

**UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION**

Roy J. Shanker)	
)	Docket No. EL23-13-000
)	
v.)	
)	
PJM Interconnection, L.L.C.)	
)	

COMMENTS OF THE INDEPENDENT MARKET MONITOR FOR PJM

Pursuant to Rule 211 of the Commission’s Rules and Regulations,¹ Monitoring Analytics, LLC, acting in its capacity as the Independent Market Monitor (“Market Monitor”) for PJM Interconnection, L.L.C. (“PJM”),² submits these comments responding to complaint filed November 30, 2022, by Dr. Roy J. Shanker, Ph.D. (“Dr. Shanker” or “Shanker”) (“Complaint”). The Complaint requests that the Commission determine that PJM has improperly included output from Energy Resources in its accreditation of the Accredited Unforced Capacity (“AUCAP”) offered for sale in its Reliability Planning Model (“RPM”) capacity auctions by intermittent resources. The Complaint alleges that this improper accreditation explicitly violates the terms of Schedule 9.1 and 10 of the Reliability Assurance Agreement (“RAA”), as well as Section 2.1a of all applicable Interconnection Service Agreements (“ISAs”). The Market Monitor agrees that PJM has permitted offers

¹ 18 CFR § 385.211 (2022).

² Capitalized terms used herein and not otherwise defined have the meaning used in the PJM Open Access Transmission Tariff (“OATT”), the PJM Operating Agreement (“OA”) or the PJM Reliability Assurance Agreement (“RAA”).

from capacity resources that were, in part, incorrectly defined as capacity, with the result that the total capacity offered from these resources in PJM capacity auctions was overstated and the clearing prices suppressed. The Market Monitor agrees that such offers should not have been permitted. The Market Monitor agrees that such offers should not be permitted in any auction for the 2025/2026 Delivery Year, and that the BRA for the 2025/2026 Delivery Year should not be conducted until this issue has been resolved. The Base Residual Auction for the 2025/2026 Delivery Year, currently scheduled for June 14, 2023, is the first auction for the 2025/2026 Delivery Year.

The Market Monitor does not support modifying the results of prior auctions. The Market Monitor recommends that the offered MW from intermittent resources and storage resources be correctly defined for the 2025/2026 Delivery Year and subsequent delivery years. The Market Monitor believes that PJM agrees with the proposed approach going forward. The Market Monitor's position is that it is critical to resolve the issue on a going forward basis and that assigning intention or fault to prior actions is not relevant in this matter.

I. COMMENTS

A. Capacity Resources, CIRs and Deliverability

The definition of capacity resources requires that energy from capacity resources must be deliverable. Deliverable has a formal meaning in the OATT and RAA and Manuals. In order to qualify as a capacity resource in PJM markets, a resource must demonstrate that the energy from the capacity resource equal to the resource's full proposed ICAP (installed capacity) is deliverable. The resource must obtain CIRs (capacity interconnection rights) equal to the full proposed ICAP. The OATT defines the requirements to be a capacity resource in Attachment O, Specifications for Interconnection Service Agreement.

The OATT § 36.1.1, Interconnection Services for Generation, requires that the output of capacity resources be deliverable:

Capacity Resource status is based on providing sufficient transmission capability to ensure deliverability of generator output to the aggregate PJM Network Load and to satisfy the contingency criteria in the Applicable Standards. Specific tests performed during the Generation Interconnection Feasibility Study and later System Impact Study will identify those upgrades required to satisfy the contingency criteria applicable at the generator's location.

The PJM OATT Attachment DD § 5.5, Eligibility for Participation in PJM Auctions, further clarifies the requirements to be a capacity resource:

Capacity Resources must satisfy the capability and deliverability requirements of RAA, Schedule 9 and RAA, Schedule 10, the requirements for Demand Resources or Energy Efficiency Resources in Tariff, Attachment DD-1 and RAA, Schedule 6, as applicable, and, for the 2018/2019 Delivery Year and subsequent Delivery Years, the criteria in Tariff, Attachment DD, section 5.5A.

