Financial Transmission and Auction Revenue Rights

In an LMP market, the lowest cost generation is dispatched to meet the load, but when there are transmission constraints, load pays the high local price for all generation, including the low cost generation serving part of that load. The low cost generation receives payment only for its low local price and does not receive the payment made by load for the output of the low cost generation at the high local price. The result is that load pays the correct local price but pays too much in total for energy because it is paying more for the low cost generation than the low cost generation receives. Load pays the difference between the high local price and the low local price of the low cost generation. That payment is appropriately not made to the low cost generation which is paid its LMP. In an LMP market, load pays more than generation receives. FTRs are the mechanism for returning those excess payments to load. But the current FTR mechanism in PJM does not and cannot return all the excess payments to load. The FTR mechanism in PJM needs a significant redesign in order to achieve that objective. The FTR mechanism has become unduly complicated and has deviated significantly from its original purpose. Return of all the excess payments to load would result in a perfect hedge against congestion. The current FTR mechanism has significantly attenuated the value of the FTR/ARR design as a hedge against congestion for load.

The FTR mechanism should be a simple accounting method for assigning congestion rights to load. But PJM has had to add increasingly complex rules and regularly intervene in the FTR mechanism because the PJM FTR design has moved further and further from these economic fundamentals. Some market participants have profited in various ways from these design flaws and those market participants now strongly defend the current design.

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, both 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 to intrazonal load 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 combined day-ahead and balancing (real-time) markets. FTRs permitted the loads, which pay for the transmission system, to continue to receive the benefits of access to either local or remote low cost generation by returning 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 was required to pay more for low cost generation than is paid to low cost generation. But there was a flaw built in from the very beginning of the FTR design that had no significant impact initially but which was ultimately the source of all the issues with the FTR mechanism. That flaw was the idea that congestion was based on contract paths in a network system rather than a result of the actual operation of the complex network. The flaw was especially ironic given that most load was served by intrazonal generation subject to cost of service regulation rather than contracts with extrazonal generation. That flaw was inconsistent with the most basic logic of LMP and the resultant fissure has continued to widen. The origin of FTRs was the recognition that the way to hold load harmless from making the excess payments created by the LMP system was to return the excess payments to load. The rights to congestion belong to load. If implemented correctly, FTRs would be the financial equivalent of firm transmission service for load. If implemented correctly, FTRs would be a perfect hedge against congestion for load. The result of the current FTR mechanism is a significant reduction in the value of FTRs as a hedge for load.

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

The notion that FTRs exist in order to provide a hedge for generation is a fallacy. In an LMP system, the basic incentive structure for generation derives from the fact that generation is paid the LMP at the generator bus. If generation were to be guaranteed a price at a distant constrained load bus rather than at the generation bus, there would be no incentive for generation to locate where it is needed on the system. In addition, the payment of the price at the generator bus is fundamental to the logic of locational marginal pricing which produces local prices equal to the marginal value of generation at every point. There is no logical or theoretical basis in locational marginal pricing for the assertion that generation at low price nodes is underpaid and should be paid more from congestion dollars. Generation does not pay congestion. Some generation receives a price lower than the system marginal price (SMP) and some generation receives a price greater than SMP but that does not mean that generation is paying congestion. It means that generation is being paid an LMP that is higher or lower than the system load-weighted average LMP. If a generating unit wants a hedge, it may enter into an arm's length transaction with a willing counter party as a hedge. That is the way hedges work in markets. That is not the purpose of FTRs.

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 or, more precisely, that the rights to all congestion revenues are assigned to load. In order to do that, congestion must be defined correctly based on the operation of the network and not on arbitrary contract paths.

Effective April 1, 1999, when 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 (real-time) congestion to load. Congestion, in PJM's two settlement market, is the sum of day ahead and balancing congestion. 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. But the actual implementation produces a very different result.

ARRs were an add on concept, defined based on a misunderstanding of FTRs, which had its roots in the assignment of congestion to load using contract paths (generation to load paths) rather than on the calculation of congestion actually paid. ARRs used assumed contract paths to assign congestion to load. The use of contract paths for ARRs was a more critical mistake than using contract paths for FTRs because contract paths did not and do not account for all congestion. The use of contract paths led to the mistaken conclusion that some congestion did not belong to load and could be sold to FTR buyers. The ARR concept, as it is currently implemented, does not allow the FTR sellers, load, to establish a price at which they are willing to sell, but forces load to accept whatever prices buyers are willing to pay. The revenue from the sale of congestion rights is not even paid in full to ARR holders. Sellers are required to return some of the cleared auction revenue to FTR buyers when FTR profits are not adequate. So called surplus revenue is paid to FTR holders to ensure payment despite the fact that willing FTR buyers paid the revenues in the auction for the rights to an uncertain level of congestion.

The use of generation to load contract paths rather than the direct calculation of congestion led to an increased divergence between the congestion on

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

the generation to load contract paths and total congestion. This divergence between actual network use and historic contract paths was exacerbated as new zones were added with their own historic generation to load contract paths and as significant numbers of generating units retired and new units were added.[3] Rather than understanding that the divergence resulted from the fact that a contract path based approach did not correctly calculate congestion in a network system, especially as the system grew significantly, the issue was characterized as the existence of excess capacity on the transmission system. But congestion was never about capacity on the transmission system. Prior to the introduction of ARRs, the so called excess congestion that exceeded the congestion on the defined contract paths was returned to load, regardless of its source. There is no such thing as excess congestion. The overlay of ARRs on the FTR concept did not change the fundamental logic of congestion, but permitted the introduction of a system in which the divergence was formally created between the amount of congestion paid by load and the amount of congestion returned to load. Congestion belongs to the load, by definition. The introduction of ARRs based on a contract path fiction undermined the assignment of all congestion rights to load.

The contract path fiction is also the source of the incorrect definition of the product that is bought and sold as FTRs, the available supply of the product and the price paid to the buyers of the product. The product is defined as the difference in congestion prices across specific transmission contract paths. The difference in congestion prices across contract paths is not congestion and is not equal to congestion revenues. The quantity of the product made available for sale in the FTR auctions is defined as system capability, meaning the capacity of the transmission system to deliver power. But system capability is not congestion and system capability is not the difference in congestion prices across transmission contract paths nor the potential for such difference. The definition of ARRs based on contract paths led to the mistaken idea that some transmission system capacity was used by ARRs but some was not and that both the ARR capability and the excess capability was available for sale as FTRs. This fundamental confusion in the design of the market is the source of so called revenue shortfalls, of the redesign of the market to exclude balancing congestion, and of the need for PJM to intervene in the market. PJM has had to regularly intervene in the market because the market as designed cannot reach equilibrium based on the economic fundamentals. The product, the quantity of the product and the price of the product are all incorrectly defined.

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 fact that ARR holders cannot set the sale price for congestion revenue rights, the return of market revenues to FTR buyers when profit targets are not met, the failure to assign all FTR auction revenues to ARR holders, the differences between modeled and actual system capability, the definition and allocation of surplus, and the numerous cross subsidies among participants. The fundamental distortion was the assignment of the rights to congestion revenue based on specific generation to load transmission contract 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.

The cumulative offset by ARRs for the 2011/2012 planning period through the first ten months of the 2020/2021 planning period, using the rules effective for each planning period, was 74.1 percent. Load has been underpaid by $2.4 billion from the 2011/2012 planning period through the 2020/2021 planning period.

The overall underassignment of congestion to load includes dramatically different results by zone. Load in some zones receives congestion revenues well in excess of the congestion they pay while the reverse is true for other zones.

If the original PJM FTR approach had been designed to return congestion revenues to load without use of the generation to load contract paths, and

3 For a comprehensive report on capacity retirements and capacity additions in PJM, see: "2020 PJM Generation Capacity and Funding Sources: 2007/2008 through 2021/2022," (September 15, 2020) available at <http://www.monitoringanalytics.com/reports/Reports/2020/Constraint_Based_Congestion_Calculations_20200722.pdf>.

if the distortions subsequently introduced into the FTR design had not been added, many of the subsequent issues with the FTR design and complex redesigns would have been avoided. PJM would not have had to repeatedly intervene in the functioning of the FTR system in an effort to meet the artificial and incorrectly defined goal of revenue adequacy. The design should simply have provided for the return of all congestion revenues to load. The design should have also provided for the ability of load to sell the rights to congestion revenue. That sale could be organized as an FTR auction with the product and the price clearly defined. 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.

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

Table 13-1 The FTR/ARR markets results were partially competitive

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

- Market structure was evaluated as competitive. The ownership of FTR obligations is unconcentrated for the individual years of the 2020/2023 Long Term FTR Auction, the 2020/2021 Annual FTR Auction and each period of the Monthly Balance of Planning Period Auctions. The ownership of FTR options is moderately or highly concentrated for every Monthly FTR Auction period and moderately concentrated for the 2020/2021 Annual FTR Auction. Ownership of FTRs is disproportionately (78.3 percent) by financial participants. The ownership of ARRs is unconcentrated.
- Participant behavior was evaluated as partially competitive as a result of the behavior of GreenHat Energy, LLC. ARR holders who are the sellers of FTRs are not permitted to participate in the market clearing.
- Market performance was evaluated as partially competitive because of the flaws in the market design. Sellers, the ARR holders, cannot set a sale price. Buyers can reclaim some of their purchase price after the market clears if the product does not meet a profitability target. The market resulted in a substantial shortfall in congestion payments to load and significant and unsupportable disparities among zones in the share of congestion returned to load. FTR purchases by financial entities remain persistently profitable in part as a result of the flaws in the market design.
- Market design was evaluated as flawed because there are significant and fundamental flaws with the basic ARR/FTR design. The FTR auction market is not actually a market because the sellers have no independent role in the process. ARR holders cannot determine the price at which they are willing to sell rights to congestion revenue. Buyers have the ability to reclaim some of the price paid for FTRs after the market clears. The market design is not an efficient or effective way to ensure that the rights to all congestion revenues are assigned to load. The product sold to FTR buyers is incorrectly defined as target allocations rather than a share of congestion revenue. ARR holders' rights to congestion revenues are not correctly defined because the contract path based assignment of congestion rights is inadequate and incorrect. Ongoing PJM subjective intervention in the FTR market that affects market fundamentals is also an issue and a symptom of the fundamental flaws in the design. The product, the quantity of the product and the price of the product are all incorrectly defined.
- 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 and the fact that sellers are required to return some of the cleared auction revenue to FTR buyers when FTR profits are not adequate, means that the FTR design does not actually function as a market and is evidence of basic flaws in the market design.

Overview

Auction Revenue Rights

Market Structure

- **ARR Ownership.** In the 2021/2022 planning period ARRs were allocated to 1,459 individual participants, held by 131 parent companies. ARR ownership for the 2021/2022 planning period was unconcentrated with an HHI of 700.

Market Behavior

- **Self Scheduled FTRs.** For the 2021/2022 planning period, 26.1 percent of eligible ARRs were self scheduled as FTRs.

Market Performance

- **ARRs as an Offset to Congestion.** ARRs have not served as an effective mechanism to return all congestion revenues to load. For the 2020/2021 planning period, ARRs offset only 46.2 percent of total congestion. Congestion payments by load in some zones were more than offset and congestion payments in some zones were less than offset. Load has been underpaid congestion revenues by $2.4 billion from the 2011/2012 planning period through the 2020/2021 planning period. The cumulative offset for that period was 73.7 percent of total congestion.
- **ARR Payments.** For the 2020/2021 planning period, the ARR target allocations, which are based on the nodal price differences from the Annual FTR Auction, were $517.1 million, while PJM collected $691.2 million from the combined Long Term, Annual and Monthly Balance of Planning Period FTR Auctions, making ARRs revenue adequate. For the 2019/2020 planning period, the ARR target allocations were $752.2 million while PJM collected $982.0 million from the combined Annual and Monthly Balance of Planning Period FTR Auctions.
- **Residual ARRs.** Residual ARRs are only available on contract 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 2020/2021 planning period, PJM allocated a total of 25,028.0 MW of residual ARRs with a total target allocation of $11.7 million, down from 27,233.2 MW, with a total target allocation of $12.4 million, in the 2019/2020 planning period.
- **ARR Reassignment for Retail Load Switching.** There were 29,776 MW of ARRs associated with $426,700 of revenue that were reassigned in the 2020/2021 planning period. There were 31,683 MW of ARRs associated with $657,300 of revenue that were reassigned for the same time frame of the 2019/2020 planning period.

Financial Transmission Rights

Market Design

- **Monthly Balance of Planning Period FTR Auctions.** The design of the Monthly Balance of Planning Period FTR Auctions was changed effective with the 2020/2021 planning period. The new design includes auctions for each remaining month in the planning period. The prior design included auctions for the next three individual months plus remaining quarters.

Market Structure

- **Patterns of Ownership.** For the Monthly Balance of Planning Period Auctions, financial entities purchased 84.5 percent of prevailing flow and 91.9 percent of counter flow FTRs for January through June, 2021. Financial entities owned 78.3 percent of all prevailing and counter flow FTRs, including 71.7 percent of all prevailing flow FTRs and 85.9 percent of all counter flow FTRs during the period from January through June 2021. Self scheduled FTRs account for 3.0 percent of all FTRs held.
- **Market Concentration.** For prevailing flow obligation FTRs in the Monthly Balance of Planning Period Auctions for the 2020/2021 planning period,

all market periods were unconcentrated. For counter flow obligation FTRs for the 2020/2021 planning period, two periods were moderately concentrated and all others were unconcentrated. All periods were highly concentrated for FTR options. FTR options in the Annual FTR Auction were moderately concentrated.

Market Behavior

- **Sell Offers.** In a given auction, market participants can sell FTRs acquired in preceding auctions or preceding rounds of auctions. In the 2021/2024 Long Term FTR Auction, total participant FTR sell offers were 446,464 MW. In the 2021/2022 Annual FTR Auction, total participant FTR sell offers were 466,575 MW. In the Monthly Balance of Planning Period FTR Auctions for the 2020/2021 planning period, total participant FTR sell offers were 16,226,420 MW.
- **Buy Bids.** In the 2021/2024 Long Term FTR auction, total FTR buy bids were 2,743,836 MW, up 23.9 percent from 2,213,927 MW the previous long term auction. There were 2,070,424 MW of buy and self scheduled bids in the 2021/2022 Annual FTR Auction, down 12.3 percent from 2,361,145 MW the previous planning period. The total FTR buy bids from the Monthly Balance of Planning Period FTR Auctions for the 2020/2021 planning were 35,023,755 MW.
- **FTR Forfeitures.** Total FTR forfeitures were $4.6 million for the 2020/2021 planning period. On May 20, 2021, FERC issued an order ruling the $0.01 definition of an increase in the value of an FTR unjust and unreasonable, but upheld the other parts of PJM's forfeiture rule, and required PJM to modify the rule.
- **Credit.** There were five collateral defaults in 2021. There were five payment defaults in 2021 not involving GreenHat Energy, LLC for a total of $1.8 million. GreenHat Energy's default payments ended with the 2020/2021 planning period. GreenHat Energy accrued total accrued payment defaults of $162.0 million, including the auction liquidation costs.[4] 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 $179.5 million.

Market Performance

- **Quantity.** The 2021/2023 Long Term FTR Auction cleared 426,602 MW (15.5 percent) of FTR buy bids, up 54.8 percent from 275,655 (12.5 percent) in the 2020/2023 Long Term FTR Auction. The Long Term FTR Auction also cleared 77,230 MW (17.3 percent) of FTR sell offers, compared to 49,411 (17.4 percent), a 56.3 percent increase.
- In the 2021/2024 Long Term FTR Auction, 426,602 MW (15.5 percent) of buy bids cleared and 77,230 MW (17.3 percent) of sell offers cleared. In the Annual FTR Auction for the 2021/2022 planning period 562,293 MW (27.2 percent) of buy and self schedule bids cleared, down 3.7 percent from 583,629 (24.7 percent) for the previous planning period. In the 2020/2021 planning period, Monthly Balance of Planning Period FTR Auctions cleared 5,686,087 (16.2 percent) of FTR buy bids and 2,770,301 MW (17.1 percent) of FTR sell offers. For the 2019/2020 planning period, Monthly Balance of Planning Period FTR Auctions cleared 4,124,903 (17.8 percent) of FTR buy bids and 1,995,514 MW (21.3 percent) of FTR sell offers.
- **Price.** The weighted average buy bid FTR price in the 2021/2024 Long Term FTR Auction was $0.05 per MW, down from $0.08 per MW for the 2020/2023 planning period. The weighted average buy bid FTR price in the Annual FTR Auction for the 2021/2022 planning period was $0.56 per MW, up from $0.45 per MW in the 2020/2021 planning period. The weighted average buy bid cleared FTR price in the Monthly Balance of Planning Period FTR Auctions for all periods of the 2020/2021 planning period was $0.13 per MWh.
- **Revenue.** The 2021/2024 Long Term FTR Auction generated $93.9 million of net revenue for all FTRs, up 153.1 percent from $37.1 million from the 2020/2023 Long Term FTR Auction. The 2021/2022 Annual FTR Auction generated $692.4 million in net revenue, up from $577.0 million for the 2020/2021 Annual FTR Auction. The Monthly Balance of Planning Period

4 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.

FTR Auctions resulted in net revenue of $41.4 million in the 2020/2021 planning period, down from $52.9 million for the same time period in the 2019/2020 planning period.

- **Revenue Adequacy.** FTRs were paid at 98.7 percent of the target allocation level for the 2020/2021 planning period, including 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 2020/2021 planning period, physical entities made $79.9 million in profits on FTRs purchased directly (not self scheduled), up from $92.5 million in losses in the 2019/2020 planning period and financial entities made $280.6 million in profits, up from $21.1 million in losses in the 2019/2020 planning period.

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

Market Design

- The MMU recommends that the current ARR/FTR design be replaced with defined congestion revenue rights (CRRs). A CRR is the right to actual congestion that is paid by physical load at a specific bus, zone or aggregate. (Priority: High. First reported 2015. Status: Not adopted.)

ARR

- 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. The MMU recommends that the current design be replaced with a design in which the rights to actual congestion paid are assigned directly to the load that paid that congestion by node. (Priority: High. First reported 2015. Status: Partially adopted.)
- The MMU recommends that, under the current FTR design, the rights to all congestion revenue 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 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.)

FTR

- The MMU recommends that FTR funding be based on total congestion, including day-ahead and balancing congestion. (Priority: High. First reported 2017. Status: Not adopted.)
- The MMU recommends that PJM enforce the FTR auction bid limits at the parent company level starting immediately. (Priority: High. First reported 2020. Status: Adopted 2021.)
- The MMU recommends a requirement that the details of all bilateral FTR transactions be reported to PJM. (Priority: High. First reported 2020. 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 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.)
- MMU recommends that PJM 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 Long Term FTR product be eliminated. If the Long Term FTR product is not eliminated, the Long Term FTR Market should 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 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 the forfeiture amount from the FTR forfeiture rule be based on the correct hourly cost of an FTR, rather than a simple daily price divided by 24. (Priority: High. First reported 2018. Status: Adopted 2019.)

Surplus

- 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.[5] (Priority: High. First reported 2015. Status: Not adopted.)

FTR Subsidies

- 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.)

FTR Liquidation

- 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.)

Conclusion

Solutions

The annual ARR allocation should be designed to ensure that the rights to all congestion revenues are assigned to load, without requiring contract path or point to point physical or financial 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.

5 See "PJM Manual 6: Financial Transmission Rights," Rev. 26 (Jan. 27, 2021).

The current contract path based design should be replaced with a design in which the rights to actual congestion paid are assigned directly to the load that paid that congestion by node. The assigned right is to the actual difference between load payments, both day-ahead and balancing, and revenues paid to the generation used to serve that load. The load can retain the right to the congestion revenues or sell the rights through auctions. The correct assignment of congestion revenues to load is fully consistent with retaining FTR auctions for the sale by load of their congestion revenue rights.

