UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

Calpine Corporation, Dynegy Inc., Eastern Generation, LLC, Homer City Generation, L.P., NRG Power Marketing LLC, GenOn Energy Management, LLC, Carroll County Energy LLC, C.P. Crane LLC, Essential Power, LLC, Essential Power OPP, LLC, Essential Power Rock Springs, LLC, Lakewood Cogeneration, L.P., GDF SUEZ Energy Marketing NA, Inc., Oregon Clean Energy, LLC and Panda Power Generation Infrastructure Fund, LLC	)	Docket Nos. EL16-49-000
v.	)	
PJM Interconnection, L.L.C.	)	
PJM Interconnection, L.L.C.	)	ER18-1314-000 ER18-1314-001
PJM Interconnection, L.L.C.	)	EL18-178-000 (Consolidated)

REPLY COMMENTS OF THE CLEAN ENERGY INDUSTRIES ON THE APPLICATION OF THE MINIMUM OFFER PRICE RULE

Pursuant to Rule 212 of the Rules of Practice and Procedure of the Federal Energy Regulatory Commission (the “Commission”), 18 C.F.R. § 385.212 (2016), the American Wind Energy Association (“AWEA”),[1] the Solar RTO Coalition (“Coalition”),[2] the Solar Energy

[1] AWEA is a national trade association representing a broad range of entities with a common interest in encouraging the expansion and facilitation of wind energy resources in the United States. AWEA’s members include active participants in the markets administered by PJM.

[2] The Solar RTO Coalition is a coalition of solar developers and capital providers that develop, own, operate and finance solar projects that are both existing and under development throughout the United States, including solar projects in PJM.

Industries Association ("SEIA"),[3] joined in these reply comments by other Clean Energy Associations, Advanced Energy Economy ("AEE")[4], the American Council on Renewable Energy ("ACORE")[5] and the Mid-Atlantic Renewable Energy Coalition ("MAREC")[6] (collectively, the "Clean Energy Industries"), respectfully submit these reply comments ("Reply Comments") in response to the positions of several parties' initial comments addressing the June 29 Order[7] issued in the above-captioned proceedings related to the redesign of PJM Interconnection, L.L.C.'s ("PJM") capacity market. These Reply Comments focus on the issue of the Minimum Offer Price Rule's ("MOPR") application to renewable energy certificates ("RECs"), as well as associated issues.

Importantly, nothing contained in these Reply Comments should be construed by the Commission or any party as a change in any of the positions that the Clean Energy Industries

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[3] SEIA is the national trade association of the U.S. solar energy industry, which now employs more than 250,000 Americans. SEIA works with its member companies to build jobs and diversity, champion the use of cost competitive solar in America, remove market barriers and educate the public on the benefits of solar energy. The comments contained in this filing represent the position of SEIA as an organization, but do not necessarily reflect the views of any particular member with respect to any issue.

[4] AEE is a national organization of businesses making the energy we use secure, clean, and affordable. AEE and its state and regional partner organizations, which are active in 27 states across the country, represent more than 100 companies and organizations that span the advanced energy industry and its value chains. Technologies represented include, but are not limited to, energy efficiency, demand response, natural gas, solar photovoltaics, solar thermal electric, ground-source heat pumps, wind, storage, biofuels, electric vehicles, AMI, transmission and distribution efficiency, fuel cells, hydropower, nuclear power, combined heat and power, and enabling software. AEE promotes the interests of its members by engaging in policy advocacy at the federal, state, and regulatory levels, by convening groups of CEOs to identify and address cross-industry issues, and by conducting targeted outreach to key stakeholder groups and policymakers. The comments provided here are reflective of the broad view of AEE's membership; however, individual members of AEE may submit their own comments that reflect different views.

[5] ACORE is a national non-profit organization dedicated to advancing the renewable energy sector through market development, policy changes and financial innovation.

[6] MAREC is a coalition of wind energy companies, solar companies, wind turbine manufacturers, public interest organizations, law firms, and service companies dedicated to promoting the growth and development of renewable energy in the Mid-Atlantic region, primarily in the region where PJM operates.

[7] *Calpine Corp. et al. v. PJM Interconnection, L.L.C.*, 163 FERC ¶ 61,236 (2018) ("June 29 Order").

members took in their joint and individual initial comments in the above-captioned proceedings.[8] Additionally, as a threshold matter, the Clean Energy Industries continue to believe that the June 29 Order "thwarts lawful state policies without the necessary supporting evidence for such a need"[9] and, for the reasons set forth in the Clean Energy Associations Request for Rehearing, continue to object to the June 29 Order on both legal and policy grounds.[10]

I. COMMENTS

A. The Commission Must Avoid Adopting Far-Reaching MOPR Proposals That Would Result in Unjust and Unreasonable Over-Mitigation of PJM's Capacity Market

1. The "Clean MOPR" and "Extended MOPR" Proposals Should Be Rejected by the Commission

The Clean Energy Industries respectfully request that the Commission reject the requests to institute, as a solution to the perceived market harms identified in the June 29 Order, the "Clean MOPR" or "Expanded MOPR" proposals promoted by various parties.[11] Generally

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[8] *See generally* Comments of the American Wind Energy Association, the Solar RTO Coalition, the Mid-Atlantic Renewable Energy Coalition, and the Solar Energy Industries Association, Docket No. EL16-49-000, et al., (Oct. 2, 2018) ("Clean Energy Industries Initial Comments"); Comments of Advanced Energy Economy, Docket No. EL16-49-000, et al., (Oct. 2, 2018) ("AEE Initial Comments"); Comments of the American Council on Renewable Energy (ACORE), Docket No. EL16-49-000, et al., (Oct. 2, 2018). Note that for purposes of these Reply Comments, AEE and ACORE have joined the "Clean Energy Industries". AEE and ACORE continue to also fully support the positions taken in their individual Initial Comments.

[9] *See* Request For Rehearing of the Clean Energy Associations, Docket No. EL16-49-000, et al., at 2 (Jul. 30, 2018) (hereinafter "Clean Energy Associations Request for Rehearing"). While the Coalition was not a signatory to the Clean Energy Associations Request for Rehearing, it fully supports the arguments and positions taken therein.

[10] Accordingly, nothing contained in these comments should be construed by the Commission or any party as constituting a change in position taken by any or all of the Clean Energy Industries members in their Request for Rehearing or constitute any waiver of any rights or privileges of any party with respect to the Commission's rehearing of the June 29 Order, or any associated appeal. *See e.g. Calpine Corp. et al. v. PJM Interconnection, L.L.C.*, *Order Granting Rehearings For Further Consideration*, Docket Nos. EL16-49-001, et al., (Aug. 29, 2018).

[11] *See e.g.* Initial Brief of the Electric Power Supply Association, Docket No. EL16-49-000, et al., at 9-15 (Oct., 2, 2018); Initial Brief of LS Power Associates, L.P., Docket No. EL16-49-000, et al., at 6-10 (Oct., 2, 2018); Initial Brief of Carroll County Energy LLC., CPV Power Holdings, L.P., Energy Capital Partners IV, LLC, Panda Power Generation Infrastructure Fund, LLC, Rockland Capital, LLC, and Tenaska, Inc., Docket No. EL16-49-000, et al., at 3-8 (Oct., 2, 2018)

speaking, these proposals would take the "MOPR-Ex" proposal submitted by PJM in Docket No. ER18-1314-000,[12] eliminate the exemptions and exceptions included therein, and broaden the definition of "Material Subsidy." The Commission must reject these proposed market solutions because they go far beyond addressing the purported market harm outlined by the Commission in the June 29 Order.[13]

As previously explained by AEE and others, the Commission and the courts have consistently held that in the regulation of competitive markets, a balance must be struck between over-mitigation and under-mitigation.[14] Following this precedent, the MOPR should be applied to state policies only when they provide or require out-of-market support that is "meaningful" or "material" to the ability of a resource to construct an uneconomically low offer in the capacity market. In other words, what must be mitigated through the application of the MOPR are *only* those out-of-market revenues provided or required by a state policy that make the difference as to whether or not a resource can offer low enough to clear the capacity market.[15] By contrast, adoption of the "Clean MOPR" or "Expanded MOPR" proposals by the Commission would over-mitigate PJM's capacity market by improperly mitigating offers from Capacity Market

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[12] *See e.g.* Capacity Repricing or in the Alternative MOPR-Ex Proposal: Tariff Revisions to Address Impacts of State Public Policies on the PJM Capacity Market, Docket No. ER18-1314-000, at 99-116 (Apr. 9, 2018).

[13] *See e.g.* June 29 Order at P 5 (holding that the Commission took action to address only "*the price suppressive impact* of resources receiving out-of-market support." (emphasis added)).

