



the Commission institute a proceeding to investigate, under Section 206 of the Federal Power Act, whether the PJM ARR/FTR market design is just and reasonable.<sup>2</sup> A Section 206 investigation would allow the Commission to consider multiple proposals for reform, develop its own proposal, and adopt a durable solution that results in true reform.

## I. ANSWER

### **A. The Market Monitor's Proposed Approach Would Return Load's Congestion Payments to Load.**

Appian Way (at 9–13) states that the current path based ARR/FTR design provides benefits to load by reducing the risk and cost of building new generation resources, reducing bilateral costs, supporting competitive default service from third parties and increasing liquidity and price discovery in derivative markets. Appian Way points (at 10) to LEI's "estimated benefits to load of \$523 million to \$1.2 billion annually" that they claim would be eliminated by replacing the current path based ARR/FTR market design with an ARR/FTR market design that would allow load to claim all the congestion they pay.

From the 2011/2012 planning year through December 31, 2021, load paid \$9.9 billion in congestion but received back only \$7.2 billion as an offset (Table 1). The Appian Way assertion is that load is better off as a result. The argument does not pass any test of logic or common sense. It is clearly and obviously wrong. Load is worse off by \$2.7 billion. There are no offsetting benefits. There is no ambiguity. There is no evidence and there can be no evidence that this makes load better off.

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<sup>2</sup> 16 U.S.C. § 824e.

**Table 1 ARR/FTR total congestion offset for ARR holders<sup>3</sup>**

| Planning Period | Revenue     |                        |                      |                            |                  |                               |                                 |                      | Pre 2017/2018 (Without Balancing) |                | 2017/2018 (With Balancing) |                | Post 2017/2018 (With Balancing and Surplus) |            | Effective Offset   |        |
|-----------------|-------------|------------------------|----------------------|----------------------------|------------------|-------------------------------|---------------------------------|----------------------|-----------------------------------|----------------|----------------------------|----------------|---|------------|--------------------|--------|
|                 | ARR Credits | Unadjusted FTR Credits | Day Ahead Congestion | Balancing + M2M Congestion | Total Congestion | Surplus Revenue Pre 2017/2018 | 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       | \$515.6     | \$310.0                | \$1,025.4            | (\$275.7)                  | \$749.7          | (\$50.6)                      | \$35.6                          | \$113.9              | \$775.0                           | 103.4%         | \$585.5                    | 78.1%          | \$663.8                                     | 88.5%      | \$775.0            | 103.4% |
| 2012/2013       | \$356.4     | \$268.4                | \$904.7              | (\$379.9)                  | \$524.8          | (\$94.0)                      | \$18.4                          | \$62.1               | \$530.7                           | 101.1%         | \$263.2                    | 50.2%          | \$306.9                                     | 58.5%      | \$530.7            | 101.1% |
| 2013/2014       | \$339.4     | \$626.6                | \$2,231.3            | (\$360.6)                  | \$1,870.6        | (\$139.4)                     | (\$49.0)                        | (\$49.0)             | \$826.5                           | 44.2%          | \$556.3                    | 29.7%          | \$556.3                                     | 29.7%      | \$826.5            | 44.2%  |
| 2014/2015       | \$487.4     | \$348.1                | \$1,625.9            | (\$268.3)                  | \$1,357.6        | \$36.7                        | \$111.2                         | \$400.6              | \$872.2                           | 64.2%          | \$678.4                    | 50.0%          | \$967.8                                     | 71.3%      | \$872.2            | 64.2%  |
| 2015/2016       | \$641.8     | \$209.2                | \$1,098.7            | (\$147.6)                  | \$951.1          | \$9.2                         | \$42.1                          | \$188.9              | \$860.2                           | 90.4%          | \$745.5                    | 78.4%          | \$892.3                                     | 93.8%      | \$860.2            | 90.4%  |
| 2016/2017       | \$648.1     | \$149.9                | \$885.7              | (\$104.8)                  | \$780.8          | \$15.1                        | \$36.5                          | \$179.0              | \$813.1                           | 104.1%         | \$729.6                    | 93.4%          | \$872.1                                     | 111.7%     | \$813.1            | 104.1% |
| 2017/2018       | \$429.6     | \$212.3                | \$1,322.1            | (\$129.5)                  | \$1,192.6        | \$52.3                        | \$80.4                          | \$370.7              | \$694.2                           | 58.2%          | \$592.8                    | 49.7%          | \$883.1                                     | 74.1%      | \$592.8            | 49.7%  |
| 2018/2019       | \$531.6     | \$130.1                | \$832.7              | (\$152.6)                  | \$680.0          | (\$5.8)                       | \$16.2                          | \$112.2              | \$655.87                          | 96.4%          | \$525.3                    | 77.2%          | \$621.3                                     | 91.4%      | \$621.3            | 91.4%  |
| 2019/2020       | \$547.6     | \$91.9                 | \$612.1              | (\$169.4)                  | \$442.7          | (\$1.6)                       | \$21.6                          | \$157.8              | \$637.9                           | 144.1%         | \$491.7                    | 111.1%         | \$627.9                                     | 141.8%     | \$627.9            | 141.8% |
| 2020/2021       | \$392.7     | \$179.9                | \$899.6              | (\$256.2)                  | \$643.4          | (\$43.2)                      | (\$0.0)                         | (\$0.0)              | \$529.31                          | 82.3%          | \$316.4                    | 49.2%          | \$316.4                                     | 49.2%      | \$316.4            | 49.2%  |
| 2021/2022*      | \$275.0     | \$166.3                | \$815.5              | (\$105.4)                  | \$710.0          | (\$34.9)                      | (\$17.6)                        | (\$17.6)             | \$406.5                           | 57.2%          | \$318.3                    | 44.8%          | \$318.3                                     | 44.8%      | \$318.3            | 44.8%  |
| Total           | \$5,165.1   | \$2,692.7              | \$12,253.5           | (\$2,350.1)                | \$9,903.4        | (\$256.2)                     | \$295.4                         | \$1,518.6            | \$7,601.6                         | 76.8%          | \$5,803.1                  | 58.6%          | \$7,026.3                                   | 70.9%      | \$7,154.4          | 72.2%  |