Issues

If the original PJM FTR approach had been designed to return congestion revenues to load without use of the generation to load contract paths, and if the distortions subsequently introduced into the FTR design not been added, many of the subsequent issues with the FTR design and complex redesigns would have been avoided. PJM would not have had to repeatedly intervene in the functioning of the FTR system in an effort to meet the artificial and incorrectly defined goal of revenue adequacy.

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 including so called revenue adequacy. 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.[6] The FERC order of September 15, 2016, introduced a subsidy to FTR holders at the expense of ARR holders.[7] The order requires PJM to ignore balancing congestion when calculating total congestion dollars available to fund FTRs. As a result, balancing congestion and M2M payments are assigned to load, rather than to FTR holders, as of the 2017/2018 planning period. When combined with the direct assignment of both surplus day-ahead congestion and surplus FTR auction revenues to FTR holders, the Commission's order shifted substantial revenue from load to the holders of FTRs and further reduced the offset to congestion payments by load. This approach ignores the fact that load pays 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 total congestion and pays negative balancing congestion again. The fundamental reasons that there has been a significant and persistent difference between day-ahead and balancing congestion include inadequate transmission modeling in the FTR auction and the role of UTCs in taking advantage of these modeling differences and creating negative balancing congestion. There is no reason to impose these costs on load.

These changes were made in order to increase the payout to holders of FTRs who are not loads. Increasing the payout to FTR holders at the expense of the load is not a supportable market objective. PJM should implement an FTR design that calculates and assigns congestion rights to load rather than continuing to modify the current, fundamentally flawed, design.

6 Such subsidies have been suggested repeatedly. See FERC Dockets Nos. EL13-47-000 and EL12-19-000.
7 See 156 FERC ¶ 61,180 (2016), *reh'g denied*, 156 FERC ¶ 61,093 (2017).

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 only 49.5 percent of total congestion costs for the 2017/2018 planning period rather than the 58.0 percent offset that would have occurred under the prior rules, a difference of $101.4 million.

A subsequent rule change was implemented that modified the allocation of surplus auction revenue 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 total target allocations, and then distributed to ARR holders.[8] ARR holders will only be allocated this surplus after full funding of FTRs is accomplished. While this rule change increased the level of congestion revenues returned to load, the rules do not recognize ARR holders' rights to all congestion revenue. With this rule in effect for the 2020/2021 planning period, ARRs and FTRs offset 46.2 percent of total congestion.

The complex process related to what is termed the overallocation of Stage 1A ARRs are entirely an artificial result of reliance on the contract path model in the assignment of FTRs. For example, there is a reason that transmission is not built to address the Stage 1A overallocation issue. The Stage 1A overallocation issue is a fiction based on the use of outdated and irrelevant generation to load contract paths to assign Stage 1A rights that have nothing to do with actual power flows.

Proposed Design

To address the issues with the current contract path based ARR/FTR market design, the MMU recommends that the current design be replaced with a design in which the rights to actual congestion paid are assigned directly to the load that paid that congestion by node. The assigned right would be the actual difference between load payments, both day-ahead and balancing, and revenues paid to the generation used to serve that load. The load could retain the right to the network congestion or sell the right through auctions.

8 163 FERC ¶61,165 (2018).

The correct assignment of congestion revenues to load is fully consistent with retaining FTR auctions for the sale by ARR holders of their congestion revenue rights.

With a network assignment of actual congestion, there would be no cross subsidies among rights holders and no over or under allocation of rights relative to actual network market solutions. There would be no revenue shortfalls as congestion payments equal congestion collected. The risk of default would be isolated to the buyer and seller of the right, and any default would not be socialized to other right holders. In the case of a defaulting buyer, the rights to the congestion revenues would revert to the load. There would be 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 as a result of transmission constraints.

The MMU proposal requires the calculation of constraint specific congestion and the calculation of that specific constraint's congestion related charges to each physical load bus downstream of that constraint. Under the MMU proposal, the constraint specific congestion calculated by hour, from both the day-ahead and balancing market would be paid directly to the physical load as a credit against the associated load serving entity's (LSE) energy bill. This right to the congestion is defined as the congestion revenue right (CRR) that belongs to the physical load at a defined bus, zone or aggregate. The LSE could choose to sell all or a portion of the CRR through auctions.

A CRR is the right to actual, realized network related congestion that is paid by physical load at a specific bus, zone or aggregate. Under the MMU proposal a bus, zone or aggregate specific CRR could be sold as a defined share of the actual congestion. For example, an LSE could sell 50 percent of its congestion revenue right for the planning period to a third party. The third party buyer would then be entitled to 50 percent of the congestion that will be credited to that specific bus, zone or aggregate for the planning period. The remaining 50 percent of the congestion credit for the specified bus, zone or aggregate would be paid to the LSE along with auction clearing price for the 50 percent of CRR that was sold to the third party. Depending on actual congestion, an

LSE selling its congestion revenue rights could be better or worse off than if it retained its rights.

Under the MMU proposal, the LSE would be able to set reservation prices in the auction for the sale of portions or all of its CRR. Third parties would have an opportunity to bid for the offered portions of the CRR, and the market for the congestion revenue associated with the specified bus, zone or aggregate would clear at a price. If the reservation price of an identified portion of the offered CRR was not met at the clearing price, that portion of the offered CRR would remain with the load. Auctions could be annual and/or monthly.

Under the MMU proposal, point to point rights (FTRs) could exist as a separate, self-funded hedging product based on simultaneously feasible prevailing and counter flows in a PJM managed network based auction. The only supply and the only source of revenues in the point to point market for prevailing flow FTRs would be counter flow offers and direct payments for specific rights.

Auction Revenue Rights

Auction Revenue Rights (ARRs) are the mechanism used to assign congestion rights to load, using an archaic contract path based approach, and sell those rights to FTR buyers in various 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 and 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 supply. But some auction revenues may be returned to FTR buyers, despite the fact that FTR buyers willingly paid a defined price for FTRs. PJM has significant discretion over the level of supply made available to FTR buyers. The appropriate goals of that discretion should 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.[9] ARR target allocations are a set value at the time of the Annual FTR Auction. It is logically possible for ARRs to be revenue inadequate if the money collected from the FTR auction is not enough to pay the entirety of ARR target allocations for the planning period. This is extremely unlikely and can only happen if there is a modeling difference between the system model used for ARRs and the system model used for FTRs and the FTR MW are reduced. 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.

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. In the current design, all auction revenues should be paid to ARR holders.

The quantity of the product made available as ARRs or for sale in the FTR auctions is defined as system capability, meaning the capacity of the transmission system to deliver power. But system capability is not congestion and system capability is not the difference in congestion prices across transmission contract paths nor the potential for such difference. The concept of system capability is not relevant to assigning the rights to congestion revenues to load. The use, or misuse, of the concept of system capability in assigning ARRs is derived entirely from the contract path approach used in the PJM design. The definition of ARRs based on contract paths led to the mistaken idea that some transmission system capacity was used by ARRs but some was not and that both the ARR capability and the excess capability was available for sale as FTRs. In the current approach, 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.

9 These nodal prices are a function of the market participants' annual FTR bids and binding transmission constraints.

Market Design

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, DUQ and DOM Control Zones. For the 2007/2008 and subsequent planning periods through the present, all eligible market participants were allocated ARRs.

Each March, PJM allocates annual ARRs to eligible customers in a three stage process: Stage 1A, Stage 1B and Stage 2B. Stage 1A ARRs are assigned based on historic contract paths and Stage 1A ARRs must be preserved for at least ten planning periods regardless of system or regulatory changes.[10]

In Stage 1A, LSEs can obtain ARRs, based on their lowest daily peak load in the prior twelve month period, and based on generation to load contract paths that reflect generation resources that had historically served load, or their qualified replacements if the resource has retired and PJM has replaced it. The historical reference year is the year in which PJM markets were implemented, 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, subject to a cap of lowest daily peak load in the prior year. Network service customers can obtain Stage 1A ARRs based on the MW of firm service provided during the reference year, subject to a cap of lowest daily peak load in the prior 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.[11]

In Stage 1B, network transmission service customers can obtain ARRs based on their share of zonal peak load, based on generation to load contract paths, 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.

In Stage 2, 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.

When ARR holders self schedule FTRs, the ARR holders choose to be paid based on variable target allocations rather than the fixed ARR value determined in the annual FTR auction. ARR holders can self schedule ARRs as FTRs during the Annual FTR Auction.[12] ARRs can be traded between LSEs prior to the first round of the Annual FTR Auction.

Effective for the 2015/2016 planning period, when residual zonal pricing was introduced, ARRs default to sinking at the load settlement point if different than the zone, but the ARR holder may elect to sink their ARR at the zone instead.[13]

In 2016, FERC ordered PJM to remove retired resources from the generation to load contract paths used to allocate Stage 1A ARRs.[14] PJM replaced retired units with operating generators, termed qualified replacement resources (QRRs).[15] Existing Stage 1A resources retain 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 contract

10 See "PJM Manual 6: Financial Transmission Rights," Rev. 26(Jan 27, 2021 at 23.
11 See "PJM Manual 6: Financial Transmission Rights," Rev 26 (Jan. 27, 2021).
12 OATT Attachment K 7.1.1.(b).
13 See "PJM Manual 6: Financial Transmission Rights," Rev. 26 (Jan 27, 2021) at 35.
14 156 FERC ¶ 61,180 (2016).
15 See FERC Docket No. EL16-6-003.

paths should not be used as a basis for assigning the rights to congestion revenue. Contract paths are not an accurate representation of the reasons that congestion revenues are paid or of how load is served in a network and will, by definition, not accurately measure the exposure of load to congestion.

Market Structure

ARRs are allocated on an annual basis. For the 2021/2022 planning period there were 1,459 individual participants, held by 131 parent companies.

The ownership of ARRs was unconcentrated, with an HHI of 851, for the 2020/2021 planning period.

Market Performance

Volume

Table 13-3 shows the MW of ARR allocations for each round of the 2020/2021 and 2021/2022 planning periods.

Table 13-3 Annual ARR allocation volume: 2020/2021 and 2021/2022 planning periods

Planning Period	Stage	Round	Requested Count	Requested Volume (MW)	Cleared Volume (MW)	Cleared Volume	Uncleared Volume (MW)	Uncleared Volume
2020/2021	1A	0	30,444	76,360	76,340	100.0%	20	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	108,682	63.1%	63,528	36.9%
2021/2022	1A	0	27,726	66,118	66,118	100.0%	0	0.0%
	1B	1	18,633	36,067	25,476	70.6%	10,591	29.4%
	2	2	8,105	19,307	2,875	14.9%	16,432	85.1%
		3	8,946	19,238	3,679	19.1%	15,559	80.9%
		4	6,335	19,267	4,586	23.8%	14,681	76.2%
		Total	23,386	57,812	11,140	19.3%	46,672	80.7%
	Total		69,745	159,997	102,734	64.2%	57,263	35.8%

Table 13-4 shows the share of ARR MW, by stage, for ARRs with paths that source inside or outside the zone where the load is located, for the 2021/2022 planning period. Table 13-4 shows that 83.2 percent of the ARR MW are based on generation inside the zone where the ARR load is located and 16.8 percent of the ARR MW are based on generation outside the zone where the ARR load is located. This illustrates one of the fundamental issues with the path based approach which originated in a cost of service design where most load was served by, or assumed to be served by, generation in the same zone as load. In fact, in the PJM market, which operates as an integrated network, a significant proportion of congestion is based on constraints that are not in the same zone as load. The path based approach cannot reflect the actual congestion paid by load.

Table 13-4 Share of ARRs that source in/out of load zone: 2021/2022 planning period

	Stage 1A		Stage 1B		Stage 2	
	Out of Zone	In Zone	Out of Zone	In Zone	Out of Zone	In Zone
ACEC	19.7%	27.2%	7.6%	40.5%	0.4%	4.6%
AEP	9.0%	56.9%	1.4%	27.4%	0.0%	5.2%
APS	7.8%	52.8%	2.6%	35.5%	0.1%	1.2%
ATSI	16.6%	50.6%	1.9%	14.8%	2.7%	13.4%
BGE	39.8%	30.3%	0.4%	11.7%	4.6%	13.3%
COMED	0.0%	74.6%	0.0%	15.9%	0.0%	9.4%
DAY	62.1%	5.3%	1.6%	5.7%	8.5%	16.8%
DOM	0.3%	61.1%	0.0%	37.6%	0.0%	0.9%
DPL	23.1%	49.5%	2.6%	9.3%	6.1%	9.5%
DUKE	28.9%	30.7%	0.1%	24.8%	0.6%	14.8%
DUQ	52.7%	0.0%	19.7%	2.0%	10.2%	15.4%
EKPC	28.2%	50.5%	0.3%	0.0%	21.0%	0.0%
EXT	50.0%	0.0%	49.6%	0.0%	0.4%	0.0%
JCPLC	1.6%	71.4%	0.1%	1.2%	17.2%	8.6%
MEC	29.1%	55.8%	1.2%	8.8%	0.0%	5.0%
PE	16.8%	62.6%	0.1%	16.7%	0.0%	3.8%
PECO	2.5%	58.2%	7.5%	29.0%	0.3%	2.5%
PEPCO	20.8%	24.5%	0.6%	0.8%	0.9%	52.3%
PPL	0.0%	69.0%	0.0%	20.4%	1.3%	9.3%
PSEG	18.8%	34.1%	5.8%	18.1%	10.2%	13.0%
REC	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%
Total	12.3%	52.0%	2.1%	22.7%	2.3%	8.5%

Stage 1A Infeasibility

Stage 1A ARRs are allocated for a year, but guaranteed for 10 years, with the ability for a participant to opt out of any planning period within the 10 years. 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. 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 contract 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.

For the 2019/2020 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. Stage1A related over allocations have to be made up elsewhere in PJM's FTR market model, in the form of reduced system capability, in order for PJM to achieve its goal of fully funding FTRs.

Table 13-5 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 67 facility/contingency pairs, 53 of which were internal to PJM, a total of 7,704.[16] There were no overloaded facilities associated with MISO due to transmission outages.

Table 13-5 Stage 1A overloaded facility reasons and MW

Reason	Type	MW	Count
Network Load	M2M Flowgate	1,767	21
Network Load	Pseudo Tie Flowgate	56	1
Transmission Outage	Internal PJM	5,881	53

Figure 13-1 shows the predicted and estimated impact of Stage 1A infeasibilities on funding for the 2012/2013 through 2020/2021 planning periods, as well as the predicted impact on funding for the 2021/2022 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 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.

16 *PJM 2021/2022 Stage 1A Over allocation notice*, PJM FTRs, <http://www.pjm.com/-/media/markets-ops/ftr/annual-arr-allocation/2021-2022/2021-2022-stage-1a-over-allocation-notice.ashx?la=en> (July 6, 2021).

Figure 13-1 Stage 1A Infeasibility funding impact

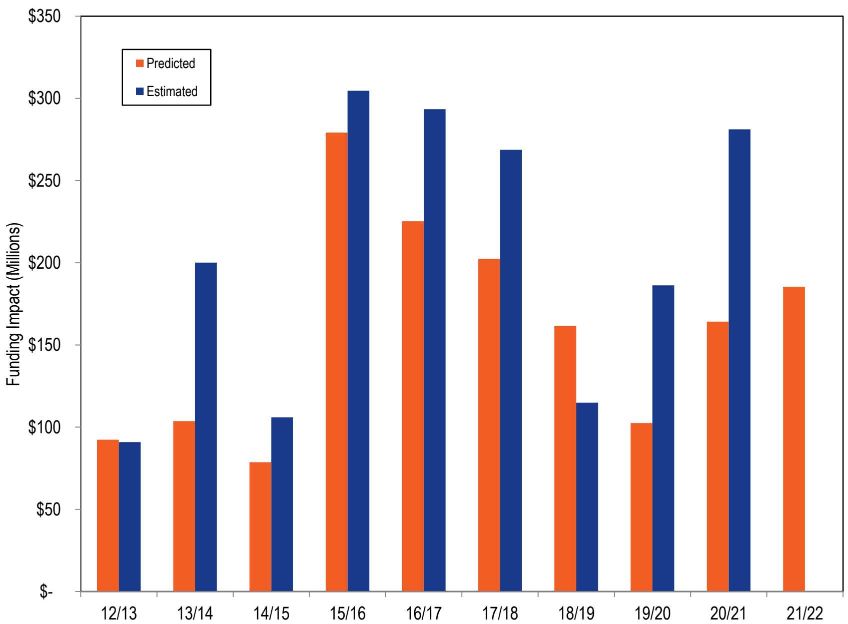


Table 13-6 shows the MW of retired generation sources for Stage 1A ARRs, the QRR MW assigned by PJM for all resources and the replacement MW that were considered rate based. A rate based unit is a replacement generator that is owned by the ARR holder, or subject to firm energy and capacity supply contracts. PJM created the synthetic zone Midatlantic for the QRR assignment although it is not clear why.

Table 13-6 Qualified Replacement Resource results: 2021/2022

Zone	Historical Retired	Replacement (All)	Replacement (Rate-based)
AEP/DAY	10,045.9	7,568.0	1,838.3
ATSI	5,614.3	3,736.0	50.4
ComEd	5,954.8	4,593.5	4.5
DEOK	2,630.0	1,729.2	57.6
Dominion	4,210.6	5,676.8	4,824.0
DLCO	834.0	211.7	0.0
EKPC	198.1	229.3	0.0
Midatlantic	19,830.2	15,530.7	375.9
OVEC	0.0	459.2	1,854.0
Total	49,317.9	39,734.4	9,004.7

ARR Reassignment for Retail Load Switching

PJM rules provide that when load switches between LSEs during the planning period, an LSE gaining load in the same control zone is allocated a proportional share of positively valued ARRs and residual ARRs within the control zone based on the shifted load.[17] ARRs are reassigned to the nearest 0.001 MW and may be reassigned multiple times over a planning period. The reassignment of positively valued ARRs 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 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 31,683 MW of ARRs associated with $657,300 of revenue that were reassigned for the 2019/2020 planning period. There were 29,776 MW of ARRs associated with $426,700 of revenue that were reassigned in the 2020/2021 planning period.

Table 13-7 summarizes ARR MW and associated revenue reassigned for network load in each control zone where changes occurred between June 2019 and May 2021.

17 See "PJM Manual 6: Financial Transmission Rights," Rev. 26 (Jan. 27, 2021).

Table 13-7 ARRs and ARR revenue automatically reassigned for network load changes by control zone: June 2019 through May 2021

	ARRs Reassigned (MW-day)		ARR Revenue Reassigned [Dollars (Thousands) per MW-day]	
Control Zone	2019/2020 (12 months)	2020/2021 (12 months)	2019/2020 (12 months)	2020/2021 (12 months)
ACEC	373	417	$4.8	$2.9
AEP	5,435	2,613	$151.0	$25.2
APS	1,383	1,386	$39.4	$20.8
ATSI	2,865	3,012	$42.6	$25.5
BGE	2,252	2,419	$103.9	$151.1
COMED	2,583	2,588	$27.1	$16.8
DAY	765	687	$9.3	$5.1
DUKE	839	827	$58.3	$26.2
DUQ	1,622	1,526	$5.8	$6.7
DOM	632	431	$6.2	$4.4
DPL	702	736	$52.2	$21.7
EKPC	0	0	$0.0	$0.0
JCPLC	1,032	927	$4.8	$4.3
MEC	540	608	$5.6	$2.9
OVEC	0	0	$0.0	$0.0
PECO	3,196	3,605	$24.8	$24.7
PE	570	603	$15.7	$7.3
PEPCO	1,947	2,176	$35.4	$27.3
PPL	3,538	3,358	$38.3	$38.5
PSEG	1,340	1,506	$31.8	$15.3
REC	69	352	$0.2	$0.1
Total	31,683	29,776	$657.3	$426.7

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.

