($0.33)	($0.60)	($0.50)
		Year 3	($0.75)	($0.32)	($0.61)	($0.48)
		Total	($1.02)	($0.32)	($0.58)	($0.49)
	Prevailing Flow	Year 1	$0.97	$0.31	$0.59	$0.51
		Year 2	$1.06	$0.28	$0.56	$0.52
		Year 3	$1.15	$0.25	$0.49	$0.50
		Total	$1.05	$0.29	$0.56	$0.51
	Total		$0.46	$0.01	$0.05	$0.08
Sell offers	Counter Flow	Year 1	($0.39)	($0.24)	($0.47)	($0.34)
		Year 2	($0.07)	($0.18)	($0.35)	($0.27)
		Year 3	$0.00	($0.18)	($0.38)	($0.30)
		Total	($0.37)	($0.22)	($0.43)	($0.32)
	Prevailing Flow	Year 1	$0.98	$0.30	$0.59	$0.45
		Year 2	$0.32	$0.30	$0.62	$0.46
		Year 3	$0.11	$0.33	$0.67	$0.48
		Total	$0.67	$0.30	$0.60	$0.45
	Total		$0.41	$0.16	$0.37	$0.27

Table 13-23 shows the weighted-average cleared buy bid prices by trade type, FTR product, FTR direction and class type for the Annual FTR Auction for the 2020/2021 planning period. The weighted-average cleared buy bid price in the 2020/2021 Annual FTR Auction was $0.18 per MW, down from $0.28 per MW in the 2019/2020 planning period.

Table 13-23 Annual FTR Auction weighted-average cleared prices (Dollars per MW): 2020/2021

			Class Type			
Trade Type	Type	FTR Direction	24-Hour	On Peak	Off Peak	All
Buy bids	Obligations	Counter Flow	($0.50)	($0.35)	($0.24)	($0.31)
		Prevailing Flow	$1.25	$0.52	$0.28	$0.51
		Total	$0.75	$0.17	$0.05	$0.18
	Options	Counter Flow	$0.00	$0.00	$0.00	$0.00
		Prevailing Flow	$0.07	$0.23	$0.14	$0.18
		Total	$0.07	$0.23	$0.14	$0.18
Self-scheduled bids	Obligations	Counter Flow	($0.24)	NA	NA	($0.24)
		Prevailing Flow	$0.64	NA	NA	$0.64
		Total	$0.62	NA	NA	$0.62
Buy and self-scheduled bids	Obligations	Counter Flow	($0.48)	($0.35)	($0.24)	($0.31)
		Prevailing Flow	$0.89	$0.52	$0.28	$0.53
		Total	$0.69	$0.17	$0.05	$0.22
	Options	Counter Flow	$0.00	$0.00	$0.00	$0.00
		Prevailing Flow	$0.07	$0.23	$0.14	$0.18
		Total	$0.07	$0.23	$0.14	$0.18
Sell offers	Obligations	Counter Flow	($0.94)	($0.37)	($0.23)	($0.33)
		Prevailing Flow	$0.44	$0.36	$0.20	$0.30
		Total	$0.22	$0.09	$0.03	$0.07
	Options	Counter Flow	NA	NA	NA	NA
		Prevailing Flow	$0.00	$0.26	$0.13	$0.19
		Total	$0.00	$0.26	$0.13	$0.19

Table 13-24 shows the cleared buy bid volume, cleared buy bid revenue and cleared revenue/cleared MW for the seven latest planning periods. In the 2014/2015 planning period the $/MW increased significantly from the 2013/2014 planning period due to PJM's decisions to limit capacity through conservative modeling. In the 2017/2018 Annual FTR Auction, the $/MW decreased to lower than 2013/2014 levels, due in part to the partial relaxation of PJM's conservative modeling practices due to the reassignment of balancing congestion and M2M payments to load and exports. This reduction continued into the 2019/2020 planning period. The reassignment of balancing congestion and M2M payments to load did not increase the per MW value of ARRs.

Table 13-24 Cleared volume, revenue and $/MW: 2012/2013 through 2020/2021 Annual FTR Auction

	Cleared Buy Bid Volume	Percent Cleared	Buy Bid Revenue (millions)	Buy Bid Revenue ($/MW)
2012/2013	371,295	14.5%	$627.3	$1,689
2013/2014	420,489	12.8%	$567.6	$1,350
2014/2015	365,843	11.2%	$789.7	$2,159
2015/2016	378,328	15.4%	$948.6	$2,507
2016/2017	420,198	16.2%	$918.0	$2,185
2017/2018	513,263	22.3%	$555.2	$1,082
2018/2019	587,775	20.4%	$635.6	$1,081
2019/2020	611,878	21.9%	$649.0	$1,061
2020/2021	556,034	23.8%	$449.6	$809

Table 13-25 shows the weighted average cleared buy bid price in the Monthly Balance of Planning Period FTR Auctions by bidding period for the first five months of 2020. For example, for the January Monthly Balance of Planning Period FTR Auction, the current month column is January, the second month column is February and the third month column is March. Quarters 1 through 4 are represented in the Q1, Q2, Q3 and Q4 columns. The total column represents all of the activity within the January Monthly Balance of Planning Period FTR Auction.

The cleared weighted-average price paid in the Monthly Balance of Planning Period FTR Auctions for 2020 was $0.11 per MW, down from $0.18 per MW for the same period last year, a 38.9 percent decrease in FTR prices. The cleared weighted-average price for the current planning period was $0.15 per MW, down 28.6 percent from $0.21 per MW for the same period last year.

Table 13-25 Monthly Balance of Planning Period FTR Auction cleared, weighted-average, buy bid price per period (Dollars per MW): 2020

Monthly Auction	Prompt Month	Second Month	Third Month	Q1	Q2	Q3	Q4	Total
Jan-20	$0.08	$0.16	$0.12				$0.20	$0.13
Feb-20	$0.06	$0.18	$0.16				$0.25	$0.13
Mar-20	$0.07	$0.14	$0.26					$0.11
Apr-20	$0.05	$0.13						$0.07
May-20	$0.05							$0.05

Profitability

FTR profitability is the difference between the revenue received directly from holding an FTR plus any revenue from the sale of an FTR, and the cost of the FTR. For a prevailing flow FTR, the FTR revenue is the actual revenue that an FTR holder is paid as the target allocation plus the auction price from the sale of the FTR, if relevant, and the FTR cost is the auction price. For a counter flow FTR, the FTR revenue is the auction price that an FTR holder is paid to take the FTR plus the positive auction price from the sale of the FTR, if relevant, and the FTR cost is the target allocation that the FTR holder must pay plus the negative auction price from the sale of the FTR, if relevant. Bilateral transactions are excluded from the profit calculations because there are inconsistent reporting requirements and no assurance that reported prices reflect the actual prices. ARR holders that self schedule FTRs receive congestion revenues but do not receive profits from those FTRs because ARR holders are assigned rights to congestion revenues which they choose to take directly as the congestion payments associated with the corresponding FTRs.

Hourly FTR profits are the sum of the hourly revenues minus the hourly costs for each FTR (not self scheduled) held by an organization. The hourly revenues equal hourly FTR target allocations, adjusted by the payout ratio. The hourly auction costs are the product of the FTR MW and the auction price divided by the time period of the FTR in hours. The FTR revenues do not include after the fact adjustments which are very small and do not occur in every month.

The surplus includes surplus day-ahead congestion revenue and FTR auction surplus. At least part of the surplus is included in FTR profits because the surplus is first allocated to FTR holders to cover any shortfall in paying FTR target allocations. Beginning with the 2018/2019 planning period, after covering any shortfall in FTR target allocations within the planning period, the net surplus at the end of the planning year is distributed to ARR holders.

The fact that FTR profits in each planning period have been positive for financial entities as a group, regardless of the payout ratio, raises questions about the competitiveness of the market. FTR profits for financial entities were not positive in the 2019/2020 planning period when accounting for GreenHat losses but were positive otherwise. FTR profits for financial entities were positive in every completed planning year from 2014/2015 through 2018/2019 except 2016/2017 planning year, and were positive if summed over the entire period (Table 13-28). It is not clear, in a competitive market, why FTR profits for financial entities remain persistently profitable. In a competitive market, it would be expected that profits would be competed to zero.

In the 2019/2020 planning period, profits for financial entities are negative as a result of a significant decrease in energy market prices and the associated significant decrease in congestion. GreenHat's losses without including its bilateral transactions were $46.3 million in the 2019/2020 planning period. Without GreenHat, the profits for all other financial entities were positive, $25.2 million.

Table 13-26 lists FTR profits, and the congestion returned through self scheduled FTRs, by organization type and FTR direction for FTRs for the 2019/2020 planning period. This table includes the auction cost and revenue from both buying and selling FTRs that were effective between June 2019 and May 2020. This includes FTRs from the 2017/2020, 2018/2021 and 2019/2022 Long Term auctions, the 2019/2020 Annual auction, and the Monthly auctions from June 2019 to May 2020. The costs and revenues of the yearly and quarterly FTR products are prorated based on the time period of the FTRs. Any revenues or costs related to bilateral transactions are not included in profits. All participants who were assigned ARRs are classified as physical ARR. Some participants that are not eligible for ARRs are classified as physical because they are physical participants, for example companies that own only generation.

Self scheduled FTRs have zero cost. ARR holders who self scheduled FTRs received $96.8 million in congestion revenues. Revenues from self scheduled FTRs are a return of congestion to the load that paid the congestion and are not profits.