[14] *See e.g.* AEE Initial Comments at 7 (citing *Edison Mission Energy v. FERC*, 394 F.3d 964, 969 (D.C. Cir. 2005) ("[Mitigation] may well do some good by protecting consumers and utilities against… the exercise of market power. But the Commission gave no reason to suppose that it does not also wreak substantial harm.") ("*Edison Mission Energy*")); *see also, e.g., Midwest Independent System Operator, Inc.*, 109 FERC ¶ 61,157 at P 238 (2004) (explaining that assuring just and reasonable rates requires the Commission to "balance under-mitigation and over-mitigation").

[15] *See e.g.* AEE Initial Comments at 7-8.

Sellers[16] that do not have market power and whose resources do not receive the kind of material, out-of-market revenues that the Commission claims are causing harm to PJM's capacity market by suppressing prices. Mitigating offers from Capacity Market Sellers that do not possess market power in any relevant market and that do not receive any material subsidies (as defined by the Commission in the June 29 Order) will not produce competitive market outcomes,[17] and the Commission should reject the Clean MOPR and Expanded MOPR proposals on these grounds. Importantly, unlike proponents of the Clean MOPR and Expanded MOPR, the Clean Energy Industries believe that if the MOPR must be utilized, it should only apply where an out-of-market payment actually and materially allows a generation owner to submit lower offers into PJM's capacity market, consistent with the theory of market harm propounded by the Commission in the June 29 Order.[18] Accordingly, the Clean Energy Industries urge the Commission to adopt a final order in the above-captioned proceedings ("Final Order") that tracks the Clean Energy Industries' position on this issue, and also comports with longstanding Commission and court precedent.

2. The Commission Should Not Adopt a Two-Stage Market Construct to PJM at This Time

Additionally, the Commission should reject calls to adopt a two-stage market design proposal, such as the "Capacity Performance and Sponsored Supply" ("CaPSS") model proffered

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[16] Capitalized terms not otherwise defined herein have the meaning specified in, as applicable, the PJM Open Access Transmission Tariff ("Tariff"), the Reliability Assurance Agreement among Load-Serving Entities in the PJM Region, and the Amended and Restated Operating Agreement of PJM Interconnection, L.L.C.

[17] *See e.g. Tejas Power Corp. v. FERC*, 908 F.2d 998, 1004 (D.C. Cir. 1990) ("[I]n a competitive market, where neither buyer nor seller has significant market power, it is rational to assume that the terms of their voluntary exchange are reasonable, and specifically to infer that the price is close to marginal cost, such that the seller makes only a normal return on its investment.").

[18] Additionally, the MOPR should not apply when a competitive process has been used to choose the resources that best meet the state policy objective. *See e.g.* Clean Energy Industries Initial Comments at 20-21; AEE Initial Comments at 22-23.

by Vistra Energy Corp. and Dynegy Marketing and Trade.[19] This proposal essentially seeks to apply ISO New England Inc.'s ("ISO-NE") Competitive Auctions with Sponsored Policy Resources ("CASPR") to PJM.[20] However, applying a CASPR-type market construct to PJM at this time would be entirely improper for several reasons.

First, as a threshold matter, the CaPSS proposal does not respond to the issues raised in the June 29 Order. Rather than opining on the specific rulings and questions set forth in the June 29 Order, Vistra and Dynegy essentially propose an entirely different capacity market construct.

Second, while the Commission may have approved the CASPR construct in ISO-NE, there is insufficient record evidence for the Commission to conclude that a CASPR-type proposal (such as CaPSS) would produce just and reasonable market outcomes in PJM. Parties in the above-captioned proceedings, including PJM, have focused intensely on developing a record on proposed market design features such as the MOPR, Capacity Repricing, and the FRR Alternative. It would be improper for the Commission to issue a Final Order that would implement a capacity market construct that has not been examined in-depth and opined upon by all parties in the above-captioned proceedings, and without any analysis from PJM on how it would impact its capacity market, or whether and how it could be implemented by the 2019 Base Residual Auction ("BRA").

Third, like the Clean MOPR and Extended MOPR proposals, CaPSS would not in fact correct for the "price suppressive" effects of offers from resources receiving state subsidies that the Commission claims is resulting in unjust and unreasonable capacity rates. Instead, CaPSS

[19] *See e.g.* Comments of Vistra Energy Corp. and Dynegy Marketing and Trade, LLC, Docket No. EL16-49-000, et al, at 13-25 (Oct. 2, 2018) ("Vistra and Dynegy Initial Comments").

[20] *See ISO New England Inc.*, 162 FERC ¶ 61,205 (2018) ("CASPR Order").

would subject all resources that "seek a 'Material Subsidy'" to an expanded MOPR in the first phase of the capacity market auction.[21] However, as previously explained in depth by the Clean Energy Industries, not all resources receiving state subsidies in fact allow their owners to submit low offers into the capacity market, meaning that not all such resources' offers should be mitigated.[22] Further, in order to fully participate in a BRA, CaPSS essentially would require all resources that "seek a Material Subsidy" to buy into the capacity market via a second, voluntary substitution auction.[23] However, because the proposed substitution auction is voluntary, adoption of CaPSS will almost certainly apply the MOPR to some offers from renewable energy resources that seek or that are eligible to receive state subsidies such as RECs, but that nonetheless do not actually submit uneconomically low offers that suppress capacity market prices. Accordingly, like the Clean MOPR and Extended MOPR proposals, CaPSS will result in the over-mitigation of PJM's capacity market and lead to unjust and unreasonable market outcomes, and thus must be rejected by the Commission.

B. PJM's Proposal Fails to Ensure That Voluntary Purchases of Renewable and Clean Energy by Corporations and Other Private Entities, Conducted Outside of any State Mandate, Are Excluded From The MOPR

In its Initial Filing, PJM appropriately acknowledges that the MOPR directed by the Commission should not apply to RECs that are acquired or purchased for purposes of satisfying voluntary, privately-established renewable energy or sustainability goals, since these REC transactions are "not required by a state program."[24] The June 29 Order is focused on applying

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[21] *See* Vistra and Dynegy Initial Comments at 14.

[22] *See e.g.* Clean Energy Industries Initial Comments at 13-17; AEE Initial Comments at 10-14.

[23] *See e.g.* Vistra and Dynergy Initial Comments at 18-25.

[24] *See* Initial Submission of PJM Interconnection, L.L.C., Docket No. EL16-49-000, et al., at 22 (Oct. 2, 2018) ("PJM Initial Filing").

an expanded MOPR to address "meaningful out-of-market support . . . that *states* have provided or required" to "keep existing uneconomic resources in operation, or to support the uneconomic entry of new resources."[25] This language evidences the Commission's clear intent to ensure that any expanded MOPR is not applied to voluntary renewable and clean energy purchases that are not directed or required by any state policy or program.

Unfortunately, PJM's proposed application of the MOPR described in its Initial Filing would exclude from mitigation only a narrowly-defined class of voluntary private REC transactions, while leaving a large number of other voluntary private REC transactions at risk of being subject to unwarranted mitigation. Specifically, PJM states that it intends to exclude from the MOPR only "voluntary bilateral arrangement[s,] . . . such as with an end-user seeking to retire the REC to fulfill its voluntary corporate clean energy goals."[26] PJM further states that it will presume that all REC sales to an "intermediary" (such as a REC broker) are for purposes of compliance with a mandatory state program, and thus should be subject to the MOPR.[27] The end result is that PJM's proposal would exclude from the MOPR <u>only</u> direct purchases of RECs from a renewable energy project by a corporation or other entity seeking to satisfy voluntary goals, while applying the MOPR to any corporation or entity purchasing "unbundled" RECs in secondary markets (including from brokers of RECs and other "intermediaries") to satisfy its

[25] June 29 Order at PP 149-150 (emphasis added).

[26] *See* PJM Initial Filing at 22.

[27] *Id.* at 23 n. 39. While PJM makes this clear statement of intent in its Initial Filing, the accompanying sample pro forma tariff changes provided with PJM's filing is not as clear regarding the application of MOPR to REC sales to intermediaries. *See* PJM Initial Filing, Attachment A, proposed new definition of "Material Subsidy" ("A renewable energy credit (including for onshore and offshore wind, as well as solar, collectively, RECs) will not be considered to be a Material Subsidy, if the Capacity Market Seller sells the REC to a purchaser that is not required by a state program to purchase the REC, and that purchaser does not receive any state financial inducement or credit for the purchase of the REC."). Because PJM was not invited by the Commission to submit pro forma tariff language, and understands that this language was drafted for illustrative purposes only, the Clean Energy Industries are treating PJM's statements in its Initial Comments as controlling.

privately-established goals. PJM's proposal also leaves uncertainty surrounding how the MOPR would apply to the large variety of other commercial arrangements that corporations and other entities with voluntary environmental and clean energy commitments may use to obtain renewable energy and/or RECs.