OATT Attachment O Form of ISA § 2.1 states:

Capacity Interconnection Rights: {Instructions: this section will not apply if the Customer Facility is exclusively an Energy Resource and thus is granted no CIRs; see alternate section 2.1 below} Pursuant to and subject to the applicable terms of the Tariff, the Interconnection Customer shall have Capacity Interconnection Rights at the Point(s) of Interconnection specified in this Interconnection Service Agreement in the amount of ___ MW. {Instructions: this number is the total of the Capacity Interconnection Rights that are granted as a result of the Interconnection Request, plus any prior Capacity Interconnection Rights}

When a resource has obtained CIRs equal to a MW level less than its full capability, the CIRs define the portion of the resource that is a Capacity Resource. Output from the resource above the level of its CIRs is an Energy Resource and not a Capacity Resource.

OATT Attachment O Form of ISA § 2.1a states:

2.1a To the extent that any portion of the Customer Facility described in section 1.0 is not a Capacity Resource with Capacity Interconnection Rights, such portion of the Customer Facility shall be an Energy Resource. PJM reserves the right to limit total injections to the Maximum Facility Output in the event reliability

would be affected by output greater than such quantity.
{Instructions: this version of section 2.1 will be used in lieu of section 2.1 above when a Generating Facility will be an Energy Resource and therefore will not be granted any CIRs:}

OATT Attachment O Form of ISA § 2.1 states:

[2.1 The generating unit(s) described in section 1.0 shall be an Energy Resource. Pursuant to this Interconnection Service Agreement, the generating unit will be permitted to inject ___ MW (nominal) into the system. PJM reserves the right to limit injections to this quantity in the event reliability would be affected by output greater than such quantity.]

Schedule 10 of the RAA, referenced in the OATT Attachment DD § 5.5, defines deliverability in more detail:

Certification of deliverability means that the physical capability of the transmission network has been tested by the Office of the Interconnection and found to provide that service consistent with the assessment of available transfer capability as set forth in the PJM Tariff and, for Generation Resources owned or contracted for by a Load Serving Entity, that the Load Serving Entity has obtained or provided for Network Transmission Service to have capacity delivered on a firm basis under specified terms and conditions.

PJM Manual 14B, Attachment C, defines the deliverability tests in even more detail. The details of the definition of deliverability make it clear that whether a resource has been curtailed when subject to routine economic dispatch is not relevant to the definition of deliverability.

The difference between an energy resource and a capacity resource is that the capacity resource must demonstrate deliverability and must obtain the corresponding CIRs, while the energy resource does not need to demonstrate deliverability and therefore does not need to obtain CIRs.

PJM's reliability analysis defines the total required amount of capacity that must be purchased in the capacity auctions in order to ensure the reliability of the PJM system. Energy resources do not contribute to PJM's defined level of reliability.

B. ELCC Analysis

Intermittent resources and storage resources are assigned a capacity value that can be offered in the PJM Capacity Market based on ELCC (effective load carrying capability) analysis, termed accredited UCAP, defined in RAA Schedule 9.1.

RAA Schedule 9.1, Section G states:

Rules and procedures for technically determining and demonstrating the installed capacity of ELCC Resources shall be developed by the Office of the Interconnection and maintained in the PJM Manuals. The installed capacity of a Limited Duration Resource is based on the sustained level of output that the unit can provide and maintain over a continuous period, whereby the duration of that period matches the characteristic duration of the corresponding ELCC Class, with consideration given to ambient conditions expected to exist at the time of PJM system peak load, as described in the PJM Manuals.

RAA Schedule 9.1, Section H states:

The effective load carrying capability analysis shall compare expected hourly load levels (based on historical weather) with the expected hourly output of the expected future resource mix in order to identify the relative resource adequacy value of the portfolio of all ELCC Classes, as well of each individual ELCC Class, compared to a group of Unlimited Resources with no outages.