Table 13-26 FTR profits and revenues by organization type and FTR direction: 2019/2020

	Purchased FTRs Profit			Self Scheduled FTRs Revenue Returned		
Organization Type	Prevailing Flow	Counter Flow	Total	Prevailing Flow	Counter Flow	Total
Financial	($302,623,078)	$281,483,435	($21,139,644)			
Financial without GreenHat	($264,887,251)	$290,038,102	$25,150,852			
Physical	($79,572,071)	$36,711,416	($42,860,656)			
Physical ARR	($83,508,646)	$33,894,455	($49,614,191)	$96,499,269	$294,514	$96,793,783
Total	($465,703,796)	$352,089,305	($113,614,490)	$96,499,269	$294,514	$96,793,783

Table 13-27 lists the monthly FTR profits for the 2018/2019 planning period and the 2019/2020 planning period by organization type. FTR profits include revenue from FTR sales and do not include any revenue or cost from bilateral transactions. FTR revenues for self scheduled FTRs are not included. FTR profits for FTRs purchased in auctions by ARR holders are included.

Table 13-27 Monthly FTR profits by organization type: 2018/2019 and 2019/2020[40]

	Organization Type				
Month	Financial	Financial without GreenHat	Physical	Physical ARR	Total
Jun-18	$18,875,031	$27,132,049	$6,636,932	$5,042,150	$30,554,113
Jul-18	$10,505,573	$22,205,316	$523,378	($3,442,614)	$7,586,336
Aug-18	$8,981,769	$29,529,971	($721,584)	$1,108,277	$9,368,463
Sep-18	$20,137,215	$25,049,445	$10,902,721	$12,128,364	$43,168,300
Oct-18	$22,878,423	$31,517,750	$2,944,925	$6,364,562	$32,187,909
Nov-18	$9,748,869	$20,835,262	$4,556,206	$6,665,448	$20,970,523
Dec-18	$18,418,585	$25,142,877	($1,802,570)	$188,932	$16,804,947
Jan-19	$39,461,828	$56,389,559	$338,814	$1,893,058	$41,693,700
Feb-19	($5,562,558)	($957,360)	($13,018,037)	($8,763,255)	($27,343,850)
Mar-19	($3,125,807)	$3,968,252	($4,303,577)	($6,721,937)	($14,151,320)
Apr-19	($17,541,471)	($13,105,324)	($8,219,627)	($11,122,750)	($36,883,848)
May-19	($9,691,228)	($4,331,040)	($3,782,813)	($6,248,557)	($19,722,598)
	Summary for Planning Period 2018/2019				
Total	$113,086,231	$223,376,757	($5,945,233)	($2,908,321)	$104,232,677
Jun-19	($7,530,412)	($5,175,703)	($4,406,629)	($5,300,686)	($17,237,726)
Jul-19	$11,073,631	$13,727,088	$1,715,298	$2,195,625	$14,984,553
Aug-19	($11,192,103)	($7,445,637)	($4,515,760)	($2,965,124)	($18,672,988)
Sep-19	$13,219,100	$20,305,030	$6,308,310	$4,870,000	$24,397,410
Oct-19	$6,628,121	$12,845,824	$2,404,277	$3,916,338	$12,948,736
Nov-19	$6,579,914	$10,996,869	$2,167,865	$2,038,284	$10,786,063
Dec-19	$6,176,313	$11,021,397	($212,596)	($3,696,208)	$2,267,509
Jan-20	($5,308,687)	($132,954)	($10,539,357)	($10,405,137)	($26,253,180)
Feb-20	($14,980,199)	($11,873,252)	($11,213,649)	($10,337,622)	($36,531,470)
Mar-20	($14,165,737)	($12,669,353)	($8,006,489)	($10,777,549)	($32,949,775)
Apr-20	($14,526,206)	($11,926,918)	($11,145,117)	($11,779,700)	($37,451,023)
May-20	$2,886,620	$5,478,459	($5,416,808)	($7,372,412)	($9,902,600)
	Summary for Planning Period 2019/2020				
Total	($21,139,644)	$25,150,852	($42,860,656)	($49,614,191)	($113,614,490)

Table 13-28 lists the historical profits by calendar year by organization type beginning in the 2014/2015 planning period for FTRs purchased. (Profits do not include congestion revenue to self scheduled FTRs.) Profits include revenue from the sale of FTRs and exclude bilateral transactions. Profits include any end of planning period surplus distribution or uplift payments. The end of planning period surplus or uplift was distributed to FTR holders prorata based on FTR positive target allocations through the 2017/2018 planning period. Beginning with the 2018/2019 planning period, any net end of planning period surplus, after paying out any shortfall in FTR target allocations within the planning period, was distributed to ARR holders. Surplus allocated to ARR holders in the 2018/2019 planning period was $112.3 million and in 2019/2020 it was $140.7 million.

40 The GreenHat Default Allocation Assessment by PJM was $113 million in the 2018/2019 planning period and $46.3 million for the 2019/2020 planning period, excluding the FTR Waiver Settlement of $17.5 million. The calculated GreenHat losses do not exactly match the assessment. The loss calculation is based on GreenHat's actual portfolio instead of the assessment formula and does not consider bilateral transaction or GreenHat's collateral.

Table 13-28 FTR profits by organization type: 2014/2015 through 2019/2020[41]

		2014/2015	2015/2016	2016/2017	2017/2018	2018/2019	2019/2020
Financial	Profit	$250,551,943	$68,895,867	($12,525,947)	$239,981,474	$113,086,231	($21,139,644)
	Surplus	$19,453,837	$4,921,078	$8,810,267	$90,361,918		
	Total	$270,005,781	$73,816,945	($3,715,680)	$330,343,392	$113,086,231	($21,139,644)
Financial without GreenHat	Profit	$250,551,785	$70,094,918	($11,821,248)	$240,111,850	$223,376,757	$25,150,852
	Surplus	$19,453,837	$4,921,078	$8,810,267	$90,361,918		
	Total	$270,005,623	$75,015,995	($3,010,981)	$330,473,768	$223,376,757	$25,150,852
Physical	Profit	$82,853,390	$10,007,327	($4,010,669)	$57,532,872	($5,945,233)	($42,860,656)
	Surplus	$5,395,706	$1,865,146	$4,181,855	$34,296,618		
	Total	$88,249,096	$11,872,473	$171,186	$91,829,490	($5,945,233)	($42,860,656)
Physical ARR	Profit	$112,609,140	$82,181,795	($2,468,152)	$66,458,939	($6,248,557)	($49,614,191)
	Surplus	$18,515,990	$7,110,576	$12,040,688	$47,753,635		
	Surplus from Self scheduled FTRs	$15,530,158	$3,073,711	$6,469,297	$42,513,186		
	Total	$131,125,130	$89,292,371	$9,572,536	$114,212,574	($6,248,557)	($49,614,191)
Total		$489,380,007	$174,981,788	$6,028,043	$536,385,456	$100,892,442	($113,614,490)

* Bilateral transactions are included in surplus allocation calculation but are not included in profits calculation

Table 13-29 shows the profit of the five most and the five least profitable participants by organization type. Total MWh is the sum of all MWh by organization type regardless of profitability. The Top 5 Profit is the sum of the profits of the five most profitable participants. The Top 5 Profit/MWh is the Top 5 Profit divided by the sum of the MWh of the top five participants. The Top 5 Market Share of MWh is the sum of the MWh of the top five participants divided by Total MWh. The Top 5 Profit Share Among Profitable Participants is the Top 5 Profit divided by the sum of the profits of all profitable participant. The same logic applies for the statistics related to the Bottom 5 participants. The All row includes all participants when calculating the share of the profits and losses of the top 5 and bottom 5 participants. When all participants across organization types are considered, all Top 5 participants are financial organizations and four of the Bottom 5 are financial organizations.

Table 13-29 Top five and bottom five FTR profits by organization type: 2019/2020: June through May

Organization Type	Total MWh	Top 5 Profit	Top 5 Profit/MWh	Top 5 Market Share in MWh	Top 5 Profit Share Among Profitable Participants	Bottom 5 Loss	Bottom 5 Loss/MWh	Bottom 5 Market Share in MWh	Bottom 5 Loss Share Among Unprofitable Participants
Financial	3,931,922,118	$89,007,553	$0.14	16.6%	41.7%	($195,290,524)	($0.32)	15.4%	83.2%
Financial without GreenHat	3,708,497,486	$89,007,553	$0.14	17.6%	41.7%	($156,621,839)	($0.32)	13.4%	83.2%
Physical	678,808,488	$17,046,097	$0.11	22.5%	60.0%	($35,569,644)	($0.30)	17.7%	49.9%
Physical ARR	538,204,167	$13,848,238	$0.07	38.3%	82.5%	($51,040,267)	($0.20)	47.9%	76.9%
All	5,148,934,773	$89,007,553	$0.14	12.7%	34.4%	($207,562,511)	($0.30)	13.5%	55.7%

Table 13-30 shows shares of profitable and unprofitable FTR MW by organization type. Financial organizations had more profitable FTRs than unprofitable FTRs in MW with and without inclusion of GreenHat's losses. Physical organizations and physical ARR organizations had more unprofitable FTRs than profitable FTRs.

41 Prior to 2018/2019 planning year, bilateral transactions were included and revenues from FTR sales were not included. Bilateral profits and losses net to zero in market total profits and losses.