This narrow exclusion for voluntary REC purchases, if adopted by the Commission, risks sweeping many voluntary renewable energy purchases into the MOPR, resulting in unjust and unreasonable over-mitigation and threatening to disrupt the rapidly expanding market for corporate renewable energy purchases in the PJM region. Corporations and private entities satisfy their voluntary, privately-established clean energy and sustainability goals through a variety of commercial arrangements and contracting mechanisms – direct purchases of RECs and/or associated energy (through a bilateral transaction like that described by PJM) is only one.[28] Purchases of unbundled RECs in secondary REC markets from brokers or other entities (termed "intermediaries" in PJM's proposal) is a prominent method by which corporations and other entities satisfy their voluntary, privately-established renewable energy goals.[29] Yet PJM's proposal would appear to subject this much broader set of transactions with "intermediaries" to the MOPR, while excluding only the narrower set of direct bilateral transactions with renewable energy projects.[30]

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[28] *See e.g.* AEE Initial Comments, Attachment A, Renewable Energy Certificates Market Primer ("REC Markets Primer").

[29] In 2017, 51,744,000 MWh of unbundled RECs were purchased by 192,000 market participants. Unbundled RECs were by far the largest source of voluntary green power sales in the country last year, making up 46% of the voluntary market. *See* National Renewable Energy Laboratory, "*Status and Trends in the U.S. Voluntary Green Power Market (2017 Data)*" (Oct. 2018) ("NREL 2017 Report").

[30] In addition, as noted above, corporate entities and others satisfying environmental and clean energy goals use a number of other commercial mechanisms, including and sales and purchases of both bundled and unbundled RECs in the secondary markets, "REC arbitrage", and others. PJM's proposal leaves uncertainty as to how the MOPR will apply to all of these other arrangements.

It is important to note that voluntary renewable energy purchasers rely on the secondary markets and "intermediaries" like REC brokers for a number of reasons. As noted in the REC Markets Primer, REC marketers and brokers purchase RECs from a wide variety of sources over multiple years, allowing them to privately absorb risk and offer cost certainty to voluntary purchasers, while also helping voluntary purchasers maximize value based on their own unique preferences, constraints, and goals.[31] In addition, most corporate entities procuring RECs to satisfy their environmental and clean energy commitments only purchase RECs that meet the Green-e Energy Standard to ensure that their purchases of clean energy meet environmental integrity criteria and satisfy their specific goals and commitments.[32] To meet this standard, renewable energy sellers must go through a third-party verification audit to verify that the environmental integrity criteria and consumer protection requirements have been satisfied (*e.g.*, that the renewable energy delivered to customers has been procured and matches with the disclosures they have received). Given the administrative burden and costs of certification, REC intermediaries like brokers often take on the task of verifying that the Green-e standards have been met, and by purchasing RECs from multiple projects and offering a portfolio of RECs to multiple customers, they are able to spread the costs of certification across a wider number of transactions. If individual renewable energy project owners or voluntary REC purchasers were required to take on the burden of certification (which could occur if sales to intermediaries become subject to MOPR), it could raise the overall costs of voluntary renewable energy transactions (by spreading the transactions costs over fewer RECs) and hinder further

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[31] *See* REC Markets Primer at 6.

[32] *See* https://www.green-e.org for more information. For example, this stakeholder-driven standard requires that renewable energy sold in voluntary transactions meet environmental integrity criteria (for instance, the type of resource generating the energy, when the projects came online, etc.) and consumer protection requirements (to ensure that customers receive accurate disclosures about the renewable energy they are receiving).

development of the robust voluntary renewable purchase market that is developing in the PJM region. This would mean that the Commission would be imposing administrative and financial burdens on transactions that are clearly outside of its jurisdiction, and that are not "provided or required by certain states for the purpose of supporting the entry or continued operation of preferred generation resources."[33]

More broadly, PJM's proposal to limit the types of voluntary renewable energy purchases and RECs that are excluded from the application of the MOPR also threatens to damage the robust private markets for RECs that have developed over time and have served to encourage competition among renewable energy generators, lower the costs of RPS programs to consumers, and facilitate the expansion of voluntary renewable energy purchase programs. The REC Markets Primer describes the liquidity of these markets and their benefits to customers, including the important price certainty and cost reduction benefits they have provided.[34] Upending these markets will have negative consequences for consumers and economic development in the PJM region.

Notably, PJM's proposal to narrowly define the voluntary REC transactions that will be excluded from the MOPR proceeds from two flawed assumptions: (1) that RECs "still are largely used . . . as a means for load-serving entities to demonstrate compliance with mandatory state renewable portfolio standard programs", and (2) that "the large bulk of REC purchases [are] made to show compliance with state RPS programs."[35] The available data and market trends completely belie these assumptions. Markets for voluntary corporate renewable and clean

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[33] *See* June 29 Order at P 1.

[34] *See generally* REC Markets Primer.

[35] *See* PJM Initial Filing at 22-23.

energy purchases, and renewable and clean energy purchases in excess of mandates, are rapidly expanding both nationally and in the PJM region.[36] Voluntary renewable energy purchases, including voluntary RECs, have grown to almost half of all renewable energy purchases.[37] These data and market trends belie PJM's assumption that all or "most" RECs sold to an "intermediary", such as a REC broker, are for purposes of compliance with a mandatory state program – given the rapid expansion in voluntary purchases, such an assumption is unreasonable. There is also little evidence to support the theory that RPS program requirements will increase at the same pace as voluntary corporate entity renewable and clean energy purchases, and PJM cites to none in its Initial Filing.

PJM's Initial Filing and proposal also misapprehend how REC markets work in practice. Most notably, PJM characterizes voluntary RECs as an emerging "parallel market" to the market for compliance markets, suggesting that the two markets can be neatly divided for purposes of applying the MOPR.[38] As the REC Markets Primer explains, however, RECs are sold directly and in secondary markets to both load-serving entities with RPS compliance obligations and voluntary purchasers.[39] In fact, compliance entities and voluntary purchasers typically compete

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[36] *See, e.g.*, Business Renewables Center, "State of the Market" Presentation at 15-19, *available at* https://info.rmi.org/brcsotm2017 (showing rapid increase in voluntary corporate renewable energy deals in PJM states from 2015 to present); *see also, generally*, NREL 2017 Report; Center for Resource Solutions, "Two Markets, Overlapping Goals: Exploring the Intersection of RPS and Voluntary Markets for Renewable Energy in the U.S.", July 2017 Presentation, *available at* https://resource-solutions.org/wp-content/uploads/2017/08/RPS-and-Voluntary-Markets.pdf. ("CRS Report").

[37] *See* NREL 2017 Report at v and Figure ES-1 (showing that nearly half of all renewable energy purchases are customers engaging in voluntary purchases or utilities procuring renewables in excess of state-mandated amounts).

[38] *See* PJM Initial Filing at 22.

[39] *See generally* REC Markets Primer (explaining these dynamics throughout).

to purchase the same RECs, and may value them differently.[40] Competition among all of the entities in these markets serves to drive down the overall price of RECs as supply increases.[41]

Moreover, because RECs are only created when renewable energy is generated and are typically an annual product, the same renewable energy project can generate RECs used for RPS compliance one year, and generate RECs used for voluntary purposes another year. Finally, as noted above, corporations or other entities seeking to satisfy voluntary goals may sell the RECs they have obtained through a bilateral arrangement to a load-serving entity with a compliance obligation, and then purchase voluntary RECs for their own purposes.[42] In short, compliance and voluntary REC markets do not exist in parallel, but instead are integrated markets serving multiple purposes.

PJM also states that it is advancing a narrow definition of voluntary REC transactions that will not be subject to the MOPR to "avoid gaming opportunities."[43] However, PJM does not explain the "gaming opportunities" that it believes are of concern. It is unclear how a MOPR that appropriately recognizes and excludes voluntary RECs procured for purposes of satisfying voluntary environmental and clean energy commitments could allow a renewable energy project developer or other entity to "mask" revenues it receives from a state-mandated program, or otherwise engage in "gaming".

PJM may assert that it is necessary to apply mitigation to a broad set of RECs, even if it inadvertently captures RECs used for voluntary purposes, because tracking whether a given REC is ultimately used for compliance or voluntary purposes is difficult. PJM's default position

[40] *See id.* at 4.

[41] *See id.* at 3.

[42] *See* CRS Report at 12.

[43] *See* PJM Initial Filing at 23 n. 39.

appears to be "when in doubt, apply the MOPR." While the Clean Energy Industries agree that the robust and liquid nature of REC markets makes tracking their ultimate use difficult, that fact alone does not justify defaulting to broader and tighter mitigation. As the Clean Energy Industries have explained, the Commission is legally obligated to ensure that mitigation mechanisms are narrowly tailored to address the market power or market harm it has identified, and do not "do more harm than good" by extending their reach further.[44] PJM's narrow definition of voluntary RECs would surely "do more harm than good" by making a large segment of voluntary transactions that occur outside of state-mandated programs and do not receive any state policy-driven revenues subject to the MOPR. Given the Commission's legal obligation to avoid over-mitigation, in those instances where it cannot determine that a given project or transaction is causing the market harm that it has determined justifies mitigation (in this case, that the project or transaction is receiving revenues from a state mandated program that result in capacity market price suppression), it must default to excluding that project or transaction from mitigation, contrary to PJM's default position of applying mitigation.[45]

C. PJM's Proposal to Apply the MOPR To Any Resource "Entitled To" a Material Subsidy Will Over-Mitigate the Market and Lead to Uncompetitive Results.