\* seven months of 2021/2022 planning period

LEI characterizes the \$2.7 billion as “leakage” from load to other market participants. Appian Way appears to want to characterize this leakage as a benefit to load. But this underpayment to load is a direct loss to load. Load should not be required to subsidize other market participants.

**B. LSEs’ Purported Preferences Are Irrelevant.**

Appian Way (at 13) alleges that LSEs have a “strong preference for the current construct.” While the basis for the statement is not clear, it is also irrelevant. Load serving entities (LSEs) are not the load. LSEs are companies that sell energy to customers. In concept LSEs are profitable if they sell power and services for more than they pay for them. That does not mean that the current design is correct or good for load.

It is unlikely that load would express a strong preference for giving up \$2.7 billion if asked.

Load would be better off, and the market would be more efficient, with a well defined property right that ensures that congestion revenue is returned to those that pay congestion. LSEs would adapt and would still have the information they need to determine their costs and the prices they need to charge, along with all other market participants.

<sup>3</sup> 2021 State of the Market Report for PJM, Volume 2; Section 13: Financial Transmission and Auction Revenue Rights; to be published on March 10, 2022.

### **C. The Current Path Based ARR/FTR Design Is Fundamentally Flawed.**

Appian Way (at 15-17) and Vitol (at 14-15) assert that a congestion property right designed to return all congestion revenue to the load that paid it would devalue the hedge available to load under the current path based market design and would adversely affect competition. The assertions are simply wrong.

The basic Appian Way/Vitol argument is that load pays \$9.9 billion in congestion, but should only get back \$7.2 billion while the rest goes to financial participants and LSEs who get rights to the \$2.7 billion and sell load a hedge while keeping a profit. It is logically and mathematically impossible that load could be better off under this design. Load should receive \$9.9 billion. That would be a perfect hedge against congestion for load. The Appian Way/Vitol hedge is worse for load, by definition.

LEI defines the \$2.7 billion in this example as leakage. It is not leakage. It is evidence that the market design is not meeting what even LEI admits is its goal, to return all congestion to load. No other group of market participants would be told, with no hint of irony, that they should be happy to receive \$7.2 billion when they are owed \$9.9 billion. No other group of market participants would accept such a conclusion.

The \$2.7 billion is not leakage, it is a subsidy from load to other market participants.

The point to point rights under the current ARR/FTR market design are not related to actual congestion payments and are simply an atavistic remnant of pre market and pre LMP thinking. No one has asserted that these point to point rights have any direct link to congestion payments by load.