When a resource has obtained CIRs equal to a MW level less than its full capability, only the output from the capacity resource MW, equal to the CIR MW, is includable in the ELCC analysis per RAA Schedule 9.1, Section H:

Energy Resources are not included in the effective load carrying capability analysis. Generating units that are expected to only offer or otherwise provide a portion of their Accredited UCAP for that Delivery Year are represented in the analysis in proportion to the expected quantity offered or delivered divided by the Accredited UCAP.

C. Intermittent Resources, Storage Resources, CIRs and Deliverability

The tariff requirements for deliverability, the requirements to have CIRs to support deliverability, and the definition of the ELCC analysis together make clear that energy resources do not require CIRs, are not deliverable, and are therefore not capacity resources. The tariff also makes clear that when a resource is only partially designated as a capacity resource, the output above the MW level for which CIRs are obtained and which is therefore deliverable, is an energy resource and not a capacity resource.

The conclusion is that the output of an intermittent resource (or any resource) above the level of CIRs obtained for that resource is an energy resource and not a capacity resource. The conclusion is also that energy output above the level of CIRs obtained for a resource is not deliverable and cannot be included in the determination of the level of capacity assigned to an intermittent resource.

PJM has, to date, based on a mistaken interpretation of the market rules, based on an initial oversight, included energy deliveries above the level of CIRs obtained for intermittent resources in defining the ELCC values for those resources, affecting both the capacity value of individual resources and the capacity value of the total ELCC resources and therefore capacity auction clearing prices.^{3 4} The result is that the capacity value of intermittent resources has been overstated in the capacity market auctions for the 2022/2023 Delivery Year that incorporated derating values for intermittent resources based on output from the energy portion of the resources, and in the capacity market auctions for the 2023/2024 Delivery Year and the 2024/2025 Delivery Year that incorporated ELCC analysis.

³ See PJM answer to 4(e), Attachment 1, PJM Response to Deficiency Letter, EL21-278-001 (March 1, 2021).

⁴ See Answer and Motion for Leave to Answer of the Independent Market Monitor for PJM, ER21-278-000 (April 30, 2021) at 3.

The result of those overstatements was to suppress capacity market prices for the defined delivery years below the efficient and competitive level.

The incorrect calculations include two dimensions, both of which must be corrected. The ELCC values for individual resources must be corrected. In addition, the corresponding assumption for the entire portfolio of ELCC resources must also be addressed. The capacity value of the entire portfolio of ELCC resources must also be based solely on deliverable energy output from the capacity portion of the resources, the CIR values. The correct result will be that the capacity value of the entire portfolio is calculated correctly and the share of each individual ELCC resource within the portfolio is calculated correctly.

PJM should be required to recalculate the capacity values for intermittent resources based on CIR values prior to running the Base Residual Auction for the 2025/2026 Delivery Year, currently scheduled for June 14, 2023. PJM should be directed to not conduct the BRA for the 2025/2026 Delivery Year until this issue has been resolved, in order to ensure an efficient and competitive market result and to ensure that the errors made to date are not continued. PJM can make the necessary changes by adopting an accurate and consistent interpretation of the existing rules.

D. Market Monitor Analysis

The Market Monitor provided public reports on the PJM capacity auctions and on the level of intermittent capacity overstatement and its impact on auction clearing prices and quantities. These reports were referenced in the Complaint.