As discussed at length in the Clean Energy Industries' Initial Comments, the MOPR should only apply to those state programs that provide revenues which have a corresponding "price suppressive" impact on resources' offers into the capacity market,[46] meaning that, *inter alia*, the MOPR should not apply to subsidies (such as most RECs) that do not provide known

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[44] *See Edison Mission Energy* 394 F.3d at 969.

[45] *See id.*

[46] *See e.g.* Clean Energy Industries Initial Comments at 4 (citing June 29 Order at P 5).

revenues at the time of the BRA because speculative revenues do not materially impact offers into PJM's capacity market.[47] Put another way, what must be mitigated through the expanded MOPR is no more than those out-of-market revenues provided or required by a state policy that are known at the time of the auction such that they make the difference as to whether or not a resource can actually offer low enough to clear the capacity market.[48] The Clean Energy Industries' position on this issue is in line with the Commission's central ruling in the June 29 Order, holding that the Commission took action to "address *the price suppressive impact* of resources receiving out-of-market support."[49]

Unfortunately, PJM's proposal to subject any resource that is "receiving *or entitled to receive"*[50] a Material Subsidy goes well beyond merely addressing the price suppressive impact of resources receiving out-of-market support, and will instead result in over-mitigating offers from competitive resources, which will in turn lead to uncompetitive results in PJM's capacity market. PJM states that "PJM's rationale for using the terminology 'entitled to' is to ensure that only those material resources which have or will have a subsidy at the time of the BRA, or by the time of the Delivery Year, are considered as having a Material Subsidy and are subject to the MOPR or are eligible for the RCO."[51] However, this position overlooks the fact that some resources may technically be eligible for a state subsidy at some point now or in the future, yet

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[47] *See e.g.* Clean Energy Industries Initial Comments at 13-17.

[48] *See* AEE Initial Comments at 8-9.

[49] *See* June 29 Order at P 5 (emphasis added).

[50] *See* PJM Initial Filing at 25 (emphasis in original).

[51] *See id.*

cannot adjust their offers into the capacity market as a result of such mere eligibility. As the Clean Energy Industries explained in their Initial Comments:

> most REC revenues do not actually and materially impact offers into the capacity market from Market Sellers of renewable energy resources. This is a crucial issue for the Commission to consider because if a Market Seller is not lowering its offer into the capacity market as a result of REC revenue, and therefore not suppressing capacity market prices in the manner that the Commission was concerned about in the June 29 Order, then it follows that the Market Seller's offer should not be subject to the MOPR because mitigating an offer that is not actually suppressing offers into the capacity market would constitute *mitigating a competitive offer*.[52]

The REC Markets Primer submitted by AEE further explains how REC market dynamics result in an unpredictable revenue stream for renewable energy generators that is not known at the time they offer into the PJM capacity market.[53]

By failing to recognize that every subsidy that a resource may be eligible for does not in fact suppress offers into PJM's capacity market, PJM is proposing an overly broad MOPR construct that, along with its aforementioned proposed treatment of RECs sold to intermediaries, will result in capacity market rules that over-mitigate offers from competitive resources, and accordingly, unjust and unreasonable outcomes. Therefore, the Commission should not adopt PJM's "entitled to" standard, and instead should establish a standard that only applies the MOPR to revenues attributable to state subsidies in the event that such revenues actually suppress offers into the capacity market.

D. PJM's Proposed MOPR Floor Prices Result in Incorrect and Artificially Inflated MOPR Values For New Wind and Solar Resources

In the event that the MOPR is to apply to any offers from wind and solar resources, flaws in PJM's proposed default ACR calculation will artificially inflate the MOPR Floor Offer Prices

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[52] *See* Clean Energy Industries Initial Comments at 13 (emphasis in original, citations omitted).

[53] *See* REC Markets Primer; *see also* AEE Initial Comments at 10-13.

for new wind and solar assets to uncompetitive and inaccurate levels. These proposed values far exceed reasonable capacity clearing price expectations, and in effect will require wind and solar resources to undergo the burdensome process of justifying unit-specific asset values to offer into PJM's capacity market at reasonable and accurate MOPR Floor Offer Prices. The Commission should require PJM to reset its default values to a level that appropriately estimates these resources' capacity market revenue requirements.

1. Overview of PJM's Approach for Calculating the Default MOPR Floor Offer Price Levels for Wind and Solar Resources

PJM's approach is patterned on the Net Cost of New Entry ("CONE") calculation.[54] Net CONE is an estimate of the levelized annual cost to construct a prospective greenfield resource net of assumed wholesale energy and ancillary service ("E&AS") revenue.[55] This process begins by estimating the overnight cost to construct a greenfield reference generating station. Here, the overnight construction costs and fixed operating and maintenance ("FOM") costs were sourced from the National Renewable Energy Laboratory's ("NREL") Annual Technology Baseline database for project installations beginning in 2022.[56] These costs are multiplied by a carrying charge to account for the cost of capital, taxes, and other fixed costs that would be incurred throughout a presumed useful life. In this case, PJM applied the 10% carrying charge that the Brattle Group[57] developed for natural gas combustion turbines and combined cycles to arrive to

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[54] *See* PJM Initial Filing at 38-39.

[55] *See* PJM Initial Filing, Affidavit of Adam Keech on Behalf of PJM Interconnection, L.L.C, at P 17 ("Keech Affidavit").

[56] *See id.* at P 18.

[57] *See* PJM Cost of New Entry: Combustion Turbines and Combined-Cycle Plants with June 1, 2022 Online Date., *available at* https://www.pjm.com/~/media/committees-groups/committees/mic/20180425-special/20180425-pjm-2018-cost-of-new-entry-study.ashx ("Brattle Study").

arrive at the levelized total annual revenue requirement that resources must recover over a presumed 20-year useful life.[58]

Next, PJM estimated the total first-year energy revenues that the reference resource would have earned, net of first-year variable costs, in each Zone within its territory during the preceding three calendar years. The lowest overall energy value was subtracted from the total annual revenue requirement to arrive at Net CONE which represents the minimum capacity price needed to justify new economic entry into the capacity market. PJM's default MOPR Floor Offer Prices equal the Net CONE values calculated under this approach. However, flaws in PJM's approach produced default values for wind and solar assets that ran between $387 per MW-day and $4,327 per MW-day,[59] and substantially overstate these resources' capacity market revenue requirements.

2. PJM's Use of The Resource's Lowest Estimated Energy Revenues Is Unreasonable

PJM states that use of the lowest estimated energy revenues is reasonable "for each planned resource type across the *entire PJM Region* given the existence of an alternative, resource-specific MOPR Price option."[60] In effect, PJM states that the accuracy of this assumption is irrelevant simply because market participants are not required to use the default values. To the contrary, it is unreasonable to apply a proxy value to resources throughout PJM that are based upon an assumption that is at the extreme end of the zone of reasonableness. This approach skews the default offer prices to an unrepresentatively high level by design. The theoretical availability of an alternative (in this case, a resource-intensive, unit-specific review

[58] *See* Keech Affidavit at P 18.

[59] *See id.* at P 17.

[60] *See id.* at P 21 (emphasis added).

process) does not absolve the Commission of its duty to ensure that filed rates, including this filed proxy value, are just and reasonable and supported by substantial evidence.

Moreover, PJM's calculation departs from the methodology that is used to calculate the PJM Region's Net CONE value for RPM planning purposes. PJM's governing documents provide that the RTO Net CONE for the RTO region is based on the "annual *average revenues for the PJM Region* based on . . . actual hourly average prices recorded in the PJM region during such a period."[61] Therefore, use of the lowest energy revenue offset to set default MOPR values is inconsistent with the methodology for calculating the regional Net CONE set forth in PJM's Commission-approved tariff and applicable business manuals.