### **D. Properly Defined Property Rights Are Required for an Efficient Market**

A fundamental issue in any efficient market is the definition and ownership of property rights. Efficient price discovery is not possible unless rights are well defined. Congestion belongs to load. Load owns the property right. Load should have the ability to claim all congestion paid by load. A well designed ARR/FTR market requires defining congestion revenue rights so that each load has the rights to all the congestion they pay. The resulting property rights assigned to each load would provide the perfect hedge

against the congestion they would pay due to actual network service. A path based set of rights cannot provide this result.

A property right based on actual network use, that allows the full return of congestion paid, would provide more flexibility than the current set of path based rights. In contrast to how congestion is actually collected on a network basis, ARRs are path based property rights that require the use of predetermined source points, usually within the load's zone, and sink at the load zone. Path based ARRs are allocated to zonal load based on historical generation to load transmission contract paths, in many cases based on 1999 contract paths. Even under PJM's proposed source and sink expansions, most point to point paths available to ARR holders are restricted to fixed, historical sources within the ARR holders' own zone. As a result, the current path based allocated rights are, and will be, of limited value as an offset to price differences and congestion as the PJM network system is upgraded, old generation retires and new resources come on line. Unlike the current set of allocated fixed point to point rights, a right to the actual congestion paid is unlimited in its flexibility, and always adapts in every market interval to the actual sources of network congestion paid by the load.

Property rights defined to return all congestion to the load that paid it would provide the flexibility to structure contracts with prospective generators or any counterparty anywhere on the system. Load could also sell all or a portion of the congestion revenue rights in exchange for fixed payments.

Congestion revenue rights do not preclude the existence of a point to point market for hedges. This market would exist separate from the congestion revenues collected from load. This point to point hedge market would facilitate the interaction of actual buyers and sellers. In other words, the prices for point to point hedges in this market would better reflect the prices of an actual market for hedges against price risk found in other commodity markets. Having a market in which participants can freely trade price differences between nodes does not require a \$2.7 billion subsidy from load.

### **E. Properly Defined Property Rights for Congestion Would Facilitate Open Access and Competition.**

Appian Way (at 17) argues that a properly defined property right that allowed load the rights to all the congestion it paid would “impede open-access and competition ...” Vitol suggests t(Vitol at 15–17) that path based congestion rights are critical to the success of renewable energy projects. These arguments are incorrect.

Contrary to these arguments, firm point to point rights, physical or financial, do not provide nondiscriminatory open access to the LMP market.

The only requirement for open access and competition among suppliers is a connection to the grid and LMP. LMP provides open access to the market. The LMP market allows every existing or potential supplier the ability to participate in an open and nondiscriminatory way on the network, with no fear of incumbent generation being favored in dispatch and commitment decisions. The open access provided by the LMP market is what has made the competitive market possible.

In order to benefit from the competition provided by the LMP market, load needs to recover the congestion they pay due to the difference in prices they pay for energy and the prices that the generation receive for that energy. This requires the allocation of a congestion property right to load that allows the load to claim all the congestion they pay, which in turn, requires a congestion right that is consistent with how the network actually prices and delivers power. The current point to point, path based ARR/FTR market is not and cannot be made consistent with actual network solution and therefore does not allow load to recover the congestion they pay due to the LMP market design. This is why the current point to point, path based ARR/FTR market is unjust and unreasonable and produces arbitrary results to the load.

### **F. Load Pays All Congestion.**

Appian Way (at 18–21) claims that “it is not possible to know if loads are ‘paying more’ or generators are ‘being paid less’ due to congestion.” Appian Way is wrong. Congestion is, by definition, what load pays minus what generation is paid. It can be calculated.

The shadow price for each binding constraint from the least cost optimization indicates the exact price difference caused by the constraint between the points connected by the constraint. For example, a shadow price of \$1 indicates that there is a \$1 difference in LMP between the source and sink point of the constraint. Generation at the source point is paid \$1 less than load pays at the sink point. Due to the price difference between source and sink due to the constraint, congestion is collected from the load (payment by load exceed payments to generation). If the line limit on the constraint is 10 MW and the shadow price is \$1/MW, this means that \$10 ( $\$1 \times 10 \text{ MW}$ ) in congestion is paid by load as a result of this constraint.