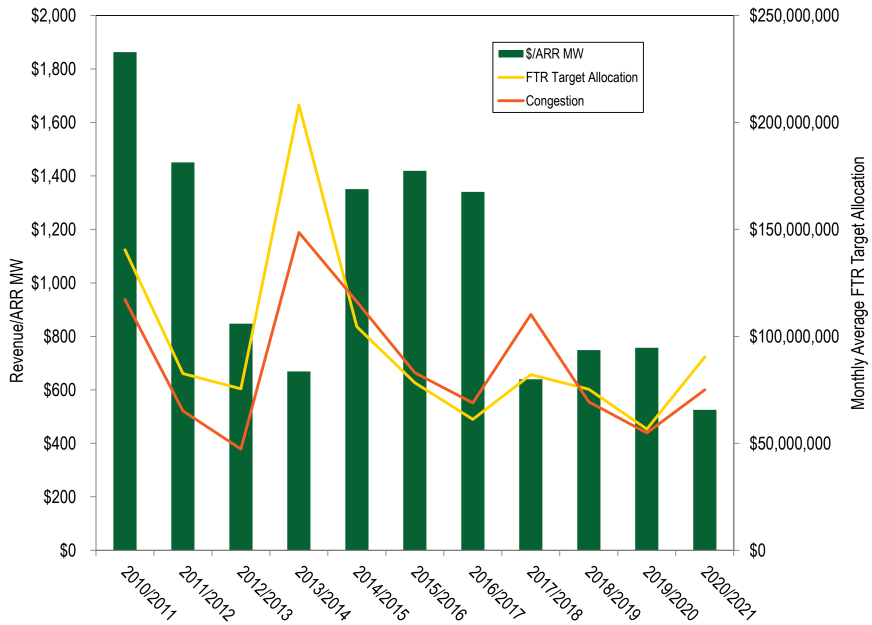
Figure 13-2 shows the revenue per ARR MW held for each month of the 2010/2011 planning period through the 2019/2020 planning period. The revenue per ARR MW held do not include target allocation related payouts for self scheduled FTRs, but do include Residual ARRs starting in August 2012.

PJM has had to repeatedly intervene in the functioning of the FTR system in an effort to meet the artificial and incorrectly defined goal of revenue adequacy. 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 relative to prior years. The decrease in system capability caused by PJM's more conservative modeling of the FTR market model reduced Stage 1B and Stage 2 ARR allocations. 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 2020/2021 planning period decreased 29.6 percent from the previous planning period (Figure 13-2).

Load pays balancing congestion costs, not included in Figure 13-2, which reduce the revenue received by ARR holders. There is no support for the assertion made by proponents of shifting balancing congestion solely to load that higher ARR values would result (Figure 13-2).

Figure 13-2 Revenue per ARR MW paid to ARR holders compared to congestion and FTR target allocations: 2010/2011 through 2020/2021



ARR holders have limited options to pick source points for their ARRs. The holders of Stage 1A rights are limited to specific historical sources (or PJM defined replacement sources when resources retire), which are generally sources within the same zone as the load. The source of a load zone's actual congestion is, in significant part, the result of transmission constraints that separate that zone from resources external to that zone, not by constraints that limit access to internal resources.

As a result, the congestion offset revenues per MW of internally sourced Stage 1A ARR rights are less than the revenue per MW of Stage 1A ARR rights from externally sourced resources. Table 13-8 shows the share of ARR revenue, based on the Annual FTR Auction prices, by stage, for ARRs with paths that source inside or outside the zone where the load is located, for the 2021/2022 planning period. While 12.3 percent of all ARR MW are Stage 1A ARRs with sources outside the zone where load is located, those ARRs provide 32.7 percent of the total ARR revenues.

This illustrates one of the fundamental issues with the path based approach which originated in a cost of service design where most load was served by, or assumed to be served by, generation in the same zone as load. In fact, in the PJM market, which operates as an integrated network, a significant proportion of congestion is based on constraints that are not in the same zone as load. The path based approach does not and cannot reflect the actual congestion paid by load. The use of the path based approach is the fundamental source of the under assignment of congestion revenue rights to load in the ARR/FTR model.

Table 13-8 Share of ARR revenue that sources in/out of load zone: 2021/2022 planning period

	Stage 1A		Stage 1B		Stage 2	
	Out of Zone	In Zone	Out of Zone	In Zone	Out of Zone	In Zone
ACEC	44.3%	18.2%	6.4%	27.7%	0.5%	2.9%
AEP	10.4%	68.4%	0.8%	17.9%	0.0%	2.4%
APS	15.0%	61.0%	1.1%	22.3%	0.0%	0.6%
ATSI	94.0%	2.3%	0.3%	1.3%	2.4%	(0.3%)
BGE	79.0%	12.8%	0.5%	4.7%	1.9%	1.1%
COMED	0.0%	92.1%	0.0%	3.5%	0.0%	4.4%
DAY	88.3%	0.2%	2.0%	0.1%	9.4%	0.0%
DOM	0.8%	75.5%	0.0%	23.2%	0.0%	0.5%
DPL	35.3%	52.5%	1.5%	8.3%	0.4%	2.0%
DUKE	75.5%	16.4%	0.0%	4.1%	0.4%	3.4%
DUQ	80.6%	(0.0%)	6.9%	(0.1%)	5.7%	7.0%
EKPC	79.0%	11.9%	0.2%	0.0%	8.9%	0.0%
EXT	50.0%	0.0%	49.6%	0.0%	0.4%	0.0%
JCPLC	(0.1%)	7.6%	0.1%	0.6%	84.7%	7.2%
MEC	39.7%	58.9%	1.3%	0.5%	0.1%	(0.4%)
PE	38.2%	53.5%	0.1%	6.2%	0.0%	2.1%
PECO	1.9%	75.1%	5.0%	16.1%	0.2%	1.7%
PEPCO	88.1%	7.7%	1.3%	0.3%	0.2%	2.4%
PPL	(0.0%)	88.5%	(0.0%)	10.3%	0.1%	1.1%
PSEG	34.6%	46.8%	2.6%	2.7%	7.7%	5.7%
REC	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%
Total	32.7%	52.0%	0.9%	11.1%	1.4%	1.9%

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. Residual ARRs can only be allocated to participants whose ARRs were prorated in Stage 1B and only to a maximum of the prorated reduction, so not all available Residual ARRs are allocated. Residual ARRs are automatically assigned to eligible participants the month before the effective date, are effective for a single month 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.[18] In prior planning periods, PJM's modeling of excess outages in order to manage FTR market outcomes resulted in the allocation of some ARRs that would have been allocated in Stage 1B being allocated as Residual ARRs on a month to month basis without the option to self schedule.

Table 13-9 shows the Residual ARRs allocated to participants and the associated target allocations. The available volume is the total additional capacity available to be allocated as Residual ARRs. The cleared volume is the residual ARR capacity actually allocated to participants with prorated ARRs based on the level of prorated ARRs in Stage 1B and the affected paths. In the 2020/2021 planning period, PJM allocated a total of 25,028.0 MW of Residual ARRs with a target allocation of $11.7 million. In the same time period for the 2019/2020 planning period, PJM allocated a total of 25,028.0 MW of residual ARRs with a target allocation of $12.4 million.

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

Table 13-9 Residual ARR allocation volume and target allocation: 2014/2015 planning period through 2020/2021 planning period

Planning Period	Available Volume (MW)	Cleared Volume (MW)	Cleared Volume	Target Allocation
2014/2015	65,095.3	22,532.9	34.6%	$8,160,918.27
2015/2016	61,807.0	37,042.4	59.9%	$8,620,353.27
2016/2017	71,000.7	35,034.9	49.3%	$6,986,723.44
2017/2018	81,040.8	39,597.4	48.9%	$17,497,625.78
2018/2019	49,646.9	27,335.6	55.1%	$11,817,002.00
2019/2020	48,286.5	27,233.2	56.4%	$12,369,580.58
2020/2021	43,484.2	25,028.0	57.6%	$11,677,033.36

IARRs

In theory, 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.[19]

There are three sources of IARRs: IARRs based on a specific transmission investment; IARRs based on merchant transmission or generation interconnection projects; and IARRs based on RTEP upgrades. In the case of a specific transmission investment, the participant elects desired IARR MW between a specified source and sink and PJM and the affected transmission owners determine the upgrades necessary to create incremental capability.[20] In the other two cases, the participants paying for the upgrades are assigned IARRs if any are created. There have been 13 successful IARR requests totaling 2,990.1 MW. One IARR path of 64.5 MW was terminated (June 1, 2012), leaving 12 unique source and sink combinations of 2,925.6 MW of IARRs. Of these 12 unique paths, three paths consisting of 1,200.0 MW were based on specific transmission investments requests, six paths consisting of 1,047.4 MW were based on merchant transmission requests and three paths

19 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>.

20 See Attachment EE of the PJM Open Access Transmission Tariff <https://www.pjm.com/directory/merged-tariffs/oatt.pdf>.

consisting of 678.6 MW were based on customer funded (RTEP) transmission projects. The three paths based on specific transmission investments involved a generation company working with its affiliated transmission company. The other nine paths were based on projects that would have been built regardless of the addition of IARRs.

The MMU supports increased competition to provide transmission using market mechanisms. The IARR process is not a viable mechanism for facilitating competitive transmission investments. Maintaining the IARR process impedes the search for real solutions. PJM's process for creating and assigning IARRs is fundamentally flawed and cannot be made consistent with the requirements of Order No. 681 which established IARRs.[21]

Order No. 681 requires that long-term firm transmission rights made feasible by transmission upgrades or expansions be available upon request to the party that pays for such upgrades or expansions.[22] 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, which are given first and absolute priority in PJM's annual allocation process. Granting Stage 1A status to IARRs is preferential treatment of IARR rights relative to the ARR rights belonging to load. 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 the annual supply (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 approved at the expense of other preexisting congestion rights. In the case of IARRs, this is in violation of Order No. 681.

21 See November 7, 2019 Comments on TranSource, LLC v. PJM, 168 FERC ¶ 61,119 (2019) ("Opinion No. 566").
22 *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).

The MMU recommends that IARRs be eliminated from the PJM tariff. If IARRs are not eliminated, the MMU recommends that IARRs be subject to prorating like all other ARR rights rather than being exempt from prorating.

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. These day-ahead congestion price differences, multiplied by the FTR position in MW, are termed the FTR target allocations. The FTR target allocations define 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. Negative target allocations require the FTR holder to make payments rather than receive revenues in the FTR market. One of the fundamental flaws in the FTR design is the mismatch between congestion and the differences in day-ahead prices between nodes. The difference in day-ahead congestion prices is not congestion. Target allocations are not congestion.

Under the current rules, the revenue available to pay FTR holders' target allocations in a given month includes day-ahead congestion, payments by holders of negatively valued FTRs, auction revenues greater than ARR target allocations, and any charges made to day-ahead operating reserves which occur where there are hours with net negative congestion. Any such revenue above FTR target allocations from prior months in a planning period are used to pay any current month shortfalls. Target allocations are a cap on payments to FTR holders for each planning period. At the end of each planning period, any surplus revenue above the target allocations is distributed 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. For example, if the payout ratio is less than 1.0 at the end of the planning period, the payments to all FTRs are reduced. Payments are made pro rata based on target allocations. The result is widespread cross subsidies because assignment of path specific 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 period.

Auction market participants may offer to buy FTRs between any eligible pricing nodes on the system, as defined by PJM for each auction. For the Annual FTR Auction and FTRs bought in the monthly auctions, the available FTR source and sink points include hubs, control zones, aggregates, generator buses, load buses and interface pricing points. 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. 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.

FTRs are bought from supply defined by PJM. The fact that load is selling congestion revenue rights is not fully recognized in the FTR design, although FTR buyers can resell FTRs at a price they agree to accept. Load has no role in defining the price at which PJM sells FTRs on their behalf. PJM's objective in the auctions is to maximize auction revenue, given the total set of bid prices and bid MW, but absent reservation prices from load. The failure to allow sellers the ability to decide at what price to sell FTRs is a fundamental flaw in the FTR market. The result is that PJM cannot actually maximize auction revenue and that the FTR market is not really a market.

Once bought from PJM, FTRs can be bought and sold. Buy bids are bids to buy FTRs in the auctions. Sell offers are offers to sell existing FTRs in the auctions.

Market participants can buy and sell existing FTRs, outside of the auction process, through a voluntary bulletin board, termed the PJM bilateral market. FTRs can also be exchanged bilaterally without using the bulletin board. There is no requirement to report bilateral transactions, or any information about them, to PJM.

Supply and Demand

Total FTR supply in each auction is limited by the definition of the transmission system capacity included in the PJM FTR market model as modified, for example, by PJM assumptions about transmission outages, for which there are no clear rules. PJM may also limit available transmission capacity through subjective judgment exercised without any clear guidelines.

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

The FTR 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.[23] 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 will generally have significant distributional consequences; they will affect different areas very differently. The fact that outages are modeled at significantly lower than historical levels results in selling too much FTR capacity, which creates downward pressure on ARR prices. To address this issue, the MMU recommends that PJM use probabilistic outage modeling to better align the supply of ARRs and FTRs with actual expected transmission capacity.

Long Term FTR Auctions

In July 2006, FERC approved Order No. 681 mandating the creation of long term firm transmission rights in transmission organizations with organized electricity markets. FERC's goal was that "load serving entities be able to

23 See the *2019 State of the Market Report for PJM*, Volume II, Section 12: Transmission Facility Outages: Transmission Facility Outages Analysis for the FTR Market.

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."[24] 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 is never made available to load in the form of ARRs and is only made available to FTR buyers.

PJM conducts the Long Term FTR Auction for the next three consecutive planning periods. The Long Term FTR Auction consists of five rounds beginning in June of the preceding planning period and continuing through March. FTRs purchased in prior rounds or Long Term Auctions may be offered for sale in subsequent rounds of the long term, annual or monthly FTR auctions. FTRs obtained in the Long Term FTR Auctions have terms of one year. FTR products available in the Long Term Auction include 24 hour, on peak and off peak FTR obligations, with FTR options unavailable in the Long Term FTR Auctions.

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 uses the resulting ARRs as the basis for reserving capability for ARR holders in the Long Term FTR Auction. The ARR requests are greater than the previously cleared ARRs. The difference between the requested ARRs and the ARR/FTR market model's transmission system capacity, both without outages, determines the residual capability offered in the Long Term FTR Auction. The revisions provide ARR holders with more congestion rights in the Long Term FTR Auction that will carry into the Annual FTR Auction.

24 Order No. 681 at P 17.

But the revisions do not address the congestion revenue rights sold in years two and three of the Long Term FTR Auction, which remain unavailable to ARRs. Capacity awarded in the Long Term FTR Auction is unavailable as ARRs in years two and three. As a result, the rights to significant congestion revenues are still assigned to the Long Term FTR Auction without ever having been made available 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.

Long Term FTR Auction transmission capacity is determined by removing all outages and running an offline model of the previous Annual FTR Auction model with all ARR bids from the prior annual ARR allocation. Any ARR MW that clear in this offline model are reserved for ARR holders in the relevant planning periods, and are removed from the Long Term FTR Auction capability. Even this approach does not, and cannot, preserve all possible capacity for ARR holders in the first year of the Long Term Auction due to changes in system topology and outage selection between planning periods. PJM outage assumptions are a key factor in determining the supply of ARRs and the related supply of FTRs in the Annual FTR Auction.

Annual FTR Auctions

Annual FTRs are effective for an entire planning period, June 1 through May 31. Outages expected to last two or more months, as well as any outages of a shorter duration that PJM decides would cause FTR revenue inadequacy if not modeled, are included in the determination of the simultaneous feasibility for the Annual FTR Auction.[25] 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, is not defined 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. The Annual FTR Auction consists of four rounds that allow any PJM member to bid for any FTR or to offer for sale any FTR that they currently hold. FTRs

25 See "PJM Manual 6: Financial Transmission Rights," Rev. 26 (Jan. 27, 2021).

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.

Monthly Balance of Planning Period FTR Auctions

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. 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. Before the 2020/2021 planning period, the first three individual months, and quarterly periods that had not yet begun, were available for bid or offer. Beginning with the 2020/2021 planning period, market participants can bid for or offer monthly FTRs for any of the remaining individual calendar months in the planning period. FTRs in the auctions include obligations and options and 24 hour, on peak and off peak products.[26]

Bilateral Market

Market participants can buy and sell existing FTRs, outside of the auction process, through a voluntary bulletin board, termed the PJM bilateral market. FTRs can also be exchanged bilaterally without using the bulletin board. There is currently no requirement to report bilateral transactions, or any information about them, to PJM. 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. Bilateral transactions not reported to PJM are dependent on the contract established between the parties.

For bilateral trades reported to 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. Bilateral FTRs reported to PJM can also include 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.

26 See "PJM Manual 6: Financial Transmission Rights," Rev. 26 (Jan. 27, 2021).

FTR Bid Limits

PJM has the authority to limit participant's bids to 5,000 to avoid or mitigate significant system performance problems related to bid/offer volume.[27] PJM has had a cap of 10,000 bids and offers per auction round and per period at the corporate family level for more than a year, although the rule has not been enforced. On December 11, 2019, PJM made an informational announcement to urge participants to respect the rule.[28] Some participants continued to exceed the limit in 2020 through the use of multiple affiliates, although the number of such participants was significantly reduced. On October 26, 2020, the MMU informed stakeholders that it had notified companies that violated the limits persistently that the companies should comply, and recommended that PJM enforce the limit.[29] On November 5, 2020, PJM proposed to add a language in PJM Manual 6 regarding the bid limit.[30] The MMU recommends that PJM enforce the FTR auction bid limits at the corporate family level starting immediately.

Market Structure

In order to evaluate the ownership of FTRs, the MMU categorizes 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

27 Operating Agreement Schedule 1 § 7.3.5(d) allows PJM to limit participant's bids to 5,000 to avoid or mitigate significant system performance problems related to bid/offer volume.

28 *See* "Informational Update: FTR Auction Bid Limits," PJM Presentation to the Market Implementation Committee (December 11, 2019) <https://www.pjm.com/-/media/committees-groups/committees/mic/20191211/20191211-item-06-ftr-auction-bid-limits.ashx>.

29 *See* "Market Monitor Report," IMM Presentation to the Members Committee (October 26, 2020) <https://www.pjm.com/-/media/committees-groups/committees/mc/2020/20201026-webinar/20201026-item-07-imm-report.ashx>.

30 *See* "Manual 6, Rev. 26: FTR Auction Bid Limits," PJM Presentation to the Market Implementation Committee (November 5, 2020) <https://www.pjm.com/-/media/committees-groups/committees/mic/2020/20201105/20201105-item-05a-m6-updates-ftr-bid-limits.ashx>.

generally considered to be financial entities even if they are utilities in their own countries.

Table 13-10 shows the 2021/2024 Long Term FTR Auction market cleared FTRs by trade type, organization type and FTR direction. The results show that financial entities purchased 83.0 percent of prevailing flow buy bid FTRs and 91.4 percent of counter flow buy bid FTRs with the result that financial entities purchased 87.1 percent of all long term FTR auction cleared buy bids. Physical entities purchased 17.0 percent of all cleared long term FTRs in the 2021/2024 Long Term FTR Auction, down 4.90 percentage points from the previous Long Term FTR Auction.