Table 13-30 MW share by profitability by organization type

Organization Type	Unprofitable	Profitable
Financial	30.5%	69.5%
Financial without GreenHat	26.3%	73.7%
Physical	52.0%	48.0%
Physical ARR	56.7%	43.3%
Total	36.1%	63.9%

Revenue

Long Term FTR Auction Revenue

Table 13-31 shows the long term FTR auction revenue data by trade type, FTR direction, period type and class type. The 2020/2023 Long Term FTR Auction netted $37.1 million in revenue, $124.6 million less than the previous Long Term FTR Auction. Buyers paid $95.2 million and sellers received $58.1 million, down $91.7 million and up $32.9 million over the previous Long Term FTR Auction.

Table 13-31 Long Term FTR Auction Revenue: 2020/2023

			Class Type			
Trade Type	FTR Direction	Period Type	24-Hour	On Peak	Off Peak	All
Buy bids	Counter Flow	Year 1	($22,318,754)	($64,094,519)	($35,893,252)	($122,306,525)
		Year 2	($10,053,193)	($45,361,211)	($23,282,660)	($78,697,064)
		Year 3	($5,816,272)	($39,884,015)	($22,788,798)	($68,489,085)
		Total	($38,188,219)	($149,339,746)	($81,964,710)	($269,492,674)
	Prevailing Flow	Year 1	$34,035,144	$88,920,939	$44,375,798	$167,331,882
		Year 2	$33,923,568	$55,019,461	$24,420,131	$113,363,160
		Year 3	$31,256,422	$35,018,941	$17,692,459	$83,967,822
		Total	$99,215,134	$178,959,342	$86,488,388	$364,662,864
	Total		$61,026,915	$29,619,596	$4,523,678	$95,170,189
Sell offers	Counter Flow	Year 1	($345,042)	($7,063,939)	($4,715,412)	($12,124,394)
		Year 2	($3,967)	($2,702,642)	($1,305,526)	($4,012,135)
		Year 3	$0	($492,033)	($163,421)	($655,454)
		Total	($349,010)	($10,258,614)	($6,184,359)	($16,791,983)
	Prevailing Flow	Year 1	$1,513,534	$28,279,255	$13,924,800	$43,717,589
		Year 2	$397,614	$19,123,997	$8,943,235	$28,464,846
		Year 3	$9,539	$1,696,323	$1,010,952	$2,716,814
		Total	$1,920,687	$49,099,575	$23,878,987	$74,899,249
	Total		$1,571,677	$38,840,961	$17,694,628	$58,107,266
Total			$59,455,238	-$9,221,365	-$13,170,950	$37,062,923

Annual FTR Auction Revenue

Table 13-32 shows the Annual FTR Auction revenue by trade type, type, FTR direction and class type. The Annual FTR Auction for the 2020/2021 planning period generated $577.0 million, down 31.7 percent from $844.6 million in the 2019/2020 planning period, and down 29.9 percent from $822.6 million in the 2018/2019 planning period. Counter flow FTR holders received $253.0 million, down 13.7 percent from the previous planning period and prevailing flow FTR holders paid $830.0 million, down 27.0 percent from the previous planning period.

Table 13-32 Annual FTR auction revenue: 2020/2021

			Class Type			
Trade Type	Type	FTR Direction	24-Hour	On Peak	Off Peak	All
Buy bids	Obligations	Counter Flow	($33,669,551)	($144,579,601)	($109,871,559)	($288,120,710)
		Prevailing Flow	$210,560,033	$318,897,037	$161,800,503	$691,257,573
		Total	$176,890,482	$174,317,436	$51,928,944	$403,136,862
	Options	Counter Flow	$0	$0	$0	$0
		Prevailing Flow	$1,050,160	$26,657,118	$18,770,949	$46,478,226
		Total	$1,050,160	$26,657,118	$18,770,949	$46,478,226
	Total	Counter Flow	($33,669,551)	($144,579,601)	($109,871,559)	($288,120,710)
		Prevailing Flow	$211,610,193	$345,554,155	$180,571,452	$737,735,799
		Total	$177,940,642	$200,974,554	$70,699,893	$449,615,089
Self-scheduled bids	Obligations	Counter Flow	($773,070)	NA	NA	($773,070)
		Prevailing Flow	$151,477,251	NA	NA	$151,477,251
		Total	$150,704,181	NA	NA	$150,704,181
Buy and self-scheduled bids	Obligations	Counter Flow	($34,442,621)	($144,579,601)	($109,871,559)	($288,893,780)
		Prevailing Flow	$362,037,284	$318,897,037	$161,800,503	$842,734,824
		Total	$327,594,663	$174,317,436	$51,928,944	$553,841,043
	Options	Counter Flow	$0	$0	$0	$0
		Prevailing Flow	$1,050,160	$26,657,118	$18,770,949	$46,478,226
		Total	$1,050,160	$26,657,118	$18,770,949	$46,478,226
	Total	Counter Flow	($34,442,621)	($144,579,601)	($109,871,559)	($288,893,780)
		Prevailing Flow	$363,087,444	$345,554,155	$180,571,452	$889,213,050
		Total	$328,644,823	$200,974,554	$70,699,893	$600,319,270
Sell offers	Obligations	Counter Flow	($4,910,235)	($17,986,656)	($12,990,081)	($35,886,972)
		Prevailing Flow	$11,891,004	$29,297,370	$17,156,279	$58,344,652
		Total	$6,980,769	$11,310,713	$4,166,198	$22,457,680
	Options	Counter Flow	$0	$0	$0	$0
		Prevailing Flow	$0	$550,144	$313,778	$863,923
		Total	$0	$550,144	$313,778	$863,923
	Total	Counter Flow	($4,910,235)	($17,986,656)	($12,990,081)	($35,886,972)
		Prevailing Flow	$11,891,004	$29,847,514	$17,470,057	$59,208,575
		Total	$6,980,769	$11,860,858	$4,479,976	$23,321,603
Total			$321,664,054	$189,113,697	$66,219,916	$576,997,667

The total net of all buy and sell offers in the Annual FTR Auction, not including self scheduled FTRs, was $844.6 million for the 2019/2020 planning period and $577.0 million for the 2020/2021 planning period, a 31.7 percent decrease in revenue. The total buy bids were 611,878 MW for the 2018/2019 planning period and 556,034 MW for the 2019/2020 planning period. The revenue of FTRs per cleared MW decreased from $1,009.7 for the 2019/2020 planning period to $808.6 for the 20120/2021 planning period, a 23.8 percent decrease.

FTRs sold in Long Term FTR Auctions are sold at a substantial discount to the same FTR sold in Annual FTR Auctions. Table 13-33 shows the increase in total auction revenue that would have resulted for the 2014/2015 through 2020/2021 planning periods if long term FTRs were sold at annual auction clearing prices. This difference provides a good estimate of the value of the transmission capability made available in the Long Term FTR Auction that is not made available to ARR holders. This capability should be made available to ARR holders in the Annual FTR Auction where it is the most valuable.

Table 13-33 Estimated additional Long Term FTR Auction revenue at Annual FTR Auction prices

	Long Term FTR Product				
Planning Period	YR3	YR2	YR1	YRALL	Total Difference
2014/2015	$59,598,642	$30,284,173	$52,030,909	$926,989	$142,840,713
2015/2016	$67,896,588	$40,975,278	$9,936,078	$303,082	$119,111,026
2016/2017	$42,378,048	$3,854,373	$11,055,824	$1,079,901	$58,368,147
2017/2018	$6,134,076	($1,841,715)	$12,396,817	$227,524	$16,916,702
2018/2019	$7,872,604	$2,926,457	$13,480,353	($111,226)	$24,168,189
2019/2020	$9,711,188	$4,098,887	$103,227,004	$805,425	$117,842,504
2020/2021	($416,585)	$52,736,819	($9,690,808)	$1,242,707	$43,872,132
Total	$183,879,959	$76,198,567	$98,899,981	$2,426,270	$361,404,776

Monthly Balance of Planning Period FTR Auction Revenue

Table 13-34 shows monthly balance of planning period FTR auction revenue by trade type, type and class type for 2020. The Monthly Balance of Planning Period FTR Auctions for the 2019/2020 planning period netted $52.9 million in revenue, the difference between buyers paying $331.1 million and sellers receiving $278.2 million. For the entire 2018/2019 planning period, the Monthly Balance of Planning Period FTR Auctions netted $59.7 million in revenue with buyers paying $324.9 million and sellers receiving $265.2 million.

