UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

Old Dominion Electric Cooperative and Direct Energy Business, L.L.C., on behalf of itself and its affiliate, Direct Energy Business Marketing, L.L.C., and American Municipal Power, Inc.	)	EL17-32-000
v.	)	
PJM Interconnection, L.L.C.,	)	EL17-36-000
Advanced Energy Management Alliance	)	**(not consolidated)**
v.	)	
PJM Interconnection, L.L.C.	)	

PROTEST OF THE PJM POWER PROVIDERS GROUP

Pursuant to Rule 211 of the Federal Energy Regulatory Commission's ("FERC" or the "Commission") Rules of Practice and Procedure, 18 C.F.R. § 385.211 (2016), and the Commission's Notices issued on December 28, 2016, January 6, 2017, and January 17, 2017, the PJM Power Providers Group ("P3")[1] hereby submits this protest of the above docketed complaints.

[1] P3 is a non-profit organization dedicated to advancing federal, state and regional policies that promote properly designed and well-functioning electricity markets in the PJM Interconnection, L.L.C. ("PJM") region. Combined, P3 members own over 84,000 MWs of generation assets, produce enough power to supply over 20 million homes and employ over 40,000 people in the PJM region covering 13 states and the District of Columbia. The comments contained in this filing represent the position of P3 as an organization, but not necessarily the views of any particular member with respect to any issue. For more information on P3, visit www.p3powergroup.com. P3 filed a doc-less Motion to Intervene on January 9, 2017.

On December 23, 2016, Old Dominion Electric Cooperative ("ODEC"), Direct Energy Business, L.L.C., on behalf of itself and its affiliate, Direct Energy Business Marketing, L.L.C. ("Direct Energy"), and American Municipal Power, Inc. ("AMP") (collectively, "ODEC Complainants") submitted the above-captioned complaint against PJM Interconnection, L.L.C., ("PJM"), pursuant to sections 206 and 306 of the Federal Power Act ("FPA"), 16 U.S.C. § 824e, § 825e, and Rule 206 of the Commission's Rules of Practice and Procedure, 18 C.F.R. § 385.206, alleging, among other things, that PJM's Reliability Pricing Model ("RPM") is no longer just and reasonable, and requesting that the Commission take action in order to prevent the alleged loss of participation by Seasonal Capacity Performance Resources[2] in the RPM ("ODEC Complaint").

On January 5, 2017, the Advanced Energy Management Alliance ("AEMA") filed a complaint against PJM, pursuant to Sections 206 and 306 of the FPA, 16 U.S.C. §§ 824e and 825e, and Rules 206 and 212 of the Commission's Rules of Practice and Procedure, 18 C.F.R. § 385.206 and § 385.212, alleging that certain provisions of PJM's Open Access Transmission Tariff ("Tariff ") and Reliability Agreement among Load Serving Entities in the PJM Region ("RAA") are unjust, unreasonable and unduly discriminatory because they will eliminate seasonal resource participation in PJM's capacity market and unnecessarily increase costs to customers. AEMA also requested that the Commission consolidate its complaint with the ODEC Complaint ("AEMA Complaint" or "Complaints" or "Complainants" when referenced in combination with the ODEC Complaint).

[2] According to PJM, Seasonal Capacity Performance Resources include Storage Resources, Intermittent Resources, Demand Response, Energy Efficiency, and Environmentally Limited Resources. *Proposed Modifications for Enhanced Aggregation, Non-Summer Capacity Interconnection Rights, and Modified Demand Response Resource Measurement & Verification to Support Capacity Performance*, PJM Interconnection, L.L.C., Docket No. ER17-367-000 (filed Nov. 17, 2017), at pp. 3-4 ("Seasonal Capacity Filing").

As more fully described herein, including the attached Affidavit from Dr. Roy Shanker, both the ODEC and AEMA Complaints are collateral attacks on the Commission's June 9, 2015, PJM Capacity Performance Order ("CP Order" or "Order"),[3] and otherwise fail to meet their burden under Sections 206 and 306 of the FPA. In so far as the Complaints seek to relitigate the same issues that were raised and addressed in the CP Order, fail to cite any new evidence or changed circumstances to warrant overturning that Order, and reiterate issues raised in their respective protests to PJM's November 17, 2015,[4] Seasonal Capacity Filing, Complainants' Complaints should be dismissed with prejudice.

I. BACKGROUND

A. PJM Capacity Performance Filing

On December 12, 2014, PJM submitted two filings with the Commission seeking reforms and revisions to the PJM Tariff, RAA, the Amended and Restated Operating Agreement of the PJM Interconnection, L.L.C., ("Operating Agreement"), and PJM's RPM capacity market, to better ensure that committed capacity resources would perform when called upon to meet the reliability needs of the PJM Region.[5] As a core tenet of PJM's CP Filing, PJM proposed to replace its existing capacity products with a new capacity product – the Capacity Performance Resource ("CP Resource") – that would be capable of sustained, predictable operation such that

[3] Order on Proposed Tariff Revisions, *PJM Interconnection, L.L.C.*, 151 FERC ¶ 61,208 (2015) ("CP Order").

[4] Protest and Request for Institution of Investigation of Old Dominion Electric Cooperative and Direct Energy Business, L.L.C., on behalf of itself and its affiliate, Direct Energy Business Marketing, L.L.C., dated December 8, 2016, Docket No. ER17-367-000 ("ODEC Seasonal Capacity Protest") and Protest by Advanced Energy Management Alliance, Natural Resources Defense Council, Rockland Electric Company, Sierra Club, and Environmental Law & Policy Center, dated December 8, 2016, Docket No. ER17-367-000 ("AEMA Seasonal Capacity Protest").

[5] *PJM Interconnection, L.L.C., Reforms to the Reliability Pricing Market ("RPM") and Related Rules in the PJM Open Access Transmission Tariff ("Tariff") and Reliability Assurance Agreement Among Load Serving Entities ("RAA"), proposed Tariff*, Docket No. ER15-623-000 (filed December 12, 2014), and *PJM Interconnection, L.L.C.*, Docket No. EL15-29-000 (filed December 12, 2014) ("CP Filing").

the resource would reliably provide energy and reserves in emergency conditions at any time during the year. PJM also proposed the use on a transitional basis of a "Base Capacity Resource" -- essentially the existing capacity product, but with enhanced assurance of delivery of energy and reserves during hot weather operations.

PJM proposed "a measured increase of Capacity Performance Resources, with a corresponding phase-out of Base Capacity Resources" by the 2020/2021 Delivery Year. PJM asserted that the five-year transition period leading up to the CP Resource being the sole capacity product reflected "an appropriate balance between (i) the realities of resource investment (both in terms of cost and timing) to meet the necessary operational and performance requirements, (ii) protecting consumers from price spikes, and (iii) resource adequacy and system reliability."[6]

B. June 9, 2015, CP Order

On June 9, 2015, the Commission issued an Order on the CP Filing, which included a conditional acceptance of the Capacity Performance provisions, including the definition of Capacity Performance Resources and the five-year phase-out of the Base Capacity Resource.[7] The Commission found, in part that:

> ". . . PJM's establishment of a Capacity Performance Resource product is intended to address a concrete problem of resource non-performance through the creation of performance incentives and a penalty structure that will improve overall reliability. Phasing in these same risks and rewards over the transition period in a balanced manner per PJM's proposal is reasonable. Capacity Performance Resources accept greater risks for non-performance than Base Capacity Resources, in exchange for potentially higher capacity revenues and performance payments. PJM's proposal simply allows some resources to begin taking on these additional risks and benefits earlier."[8]

[6] CP Filing, at pp. 2; 27-35.

[7] CP Order, *supra*.

[8] CP Order, at p. 94.

C. CP Rehearing and Clarification Order

On July 22, 2015, the Commission issued a Rehearing and Clarification Order, denying a request for clarification, granting, in part, a request for rehearing, and granting, in part, a complaint, finding that PJM must allow Annual Demand Resources and all other non-generation resources to qualify as Capacity Performance Resources and to participate in PJM's Capacity Performance Transition Incremental Auctions (Transition Auctions), if they qualified. [9]

D. CP Order on Rehearing and Compliance

On May 10, 2016, the Commission issued an Order on Rehearing and Compliance.[10] Among other findings, the Commission upheld PJM's treatment of Base Capacity Resources in the Transitional Auctions and phase-out of the Base Capacity Resources by the 2020/2021 Delivery Year. In part, the Commission stated:

> "We disagree with these arguments and deny rehearing. PJM is treating all resources identically in this respect. The rehearing requesters are in effect asking for special treatment for certain resources, permitting them to provide a lesser quality of service for the same price. We cannot find unreasonable PJM's conclusion that non-year round resources do not provide equivalent service as year-round resources. Permitting non-year-round resources to continue participating could result in a loss of reliability during the fall, winter and spring when PJM will not have as many resources to respond to emergencies, such as a polar vortex. Moreover, PJM has provided reasonable accommodation to permit greater participation in the capacity market by such resource types, including a reasonable transition period and the ability to participate in aggregated offers."[11]

[9] Order denying request for clarification, granting in part request for rehearing, granting in part complaint, & directing compliance filing re PJM Interconnection, LLC vs. Essential Power Rock Springs, LLC etc, ER15-623 et al. (July 22, 2015).

[10] Order on Rehearing and Compliance, *PJM Interconnection, L.L.C.*,151 FERC ¶ 61,157 (2016) ("Order on Rehearing and Compliance").

[11] Order on Rehearing and Compliance, at P 59, p. 27.

In rejecting numerous challenges to PJM's planned phase-out of Base Capacity Resources, the Commission found, in part, that:

> "In the Capacity Performance Order, the Commission accepted PJM's proposed transition mechanisms. The Commission found PJM's proposal to implement the transition to 100 percent Capacity Performance Resources over five years would allow resources to make gradual improvements and reduce the burdens such improvements may impose. The Commission also found that the mechanisms struck an appropriate balance between the costs associated with procuring Capacity Performance Resources throughout the transition period and the needed reliability improvements over that same period."[12]

E. Petition for Review – U.S. Court of Appeals

On July 8, 2016, AEMA filed a Petition for Review in the U.S. Court of Appeals for the District of Columbia Circuit of the June 9, 2015, CP Order and the May 10, 2016, Order on Rehearing and Compliance ("CP Petition for Review"). On July 11, 2016, AMP, one of the three parties to the ODEC Complaint, also filed a CP Petition for Review. Seven other parties filed Petitions for Review and the cases were consolidated.[13]

On November 23, 2016, the Commission filed a Brief of Respondent. The Commission, in part, affirms that the treatment of Seasonal Capacity Performance Resources under PJM's Capacity Performance market design are just and reasonable, and asserts that challenges made by certain parties regarding the alleged discrimination of these resources must fail, as the petitioners

[12] Order on Rehearing and Clarification, at P 155, p. 67.

[13] *Advanced Energy Management Alliance, et al.,* v. *FERC, On Petitions for Review of Orders of the Federal Energy Regulatory Commission*, U.S. District Court of Appeals, D.C. Circuit, Nos. 16-1234, 16-1235, 16-1236, and 16-1239 (Consolidated) ("CP Petition for Review"). In addition to AEMA and AMP, the other parties that sought Petitions for Review include: American Public Power Association, National Rural Electric Cooperative Association, New Jersey Board of Public Utilities, Public Power Association of New Jersey, Natural Resources Defense Council, and the Sierra Club, the Union of Concerned Scientists.

in question failed to preserve their discrimination arguments on rehearing and thus are jurisdictionally barred from doing so on judicial review.[14] The Commission stated that:

> "Even assuming jurisdiction, the Commission properly approved PJM's requirement that Capacity Performance Resources be able to perform in emergency conditions throughout the year, and found that allowing certain types of resources to submit aggregated offers was a reasonable accommodation for the inherent limitations of those resources."[15]

F. November 17, 2016, PJM Seasonal Capacity Filing

On November 17, 2016, PJM submitted proposed revisions to its Tariff and RAA, pursuant to Section 205 of the FPA, in order in enhance participation of specified Seasonal Capacity Resources in PJM's RPM. Specifically, PJM proposes to: (1) enhance its aggregation rules to provide additional ways in which eligible resources can participate in RPM; (2) provide an opportunity for such eligible resources to obtain additional Capacity Interconnection Rights ("CIRs") for the winter period to support aggregation; and (3) modify rules for measuring Demand Resource ("DR") performance during the winter period.[16] PJM requested an effective date of January 19, 2017, for changes associated with the enhanced aggregation rules and winter CIRs, which it stated will allow all Capacity Market Sellers to prepare to take advantage of the enhanced rules prior to the May 2017 Base Residual Auction ("BRA") ("PJM Seasonal Capacity Filing").

As noted above, on December 8, 2016, Complainants ODEC and Direct Energy submitted a protest of PJM's Seasonal Capacity Filing, requesting, in part, that PJM be ordered

[14] *Brief of Respondent*, Federal Energy Regulatory Commission, Petition for Review, at pp. 17; 56-62 ("FERC Response Brief").

[15] FERC Response Brief, at p. 17.

[16] PJM Seasonal Capacity Filing, pp. 1-5.

to maintain the Base Capacity Resource product for the 2020/2021 Delivery Year, with the same product and market clearing components that were available for the 2019/2020 Delivery Year, subject to two tariff recommendations, including changes to the penalty structure and stop-loss limit provisions for Base Capacity Resources. In addition, the protest requested that the Commission institute an investigation under FPA Section 206, *sua sponte*, to ensure Complainants desire for participation and value recognition of seasonal capacity performance resources. AEMA's protest of PJM's Seasonal Capacity Filing, amongst other issues, also argues for an extension of the Base Capacity Resources.

On December 23, 2016, Commission Staff issued a notice of Deficiency Letter to PJM, requesting additional information on its Seasonal Capacity Filing in order to process the filing. Detailed questions for PJM's response regarding market-clearing mechanics and other issues regarding Seasonal Capacity Performance Resources need to be submitted by PJM by January 23, 2017. PJM submitted its response to the Deficiency Letter on January 23, 2017.[17]

G. ODEC and AEMA Complaints

On December 23, 2016, the above-captioned ODEC Complaint was filed. While the ODEC Complaint notes that it is "not seeking to 'undo' the fundamental components of PJM's CP for all resources,"[18] it nonetheless alleges that the PJM rules regarding participation by Seasonal Capacity Performance Resources in RPM are unjust, unreasonable, unduly discriminatory or preferential. To that end, the ODEC Complaint requests a change to the Transition Mechanism approved in the CP Order and requests the continuation of Base Capacity Resources, with targeted Tariff changes, for an additional year, allowing their participation in the

[17] Response of PJM Interconnection, L.L.C., to Commission's December 23, 2016 Information Request, dated January 23, 2017, Docket No. ER17-367-000 ("PJM Response to Deficiency Letter").

[18] ODEC Complaint, at p. 8.

upcoming BRA for the 2020/2021 Delivery Year. The ODEC Complaint alleges that "circumstances have changed" since the Commission's CP Order, including, in part: (1) the impending elimination of the Base Capacity Resource from participation in RPM; (2) the existence of substantial factual evidence that indicates that PJM capacity needs continue to vary by season; and (3) a Commission notice of proposed rulemaking ("NOPR") that, according to Complainants, signals a shift in the Commission with respect to Regional Transmission Organization ("RTO") accommodation of non-conventional generation sources in market design.[19]

In addition to the request to continue allowing Base Capacity Resources to participate in RPM, the ODEC Complaint requests that the Commission require PJM to file a new mechanism to ensure participation of Seasonal Capacity Performance Resources in the BRAs by September 30, 2017, and to institute a Section 206 investigation, *sua sponte*, to investigate the reasonableness of PJM's rules for permitting Seasonal Capacity Performance Resources to participate in the RPM auctions.

On January 5, 2017, AEMA filed its similar complaint to that of ODEC's, alleging, in part, that new evidence and changed circumstances demonstrate that full implementation of CP in May 2017 will be unjust, unreasonable and unduly discriminatory for several reasons, including that: PJM would be over-procuring capacity for the winter season; capacity is more valuable in summer than in the winter; new PJM reliability studies indicate that requiring 100% annual capacity is an attempt to solve a problem that does not exist; and that PJM has not addressed the mismatch between CP and cost allocation, among other issues. The AEMA Complaint alleges that PJM's Seasonal Capacity Filing will not make CP more reasonable. As

[19] ODEC Complaint, at p. 6.

with ODEC's Complaint, the AEMA Complaint seeks to extend Base Capacity Resource participation in PJM's upcoming May 2017 BRA for the 2020/2021 Delivery Year and submits replacement Tariff and RAA provisions to that effect.

II. PROTEST

A. Both The ODEC and AEMA Complaints Should Be Summarily Rejected as an Impermissible Collateral Attack on Prior Commission Orders.