Table 13-10 Long term FTR auction patterns of ownership by FTR direction: 2021/2024

		FTR Direction		
Trade Type	Organization Type	Prevailing Flow	Counter Flow	All
Buy Bids	Physical	17.0%	8.6%	12.9%
	Financial	83.0%	91.4%	87.1%
	Total	100.0%	100.0%	100.0%
Sell Offers	Physical	18.6%	25.3%	20.8%
	Financial	81.4%	74.7%	79.2%
	Total	100.0%	100.0%	100.0%

Table 13-11 shows the HHI for the periods in the 2017/2020 through 2021/2024 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 13-11 Long term HHIs by auction

Auction	YR1	YR2	YR3	YRALL
17/20 Long Term Auction	779	1779	1354	8533
18/21 Long Term Auction	711	940	749	8654
19/22 Long Term Auction	492	647	768	9954
20/23 Long Term Auction	567	575	638	NA
21/24 Long Term Auction	495	535	767	NA

Table 13-12 shows the annual FTR auction cleared FTRs for the 2021/2022 planning period by trade type, organization type and FTR direction. In the Annual FTR Auction for the 2021/2022 planning period, financial entities purchased 74.6 percent of prevailing flow FTRs, up 3.4 percentage points, and 88.8 percent of counter flow FTRs, up 5.2 percentage points, with the results that financial entities purchased 79.8 percent, up 4.2 percentage points, of all annual FTR auction cleared buy bids for the 2021/2022 planning period.

Table 13-12 Annual FTR Auction patterns of ownership by FTR direction: 2021/2022

			FTR Direction		
Trade Type	Organization Type	Self-Scheduled FTRs	Prevailing Flow	Counter Flow	All
Buy Bids	Physical	Yes	7.5%	0.1%	4.8%
		No	17.9%	11.1%	15.4%
		Total	25.4%	11.2%	20.2%
	Financial	No	74.6%	88.8%	79.8%
	Total		100.0%	100.0%	100.0%
Sell Offers	Physical		9.5%	6.2%	8.2%
	Financial		90.5%	93.8%	91.8%
	Total		100.0%	100.0%	100.0%

Table 13-13 shows the HHI values for cleared buy and self scheduled bids for the 2016/2017 through 2021/2022 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 13-13 Annual auction HHIs by auction

Auction	Offset Type	Trade Type	HHI
21/22 Annual Auction	Obligation	Buy	420
	Obligation	Self Scheduled	3291
	Option	Buy	957
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 13-14 presents the monthly balance of planning period FTR auction cleared FTRs for 2021 by trade type, organization type and FTR direction. Financial entities purchased 84.5 percent of prevailing flow FTRs, up 1.9 percentage points, and 91.9 percent of counter flow FTRs, up 4.2 percentage points, from 2020, with the result that financial entities purchased 88.0 percent, up 2.8 percentage points, of all prevailing and counter flow FTR buy bids in the monthly balance of planning period FTR auction for 2021.

Table 13-14 Monthly Balance of Planning Period FTR Auction patterns of ownership by FTR direction: January through June, 2021

		FTR Direction		
Trade Type	Organization Type	Prevailing Flow	Counter Flow	All
Buy Bids	Physical	15.5%	8.1%	12.0%
	Financial	84.5%	91.9%	88.0%
	Total	100.0%	100.0%	100.0%
Sell Offers	Physical	4.8%	3.1%	4.3%
	Financial	95.2%	96.9%	95.7%
	Total	100.0%	100.0%	100.0%

Table 13-15 shows the monthly cumulative HHI values for cleared obligation MW for the 2020/2021 planning period monthly auctions for prevailing flow FTRs. Cleared prevailing flow bids were unconcentrated in all of the months.[31]

Table 13-15 Monthly Balance of Planning Period FTR Auction HHIs by period for prevailing flow FTRs

	Auction Period											
Auction	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY
Jun-20	359	415	446	591	720	625	855	686	763	752	686	768
Jul-20		296	369	446	551	518	701	553	546	646	594	607
Aug-20			304	398	458	469	623	506	506	590	555	555
Sep-20				314	413	435	577	491	467	531	519	506
Oct-20					341	404	503	443	432	545	536	536
Nov-20						340	456	422	440	549	552	565
Dec-20							386	398	413	530	543	562
Jan-21								337	379	502	513	538
Feb-21									337	450	479	511
Mar-21										410	467	498
Apr-21											425	478
May-21												425

Table 13-16 shows the monthly cumulative HHI values for cleared obligation MW for the 2020/2021 planning period monthly auctions by month for counter flow FTRs. Cleared counter flow bids were unconcentrated in all but two of the months, which were moderately concentrated, in the 2020/2021 planning period.

31 *See 2021 Quarterly State of the Market Report for PJM: January through June*, Section 3: Energy Market, Competitive Assessment for HHI definitions.

Table 13-16 Monthly Balance of Planning Period FTR Auction HHIs by period for counter flow FTRs

	Auction Period											
Auction	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY
Jun-20	655	636	806	771	914	905	1012	772	831	939	1007	974
Jul-20		514	571	658	745	753	811	642	673	773	866	855
Aug-20			508	560	625	660	708	603	632	728	776	768
Sep-20				537	596	604	673	599	627	697	763	764
Oct-20					546	567	638	616	646	736	773	786
Nov-20						585	608	604	631	746	812	797
Dec-20							653	615	650	722	808	807
Jan-21								622	617	705	799	798
Feb-21									522	640	747	759
Mar-21										600	722	725
Apr-21											645	704
May-21												666

Table 13-17 shows the average daily FTR ownership for all FTRs for the first six months of 2021, by FTR direction and self scheduled FTRs.

Table 13-17 Daily FTR held position ownership by FTR direction: 2021

	FTR Direction		
Organization Type	Prevailing Flow	Counter Flow	All
Physical	22.8%	14.1%	18.7%
Physical Self Scheduled	5.6%	0.1%	3.0%
Financial	71.7%	85.9%	78.3%
Total	100.0%	100.0%	100.0%

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 transmission limit is not consistent with revenue adequacy goals and simultaneous feasibility, then transmission limits are reduced pro rata based on the MW of Stage 1A infeasibility and the availability of auction bids for counter flow FTRs.[32] 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.[33] The use of both of these procedures is contingent on the conditions that: PJM actions not affect 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 2021/2024 Long Term FTR Auction, 209,914 MW (24.2 percent of bid volume; 49.2 percent of total FTR volume) of counter flow FTR buy bids cleared, an increase from 122,311 MW and 19.8 percent of total FTR volume. In the same auction, prevailing flow FTR buy bids cleared 216,688 MW (11.5 percent of bid volume; 50.8 percent of total FTR volume) a decrease from 275,655 MW and a decrease from 11.5 percent of total FTR volume. In the 2021/2024 Long Term FTR Auction, 25,046 MW (12.9 percent) of counter flow sell offers and 52,183 MW (20.6 percent) of prevailing flow sell offers cleared.

Table 13-18 Long Term FTR Auction market volume: 2021/2024

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	130,159	360,617	95,596	26.5%	265,021	73.5%
		Year 2	81,976	270,226	59,259	21.9%	210,967	78.1%
		Year 3	68,822	235,465	55,058	23.4%	180,407	76.6%
		Total	280,957	866,309	209,914	24.2%	656,395	75.8%
	Prevailing Flow	Year 1	231,969	835,606	109,412	13.1%	726,195	86.9%
		Year 2	147,762	584,870	61,362	10.5%	523,508	89.5%
		Year 3	112,954	457,050	45,914	10.0%	411,136	90.0%
		Total	492,685	1,877,527	216,688	11.5%	1,660,839	88.5%
	Total		773,642	2,743,836	426,602	15.5%	2,317,234	84.5%
Sell offers	Counter Flow	Year 1	57,301	107,859	16,211	15.0%	91,648	85.0%
		Year 2	28,852	60,511	6,789	11.2%	53,723	88.8%
		Year 3	9,919	25,307	2,047	8.1%	23,260	91.9%
		Total	96,072	193,677	25,046	12.9%	168,631	87.1%
	Prevailing Flow	Year 1	80,430	162,681	36,711	22.6%	125,969	77.4%
		Year 2	32,930	69,531	12,147	17.5%	57,384	82.5%
		Year 3	8,509	20,575	3,325	16.2%	17,250	83.8%
		Total	121,869	252,786	52,183	20.6%	200,603	79.4%
	Total		217,941	446,464	77,230	17.3%	369,234	82.7%

32 See "PJM Manual 6: Financial Transmission Rights," Rev. 26 (Jan. 27, 2021).
33 See *id.*

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 2021/2024 auctions.

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

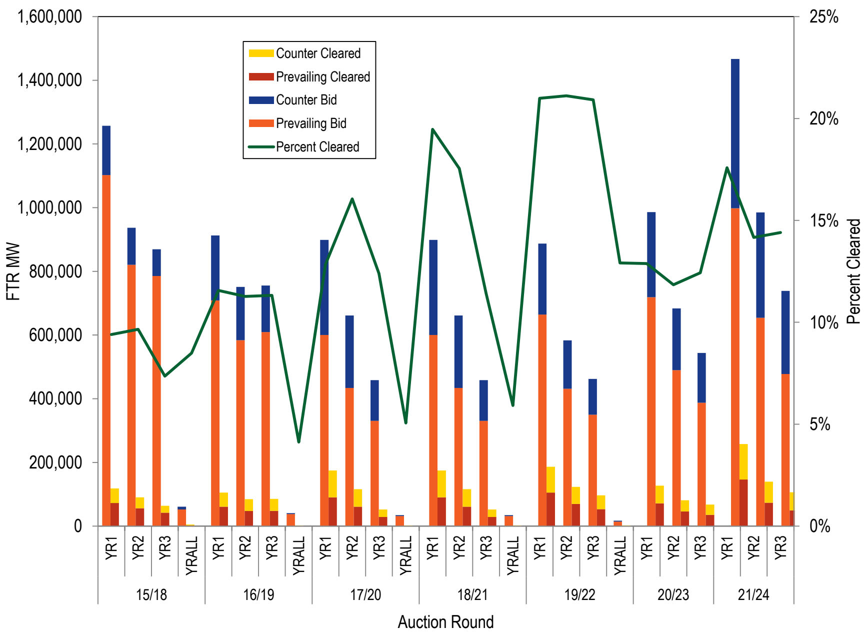


Table 13-19 compares cleared FTR obligations (not options) acquired in the Long Term FTR Auctions to the total cleared FTR obligations from the Annual FTR Auction, for FTRs in the 2014/2015 through 2021/2022 planning periods. A three year FTR is distributed to each individual planning period during its three year effective period. Long term FTRs that are effective in a single planning period were an average of 41.1 percent of total FTR volume in the 2014/2015 through 2021/2022 planning periods.

Table 13-19 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%
2021/2022	98,829	80,998	205,008	384,835	512,449	42.9%

Table 13-20 shows the MW proportion of FTRs by source and sink node type for cleared buy bids in the 2021/2024 Long Term FTR Auction. Generator to generator FTRs comprise 62.1 percent of all cleared FTR buy bids.

Table 13-20 Long Term FTR node type matrix: 2021/2024 auction

	Sink Type					
Source Type	Aggregate	Generator	Hub	Interface	Residual Metered Aggregate	Zone
Aggregate	0.9%	6.3%	0.2%	0.1%	0.2%	0.2%
Generator	6.7%	62.1%	2.9%	1.1%	0.4%	3.7%
Hub	0.2%	0.8%	0.9%	0.4%	0.4%	3.3%
Interface	0.0%	0.3%	0.1%	0.0%	0.0%	0.1%
Residual Metered Aggregate	0.1%	0.8%	0.0%	0.0%	0.0%	0.0%
Zone	0.4%	2.1%	1.9%	0.1%	1.2%	2.1%

Annual FTR Auction

Table 13-21 shows the annual FTR auction market volume for the 2021/2022 planning period. Total FTR buy bids were 2,070,424 MW, down 1.2 percent from 2,364,145 MW for the previous planning period. For the 2021/2022 planning period 535,277 MW (26.2 percent) of buy bids cleared, up 2.4 percentage points from 556,034 MW for the previous planning period. There were 466,575 MW of sell offers with 66,830 MW (14.3 percent) clearing for the 2021/2022 planning period. The total volume of cleared buy and self scheduled bids was 562,293 MW, down 9.0 percent from 583,629 MW in the previous Annual FTR Auction.

Table 13-21 Annual FTR Auction market volume: 2021/2022

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	145,908	552,109	206,353	37.4%	345,756	62.6%
		Prevailing Flow	310,514	1,233,197	279,079	22.6%	954,118	77.4%
		Total	456,422	1,785,307	485,433	27.2%	1,299,874	72.8%
	Options	Counter Flow	26	341	50	14.8%	291	85.2%
		Prevailing Flow	30,895	257,760	49,794	19.3%	207,966	80.7%
		Total	30,921	258,101	49,844	19.3%	208,257	80.7%
	Total	Counter Flow	145,934	552,451	206,404	37.4%	346,047	62.6%
		Prevailing Flow	341,409	1,490,958	328,874	22.1%	1,162,084	77.9%
		Total	487,343	2,043,408	535,277	26.2%	1,508,131	73.8%
Self-scheduled bids	Obligations	Counter Flow	54	221	221	100.0%	0	0.0%
		Prevailing Flow	3,686	26,795	26,795	100.0%	0	0.0%
		Total	3,740	27,016	27,016	100.0%	0	0.0%
Buy and self-scheduled bids	Obligations	Counter Flow	145,962	552,330	206,574	37.4%	345,756	62.6%
		Prevailing Flow	314,200	1,259,992	305,874	24.3%	954,118	75.7%
		Total	460,162	1,812,322	512,448	28.3%	1,299,874	71.7%
	Options	Counter Flow	26	341	50	14.8%	291	85.2%
		Prevailing Flow	30,895	257,760	49,794	19.3%	207,966	80.7%
		Total	30,921	258,101	49,844	19.3%	208,257	80.7%
	Total	Counter Flow	145,988	552,671	206,625	37.4%	346,047	62.6%
		Prevailing Flow	345,095	1,517,752	355,668	23.4%	1,162,084	76.6%
		Total	491,083	2,070,424	562,293	27.2%	1,508,131	72.8%
Sell offers	Obligations	Counter Flow	72,378	212,555	27,220	12.8%	185,334	87.2%
		Prevailing Flow	78,869	240,820	38,225	15.9%	202,594	84.1%
		Total	151,247	453,374	65,446	14.4%	387,928	85.6%
	Options	Counter Flow	1	35	0	NA	35	NA
		Prevailing Flow	1,436	13,166	1,384	10.5%	11,782	89.5%
		Total	1,437	13,201	1,384	10.5%	11,817	89.5%
	Total	Counter Flow	72,379	212,590	27,220	12.8%	185,370	87.2%
		Prevailing Flow	80,305	253,986	39,610	15.6%	214,376	84.4%
		Total	152,684	466,575	66,830	14.3%	399,745	85.7%

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 2021/2022 planning period.

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

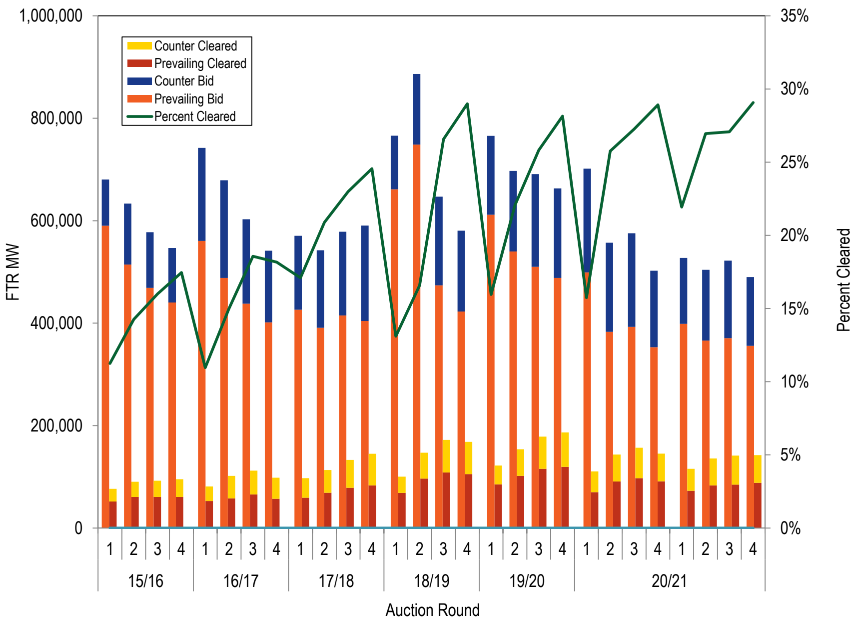


Figure 13-5 shows the proportion of ARRs self scheduled as FTRs for the last thirteen planning periods. The maximum possible level of self scheduled FTRs is equal to total ARRs. Eligible participants self scheduled 27,016 MW (26.1 percent) of ARRs as FTRs for the 2021/2022 planning period, compared to 27,016 MW (25.4 percent) in the previous planning period.

Figure 13-5 Comparison of self scheduled FTRs: 2009/2010 through 2021/2022

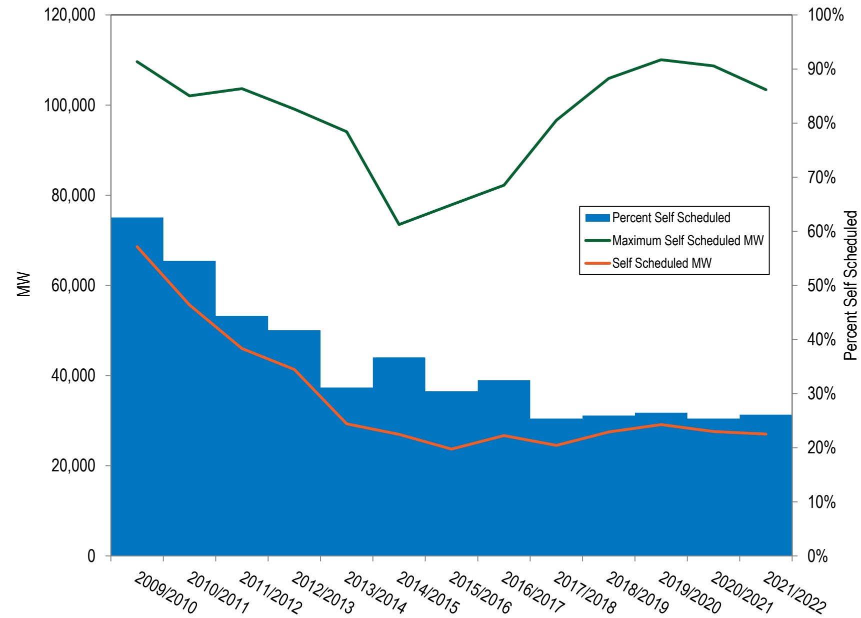


Table 13-22 shows the MW proportion of FTRs by source and sink node type for cleared cleared buy and self scheduled bids in the 2021/2022 Annual FTR Auction.

Generator to generator FTRs comprise 53.7 percent of all cleared FTR buy and self scheduled bids, up 5.7 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 13-22 Annual auction FTR node type matrix by proportion of MW: 2021/2022

	Sink Type					
Source Type	Aggregate	Generator	Hub	Interface	Residual Metered Aggregate	Zone
Aggregate	1.8%	5.1%	0.2%	0.0%	0.2%	0.4%
Generator	11.1%	53.7%	4.2%	0.7%	5.3%	8.4%
Hub	0.3%	0.8%	0.5%	0.0%	0.3%	1.3%
Interface	0.1%	0.4%	0.0%	0.0%	0.1%	0.1%
Residual Metered Aggregate	0.1%	0.5%	0.0%	0.0%	0.0%	0.0%
Zone	0.4%	1.4%	0.6%	0.0%	0.5%	1.3%

Monthly Balance of Planning Period Auctions

Table 13-23 provides the monthly balance of planning period FTR auction market volume for the entire 2019/2020 and 2020/2021 planning periods. There were 29,351,515 MW of FTR obligation buy bids and 12,711,366 MW of FTR obligation sell offers for all bidding periods in the 2020/2021 planning period. The monthly balance of planning period FTR auction cleared 5,374,799 (18.3 percent) of FTR obligation buy bids and 2,216,261 MW (17.4 percent) of FTR obligation sell offers.