The practical impact of this flaw is demonstrated though the simplified example provided below in Figure 1, where total energy revenues earned if a generic 100 MW nameplate generator operating at 35 percent capacity factor sold its entire output at the Real-Time LMP.[62]

Figure 1

Nameplate Capacity	**Capacity Factor**	**Total Generation**	**Real-Time Avg. LMP**	**Total Generation**	**Total Energy Revenues**
(MW)	(%)	(MWh)	($/MWh)	(MWh)	($/yr)
100	35%	306,600	[a]	[b]	[c] = [a] * [b]
PJM Proposed E&AS Approach			$ 23.52	306,600	$ 7,211,155
Historic Avg. RTO Region E&AS Approach			$ 30.13	306,600	$ 9,237,313
			E&AS Rev. Excluded by PJM ($)		***$ (2,026,158)***
			Delta E&AS from Hist. Avg.(%)		***128.1%***

Using the lowest zonal energy revenue profile in this case produced energy revenue values that were over *$2 million per year* lower than the historic three year-average approach for calculating the RTO-region Net CONE provided in the PJM Tariff. Said differently, the regional average

[61] *See* PJM Manual 18 PJM Capacity Market Section 3.3.2 Net Energy and Ancillary Services Offset (citing Tariff, Attachment DD, Section 5.10(a)(v and vi) (emphasis added)).

[62] Real-Time LMP values were sourced from S&P Global Market Intelligence.

RTO approach produced energy revenue estimates that were 128 percent greater those calculated under PJM's proposal, suggesting that PJM's proposed default MOPR price floor values are excessive.

Accordingly, PJM's proposal to assume the lowest estimated energy market revenues in calculating NET CONE should be rejected because it produces unjust and unreasonable default MOPR Floor Offer Prices that are not representative of wind and solar resources' capacity revenue requirements. The Commission should direct PJM to calculate these values using RTO-wide average energy revenues, or develop default levels that are specific to each Zone within PJM.

3. PJM Does Not Appear to Have Included Ancillary Service Revenues in the Default MOPR Floor Price Calculations for Renewable Resources

PJM's proposal is silent as to whether or to what extent ancillary service revenues are included in the default offer price estimates. However, PJM's Tariff states that "ancillary service revenues of $2,199 per MW-year" should be added to the energy revenue portion of the E&AS offset.[63] Excluding ancillary service revenues from the default value calculation would overstate the MOPR floor price requirement to an unrepresentative level. The Commission should direct PJM to appropriately account for ancillary service revenues consistent with the Commission-approved methodology for determining Net CONE.

4. Standard Inputs Including the Carrying Charge and Useful Life for Combined Cycle and Combustion Turbines Are Improper for Renewable Energy Resources

PJM's proposal to use a carrying charge and useful life sourced from Brattle's CONE study fails to capture differences between renewable resources and natural gas fired generators.

[63] *See* Tariff, Attachment DD, Section 5.10(4)(V)(A).

This results in financial assumptions that exceed levels needed to sustain renewable investment and produces artificially high MOPR default values for solar and wind resources.

The Brattle study assumes an after-tax weighted cost of capital ("ATWACC") of 7.5 percent that is equivalent to a return on equity of 12.8 percent, and a 6.5 percent cost of debt using a 65/35 debt-to-equity ratio.[64] A 29.25% effective combined state and federal tax rate was assumed for most areas of PJM. Bonus depreciation was also factored into the carrying charge as a result of recent changes to federal tax laws.[65]

However, PJM's "one-size fits all" approach that applies these estimates to all resources fails to capture financing structures that are more typical to renewable energy projects. For example, NREL's recent report, *PV Project Finance in the United States, 2017*, notes that a tax equity flip structure is the most common financial structure associated with solar developments.[66] This transactional structure allows a tax-equity investor to monetize federal investments tax credits ("ITC") that are available to certain renewable resources but not gas generation assets. This results in mid-cost weighted average cost of capital values for utility-scale solar projects that range between 6.2 percent and 7.2 percent.[67] Similar structures drive capital structures for wind resources. PJM should be required to utilize financing assumptions that better reflect the specific resources to which such assumptions are being applied.

PJM has proposed using a useful life of 20 years to formulate a MOPR for solar, however, the useful life of a utility-scale solar facility is widely recognized to be around 40

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[64] Brattle Study at iv.

[65] *See id.* at 47.

[66] *See* National Renewable Energy Laboratory, "PV Project Finance in the United States, 2017", *available at* https://www.nrel.gov/docs/fy18osti/70157.pdf.

[67] *See id.*

years. Additionally, the useful life for modern wind resources is approximately 30 years. Using the shorter 20-year useful life increases the annual revenue requirement and drives the default MOPR floor prices to an uncompetitive level. The default values should be updated to account for these asset-class specific parameters. Arbitrarily reducing the useful life of utility-scale solar and wind facilities will have an unjust and unreasonable impact on solar and wind resources' ability to participate in PJM's capacity market if the MOPR is ever applied to such resources.

5. *PJM Uses Identical E&AS Offset Values for Onshore and Offshore Wind Resources.*

Figure 2 below shows that that PJM's default values are calculated using different installed cost metrics for Onshore and Offshore wind assets, but identical E&AS revenue estimates.[68] No explanation or justification is otherwise provided.

Figure 2

Resource Type	PJM Est. CONE ($/MW-day)	PJM Est. E&AS Offset ($/MW-day)	PJM Default MOPR Floor Price ($/MW-day)
Onshore Wind	$ 3,670	***$ 1,180***	$ 2,490
Offshore Wind	$ 5,507	***$ 1,180***	$ 4,327

However, it is extremely unlikely that Onshore and Offshore resources would have identical operating profiles and energy revenue expectations. At a minimum, the asset generation profiles and wholesale power prices at each site would be different almost by definition. The Commission should direct PJM to develop asset class-specific default values that reasonably account for the E&AS revenue expectations for each underlying resource type.

[68] *See* Keech Affidavit at P 17.

6. New Approaches Should be Used to Calculate the Default MOPR Floor Prices For All Resources

The MOPR began as a component of the 2006 settlement establishing RPM as a mechanism to prevent capacity price suppression through monopsony power.[69] Despite many subsequent modifications, the MOPR has always applied only to *new assets* based on the theory that buyers could strategically subsidize unnecessary market entry solely to reduce their capacity costs. The MOPR has historically targeted natural-gas fired combined cycle and combustion turbines because they were perceived as the most likely candidates for this strategy given their modest development costs and high capacity values relative to other asset types.

However, the June 29 Order found that PJM's new-unit-only, gas-generator MOPR construct was no longer reasonable because it failed to protect capacity prices from increasingly prevalent incentive programs aimed at preventing existing unit retirements. The Commission directed PJM to develop a new MOPR paradigm to mitigate sell offers for any resource with access to a "material subsidy." Because the MOPR will now serve an entirely different purpose if implemented by the Commission as contemplated by the June 29 Order, the methods used to calculate competitive sell offer levels should also be revised. However, PJM's proposed method for calculating MOPR price floor levels has not changed to reflect the fact that the MOPR will now serve a different purpose, and results in artificially high MOPR price floor levels for solar and wind resources. Accordingly, the Clean Energy Industries present alternative MOPR calculations for the Commission to consider, which as described in more detail below,

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[69] *See* 2006 PJM MOPR Order, 117 FERC ¶ 61,331 at P 103; see also *PJM Interconnection, L.L.C.*, 123 FERC ¶ 61,037 (2008); *PJM Interconnection, L.L.C.*, 126 FERC ¶ 61,275 (2009); 2011 PJM MOPR Order, 135 FERC ¶ 61,022; 2011 PJM MOPR Rehearing Order, 137 FERC ¶ 61,145; *PJM Interconnection, L.L.C.*, 143 FERC ¶ 61,090 (2013) (2013 PJM MOPR Order), order on reh'g & compliance, 153 FERC ¶ 61,066 (2015), vacated & remanded sub nom. *NRG Power Mktg., LLC v. FER*C, 862 F.3d 108 (D.C. Cir. 2017).

demonstrate why PJM's proposed MOPR price floor calculation is unjust and unreasonable as applied to solar and wind resources.

i. The Net Avoidable Cost Rate ("ACR") Approach

The proposed Default Avoidable Cost Rate approach would be used to calculate MOPR floor prices for both new and existing resources. As stated by the Independent Market Monitor ("IMM") for PJM:

> Prior attempts to distinguish between the definition of competitive offers of new entrants and the competitive offers of existing resources were a mistake, as is PJM's continued application of that approach in its repricing proposal. A competitive offer is a competitive offer, regardless of whether the resource is new or existing. The prior approach of defining a high competitive offer for a new entrant, equal to the net cost of entry for the resource, and then eliminating any requirement in year two, illustrates the fallacy. Resource owners enter and remain in the market with the expectation that they will recover their costs and earn a return on and of capital. That is true of new entrants and existing resources. A competitive offer in the capacity market is the marginal cost of capacity, or net ACR, regardless of whether the resource is planned or existing. The energy market appropriately does not recognize a difference in the definition of marginal cost between the offers of new, or planned, units and the offers of existing units. Neither should the capacity market.[70]

The Clean Energy Industries agree. There is little economic rationale in establishing different competitive offer levels for the same resource simply based upon whether the resource has cleared a capacity auction or not. The installed cost to develop both subsidized and unsubsidized resources are sunk during construction. Competitive markets afford new entrants the opportunity to recover fixed and variable operating costs through a combination of capacity, energy, and ancillary service revenues. A rational investor should exit the market when these sources of revenues fail to sustain operations and not when they fail to provide the recovery of sunk costs or

[70] *See* Brief of the Independent Market Monitor for PJM, Docket No. EL16-49-000, et al., at PP 16-17 (Oct. 2, 2018).

anticipated return. Therefore, it is reasonable to establish competitive capacity offers levels for new and existing resources that reflect these units' avoidable operating costs.

ii. The Depreciated MOPR Approach

The depreciated MOPR approach is also an acceptable alternative formulation that retains the economic rationale for the Avoidable Cost Rate approach mentioned above, but could be implemented through modest reforms to PJM's proposal.