The claims and requested relief set forth in both the ODEC and AEMA Complaints should be barred as collateral attacks on the Commission's June 9, 2015, CP Order, as well as the July 22, 2015, Rehearing and Clarification Order, and the May 10, 2016, Order on Rehearing and Compliance. As the Commission has previously found, "[c]ollateral attacks on final orders and relitigation of applicable precedent by parties that were active in the earlier cases thwart the finality and repose that are essential to administrative efficiency and are strongly discouraged."[20]

Collateral Estoppel is an efficiency rule that is meant to save judicial or administrative resources by avoiding the relitigation of issues of fact that have already been actually litigated. Therefore, this Commission has held that "[I]n the absence of new or changed circumstances requiring a different result, it is contrary to sound administrative practice and a waste of resources to relitigate issues in succeeding cases once those issues have been finally determined."[21]

[20] *Entergy Nuclear Operations, Inc. v. Consolidated Edison Co. of New York, Inc*., 112 FERC ¶ 61,117, at P 12 (2005). *See also EPIC Merchant Energy NJ/PA, L.P., SESCO Enterprises, L.L.C., and Coaltrain Energy L.P. v. PJM Interconnection, L.L.C.*, 131 FERC ¶ 61,130 (2010) (dismissing as an impermissible collateral attack a complaint that merely sought to re-litigate the same issues as raised in the prior case citing no new evidence or changed circumstances).

[21] San Diego Gas and Elec. Co. v. Pub. Serv. Co. of N.M., 86 FERC ¶ 61,253 (1999); see also Pac. Gas & Elec. Co., 121 FERC ¶ 61,065, at P 38 (2007); Alamito Co., 41 FERC ¶ 61,312, at 61,829 (1987), order on reh'g, 43 FERC ¶ 61,274 (1988), (citing Cent. Kansas Power Co., Inc., 5 FERC ¶ 61,291, at 61,621 (1978), "Central Kansas Power").

The claims set forth in the Complaints should be barred as a collateral attack due to the fact that: (1) the claims presented relate to essential issues that were decided on the merits and on several occasions, and (2) Complainants have presented no new evidence or new circumstances that would justify relitigation of the same claims.[22] Therefore, the Complaints should be summarily dismissed as a collateral attack on previous Commission orders.

1. The Claims Presented Relate to Essential Issues That Have Already Been Finally Decided On The Merits in the CP Order and the Subsequent Orders on Rehearing.

All of the issues and claims raised by the ODEC and AEMA Complainants have been raised, argued, considered and decided upon within the context of the CP Order and the subsequent orders on rehearing. In other words, the claims have all been fully litigated before the Commission in a matter that produced thousands of pages of filings and testimony for the Commission's consideration and after a high-profile PJM stakeholder process.[23]

Thus, the Complainants' claims that: (1) Annual Resources should not be the only resources allowed to participate in PJM's RPM under the FERC-approved CP construct; (2) Seasonal Capacity Performance Resources cannot meaningfully participate in RPM without Base Capacity; (2) the elimination of Base Capacity Resources is not required to maintain reliability and will create more costs for consumers, and CP unjustly shifts winter capacity costs onto DR loads; (3) PJM's modified aggregation efforts will not remedy the loss of Base Capacity for Seasonal Capacity Performance Resources; and (4) the penalty structure and stop-loss limitation

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[22] *American Electric Power Service Corp.*, 122 FERC ¶61,083 at P 68 (2008).

[23] Capacity Performance remains the only issue in which PJM employed the Enhance Liaison Committee process which involved direct meetings between PJM stakeholders and the PJM Board.

are unjust and unreasonable, have already been litigated by Complainants and other parties within the context of the Capacity Performance docket, through the following pleadings:

- **AMP, ODEC and SMECO's Jan. 20, 2015, Protest and Motion to Reject Filing or, in the alternative, for Suspension and Hearings[24]:**
  - "By forcing resources…to combine to meet annual Capacity Performance requirements rather than PJM combining resources procured through the auction process, . . . PJM's proposal unduly discriminates against Demand Response, intermittent and renewable generation resources." (p. 51).
  - "If necessary, implementation of the 2016 BRA should be delayed in order . . . to find a way to make the dual Capacity Performance and Base approach (like what will be used for the 2016-17 and 2017-18 Delivery Years) work on a more permanent basis." (p.52).

- **AEMA's January 20, 2015 Protest[25]**
  - Various components of the CP proposal will negatively affect demand response resource participation in PJM's capacity market. (p. 3)
  - Preserving Base Capacity Resources is a prerequisite to procuring reliable capacity in an economically efficient manner. (p. 2)
  - The proposed increase in the penalty structure is not just and reasonable and should be rejected. (p. 2)

- **AMP, ODEC and SMECO March 2, 2015, Motion for Leave to Answer and Answer[26]:**

[24] Protest and Motion to Reject Filing, or in the Alternative, for Suspension and Hearings by American Municipal Power, Inc., Old Dominion Electric Cooperative, and Southern Maryland Electric Cooperative, Inc., Jan. 20, 2015, Docket No. ER15-623-000.

[25] Protest of Advanced Energy Management Alliance, Jan. 20, 2015, Docket No. ER15-623.

[26] Motion for Leave to Answer and Answer of the American Municipal Power, Inc., Old Dominion Electric Cooperative, and Southern Maryland Electric Cooperative, Inc., March 2, 2015, Docket No. ER15-623-000.

- CP proposal, including its coupled and aggregated offer components, "unduly discriminate against traditional resources and renewable resources, as well as perhaps demand response." (pp. 11-12).

- CP requirements will allegedly subject certain resources to new requirements with which they will either not be able to meet, or which will increase costs, as they will be exposed to excessive penalties as a result of non-compliance (p. 11)

- **AEMA March 2, 2015, Motion for Leave to Answer and Answer[27]**

  - Base Capacity Resources should be retained because PJM fails to justify eliminating this product. (p. 7)

  - The new winter peak established on January 20, 2015 remains substantially below summer peaks, further proving the value of summer-only resources. (p. 10)

    PJM's CP proposal is not technology neutral and includes discriminatory treatment of Demand Resources be prescribing different summer and winter measurement and verification methodologies. (p. 12)

Furthermore, Complainants' request for an evidentiary hearing have been raised and litigated beforehand as well, in both the AMP, ODEC and SMECO March 2 pleading, above (request for a rejection or 5-month suspension of CP proposal and an evidentiary hearing (p. 24) and the AMP, ODEC and SMECO April 24th protest (requesting the Commission to reject CP, or issue a 5-month suspension and establish hearing procedures).

As noted in the above-referenced CP Order, as well as the July 22, 2015, CP Rehearing and Clarification Order, and the May 10, 2016, CP Order on Rehearing and Compliance, all of these claims relating to the phasing out of the Base Capacity Resource product for the 2020/2021

[27] Motion for Leave to Answer and Answer of Advanced Energy Management Alliance, March 2, 2015, Docket No. ER15-623-000.

Delivery Year were considered and rejected by the Commission. For example, the Commission specifically considered whether PJM's proposal for a single product, on a phased-in basis, was just and reasonable:

> [a]s a general matter, we accept PJM's proposal to establish, on a phased-in basis, an Annual Demand Resource product that will: (i) replace PJM's existing demand response capacity products, and (ii) require conformance with the standards applicable to a Capacity Performance Resource, as modified herein.

In so finding, the Commission also noted that "currently the vast majority of Demand Resources are available to PJM during the summer peak season only, with Limited Demand Response available for 10 days and for a maximum of 6 hours a day."[28] Thus, the Commission was well aware of the potential affect that its ruling would have on the current Demand Resources when it decided to transition to a single, CP product. As noted above, the Commission approved the termination of Base Capacity Resources with the 2020/2021 Delivery Year due to the fact that PJM had provided a "reasonable transition period and the ability (for these seasonal resources) to participate in aggregated offers."[29]

The Complainants' claims contained in their respective Complaints all relate to essential issues that have already been finally decided on the merits in the Commission's CP Order and the subsequent orders on rehearing. Therefore, the claims are a collateral attack of these orders and the Complaints must be summarily dismissed.

Furthermore, as noted above, both AMP and AEMA sought judicial appeal of the very subject matter of the complaint. In fact, in their Opening Brief to the D.C. Circuit Court of Appeals, AMP and AEMA present nearly all of the key arguments addressed in their Complaints, namely that this Commission failed to identify CP's costs and benefits, that CP is

[28] June 9 order at P. 99.

[29] *PJM Interconnection, L.L.C.*, 155 FERC ¶61,157 (May 10, 2016) ("CP Rehearing Order").

unduly discriminatory towards renewable resources and demand response, and that PJM's aggregation rules are unjust and unreasonable.[30] So as the D.C. Circuit judges hear oral argument on the issue of whether seasonal capacity products are treated discriminatorily, the Commission is being asked to adjudicate a complaint on the very same issue. The doctrine of Collateral Estoppel is designed to prevent placing an entity like the Commission in this position.

If a party is unhappy with a Commission order, its recourse is to avail itself of the appeals process under Section 313(b) of the FPA, 16 U.S.C. 825*l*(b), Complainants, such as ODEC and Direct Energy, who failed to meet the requirements for preserving their arguments on appeal should not be allowed to end-run those procedural protections by merely re-raising the same concerns through a complaint that recycles the same arguments and facts. To the extent that AMP timely filed an appeal, then the matter is before the Court to decide and AMP (and others who timely appealed) should not be allowed to circumvent that appeals process by raising the same issue in a complaint.

2. Complainants Have Presented No New Evidence or New Circumstances That Would Justify Relitigation of the Same Claims.

In order to demonstrate that their Complaints are not a collateral attack, the Complainants must present new evidence or new circumstances that would justify relitigation of issues that have been previously litigated and decided.[31] The ODEC Complainants allege that such "new" developments include (i) the "past two years of experience" with the implementation of CP, (ii) the Commission's continued commitment to equal participation in organized markets by non-

[30] Joint Opening Brief of Petitioners Advanced Energy Management Alliance, American Public Power Association, National Rural Electric Cooperative Association, New Jersey Board of Public Utilities, Public Power Association of New Jersey, Natural Resources Defense Council, Sierra Club, Union of Concerned Scientists, and American Municipal Power, Inc., dated September 23, 2016, Case Nos. 16-1234, 16-1235, 16-1236 and 16-1239. https://www.nrdc.org/sites/default/files/opening-brief-on-petition-for-review-of-ferc-orders-20160923.pdf

[31] Central Kansas Power, *supra*, at ¶ 61,621

conventional resources, recently reiterated in the Commission's NOPR on participation in RTO and ISO markets by electric storage and distributed energy resources,[32] (iii) what they view as failed efforts in the PJM stakeholder process, via the Seasonal Capacity Resource Senior Task Force ("SCRSTF") to reach agreement on rules for Seasonal Capacity Performance Resources. The AEMA Complainants allege that new PJM reliability studies that allegedly indicate that requiring 100% annual capacity is an attempt to solve a problem that does not exist. P3 submits that none of these circumstances amount to anything "new" in order to justify relitigation of the request to continue Base Capacity Resources in the RPM auctions.

The "past two years of experience" with the implementation of Capacity Performance is not "new;" it was contemplated. The very essence of the five-year CP Transition Mechanism contemplated the phasing out of the Base Capacity Resource over the past two BRAs, culminating with its cessation in the 2020/2021 Delivery Year. Attempting to cite the experience of the past BRAs in this regard would not amount to a new circumstance that the original CP Order did not contemplate.

In the same regard, the fact that the Commission continues to support non-conventional resources' participation in RTOs and ISOs, while noteworthy, is not a "new circumstance" that would justify relitigation of the issue of Base Capacity Resource participation in the BRAs. First, the Storage NOPR is a proposed rule; it is open for comment and is not a final Commission determination. Thus, portraying it as a new Commission policy is an overstatement. In addition, even if it were a final ruling, Complainants take the Storage NOPR out of context in attempting to utilize it as any evidence that would impact these proceedings. The Commission's July 22, 2015, CP Rehearing and Clarification Order, referenced above, made clear that Annual Demand

[32] *Electric Storage Participation in Markets Operated by Regional Transmission System Operators and Independent System Operators, Notice of Proposed Rulemaking*, 157 FERC ¶61,208 (2015) ("Storage NOPR").

Resources and other non-generation resources had the ability to qualify as Capacity Performance Resources. As the Commission has never wavered in its support for non-generation to participate in the market as a CP Resource, it certainly is not "new evidence" that the Commission remains committed to ensuring the proper participation these resources in organized markets.

Furthermore, even if the SCRSTF was unable to reach consensus on various issues surrounding Seasonal Capacity Performance Resources, this "non-consensus" does not amount to new evidence that would warrant relitigation of the Base Capacity transition. Rather, the stakeholder stalemate prompted PJM to make its Seasonal Capacity Filing to propose further aggregation flexibility and commensurate rule changes so Seasonal Capacity Performance Resources can submit aggregated offers into the BRA. ODEC Complainants admit that the protest they have submitted in that proceeding is the same as they are requesting in this Complaint docket, including the request for the Commission to institute a proceeding under FPA Section 206, *sua sponte*.[33] The issues raised in the Complaints are already the subject of the ongoing proceeding in PJM's Seasonal Capacity Filing docket -- yet another reason the Commission should decline to decide these issues here.[34] At the very least, the phasing out of the Base Capacity Resource was never contingent upon the outcome of a stakeholder process, so Complainants cannot claim this as "new evidence" or a "new circumstance."

Finally, as Dr. Shanker explains, the AEMA misinterprets the PJM sensitivity results provided during the SCRSTF deliberations as "new" information. Contrary to the AEMA Complaint's allegation that "multiple planning and operational studies completed since Capacity

[33] ODEC Complaint at pp. 28-35.

[34] *California Independent System Operator Corp.*, 87 FERC ¶61,016, ¶61,050 (1999); *Consumers Union of United States, Inc.* 98 FERC ¶61,305 at PP 17-18 (2002).

Performance was approved conclude that PJM's winter and summer capacity needs are different," and that "new data shows that summer capacity has many times the reliability value of winter capacity,"[35] these studies are not new and do not produce some different result that would contradict the current CP construct. As Dr. Shanker states:

> "AEMA claims that PJM has recently released new information about the adequacy (not security) aspects of the PJM CP design related to LOLE and seasonal reliability impacts. While some of the specific sensitivity results were produced for the current stakeholder process, the basic information has been well known, well understood and public for years. For example, AEMA claims that the high concentration of LOLE in the summer months (as much as 99.9%) is part of this type of new understanding presented by PJM. This simply is not true."[36]

Dr. Shanker cites three past PJM Reserve Requirement Studies, dating back to 2010, that track data from the Expected Weekly Maximum ("EWM") and LOLE values, noting that most models attain 99.9% of the risk within a few weeks of the summer period. Thus, this particular "information" is not new.

Dr. Shanker explains that the same is true of the AEMA comments regarding the Winter Weekly Reserve Target ("WWRT"). Dr. Shanker states, in part, that:

> ". . . This is 'old news.' Referring to the same three Reserve Requirement Studies cited just above, in the 2010 Study, the WWRT cited values were 25% for 2009; 26% for 2010; and 27% for 2015 and 2016 RRSs. The only change has been the consideration of a monthly WWRT rather than average for this winter, but the underlying analyses, approach and conclusion has not changed. The underlying of LOLE has been relatively constant for as long as I have reviewed PJM information, this goes back prior to the establishment of the RTO. The same is true for the need for winter reserves targets to assure adequate flexibility for maintenance, given the fact that virtually no planned maintenance is allowed during the summer period. This later fact is important in understanding how AEMA misinterprets a key sensitivity, and is discussed below."[37]

[35] AEMA Complaint, at pp. 5-6.

[36] Affidavit of Dr. Roy Shanker, at p.18.

[37] Affidavit of Dr. Roy Shanker, at p. 19.

The AEMA Complaint hinges most of its arguments about changed circumstances around the notion that PJM is a summer peaking system and a suggestion that CP would unnecessarily over-procure resources in the winter. As Dr. Shanker explains: "The associated high winter reserves *are not excess,* as AEMA seems to argue, but a direct result of the need to meet annual requirements and the lack of any summer maintenance for all cleared resources while balancing necessary maintenance over the remainder of the year."[38]

For all of these reasons, there is no "new evidence" to support either Complaint. Complainants have clearly failed the Commission's requirements to show otherwise. Their respective Complaints are nothing more than a collateral attack of this Commission's CP Order and its commensurate orders on rehearing, and they must be summarily dismissed with prejudice.

B. Even Assuming that the Complaints are Not a Collateral Attack on the Commission's Orders, the Complainants Have Not Met Their Burden to Demonstrate That the Elimination of the Base Capacity Resource Product is Unjust and Unreasonable.