There were 5,672,240 MW of FTR option buy bids and 3,515,054 MW of FTR option sell offers for all bidding periods in the Monthly Balance of Planning Period FTR Auctions for the 2020/2021 planning period. The ownership of options was highly concentrated in all periods. The monthly auctions cleared 311,288 MW (5.5 percent) of FTR option buy bids and 554,040 MW (15.8 percent) of FTR option sell offers.

Table 13-23 Monthly Balance of Planning Period FTR Auction market volume: 2021

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-21	Obligations	Buy bids	381,342	1,836,655	322,062	17.5%	1,514,593	82.5%
		Sell offers	217,469	811,662	130,359	16.1%	681,304	83.9%
	Options	Buy bids	6,018	442,023	14,751	3.3%	427,272	96.7%
		Sell offers	28,121	237,886	32,306	13.6%	205,581	86.4%
Feb-21	Obligations	Buy bids	376,380	1,790,943	392,484	21.9%	1,398,459	78.1%
		Sell offers	202,939	761,827	137,133	18.0%	624,694	82.0%
	Options	Buy bids	2,117	200,050	8,830	4.4%	191,221	95.6%
		Sell offers	20,855	207,239	30,062	14.5%	177,176	85.5%
Mar-21	Obligations	Buy bids	294,408	1,424,569	327,035	23.0%	1,097,534	77.0%
		Sell offers	150,359	603,193	126,499	21.0%	476,694	79.0%
	Options	Buy bids	1,593	102,266	5,694	5.6%	96,572	94.4%
		Sell offers	14,659	155,357	37,104	23.9%	118,253	76.1%
Apr-21	Obligations	Buy bids	232,361	1,038,292	235,418	22.7%	802,874	77.3%
		Sell offers	103,242	396,155	88,706	22.4%	307,449	77.6%
	Options	Buy bids	952	95,317	4,750	5.0%	90,567	95.0%
		Sell offers	8,212	100,079	33,112	33.1%	66,967	66.9%
May-21	Obligations	Buy bids	143,525	726,081	172,760	23.8%	553,321	76.2%
		Sell offers	45,385	177,164	47,835	27.0%	129,329	73.0%
	Options	Buy bids	476	6,658	1,963	29.5%	4,695	70.5%
		Sell offers	3,048	45,362	21,620	47.7%	23,742	52.3%
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%
2020/2021**	Obligations	Buy bids	6,378,593	29,351,515	5,374,799	18.3%	23,976,716	81.7%
		Sell offers	3,827,330	12,711,366	2,216,261	17.4%	10,495,105	82.6%
	Options	Buy bids	89,167	5,672,240	311,288	5.5%	5,360,952	94.5%
		Sell offers	516,603	3,515,054	554,040	15.8%	2,961,014	84.2%

* Shows 12 months for 2019/2020 ** Shows 12 months for 2020/2021

Figure 13-6 shows the bid volume from each monthly auction for each period of the Monthly Balance of Planning Period FTR Auction. The prompt month is the first month for which FTRs are sold. The bid volume for the non-prompt months is significantly lower than for the prompt months. On average, the non-prompt month bid volume is 42.6 percent of the prompt month bid volume.

Figure 13-6 Monthly Balance of Planning Period FTR Auction bid volume (MW per period): June 2020 through May 2021 Auction

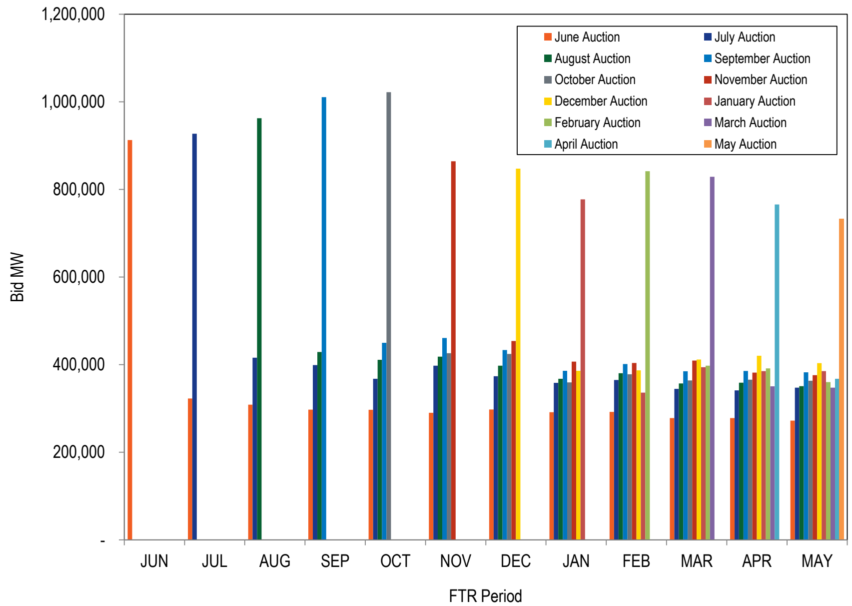


Figure 13-7 Monthly Balance of Planning Period FTR Auction cleared volume (MW per period): June 2020 through May 2021 Auction

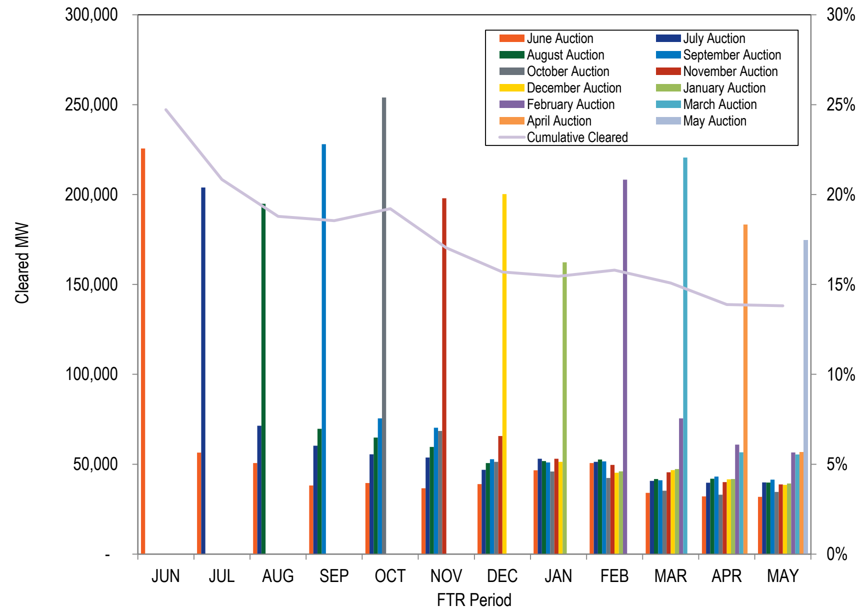


Figure 13-7 shows the cleared volume from each monthly auction for each period of the Monthly Balance of Planning Period FTR Auction. The cleared volume for non-prompt months is also significantly lower than in prompt months. On average, the non-prompt month cleared volume is 24.8 percent of the prompt month cleared volume.

Bilateral Market

Table 13-24 provides the PJM registered secondary bilateral FTR market volume for the 2019/2020 and the 2020/2021 planning periods. Bilateral FTR transactions registered through PJM do not need to include an accurate price or the entire volume of the transaction. Bilateral FTR transactions are not required to be registered through PJM. As a result, the bilateral data are not a reliable basis for evaluating actual bilateral activity in PJM FTRs.

Table 13-24 Secondary bilateral FTR market volume: 2019/2020 and 2020/2021[34]

Planning Period	Type	Class Type	Volume (MW)
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
2020/2021	Obligation	24-Hour	6,164.0
		On Peak	392.0
		Off Peak	96.0
		Total	6,652.0
	Option	24-Hour	0.0
		On Peak	0.0
		Off Peak	0.0
		Total	0.0

Figure 13-8 shows the FTR bid, net bid and cleared volume from June 2003 through May 2021 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 13-8 Long Term, Annual and Monthly FTR Auction bid and cleared volume: June 2003 through May 2021

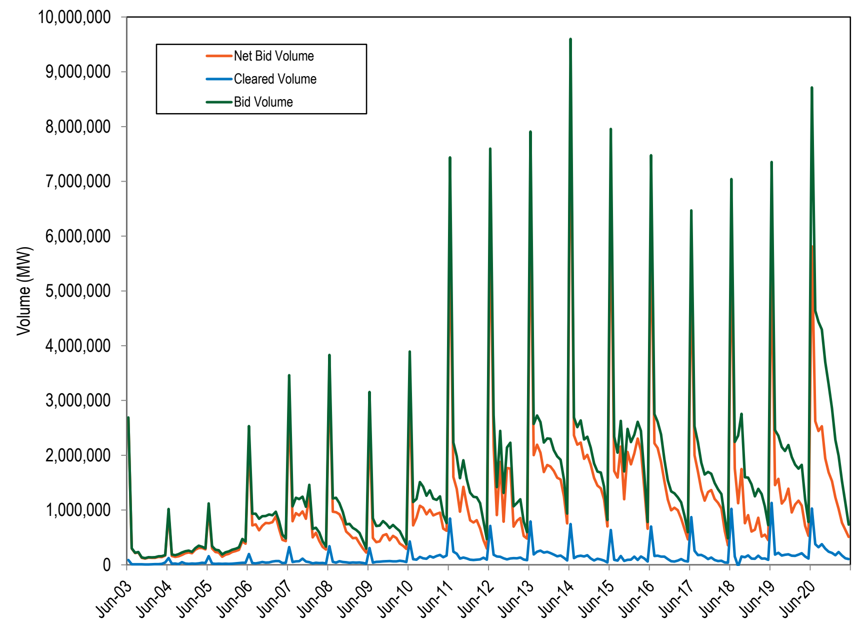
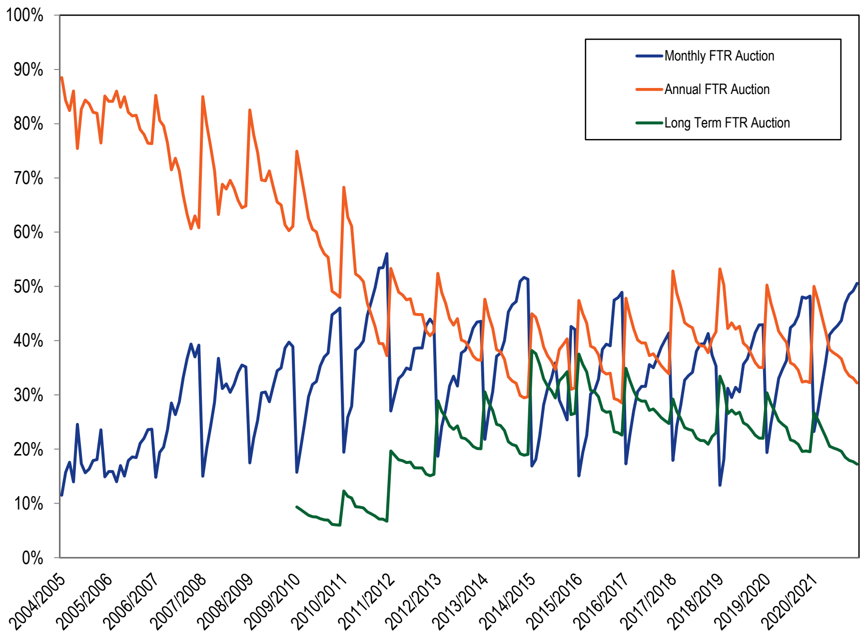


Figure 13-9 shows cleared auction volumes by auction type as a percent of the total FTR cleared volume by calendar months for June 2004 through May 2021. FTR volumes are included in the calendar month they are effective, with long term and annual FTR auction volumes spread equally to each month in the 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.

34 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 13-9 Cleared auction volume (MW) as a percent of total FTR cleared volume by calendar month: June 2004 through May 2021



Price

Table 13-25 shows the cleared, weighted-average prices by trade type, FTR direction, period type and class type for the 2021/2024 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 -$0.45 and $0.52, compared to -$0.49 and $0.51 from the 2020/2023 Long Term FTR Auction. Weighted average sell bid counter flow and prevailing flow FTR prices were -$0.42 and $0.41, compared to -$0.32 for counter flow FTRs and $0.45 for prevailing flow FTRs.

Table 13-25 Long Term FTR Auction weighted-average cleared prices (Dollars per MW): 2021/2024

			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)	($0.54)	($0.48)
		Year 2	($0.68)	($0.34)	($0.56)	($0.47)
		Year 3	($0.59)	($0.29)	($0.46)	($0.39)
		Total	($0.88)	($0.31)	($0.52)	($0.45)
	Prevailing Flow	Year 1	$1.14	$0.30	$0.56	$0.52
		Year 2	$1.08	$0.29	$0.53	$0.52
		Year 3	$1.17	$0.27	$0.44	$0.51
		Total	$1.13	$0.29	$0.52	$0.52
	Total		$0.48	($0.02)	$0.01	$0.05
Sell offers	Counter Flow	Year 1	($0.24)	($0.25)	($0.55)	($0.40)
		Year 2	($0.29)	($0.34)	($0.58)	($0.45)
		Year 3	($0.03)	($0.32)	($0.48)	($0.41)
		Total	($0.27)	($0.28)	($0.55)	($0.42)
	Prevailing Flow	Year 1	$0.64	$0.26	$0.57	$0.42
		Year 2	$0.46	$0.24	$0.58	$0.42
		Year 3	$0.21	$0.21	$0.39	$0.30
		Total	$0.56	$0.25	$0.56	$0.41
	Total		$0.35	$0.08	$0.20	$0.14

Table 13-26 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 2021/2022 planning period. The weighted-average cleared buy bid price in the 2021/2022 Annual FTR Auction was $0.24 per MW, up from $0.18 per MW in the 2020/2021 planning period.

Table 13-26 Annual FTR Auction weighted-average cleared prices (Dollars per MW): 2021/2022

			Class Type			
Trade Type	Type	FTR Direction	24-Hour	On Peak	Off Peak	All
Buy bids	Obligations	Counter Flow	($0.43)	($0.38)	($0.22)	($0.31)
		Prevailing Flow	$1.42	$0.64	$0.34	$0.58
		Total	$0.84	$0.21	$0.09	$0.21
	Options	Counter Flow	$0.00	$0.00	$0.00	$0.00
		Prevailing Flow	$0.43	$0.28	$0.18	$0.25
		Total	$0.43	$0.28	$0.18	$0.25
Self-scheduled bids	Obligations	Counter Flow	($0.07)	NA	NA	($0.07)
		Prevailing Flow	$0.77	NA	NA	$0.77
		Total	$0.77	NA	NA	$0.77
Buy and self-scheduled bids	Obligations	Counter Flow	($0.42)	($0.38)	($0.22)	($0.31)
		Prevailing Flow	$1.00	$0.64	$0.34	$0.61
		Total	$0.80	$0.21	$0.09	$0.26
	Options	Counter Flow	$0.00	$0.00	$0.00	$0.00
		Prevailing Flow	$0.43	$0.28	$0.18	$0.25
		Total	$0.43	$0.28	$0.18	$0.25
Sell offers	Obligations	Counter Flow	($1.05)	($0.65)	($0.36)	($0.54)
		Prevailing Flow	$0.63	$0.53	$0.27	$0.42
		Total	($0.06)	$0.05	$0.00	$0.02
	Options	Counter Flow	NA	NA	NA	NA
		Prevailing Flow	$0.01	$0.25	$0.11	$0.15
		Total	$0.01	$0.25	$0.11	$0.15

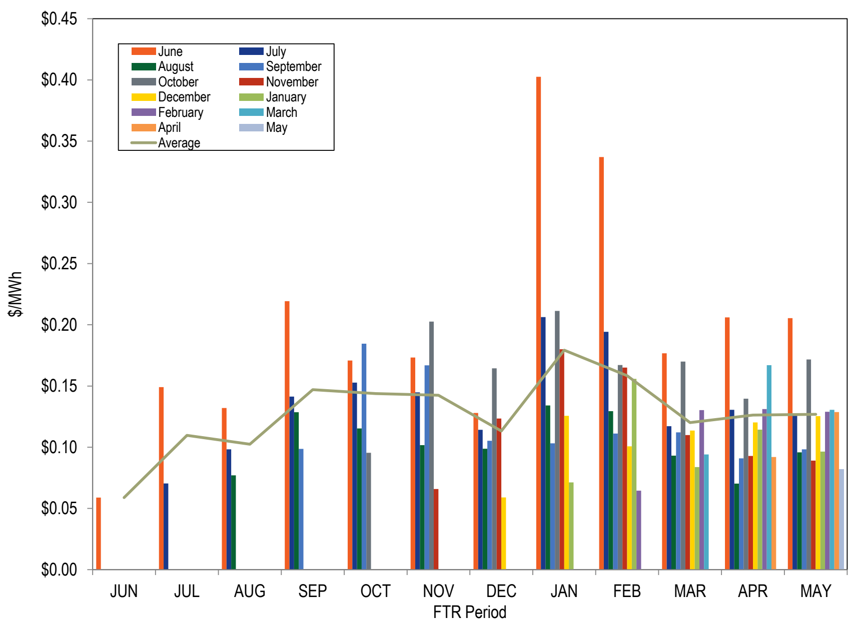
Table 13-27 shows the cleared buy bid volume, cleared buy bid revenue and cleared revenue/cleared MW for the eight latest planning periods. In the 2014/2015 planning period the $/MW increased significantly from the 2013/2014 planning period due to PJM's decisions to limit capacity through conservative 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 13-27 Cleared volume, revenue and $/MW: 2012/2013 through 2021/2022 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
2021/2022	535,277	26.2%	$519.0	$970

Figure 13-10 shows the weighted average cleared buy bid price of obligations in the Monthly Balance of Planning Period FTR Auctions by bidding period for the 2020/2021 planning period and the average price per MWh for each of the FTR periods.

Figure 13-10 Monthly Balance of Planning Period FTR Auction cleared, weighted-average, buy bid price per period (Dollars per MWh): 2020/2021 planning period



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. FTR profitability is relevant only to participants purchasing FTRs and is not relevant to self scheduled FTRs. 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. Profits include the payment of surplus to FTRs.

Bilateral transactions are excluded from the profit calculations because there are inconsistent reporting requirements and no assurance that reported prices reflect the actual prices under the PJM rules. ARR holders that self schedule FTRs receive congestion revenues but do not receive profits from those FTRs because ARR holders are assigned the 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. 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. Revenues from the surplus are 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 period 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 without GreenHat losses were positive in every completed planning period from 2012/2013 through 2020/2021 except the 2016/2017 planning period, and were positive if summed over the entire period (Table 13-30). 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.