Table 13-34 Monthly Balance of Planning Period FTR Auction revenue: January through May, 2020

Monthly			Class Type			
Auction	Type	Trade Type	24-Hour	On Peak	Off Peak	All
Jan-20	Obligations	Buy bids	$2,722,807	$9,772,463	$5,897,569	$18,392,839
		Sell offers	$613,192	$6,329,072	$3,861,063	$10,803,327
	Options	Buy bids	$8,255	$506,682	$330,074	$845,010
		Sell offers	$57,206	$3,134,561	$1,844,982	$5,036,749
Feb-20	Obligations	Buy bids	$8,482,540	$7,009,196	$2,400,689	$17,892,426
		Sell offers	$554,350	$7,558,765	$3,516,954	$11,630,068
	Options	Buy bids	$0	$614,467	$273,334	$887,800
		Sell offers	$39,630	$3,015,705	$1,524,774	$4,580,110
Mar-20	Obligations	Buy bids	$5,723,624	$6,212,182	$2,869,495	$14,805,301
		Sell offers	$1,324,669	$5,356,343	$2,536,234	$9,217,245
	Options	Buy bids	$0	$385,671	$189,479	$575,150
		Sell offers	$46,986	$2,119,631	$1,384,310	$3,550,927
Apr-20	Obligations	Buy bids	$790,059	$4,183,958	$1,529,936	$6,503,953
		Sell offers	$41,448	$2,776,189	$734,853	$3,552,490
	Options	Buy bids	$0	$166,392	$110,528	$276,920
		Sell offers	$24,751	$1,253,544	$677,821	$1,956,117
May-20	Obligations	Buy bids	($20,781)	$2,228,724	$942,289	$3,150,231
		Sell offers	$35,292	$1,156,210	$447,672	$1,639,174
	Options	Buy bids	$2,796	$24,557	$15,889	$43,242
		Sell offers	$6,653	$738,265	$354,859	$1,099,777
2018/2019*	Obligations	Buy bids	$93,669,208	$132,488,450	$61,989,515	$288,147,173
		Sell offers	$11,150,630	$104,938,558	$61,964,081	$178,053,269
	Options	Buy bids	$4,501,727	$18,020,791	$14,189,999	$36,712,518
		Sell offers	$1,042,372	$54,821,585	$31,237,878	$87,101,835
	Net Total		$85,977,934	($9,250,902)	($17,022,444)	$59,704,587
2019/2020**	Obligations	Buy bids	$133,437,559	$129,554,826	$45,741,569	$308,733,954
		Sell offers	$7,250,257.25	$132,773,410	$66,392,916	$206,416,583
	Options	Buy bids	$567,551	$13,430,803	$8,397,321	$22,395,675
		Sell offers	$1,210,460	$44,320,769	$26,237,313	$71,768,541
	Net Total		$125,544,393	($34,108,549)	($38,491,339)	$52,944,505

* Shows Twelve Months for 2018/2019 **Shows twelve months for 2019/2020

FTR Target Allocations

FTR target allocations were examined separately by source and sink contribution. Hourly FTR target allocations were divided into those that were benefits and liabilities and summed by sink and by source. Figure 13-8 shows the 10 largest positive and negative FTR target allocations, summed by sink, for the 2019/2020 planning period. The top 10 sinks that produced financial benefit accounted for 31.2 percent of total positive target allocations with the Western Hub accounting for 12.1 percent of all positive target allocations.

The top 10 sinks that created liability accounted for 20.1 percent of total negative target allocations with Peach Bottom accounting for 3.6 percent of all negative target allocations.

Figure 13-8 Ten largest positive and negative FTR target allocations summed by sink: 2019/2020

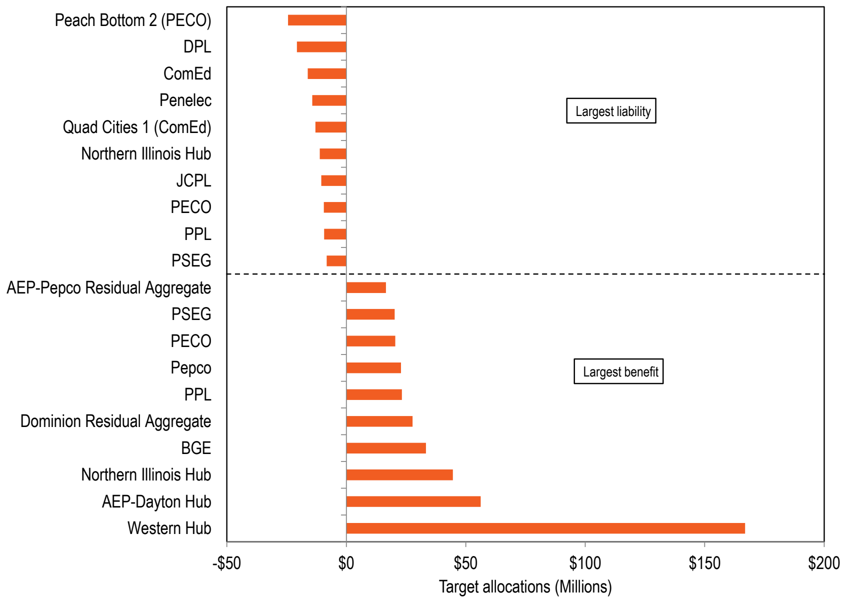
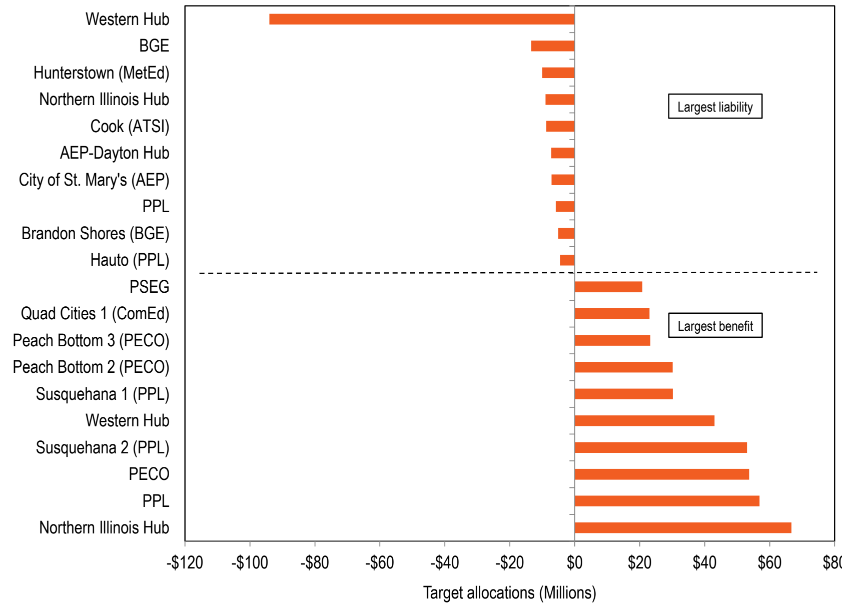


Figure 13-9 shows the 10 largest positive and negative FTR target allocations, summed by source, for the 2019/2020 planning period. The top 10 sources with a positive target allocation accounted for 29.0 percent of total positive target allocations with the Northern Illinois Hub accounting for 4.8 percent of total positive target allocations. The top 10 sources with a negative target allocation accounted for 24.2 percent of all negative target allocations, with the Western Hub accounting for 13.8 percent.

Figure 13-9 Ten largest positive and negative FTR target allocations summed by source: 2019/2020



Surplus Congestion Revenue

Beginning in the 2018/2019 planning period, surplus congestion revenue is distributed to ARR holders in proportion to their ARR target allocations.[42] This change to surplus congestion revenue recognizes that any surplus revenue is in part a result of unallocated system capability that belongs to ARR holders, not FTR holders. This change also recognizes that the surplus auction revenue is a result of the prices voluntarily paid by FTR buyers for FTRs and that the resulting revenue belongs solely to the sellers, the ARR holders. Nonetheless, this surplus congestion revenue was paid to FTR holders from the creation of ARRs through the 2017/2018 planning period. While the change in the treatment of surplus congestion revenue returns the value of some of the unallocated rights to ARR holders, it does not fully recognize that ARR holders own the rights to all congestion revenues.

42 163 FERC ¶61,165 (2018).

Surplus day-ahead congestion is the difference between the day ahead congestion collected and FTR target allocations. Surplus FTR auction revenue is the difference between the sum of monthly FTR auction revenue from the Long Term, Annual and monthly auctions, and ARR target allocations. Surplus FTR auction revenue can result from high prices in the FTR auctions, and can result from both FTR capacity sold in excess of assigned ARR capacity on specific paths, and FTR capacity sold on paths not available to ARR holders.

Surplus congestion revenue is the sum of the surplus day-ahead congestion revenue and the surplus FTR auction revenue at the end of each month. Beginning with the 2014/2015 planning period, may use surplus FTR auction revenue to pay for the clearing of counter flow FTRs as part of the auction clearing process.[43] The remaining surplus is first used to ensure that ARR target allocations in the month are fully funded. Any remaining surplus is used to pay any shortfall in FTR target allocations for the month. Any remaining surplus is used to pay any shortfall in FTR target allocations from prior months in the planning period. Any remaining surplus is used to pay any shortfall in FTR target allocations for subsequent months in the planning period. Any congestion surplus remaining at the end of the planning period is distributed to ARR holders based on their positive target allocations.

If, at the end of the planning period, all the surplus congestion revenue has been provided to FTR holders and target allocations for the year are not covered, an uplift charge is assigned to FTR holders to cover the net planning year deficiency. An individual participant's uplift charge allocation is the ratio of their share of net positive target allocations to the total net positive target allocations.