#### **G. Cross Subsidies Exist in the Current FTR/ARR Allocation.**

Appian Way argues (22–23) that the Market Monitor’s analysis, which demonstrates that the actual congestion offset for load differs from year to year, means there is an error in the metric. Appian Way does not actually identify a mathematical issue with the metric, so it focuses on the results. The fact that the actual offset varies from year to year and from zone to zone with any year is evidence of the flaws in the current design rather than an issue with the metric. The Market Monitor agrees that the pattern of actual offsets is unexplained, by PJM or by any intervener. There is no underlying logic linking actual congestion paid by load to the offset. It is not surprising that the pattern appears random. If done correctly, the offset would be 100 percent in every zone in every year, based on the congestion revenue rights.

#### **H. The Market Monitor’s Proposed Approach Does Not Create Cross Subsidies.**

Appian Way (at 23) claims that the “IMM approach will tend to cross-subsidize utility customers who spend less on transmission and may face more congestion as a result relative to utility customers that invest more in transmission and therefore may face less congestion.” Appian Way would blame load for paying higher levels of congestion when the decisions that result in congestion are not made by load. The argument is specious.

In a rational process, the decision to build transmission would be based on whether the proposed transmission reduces energy costs more than the transmission would cost.

The calculation of energy costs before and after should include the congestion offset, and therefore the total realized energy costs, available to the load with and without the transmission project. To realize the cost savings from transmission projects, load has to recover the congestion they will pay because of the project.

Appian Way also does not appear to recognize that an increase in transmission capability that does not fully eliminate the price difference actually increases rather than decreases congestion revenues.

**I. The Market Monitor's Proposed Approach Does Not Distort LMP Price Signals.**

Appian Way (at 23) claims that the return of congestion to load is "economically inefficient because it distorts LMP price signals, and incentives for energy consumption and transmission investment." Appian Way is wrong.

The assignment of congestion revenue does not distort or eliminate the marginal signal provided by LMPs. Returning the congestion to the load that pays it does not distort or eliminate the marginal signal to the load for two basic reasons. Most directly, the marginal price signal remains unaffected because load pays full LMP, without a congestion offset, for every additional MW purchased from the local, higher cost generation. In addition, the return of congestion to load is a lump sum payment, not a marginal price. Lump sum payments have an income effect but no marginal price effect, by definition. The return of congestion to the load that paid it leaves both the marginal signal and the total signal aligned with the LMP market. Returning congestion to load ensures that load pays all generation the correct amount. It is the failure to return congestion to load that forces load to overpay for lower cost generation delivered on transmission lines.

**J. The Market Monitor's Calculation of Congestion Payments is Correct.**

Appian Way (at 26) asserts that "the IMM allocation approach is arbitrary and not based on sound engineering principles; it requires multiple pro-ration calculations and is dependent on the arbitrary choice of reference bus for each constraint (in fact, choosing a different reference bus changes the allocation), among other oddities."

Appian Way is incorrect. The reference bus is irrelevant to the calculation. The Market Monitor's analysis is based on the fundamental principles and math of an LMP market. The calculation of the actual congestion paid is based on the actual market results.

Congestion revenue in an LMP market is caused by binding transmission constraints in the optimization. The shadow price of a binding transmission constraint is the marginal impact of that constraint on the price of energy. The shadow price is the price difference caused by the constraint in the market solution. The shadow price therefore provides information about how much the constraint is costing load per MW, relative to what generation is being paid per MW, in terms of congestion revenue. The total amount of congestion collected by a binding constraint is equal to the shadow price of the constraint times the market flow on that constraint. In other words, congestion collected from a binding transmission constraint is equal to the price difference caused by the constraint (the shadow price) times the market flow on the constraint. So, if 10 MW of market flow occurs on a constraint with a shadow price of a \$1, \$10 of congestion are collected from the load due to this constraint.

What determines how much congestion any individual load contributes based on a specific constraint is dependent on the proportion of market flow on the constraint from that individual load. This measures how much of the lower cost power is used by each load on the higher price side of the constraint. For example, if there are only two loads, with equal market flow effects on the constraint, then each load contributed 50 percent of the congestion collected by that constraint.

In determining the contribution of a load to market flow, it is important to use the actual flow, not the relative, flow to the reference bus, of each load MW. Taking the difference in the dfax between two points (the constraint source point and the load bus) eliminates the relative flow to the reference bus, and reveals the direct relationship between the source and sink point. This is done for every load relative to the constraint, and the proportion of a load's contributed market flow is that load's proportion of the total congestion collected by the constraint.