1. The Commission Decided to Phase-Out Base Capacity Resource Product for Valid Reasons, Namely That It Does Not Provide The Same Reliability That the CP Product Does.

With eyes wide open and with an abundance of record evidence before it, the Commission approved the transition to 100% Capacity Performance by the 2017 BRA. While some argued that the transition should have been shorter,[39] the Commission agreed with PJM that "implementing the transition over five years will allow resources to make gradual

[38] Affidavit of Dr. Roy Shanker, at p.12.

[39] Comments and Limited Protest of the PJM Utilities Coalition, dated Jan. 20, 2016, Docket No. ER15-623-000, at pp. 43-45.

improvements and reduce the burdens such improvements may impose."[40] Neither Complaint offers compelling arguments that this conclusion of the Commission, a mere 18 months ago, was misguided.

The Commission was rightfully concerned in 2015 that resources be provided sufficient time to make necessary investments to meet the rigorous capacity performance standards while sending a clear signal that the reliability must be improved. The resources that have made these investments will be competitively disadvantaged should the Commission decide to deviate from its clear guidance that the transition will consist of five years and allow inferior resources to receive another year's worth of capacity payments. Further, the fact that, even with investment, certain resources are not capable of meeting the rigorous Capacity Performance standards should not come as a surprise to the Commission, PJM, or the owners of those assets. Capacity Performance was specifically designed knowing that certain resources needed to improve their performance capabilities or find a way to participate in the market without being a capacity resource. Indeed, Complainants acknowledge that they seek capacity payments for resources that "are not and cannot become capable of performing"[41] to the standards that the Commission approved for Capacity Performance Resources.

Complainants argue that Seasonal Capacity Performance Resources are being held to unrealistic performance standards under current PJM rules. This argument is without merit. Under Capacity Performance, all generation resources are held to the same standard – perform when called upon or face a significant penalty. Whether a resource's fuel is coal, natural gas, oil or wind, Capacity Performance demands that all units have the necessary fuel, or other

[40] CP Order, at p. 253.

[41] ODEC Complaint, at p. 21.

operational necessities, and be prepared to contribute megawatts under emergency conditions. Maintenance outages that can be planned, coordinated and modified based on actual conditions are available to all units, including "Seasonal Capacity Performance Resources," and are fundamentally different than not being available due to performance inhibitors, such as a lack of fuel. The Commission should understand this distinction, even if Complainants cannot.

Moreover, Complainants ignore the fact that Capacity Performance is both a resource adequacy AND operational security product. Not only does there need to be a sufficient number of megawatts available to meet peak load, those megawatts also need to be able to perform whenever called upon. Both aspects are essential to the viability of Capacity Performance and neither can be ignored. As Dr. Shanker observes, "AEMA appears to have totally ignored this annual security performance feature and associated PAH related compensation and offer requirements of the CP design. In the RPM/CP auction, PJM is purchasing sufficient resources to meet its expected LOLE targets *and* a performance call to address security issues. A separate summer-only product cannot meet the annual PfP call requirement unless aggregated with a complementary product for the rest of the year."[42]

Further, as stated in its Complaint, "[T]he AEMA's fundamental objection is to the imminent requirement that, beginning in Delivery Year 2020/2021, only annual resources will be allowed to participate in PJM's capacity market."[43] However, as noted above, this Commission agreed with PJM that Base Capacity Resources were an inferior product, and thus moved PJM's capacity market toward a capacity construct with only a single annual resource. The Commission was clear in finding that, "[P]ermitting non-year-round resources to continue

[42] Affidavit of Dr. Roy Shanker, at p. 9.

[43] AEMA Complaint, at p. 13.

participating could result in a loss of reliability during the fall, winter and spring when PJM will not have as many resources to respond to emergencies, such as a polar vortex."[44]

Furthermore, as Dr. Shanker explains:

> "The inferior nature of these products both degrades reliability and distorts prices. This reality has been noted repeatedly by the Independent Market Monitor ("IMM") and repeatedly criticized in comments addressing seasonal DR products under the previous PJM capacity designs through the current transitional Base Capacity Resource product implementation. If one conducts a search on the IMM's website (monitoringanlytics.com) of the terms "inferior products" or "inferior capacity products" approximately 100 citations appear.[45] Some are repetitive or cross references, but they all point to the uniform position that the presence of resources that have reduced obligations from a traditional generation resource reflects an inferior adequacy/capacity product, that distorts market pricing via price suppression for annual products. [46] No amount of posturing by AEMA can change this fact."[47]

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[44] Order on Rehearing and Compliance, at P 59, p. 27.

[45] Monitoringanalytics.com (Search "inferior products" ; "inferior capacity products."

[46] See E.g. "Effective for the 2018/2019 and subsequent Delivery Years, the Extended Summer and Limited DR products are eliminated. For a transition period during the 2018/2019 and 2019/2020 Delivery Years, PJM will procure two product types, Capacity Performance and Base Capacity. Effective for the 2018/2019 and the 2019/2020 Delivery Years, a Base Capacity Demand Resource Constraint and a Base Capacity Resource Constraint, replacing the Sub-Annual and Limited Resource Constraints, are established for each modeled LDA. These maximum quantities are set for reliability purpose to limit the quantity procured of the inferior products, including Base Capacity Generation Resources, Base Capacity Demand Resources, and Base Capacity Energy Efficiency Resources." Page 12. (http://www.monitoringanalytics.com/reports/Reports/2016/IMM_Analysis_of_the_2018_2019_RPM_Base_Residual_Auction_20160630.pdf)

See also 2014 State of the Market Report Footnote 20 expressing similar concerns on the then current market rules, (http://www.monitoringanalytics.com/reports/PJM_State_of_the_Market/2014/2014-som-pjm-volume2-sec6.pdf) (Note some of these issues have been addressed via rule changes, particularly the introduction of the CP construct and elimination of inferior products):

The Market Monitor has documented in numerous reports the price suppressing effects and market design flaws attributable to the current treatment of Demand Resources in the PJM Capacity Market, including:

- The failure to require performance from Demand Resources that is comparable to the performance provided by Generation Capacity Resources and that would therefore make Demand Resources substitutes for Generation Resources while providing substantially the same compensation to both. See, e.g., Monitoring Analytics, LLC, *2013 State of the Market Report for PJM* (March 13, 2013) ("2013 SOM") at 197, 203; see also, Monitoring Analytics, LLC, *Analysis of the 2016/2017 RPM Base Residual Auction* (April 18, 2014) at 3, 35–27 ("2016/2017 BRA Report"), which can be accessed at: <*http://www.monitoringanalytics.com/reports/Reports/2014/IMM_Analysis_of_the_20162017_RPM_Base_Residual_Auction_20140418.pdf*>.

The fact that Base Capacity Resources, particularly as they relate to demand resources, are inferior, has been a subject before this Commission for many years. As P3 noted in a 2013 filing before this Commission that was also supported with an Affidavit from Dr. Shanker, "[A]s the PJM Independent Market Monitor has articulated many times, "[B]oth the Limited and the Extended Summer DR products should be eliminated in order to ensure that the DR product has the same unlimited obligation to provide capacity year round as Generation Capacity Resources."[48]

In many respects, the Complainants are confirming the concerns that the Commission had when it approved Capacity Performance in 2015. At the time, the Commission was concerned that "that a resource adequacy construct that fails to provide adequate incentives for resource performance can threaten the reliable operation of PJM's system and force consumers to pay for

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- The failure to remove inferior Demand Resource products from the capacity markets which cannot, by definition of the products, be substitutes for Generation Resources and the failure to require demand resource products to respond year round during any hour.
- The failure to require Demand Resources to make physical offers. See, e.g., 2013 SOM at 160, 171–172; Monitoring Analytics, LLC, Analysis of Replacement Capacity for RPM Commitments: June 1, 2007 to June 1, 2013 (September 13, 2013), which can be accessed at: <*http://www.monitoringanalytics.com/reports/Reports/2013/IMM_Report_on_Capacity_Replacement_Activity_2_20130913.pdf*>; Comments of the Independent Market Monitor for PJM, Docket No. ER14-1461 (April 1, 2014).
- The failure to require Demand Resources to make daily offers into the Day-Ahead Energy Market as required of Generation Capacity Resources. See, e.g., 2013 SOM at 197, 203; Complaint and Motion to Consolidate of the Independent Market Monitor for PJM, Docket No. EL14-20 (January 27, 2014).
- The failure to apply a uniform system offer cap to Demand Resources and Generation Capacity Resources. Id.
- The failure to develop measurement and verification rules sufficient to ensure that Demand Resources do not consume capacity when it is needed by those who pay for it. See, e.g., 2013 SOM at 197–198, 210; Comments of the Independent Market Monitor for PJM, Docket No. ER14-822 (January 1, 2014).

[47] Affidavit of Dr. Roy Shanker, at p. 14.

[48] Comments of the PJM Power Providers Group, *PJM Interconnection, L.L.C.*, ER14-504-000, dated December 20, 2013, p. 9.
http://www.p3powergroup.com/siteFiles/News/05ECB2CB3E10EB96439A517106FD00A2.pdf

capacity without receiving commensurate reliability benefits."[49] By seeking a capacity construct that compensates resources with limited availability as if those resources are always available, Complainants seek to return PJM to the very construct that the Commission determined to be unjust and unreasonable. As Dr. Shanker astutely observes, "[i]f there was a desire to evaluate a seasonal construct, one would have to build the elements from the beginning, with independent seasonal products, independent seasonal maintenance and performance requirements, independent load assumptions and a compensation structure that assures appropriate compensation for supporting new entry (via each product or product(s)) and retaining economic existing supply."[50] The Commission has clearly chosen a different direction.

2. PJM has Proposed an Enhanced Aggregation Model, in which PJM Will Facilitate Aggregation to Provide Additional Opportunities for Seasonal Capacity Performance Resources to Participate.

PJM has gone to enormous lengths to provide compensation opportunities for Seasonal Capacity Performance Resources based on the value that these resources provide to the grid. These resources have the opportunity to earn energy market revenues based on their competitiveness with other resources. Seasonal Capacity Performance Resources also can be compensated with Capacity Performance penalty dollars if a unit is capable of filling a capacity need that another Capacity Performance unit fails to provide. Finally, and importantly, a Seasonal Capacity Performance Resource is capable of joining forces with other resources to form a single resource that is capable of meeting the standards that all other CP resources shoulder.

[49] CP Order, at p. 6.

[50] Affidavit of Dr. Roy Shanker, at p. 5.

In its original Capacity Performance Filing, PJM proposed, and the Commission approved, the ability for capacity storage resources, intermittent resources, environmentally-limited, DR, or energy efficiency resources that are located within the same Locational Deliverability Area ("LDA") to submit a single, aggregated capacity bid that is capable of meeting the capacity performance standards. Under this approach, market participants are required to reach a commercial agreement prior to submitting a bid into a capacity auction and PJM treated that bid as a single bid.

In its recent Seasonal Capacity Filing, PJM submitted tariff changes that are designed to further facilitate the ability of seasonal resources to participate in the PJM capacity auctions as a single resource. While P3 has concerns with many of the aspects of the Seasonal Capacity Filing, and has similar questions to those raised in the Commission Staff's Notice of Deficiency letter, the PJM Seasonal Capacity Filing represents a good faith effort by PJM to increase opportunities for seasonal resources to participate in RPM, while respecting the core tenets of the Capacity Performance construct. Filing a Complaint that is at odds with the principles of the Capacity Performance Order prior to a Commission adjudication of these tariff changes is premature, at best.

Moreover, arguments that there has been little aggregation to date in PJM ignore the fact that there is little or no incentive for a Seasonal Capacity Performance Resource owner to aggregate as long as the Base Capacity Resource product remains. While the economics of different resources can vary, Base Capacity likely represents an easier path to compensation for certain resources than aggregation, so it should not come as surprise to hear that aggregation, to date, is not pervasive.

Elimination of the Base Capacity Resource product should also increase incentives to bilaterally aggregate outside of PJM's proposed aggregation process pending in PJM's Seasonal Capacity Filing. That is, there is no requirement to aggregate through the PJM-facilitated process. Thus, the fact that there has been little aggregation to date does not mean that there will not be aggregation in the future, once the Base Capacity Resource product is eliminated.

III. CONCLUSION

For the foregoing reasons, P3 respectfully requests that the Commission consider P3's protest and dismiss the Complaints with prejudice.

Respectfully submitted,

On behalf of the PJM Power Providers Group

By: */s/Glen Thomas*

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January 25, 2017

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 25th day of January, 2017.

On behalf of the PJM Power Providers Group

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UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

Old Dominion Electric Cooperative and Direct Energy Business, L.L.C., on behalf of itself and its affiliate, Direct Energy Business Marketing, L.L.C., and American Municipal Power, Inc.	)	EL17-32-000
v.	)	
PJM Interconnection, L.L.C.,	)	
Advanced Energy Management Alliance	)	EL17-36-000 **(not consolidated)**
v.	)	
PJM Interconnection, L.L.C.	)	

Affidavit of Dr. Roy J. Shanker

January 25, 2017

1. My name is Roy J. Shanker. My address is P. O. Box 1480, Pebble Beach, California, 93953. I have been retained by the PJM Power Providers Group ("P3") to review the Advanced Energy Management Alliance ("AEMA") Complaint in this docket, dated January 5, 2017, ("Complaint") and comment on my findings. The AEMA filing makes a number of assertions regarding features of the PJM Capacity Performance ("CP") construct under the Reliability Planning Model ("RPM") that it alleges to be unjust and unreasonable. For the reasons I describe in this affidavit, many of these assertions are incorrect and misleading. After I discuss my relevant experience, below, I offer my specific analysis and findings that demonstrate that the AEMA assertions related to CP are incorrect, and that a proper understanding of the CP/RPM design supports a conclusion that the status quo is neither unjust nor unreasonable. Because of the broad scope of the AEMA comments, I have limited my conclusions and findings to those issues I believe will be most useful to the Commission and have not tried to enumerate all the errors and inconsistencies in the Complaint.

I. Qualifications and Experience.

2. My resume, attached as Exhibit RJS-1, summarizes my experience in numerous regulatory proceedings before state commissions and the Federal Energy Regulatory Commission ("FERC" or "Commission"). As detailed therein, I have over 40 years of experience covering a broad range of issues in the electric utility industry, and have worked as an independent consultant for the past 36 years. Most relevant to the present matter is my experience with the design and development of the PJM markets. I began participating in this process in approximately 1995 as PJM commenced market design activities related to its becoming an independent system operator and subsequently a regional transmission organization ("ISO/RTO"). In addition, I had almost two decades of professional interaction with PJM and member companies prior to the establishment of PJM as an ISO/RTO.

3. I have been involved in virtually all areas of the PJM market design and development, and participate actively in stakeholder activities, particularly those related

to the capacity market and its evolution into the current RPM structure. This work has included continuing participation in the stakeholder processes related to both the development design and implementation of CP/RPM, as well as the various modifications that have occurred since its initial adoption. This has included participation in the Seasonal Capacity Resources Senior Task Force ("SCRSTF") that was frequently cited in the AEMA filing. I have submitted affidavits and testified before the Commission on numerous occasions related to capacity issues in RTOs in general and RPM in particular.

4. I have a bachelor's degree from Swarthmore College and both a master's and a doctorate degree from Carnegie-Mellon University.

II. Conclusions and Findings.

5. My general conclusion is that the AEMA claims and findings are either incorrect, irrelevant or both. They are based on an erroneous understanding of both the CP product and overall capacity design as well as a selective "interpretation" of the "new information" that PJM presented during the SCRSTF stakeholder process. In many instances, AEMA has simply identified features that are inherent in the specific CP product definition and related design and implementation. While AEMA may take issue with specific features, or not like the consequences of the features for the specific business models of AEMA members, the features are not indicative of anything that is unjust or unreasonable. Rather, these elements reflect a different paradigm for assuring reliability (both adequacy and security) that was adopted with the switch to the CP pay for performance ("PfP") design and the associated changes. Indeed many of the issues raised and characterized as "new evidence" simply recognize the change in paradigm of moving to CP and the associated adoption of a dual adequacy and security product, and the inferiority of the seasonal products AEMA is advocating.

6. Mistakenly, AEMA bases its entire criticism on the assumption that CP is solely an adequacy product (e.g. the assurance of a specific quantity of capacity to address a target loss of load expectation ("LOLE")). To the contrary, CP was explicitly designed as a combined adequacy ***and*** security product/performance structure. As PJM clearly

represented, CP operates as a PfP paradigm under a two settlement system (addressing security in real time performance),[1] coupled with constraints and targets on the quantity of capacity obtained to meet LOLE requirements (thus assuring adequacy for both LDAs and the system as a whole).