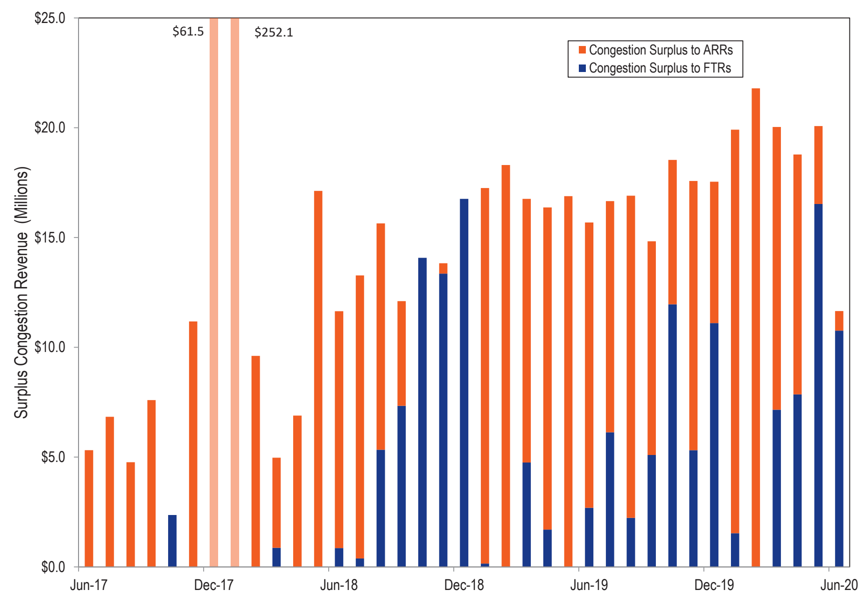
Prior to the 2017/2018 planning period, the surplus congestion revenue was not the simple sum of the surplus FTR auction revenue and surplus day-ahead congestion because there were various cross market charges subtracted from FTR revenue, including M2M and competing use charges, which reduced available surplus congestion revenue.

43 *See* "PJM Manual 6: Financial Transmission Rights," Rev. 23 (Sep. 1, 2019).

Figure 13-10 shows the distribution of the total monthly surplus congestion revenue to ARR and FTR holders if it were settled monthly.

The market rules should recognize that ARR holders have the right to all surplus congestion revenue, not just the remainder after funding FTRs. The MMU recommends that all FTR auction revenue and all surplus day-ahead congestion revenue be distributed directly to ARR holders on a monthly basis. In Figure 13-10 the amount represented by each bar would be assigned to ARR holders in every month. In late 2018, there were high target allocations with low congestion collected, resulting in the allocation of most or all of the surplus congestion revenue to FTR holders. This is an indication that too many FTRs were sold. In the 2019/2020 planning period, the current rules resulted in the payment of $88.4 million of surplus congestion revenue to FTR holders that should have been paid to ARR holders.

Figure 13-10 Monthly surplus congestion revenue distributed to ARR and FTR holders: June 2017 through June 2020[44]



44 The bars for December 2018 and January 2019 are truncated.

Figure 13-11 shows the surplus FTR auction revenue from the 2011/2012 planning period through the 2019/2020 planning period. Each new planning period introduces a new FTR model, including outages and PJM's discretionary adjustments for revenue adequacy. The differences in the assumptions in the market model can result in large differences in FTR auction surplus and ARR revenue from one planning period to another.

FTR auction revenue is the value that FTR buyers assign to congestion rights that belong to ARR holders. There is no logical or market based reason to assign any part of that auction revenue back to the FTR buyers. It is an unsupported wealth transfer. Auction revenue from the sale of FTRs should be distributed directly and completely to ARR holders. The MMU recommends that all FTR auction revenue be distributed to ARR holders on a monthly basis.

Figure 13-11 Monthly FTR auction surplus: 2011/2012 through 2019/2020

Table 13-35 shows the surplus FTR auction revenue, surplus day-ahead congestion revenue and surplus congestion revenue for planning periods 2010/2011 through the 2019/2020 planning period.

Table 13-35 Surplus FTR Auction Revenue: 2010/2011 through 2019/2020[45]

Planning Period	Surplus FTR Auction Revenue (Millions)	Surplus Day-Ahead Congestion (Millions	Surplus Congestion Revenue (Millions)
2010/2011	$29.7	($1,218.7)	($449.3)
2011/2012	$108.9	($460.3)	($192.5)
2012/2013	$66.7	($328.5)	($292.3)
2013/2014	$71.7	($715.3)	($678.7)
2014/2015*	$29.0	$139.8	$139.6
2015/2016	$29.6	$56.4	$42.5
2016/2017	$27.9	$97.1	$72.6
2017/2018	$27.4	$344.0	$371.2
2018/2019	$180.8	($68.5)	$112.3
2019/2020	$217.8	($87.9)	$140.7
Total	$789.5	($2,241.8)	($733.9)

*Start of counter flow "buy back"

Revenue Adequacy

FTR revenue adequacy simply compares congestion revenues to FTR target allocations. Target allocations define the maximum payments to FTRs but target allocations are not congestion. FTR revenue adequacy is not equivalent to the adequacy of ARRs as an offset for load against total congestion. A path specific target allocation is not a guarantee of payment.

Actual congestion revenues are unrelated to PJM's decisions about the FTR auction model. As a result, the fewer FTRs sold, the higher the probability that congestion will exceed the sum of the FTR target allocations. For example, PJM's subjective decision to reduce available system capability in FTR auctions for the 2014/2015 through 2016/2017 planning periods resulted in a high level of revenue adequacy. PJM's decisions have included the arbitrary use of higher outage levels and the decision to include additional constraints (closed loop interfaces) both of which reduced system capability in the FTR auction model. PJM's actions have led to a significant reduction in the allocation of Stage 1B and Stage 2 ARRs and therefore a reduction in available FTRs.

45 Total congestion surplus not equal to the sum of the columns in years prior to the 2017/2018 planning period because other charges were subtracted from the congestion surplus.

While PJM's arbitrary decision to increase outages in the ARR allocation and in the Annual FTR Auction reduced FTR revenue inadequacy, it did not address the Stage 1A ARR over allocation issue directly because Stage 1A ARR allocations cannot be prorated. PJM's actions for the 2014/2015 through 2016/2017 planning periods resulted in decreased Stage 1B ARR allocations, decreased Stage 2 ARR allocations and decreased FTR capability. The direct assignment of balancing congestion and M2M payments to load beginning in the 2017/2018 planning period increased the congestion revenue available to pay FTR holders. In response, PJM reduced the number of outages taken in the ARR allocation and in the Annual FTR Auction, increasing ARR allocations and FTR availability.

The current ARR/FTR design does not serve as an efficient way to ensure that load receives all the congestion revenues or has the ability to receive the auction revenues associated with all the potential congestion revenues. There are several reasons for the disconnect between congestion revenues and ARR/FTR revenues. The reasons include: the use of generation to load paths rather than a measure of total congestion to assign congestion revenue rights; the failure to provide to ARR holders the full system capability that is provided to FTR purchasers in the Long Term FTR Auction; unavoidable modeling differences such as emergency outages; avoidable modeling differences such as outage modeling decisions; and cross subsidies among and between FTR participants and ARR holders.

The September 15, 2016, FERC order increased the gap between congestion revenue and ARR/FTR revenue collected. The result of allocating balancing congestion and M2M payments to load, and allocating surplus congestion revenue, which includes excess day-ahead congestion revenue and FTR auction revenue, solely to FTR holders, increased revenue to FTRs and reduced payments to load. The May 31, 2018, FERC Order, effective for the 2018/2019 planning period, assigned surplus congestion revenue to ARR holders and increased payments to load, partially offsetting the impacts of the prior order.[46]

Revenue adequacy for ARRs is an almost meaningless concept. Revenue adequacy for ARRs means that FTR buyers collectively pay more than zero for FTRs in FTR auctions, and that those payments were received by ARR holders. Unsurprisingly, ARRs have been revenue adequate for every auction to date. ARR revenue adequacy has nothing to do with the adequacy of ARRs as an offset to total congestion. ARRs can be revenue adequate at the same time that ARRs return only half of congestion to load.

Total net FTR auction revenue for the 2018/2019 planning period, before accounting for self scheduling, load shifts or residual ARRs, was $907.6 million. The FTR auction revenue pays ARR holders' credits. For the 2019/2020 planning period, total net FTR auction revenue was $982.0 million.

Table 13-36 lists expected ARR target allocations from the Annual ARR Allocation and net revenue sources from the Long Term, Annual and Monthly Balance of Planning Period FTR Auctions for the 2018/2019 planning period and 2019/2020 planning periods.

Table 13-36 presents the PJM FTR revenue detail for the 2018/2019 planning period and the 2019/2020 planning period. In this table, under the new balancing congestion and M2M payment rules, any negative congestion is from day-ahead congestion and does not include balancing congestion. A negative deficiency is a surplus, which will be distributed to ARR holders at the end of the planning period, while a positive deficiency is a shortfall, which will be charged as FTR uplift at the end of the planning period.

46 163 FERC ¶61,165 (2018).

Table 13-36 Total annual PJM ARR and FTR revenue detail (Dollars (Millions)): 2018/2019 and 2019/2020

Accounting Element	2018/2019	2019/2020
ARR information		
ARR target allocations	$726.8	$752.2
ARR credits	$726.8	$752.2
FTR auction revenue	$907.6	$982.0
Annual FTR Auction net revenue	$822.6	$844.6
Long Term FTR Auction net revenue	$25.2	$84.5
Monthly Balance of Planning Period FTR Auction net revenue	$59.7	$52.9
Surplus auction revenue		
ARR Surplus	$180.8	$217.8
ARR payout ratio	100%	100%
FTR targets		
Positive target allocations	$1,137.6	$904.3
Negative target allocations	($234.2)	($224.3)
FTR target allocations	$903.3	$680.1
Adjustments:		
Adjustments to FTR target allocations	($2.1)	($6.5)
Total FTR targets	$901.2	$673.5
FTR payout ratio	100%	100%
FTR revenues		
ARR excess	$180.8	$217.8
Congestion		
Net Negative Congestion (enter as negative)	$0.0	$0.0
Hourly congestion revenue	$832.7	$596.4
M2M Payments(credit to PJM minus credit to M2M entity)	$0.0	$0.0
Adjustments:		
Surplus revenues carried forward into future months	$6.5	$0.0
Surplus revenues distributed back to previous months	$0.0	$0.0
Other adjustments to FTR revenues	$0.0	$0.0
Total FTR revenues		
Surplus revenues distributed to other months	$6.5	$0.0
Net Negative Congestion charged to DA Operating Reserves	$0.0	$0.0
Total FTR congestion credits	$1,020.0	$814.2
Total congestion credits(includes end of year distribution)	$1,020.0	$814.2
Remaining deficiency	($112.3)	($140.7)

FTR target allocations are based on hourly CLMP differences in the day-ahead energy market for FTR paths. FTR credits are paid to FTR holders and, depending on market conditions, can be less than the target allocations but are capped at target allocations. Table 13-37 lists the FTR revenues, target allocations, credits, payout ratios, congestion credit deficiencies and excess congestion charges by month.