The Market Monitor's analysis of the 2022/2023 Base Residual Auction included a scenario in which the capacity of wind and solar offers was reduced by 50 percent. The 50 percent reduction was used because there was no exact calculation at the time of the extent to which intermittent resources offered capacity MW in excess of their CIR values. The sensitivity analysis was intended to provide information about the potential impact of the overstatement of capacity. The analysis was designed to permit any analyst to scale the impact up or down based on any additional information about the difference between

capacity values, whether determined by derating factors or ELCC levels, and CIR levels.⁵ The Market Monitor's analysis concluded that if the unforced capacity of solar and wind resources offered in the 2022/2023 RPM Base Residual Auction had been reduced by 50 percent and everything else had remained the same, total RPM market revenues for the 2022/2023 RPM Base Residual Auction would have been \$4,117,925,881, an increase of \$200,935,578, or 5.1 percent, compared to the actual results. From another perspective, the inclusion of all offers from solar and wind resources resulted in a 4.9 percent decrease in RPM revenues for the 2022/2023 RPM Base Residual Auction compared to what RPM revenues would have been if offers from solar and wind resources had been reduced by 50 percent. Wind and solar capacity values for the 2022/2023 Delivery Year were determined under the capacity derate rules which have been replaced by ELCC ratings for subsequent delivery years.⁶ The calculation of the class average capacity factors used in the derate approach was based on the same faulty logic used in the ELCC analysis where generation in excess of CIRs, and therefore not deliverable, was included in the class average.

In a subsequent analysis presented to a meeting of the PC Special Session - CIRs for ELCC Resources, the Market Monitor found that capping generation at the CIR level would

⁵ In preparing this filing, the Market Monitor discovered an error in Scenario 5, Impact of Intermittent Capacity Overstatement, in the Market Monitor's Analysis of the 2022/2023 BRA. Specifically, the impact of the overstatement of ELCC capacity was not \$292,155,506, but was \$200,935,578. The Market Monitor has posted a revised report on the BRA for the 2022/2023 BRA, dated January 13, 2023. Analysis of the 2022/2023 RPM Base Residual Auction – Revised (January 13, 2023), which can be accessed at: <http://www.monitoringanalytics.com/reports/Reports/2023/IMM_Analysis_of_the_20222023_RPM_BRA_Revised_20230113.pdf>

⁶ Class Average Capacity Factor for Wind and Solar Resources, PJM Interconnection LLC (June 1, 2017), which can be accessed at: <<https://www.pjm.com/-/media/planning/res-adeq/class-average-wind-capacity-factors.ashx?la=en>>.

have reduced the class average derated MW for solar generation by 20.0 percent and would have reduced the class average derated MW for wind generation by 48.9 percent.⁷

The Market Monitor did additional analysis using these revised derate values. If the unforced capacity of solar resources offered in the 2022/2023 RPM Base Residual Auction had been reduced by 20.0 percent and the unforced capacity of wind resources offered in the 2022/2023 RPM Base Residual Auction had been reduced by 48.9 percent and everything else had remained the same, total RPM market revenues for the 2022/2023 RPM Base Residual Auction would have been \$4,090,959,850, an increase of \$173,969,547, or 4.4 percent, compared to the actual results. From another perspective, the inclusion of all offers from solar and wind resources resulted in a 4.3 percent decrease in RPM revenues for the 2022/2023 RPM Base Residual Auction compared to what RPM revenues would have been if offers from solar resources had been reduced by 20.0 percent and offers from wind resource had been reduced by 48.9 percent.

In a May 2022 stakeholder proceeding, PJM reported the impacts of capping generation at the CIR level on wind and solar ELCC class ratings for the 2023/2024 Base Residual Auction.⁸ PJM's results are shown in Table 1. The first column shows the ELCC class ratings based on energy output in excess of CIR ratings and used in the 2023/2024 Base Residual Auction. The second column shows the corrected ELCC class ratings based on energy output limited to the deliverable energy based on CIRs. The third column shows the extent to which the incorrect approach overstated the capacity from ELCC resources.

⁷ See Item 5, Slide 8, Intermittent Output and CIRs, Independent Market Monitor for PJM, PC Special Session–CIRs for ELCC Resource (February, 23, 2022), which can be accessed at: <<https://pjm.com/committees-and-groups/committees/pc>>.