7. By ignoring the pay for performance requirement, AEMA ignores a fundamental aspect of CP. Namely, a Capacity Resource cleared under CP is expected to perform every hour of the year independent of season or peak hour.[2] Demand Response ("DR"), as a Base Capacity product that is only obligated for 10 hours a day for four months a year, is fundamentally inconsistent with an annual pay for performance structure. The CP design intends for capacity to always be available, regardless of the level of demand or face material penalties. This limited capability is the basis for repeated characterizations of the DR products as inferior.[3] This omission invalidates almost all comments offered by AEMA.

8. The second supporting finding relates to the fact that most of the adequacy results cited by AEMA (e.g. addressing marginal LOLE impacts) are taken out of context, and fail to accurately represent the underlying fact that they are merely sensitivity or "excursion" studies conducted by PJM Staff to provide information during the stakeholder process. In turn, AEMA fails to properly condition its conclusions regarding the marginal value of capacity and summer and winter seasonal resources. AEMA also ignores the fact that, because the results the Complaint relies upon are sensitivities or excursions built on assumptions that are inconsistent with the basic model, the sensitivities themselves are flawed and limited. For example, a key element of the PRISM (PJM's adequacy model used to estimate LOLE and Installed Reserve Margin)

[1] The term two settlement associated with PfP refers to the result where the CP Capacity Resource receives the auction price payment in exchange for fulfillment of a call on the capacity whenever needed (or the payment of a penalty). This characterization was initially used to describe the ISO-NE pay for performance design.

[2] The CP design does allow for limited exceptions related to actions consistent with PJM direction and necessary planned resources, but in the context of an annual obligation.

[3] See P3 pleading and related citations regarding the continued concerns and criticisms of the Independent Market Monitoring regarding inferior seasonal products

results are built on optimizing maintenance schedules during the non-peak periods and maintaining the Winter Weekly Reserve Target ("WWRT"). The excursions that show the trade-offs between summer and winter are built on a predicate that "consumes" off-season maintenance to allow the maintenance free operation of the superior products in the summer. For the cases AEMA studied, PJM froze such results even though the resource quantities changed, making the conclusions questionable.

9. If there was a desire to evaluate a seasonal construct, one would have to build the elements from the beginning, with independent seasonal products, independent seasonal maintenance and performance requirements, independent load assumptions and a compensation structure that assures appropriate compensation for supporting new entry (via each product or product(s)) and retaining economic existing supply. AEMA points to unsubstantiated criticisms and facts drawn out of context. They establish nothing about CP that is unjust and unreasonable, nor do they address any of these basic elements needed for an alternative design.

10. Third, in evaluating the educational excursions/sensitivities that PJM provided, AEMA ignores the fact that the base level of reliability from PRISM was degraded by an optimistic estimate of 10%, from one event in ten years to one in nine years (and likely worse) due to the inclusion of seasonal (summer only) resources. By assuming that the seasonal product is available 24 hours a day during the summer (more than twice the required performance definition) and unavailable the rest of the year, reliability is materially degraded and a basic mismatch with model assumptions occurs.

11. Fourth, AEMA mischaracterizes a key element of the optimized use of maintenance, the WWRT. The WWRT is simply the manifestation of translating a single point representation of the adequacy requirement into an operational measure that reflects the fact that the ordering or timing of peak demand in the winter season may change. Further, it is also worth noting that WWRT is a direct reflection of the need for an annual product under PJM's planning processes. There must be "room" for non-summer maintenance of both generators and transmission system elements in order to assure the

absence of maintenance during the summer period and the WWRT is the tool used to make sure there are sufficient reserves while such maintenance is occurring in the winter. Greater levels of maintenance occur in spring and fall.[4] Seasonal products impinge on this ability. Indeed, because of the degradation of reliability due to the current use of inferior products, maintaining the WWRT might not be feasible if the system were operated inclusive of reserves at the IRM criterion. It has only been the excess capacity in the system during the past that allowed this WWRT target to be satisfied while allowing limited availability resources to participate in RPM. Otherwise sufficient reserves would not have existed to satisfy both maintenance and adequacy requirements in the winter.

12. Fifth, the AEMA proposal to maintain the current Base Capacity product is unsupported and continues a discredited and discriminatory policy that the Commission appropriately and intentionally desired to remove from the PJM market. Similarly there is no basis for the assertion that the current pricing is appropriate. The observations that the prices seem[5] right and that RPM is able to clear the Base and Annual products is not an indication of the appropriateness of the pricing. One can add numerous types of constraints and "solve" with unknown properties for the resulting prices, a lesson PJM has learned the hard way over time. Indeed, the Market Monitor and others have continually pointed out the inappropriateness of RPM pricing in the presence of inferior products.[6]

13. Six, the AEMA assertion that some of the current state demand response products are worthless under an annual construct is incorrect. These products still provide benefit for those who participate at the retail level and are able to participate at the wholesale level through aggregation or by operating at PJM direction during Performance Assessment Hours ("PAH") and earning performance bonuses. Further, the performance

[4] http://www.pjm.com/~/media/committees-groups/committees/oc/20170110/20170110-item-05-executive-operations-report.ashx

[5] Complaint at Page 29.

[6] See Monitoringanalytic.com. Searches of the site on the term "inferior products" and "inferior capacity products" identify over 100 related citations to problems created by the presence of inferior products. Some are cited in the following discussions.

requirements for these products (e.g. when air conditioning control is called) are subject to state and utility requirements which may not match PJM's zonal adequacy requirements. It is up to the retail program design to meet the RTO reliability requirements if it seeks to add value to the RTO, not vice versa. If such a program cannot meet both the annual adequacy and security (pay for performance) requirements, the state program fails to provide a capacity resource that can be considered CP. The resource still has the ability to participate in the market - - just not as a CP resource.

14. Seventh, the AEMA representations regarding the level of investment by its members are irrelevant. Since the beginning of the market 20 years ago, participants (suppliers and load) have been exposed to regulatory and market risk based on changing rules and conditions. As has been clearly demonstrated by the retirement of many existing units, no party is guaranteed "adequate" compensation. Potential loss of investment in and of itself is not an indication of whether a pricing/market design is just and reasonable. AEMA also ignores that the overall CP design represents a movement towards a more adequate/secure solution, and that there is provision for seasonal products to participate, albeit not in the fashion they seem to prefer.

15. In the discussion below I first give a high level summary of the dual adequacy and security nature of the CP design, and then of the basic analytic tool used by PJM to conduct these studies, the Probabilistic Reliability Index Study Model or PRISM. Understanding the basic assumptions of both the product and of the models used to specify the adequacy requirements helps to understand the fundamental mismatch of the inferior seasonal products to CP and the associated "design" joint adequacy/security product, particularly the explicit CP and PRISM assumptions of an annual product. All of this helps put the above criticisms/findings in a more integrated context.

III. AEMA Ignores the Fact that Capacity Performance is both a Resource Adequacy and Security Product.

16. In general, reliability in an electric system is defined by two concepts: adequacy and security (or operating reliability):

- NERC's traditional definition of "reliability" was ubiquitous throughout the electric utility industry, and consists of two fundamental concepts adequacy and operating reliability:

  - Adequacy is the ability of the electric system to supply the aggregate electric power and energy requirements of the electricity consumers at all times, taking into account scheduled and reasonably expected unscheduled outages of system components.

  - Operating reliability [security] is the ability of the electric system to withstand sudden disturbances such as electric short circuits or unanticipated loss of system components.[7]

Capacity markets have traditionally addressed system adequacy by making sure that there were adequate generation resources available to meet anticipated needs. A typical metric for system adequacy is LOLE that reflects the likelihood that load may exceed available generation. Such metrics are usually based on some form of statistical summary of available generation and load.

17. PJM's traditional capacity construct was built on this type of adequacy concept and associated LOLE metric. An installed reserve margin was established based on the use of a model (PRISM) and the Reliability Pricing Model (RPM) was used to obtain resources that over time would be consistent with the metric, as well as meet certain economic criteria related to the cost of entry of new resources and the retention of existing resources.

18. The adoption of the CP paradigm changed the historic reliability construct within RPM in a very fundamental way. Instead of just considering adequacy, the capacity product in PJM under CP ***also*** considers security or operating reliability. This new paradigm has been characterized as pay for performance or a two-settlement type of product addition.[8]. As a result of this change, in addition to procuring an "adequate"

[7] http://www.nerc.com/docs/pc/Definition-of-ALR-approved-at-Dec-07-OC-PC-mtgs.pdf Note that NERC now uses "operating reliability" instead of "security" to avoid confusion with national security issues, critical infrastructure concerns etc.

[8] The notion for both PfP and two-settlement is that in exchange for an advance payment (the result of the RPM auction price/payment) Capacity Resources are obligated to perform anytime called (see footnote 4) or face very material non-performance penalties.

amount of capacity, characterized by a metric like LOLE, CP also creates an *annual* obligation for a Capacity Resource to perform whenever needed for security events 24 x 365. This performance requirement is not linked specifically to any ex ante expectation of peak periods of demand, and may occur at any time, system-wide, or in small areas of the footprint due to local operating conditions like specific local generator or transmission outages.[9] In fact, 19 of the 36 PAH events and 89 of the 161 PAH hours identified by PJM between 2011 and 2014 were local and not for system wide adequacy.[10] To the extent that a Capacity Resource is not available to deliver energy during designated Performance Assessment Hours, a very material penalty is applied. The penalty payments are potentially greater than any capacity payment based on operations during a small subset of time, the annual performance hours. This subset is unknown in advance and can occur at any hour(s) of the year. This targeted performance period is the basis for the pay for performance (security) obligation and associated CP design features impacting compensation for the annual CP product such as the offer cap.[11] Interestingly, AEMA also ignores that even resources that are not cleared as eligible CP Capacity Resources (including seasonal resources) still can receive performance based bonus payments for directed operations during Performance Assessment Hours.

19. AEMA appears to have totally ignored this annual security performance feature and associated PAH related compensation and offer requirements of the CP design. In the RPM/CP auction, PJM is purchasing sufficient resources to meet its expected LOLE targets *and* a performance call to address security issues. A separate summer-only product cannot meet the annual PfP call requirement unless aggregated with a complementary product for the rest of the year. Similarly, the adequacy LOLE requirement is based on an annual evaluation. As discussed below, the accommodation of inferior seasonal products degrades overall reliability/adequacy.

[9] As specified in Attachment DD to the PJM Tariff and Manual 18, there are limited exceptions to the PfP obligation.

[10] See attached spread sheet for local and system PAH prepared by PJM. http://www.pjm.com/~/media/committees-groups/committees/elc/postings/performance-assessment-hours-2011-2014-xls.ashx

[11] Indeed CP does not have a compensation design directed solely to adequacy or LOLE.

20. It is also important to have a basic understanding of the PRISM model prior to considering the AEMA arguments. Beyond omitting the inability of seasonal products (unless aggregated) to address the security requirements of CP, the adequacy arguments presented are incomplete and misleading due to the omission of material assumptions and features of the underlying PRISM model and the actual manner in which PJM implemented its sensitivity studies and associated operational requirements and constraints/targets.

21. PRISM has several important basic assumptions. With respect to Capacity Resources, PRISM assumes: i) an annual resource; ii) a MW quantity tied to that resource; iii) a forced outage rate for that resource with outages that are random and independent of other resources and conditions; and iv) known planned outage requirements and the ability to schedule such planned outages. With respect to the basic electric system configuration, PRISM is a two area model: i) one area is PJM, with load and generation co-located (i.e., there is infinite transmission); ii) the second area is the "world" surrounding PJM with known resources, load, reserves and load diversity versus PJM; and iii) there is a defined tie capability between PJM and the "world." Finally load is characterized by weekly load shapes/distributions over the year based on history and adjusted for current forecasts.

22. PRISM basically estimates for every week of the year the statistical likelihood that load will exceed resources.[12] This weekly probability, summed over the year, reflects the LOLE. The PRISM calculations explicitly minimize the annual requirements to meet a target LOLE, *and* the associated scheduling of planned maintenance in accomplishing this objective. Inherently PJM, via PRISM, *assumes an annual adequacy* product. Because of the fact that LOLE is concentrated in the summer, as AEMA notes, generation resources effectively have no planned outages during the summer period. As a result, PRISM assumes virtually all generation maintenance is scheduled during the non-

[12] See PJM figures from the PJM 2010 Resource Requirement Study below, which are available at: http://www.pjm.com/~/media/documents/reports/2010-pjm-reserve-requirement-study.ashx

summer months including winter. In order to balance the summer requirements, PJM and PRISM "consume" the planned outages of traditional generation resources in the winter. A seasonal product cannot contribute capacity in this fashion, and as discussed below with respect to the necessary WWRT, the seasonal product actually works against this needed flexibility. Such resources, in effect, are "on outage" in all non-summer months and must be accounted for that way.

Figure II - 10: Load distribution and Capacity Distribution depicting PRISM calculations

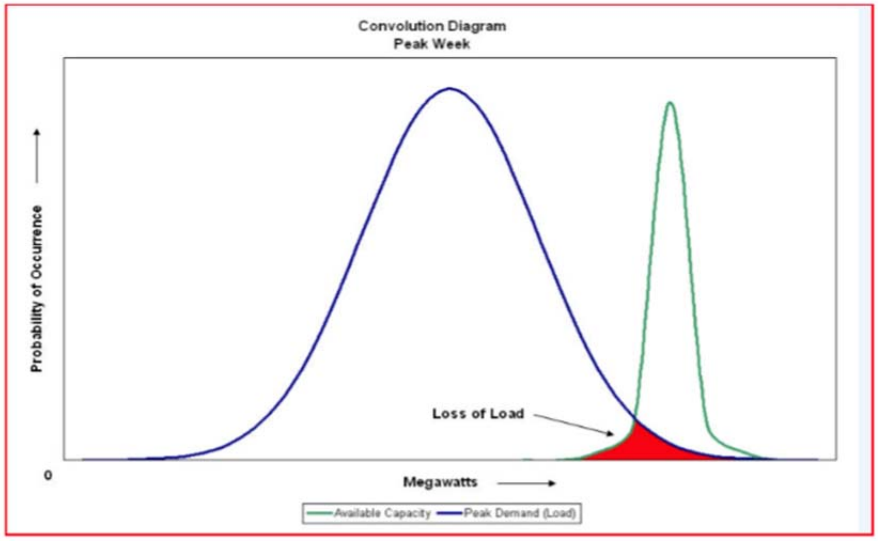
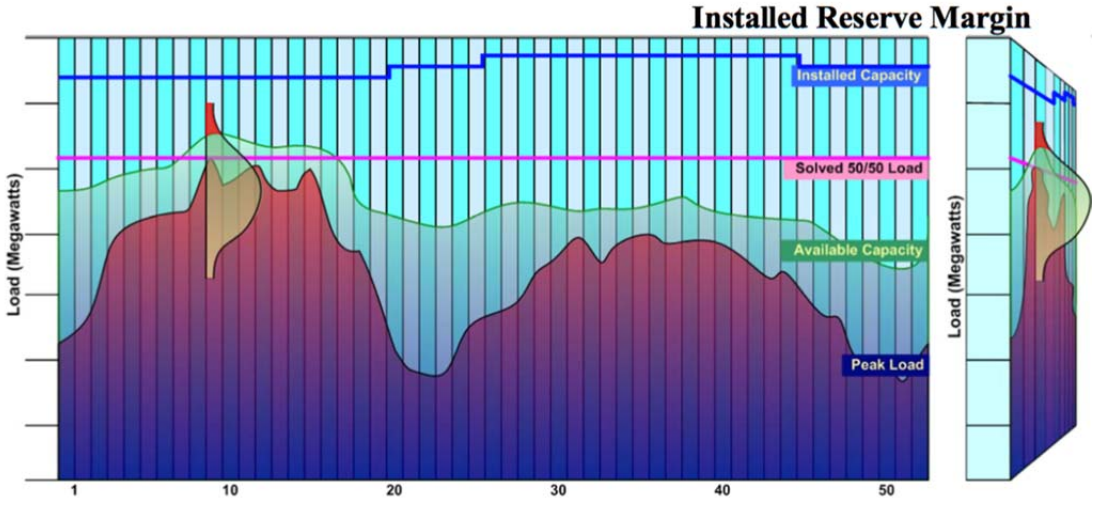
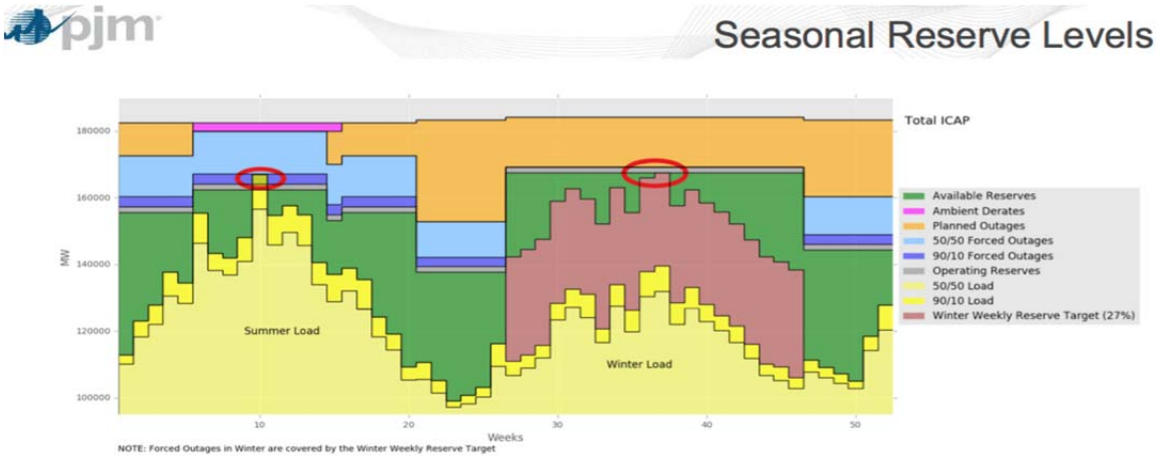


Figure II - 11: Installed Reserve Margin Automatic Solution



The Peak Load Line is shifted vertically until the 1-day-in10-years criterion is met (See Convolution Diagram). 260 week day LOLEs (aggregated into 52 weeks) are summed to get annual LOLE. (Note: PJM RTO Weekends have zero risk)

23. The associated high winter reserves *are not excess*, as AEMA seems to argue, but a direct result of the need to meet annual requirements and the lack of any summer maintenance for all cleared resources while balancing necessary maintenance over the remainder of the year.[13] Without the annual capability and the flexibility to conduct maintenance in the non-summer period, more annual resources would be necessary. The PJM-produced graphic, below, shows the balancing of annual resources (inclusive of maintenance) against annual load requirements, and how the overall annual products are "consumed" in both the summer and winter to meet adequacy requirements.[14] Indeed, the introduction of other real world factors such as transmission maintenance further emphasize the need for this non-summer "extra" capacity.[15]



[13] This information is condensed from a number of PJM references. The principle references are Manual 20, PJM Resource Adequacy Analysis (http://www.pjm.com/~/media/documents/manuals/m20.ashx) and the various annual Resource Requirement Studies (RRS) (see e.g. (http://www.pjm.com/~/media/committees-groups/subcommittees/raas/20160927/20160927-2016-pjm-reserve-requirement-study.ashx) October 2016 RRS.)