The total row in Table 13-37 is not the sum of each of the monthly rows because the monthly rows may include excess revenues carried forward from prior months and excess revenues distributed back from later months. October and December 2018 had revenue shortfalls totaling $6.5 million, but were fully funded using excess revenue from previous months.

Table 13-37 Monthly FTR accounting summary (Dollars (Millions)): 2018/2019 and 2019/2020

Period	FTR Revenues (with adjustments)	FTR Target Allocations	FTR Payout Ratio (original)	FTR Credits (with adjustments)	FTR Payout Ratio (with adjustments)	Monthly Credits Surplus/Deficiency (with adjustments)
Jun-18	$106.8	$96.0	100.0%	$106.8	100.0%	($10.8)
Jul-18	$84.1	$71.3	100.0%	$84.1	100.0%	($12.9)
Aug-18	$84.8	$74.6	100.0%	$84.8	100.0%	($10.3)
Sep-18	$107.3	$102.8	100.0%	$107.3	100.0%	($4.8)
Oct-18	$109.1	$113.8	95.9%	$113.8	100.0%	$4.7
Nov-18	$83.0	$82.5	100.0%	$83.0	100.0%	($0.5)
Dec-18	$79.8	$81.9	97.5%	$81.9	100.0%	$1.8
Jan-19	$138.0	$120.9	100.0%	$138.0	100.0%	($17.1)
Feb-19	$53.1	$34.8	100.0%	$53.1	100.0%	($18.3)
Mar-19	$61.8	$49.8	100.0%	$61.8	100.0%	($12.3)
Apr-19	$41.8	$27.1	100.0%	$41.8	100.0%	($14.8)
May-19	$63.9	$47.0	100.0%	$63.9	100.0%	($17.0)
			Summary for Planning Period 2018/2019			
Total	$1,013.5	$902.5		$1,020.2		($112.3)
Jun-19	$52.1	$39.4	100.0%	$52.1	100.0%	($13.0)
Jul-19	$91.7	$82.0	100.0%	$91.7	100.0%	($10.5)
Aug-19	$57.1	$42.8	100.0%	$57.1	100.0%	($14.7)
Sep-19	$83.4	$73.6	100.0%	$83.4	100.0%	($9.7)
Oct-19	$91.1	$84.5	100.0%	$91.1	100.0%	($6.6)
Nov-19	$84.6	$72.3	100.0%	$84.6	100.0%	($12.3)
Dec-19	$80.6	$74.1	100.0%	$80.6	100.0%	($6.4)
Jan-20	$63.2	$44.8	100.0%	$63.2	100.0%	($18.4)
Feb-20	$50.0	$28.2	100.0%	$50.0	100.0%	($21.8)
Mar-20	$51.4	$38.5	100.0%	$51.4	100.0%	($12.9)
Apr-20	$42.9	$32.0	100.0%	$42.9	100.0%	($10.9)
May-20	$66.2	$62.7	100.0%	$66.2	100.0%	($3.5)
			Summary for Planning Period 2019/2020			
Total	$814.2	$674.9		$540.5		($140.7)

Figure 13-12 shows the original PJM reported FTR payout ratio by month, excluding excess revenue distribution, for January 2004 through June 2020. The months with payout ratios above 100 percent have congestion revenue greater than the target allocations and the months with payout ratios under 100 percent have congestion revenue that is less than the target allocations. Figure 13-12 also shows the payout ratio after distributing surplus congestion revenue across months within the planning period. The payout ratio for revenue inadequate months in the current planning period may change if surplus congestion revenue is collected in the remainder of the planning period.

Figure 13-12 FTR payout ratio by month, excluding and including excess revenue distribution: January 2004 through June 2020

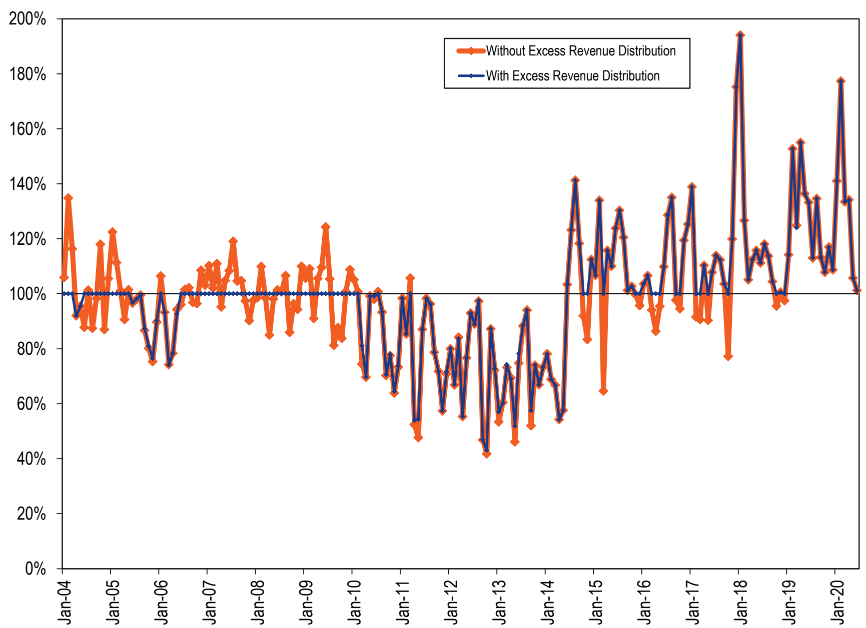


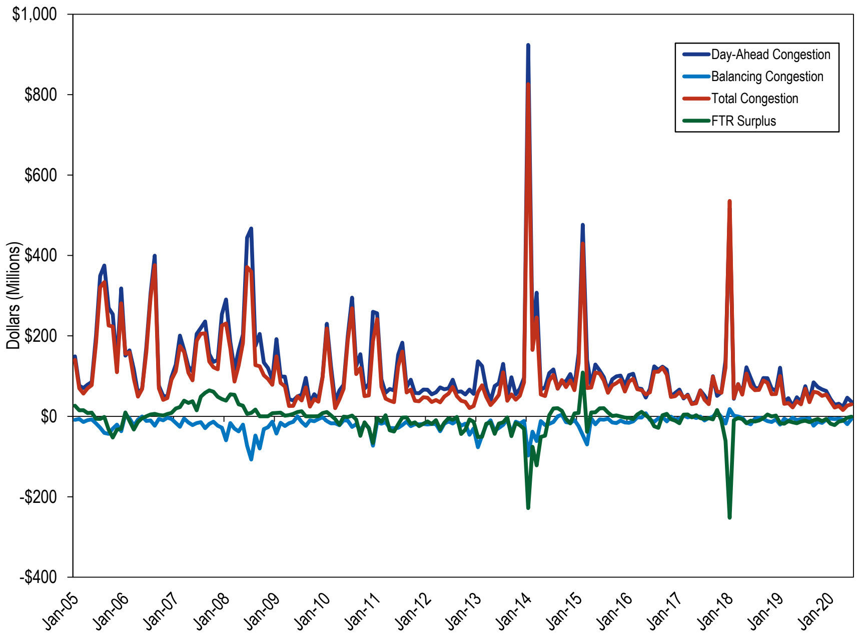
Table 13-38 shows the FTR payout ratio by planning period from the 2003/2004 planning period forward. Planning periods with a payout ratio over 100 percent are listed at 100 percent. Planning period 2013/2014 includes the additional revenue from unallocated congestion charges from Balancing Operating Reserves. For the 2014/2015, 2015/2016 and 2016/2017 planning periods, there was surplus congestion revenue paid to FTR holders pro rata in proportion to their net positive target allocations, resulting in a payout ratio of 116.2 percent, 106.8 and 113.1 percent for the planning periods.

Table 13-38 PJM reported FTR payout ratio by planning period

Planning Period	FTR Payout Ratio
2003/2004	97.7%
2004/2005	100.0%
2005/2006	90.7%
2006/2007	100.0%
2007/2008	100.0%
2008/2009	100.0%
2009/2010	96.9%
2010/2011	85.0%
2011/2012	80.6%
2012/2013	67.8%
2013/2014	72.8%
2014/2015	100.0%
2015/2016	100.0%
2016/2017	100.0%
2017/2018	100.0%
2018/2019	100.0%
2019/2020	100.0%

Figure 13-13 shows the FTR surplus, day-ahead, balancing and total congestion payments from January 2005 through June 2020.