⁸ Item 4a, Impact on Wind & Solar Class UCAP Values by Capping Hourly Outputs in UCAP Calculation at CIR level, PC Special Session–CIRs for ELCC Resources (May 19, 2022), which can be accessed at: <<https://pjm.com/committees-and-groups/committees/pc>>.

Table 1 ELCC Class Ratings⁹

2023/2024 ELCC Class Rating			
Resource Type	All Output Included (A)	Output Capped at CIR Level (B)	Percent Overstatement (A-B)/B
Onshore Wind	15%	8%	87.5%
Offshore Wind	40%	20%	100.0%
Fixed Solar	38%	33%	15.2%
Tracking Solar	54%	51%	5.9%

The Market Monitor recalculated the accredited UCAP for each wind and solar resource using the ELCC class ratings that capped generation at the CIR level, and then adjusted the capacity offer to be no higher than the lower of the revised ELCC (accredited UCAP) and the CIR. The adjustments reduced the capacity offers from wind and solar resources by 348.1 MW.

If the unforced capacity of solar and wind resources offered in the 2023/2024 RPM Base Residual Auction had been capped at the CIR values and everything else had remained the same, total RPM market revenues for the 2023/2024 RPM Base Residual Auction would have been \$2,254,726,706, an increase of \$58,281,915, or 2.7 percent, compared to the actual results. From another perspective, the inclusion of offers from solar and wind resources at levels not consistent with the CIR values resulted in a 2.6 percent decrease in RPM revenues for the 2023/2024 RPM Base Residual Auction compared to what RPM revenues would have been if offers from solar and wind capacity resources had been capped at the revised ELCC values.

PJM separately estimated the impact of the revised ELCC ratings to be a reduction of 1,300 MW UCAP for wind and solar units.^{10 11} PJM's analysis of the impact of removing

⁹ *Id.*

¹⁰ PJM included all wind and solar units in the 2026 RTEP with an interconnection service agreement (ISA).

1,300 MW of excess wind and solar capacity from the 2023/2024 BRA concluded that the impact of including that excess was to reduce total RPM market revenues by \$139 million.¹²

The PJM estimate of the impact on the capacity market for the 2022/2023 and the 2023/2024 Delivery Years is significantly larger than the Market Monitor’s estimate. PJM calculated a 1,300 MW impact while the Market Monitor calculated a 348.1 MW impact. PJM calculated the impact based on the maximum capability of the units included in the 2026 Regional Transmission Expansion Plan (“RTEP”). But some of those resources were not registered for the 2023/2024 BRA and some of those resources that could have offered in the 2023/2024 BRA did not offer. PJM’s analysis assumed that all affected units offered the maximum capability into the 2023/2024 BRA. The Market Monitor identified 7,367.2 MW of ELCC capacity eligible for the 2023/2024 BRA, but less than half of the eligible ELCC capacity was offered. The Market Monitor’s analysis focused on the impact of the overstatement of ELCC capacity by the resources that actually offered into the 2023/2024 BRA and based on the actual offers.

E. The Issues Raised in the Complaint Have Not Been Decided.

The Complaint addresses the question of whether the Commission changed the tariff definition of deliverability in the cited order (“July 30th Order”) at paragraph 53. The July 30th Order states (at P 53):

Regarding the issue of transmission constraints, we agree with PJM that the first step of the ELCC analysis, which determines the UCAP of the entire set of ELCC Resources, does not need to account for the locational nature of resources and transmission

¹¹ “CIRs for ELCC Resources: Cost Assessment of Potential Impacts to PJM Load Customers,” Item 2, page 12 in meeting notes for PC Special Sessions – CIRs for ELCC Resources, PJM Interconnection, LLC (June 24, 2022), which can be accessed at: <<https://pjm.com/committees-and-groups/committees/pc>>.