[14] See slide 5 (pdf) of materials presented to the Seasonal Capacity Resources Senior Task Force. (http://www.pjm.com/~/media/committees-groups/task-forces/scrstf/20160418/20160418-item-03-education-limited-product-constraints-under-cp.ashx)

[15] PJM's PRISM model also assumes infinite transmission. Obviously this isn't true. This assumption is partially addressed by PJM RTEP planning, and in particular the enforcement of the Capacity Emergency Transfer Objective constraints that assure sufficient reliability into a Local Distribution Area under high load and operational stress. However, just as the case with annual generation operations, transmission also requires outages, some planned (e.g. for system growth and reliability and new interconnection of generation) and some forced outages. Much of these outages also occur in the non-summer periods, particularly spring and fall. (See http://www.pjm.com/~/media/committees-groups/committees/mc/20170123-webinar/20170123-item-10b-operations-report.ashx slides 12 and 13 showing seasonal transmission outage tickets and growth in annual outages). PJM's ability to address this level of transmission outage, particularly when LOLE assumes none, is also aided by having excess *annual* generation, particularly in the spring and fall. This is not accidental. PJM and transmission owners coordinate planned transmission into the spring and fall to take advantage of additional *annual* generation.

IV. Seasonal Products that Masquerade as Capacity Performance Resources Degrade Reliability and Distort Pricing.

24. Seasonal products are unambiguously inferior to annual products. Aside from the obvious distinction of availability for only four months versus twelve, the seasonal Base Capacity product only has a daily requirement for at least 10 hours of response during a 12 hour peak period.[16] Mechanically, in order to accommodate the presence of this type of capacity versus conventional 24 hour generation resources, adequacy has to be reduced. AEMA only mentions in passing that the presence of even a limited amount of the inferior units increases LOLE from the target 1 event in 10 year to 1 event in 9 years (a ten percent degradation in reliability).[17]

25. PJM models the general impact by inserting a fully available product similar to other generation during the summer months and then removing it for the rest of the year. PJM does this until it has degraded annual reliability by 10% or down to a 1 in 9 standard, below its stated objective.[18] Even this reduction understates the adequacy impact of the inferior product, because, as stated, the product is only required to be available during 10 hours daily during the summer peak while the modeling assumes 24 hour availability. Further, while the LOLE impact might be minimal in the off-peak summer hours, the CP product would require performance outside of these periods in order to address the PfP obligations. Both of these elements make the degradation impact greater. Even when making this assumption, PJM ignores any further degradation during off peak hours for these resources because of the near zero expectation of an adequacy

[16] See Manual 18, page 62 in reference to the Base Capacity product during 2018-2019 and 2019-20, the current applicable period. https://www.pjm.com/~/media/documents/manuals/m18.ashx

[17] Complaint, page 27. "To determine Base Capacity Constraints, PJM first determines the amount of Capacity Performance needed to meet a 1-in-10 LOLE. As discussed, this results in a 10% chance of resource adequacy shortfall during the summer, and a near-zero chance the rest of the year. PJM then relaxes the non-summer LOLE from 0% to 1%, and determines how much non-summer capacity can be foregone without exceeding that standard. That result is the Base Capacity Constraint,(footnote omitted) which expresses how much summer-only capacity PJM can procure while maintaining a 10% summer, plus 1% non-summer, LOLE."

[18] See e.g. Base Capacity Constraint, SCRSTF, April 18, 2016. http://www.pjm.com/~/media/committees-groups/task-forces/scrstf/20160418/20160418-item-03-education-limited-product-constraints-under-cp.ashx Slide 9.

event off peak. This assumption, however, ignores the fact that PAH under CP may occur on or off peak. For example, 65 of the 161 PAH between 2011 and 2014 were outside of the required availability hours for a summer seasonal resource, assuming a 12 hour performance period).[19]

26. The inferior nature of these products both degrades reliability and distorts prices. This reality has been noted repeatedly by the Independent Market Monitor ("IMM") and repeatedly criticized in comments addressing seasonal DR products under the previous PJM capacity designs through the current transitional Base Capacity Resource product implementation. If one conducts a search on the IMM's website (monitoringanlytics.com) of the terms "inferior products" or "inferior capacity products" approximately 100 citations appear.[20] Some are repetitive or cross references, but they all point to the uniform position that the presence of resources that have reduced obligations from a traditional generation resource reflects an inferior adequacy/capacity product, that distorts market pricing via price suppression for annual products.[21] No amount of posturing by AEMA can change this fact.

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[19] Id, PJM PAH spread sheet.

[20] Monitoringanalytics.com (Search "inferior products" ; "inferior capacity products."

[21] See E.g. "Effective for the 2018/2019 and subsequent Delivery Years, the Extended Summer and Limited DR products are eliminated. For a transition period during the 2018/2019 and 2019/2020 Delivery Years, PJM will procure two product types, Capacity Performance and Base Capacity. Effective for the 2018/2019 and the 2019/2020 Delivery Years, a Base Capacity Demand Resource Constraint and a Base Capacity Resource Constraint, replacing the Sub-Annual and Limited Resource Constraints, are established for each modeled LDA. These maximum quantities are set for reliability purpose to limit the quantity procured of the inferior products, including Base Capacity Generation Resources, Base Capacity Demand Resources, and Base Capacity Energy Efficiency Resources." Page 12. (http://www.monitoringanalytics.com/reports/Reports/2016/IMM_Analysis_of_the_2018_2019_RPM_Base_Residual_Auction_20160630.pdf)

See also 2014 State of the Market Report Footnote 20 expressing similar concerns on the then current market rules, (http://www.monitoringanalytics.com/reports/PJM_State_of_the_Market/2014/2014-som-pjm-volume2-sec6.pdf) (Note some of these issues have been addressed via rule changes, particularly the introduction of the CP construct and elimination of inferior products):

The Market Monitor has documented in numerous reports the price suppressing effects and market design flaws attributable to the current treatment of Demand Resources in the PJM Capacity Market, including:

- The failure to require performance from Demand Resources that is comparable to the performance provided by Generation Capacity Resources and that would therefore make Demand Resources

27. The Commission has also recognized the problems of deviating from a single price for a common product. This has often been referred to as the law of one price. For a single product providing the same service, there should be a common single price. PJM's adequacy requirements assume a common product, as does the entire CP design. Similarly, there should not be an artificial differentiation in products that are intended to provide the same services.

28. The Commission has clearly articulated its view on this principle:

> "In a competitive market, prices do not differ for new and old plants or for efficient and inefficient plants; commodity markets clear at prices based on location and timing of delivery, not the vintage of the production plants used to produce the commodity. Such competitive market mechanisms provide important economic advantages to electricity customers in comparison with cost-of-service regulation. . . This market result benefits customers, because over time it results in an industry with more efficient sellers and lower prices."[22]

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substitutes for Generation Resources while providing substantially the same compensation to both. See, e.g., Monitoring Analytics, LLC, *2013 State of the Market Report for PJM* (March 13, 2013) ("2013 SOM") at 197, 203; see also, Monitoring Analytics, LLC, *Analysis of the 2016/2017 RPM Base Residual Auction* (April 18, 2014) at 3, 35–27 ("2016/2017 BRA Report"), which can be accessed at: <*http://www.monitoringanalytics.com/reports/Reports/2014/IMM_Analysis_of_the_20162017_RPM_Base_Residual_Auction_20140418.pdf*>.

- The failure to remove inferior Demand Resource products from the capacity markets which cannot, by definition of the products, be substitutes for Generation Resources and the failure to require demand resource products to respond year round during any hour.
- The failure to require Demand Resources to make physical offers. See, e.g., 2013 SOM at 160, 171–172; Monitoring Analytics, LLC, Analysis of Replacement Capacity for RPM Commitments: June 1, 2007 to June 1, 2013 (September 13, 2013), which can be accessed at: <*http://www.monitoringanalytics.com/reports/Reports/2013/IMM_Report_on_Capacity_Replacement_Activity_2_20130913.pdf*>; Comments of the Independent Market Monitor for PJM, Docket No. ER14-1461 (April 1, 2014).
- The failure to require Demand Resources to make daily offers into the Day-Ahead Energy Market as required of Generation Capacity Resources. See, e.g., 2013 SOM at 197, 203; Complaint and Motion to Consolidate of the Independent Market Monitor for PJM, Docket No. EL14-20 (January 27, 2014).
- The failure to apply a uniform system offer cap to Demand Resources and Generation Capacity Resources. Id.
- The failure to develop measurement and verification rules sufficient to ensure that Demand Resources do not consume capacity when it is needed by those who pay for it. See, e.g., 2013 SOM at 197–198, 210; Comments of the Independent Market Monitor for PJM, Docket No. ER14-822 (January 1, 2014).

[22] From Original: *See, e.g., PJM Interconnection, L.L.C.*, 117 FERC ¶ 61,331 at P 141. *See also, Commonwealth Edison Co.*, 113 FERC ¶ 61,278 at P 43 (2005) (nondiscriminatory single-clearing price capacity auctions "ha[ve] the benefit of encouraging all sellers to place bids that reflect their actual marginal opportunity costs" and have been "found to produce just and reasonable rates for all the energy

The continuation of a differentiated Base Capacity resource product with different reliability obligations and price suppression impacts works directly against this Commission policy and the associated underlying economic theory. All of this clear Commission precedent is ignored by AEMA in pursuit of a preference for an inferior product.

29. Ignoring these types of findings, AEMA offers no explanation for the price suppression that occurs from mixing inferior and superior products in the same auction structure to meet both adequacy and security obligations. The only comment in the Complaint is an unsubstantiated observation that "these results [resulting seasonal product pricing] are not out of line"[23] with *AEMA's* interpretation of reliability values.

30. But this AEMA pricing observation is meaningless and simply wrong. The only pricing information created via discriminatory product schemes like that for Base Capacity is the marginal cost of offering the inferior product. All other pricing results are distorted by the presence of the non-uniform inferior product. Because of the artificial supply, the clearing price of the remaining market products is suppressed.[24] The supposed "savings" from the price suppression are illusory, as they ultimately force

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and ancillary service markets currently operated by the independent system operators and regional transmission organizations under our jurisdiction."), *order on reh'g*, 115 FERC ¶ 61,133 (2006); *Devon Power LLC*, 110 FERC ¶ 61,315 at P 45 (2005) (paying all "generators the same market- clearing price creates incentives to minimize costs, because a generator's cost reductions are retained by the generator and thus increase its profits" while paying "different amounts to different generators based on the level of compensation needed to keep the generator in operation would create a unit-specific cost-based system and undermine the advantages of a market for capacity."); *New York Indep. Sys. Operator, Inc.*, 110 FERC ¶ 61,244 at P 65 & n.76 ("Efficient pricing requires that suppliers receive the highest market value for their resources, independent of their bids [as] [t]his gives all sellers the proper incentive to offer their resources at the marginal cost of their highest valued use."), *order on reh'g*, 113 FERC ¶ 61,155 (2005); *New York Indep. Sys. Operator*, 103 FERC ¶ 61,201 at P 81 ("[A]ll capacity suppliers, regardless of the age of their resources, are entitled to the same treatment in the ICAP market. . . . The Commission does not see how [more expensive] generators could receive ICAP revenues that were fundamentally different from those paid to other generators. Moreover, those are the types of market signals the Commission would expect to encourage new generation additions.").

[23] Complaint page 29.

[24] Id.

economic resources out of the market, churn capital stock unnecessarily and increase risk and costs for new entry. Both the Commission and the IMM have recognized this consequence of price suppression, even if AEMA does not.

31. The fact that the RPM auction "solves" or provides a solution when inferior products are introduced is irrelevant and not indicative of the legitimacy of the resulting pricing for any of the products. One can make up numerous constraints and still "solve" the market, but the "solution" will be meaningless unless the formulation of the problem is correct. For example, PJM could add a constraint to RPM that limited coal MWs to 10,000 MWs. The problem it would solve is that coal capacity would be capped at 10,000 MWs, and a set of prices would be established. This might identify the cheapest 10,000 MWs of coal capacity, but the pricing for the rest of the system, in light of this incorrect formulation or objective, would be fundamentally flawed and be irrelevant to the determination of the "right" price if this artificial or erroneous constraint were not applied.

32. PJM was not immune to formulations that strayed from their intent when attempting to simultaneously clear multiple and different products (even though both results caused price suppression). For example, in PJM's filing in Docket No. ER14-504, PJM describes how it erroneously modeled the limited and extended summer products in RPM for several auctions. PJM effectively put a floor on the superior annual products, but no cap on the inferior seasonal products. The clear result was that the pricing did not match PJM's intent and it suppressed the annual product price, removed the demand curve for annual products, yet RPM clearly "solved."[25] I noted this error in Docket No. ER12-513, but it persisted for a number of years until corrected.[26] This is a perfect

[25] PJM Interconnection, L.L.C., Docket No. ER14-504-000, November 29, 2013. I also commented on the correction of this modeling error in the same docket and P3 also commented "The revisions proposed in the November 29 Filing would correct the unintended adverse effects of earlier changes to the Reliability Pricing Model ("RPM") rules on the PJM Region's long-term ability to procure sufficient quantities of high-quality capacity needed to assure reliability."
See: http://www.p3powergroup.com/siteFiles/News/05ECB2CB3E10EB96439A517106FD00A2.pdf

[26] See Shanker Affidavit, EL12-513, page 10.
http://www.p3powergroup.com/siteFiles/News/C130D21C3FAA5A91CF7BAEB9EFDD7B0A.pdf

example of a formulation of a problem "solving" in multiple configurations and constraints, with significantly different results in the solution that were unintended. Both formulations "solved" even PJM admitted that they had used a model, and obtained results, that were inconsistent with their original intent.

33. The same fate awaits any effort to incorporate different products into a "one product/one price" situation, e.g., the CP adequacy/security product for PJM. Simply stated, the fact that a formulation will solve is no indication that the formulation properly represents the problem being addressed, and that the resulting solutions and prices are meaningful, just or reasonable. AEMA would like the Commission to adopt this flawed logic. The Commission should reject the invitation. Indeed the rebuttable presumption would be that the presence of the inferior product in the clearing process would produce an unjust and unreasonable price for competing superior products.