Figure 13-13 FTR surplus and day-ahead, balancing and total congestion: January 2005 through June 2020



ARRs as an Offset to Congestion for Load

Load pays for the transmission system and pays congestion revenues. FTRs, and later ARRs, were intended to return congestion revenues to load. With the implementation of the current, path based FTR/ARR design, the purpose of FTRs has been subverted. The inconsistencies between actual network solutions used to serve load and path based rights available to load cause a misalignment of congestion collected from ARR holders and the congestion that is collectable by the same ARR holders. These inconsistencies between actual network use and path based rights cause cross subsidies among ARR holders and between ARR holders and FTR holders. The result of this misalignment is individual zones with vastly different offsets due to cross subsidies between zones based on the location of their path based ARRs compared to their actual congestion costs.

Table 13-39 shows the ARR and FTR revenue paid to load, the congestion offset available to load with and without allocating balancing congestion to load and the congestion offset when surplus congestion revenue is allocated to load. Offsets highlighted are the actual offsets based on the effective rules in that planning period. The pre 2017/2018 offset is calculated as the ARR credits and the FTR credits excluding balancing congestion and M2M payments, divided by the total day-ahead congestion and the load share of balancing and M2M payments. The 103.6 percent payout ratio in the 2016/2017 planning period, which was the last planning period before balancing congestion was assigned to load, is likely due to PJM selecting an overly conservative ARR/FTR model to improve FTR revenue adequacy. The 2017/2018 offset is the sum of the ARR credits, adjusted FTR credits and the load share of balancing congestion and M2M payments. The post 2017/2018 offset is calculated identically to the 2017/2018 offset, but includes any surplus congestion revenue remaining in the planning period. FTRs are fully funded before ARR holders have access to the surplus, so in planning periods with revenue inadequacy there is no difference between 2017/2018 and post 2017/2018. In planning periods that are fully funded, the surplus goes to load, and provides an increased congestion offset.

The allocation of balancing congestion and M2M payments to load went into effect in the 2017/2018 planning period. If these rules had been in place beginning with the 2011/2012 planning period, ARR holders would have received a total of $1,305.1 million less in congestion offsets from the 2011/2012 through the 2018/2019 planning period. The total overpayment to FTR holders for the 2011/2012 through 2018/2019 planning period would have been $1,427.4 million.

If the surplus revenue available for the 2019/2020 planning period were distributed to ARR holders, total ARR and self scheduled FTR revenue would offset 138.8 percent, and 111.2 percent without distribution of surplus revenue, of total congestion costs for the 2019/2020 planning period. For the 2019/2020 planning period, FTR bidders paid more in the auctions than actual day-ahead target allocations for the same paths. This resulted in an offset over 100 percent because the resulting ARR value was above congestion costs. This has not happened previously, and is a result of a potentially unexpected reduction in day-ahead target allocations compared to FTR bid prices.

percentage has increased since the 2014/2015 planning period. However, the cumulative shortfall in dollars decreased only in the 2019/2020 planning period. The cumulative offset would have been 67.8 percent if the current rules had been in place for the entire period.

Table 13-39 ARR and FTR total congestion offset (in millions) for ARR holders: 2011/2012 through 2019/2020

	Revenue						Pre 2017/2018 (Without Balancing)		2017/2018 (With Balancing)		Post 2017/2018 (With Surplus)	
Planning Period	ARR Credits	FTR Credits	Day Ahead Congestion	Balancing + M2M Congestion	Total Congestion	Surplus Revenue	Total ARR/ FTR Offset	Percent Offset	Current Revenue Received	Percent Offset	New Revenue Received	New Offset
2011/2012	$512.2	$249.8	$1,025.4	($275.7)	$749.7	($192.5)	$762.0	101.6%	$598.6	79.8%	$563.0	79.8%
2012/2013	$349.5	$181.9	$904.7	($379.9)	$524.8	($292.3)	$531.4	101.3%	$275.9	52.6%	$257.5	52.6%
2013/2014	$337.7	$456.4	$2,231.3	($360.6)	$1,870.6	($678.7)	$794.0	42.4%	$574.1	30.7%	$623.1	30.7%
2014/2015	$482.4	$404.4	$1,625.9	($268.3)	$1,357.6	$139.6	$886.8	65.3%	$686.6	50.6%	$715.0	52.7%
2015/2016	$635.3	$223.4	$1,098.7	($147.6)	$951.1	$42.5	$858.8	90.3%	$744.8	78.3%	$745.2	78.4%
2016/2017	$640.0	$169.1	$885.7	($104.8)	$780.8	$72.6	$809.1	103.6%	$727.7	93.2%	$763.8	97.8%
2017/2018	$427.3	$294.2	$1,322.1	($129.5)	$1,192.6	$371.2	$721.5	60.5%	$595.7	50.0%	$886.5	74.3%
2018/2019	$529.1	$130.1	$832.7	($152.6)	$680.0	$112.3	$675.93	99.4%	$530.8	78.1%	$626.3	92.1%
2019/2020	$542.0	$91.9	$612.1	($160.4)	$442.7	$140.7	$652.54	147.4%	$492.1	111.2%	$614.2	138.8%
Total	$4,455.5	$2,201.1	$10,538.4	($1,979.5)	$8,550.0	($284.6)	$6,692.0	78.3%	$5,226.5	61.1%	$5,794.8	67.8%

Table 13-39 demonstrates the inadequacies of the ARR/FTR design. The goal of the design should be to give the rights to 100 percent of the congestion revenues to the load.

The cumulative offset, beginning in the 2011/2012 planning period, is the sum of the revenue received for that planning period and all previous planning periods divided by the total congestion for that planning period and all previous planning periods. The cumulative shortfall is the cumulative difference between the ARR holders' revenue and the congestion they paid, for the planning period and prior planning periods.

Table 13-40 shows the cumulative offset and shortfall, assuming the rules implemented in the 2017/2018 planning period. The cumulative offset

Table 13-40 ARR and FTR cumulative offset for ARR holders using 2018/2019 surplus allocation: 2011/2012 through 2019/2020

Planning Period	Cumulative Offset	Cumulative Shortfall (Millions)
2011/2012	79.8%	($151.1)
2012/2013	68.6%	($400.0)
2013/2014	46.1%	($1,696.5)
2014/2015	48.1%	($2,339.1)
2015/2016	53.3%	($2,544.9)
2016/2017	58.9%	($2,561.9)
2017/2018	61.4%	($2,868.0)
2018/2019	64.0%	($2,921.8)
2019/2020	67.8%	($2,750.2)

Table 13-41 shows the cumulative offset and shortfall using the rules that were effective in the given planning period to calculate the ARR/FTR revenue. The cumulative offset was 75.8 percent based on the rules that were in place for each planning year.

Table 13-41 ARR and FTR cumulative offset for ARR holders using effective surplus allocation rules: 2011/2012 through 2019/2020

Planning Period	Cumulative Offset	Cumulative Shortfall (Millions)
2011/2012	101.6%	$12.3
2012/2013	101.5%	$18.9
2013/2014	66.4%	($1,057.7)
2014/2015	66.1%	($1,528.5)
2015/2016	70.3%	($1,620.9)
2016/2017	74.5%	($1,592.6)
2017/2018	70.5%	($2,189.5)
2018/2019	72.3%	($2,243.2)
2019/2020	75.8%	($2,071.6)

Zonal ARR Congestion Offset

ARRs are allocated to zonal load based on historical generation to load transmission paths, in many cases based on pre 1999 paths. ARRs are allocated within zones based on zonal base load (Stage 1A) and zonal peak loads (other Stages). ARR revenue is the result of the prices that result from the sale of FTRs through the FTR auctions. ARR revenue for each zone is the revenue for the ARRs that sink in each zone.

Congestion paid by load in a zone is the total difference between what the zonal load pays in congestion charges net of payments to the generation that serves the zonal load, including generation in the zone and outside the zone.[47]

Table 13-42 shows the congestion offsets paid to load: FTR auction revenue; self scheduled FTR revenue; and the allocation of end of planning year surplus. The offset for the 2019/2020 planning period assigns the current surplus revenue at the end of the quarter to ARR holders Table 13-42 also shows payments by load for balancing congestion and M2M payments. The total congestion offset paid to load is the sum of all of those credits and charges.

Table 13-42 shows day-ahead congestion and balancing congestion and M2M charges paid by load in each zone.[48]

The zonal offset percentage shown in Table 13-42 is the sum of the congestion related revenues (offset) paid to load in each zone divided by the total congestion payment made by load in each zone.

47 *See* "Constraint Based Congestion Calculations," PJM ARR FTR Market Task Force (July 17, 2020) <https://www.pjm.com/-/media/committees-groups/task-forces/afmtf/2020/20200722/20200722-item-03a-constraint-based-congestion-calculations.ashx>.