PJM's Net CONE approach to calculating the default floor offer prices "freezes" a resource's plant investment, starting with its commercial operation date and lasting through its retirement. Although the inputs may change slightly over time, the method remains constant, meaning that resources that fail to clear the market in their first year of operations must continue to bid a level at or above their year-one Net CONE regardless of how many years have passed in between the resource's attempts to clear the auction. In effect, Capacity Market Sellers of such resources are required to submit offers that are unrepresentative of their current costs. Said differently, this method overstates costs as time passes, which constrains a resource's ability to offer a representative and competitive offer. This issue can be remedied though a relatively modest adjustment to the default MOPR floor price calculation that more accurately accounts for depreciation during an asset's useful life.

Specifically, the Depreciated MOPR Method calculates a MOPR floor price by subtracting the first-year annual energy and ancillary services revenues from the first-year annual operating costs and *remaining* levelized plant costs. This differs from PJM's proposal, which calculates a MOPR floor price by subtracting the resource's first-year annual energy and ancillary services revenues from the first-year annual operating costs and *total* levelized plant costs.

The only difference between the Depreciated MOPR Method and PJM's proposal is *when* the capacity floor price is calculated. Under PJM's proposal, MOPR floor prices are calculated at the first year of operations. In the Depreciated MOPR Method, MOPR price floors are calculated at the year in which the resource bids into the capacity market. Unlike PJM's proposal, the Depreciated MOPR Method reflects the current depreciated value of the plant and, therefore, is more representative of the underlying cost structure and value of the plant at the time of the resource's offer into the applicable BRA. The Depreciated MOPR Method is just and reasonable because it better reflects the value of the resource over time, as shown in Figure 3:

Figure 3

PJM MOPR Method vs Depreciated MOPR Method: Example Floor Price Overstatement

		Example PJM MOPR Floor Prices Over Time ($/ICAP MW-day)			
Resource	**Unit**	**Year 1**	**Year 2**	**Year 3**	**Year 4**
CCGT	$/MW-d	438	438	438	438
Solar	$/MW-d	387	387	387	387
Onshore Wind	$/MW-d	2,489	2,489	2,489	2,489
Offshore Wind	$/MW-d	4,327	4,327	4,327	4,327

		Example Depreciated MOPR Floor Prices Over Time ($/ICAP MW-day)			
Resource	**Unit**	**Year 1**	**Year 2**	**Year 3**	**Year 4**
CCGT	$/MW-d	438	416	396	378
Solar	$/MW-d	387	278	176	80
Onshore Wind	$/MW-d	2,489	1,668	891	155
Offshore Wind	$/MW-d	4,327	3,762	3,245	2,773

		Example PJM MOPR Floor Price Overstatement ($/ICAP MW-day)			
Resource	**Unit**	**Year 1**	**Year 2**	**Year 3**	**Year 4**
CCGT	$/MW-d	0	22	42	60
Solar	$/MW-d	0	109	211	307
Onshore Wind	$/MW-d	0	821	1,598	2,334
Offshore Wind	$/MW-d	0	565	1,082	1,554

		Example PJM MOPR Floor Price Overstatement (%)			
Resource	**Unit**	**Year 1**	**Year 2**	**Year 3**	**Year 4**
CCGT	%	0.0%	4.9%	9.5%	13.8%
Solar	%	0.0%	28.1%	54.5%	79.5%
Onshore Wind	%	0.0%	33.0%	64.2%	93.8%
Offshore Wind	%	0.0%	13.1%	25.0%	35.9%

Figure 3 shows that the Depreciated MOPR Method reflects the decreasing present value of the plant over time. As deprecation reduces the present value of the resource each year, the levelized cost component automatically adjusts by calculating a floor price using the remaining levelized plant costs. With each year that passes, fewer costs remain to be recovered – demonstrating that the Depreciated MOPR method is more representative and economic than the PJM's proposed method for calculating MOPR floor prices for several reasons.

First, the Depreciated MOPR Method is more representative because it reflects the present value of the plant, as measured through the levelized cost component. The levelized component estimates the annual payment needed to recover the present value of the plant investment over its operational life. For example, a plant that costs $1 million to build and is projected to last 35 years would have a lower levelized cost than a plant that costs $1 billion to build and is also projected to last 35 years, all else equal. Similarly, two plants that cost the same amount to build, but are projected to last different periods of time would result in different levelized costs – with the shorter-duration plant having a higher levelized cost than the longer-duration plant because of the shorter time frame available to recover such costs. Therefore, levelized costs are dependent upon the value of the investment and the expected life of the investment. If the investment is not worth as much today as it was ten years ago, or if the investment period is shorter for one resource than another, then the annual payment needed to recover the present value of the plant investment over its remaining operational life will be lower.

As plants age, they depreciate through "wear and tear, deterioration, or obsolescence." As they depreciate, they lose value. As they lose value, fewer costs need to be recovered. PJM's proposed method for calculating MOPR price levels does not reflect this reality. Instead, it imposes a floor price that includes the full value of a plant investment, even if the present value of the plant has declined due to depreciation. The Depreciated MOPR Method recognizes this principle and adjusts the MOPR floor price by excluding the value of depreciation already incurred. This approach results in a more representative bid because it better reflects the present value of the plant.

Second, the Depreciated MOPR Method is more economic because it can improve the competitiveness of Capacity Market Seller offers by minimizing over-mitigation. As discussed, PJM's proposal can overstate the present value of a resource over time. In its attempt to reduce the probability of a Capacity Market Seller from submitting an uneconomically low offer price, PJM's proposed method for calculating MOPR floor prices can force sellers to submit uneconomically high offer prices, thereby potentially pricing them out of the capacity market even if their current cost structure allows for an economic bid below the erroneously calculated MOPR floor price. The Depreciated MOPR Method, on the other hand, mitigates the prospect of over-mitigation of PJM's capacity market by including only the remaining undepreciated plant costs in a resource's levelized cost component. By updating the MOPR floor price in this manner, the Depreciated MOPR Method can improve the competitiveness of capacity market offer prices, consistent with the policy guidelines specified by both PJM and the Commission.

iii. The Levelized Cost of Energy ("LCOE") Approach

The Levelized Cost of Energy ("LCOE") is a commonly accepted method for calculating a generator's total revenue requirement based upon its energy output over its useful life. The LCOE method then uses the same market price and generation inputs from all other methods to derive the revenue component. For renewable energy resources, the LCOE is roughly proportional to the capital cost of the asset, given that the generating asset has no fuel costs and few or no variable costs.

Valuing MOPR Floor prices using LCOE more appropriately accounts for the variable energy output during the asset's operating life more appropriately than the current Net CONE approach, as shown in Figure 4 below:

Figure 4

PJM MOPR Method vs. LCOE MOPR Method: Example Floor Price Overstatement

Capacity Floor Price (ICAP)	Unit	CCGT	Solar	Onshore Wind	Offshore Wind
PJM MOPR Method	$/MW-d	438	387	2,489	4,327
LCOE Method	$/MW-d	255	12	23	844
PJM MOPR Overstatement	$/MW-d	183	375	2,466	3,483
PJM MOPR Overstatement	%	71.7%	3,049.7%	10,889.6%	412.8%