The Market Monitor's discussion of moving the reference bus for purposes of studying congestion illustrates that CLMP, as it is indicated on a customer's bill, is not congestion. Further, CLMP, regardless of the reference bus selected, is irrelevant to the calculation of who paid congestion. Differences in LMP between any two buses is not dependent on the reference bus and the congestion collected is not dependent on the reference bus. Taking a dfax difference is effectively moving the reference bus because it allows an examination of absolute price differences between points. In this analysis, taking the dfax differences and a constraint shadow price provides the absolute price difference caused by a constraint at every bus.

The concept of using dfax differences to determine absolute price and flow effects is not unique to the Market Monitor's analysis of congestion. The Market Monitor's analysis is based on the fundamental math of security constrained optimization that generates the LMPs paid by load and credited to generation and the resulting congestion collected from the load.

The math involved is also useful in demonstrating that CLMP is not congestion. Congestion paid is a function of shadow price, dfaxes and market flow. At any bus, the shadow price times the dfax of the bus provides the price difference caused by this constraint relative to the reference bus on the system. The difference between the LMP at any bus and the LMP at the reference bus due to a transmission constraint is called CLMP.

The resulting CLMP is not congestion. CLMP is merely the difference between the LMP at the reference bus and the LMP at the studied bus due to transmission constraint shadow prices in the market solution. The LMP at the reference bus is called the SMP. In PJM, the reference bus is the load weighted reference bus. This means that the LMP at the load reference bus is the load weighted average price on the system at that moment in time. As load changes, the location of the reference bus changes.

For any given security constrained market solution, the choice of the reference bus does not affect the market solution, including any of the prices. Changing the reference bus does not change any aspect of the market solution, including market flows. Changing the reference bus does not change the bus specific unit output, does not change the bus specific

demand, does not change the set of binding constraints, does not change the market flows, does not change the LMPs, does not change the constraint specific congestion collected from load, does not change what injections are credited for energy and does not change what the withdrawals are charged in the market solution. This is a known characteristic of security constrained market solutions.

Changing the reference bus only changes the point of reference with regard to relative flows from and to any bus on the system. In other words, changing the reference bus for a given market solution changes the dfaxes, not the market results. This is why moving a reference bus does not change bus specific LMPs, shadow prices or the congestion collected from constraints, but merely changes the relative components of LMP observed at a bus. This change in the set of dfaxes does not affect the differences in LMP, or differences in the components of LMP, between any points on the system. Changing the reference bus to the source side of a constraint, another name for taking dfax differences between specified points, does not affect the shadow price of a binding constraint or the congestion collected by the constraint and it will not affect who paid the congestion. It does, however, make the effect of specific constraints on prices and congestion collected transparent.

## II. MOTION FOR LEAVE TO ANSWER

The Commission's Rules of Practice and Procedure, 18 CFR § 385.213(a)(2), do not permit answers to answers or protests unless otherwise ordered by the decisional authority. The Commission has made exceptions, however, where an answer clarifies the issues or assists in creating a complete record.<sup>4</sup> In this answer, the Market Monitor provides the

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<sup>4</sup> See, e.g., PJM Interconnection, L.L.C., 119 FERC ¶61,318 at P 36 (2007) (*accepted answer to answer that "provided information that assisted ... decision-making process"*); California Independent System Operator Corporation, 110 FERC ¶ 61,007 (2005) (answer to answer permitted to assist Commission in decision-making process); New Power Company v. PJM Interconnection, L.L.C., 98 FERC ¶ 61,208 (2002) (answer accepted to provide new factual and legal material to assist the Commission in decision-making process); N.Y. Independent System Operator, Inc., 121 FERC ¶61,112 at P 4 (2007) (answer to protest accepted because it provided information that assisted the Commission in its decision-making process).

Commission with information useful to the Commission's decision making process and which provides a more complete record. Accordingly, the Market Monitor respectfully requests that this answer be permitted.

### III. CONCLUSION

The Market Monitor respectfully requests that the Commission afford due consideration to this pleading as the Commission resolves the issues raised in this proceeding.

Respectfully submitted,



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Dated: February 15, 2022

**CERTIFICATE OF SERVICE**

I hereby certify that I have this day served the foregoing document upon each person designated on the official service list compiled by the Secretary in this proceeding.

Dated at Eagleville, Pennsylvania,  
this 15<sup>th</sup> day of February, 2022.



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