V. AEMA Misinterprets the PJM Sensitivity Results While Relying upon Information that Cannot be Considered "New."

34. AEMA claims that PJM has recently released new information about the adequacy (not security) aspects of the PJM CP design related to LOLE and seasonal reliability impacts. While some of the specific sensitivity results were produced for the current stakeholder process, the basic information has been well known, well understood and public for years. For example AEMA claims that the high concentration of LOLE in the summer months (as much as 99.9%) is part of this type of new understanding presented by PJM.[27] This simply is not true. The citations below span the last six years:

> 2015—The Expected Weekly Maximum value (EWM) is the peak demand used by the PRISM program to calculate the loss of load expectation (LOLE). Both the EWM and LOLE are important values to track in assessing the study results.

[27] Complaint at page 13.

> From observing these values over several historic studies, 99.9% of the risk is concentrated within a few weeks of the summer period. [28]
>
> 2014—The Expected Weekly Maximum value (EWM) is the peak demand used by the PRISM program to calculate the loss of load expectation (LOLE). Both the EWM and LOLE are important values to track in assessing the study results. From observing these values over several historic studies, 99.9% of the risk is concentrated within a few weeks of the summer period.[29]
>
> 2010—The Expected Weekly Maximum value (EWM) is the peak demand used by the PRISM program to calculate the loss of load expectation (LOLE). Both the EWM and LOLE are important values to track in assessing the study results. From observing these values over several historic studies, it can be seen that most models attain 99.9% of the risk within a few weeks of the summer period.[30]

35. The same is true of the AEMA comments regarding the Winter Weekly Reserve Target.[31] This is "old news." Referring to the same three Reserve Requirement Studies cited just above, in the 2010 Study the WWRT cited values were 25% for 2009; 26% for 2010; and 27% for both the 2015 and 2016 RRSs.[32] The only change has been the consideration of a monthly WWRT rather than average for this winter, but the underlying analyses, approach and conclusion has not changed. The underlying of LOLE has been relatively constant for as long as I have reviewed PJM information, this goes back prior to the establishment of the RTO. The same is true for the need for winter reserves targets to assure adequate flexibility for maintenance, given the fact that virtually no planned maintenance is allowed during the summer period. This later fact is important in understanding how AEMA misinterprets a key sensitivity, and is discussed below.

36. A key element of AEMA's allegations rests on their perception of the PJM information regarding the relative LOLE impacts of incremental or decremental summer

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[28] 2015 Reserve Requirement Study, page 36. October 2015 http://www.pjm.com/~/media/committees-groups/subcommittees/raas/20150930/20150930-pjm-reserve-requirement-study.ashx

[29] . 2014 Reserve Requirement Study, page 38, October 2014 http://www.pjm.com/~/media/planning/res-adeq/2014-pjm-reserve-requirement-study.ashx

[30] 2010 Reserve Requirement Study, page 37, September 2010 http://www.pjm.com/~/media/documents/reports/2010-pjm-reserve-requirement-study.ashx

[31] Id page 13.

[32] Id, footnotes 19,20 and 21.

and winter resources. As shown above, this general concept is old news, and derives from the recognition of the concentration of LOLE in the summer. Ignoring all other considerations (e.g. annual products, maintenance, availability) and simply adding more generation at times of system stress will have a reliability impact that is greater than removing the same amount of generation during off periods. PJM explicitly acknowledges this market dynamic by not even analyzing weekend days when the LOLE is zero, although PAH and related obligations/penalties still can occur in all periods.[33] AEMA specifically emphasizes this in their table 1, which shows relative trade-offs in reliability impacts of summer and winter resources.

37 From an analytical perspective, what is more important than whether this information can properly be characterized as "old news" or "new news" is the context in which this information is developed and then used. AEMA attempts to leverage these findings into arguments supporting new seasonal product participation in RPM independent of aggregation. In doing so, AEMA has misinterpreted the information PJM provided and/or misrepresented its relevance to the question of whether the existing CP design is just and reasonable.

38. This is particularly true with the information regarding the ability and impact of reducing winter resources and the use and appropriateness of the WWRT. A proper understanding of how this information was developed, its properties and how and why it is used by PJM makes it clear that none of this information supports any conclusions regarding CP. To understand this one must understand how the studies were conducted by PJM and also the nature and purpose of the WWRT and the implications of inferior seasonal products on the feasibility of meeting the WWRT target.

39. During the SCRSTF stakeholder process, I asked PJM Staff on several occasions about the specific properties of these types of sensitivity studies and the relationship to

[33] Complaint Table 1, taken from PJM SCRSTF meeting materials: Estimated Changes in Reliability Requirement Given Seasonal LOLE Allocation (Aug. 12, 2016), http://www.pjm.com/~/media/committees-groups/task-forces/scrstf/20160812/20160812-pjm-response-on-lole- allocation.ashx.

the feasibility of meeting the WWRT. I later confirmed my understanding of the information that was provided. In conducting LOLE sensitivity studies, PJM simply modified the available resources up (summer) or down (winter). They did nothing else that would normally be considered in the PRISM analyses. In particular, maintenance schedules were not adjusted and remained fixed

40. For purposes of incremental summer impacts, this assumption is not problematic. However, for analyzing decrements of capacity in the winter, this simple adjustment makes the results effectively useless, and, merely indicative of the notion that marginal resources have lower LOLE impact at times of lower loads relative to total resources (something that is obvious by inspection). The reason this is true lies in the way that PJM conducts its sensitivity, the nature and need for the WWRT and the interaction of the feasibility of the WWRT with the degraded reliability associated with seasonal products and, in particular, lower levels of winter reserves. These three elements are discussed in the following paragraphs.

41. For the sensitivity study on removal of winter resources and the associated impacts on LOLE, PJM froze the planned maintenance from their base case. (They apparently did this for all sensitivities). For the winter, this means that for PJM's first case that AEMA emphasizes so much, 17,431 MWs of winter capacity was removed, *but the maintenance plan remained the same*. This assumption is simply not accurate. PJM has indicated that there are barely enough resources to cover the WWRT requirement and, as explained below, there may be a structural deficiency in the ability to meet the WWRT when inferior products are used. The current load forecast estimates approximately 132,000 MW winter peak,[34] so AEMA's 17,431 MW reduction would be approximately a 13% reduction in winter resources. However, the average WWRT is 27% of *average* weekly winter loads, an amount that was characterized as not likely to be achievable under the current CP design should the system ever clear at a quantity consistent with criteria (e.g. at IRM). The 17,431 MWs is 13% of the estimate 2016/17

[34] See http://www.pjm.com/~/media/library/reports-notices/load-forecast/2017-load-forecast-report.ashx at page 22 and at page 58.

winter peak, and the WWRT is 27% of average winter weekly peaks, making the impact on feasible WWRT much more severe. For example at an average winter weekly peak of 104,000 MWs, the reduction would have been 17% of total winter resources versus the average. With the elimination of 17,431 MWs in the winter, there would not be enough generation during the winter to allow the levels of reserves needed to accommodate maintenance for all the units that are not allowed summer maintenance. The obvious observation is there would not be enough generation left to satisfy the WWRT, as seen on the PJM graphic above.

42. This reliance on inferior seasonal products can be linked to some of the challenges associated with the January 2014 Polar Vortex. While AEMA and others are quick to note that approximately 3,000 MW of summer resources voluntarily participated, when called by PJM during the vortex,[35] the reality is that had the approximately 9,300 MW[36] of summer seasonal products been annual, even at a 20% forced outage rate there would have been approximately 7,440 MW of annual resources would have been available, approximately 4,440 MW more than the voluntary inferior products.[37] This additional annual capacity, which would have been obligated to perform under the CP market design, would have been approximately 9 times greater than PJM's critical lowest spinning reserves (500 MW) during this event.[38] This is a graphic example of the risk of ignoring the annual nature and coordinated planning involved with the CP product, and the risks associated with misinterpretations of simple excursion sensitivities that ignore all of the relevant factors to establishing the LOLE and associated performance criteria such as WWRT.

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[35] See http://www.pjm.com/~/media/library/reports-notices/weather-related/20140509-analysis-of-operational-events-and-market-impacts-during-the-jan-2014-cold-weather-events.ashx, page 19.

[36] See 2013-14 BRA Results http://www.pjm.com/~/media/markets-ops/rpm/rpm-auction-info/2013-2014-base-residual-auction-report.ashx

[37] See generally http://www.pjm.com/~/media/library/reports-notices/weather-related/20140509-analysis-of-operational-events-and-market-impacts-during-the-jan-2014-cold-weather-events.ashx . During 2014 the average (not peak) winter daily peak load was expected to be about 106,000 MW, during the Polar Vortex the peak was a record 141,846 MW. Though not explicitly stated, the WWRT would have been approximately 28,000 MW.

[38] Id page 4. Note the entire event was during emergency notices and would have been designated PAH.

43. Had there been an annual product definition with the PfP properties of CP and associated penalties (something totally missing in the AEMA comments), the approximately 22% forced outage rate during the polar vortex would never have occurred in the first place, as suppliers would have taken anticipatory steps to assure performance and fuel during more extreme weather conditions.

44. The above comments and conclusions are based on an understanding of the WWRT. This section explains the WWRT and the mismatch of the AEMA criticisms to the reality of the targeted reserves. If one only considers LOLE, based on weekly load patterns and generation availability, the order or sequencing of the 52 weeks does not really matter, so long as load and generation are properly aligned for the designated week. However, the same is not true with respect to the ordering of winter peak loads from an operational perspective. While the load forecast may capture the seasonal peak as a whole, there is unavoidable uncertainty surrounding the exact sequence of high load days. It makes a very big difference if the highest four winter peak weeks fall sequentially, or spread out over the entire winter when PJM makes its plans for the level of maintenance to allow at any given time.

45. The WWRT is PJM's method of turning the "single pass" probabilistic PRISM results with deterministic maintenance into operating guidelines for maintenance limits and the associated level of winter reserves for the entire season that reflects the potential for the ordering of peak weeks to change. Further, because there is no maintenance in the summer, PJM has to maintain greater reserves to assure reliability in the winter in order to maintain annual reliability. In turn, "to manage the LOLE risk during the winter, a limit on the amount of maintenance that may be scheduled is calculated."[39] "This limit takes the form of a reserve target, the WWRT, which should be preserved by the PJM Operation Department during the winter season."[40] This is again a consistent output of

[39] RAAS Meeting, May 31, 2016 Slide 2. http://www.pjm.com/~/media/committees-groups/subcommittees/raas/20160531/20160531-winter-weekly-reserve-target.ashx

[40] Id Slide 2.

annual products with a summer peaking system. To do this PJM uses another modeling tool, the GE MARS model.[41] MARS can directly address the order/sequencing issue because it is structured as a Monte-Carlo analysis.

46. As explained in Manual 20:

> "It is desirable to maintain a negligible loss of load risk over the winter period because virtually all the RTO region's LOLE (99.9%) is concentrated in the summer weeks, despite the complete absence of unit planned outages in the summer. *Since the summer risk cannot be reduced further (without installing additional Capacity Resources), winter reserve levels must be held greater than those over the summer to ensure the desired yearly RTO LOLE. PJM coordinates equipment outages to obtain the desired LOLE while minimizing the need for additional generating capacity.* (emphasis added)
>
> The MARS tool is used to determine the lowest winter reserve level at which PJM still maintains an LOLE of one in ten years. This reserve level is then reviewed with the PJM Planning Committee and the Operating Committee before being implemented as the winter weekly reserve target."[42]

47. The WWRT is established using a base case where LOLE is limited to .1 days per year prior to allowing any of the inferior products, which, as discussed above, PJM currently allows for Base Capacity and that in turn increases the LOLE by 10% to 0.11.

> Thus the GEMARS case for the entire delivery year that includes the upcoming winter has an LOLE of 0.1 days/year. Such a case has a certain amount of "optimized" maintenance scheduled in the winter (including a small amount during the winter peak) so that total Winter LOLE is practically "zero" … As a proxy to simulate additional maintenance in the winter, the winter peaks (in the period December-February) are increased. This increase of the peaks stops when the total LOLE risk in each of the winter months is 0.0001 days/year (a threshold set arbitrarily). …Next, the reserves during the winter period are extracted from the base case (computed as a percent of each weekly peak). Lastly, the weekly

[41] Multi-Area Reliability Simulation (MARS)– developed by General Electric International, Inc., the MARS (or GE-MARS) model is a probabilistic analysis program that uses sequential Monte Carlo simulation to analyze the resource adequacy for multiple areas. MARS is used by ISOs, RTOs, and other organizations to conduct multi-area reliability simulations.

[42] Page 14, http://www.pjm.com/~/media/documents/manuals/m20.ashx

> reserve values are averaged. The average corresponds to the Winter Weekly Reserve Target. …The Winter Weekly Reserve Target is then applied to each winter week's forecasted peak load. PJM Operations will then attempt to schedule generator maintenance such that the WWRT is maintained each week of the winter.[43]

48. In this context, AEMA's characterization of PJM's statements regarding the WWRT and adequacy of winter reserves are very misleading.[44] Certainly the system is planned to be adequate in the winter, and there are indeed a significant amount of reserves, but those reserves reflect the ability to meet the LOLE target (not further degrading reliability) *and to also satisfy maintenance requirements*, which are driven by the inability to schedule maintenance in the high demand summer period.

49. Indeed, based on information I received from PJM Staff, the WWRT requirement is binding, and actually might be infeasible under certain circumstances (*i.e.*, "at criterion" or IRM). This suggests that with the presence of inferior products currently, PJM is "stressed" in terms of meeting the WWRT and maintaining the necessarily low LOLE in the winter. This invalidates all the related AEMA comments about the oversupply of capacity in the winter.

50. At the same May 31, 2016 RAAS meeting references above, I specifically asked PJM Staff if the WWRT could always be satisfied. They replied that it could not, and PJM believed that if the system were "at criteria," that is, if the only annual capacity was allowed, and this was procured exactly at IRM, the WWRT could not be met. Only the fact that the auction was procuring additional capacity above IRM allowed the requirement to be met. This is a very important general finding key to understanding the implications of the adequacy/LOLE portion of the CP paradigm. It also relates to the importance of maintaining annual products.

[43] Id. May 31, 2016 RAAS presentation.

[44] See, e.g. Complaint pages 13-14.

51. This inability to meet WWRT "at criteria" is a structural result of including inferior products. As discussed above, the WWRT analyses proceeds from a base case where the LOLE is 0.1. However the "real" system, including the inferior seasonal products, is at 0.11 LOLE or worse. This means that the WWRT is being established against a more "adequate" system than actually exists. Operationally this means that there is no "give" to reduce further the winter resources and meet operational design consistent with annual LOLE targets and the need to keep all units available during the summer. *As a result, the static sensitivity study of switching off 497 MW of summer resources for 17,431 MW of winter resources would not have been the result nor feasible if a full study were conducted.*[45]

VI. Claimed Impacts on State DR Programs and Value of Seasonal Products are Misleading and/or Incorrect.

52. AEMA complains that by not allowing seasonal products that are not part of an aggregate (either an aggregate established by the offers bilaterally or by PJM), the CP design reduces or eliminates the value of various state demand response programs and denies opportunities to demand response programs, and particularly air conditioning controls.[46] This is a misleading characterization of a single season load control program and ignores the ability of the value of these programs to actually be captured by conforming changes, or under other designs simply by following PJM direction during PAH and receiving performance bonuses. It also ignores the material negative attributes of some of the state program designs.

53. Typical load control programs at the retail level are used to reduce a consumer's individual billing determinant from the LSE or LDC. As such, a consumer can directly benefit at the retail level if allowed under the state program via their LDC, instead of a Curtailment Service Provider ("CSP") capturing the benefit at wholesale. So instead of

[45] PJM further responded in the meeting that the basis for meeting the WWRT rests on the fact that the system has been "above criteria" with capacity over IRM. This is a function of historic capacity pricing and the shape of the demand curve. In effect the WWRT "leans" on system excess to make up for the presence of the inferior products.

[46] See Complaint, e.g. pages 11, 35, 36,37, 39.

selling a demand response product via the CSP, the individual participant can still participate in a retail program that controls their load against the retail billing determinants and capture the retail value of a capacity reduction.

54. AEMA recognizes this fact, but states that it is not important because the local customer benefit allocations for such local load control behavior, typically based on a 5 coincident peak criterion (5CP), while reducing the individual customer's costs and billing determinant, does not immediately reduce the zonal capacity costs..[47] The choice of the 5CP is determined by the state and EDC. PJM itself does not use 5CP for any purposes at all, it simply provides this information to the EDC to facilitate the EDC's implementation of its cost allocations.[48]

55. A retail demand response program could easily be designed to be more consistent with PJM's billing and capacity cost/responsibility allocations. For example, air conditioning control could be tied to single peak demand, overall seasonal load shape and/or Performance Assessment Hours. Any of these design features would change the allocation and timing of zonal responsibility as well as the payments by the individual market participants. These are all possible modifications that can be implemented at the state/local level to conform better to the price signals of the wholesale CP market design. Absent any other actions these modifications would be reflected in zonal reductions in forecasts over approximately five years as load adjustments are reflected in the forecasts. But better local design could capture immediate recognition in load adjustment or PAH performance bonuses.