LCOE Input Source: National Renewable Energy Laboratory, https://atb.nrel.gov/

Assumptions: E&AS revenue rate = $25.00/MWh

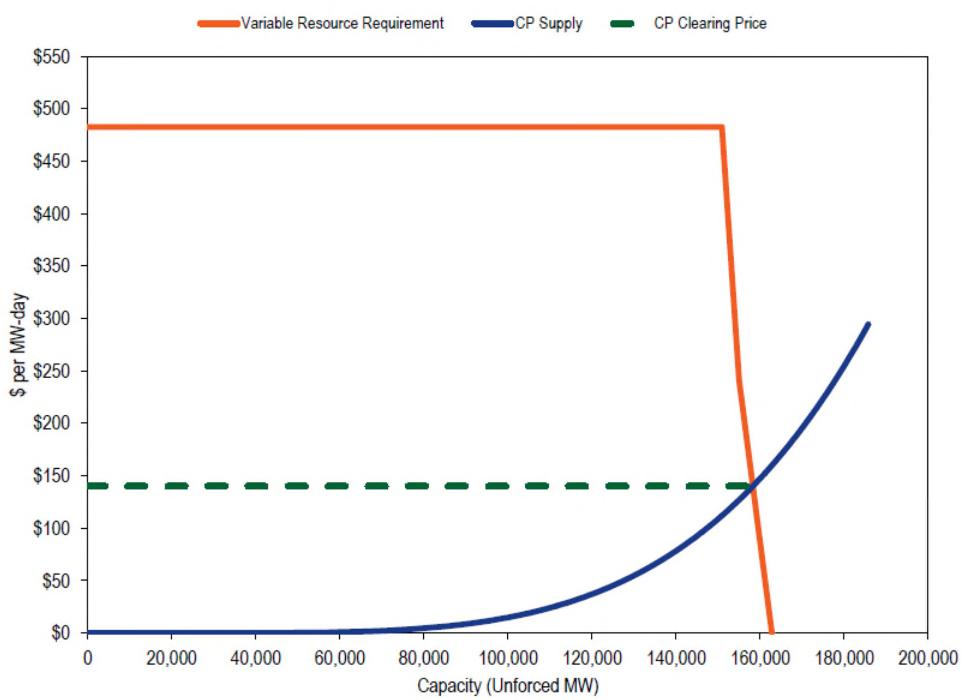
E. PJM Proceeds From an Incorrect and Unsupported Presumption That Renewables Resources Like Wind and Solar are "Uneconomic"

PJM's proposal continuously makes reference to "subsidized uneconomic" resources that need to be mitigated simply because they are receiving some form of payment outside of the PJM market construct and presupposes that all of those resources are "uneconomic" and would otherwise not clear the capacity market. Furthermore, the analysis provided by entities seeking to apply the MOPR to resources receiving RECs incorrectly assumes that these resources are not economic. However, wind and solar resources have achieved significant cost reductions over the last decade and are now some of the most economic resources in the supply stack.

As discussed in Attachment A, modern solar and wind facilities are economic based on current and projected energy market conditions. Some parties incorrectly aver that wind and solar resources are "subsidized uneconomic" resources that are distorting capacity market pricing outcomes because they are being removed from the top of the supply stack. However, this is simply not the case for solar and wind resources. Moreover, the IMM's analysis of the 2021/2022 BRA shows a decidedly different picture, as a significant amount of supply and load could be removed from the *bottom* of the supply stack without affecting the clearing price, as shown in Figure 5.[71]

Figure 5

Figure 1 RTO market supply/demand curves: 2021/2022 RPM Base Residual Auction[149]
150



Accordingly, if the Commission were to create a capacity market design in PJM that over-mitigates offers from renewable energy resources in PJM by subjecting them to the MOPR, the Commission will effectively be mitigating offers from some of the most cost-effective resources in PJM. Such over-mitigation will likely result in excluding many renewable energy resources from the capacity market entirely, despite the fact that they can supply valuable capacity to the PJM market in a cost-effective manner. Wind and solar resources, among other

[71] Monitoring Analytics, "Analysis of the 2021/2022 RPM Base Residual Auction: Revised," August 24, 2018.

types of renewable energy resources, should not be unjustly excluded from the capacity market in this manner, and should instead be given the opportunity to compete in PJM's capacity market alongside other types of resources based on rules that accurately capture their true costs and reflect the reality that they are among the most economic types of generation resources in PJM.

II. CONCLUSION

For the aforementioned reasons, the Clean Energy Industries request that the Commission consider these Reply Comments herein.

Respectfully submitted,

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Enclosures: Attachment A: Cost Data For Solar and Wind Resources

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 Washington, D.C. this 6th day of November, 2018.

Steven Shparber

Attachment A: Cost Data for Solar and Wind Resources

Solar

In the first half of 2018, 29% of all new electricity generating capacity brought online in the U.S. came from solar PV.[1] In their 2018 Annual Technology Baseline, NREL found that average installed prices for utility-scale solar PV systems in 2017 were $1,212/kW-DC (roughly $1,574/kW-AC).[2] Looking forward, NREL's Annual Technology Baseline projects costs will continue to decline to $816 - $1,171/kW-DC by 2021 and $770 - $1,171/kW-DC by 2023 (or roughly $1,000 - $1520/kW-AC).[3] This is consistent with data compiled by LBNL for the DOE in its 2017 Annual Utility-Scale Solar report,[4] and with the findings of industry analysts Wood Mackenzie Power & Renewables who reported installed system prices for utility-scale projects in Q2 2018 at $1.25/watt (AC) for fixed-tilt projects and $1.39/watt (AC) for single axis tracker projects.[5] Looking forward, the NREL ATB projects LCOE values of $19 - $40/MWh for utility-scale solar PV projects installed in 2023 and $14 - $36/MWh for projects installed in

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[1] *See U.S. Solar Market Insight, available at*: https://www.greentechmedia.com/research/subscription/u-s-solar-market-insight#gs.lg67Nbo (Sept 2018) (providing the most recent quarterly update to the collaboration between SEIA and GTM Research (now Wood Mackenzie Power & Renewables) that brings high-quality, solar-specific analysis and forecasts to industry professionals in the form of quarterly and annual reports) ("Solar Market Report").

[2] *See 2018 Annual Technology Baseline: Utility-Scale PV*, NATIONAL RENEWABLE ENERGY LABORATORIES (2018), *available at*: https://atb.nrel.gov/electricity/2018/index.html?t=su (discussing base year estimates) ("2018 Annual Technology Baseline"). Within the solar industry, the term "utility-scale solar" refers to large-scale photovoltaic, concentrating photovoltaic, and concentrating solar-thermal power projects that typically sell solar electricity directly to utilities or other buyers, rather than displacing onsite consumption. *Id.* The solar industry typically refers to projects in terms of $/kWDC based on the aggregated module capacity, whereas the electric utility industry typically refers to projects in terms of $/kWAC based on the aggregated inverter capacity. *Id.*

[3] *Id.* (discussing future year projections).

[4] *See Utility Scale Solar: Empirical Trends in Project Technology, Cost, Performance, and PPA Pricing in the United States*, LAWRENCE BERKELEY NATIONAL LABORATORY (2018 Edition) *available at* https://emp.lbl.gov/sites/default/files/lbnl_utility_scale_solar_2018_edition_report.pdf ("Utility Scale Solar Report").

[5] *See* Solar Market Report (reporting that installed system prices for utility-scale projects in 2018).

2030.[6] At the end of 2017, there were at least 188.5 GW of utility-scale solar power capacity within the interconnection queues across the nation, 99.2 GW of which first entered the queues in 2017.[7]

In a competitive market, bundled long-term PPA prices can be thought of as reflecting a project's levelized cost of energy (LCOE) reduced by the levelized value of any state or federal incentives received.[8] Driven by lower installed project prices and improving capacity factors, levelized PPA prices for utility-scale PV have fallen dramatically over time, by $20- $30/MWh per year on average from 2006 through 2012, and a decline of ~$10/MWh per year evident after.[9] Figure A below illustrates this:

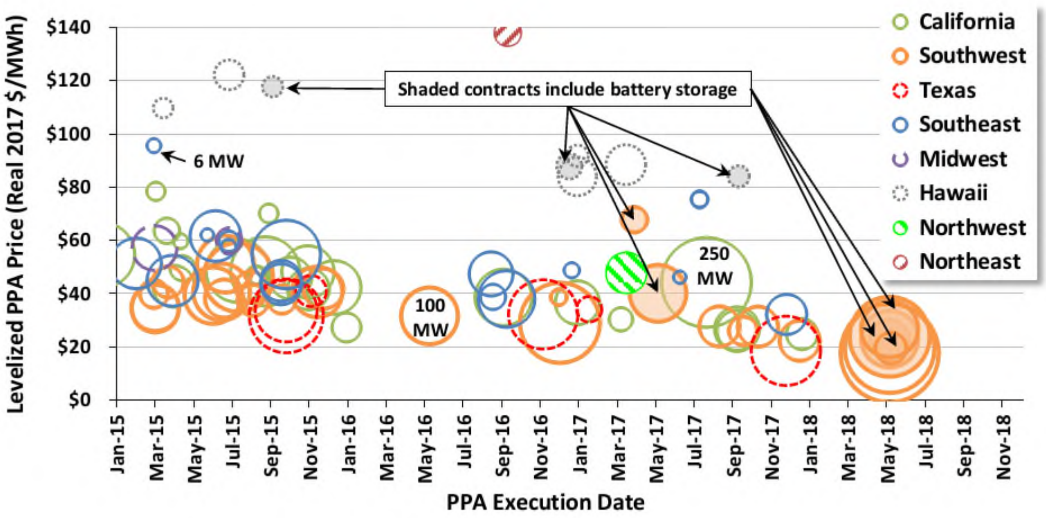
[6] 2018 Annual Technology Baseline, ***available at*** https://atb.nrel.gov/electricity/2018/index.html?t=su (presenting LCOE projections and explaining that CAPEX-not LCOE-is the most common metric for solar cost and correctly observing that "[w]hile CAPEX is one of the drivers to lower costs, R&D efforts continue to focus on other areas to lower the cost of energy from utility-scale PV, such as longer system lifetime and improved performance.")