Table 13-28 lists FTR profits, and the congestion returned through self scheduled FTRs, by organization type and FTR direction of the 2020/2021 planning period. This table includes the auction cost and revenue from both buying and selling FTRs that were effective between June 2020 and May 2021. This includes FTRs from the 2018/2021, 2019/2022 and 2020/2023 Long Term auctions, the 2020/2021 Annual auction, and the Monthly auctions from June 2020 through May 2021. The costs and revenues of the yearly 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 $116.8 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 13-28 FTR profits and revenues by organization type and FTR direction: 2020/2021

	Purchased FTRs Profit			Self Scheduled FTRs Revenue Returned		
Organization Type	Prevailing Flow	Counter Flow	Total	Prevailing Flow	Counter Flow	Total
Financial	$155,176,709	$125,409,870	$280,586,579			
Financial without GreenHat	$154,797,219	$126,108,796	$280,906,014			
Physical	$60,989,987	($48,492)	$60,941,495			
Physical ARR	$30,242,098	($11,260,046)	$18,982,052	$184,184,380	($420,719)	$183,763,660
Total	$246,408,794	$114,101,332	$360,510,126	$184,184,380	($420,719)	$183,763,660

Table 13-29 lists the monthly FTR profits for the 2019/2020 planning period and the 2020/2021 planning period by organization type. FTR profits include revenue from FTR sales, but do not include any net end of planning period surplus distribution 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. In the 2020/2021 planning period, profits for all participants were $360.5 million, up from $113.6 million in losses in the 2019/2020 planning period. The largest month to month increase in profits was in April, $81.0 million and the second largest month to month increase in profits was in February, $80.6 million. Among organization types, financial organizations had the largest increase in profits in the 2020/2021 planning period, $301.7 million. The increase in profits was a result of higher target allocations and lower auction costs.

Table 13-29 Monthly FTR profits by organization type: 2019/2020 and 2020/2021[35]

	Organization Type				
Month	Financial	Financial without GreenHat	Physical	Physical ARR	Total
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)
Jun-20	$13,553,728	$14,169,535	$2,968,368	($105,462)	$16,416,634
Jul-20	$35,758,125	$35,699,812	$9,137,003	$3,750,023	$48,645,151
Aug-20	$26,341,215	$26,180,692	$6,690,519	$3,240,451	$36,272,185
Sep-20	$23,243,038	$22,978,996	$7,356,627	$4,494,466	$35,094,131
Oct-20	$9,270,440	$8,813,003	$5,358,560	($843,912)	$13,785,088
Nov-20	$7,462,052	$7,789,762	($3,735,384)	($2,396,979)	$1,329,689
Dec-20	$26,204,312	$26,414,749	$160,949	$2,536,264	$28,901,524
Jan-21	$14,413,025	$14,543,616	($606,901)	$1,014,141	$14,820,265
Feb-21	$26,325,929	$27,249,807	$14,548,075	$3,170,577	$44,044,582
Mar-21	$31,624,116	$31,679,111	$5,276,933	$5,960,090	$42,861,139
Apr-21	$33,914,216	$32,426,080	$6,217,364	$3,418,465	$43,550,045
May-21	$32,476,383	$32,960,851	$7,569,383	($5,256,074)	$34,789,692
Summary for Planning Period 2020/2021					
Total	$280,586,579	$280,906,014	$60,941,495	$18,982,052	$360,510,126

Table 13-30 lists the historical profits by calendar year by organization type beginning in the 2012/2013 planning period for purchased FTRs. (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 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, $140.7 million in the 2019/2020 planning period, and $137.1 million in the 2020/2021 planning period.

35 The GreenHat Default Allocation Assessment by PJM was $46.3 million for the 2019/2020 planning period and $1.8 million for the 2020/2021 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 transactions or GreenHat's collateral.

Table 13-30 FTR profits by organization type: 2012/2013 through 2020/2021[36]

		2012/2013	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018	2018/2019	2019/2020	2020/2021
Financial	Profit	$201,825,234	$913,502,323	$250,551,943	$68,895,867	($12,525,947)	$239,981,474	$113,086,231	($21,139,644)	$280,586,579
	Surplus	($50,304,408)	($145,080,521)	$19,453,837	$4,921,078	$8,810,267	$90,361,918			
	Total	$151,520,826	$768,421,802	$270,005,781	$73,816,945	($3,715,680)	$330,343,392	$113,086,231	($21,139,644)	$280,586,579
Financial without GreenHat	Profit	$201,825,234	$913,502,323	$250,551,785	$70,094,918	($11,821,248)	$240,111,850	$223,376,757	$25,150,852	$280,906,014
	Surplus	($50,304,408)	($145,080,521)	$19,453,837	$4,921,078	$8,810,267	$90,361,918			
	Total	$151,520,826	$768,421,802	$270,005,623	$75,015,995	($3,010,981)	$330,473,768	$223,376,757	$25,150,852	$280,906,014
Physical	Profit	$68,537,800	$297,456,284	$82,853,390	$10,007,327	($4,010,669)	$57,532,872	($5,945,233)	($42,860,656)	$60,941,495
	Surplus	($41,626,011)	($53,642,077)	$5,395,706	$1,865,146	$4,181,855	$34,296,618			
	Total	$26,911,789	$243,814,207	$88,249,096	$11,872,473	$171,186	$91,829,490	($5,945,233)	($42,860,656)	$60,941,495
Physical ARR	Profit	$26,572,818	$366,128,947	$112,609,140	$82,181,795	($2,468,152)	$66,458,939	($6,248,557)	($49,614,191)	$18,982,052
	Surplus	($25,873,836)	($81,279,067)	$18,515,990	$7,110,576	$12,040,688	$47,753,635			
	Surplus from Self scheduled FTRs	($45,978,766)	($81,765,964)	$15,530,158	$3,073,711	$6,469,297	$42,513,186			
	Total	$698,982	$284,849,881	$131,125,130	$89,292,371	$9,572,536	$114,212,574	($6,248,557)	($49,614,191)	$18,982,052
Total		$179,131,597	$1,297,085,890	$489,380,007	$174,981,788	$6,028,043	$536,385,456	$100,892,442	($113,614,490)	$360,510,126

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

Table 13-31 shows the profits and losses of the five most and the five least profitable participants by patterns of ownership. Total MWh is the sum of all MWh by ownership type regardless of profitability. The Top 5 Profit is the sum of the profits of the five most profitable participants by ownership type. The Top 5 Profit/MWh is the Top 5 Profit divided by the sum of the MWh of the top 5 participants by ownership type. The Top 5 Market Share of MWh is the sum of the MWh of the top 5 participants by ownership type 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 participants by ownership type. The same logic applies for the statistics related to the Bottom 5 participants. The All row includes all participants including all ownership types when calculating the share of the profits and losses of the Top 5 and Bottom 5 participants. When all participants across ownership types are considered, four of the Top 5 participants and three of the Bottom 5 participants are financial participants. Of all the ownership types, the Top 5 physical ARR participants' share of profits is the highest, 87.3 percent, although the total profits of that group is the lowest. The profits of physical ARR participants are more concentrated among the top participants in the 2020/2021 planning period than in the 2019/2020 planning period. There are only a small number of physical ARR participants who directly purchase FTRs. The Bottom 5 financial participants' share of losses is the highest, 91.9 percent (excluding GreenHat's losses). Financial participants' losses are concentrated in a small number of participants.

Table 13-31 Top 5 and bottom 5 FTR profits by ownership type: 2020/2021

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	3,677,603,584	$130,859,078	$0.17	21.2%	33.7%	($98,929,798)	($0.20)	13.6%	91.6%
Financial without GreenHat	3,652,781,964	$130,859,078	$0.17	21.3%	33.7%	($98,929,798)	($0.20)	13.7%	91.9%
Physical	479,748,824	$42,693,365	$0.28	31.8%	47.1%	($20,074,516)	($0.55)	7.5%	67.7%
Physical ARR	422,287,584	$34,766,323	$0.10	82.9%	87.3%	($15,087,394)	($1.22)	2.9%	72.5%
All	4,579,639,992	$131,739,736	$0.16	18.2%	25.4%	($110,776,787)	($0.28)	8.6%	69.9%

36 Bilateral profits and losses net to zero in market total profits and losses.

Table 13-32 shows the shares of profitable and unprofitable FTR MWh by ownership type in the 2020/2021 planning period. All ownership types had more profitable MWh than unprofitable MWh.

Table 13-32 MWh share by profitability by ownership type: 2020/2021

Organization Type	Unprofitable	Profitable
Financial	17.2%	82.8%
Financial without GreenHat	16.6%	83.4%
Physical	14.8%	85.2%
Physical ARR	6.7%	93.3%
Total	15.9%	84.1%

Revenue

Long Term FTR Auction Revenue

Table 13-33 shows the long term FTR auction revenue data by trade type, FTR direction, period type and class type. The 2021/2024 Long Term FTR Auction netted $45.1 million in revenue, $8.0 million more than the previous Long Term FTR Auction. Buyers paid $93.9 million and sellers received $48.9 million, down $1.3 million and $9.2 million over the previous Long Term FTR Auction.

Table 13-33 Long Term FTR Auction Revenue: 2021/2024

			Class Type			
Trade Type	FTR Direction	Period Type	24-Hour	On Peak	Off Peak	All
Buy bids	Counter Flow	Year 1	($38,788,118)	($106,882,948)	($62,872,994)	($208,544,060)
		Year 2	($13,853,738)	($71,225,157)	($40,900,612)	($125,979,508)
		Year 3	($7,936,367)	($55,169,227)	($32,456,552)	($95,562,146)
		Total	($60,578,224)	($233,277,332)	($136,230,158)	($430,085,714)
	Prevailing Flow	Year 1	$68,082,328	$130,225,121	$65,158,734	$263,466,184
		Year 2	$47,661,107	$69,764,897	$32,131,729	$149,557,733
		Year 3	$46,115,078	$43,013,931	$21,877,662	$111,006,672
		Total	$161,858,513	$243,003,949	$119,168,126	$524,030,589
	Total		$101,280,290	$9,726,617	($17,062,032)	$93,944,874
Sell offers	Counter Flow	Year 1	($87,814)	($19,668,013)	($8,743,571)	($28,499,399)
		Year 2	($336,147)	($8,464,997)	($4,901,489)	($13,702,633)
		Year 3	($1,195)	($2,440,230)	($1,217,953)	($3,659,378)
		Total	($425,156)	($30,573,241)	($14,863,013)	($45,861,409)
	Prevailing Flow	Year 1	$2,082,120	$45,982,412	$19,827,893	$67,892,425
		Year 2	$490,249	$15,785,908	$6,048,067	$22,324,223
		Year 3	$107,683	$2,930,441	$1,461,069	$4,499,193
		Total	$2,680,052	$64,698,761	$27,337,029	$94,715,842
	Total		$2,254,896	$34,125,520	$12,474,016	$48,854,432
Total			$99,025,394	($24,398,903)	($29,536,049)	$45,090,442

Annual FTR Auction Revenue

Table 13-34 shows the Annual FTR Auction revenue by trade type, type, FTR direction and class type. The Annual FTR Auction for the 2021/2022 planning period generated $692.4 million, up 20.0 percent from $577.0 million in the 2020/2021 planning period, and down 18.0 percent from $844.6 million in the 2019/2020 planning period. Counter flow FTR holders received $220.8 million, down 12.7 percent from the previous planning period and prevailing flow FTR holders paid $913.2 million, up 10.0 percent from the previous planning period.

Table 13-34 Annual FTR auction revenue: 2021/2022

			Class Type			
Trade Type	Type	FTR Direction	24-Hour	On Peak	Off Peak	All
Buy bids	Obligations	Counter Flow	($24,885,989)	($165,673,155)	($95,834,482)	($286,393,626)
		Prevailing Flow	$179,956,973	$379,016,229	$188,556,802	$747,530,005
		Total	$155,070,984	$213,343,075	$92,722,320	$461,136,378
	Options	Counter Flow	$0	$0	$0	$0
		Prevailing Flow	$11,781,446	$25,424,679	$20,620,200	$57,826,325
		Total	$11,781,446	$25,424,679	$20,620,200	$57,826,325
	Total	Counter Flow	($24,885,989)	($165,673,155)	($95,834,482)	($286,393,626)
		Prevailing Flow	$191,738,420	$404,440,909	$209,177,002	$805,356,330
		Total	$166,852,430	$238,767,754	$113,342,520	$518,962,704
Self-scheduled bids	Obligations	Counter Flow	($133,780)	NA	NA	($133,780)
		Prevailing Flow	$181,382,650	NA	NA	$181,382,650
		Total	$181,248,870	NA	NA	$181,248,870
Buy and self-scheduled bids	Obligations	Counter Flow	($25,019,769)	($165,673,155)	($95,834,482)	($286,527,407)
		Prevailing Flow	$361,339,623	$379,016,229	$188,556,802	$928,912,655
		Total	$336,319,854	$213,343,075	$92,722,320	$642,385,248
	Options	Counter Flow	$0	$0	$0	$0
		Prevailing Flow	$11,781,446	$25,424,679	$20,620,200	$57,826,325
		Total	$11,781,446	$25,424,679	$20,620,200	$57,826,325
	Total	Counter Flow	($25,019,769)	($165,673,155)	($95,834,482)	($286,527,407)
		Prevailing Flow	$373,121,069	$404,440,909	$209,177,002	$986,738,980
		Total	$348,101,300	$238,767,754	$113,342,520	$700,211,573
Sell offers	Obligations	Counter Flow	($8,873,028)	($36,096,887)	($20,781,645)	($65,751,560)
		Prevailing Flow	$7,726,333	$43,429,708	$21,412,646	$72,568,688
		Total	($1,146,694)	$7,332,822	$631,001	$6,817,128
	Options	Counter Flow	$0	$0	$0	$0
		Prevailing Flow	$3,450	$529,203	$429,808	$962,462
		Total	$3,450	$529,203	$429,808	$962,462
	Total	Counter Flow	($8,873,028)	($36,096,887)	($20,781,645)	($65,751,560)
		Prevailing Flow	$7,729,783	$43,958,912	$21,842,455	$73,531,150
		Total	($1,143,244)	$7,862,025	$1,060,809	$7,779,590
Total			$349,244,544	$230,905,729	$112,281,710	$692,431,983

The total net of all buy and sell offers in the Annual FTR Auction, not including self scheduled FTRs, was $577.0 million for the 2020/2021 planning period and $692.4 million for the 2021/2022 planning period, a 20.0 percent increase in revenue.

FTRs sold in Long Term FTR Auctions are sold at a substantial discount to the same FTR sold in Annual FTR Auctions. Table 13-35 shows the increase in total auction revenue that would have resulted for the 2014/2015 through 2021/2022 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 13-35 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
2021/2022	$73,050,796	($3,111,721)	$13,856,264	NA	$83,795,339
Total	$266,225,357	$129,922,552	$206,292,441	$4,474,401	$606,914,751

Monthly Balance of Planning Period FTR Auction Revenue

Table 13-36 shows monthly balance of planning period FTR auction revenue by trade type, type and class type for 2021. The Monthly Balance of Planning Period FTR Auctions for the 2020/2021 planning period netted $41.4 million in revenue, the difference between buyers paying $245.0 million and sellers receiving $203.6 million. For the entire 2019/2020 planning period, the Monthly Balance of Planning Period FTR Auctions netted $52.9 million in revenue with buyers paying $331.1 million and sellers receiving $278.2 million.

Table 13-36 Monthly Balance of Planning Period FTR Auction revenue: 2021

Monthly			Class Type			
Auction	Type	Trade Type	24-Hour	On Peak	Off Peak	All
Jan-21	Obligations	Buy bids	$1,941,358	$3,115,732	$6,036,272	$11,093,362
		Sell offers	$118,732	$1,962,676	$4,515,876	$6,597,284
	Options	Buy bids	$7,201	$295,920	$368,044	$671,165
		Sell offers	$52,076	$1,307,888	$1,874,030	$3,233,994
Feb-21	Obligations	Buy bids	$1,488,611	$4,102,215	$8,421,228	$14,012,054
		Sell offers	$151,204	$3,430,637	$6,788,020	$10,369,861
	Options	Buy bids	$6,780	$178,510	$273,701	$458,991
		Sell offers	$66,074	$845,917	$1,324,871	$2,236,862
Mar-21	Obligations	Buy bids	$875,232	$4,248,129	$8,919,313	$14,042,674
		Sell offers	($370,674)	$2,359,553	$6,212,710	$8,201,589
	Options	Buy bids	$19,057	$213,699	$311,568	$544,324
		Sell offers	$52,023	$1,084,212	$1,726,196	$2,862,432
Apr-21	Obligations	Buy bids	$298,333	$3,124,790	$5,647,597	$9,070,720
		Sell offers	($41,738)	$1,795,035	$3,766,861	$5,520,159
	Options	Buy bids	$7,925	$94,663	$181,157	$283,745
		Sell offers	$28,839	$841,377	$1,210,681	$2,080,897
May-21	Obligations	Buy bids	$752,007	$1,524,128	$3,194,089	$5,470,225
		Sell offers	($71,677)	$1,089,999	$2,696,146	$3,714,468
	Options	Buy bids	$0	$139,731	$217,126	$356,857
		Sell offers	$593	$555,263	$831,306	$1,387,162
2019/2020*	Obligations	Buy bids	$133,437,559	$129,554,826	$45,741,569	$308,733,954
		Sell offers	$7,250,257	$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
2020/2021**	Obligations	Buy bids	$76,746,367	$54,636,231	$100,913,096	$232,295,694
		Sell offers	$4,698,724.82	$52,945,884	$94,347,154	$151,991,763
	Options	Buy bids	$208,720	$5,410,467	$7,087,686	$12,706,872
		Sell offers	$1,051,014	$21,345,999	$29,168,798	$51,565,811
	Net Total		$71,205,347	($14,245,186)	($15,515,170)	$41,444,992

* Shows twelve months for 2019/2020 **Shows twelve months for 2020/2021

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 13-11 shows the 10 largest positive and negative FTR target allocations, summed by sink, for the 2020/2021 planning period. The top 10 sinks that produced financial benefit accounted for 35.6 percent of total positive target allocations with the Western Hub accounting for 11.1 percent of all positive target allocations. The top 10 sinks that created liability accounted for 16.8 percent of total negative target allocations with PSEG accounting for 4.1 percent of all negative target allocations.