56. However, the adjustment process could be almost immediate. PJM has explicit provisions in its load forecasting procedures to account for modifications to forecasts due to actions by the LDC or material changes in its load that may be unknown or not visible to PJM. These modifications could become "real" in assignment of zonal capacity

[47] Complaint Table 3 and associated discussion at page 35.

[48] See http://www.pjm.com/~/media/committees-groups/task-forces/scrstf/20160506/20160506-item-01b-faqs-for-5cps-and-peak-shaving.ashx

immediately if there is a *verifiable* changes in load not visible to PJM. PJM Manual 19 provides in part that:

> The intention of these guidelines is to ensure that any adjustments made to PJM's load forecast model are properly identified, estimated, and reviewed prior to incorporation into the forecast.
>
> Issue Identification
>
> --PJM annually solicits information from its member Electric Distribution Companies (EDC) for large load shifts (either positive or negative) which are known to the EDC but may be unknown to PJM. PJM will send the request in mid-July with responses expected in time for any proposed adjustments to be reviewed with the Load Analysis Subcommittee in October/November.
>
> -Any other load changes which are brought to PJM's attention.[49]

56. Thus, if a LDC can verify that its load response programs are demonstrably reducing zonal load responsibility consistent with PJM criteria, their zonal allocation (as well as the customer's billing determinant) would be reduced. This reduction only occurs if the state and the LDC define a program with the requisite properties to yield this result and their procedures and properties can meet PJM thresholds on control and verification. Similarly, verifiable "performance" of seasonal products (e.g. wind production in excess of the amount of CP resource that can be sold based on summer ratings) would be eligible for PAH performance bonuses.

VII. Individual Market Participants' Profits or Losses Is Not Dispositive on the Issue of the Correct Market Design.

57. In Exhibits 1-4 AEMA has Affidavits from four of its member companies identifying the adverse impacts that the removal of seasonal products would have on their companies, and the significant money has been invested in their businesses. The AEMA's representations regarding the level of investment by its members are irrelevant. The issue is whether the proposed CP design is just and reasonable, not whether any specific party "wins or loses" based on such a design. Furthermore, AEMA members have been on notice for several years that the Base Capacity product was only transitional.

[49] PJM Manual 19, page 33. http://www.pjm.com/planning/resource-adequacy-planning/~/media/documents/manuals/m19.ashx

Unfortunately, regulatory risk is somewhat constant with respect to RPM. In this instance, AEMA had more notice of the upcoming change than has been provided for other RPM design changes. AEMA has presented no material new information to justify the Commission revisiting its prior decision, and PJM has actually proposed modifications to further improve access of seasonal products via aggregation.

58. As has been clearly demonstrated by the retirement of many existing units, no party is guaranteed "adequate" compensation. Potential loss in and of itself is not an indication of whether a pricing/market design is just and reasonable. AEMA also ignores that the overall design is moving towards a more adequate/secure solution for market participants and retail customers. They also ignore that there is a proposal that would allow for increased seasonal resource participation consistent with CP's fundamental pay for performance foundation.

59. All owners of capacity in PJM have been on notice for over two years that the expectations for Capacity Performance resources will be more demanding and rigorous than the traditional PJM capacity product. AEMA relies on flawed analysis and an incomplete understanding of the current rules to attempt to bring back the very capacity product that the Commission and PJM very intentionally eliminated. There is no basis in rational economic theory, business expectations or sound market design to do so.

60. This concludes my affidavit.

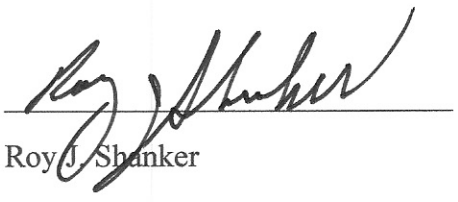
UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

Old Dominion Electric Cooperative and Direct Energy Business, L.L.C., on behalf of itself and its affiliate, Direct Energy Business Marketing, L.L.C., and American Municipal Power, Inc.	)	EL17-32-000
v.	)	
PJM Interconnection, L.L.C.,	)	EL17-36-000
Advanced Energy Management Alliance	)	**(not consolidated)**
v.	)	
PJM Interconnection, L.L.C.	)	

AFFIDAVIT

I, Roy J. Shanker, do hereby swear and affirm under penalty of law that the statements in the foregoing Affidavit of Roy J. Shanker, Ph. D. on behalf of the PJM Power Providers Group are true, correct, accurate and complete to the best of my knowledge, information and belief.

Executed this 25th day of January, 2017.



Roy J. Shanker

EXHIBIT RJS-1

QUALIFICATIONS
AND
EXPERIENCE OF

DR. ROY J. SHANKER

EDUCATION:

Swarthmore College, Swarthmore, PA
A.B., Physics, 1970

Carnegie-Mellon University, Pittsburgh, PA
Graduate School of Industrial Administration
MSIA Industrial Administration, 1972
Ph.D., Industrial Administration, 1975

Doctoral research in the development of new non-parametric multivariate techniques for data analysis, with applications in business, marketing and finance.

EXPERIENCE:

1981 - Present — Independent Consultant
P.O. Box 1480
Pebble Beach, CA 93953

Providing management and economic consulting services in natural resource-related industries, primarily electric and natural gas utilities.

1979-81 — Hagler, Bailly & Company
2301 M Street, N.W.
Washington, D.C.

Principal and a founding partner of the firm; director of electric utility practice area. The firm conducted economic, financial, and technical management consulting analyses in the natural resource area.

1976-79 — Resource Planning Associates, Inc.
1901 L Street, N.W.

Washington, D.C.

Principal of the firm; management consultant on resource problems, director of the Washington, D.C. utility practice. Direct supervisor of approximately 20 people.

1973-76 Institute for Defense Analysis
Professional Staff
400 Army-Navy Drive
Arlington, VA

Member of 25 person doctoral level research staff
conducting economic and operations research analyses of military and resource problems.

RELEVANT EXPERIENCE:

2016

237- On behalf of DC Energy, Vitol, Intertia Power, Saracen Energy East. Federal Energy Regulatory Commission Dockets EL16-6, ER16-121. Submission of post technical session statement regarding PJM FTR market "netting" proposal.

236-On behalf of DC Energy, Vitol, Intertia Power, Saracen Energy East. Federal Energy Regulatory Commission Dockets EL16-6, ER16-121. Participant in two Technical Session Panels addressing PJM FTR market design and deficiency in the pending proposal to remove netting in the market settlement.

2015

235- On behalf of the Electric Power Supply Associaton. Federal Energy Regulatory Commission Dockets EL15-70, 71, 72, 82. Affidavit regarding MISO capacity market design and also addressing use of opportunity costs in offers.

234-On behalf of the Electric Power Supply Associaton. Federal Energy Regulatory Commission Dockets EL15-70, 71, 72, 82. Discussant in technical session addressing the establishment of opportunity costs as the basis for capacity reference pricing in the MISO Planning Resource Auctions.

233-On behalf of Dominion Virginia Power. Federal Energy Regulatory Commission Docket ER15-1966. Affidavit regarding changing economic

incentives for suppliers associated with the modification of PJM's calculation of Lost Opportunity Costs.

232-On behalf of "Indicated Suppliers" Federal Energy Regulatory Commission Docket No. EL15-64-000. Testimony addressing the appropriateness of proposed changes to the NYISO buyer side mitigation exemptions.

231-On behalf of Hydro Quebec, Energy Services U.S. Federal Energy Regulatory Commission Docket No. ER15-623. Affidavit addressing the consistent treatment of energy imports under PJM's Capacity Performance proposal.

230-Before the Supreme Court of the United States, No. 14-995, On Petition for a Writ of Certiorari to the United States Court of Appeals for the Third Circuit. Brief of electrical engineers, scientists and economists as amici curiae in support of petitioners. Metropolitan Edison et. al. versus Pennsylvania Public Utility Commission et. al. http://www.americanbar.org/content/dam/aba/publications/supreme_court_preview/briefs_2015_2016/14-840_Borlick_et_al.pdf

2014

229-On behalf of Benton County Wind Farm. United States District Court Southern District of Indiana, Indianapolis Division, Civil Action No. 1:13-cv-1984-SEB-TAB. Expert Reports addressing custom and practice in electric power purchase agreements.

228-On behalf of FirstEnergy Services. FERC Docket EL14-55. Affidavit related to the appropriate characterization of Demand Response in Capacity Markets reflecting performance as the reduction of retail energy consumption.

227)-Federal Energy Regulatory Commission. Docket RM10-17. On my own behalf, a statement regarding the ability of the PJM capacity and energy markets to clear in the transition from any determination that demand response would be excluded jurisdictionally from wholesale markets. This could in turn result in a more appropriate representation of retail demand response.

226) Illinois Commerce Commission. Matter: No. 13-0657. On behalf of Commonwealth Edison Company. Testimony regarding the operation of the PJM regional transmission expansion planning process in general and particularly with regards to the preservation of long-term transmission

rights (Stage 1A Auction Revenue Rights), and the consequences that occur when such mandated rights are infeasible.

225-Federal Energy Regulatory Commission. Docket ER14-1579. On behalf of H-P Energy. Affidavit explaining importance of property rights and associated contracts within the PJM transmission planning process, particularly as they pertain to Upgrade Construction Service Agreements.

2013

224-Federal Energy Regulatory Commission. Docket No. ER14-456. On behalf of NextEra Energy to analyze a proposed modification to the PJM Tariff allowing for "easily resolved constraints" to be address by transmission upgrades without any analyses of benefits.

223-Federal Energy Regulatory Commission. Docket No. ER14-504. Affidavit on behalf of PJM Power Producers addressing the interaction between the PJM adequacy planning processes and the formulation of saturation constraints on Limited and Extended Summer Demand Response products.

222-Federal Energy Regulatory Commission. Docket AD13-7. Invited speaker on the Commission's technical session regarding capacity markets in RTO's. Comments addressed basic principles of market design, market features, and consequences of market failures and deviations from design principles.

221-Federal Energy Regulatory Commission. Docket No. EL13-62 on behalf of TC Ravenswood LLC. Two affidavits addressing the treatment of reliability support services agreements and associated capacity in the NYISO capacity market design.

2012

220-Federal Energy Regulatory Commission. Docket No. ER12-715-003. On behalf of First Energy Services Company. An affidavit and testimony addressing the appropriateness of the application of a proposed new MISO tariff provision after the fact to a withdrawing MISO member.

219-Federal Energy Regulatory Commission. Docket ER13-335. On behalf of Hydro Quebec U.S. Affidavit addressing appropriate application of ISO-NE Market Rule 1/ Tariff with respect to the qualification of new external capacity to participate in the Forward Capacity Market.

218-Federal Energy Regulatory Commission. Docket IN12-4. On behalf of 220-Deutsche Bank Energy Trading. Affidavit regarding a review of

specific transactions, related congestion revenue rights, and deficiencies in CAISO tariff implementation during periods when market software produces multiple feasible pricing solutions.

217-Federal Energy Regulatory Commission. Docket No. ER12-715-003. On behalf of FirstEnergy Services Company. Affidavit regarding implementation of the MISO Tariff with respect to the determination of appropriate exit fees and charges related to certain transmission facilities.

216-Federal Energy Regulatory Commission. Docket No. IN12-11. On behalf of Rumford Paper Company. Affidavit regarding free riding behavior in the design of demand response programs, and its relationship to accusations of market manipulation.

215-Federal Energy Regulatory Commission. Docket No. IN12-10. On behalf of Lincoln Paper and Tissue LLC. Affidavit regarding relationship of demand response behavior and value established in Order 745 to claimed market impacts associated with accusations of market manipulation.

214-Federal Energy Regulatory Commission. Docket No. AD12-16-000. On behalf of PJM Power Providers, testimony regarding deliverability of capacity between the MISO and PJM RTO's and associated basic adequacy planning concepts.

213-United States Court Of Appeals, District of Columbia Circuit. Electric Power Supply Asociation, et al (Petitioners) v. Federal Energy Regulatory Commission et al (Respondents) Nos. 11-1486. Amici Curiae brief regarding the appropriate pricing of demand reduction services in wholesale markets vis a vis the FERC determinations in Order 745.

212-United States Supreme Court. Metropolitan Edison Company and Pennsyvalnia electric Company (Petitioners), Pennsylvania Public Utility Commission (Respondent) (No. 12-4) Amici Curiae brief regarding the nature of physical losses in electric transmission and relationship to proper marginal cost pricing of electric power and the marginal cost of transmission service.

2011

211-Federal Energy Regulatory Commission Docket No. ER12-513-000. On behalf of PJM Power Providers, testimony regarding the establishment of system wide values for the net cost of new entry related to modifications of the Reliability Planning Model.

210-Federal Energy Regulatory Commission Docket No. EL11-56-000, on behalf of First Energy Services. Affidavit regarding the appropriateness of proposed transmission cost allocation of Multi-Value Projects to an exiting member of the Midwest Independent System Operator.

209-Federal Energy Regulatory Commission Docket No. ER11-4081-000, on behalf of "Capacity Suppliers". Affidavit addressing correct market design elements for Midwest Independent System Operator proposed resource adequacy market.

208-Public Utility Commission of Ohio, Case Nos. 11-346-EL-SSO,11-348-EL-SSO,Nos. 11-349-EL-AAM, 11-350-EL-AAM, on behalf of First Energy Services. Testimony regarding the interaction between the capacity default rates for retail access under the PJM Fixed Resource Requirement and the PJM Reliability Planning Model valuations.

207-Federal Energy Regulatory Commission Dockets No. ER11-2875, EL11-20, Staff Technical Conference on behalf of PJM Power Providers, addressing self supply and the Fixed Resource Requirement elements of PJM's capacity market design.

206-New Jersey Board of Public Utilities, Docket Number EO11050309 on behalf of PSEG Companies. Affidavit addressing the implications of markets and market design elements, and regulatory actions on the relative risk and trade-offs between capital versus energy intensive generation investments.

205-Federal Energy Regulatory Commission Docket No. ER11-2875. Affidavit and supplemental statement on behalf of PJM Power Providers addressing flaws in the PJM tariff's Minimum Offer Price Rule regarding new capacity entry and recommendations for tariff revisions.

204-Federal Energy Regulatory Commission Docket No. EL11-20. Affidavit on behalf of PJM Power Providers addressing flaws in the PJM tariff's Minimum Offer Price Rule regarding new capacity entry.

203-Federal Energy Regulatory Commission Docket Nos. ER04-449. Affidavit and supplemental statement on behalf of New York Suppliers addressing the appropriate criteria for the establishment of a new capacity zone in the NYISO markets.

2010

202-New Jersey State Assembly and Senate. Statements on behalf of the Competitive Supplier Coalition addressing market power and reliability impacts of proposed legislation, Assembly Bill 3442 and Senate Bill 2381.

201-Federal Energy Reglatory Commission. Docket ER11-2183. Affidavit on behalf of First Energy Services Company addressing default capacity charges for Fixed Resource Requirement participants in the PJM Reliability Pricing Model capacity market design.

200-Federal Energy Regulatory Commission. Docket ER11-2059Affidavit on behalf of First Energy Services Company addressing deficiencies and computational problems in the proposed "exit charges" for transmission owners leaving the MISO RTO related to long term transmission rights.

199-Federal Energy Regulatory Commission Docket RM10-17. Invited panelist addressing metrics for cost effectiveness of demand response and associated cost allocations and implications for monopsony power.

198-Federal Energy Regualtory Commission Consolidated Dockets ER10-787-000, EL10-50-000, and EL10-57-000. Two affidavits on behalf of the New England Power Generators Association regarding ISO-NE modified proposals for alternative price rule mitigation and zonal definitions/functions of locational capacity markets.

197-Federal Energy Regulatory Commission Docket No. ER10-2220-000. Affidavit on behalf of the Independent Energy Producers of New York. Addressing rest of state mitigation thresholds and procedures for adjusting thresholds for frequently mitigated units and reliability must run units.

196-Federal Energy Regulatory Commission Docket PA10-1. Affidavit on behalf of Entergy Services related to development of security constrained unit commitment software and its performance.

195-Federal Energy Regulatory Commission Docket No. ER09-1063-004. Testimony on behalf of the PJM Power Providers Group (P3) regarding the proposed shortage pricing mechanism to be implemented in the PJM energy market. Reply comments related to a similar proposal by the independent market monitor.

194-PJM RTO. Statement regarding the impact of the exercise of buyer market power in the PJM RPM/Capacity market. Panel discussant on the issue at the associated Long Term Capacity Market Issues Sympossium.