[7] ***See*** Utility Scale Solar Report at 49, ***available at*** https://emp.lbl.gov/sites/default/files/lbnl_utility_scale_solar_2018_edition_report.pdf. As the report authors correctly observe "[t]hough not all of these projects will ultimately be built as planned, the widening geographic distribution of solar projects within these queues is as clear of a sign as any that the utility-scale market is maturing and expanding outside of its traditional high-insolation comfort zones." ***Id.*** at 50.

[8] ***Id.*** at 47.

[9] ***Id.*** at 33.

Figure A: Levelized PPA Prices by Region, Contract Size, and PPA Execution (2015-2018)[10]



A review of solar PPAs signed in 2018 for utility-scale solar projects reveals a median levelized price of $22.30/MWh, down nearly 86% from the average PPA price 10 years ago (adjusted for inflation).[11] Roughly two-thirds of the PPAs feature pricing that does not escalate in nominal dollars over the life of the contract—which means that pricing actually declines over time in real dollar terms.[12] By offering flat or even declining prices in real dollar terms over long periods of time, these solar PPAs provide buyers with a long-term hedge against the risk of rising fossil fuel prices.[13]

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[10] *Id.* at 32-33 (presenting figure 19). As the authors explain, as of August 2018, "more than 80% of all projects and capacity within the PPA sample were either partially or fully operating, with the remainder representing more-recently signed contracts for projects that are still under development or construction. While it remains to be seen whether all of these projects can be profitably built and operated under the aggressive PPA price terms shown in Figures 18 and 19, the sample does not include any PPAs that have already been terminated.").

[11] *Id.* at 41.

[12] *Id.* at 39.

[13] *See, e.g.*, *Less Carbon Means More Flexibility*, McKinsey & Company (Oct. 2018) (explaining that technological improvements and the new operational realities of a renewables-based electricity mix create opportunities for new types of resources and recommending 1) creation of new services to meet new realities; 2) improve integration at the T&D interface, 3) update legacy market-participation models and dispatch rules, and 4) recognize separate roles for flexibility and resiliency).

Wind

Data compiled by the Lawrence Berkeley National Laboratory ("LBNL") for the U.S. Department of Energy ("DOE") in the Annual Wind Technologies Market Report show a $1,587/kW average installed cost for U.S. onshore wind projects completed nationwide in 2016.[14] Similar to LBNL, the National Renewable Energy Laboratory ("NREL") 2017 Annual Technology Baseline ("ATB") reports an average installed cost of $1,529-$1,669/kW for 2016 U.S. onshore wind projects nationwide.[15] Even more importantly, installed costs for wind are expected to continue to decline. The NREL ATB estimates installed costs for U.S. onshore wind projects will fall from $1,529-$1,669/kW to $1,401-$1,628/kW by 2021 alone.

In the Great Lakes region, including PJM projects, recent PPA prices average $36/MWh. Separate from the Annual Wind Technologies Market Report, Indiana electric utility NIPSCO released RFP results this year showing an average bid of $26.97/MWh for new wind projects expected to come online in the near term through 2023.[16]

Even without incentives, wind resources available in the market today are cost-competitive. The NREL ATB reports a $36-$58/MWh LCOE without incentives for 2017 U.S. onshore wind projects. The Wall Street firm Lazard also develops an annual analysis estimating LCOE for a variety of energy generation technologies. In November 2017, Lazard Associates published its Levelized Cost of Energy Analysis, Version 11.0. Costs are provided without

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[14] Lawrence Berkeley National Laboratory, *2016 Wind Technologies Market Report*, August 2017, https://emp.lbl.gov/wind-technologies-market-report, 59.

[15] National Renewable Energy Laboratory, "2017 ATB." 2017. https://atb.nrel.gov/electricity/2017/. Onshore data derived from the "low" values for land-based wind techno-resource groups ("TRG") 1-7. TRG 1 resources are anticipated to be the lowest cost and highest performance wind resources, and are mostly concentrated in the Central U.S. A fair amount of potential in the Southeast opens up in TRG 5, and the entire Southeastern region opens up with TRG 7. The current market is most aligned with the "low" values.

[16] NIPSCO, "NIPSCO Integrated Resource Plan 2018 Update." July 2018. https://www.nipsco.com/docs/default-source/about-nipsco-docs/7-24-2018-nipsco-irp-public-advisory-presentation.pdf.

subsidies or incentives, and are backwards looking. Therefore, Lazard estimates should be viewed as current year benchmarks, and cost reductions should be projected for forecasts. Lazard reports a $30-$60/MWh LCOE for U.S. onshore wind projects brought online in 2017, making it the lowest cost source of new generation compared to natural gas combined cycle at $42-$78/MWh and nuclear at $112-$183/MWh.[17] Regionally, Lazard shows a $30-$50/MWh LCOE for Midwest wind projects, including PJM projects. The NREL ATB estimates unsubsidized LCOE for U.S. onshore wind projects to fall from $36-$58/MWh in 2017 to $29-$47/MWh by 2030.[18] This is largely due to wind turbine technology advancements, as well as performance and siting improvements.

The LBNL Annual Wind Technologies Report includes the chart below illustrating the advantage of current wind pricing relative to expected future natural gas costs. [19] As shown below, real costs for actual wind contracts signed over the last several years tend to decline over time as inflation reduces their fixed cost, while natural gas prices are expected to increase by a large but uncertain amount over time. Wind contracts signed today provide economic benefit in all gas price scenarios, and a very large benefit in many gas price futures. Macquarie Research recently published a report in support of this premise, projecting wind costs in 2023 around $42/MWh after the phase down of the PTC, compared to $66/MWh for natural gas combined-cycle plants in that year due to the increasing cost of natural gas.[20]

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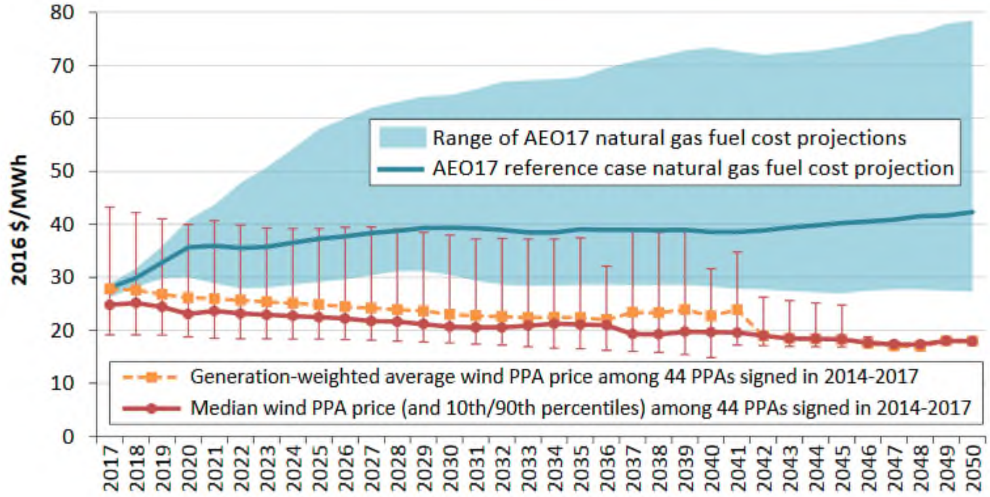
[17] Lazard, "Lazard's Levelized Cost of Energy Analysis – Version 11.0." 2017. https://www.lazard.com/media/450337/lazard-levelized-cost-of-energy-version-110.pdf, 2.

[18] National Renewable Energy Laboratory, "2017 ATB." 2017. https://atb.nrel.gov/electricity/2017/.

[19] Ibid.

[20] Bandyk, M, "Unsubsidized Wind Poised to Become Cost-Competitive Soon, Report Says." SNL. July 2016. https://www.snl.com/web/client?auth=inherit#news/article?id=37071925&KeyProductLinkType=4.

Figure B



Wind's costs have fallen by 67% since 2009 alone and technology advancements are opening up new viable project sites.[21] According the PJM IMM' 2nd quarter state of the market report, energy market prices averaged around $40 per MWh.[22]

[21] Ibid.

[22] Monitoring Analytics, "2018 Quarterly State of the Market Report for PJM: January through June," Section 3 – Energy Market. http://www.monitoringanalytics.com/reports/PJM_State_of_the_Market/2018/2018q2-som-pjm-sec3.pdf