¹² “Transitional Costs to Load To Support CIRs for ELCC Resource Solution Packages,” Item 2 in meeting notes for PC Special Session – CIRs for ELCC Resources, PJM Interconnection, LLC (September 6, 2022), which can be accessed at: <<https://pjm.com/committees-and-groups/committees/pc>>.

constraints within the PJM footprint, or limit resources' modeled output to their CIRs. As PJM explains, its existing resource adequacy study, the Reserve Requirement Study, does not consider transmission constraints within the PJM region because the RTEP is designed to ensure that specific areas of the PJM footprint have the necessary transmission infrastructure to receive the required level of energy imports. [footnote omitted] Additionally, PJM states it will implicitly account for historically binding transmission constraints by considering each Variable Resource's historic performance, including instances of curtailment due to transmission constraints. Given the fact that a Variable Resource may deliver more than its CIR quantity to the PJM system during hours when the transmission system is not constrained, we find PJM's approach reasonable in contrast to artificially limiting a Variable Resource's output to its CIRs within the ELCC model.[footnote omitted] Finally, after PJM has determined ELCC Resources' Accredited UCAP, PJM will limit an ELCC Resource's capacity market offer to be no greater than its CIRs, ensuring that the capacity market clearing process will not give an ELCC resource a capacity supply obligation that exceeds the capacity the resource can physically deliver. Thus, we find PJM's proposed treatment of transmission constraints within its ELCC analysis just and reasonable. Furthermore, we continue to find LS Power's concern about the compatibility between the ELCC analysis and the CETO/CETL analysis, which is used to determine the LDA transfer limits used within the capacity auction, outside the scope of the instant filing. We find that the ELCC framework will offer an improvement in contrast to the status quo treatment of ELCC Resources within the CETO/CETL analysis, and we note PJM's statement that it may need to improve its CETO, CETL, and LDA policies in the future as the resource mix evolves.

Much of paragraph 53 addresses locational differences in ELCC values. Relevant to the question of capacity value, the Commission stated that:

“... we agree with PJM that the first step of the ELCC analysis ... , which determines the UCAP of the entire set of ELCC Resources, does not need to ... limit resources' modeled output to their CIRs.”

Given the fact that a Variable Resource may deliver more than its CIR quantity to the PJM system during hours when the

transmission system is not constrained, we find PJM's approach reasonable in contrast to artificially limiting a Variable Resource's output to its CIRs within the ELCC model. [footnote omitted] Finally, after PJM has determined ELCC Resources' Accredited UCAP, PJM will limit an ELCC Resource's capacity market offer to be no greater than its CIRs, ensuring that the capacity market clearing process will not give an ELCC resource a capacity supply obligation that exceeds the capacity the resource can physically deliver.

Despite the fact that paragraph 53 questions limiting the energy output to the CIRs within the ELCC model, the last sentence of this part of paragraph 53 makes clear that the objective is that the ELCC resources should not have a capacity value that exceeds the capacity the resources can physically deliver, no greater than its CIR value. The Complaint and the relief sought is consistent with those principles. Paragraph 53 does not explicitly address the fact that the ELCC value is a function of the CIR value, but is less than or equal to the CIR value. The CIR value defines the energy deliverable from the defined CIRs. But for intermittent resources, that energy will, on average, be less than the CIRs and in some cases, much less than the CIRs. Thus the ELCC value, currently based on average energy output over a significant number of hours, will generally be less than the CIR value. Paragraph 53 does not decide the issue raised in the Complaint.

The July 30th Order makes no findings on the proper interpretation of the existing and extensive OATT and RAA provisions because the issues were not raised. The OATT language submitted by PJM and approved by the Commission after the July 30th Order and based on the July 30th Order, unambiguously supports the position that the derated ELCC values must be based solely on energy deliverable from intermittent and storage resources based on their CIRs, both for individual resources and for the entire portfolios of resources.

II. CONCLUSION

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

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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 13th day of January 2023.



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