Figure 13-11 Ten largest positive and negative FTR target allocations summed by sink: 2020/2021

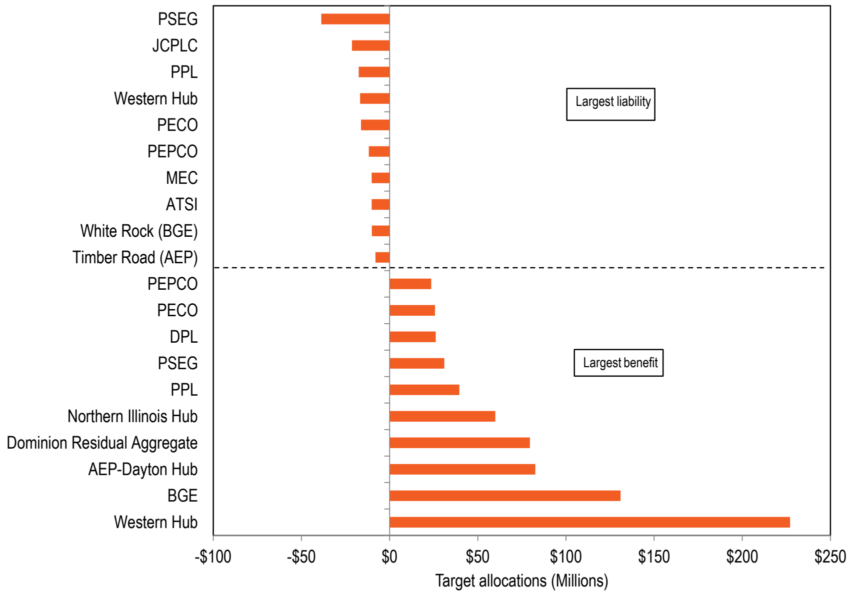
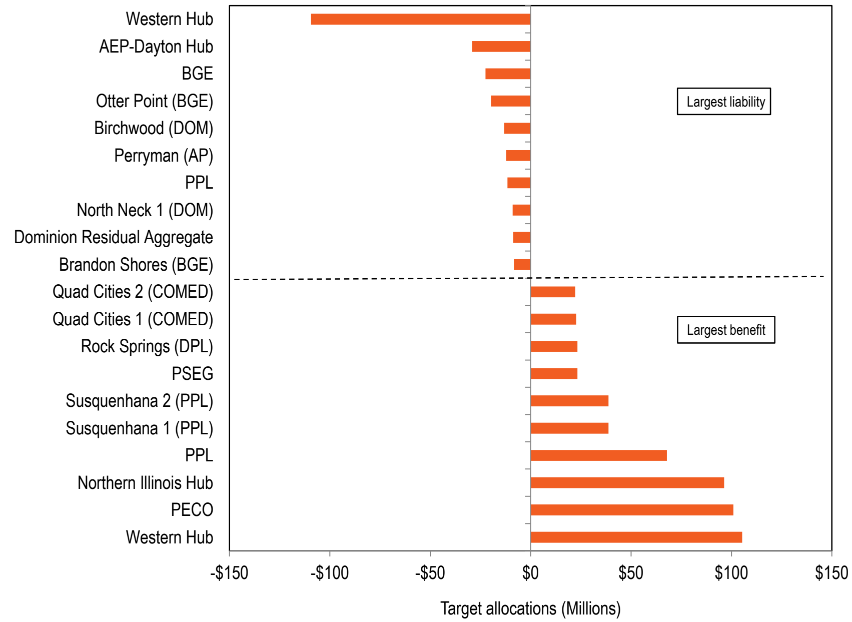


Figure 13-12 shows the 10 largest positive and negative FTR target allocations, summed by source, for the 2020/2021 planning period. The top 10 sources with a positive target allocation accounted for 26.4 percent of total positive target allocations with the Western Hub accounting for 5.2 percent of total positive target allocations. The top 10 sources with a negative target allocation accounted for 25.5 percent of all negative target allocations, with the Western Hub accounting for 11.2 percent of total negative target allocations.

Figure 13-12 Ten largest positive and negative FTR target allocations summed by source: 2020/2021



Surplus Congestion Revenue

Surplus congestion revenue is a misnomer. In fact, there is no such thing as surplus congestion revenue. The rights to all congestion revenue belong to load. Surplus congestion revenue, as defined in PJM rules, is an artifact of the flawed design of the current approach to FTR/ARRs.

In the current design, surplus congestion revenue should be allocated to ARR holders because such revenue is part of total congestion revenues. 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 and should be settled monthly.

Surplus day-ahead congestion is defined as the difference between the day-ahead congestion collected and FTR target allocations. Surplus FTR auction revenue is defined as 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 from 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 defined as the sum of the surplus day-ahead congestion revenue and the surplus FTR auction revenue at the end of each month.[37] Beginning with the 2014/2015 planning period, PJM may use surplus FTR auction revenue to pay for the clearing of counter flow FTRs as part of the auction clearing process.[38] 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 current month or prior months in the planning period. Any remaining surplus is used to pay any shortfall in FTR target allocations for the entire planning period at the end of the planning period. Any remaining surplus is distributed to ARR holders.[39]

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 period 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.

Figure 13-13 shows the distribution of the monthly surplus congestion revenue distributed to FTR holders as if it were settled monthly. The figure shows the portions of total monthly surplus, represented by the total height of the bar, that are from day-ahead congestion surplus, represented by the blue portion of the bar, and from auction surplus, represented by the orange portion of the bar. The horizontal green lines represent the amount of revenue that FTRs were paid from the surplus to be made whole for that month. The height of the bar below the green line is the portion of auction surplus that went to FTR holders, and the height of the bar above the green line is the portion that would have gone to ARR holders at the end of the planning period, if nothing changed and this surplus was not provided to FTRs. If a green line is above the bar that means there was not enough surplus congestion in that month to make FTRs whole. For example, September 2020 did not have enough surplus congestion to make FTRs whole. Those FTRs were made whole using surplus revenue from previous months.

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 be distributed to ARR holders monthly, regardless of FTR funding levels. 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. In Figure 13-13 the amount represented by each bar would be assigned to ARR holders in every month. In the 2020/2021 planning period, $137.1 million of surplus congestion revenue was paid to FTR holders that would have been paid to ARR holders under the MMU recommendation.

37 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.

38 *See* "PJM Manual 6: Financial Transmission Rights," Rev. 26 (Jan. 27, 2021).

39 On May 31, 2018, a rule change was implemented. Effective for the 2018/2019 planning period, surplus day-ahead congestion charges and surplus FTR auction revenue that remain at the end of the Planning Period allocated to ARR holders, rather than to FTR holders. 163 FERC ¶ 61,165.

Figure 13-13 Monthly surplus congestion and auction revenue distributed to FTR holders: June 2017 through June 2021[40]

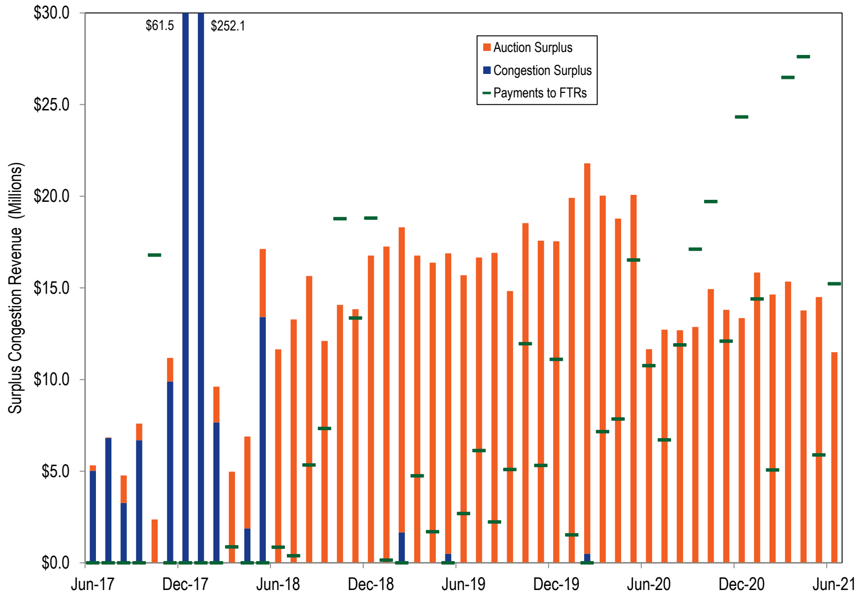
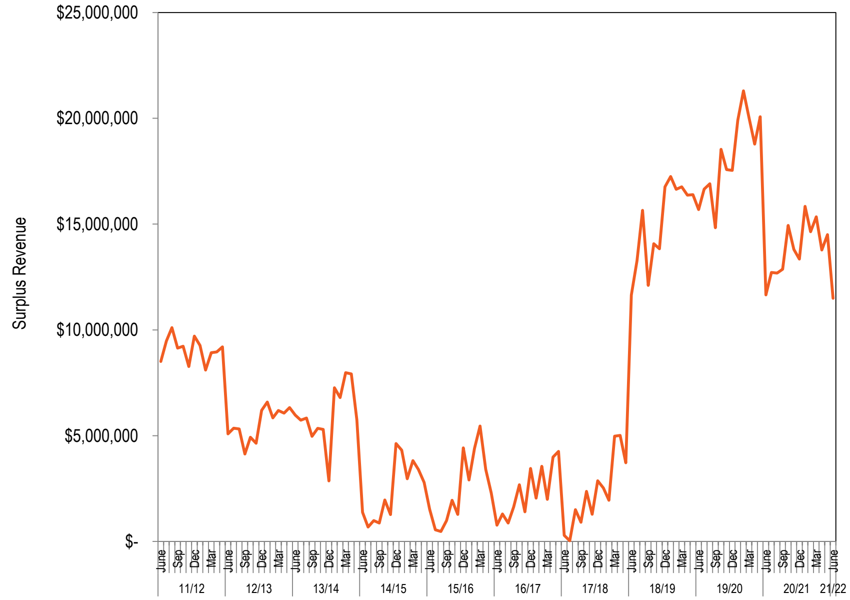


Figure 13-14 shows the surplus FTR auction revenue from the 2011/2012 planning period through the 2020/2021 planning period. Each new planning period introduces a new FTR model, including outages and PJM's discretionary adjustments for revenue adequacy. The differences in the assumptions in the market 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 inconsistent with the operation of a market that sellers are required to return some of the purchase price to buyers if the purchase is less profitable for buyers than expected. 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 13-14 Monthly FTR auction surplus: 2011/2012 through 2021/2022



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

Table 13-37 shows the surplus FTR auction revenue, surplus day-ahead congestion revenue and surplus congestion revenue for planning periods 2010/2011 through the 2020/2021 planning period.

Table 13-37 Surplus FTR Auction Revenue: 2010/2011 through 2020/2021[41]

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
2020/2021	$166.1	($185.1)	($14.5)
Total	$955.6	($2,426.9)	($748.5)

*Start of counter flow "buy back"

Revenue Adequacy

FTR revenue adequacy, like surplus congestion revenue, is a misnomer. FTR revenue adequacy, as defined in PJM rules, is an artifact of the flawed design of the current approach to FTR/ARRs.

As defined, FTR revenue adequacy simply compares congestion revenues to FTR target allocations. (Target allocations are the CLMP differences between the source and sink of the FTR times the MW of the FTR.) There is no reason to expect congestion revenues to equal FTR target allocations under the path based approach. Revenue adequacy is not a benchmark for how well the FTR process is working. 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 the FTRs made available for sale in FTR auctions. 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.

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. Instead, 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 in the current design. 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.

41 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.

Revenue adequacy for ARRs is, for practical purposes, a 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, or even much less.

Total net FTR auction revenue for the 2019/2020 planning period, before accounting for self scheduling, load shifts or residual ARRs, was $982.0 million. The FTR auction revenue pays ARR holders' credits. For the 2020/2021 planning period, total net FTR auction revenue was $691.2 million.

Table 13-38 presents the PJM FTR revenue detail for the 2019/2020 planning period and the 2020/2021 planning period. This includes 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.[42] 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.

42 The final ARR values may change if load shifts.

Table 13-38 Total annual ARR and FTR revenue detail (Dollars (Millions)): 2019/2020 and 2020/2021

Accounting Element	2019/2020	2020/2021
ARR information		
ARR target allocations	$752.2	$517.1
ARR credits	$752.2	$517.1
FTR auction revenue	$982.0	$691.2
Annual FTR Auction net revenue	$844.6	$577.0
Long Term FTR Auction net revenue	$84.5	$72.7
Monthly Balance of Planning Period FTR Auction net revenue	$52.9	$41.4
Surplus auction revenue		
ARR Surplus	$217.8	$166.1
ARR payout ratio	100%	100%
FTR targets		
Positive target allocations	$904.3	$1,397.7
Negative target allocations	($224.3)	($313.0)
FTR target allocations	$680.1	$1,080.3
Adjustments:		
Adjustments to FTR target allocations	($7.9)	($4.5)
Total FTR targets	$673.5	$861.8
FTR payout ratio	100%	98.7%
FTR revenues		
ARR excess	$217.8	$166.1
Congestion		
Net Negative Congestion (enter as negative)	$0.0	$0.0
Hourly congestion revenue	$596.4	$899.6
M2M Payments(credit to PJM minus credit to M2M entity)	$0.0	$0.0
Adjustments:		
Surplus revenues carried forward into future months	$0.0	$9.0
Surplus revenues distributed back to previous months	$0.0	$20.2
Other adjustments to FTR revenues	$0.0	$0.0
Total FTR revenues		
Surplus revenues distributed to other months	$0.0	$29.2
Net Negative Congestion charged to DA Operating Reserves	$0.0	$0.0
Total FTR congestion credits	$814.2	$1,094.9
Total congestion credits(includes end of year distribution)	$814.2	$1,094.9
Remaining deficiency	($140.7)	$14.5

FTR target allocations are defined 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 13-39 lists the FTR revenues, target allocations, credits, payout ratios, congestion credit deficiencies and excess congestion charges by month.

The total row in Table 13-39 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. September 2020 had revenue shortfalls totaling $4.2 million, but September FTR target allocations were fully funded using surplus revenue from previous months. March and April 2021 had revenue shortfalls that could not be made whole using surplus revenues from previous months, resulting in a revenue shortfall for the planning period.

Table 13-39 Monthly FTR accounting summary (Dollars (Millions)): 2019/2020 and 2020/2021

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-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		$814.2		($140.7)
Jun-20	$74.4	$73.3	100.0%	$74.7	100.0%	($1.1)
Jul-20	$118.3	$112.3	100.0%	$118.3	100.0%	($6.0)
Aug-20	$95.2	$94.4	100.0%	$95.2	100.0%	($0.8)
Sep-20	$90.9	$95.2	94.9%	$95.2	100.0%	$0.0
Oct-20	$67.5	$72.2	93.1%	$72.2	100.0%	$0.0
Nov-20	$55.1	$53.4	100.0%	$55.1	100.0%	($1.7)
Dec-20	$79.6	$90.5	87.5%	$90.5	100.0%	$0.0
Jan-21	$69.0	$67.6	100.0%	$69.0	100.0%	($1.4)
Feb-21	$104.9	$95.4	100.0%	$104.9	100.0%	($9.6)
Mar-21	$96.3	$107.5	89.6%	$105.5	98.2%	$1.1
Apr-21	$95.6	$109.4	87.4%	$95.6	87.4%	$13.4
May-21	$118.9	$110.3	100.0%	$118.9	100.0%	($8.6)
Summary for Planning Period 2020/2021						
Total	$1,065.7	$1,081.5		$1,095.3		$14.5

Figure 13-15 shows the original PJM reported FTR payout ratio by month, excluding excess revenue distribution, for January 2004 through June 2021. 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 13-15 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 13-15 FTR payout ratio by month, excluding and including excess revenue distribution: January 2004 through June 2021

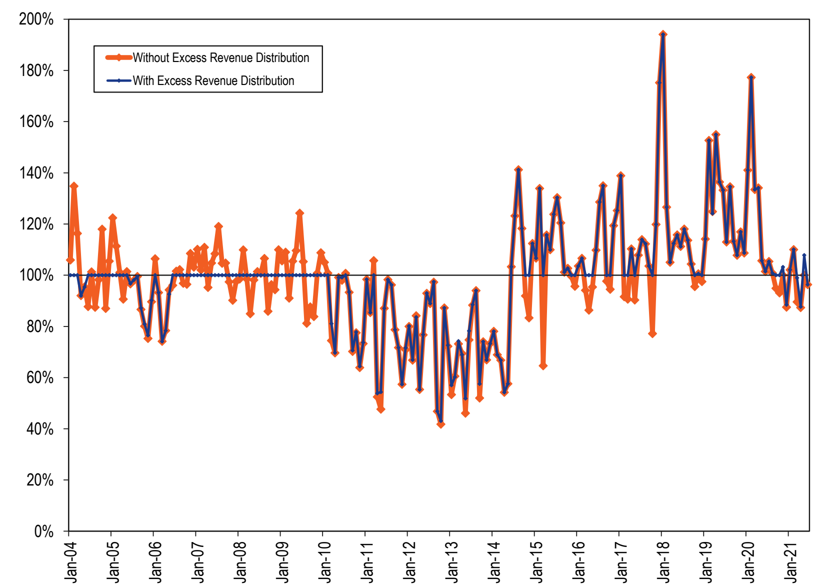


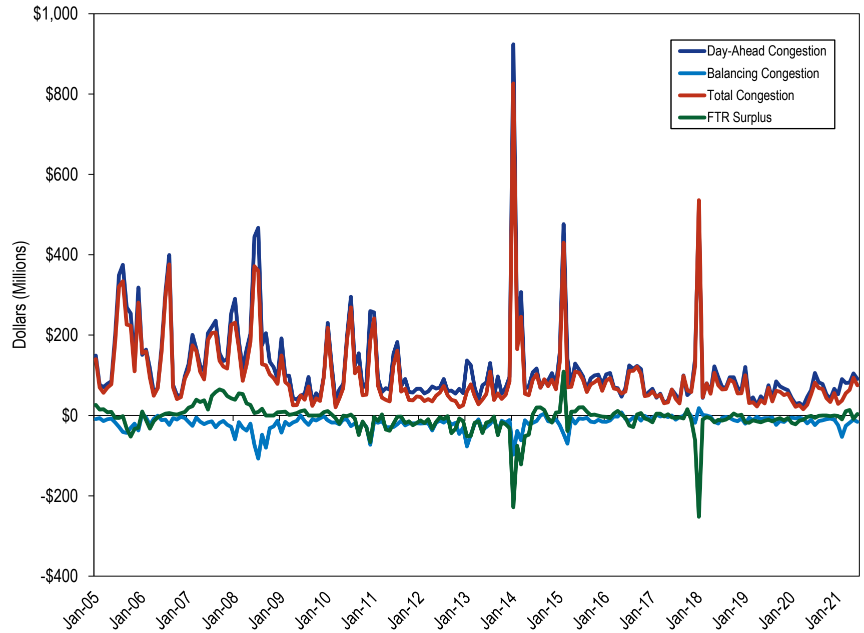
Table 13-40 shows the FTR payout ratio by planning period from the 2003/2004 planning period forward. Planning period 2013/2014 includes the additional revenue from unallocated congestion charges from Balancing Operating Reserves. Beginning with the 2018/2019 planning period payments to FTRs are limited to 100 percent of the target allocations.

Table 13-40 Reported FTR payout ratio by planning period[43]

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	116.2%
2015/2016	106.8%
2016/2017	112.6%
2017/2018	138.5%
2018/2019	100.0%
2019/2020	100.0%
2020/2021	98.7%

Figure 13-16 shows the FTR surplus, day-ahead, balancing and total congestion payments from January 2005 through June 2021.

Figure 13-16 FTR surplus and day-ahead, balancing and total congestion: 2005 through June 2021



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 to offset an unintended consequence of locational marginal pricing. 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 paid by load and the congestion paid to load, in aggregate and on a specific load basis. These inconsistencies between actual network use and path based rights cause cross subsidies between ARR holders

43 The actual payout ratios for planning periods 2006/2007, 2007/2008, and 2008/2009 may have exceeded 100 percent.

and FTR holders and among ARR holders. One result of this misalignment is that individual zones have very different offsets due to the location of their path based ARRs compared to their actual congestion costs from actual network use.

Table 13-41 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. The highlighted offsets are the actual offsets based on the rules that were effective 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 allocation of balancing congestion and M2M payments to load went into effect for 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 $1,351.4 million less in congestion offsets from the 2011/2012 through the 2020/2021 planning period. The total overpayment to FTR holders for the 2011/2012 through 2020/2021 planning period would have been $1,534.3 million.

Total ARR and self scheduled FTR revenue offset 46.2 percent of total congestion costs for the 2020/2021 planning period. For the 2019/2020 planning period, FTR bidders paid more in the auctions than the actual day-ahead target allocations for the same paths. The unexpected reduction in energy prices in 2020 led to a corresponding unexpected reduction in target allocations and in actual congestion. This resulted in an offset over 100 percent because the resulting total ARR value was greater than actual congestion costs. FTR prices were lower in the Annual FTR Auction for 2020/2021, reducing the offset for the 2020/2021 planning period.