48 See *2019 State of the Market Report for PJM*, Volume 2, Section 11: Congestion and Marginal Losses

Table 13-42 Zonal ARR and FTR total congestion offset (in millions) for ARR holders: 2019/2020 planning period

Zone	ARR Credits	FTR Credits	Balancing+ M2M Charge	Surplus Allocation	Total Offset	Day Ahead Congestion	Balancing Congestion	M2M Payments	Total Congestion	Offset
AECO	$7.8	$0.0	($2.1)	$1.4	$7.2	$5.8	($1.5)	($0.4)	$3.8	187.5%
AEP	$68.3	$25.0	($23.2)	$31.2	$101.4	$110.1	($21.0)	($4.8)	$84.3	120.3%
APS	$42.6	$10.8	($9.0)	$11.8	$56.2	$42.4	($7.7)	($1.9)	$32.8	171.0%
ATSI	$35.1	$0.1	($12.5)	$6.5	$29.2	$50.7	($10.2)	($2.6)	$37.9	77.0%
BGE	$63.5	$3.0	($6.2)	$12.4	$72.6	$21.9	($4.9)	($1.3)	$15.7	461.9%
ComEd	$54.0	$9.0	($20.8)	$11.9	$54.1	$85.0	($14.5)	($4.3)	$66.2	81.7%
DAY	$11.0	$0.4	($3.1)	$2.1	$10.5	$13.6	($2.9)	($0.6)	$10.1	103.8%
DEOK	$34.3	$3.3	($5.0)	$8.2	$40.8	$20.9	($4.5)	($1.0)	$15.4	265.4%
DLCO	$5.9	$0.1	($2.6)	$1.0	$4.4	$8.3	($2.1)	($0.7)	$5.5	80.1%
Dominion	$5.3	$29.5	($19.7)	$12.4	$27.5	$76.1	($16.2)	($0.5)	$59.4	46.3%
DPL	$49.3	$1.0	($3.5)	$9.4	$56.2	$26.1	($2.9)	($4.1)	$19.0	294.9%
EKPC	$2.3	$0.0	($2.1)	$0.4	$0.6	$10.3	($2.2)	($0.4)	$7.7	8.4%
EXT	$1.9	$0.0	$0.0	$0.4	$2.2	$0.5	($2.2)	$0.0	($1.7)	(134.5%)
JCPL	$5.8	$0.1	($4.2)	$1.1	$2.9	$13.8	($3.4)	($0.9)	$9.6	29.8%
Met-Ed	$7.0	$0.6	($2.8)	$1.4	$6.2	$12.8	($3.3)	($0.6)	$9.0	69.0%
OVEC	$0.0	$0.0	$0.0	$0.0	$0.0	$0.5	$0.1	$0.0	$0.5	0.0%
PECO	$23.6	$0.3	($7.8)	$4.4	$20.5	$21.6	($6.0)	($1.6)	$14.0	147.0%
PENELEC	$13.8	$4.7	($3.0)	$3.3	$18.8	$14.6	($2.8)	($0.6)	$11.2	168.7%
Pepco	$46.2	$2.0	($6.1)	$5.7	$47.8	$19.9	($4.5)	($1.3)	$14.1	338.7%
PPL	$27.9	$1.9	($7.0)	$7.0	$29.6	$29.0	($6.2)	($1.5)	$21.3	139.0%
PSEG	$35.9	$0.0	($8.8)	$8.5	$35.6	$27.3	($6.5)	($1.8)	$19.0	187.3%
RECO	$0.7	$0.0	($0.3)	$0.1	$0.6	$1.0	($0.2)	($0.1)	$0.7	88.1%
Total	$542.0	$91.9	($149.9)	$140.7	$624.7	$612.1	($125.6)	($31.0)	$455.4	137.2%

The total congestion offset paid to loads in the 2019/2020 planning period would be 137.2 percent of congestion costs if the surplus revenue available were distributed to ARR holders.[49] The results vary significantly by zone. Loads in some zones, like BGE, receive substantially more in offsets than their total congestion payments. Loads in other zones, like JCPL, receive substantially less in offsets than their total congestion payments. The offsets are a function of the assignment of ARRs and the valuation of ARRs in the FTR auctions. Loads in some zones, like EKPC, pay balancing and M2M charges resulting in an offset that appears negative. The EXT Zone is a set of external interfaces (MISO, DUKEXP and CPLEEXP) that are allocated ARRs (the allocated ARRs sink at the external interface) based on agreements with PJM. There is no PJM billable load associated with these ARR positions. EXT is paid ARR credits based on ARR assignments, but the offsets are less than the negative balancing congestion allocated to EXT.

49 The 128.6 percent offset result is not identical to the 129.1 percent offset included in this section as a result of rounding and of the inclusion of only the M2M charges assigned to load in this table.

Credit

There were no collateral defaults in the first six months of 2020. There were 20 payment defaults in the first six months of 2020 not involving GreenHat Energy, LLC for a total of $12,644. GreenHat Energy continued to accrue payment defaults of $15.1 million in the first six months of 2020 for a total of $162.1 million in defaults to date, which will continue to accrue through May 2021, including the auction liquidation costs.[50] In addition, PJM added the settlement fee and claimant payee funds to the default allocation, resulting in allocations of $12.5 million and $5.0 million for a total of $179.6 million.

GreenHat Settlement Proceedings

On June 5, 2019, FERC issued an order that established a paper hearing and settlement judge procedures regarding the GreenHat liquidation waiver request.[51] FERC recognized "…there are multiple complexities associated with implementing the Waiver Order Directive that should be addressed in a paper hearing…"[52] Before the paper hearing began, FERC established a settlement procedure to "…encourage the parties to make every effort to settle their disputes before the paper hearing commences."[53]

- By delegated order issued December 30, 2019, the Commission approved a settlement agreement between PJM and the interested parties.[54] The result of the settlement is a release of all claims of harm resulting from

50 See the *2019 Quarterly State of the Market Report for PJM: January through June* for a more complete explanation of credit issues that occurred in 2019.
51 On June 21, 2018, GreenHat Energy, LLC was declared in payment default for non-payment of a $1.2 million weekly invoice on June 5, 2018. GreenHat had been declared in default twice earlier in June 2018 for two collateral calls totaling $2.8 million. Daugherty, Suzanne, email sent to the MC, MRC, CS, and MSS email distribution list, "Notification of GreenHat Energy, LLC Payment Default," (June 22, 2018).
52 See 167 FERC ¶ 61, 2019 at P 27 (2019).
53 See *Id.* at P 28.
54 See 169 FERC ¶ 61,260 (2019).

the July auction liquidation of GreenHat's portfolio, the payment of $12.5 million directly to two participants, and payment of up to $5 million total to participants that can show economic harm from PJM's actions during the July auction.

This settlement, requiring up to $17.5 million in payments, will be recovered via the default allocation assessment fund, which is allocated to all PJM members in proportion to their total net bill.

Default Portfolio Considerations

Under the method applied to the GreenHat default, when an FTR participant defaults on their positions, their portfolio remains in the FTR market. This portfolio will continue to accrue revenues and/or charges and must be reconciled. The current method to reconcile defaulted portfolios is that, while the defaulting participant is barred from the market, PJM treats the positions as unchanged, lets the positions settle at day-ahead prices, and charges any net losses to the default allocation assessment. This method exposes all members in PJM to an uncertain charge for the default allocation assessment that will not be known until those FTRs settle.

The MMU recommends cancelling the FTRs in the defaulting portfolio rather than holding or liquidating them. This would release the capacity in the portfolio back to the FTR market. The market would then decide the value of the capacity released and the timing of its release. There is no discretion necessary to settle the defaulted position and the losses are contained within the ARR/FTR market.

Cancellation of a defaulting portfolio does not change congestion. Cancellation of a defaulting portfolio can affect ARR/FTR funding as a result of changes in auction revenue, changes in the net target allocations, and potential simultaneous feasibility violations, while any collateral collected from the defaulted participant is available to offset losses from the cancelled FTRs. However, PJM can and does address similar issues routinely. PJM has tools available, such as the counter flow buyback and Stage 1A over allocation rules, and uses them regularly in the Annual FTR Auction, to improve funding as well as address feasibility concerns. Cancellation of FTRs isolates the costs of the default to those participating in and benefitting from the FTR market.

FTR Forfeitures

Hourly FTR Cost

When the FTR forfeiture rule is triggered, only the related hourly profits are forfeited. The profit is calculated as the hourly FTR target allocation minus the FTR's hourly cost. On June 24, 2019, PJM implemented a new method to properly calculate the hourly cost of an FTR only for hours in which it is effective.[55]

FERC Order on FTR Forfeitures

After January 19, 2017, a modified FTR forfeiture rule was applied.[56] This rule considers the impact of a participant's net virtual transaction portfolio on all constraints. If a participant's net virtual portfolio impacts a constraint by the greater of 0.1 MW or 10 percent or more of the line limit, and that constraint affects an individual FTR's target allocation by $0.01, the FTR is subject to FTR forfeiture if the net virtual portfolio increased the value of the FTR. FTR forfeitures do not result from net virtual portfolios that decrease the value of their affiliates' FTRs. The forfeiture amount calculation is the hourly profit of the FTR and an FTR cannot forfeit more than once per hour.

Figure 13-14 shows the monthly FTR forfeitures under the modified FTR forfeiture rule from January 19, 2017, through May 31, 2020. PJM began retroactively billing FTR forfeitures with the September 2017 bill. In the interim period from January 2017 through September 2017 participants did not know what behaviors were causing FTR forfeitures, so they had no way to modify their bidding behavior to avoid FTR forfeitures. After September 2017, FTR forfeitures were down significantly, and stabilized, as participants could now see the effect of their activities on FTR forfeitures. Beginning with the September 2019 bill, PJM began billing using the correct hourly cost calculation. For the period of January 19, 2017, through June 30, 2020, total FTR forfeitures were $20.9 million.

55 *See* "Minor modification to Tariff Language for FTR Forfeiture Rule," Docket No. ER19-2240 (June 24, 2019).
56 See *2019 State of the Market Report for PJM*, Volume 2, Section 13: Financial Transmission Rights for the history.

Figure 13-14 Monthly FTR forfeitures for physical and financial participants