Table 13-41 ARR and FTR total congestion offset (in millions) for ARR holders: 2011/2012 through 2020/2021

	Revenue								Pre 2017/2018 (Without Balancing)		2017/2018 (With Balancing)		Post 2017/2018 (With Balancing and Surplus)		Effective Offset	
Planning Period	ARR Credits	Unadjusted FTR Credits	Day Ahead Congestion	Balancing + M2M Congestion	Total Congestion	Surplus Revenue Pre 2017/2018 Rules	Surplus Revenue 2017/2018 Rules	Post 2017/2018 Rules	Total ARR/ FTR Offset	Percent Offset	Current Revenue Received	Percent Offset	New Revenue Received	New Offset	Cumulative Revenue	Offset
2011/2012	$512.2	$310.0	$1,025.4	($275.7)	$749.7	($50.6)	$35.6	$113.9	$771.6	102.9%	$582.1	77.6%	$660.4	88.1%	$771.6	102.9%
2012/2013	$349.5	$268.4	$904.7	($379.9)	$524.8	($94.0)	$18.4	$62.1	$523.9	99.8%	$256.4	48.9%	$300.1	57.2%	$523.9	99.8%
2013/2014	$337.7	$626.6	$2,231.3	($360.6)	$1,870.6	($139.4)	($49.0)	($49.0)	$824.8	44.1%	$554.6	29.7%	$554.6	29.7%	$824.8	44.1%
2014/2015	$482.4	$348.1	$1,625.9	($268.3)	$1,357.6	$36.7	$111.2	$400.6	$867.2	63.9%	$673.4	49.6%	$962.8	70.9%	$867.2	63.9%
2015/2016	$635.3	$209.2	$1,098.7	($147.6)	$951.1	$9.2	$42.1	$188.9	$853.7	89.8%	$739.0	77.7%	$885.9	93.1%	$853.7	89.8%
2016/2017	$640.0	$149.9	$885.7	($104.8)	$780.8	$15.1	$36.5	$179.0	$805.0	103.1%	$721.6	92.4%	$864.0	110.7%	$805.0	103.1%
2017/2018	$427.3	$212.3	$1,322.1	($129.5)	$1,192.6	$52.3	$80.4	$370.7	$692.0	58.0%	$590.6	49.5%	$880.9	73.9%	$590.6	49.5%
2018/2019	$529.1	$130.1	$832.7	($152.6)	$680.0	($5.8)	$16.2	$112.2	$653.34	96.1%	$522.7	76.9%	$618.8	91.0%	$618.8	91.0%
2019/2020	$542.0	$91.9	$612.1	($169.4)	$442.7	($1.6)	$21.6	$157.8	$632.3	142.8%	$486.1	109.8%	$622.2	140.6%	$622.2	140.6%
2020/2021	$373.9	$179.3	$899.6	($256.2)	$643.4	($43.1)	($0.0)	($0.0)	$510.14	79.3%	$297.1	46.2%	$297.1	46.2%	$297.1	46.2%
Total	$4,829.4	$2,525.8	$11,438.0	($2,244.7)	$9,193.4	($221.2)	$312.9	$1,536.1	$7,134.1	77.6%	$5,423.6	59.0%	$6,646.8	72.3%	$6,774.9	73.7%

Table 13-41 illustrates 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 13-42 also shows the cumulative offset and shortfall, assuming the rules implemented in the 2017/2018 planning period. The cumulative offset percentage has increased since the 2014/2015 planning period except for the 2019/2020 planning period. The cumulative offset would have been 72.3 percent if the 2017/2018 surplus allocation rules had been in place for the entire period.

Table 13-42 ARR and FTR cumulative offset for ARR holders using 2017/2018 surplus allocation: 2011/2012 through 2020/2021

Planning Period	Cumulative Offset	Cumulative Shortfall (Millions)
2011/2012	88.1%	($89.3)
2012/2013	75.4%	($314.0)
2013/2014	48.2%	($1,630.0)
2014/2015	55.0%	($2,024.8)
2015/2016	61.7%	($2,090.0)
2016/2017	67.8%	($2,006.8)
2017/2018	68.8%	($2,318.5)
2018/2019	70.6%	($2,379.8)
2019/2020	74.3%	($2,200.2)
2020/2021	72.3%	($2,546.6)

Table 13-43 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 73.7 percent based on the rules that were in place for each planning period. Load has been underpaid by $2.4 billion from the 2011/2012 planning period through the 2020/2021 planning period. The amount of underpayment would have been even greater, $3.8 billion, if the 2017/2018 surplus allocation rules had been in place for the entire period.

Table 13-43 ARR and FTR cumulative offset for ARR holders using effective surplus allocation rules: 2011/2012 through 2020/2021

Planning Period	Cumulative Offset	Cumulative Shortfall (Millions)
2011/2012	102.9%	$21.9
2012/2013	101.6%	$21.0
2013/2014	67.4%	($1,024.8)
2014/2015	66.3%	($1,515.2)
2015/2016	70.4%	($1,612.6)
2016/2017	74.5%	($1,588.4)
2017/2018	70.5%	($2,190.4)
2018/2019	72.2%	($2,251.7)
2019/2020	75.8%	($2,072.1)
2020/2021	73.7%	($2,418.4)

Zonal ARR Congestion Offset

Zonal ARR congestion offsets vary significantly across zones. There is no reason that this should be the result. This outcome is a direct result of the flawed definition of congestion and of the method for assigning rights to congestion to ARR holders. The results show that path based ARR assignments in the current path based ARR/FTR design are not aligned with actual network use by load, and are therefore not aligned with how congestion is actually paid by load on actual network usage. Due to this misalignment of ARR rights relative to actual network usage, individual loads cannot claim the congestion they paid through assigned ARRs. The misalignment of path based ARR rights produces cross subsidies among ARR holders.

ARRs are allocated to zonal load based on historical generation to load transmission contract paths, in many cases based on 1999 contract 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.[44]

Table 13-44 shows the day-ahead congestion and balancing congestion and M2M charges paid by load in each zone along with the congestion offsets paid to load: FTR auction revenue; self scheduled FTR revenue adjusted by the payout ratio for FTRs if below 100 percent; and the allocation of end of planning period surplus.[45] The offset for the 2020/2021 planning period assigns the current surplus revenue at the end of the quarter to ARR holders. Table 13-44 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.

The zonal offset percentage shown in Table 13-44 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.

Table 13-44 Zonal ARR and FTR total congestion offset (in millions) for ARR holders: 2020/2021 planning period

Zone	ARR Credits	Adjusted FTR Credits	Balancing+ M2M Charge	Surplus Allocation	Total Offset	Day Ahead Congestion	Balancing Congestion	M2M Payments	Total Congestion	Offset
ACEC	$4.4	$0.0	($2.7)	($0.1)	$1.7	$8.2	($2.3)	($0.5)	$5.5	31.2%
AEP	$40.2	$36.4	($38.1)	($2.4)	$38.4	$149.0	($32.2)	($5.9)	$110.9	34.6%
APS	$32.9	$14.9	($14.8)	($1.4)	$33.0	$60.0	($12.5)	($2.3)	$45.2	73.0%
ATSI	$20.4	$0.2	($19.5)	($0.6)	$1.1	$70.1	($16.4)	($3.0)	$50.6	2.1%
BGE	$58.4	$3.6	($9.1)	($1.7)	$52.8	$34.0	($7.7)	($1.4)	$24.8	212.7%
COMED	$36.4	$11.5	($28.5)	($1.2)	$19.4	$106.8	($24.2)	($4.4)	$78.3	24.7%
DAY	$5.9	$0.8	($5.3)	($0.2)	$1.5	$16.3	($4.5)	($0.8)	$11.0	13.4%
DUKE	$24.2	$4.9	($8.4)	($0.8)	$20.8	$25.8	($7.1)	($1.2)	$17.4	119.5%
DUQ	$5.6	$0.2	($4.0)	($0.2)	$1.8	$10.4	($3.4)	($0.9)	$6.2	29.6%
DOM	$7.7	$85.7	($37.9)	($1.9)	$55.5	$121.5	($32.9)	($0.6)	$87.9	63.1%
DPL	$28.6	$8.1	($6.7)	($0.9)	$30.1	$46.9	($5.8)	($4.9)	$36.2	83.2%
EKPC	$3.0	$0.0	($4.2)	($0.1)	($1.1)	$12.6	($3.6)	($0.6)	$8.4	(13.0%)
EXT	$0.5	$0.0	($13.8)	($0.0)	($13.3)	$24.8	($13.8)	$0.0	$11.0	(120.7%)
JCPLC	$6.0	$0.0	($6.1)	($0.2)	($0.0)	$19.0	($5.0)	($1.1)	$12.9	(0.2%)
MEC	$3.5	$0.7	($5.3)	($0.1)	($1.1)	$21.7	($4.6)	($0.7)	$16.5	(6.9%)
OVEC	$0.0	$0.0	($0.3)	$0.0	($0.3)	$1.2	($0.3)	$0.0	$0.9	(28.8%)
PECO	$15.0	$0.2	($10.9)	($0.4)	$4.2	$35.8	($9.1)	($1.8)	$24.9	17.0%
PE	$6.1	$4.9	($6.5)	($0.3)	$4.5	$22.9	($5.7)	($0.8)	$16.4	27.3%
PEPCO	$25.9	$3.8	($8.3)	($0.8)	$21.4	$28.8	($6.9)	($1.3)	$20.5	104.5%
PPL	$24.3	$3.4	($11.5)	($0.7)	$16.1	$42.3	($9.6)	($1.9)	$30.8	52.4%
PSEG	$24.7	$0.0	($13.9)	($0.7)	$10.8	$38.9	($11.9)	($2.0)	$25.0	43.2%
REC	$0.2	$0.0	($0.6)	($0.0)	($0.4)	$2.6	($0.5)	($0.1)	$2.1	(17.0%)
Total	$373.9	$179.3	($256.2)	($14.5)	$297.0	$899.6	($219.9)	($36.3)	$643.4	46.2%

44 *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>.
45 See *2019 State of the Market Report for PJM*, Volume II, Section 11: Congestion and Marginal Losses

The total congestion offset paid to loads in the 2020/2021 planning period was 46.2 percent of congestion costs. 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 ATSI, 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.

Offset Available from Self Scheduling

It is not possible for load to recover all of the congestion that they pay under the current design in which the rights to congestion revenues are assigned based on fictitious contract paths. Table 13-45 shows the total congestion offset that would be available to ARR holders via allocated ARRs, by zone, if the ARR holders self scheduled all their allocated ARRs as FTRs in the 2018/2019 through 2020/2021 planning periods. The results show that the recovery of congestion varies significantly by zone and that some zones recover more than the congestion they pay and some zones recover less. This is not consistent with a rational FTR/ARR design based on the fundamentals of the way that congestion costs are actually paid.

Table 13-45 Offset available to load if all ARRs self scheduled: 20182019 through 2020/2021 planning periods

	18/19 Planning Period				19/20 Planning Period				20/21 Planning Period			
	SS FTR	Bal+M2M Charges	Congestion+M2M	Offset	SS FTR	Bal+M2M Charges	Congestion+M2M	Offset	SS FTR	Bal+M2M Charges	Congestion+M2M	Offset
ACEC	$11.5	($1.9)	$10.0	96.2%	$2.6	($2.1)	$3.7	15.6%	$1.8	($2.7)	$5.5	(16.4%)
AEP	$84.9	($24.2)	$105.4	57.6%	$62.7	($28.2)	$81.9	42.1%	$77.3	($38.1)	$110.9	35.3%
APS	$37.4	($9.0)	$44.7	63.5%	$31.2	($10.4)	$31.9	65.1%	$42.0	($14.8)	$45.2	60.3%
ATSI	$45.3	($12.5)	$52.3	62.8%	$27.9	($13.9)	$36.8	38.1%	$30.7	($19.5)	$50.6	22.1%
BGE	$49.0	($6.1)	$20.0	215.0%	$53.7	($6.7)	$15.3	308.0%	$79.7	($9.1)	$24.8	284.2%
COMED	$51.4	($16.7)	$96.3	36.1%	$40.6	($19.8)	$65.2	31.9%	$69.6	($28.5)	$78.3	52.4%
DAY	$11.2	($3.3)	$12.8	61.8%	$5.6	($3.9)	$9.7	17.4%	$8.0	($5.3)	$11.0	24.9%
DUKE	$50.4	($5.3)	$23.6	191.2%	$30.5	($6.0)	$14.9	164.2%	$40.9	($8.4)	$17.4	187.2%
DUQ	$7.2	($2.5)	$7.7	61.5%	$8.1	($3.2)	$5.1	95.2%	$8.9	($4.0)	$6.2	79.7%
DOM	$55.8	($18.4)	$66.0	56.7%	$32.8	($16.9)	$59.2	26.9%	$40.9	($37.9)	$87.9	3.5%
DPL	$57.7	($4.0)	$59.0	91.0%	$27.3	($8.7)	$17.4	107.3%	$56.4	($6.7)	$36.2	137.4%
EKPC	$0.9	($2.3)	$9.5	(14.5%)	$4.1	($2.9)	$7.4	16.8%	$6.6	($4.2)	$8.4	29.3%
EXT	$1.7	($4.8)	($4.1)	76.7%	$0.9	($2.2)	($1.7)	74.3%	$0.3	($13.8)	$11.0	(122.3%)
JCPLC	$2.6	($4.2)	$20.3	(7.8%)	$2.3	($4.6)	$9.2	(25.5%)	$0.9	($6.1)	$12.9	(40.2%)
MEC	$5.0	($3.3)	$14.6	11.8%	$0.8	($4.2)	$8.7	(38.5%)	$8.0	($5.3)	$16.5	16.5%
OVEC	NA	NA	NA	NA	NA	$0.1	$0.5	NA	NA	($0.3)	$0.9	NA
PECO	$15.7	($7.4)	$29.9	27.7%	$16.8	($8.2)	$13.4	63.8%	$14.0	($10.9)	$24.9	12.4%
PE	$17.5	($4.2)	$17.5	76.0%	$11.2	($3.8)	$10.8	69.1%	$13.5	($6.5)	$16.4	42.8%
PEPCO	$19.5	($5.4)	$18.2	77.8%	$23.2	($6.1)	$13.7	124.3%	$37.3	($8.3)	$20.5	141.7%
PPL	$4.3	($7.7)	$36.6	(9.1%)	$39.2	($8.5)	$20.5	149.9%	$43.7	($11.5)	$30.8	104.5%
PSEG	$35.6	($8.8)	$38.5	69.6%	$21.3	($8.9)	$18.4	67.2%	$43.2	($13.9)	$25.0	117.0%
REC	$0.2	($0.9)	$1.1	(68.7%)	$0.2	($0.3)	$0.6	(22.6%)	$1.0	($0.6)	$2.1	21.0%
Total	$565.0	($152.7)	$680.0	60.6%	$443.0	($169.4)	$442.7	61.8%	$624.8	($256.2)	$643.4	57.3%

Credit

There were five collateral defaults in 2021. There were five payment defaults in 2021 not involving GreenHat Energy, LLC for a total of $1.8 million. GreenHat Energy's default payments ended with the 2020/2021 planning period. GreenHat Energy accrued total accrued payment defaults of $162.0 million, including the auction liquidation costs.[46] 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 $179.5 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.[47] FERC recognized "…there are multiple complexities associated with implementing the Waiver Order Directive that should be addressed in a paper hearing…"[48] 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."[49]

By delegated order issued December 30, 2019, the Commission approved a settlement agreement between PJM and the interested parties.[50] The result of the settlement was a release of all claims of harm resulting from 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 additional payments, will be recovered via the default allocation assessment fund, which is allocated to all PJM members in proportion to their total net bill.

46 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.

47 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).

48 See 167 FERC ¶ 61, 2019 at P 27 (2019).

49 See *Id.* at P 28.

50 See 169 FERC ¶ 61,260 (2019).

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 and will continue to accrue revenues and/or charges and must be reconciled. Under this method, PJM leaves the participant's positions 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 a method under which defaulted FTRs would be canceled rather than holding or liquidating them. Canceling the FTRs would release the FTRs to the FTR market. The market would then decide the value of the capacity released and the timing of its release. There would be no discretion necessary to settle the defaulted position and the losses would be contained within the ARR/FTR market.

Cancellation of a defaulting portfolio does not change congestion. But 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 would isolate the costs of the default to those participating in and benefitting from the FTR market.

FTR Forfeitures

In the Forfeiture Rule Directive, the Commission determined that the Forfeiture Rule is just and reasonable and "…serves to deter such manipulation" related to virtual transaction cross product manipulation.[51] The Commission identified four main tenets with which the Forfeiture Rule must comply, including that it: (i) deter manipulation, (ii) provide transparency allowing participants to modify their behavior, (iii) base forfeitures on an individual participant's actions and (iv) is not punitive.[52]

The point of the Forfeiture Rule is to avoid an inefficient and costly process and to establish an objective rule that prevents profiting from virtual trading on one's own FTR positions. The Forfeiture Rule operates to remove the incentive to engage in manipulation; the rule does not involve findings of manipulation.[53]

The FTR forfeiture rule considers the impact of a participant's net virtual transaction portfolio on all constraints.[54] 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, metric that the participant's net virtual portfolio increased the value of the FTR, then the FTR is subject to FTR forfeiture.

The FTR Forfeiture Rule does not penalize FTR holders. The FTR forfeiture rule does not affect the profits or losses of virtual activity. The FTR Forfeiture Rule, if triggered by a participant's virtual portfolio, results in forfeiting only FTR profits and only in the specific hours for which the rule is violated. The profit is calculated as the hourly FTR target allocation minus the FTR's hourly cost. Even when FTR profits are forfeited, the value that the buyer assigned to congestion in the FTR auction (the price paid) is not affected. For example, if a buyer paid $5.00/MWh for congestion and congestion was $5.00/MWh, the forfeiture would be zero. If congestion were $7.00/MWh, the forfeiture would be $2.00/MWh. Market participants understand the relationship between FTR and virtual positions in detail and can avoid violating the FTR forfeiture rule if they choose to do so.

The FTR forfeiture rule has not reduced participation in the PJM FTR market or participation in virtual activity. There has been an increase in the number of participants in the FTR market since the implementation of the new FTR forfeiture rule, and a decrease in the number of participants with forfeitures.

On May 20, 2021, FERC issued an order ruling the $0.01 definition of an increase in the value of an FTR unjust and unreasonable, but upheld the other parts of PJM's forfeiture rule. In this Order, FERC required PJM to modify the FTR forfeiture rule and submit a compliance filing. As a result, PJM stopped billing FTR forfeitures using this method on May 20, 2021, and will not implement a forfeiture rule until FERC accepts a compliance filing.

Figure 13-17 shows the monthly FTR forfeitures under the modified FTR forfeiture rule from January 19, 2017, through May 20, 2021. As required by the FERC order, PJM began retroactively billing FTR forfeitures with the September 2017 bill. In the period from January 2017 through September 2017, participants did not have good information about the level of their FTR forfeitures, so they could not accurately modify their bidding behavior to avoid FTR forfeitures. After September 2017, FTR forfeitures decreased significantly, and stabilized, as participants received information on their FTR forfeitures.

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] Beginning with the September 2019 bill, PJM began billing using the correct hourly cost calculation. For the 2020/2021 planning period, total FTR forfeitures were $4.6 million.

51 Forfeiture Rule Directive at P 33.
52 Forfeiture Rule Directive at P 62.
53 *See* "Protest and Motion for Rejection of the Independent Market Monitor for PJM," Docket No. EL20-41 (June 1, 2020).
54 A modified FTR forfeiture rule was implemented effective January 19, 2017. See *2019 State of the Market Report for PJM*, Volume II, Section 13: Financial Transmission Rights for the full history.
55 *See* "Minor modification to Tariff Language for FTR Forfeiture Rule," Docket No. ER19-2240 (June 24, 2019).

Figure 13-17 Monthly FTR forfeitures for physical and financial participants