193-Federal Energy Regulatory Commission Docket No. ER10-787-000. Affidavit on behalf of New England Power Generators Association addressing proper design of the alternative price rules (APR) for the ISO-NE Forward Capacity Auctions. Second affidavit offered in reply. Supplemental affidavit also submitted

192-Federal Energy Regulatory Commission Docket No. RM10-17-000. Affidavit on behalf of New England Power Generators Association addressing proper pricing for demand response compensation in organized wholesale regional transmissiom organizations.

191-Federal Energy Regulatory Commission Docket No. RM10-17-000, Affidavit on my on behalf regarding inconsistent representations made between filings in this docket and contemporaneous materials presented in the PJM stakeholder process.

2009

190-Federal Energy Regulatory Commission Docket No. ER09-1682. Two affidavits on behalf of an un-named party regarding confidential treatment of market data coupled with specific market participant bidding, and associated issues.

189-American Arbitration Assoication, Case No. 75-198-Y-00042-09 JMLE, on behalf of Rathdrum Power LLC. Report on the operation of specific pricing provision of a tolling power purchase agreement.

188-Federal Energy Regulatory Commission. Docket No. IN06-3-003. Analyses on behalf of Energy Transfer Partners L.P. regarding trading activity in physical and financial natural gas markets.

187-Federal Energy Regulatory Commission. Docket No. ER08-1281-000. Analyses on behalf of Fortis Energy Trading related to the impacts of loop flow on trading activities and pricing.

186-American Arbitration Association. Report on behalf of PEPCO Energy Services regarding several trading transactions related to the purchase and sale of Installed Capacity under the PJM Reliability Pricing Model.

185-Federal Energy Regulatory Commission Docket No. EL-0-47. Analyses on behalf of HQ Energy services (U.S.) regarding pricing and sale of energy associated with capacity imports into ISO-NE.

184-Federal Energy Regulatory Commission Docket No. ER04-449 019, Affidavit on behalf of HQ Energy Services (U.S.) regarding the implementation of the consensus deliverability plan for the NYISO, and associated reliability impacts of imports.

183-Federal Energy Regulatory Commission Docket ER09-412-000, ER05-1410-010, EL05-148-010. Affidavit and Reply Affidavit on behalf

of PSEG Companies addressing proposed changes to the PJM Reliability Pricing Model and rebuttal related to other parties' filings.

2008

182-Pennsylvania Public Service Commission. *En Banc* Public Hearing on "Current and Future Wholesale Electricity Markets", comments regarding the design of PJM wholesale market pricing and state restructuring.

181-Maine Public Utility Commission. Docket No. 2008-156. Testimony on behalf of a consortion of energy producers and suppliers addressing the potential withdrawal of Maine from ISO New England and associated market and supplier response.

180-Federal Energy Regulatory Commission. Docket No. EL08-67-000. Affidavit on behalf of Duke Energy Ohio and Reliant Energy regarding criticisms of the PJM reliability pricing model (RPM) transitional auctions.

179-Federal Energy Regulatory Commission. Docket AD08-4, on behalf of the PJM Power Providers. Statement and participation in technical session regarding the design and operation of capacity markets, the status of the PJM RPM market and comments regarding additional market design proposals.

178-Federal Energy Regulatory Commission. Docket ER06-456-006, Testimony on behalf of East Coast Power and Long Island Power Authority regarding appropriate cost allocation procedures for merchant transmission facilities within PJM.

2007

177-FERC Docket No. EL07-39-000. Testimony on behalf of Mirant Companies and Entergy Nuclear Power Marketing regarding the operation of the NYISO In-City Capacity market and the associated rules and proposed rule modifications.

176-FERC Dockets: RM07-19-000 and AD07-7-000, filing on behalf of the PJM Power Providers addressing conservation and scarcity pricing issues identified in the Commission's ANOPR on Competition.

175-FERC Docket No. EL07-67-000. Testimony and reply comments on behalf of Hydro Quebec U.S. regarding the operation of the NYISO TCC

market and appropriate bidding and competitive practices in the TCC and Energy markets.

174-FERC Docket Nos. EL06-45-003. Testimony on behalf of El Paso Electric regarding the appropriate interpretation of a bilateral transmission and exchange agreement.

2006

173-United States Bankruptcy Court for the Southern District of New York. Case No. 01-16034 (AJG). Report on Behalf of EPMI regarding the properties and operation of a power purchase agreement.

172-FERC Docket No. EL05-148-000. Testimony regarding the proposed Reliability Pricing Model settlement submitted for the PJM RTO.

171-FERC Docket No. ER06-1474-000, FERC. Testimony on behalf othe PSEG Companies regarding the PJM proposed new policy for including "market efficiency" transmission upgrades in the regional transmission expansion plan.

170-FERC Docket No. EL05-148-000, FERC. Participation in Commission technical sessions regarding the PJM proposed Reliability Pricing Model.

169-FERC Docket No. EL05-148-000, FERC. Comments filed on behalf of six PJM market participants concerning the proposed rules for participation in the PJM Reliability Pricing Model Installed Capacity market, and related rules for opting out of the RPM market.

168-FERC Docket No. ER06-407-000. Testimony on behalf of GSG, regarding interconnection issues for new wind generation facilities within PJM.

2005

167-FERC Docket No. EL05-121-000, Testimony on behalf of several PJM Transmission Owners (Responsible Pricing Alliance) regarding alternative regional rate designs for transmission service and associated market design issues.

166-FERC Technical Conference of June 16, 2005. (Docket Nos. PL05-7-000, EL03-236-000, ER04-539-000). Invited participant. Statement regarding the operation of the PJM Capacity market and the proposed new Reliability Pricing Model Market design.

165-American Arbitration Association Nos. 16-198-00206-03 16-198-002070.On behalf of PG&E Energy Trading. Analyses related to the

operation and interpretation of power purchase and sale/tolling agreements and electrical interconnection requirements.

164-Arbitration on behalf of Black Hills Power, Inc. Expert testimony related to a power purchase and sale and energy exchange agreement, as well as FERC criteria related to the applicable code and standards of conduct.

2004

163-Federal Energy Regulatory Commission. Docket No. Docket No. EL03-236-003 Testimony on behalf of Mirant companies relating to PJM proposal for compensation of frequently mitigated generation facilities.

162-Federal Energy Regulatory Commission. Docket No. ER03-563-030. Testimony on behalf of Calpine Energy Services regarding the development of a locational Installed Capacity market and associated generator service obligations for ISO-NE. Supplemental testimony filed 2005.

161-Federal Energy Regulatory Commission. Docket No. EL04-135-000. Testimony on behalf on the Unified Plan Supporters regarding implications of using a flow based rate design to allocate embedded costs.

160-Federal Energy Regulatory Commission. Docket No. ER04-1229-000. Testimony on behalf of EME Companies regarding the allocation and recovery of administrative charges in the NYISO markets.

159-Federal Energy Regulatory Commission. Dockets No. EL01-19-000, No. EL01-19-001, No. EL02-16-000, EL02-16-000. Testimony on behalf of PSE&G Energy Resources and Trade regarding pricing in the New York Independent System Operator energy markets.

158-Federal Energy Regulatory Commission. Invited panelist regarding performance based regulation (PBR) and wholesale market design. Comments related to the potential role of PBR in transmission expansion, and its interaction with market mechanisms for new transmission.

157-Federal Energy Regulatory Commission. Docket No. ER04-539-000 Testimony on behalf of EME Companies regarding proposed market mitigation in the energy and capacity markets of the Northern Illinois Control Area.

156-Federal Energy Regulatory Commission. Standardization of Generator Interconnection Agreements and Procedures Docket No. RM02-1-001, Order 2003-A, Affidavit on Behalf of PSEG Companies

regarding the modifications on rehearing to interconnection crediting procedures.

155-Federal Energy Regulatory Commission. Dockets ER03-236-000,ER04-364-000,ER04-367-000,ER04-375-000. Testimony on behalf of the EME Companies regarding proposed market mitigation measures in the Northern Illinois Control Area of PJM.

154-Federal Energy Regulatory Commission. Dockets PL04-2-000, EL03-236-000. Invited panelist, testimony related to local market power and the appropriate levels of compensation for reliability must run resources.

2003

153-American Arbitration Association. 16 Y 198 00204 03. Report on behalf of Trigen-Cineregy Solutions regarding an energy services agreement related to a cogeneration facility.

152-Federal Energy Regulatory Commission. Docket No. EL03-236-000. Testimony on behalf of EME Companies regarding the PJM proposed tariff changes addressing mitigation of local market power and the implementation of a related auction process.

151-Federal Energy Regulatory Commission. Docket No. PA03-12-000. Testimony on behalf of Pepco Holdings Incorporated regarding transmission congestion and related issues in market design in general, and specifically addressing congestion on the Delmarva Peninsula.

150-Federal Energy Regulatory Commission. Docket Nos. ER03-262-007, Affidavit on behalf of EME Companies regarding the cost benefit analysis of the operation of an expanded PJM including Commonwealth Edison.

149-Supreme Court of the State of New York, Index No. 601505/01. Report on behalf of Trigen-Syracuse Energy Corporation regarding energy trading and sales agreements and the operation of the New York Independent System Operator.

148-Federal Energy Regulatory Commission. Docket No. ER03-262-000. Affidavit on behalf of the EME Companies regarding the issues associated with the integration of the Commonwealth Edison Company into PJM.

147-Federal Energy Regulatory Commission. Docket No. ER03-690-000. Affidavit on behalf of Hydro Quebec US regarding New York ISO market rules at external generator proxy buses when such buses are deemed non-competitive.

146-Federal Energy Regulatory Commission. Docket RT01-2-006,007. Affidavit on behalf of the PSEG Companies regarding the PJM Regional Transmission Expansion Planning Protocol, and proper incentives and structure for merchant transmission expansion.

145-Federal Energy Regulatory Commission. Docket No. ER03-406-000. Affidavit on behalf of seven PJM Stakeholders addressing the appropriateness of the proposed new Auction Revenue Rights/Financial Transmission Rights process to be implemented by the PJM ISO.

144-Federal Energy Regulatory Commission. Docket No. ER01-2998-002. Testimony on behalf of Pacific Gas and Electric Company related to the cause and allocation of transmission congestion charges.

143-Federal Energy Regulatory Commission. Docket No. RM01-12-000. On behalf of six different companies including both independent generators, integrated utilities and distribution companies comments on the proposed resource adequacy requirements of the Standard Market Design.

142-United States Bankruptcy Court, Northern District of California, San Francisco Division, Case No. 01-30923 DM. On behalf of Pacific Gas and Electric Dr. Shanker presented testimony addressing issues related to transmission congestion, and the proposed FERC SMD and California MD02 market design proposals.

2002

141-Arbitration. Testimony on behalf of AES Ironwood regarding the operation of a tolling agreement and its interaction with PJM market rules.

140-Federal Energy Regulatory Commission. Docket No. RM01-12-000. Dr. Shanker was asked by the three Northeast ISO's to present a summary of his resource adequacy proposal developed in the Joint Capacity Adequacy Group. This was part of the Standard Market Design NOPR process.

139-Federal Energy Regulatory Commission. Docket No. ER02-456-000. Testimony on behalf of Electric Gen LLC addressing comparability of a contract among affiliates with respect to non-price terms and conditions.

138-Circuit Court for Baltimore City. Case 24-C-01-000234. Testimony on behalf of Baltimore Refuse Energy Systems Company regarding the appropriate implementation and pricing of a power purchase agreement and related Installed Capacity credits.

137-Federal Energy Regulatory Commission. Docket No. RM01-12-000. Comments on the characteristics of capacity adequacy markets and alternative market design systems for implementing capacity adequacy markets.

2001

136-Federal Energy Regulatory Commission. Docket ER02-456-000. Testimony on behalf of Electric Gen LLC regarding the terms and conditions of a power sales agreement between PG&E and Electric Generating Company LLC.

135-Delaware Public Service Commission. Docket 01-194. On behalf of Conectiv et al. Testimony relating to the proper calculation of Locational Marginal Prices in the PJM market design, and the function of Fixed Transmission Rights.

134-Federal Energy Regulatory Commission. Docket No. IN01-7-000 On behalf of Exelon Corporation . Testimony relating to the function of Fixed Transmission Rights, and associated business strategies in the PJM market system.

133-Federal Energy Regulatory Commission. Docket No. RM01-12-000. Comments on the basic elements of RTO market design and the required market elements.

132-Federal Energy Regulatory Commission. Docket No. RT01-99-000. On behalf of the One RTO Coalition. Affadavit on the computational feasibility of large scale regional transmission organizations and related issues in the PJM and NYISO market design.

131-Arbitration. On behalf of Hydro Quebec. Testimony related to the eligibility of power sales to qualify as Installed Capacitywithin the New York Independent system operator.

130-Virginia State Corporation Commission. Case No. PUE000584. On behalf of the Virginia Independent Power Producers. Testimony related to the proposed restructuring of Dominion Power and its impact on private power contracts.

129-United States District Court, Northern District of Ohio, Eastern Division, Case: 1:00CV1729. On behalf of Federal Energy Sales, Inc. Testimony related to damages in disputed electric energy trading transactions.

128-Federal Energy Regulatory Commission. Docket Number ER01-2076-000. Testimony on behalf of Aquila Energy Marketing Corp and

Edison Mission Marketing and Trading, Inc. relating to the implementation of an Automated Mitigation Procedure by the New York ISO.

2000

127-New York Independent System Operator Board. Statement on behalf of Hydro Quebec, U.S. regarding the implications and impacts of the imposition of a price cap on an operating market system.

126-Federal Energy Regulatory Administration. Docket No. EL00-24-000. Testimony on behalf of Dayton Power and Light Company regarding the proper characterization and computation of regulation and imbalance charges.

125-American Arbitration Association File 71-198-00309-99. Report on behalf of Orange and Rockland Utilities, Inc. regarding the estimation of damages associated with the termination of a power marketing agreement.

124-Circuit Court, 15th Judicial Circuit, Palm Beach County, Florida. On behalf of Okeelanta and Osceola Power Limted Partnerships et. al. Analyses related to commercial operation provisions of a power purchase agreement.

1999

123-Federal Energy Regulatory Commission. Docket No. ER00-1-000. Testimony on behalf of TransEnergie U.S. related to market power associated with merchant transmission facilities. Also related analyses regarding market based tariff design for merchant transmission facilities.

122-Federal Energy Regulatory Commission. Docket RM99-2-000. Analyses on behalf of Edison Mission Energy relating to the Regional Transmission Organization Notice of Proposed Rulemaking.

121-Federal Energy Regulatory Commission. Docket No. ER99-3508-000. On behalf of PG&E Energy Trading, analyses associated with the proposed implementation and cutover plan for the New York Independent System Operator.

120-Federal Energy Regulatory Commission. Docket No. EL99-46-000. Comments on behalf of the Electric Power Supply Association relating to the Capacity Benefit Margin.

119-New York Public Service Commission, Case 97-F-1563. Testimony on behalf of Athens Generating Company describing the impacts on pricing and transmission of a new generation facility within the New York Power Pool under the new proposed ISO tariff.

118-JAMS Arbitration Case No. 1220019318 On behalf of Fellows Generation Company. Testimony related to the development of the independent power and qualifying facility industry and related industry practices with respect to transactions between cogeneration facilities and thermal hosts.

117-Court of Common Pleas, Philadelphia County, Pennsylvania. Analyses on behalf of Chase Manhattan Bank and Grays Ferry Cogeneration Partnership related to power purchase agreements and electric utility restructuring.

1998

116-Virginia State Corporation Commission. Case No. PUE 980463. Testimony on behalf of Appomattax Cogeneration related to the proper implementation of avoided cost methodology.

115-Virginia State Corporation Commission. Case No. PUE980462 Testimony on behalf of Virginia Independent Power Producers related to an applicaton for a certificate for new generation facilities.

114-Federal Energy Regulatory Commission. Analyses related to a number of dockets reflecting amendments to the PJM ISO tariff and Reliability Assurance Agreement.

113-U.S. District Court, Western Oklahoma. CIV96-1595-L. Testimony related to anti-competitive elements of utility rate design and promotional actions.

112-Federal Energy Regulatory Commission Dockets No. EL94-45-001 and QF88-84-006. Analyses related to historic measurement of spot prices for as available energy.

111-Circuit Court, Fourth Judicial Circuit, Duval County, Florida. Analyses related to the proper implementation of a a power purchase agreement and associated calculations of capacity payments. (Testimony 1999)

1997

110-United States District Court for the Eastern District of Virginia, CA No. 3:97CV 231. Analyses of the business and market behavior of Virginia Power with respect to the implementation of wholesale electric power purchase agreements.

109-United States District Court, Southern District of Florida, Case No. 96-594-CIV, Analyses related to anti-competitive practices by an electric utility and related contract matters regarding the appropriate calculation of energy payments.

108-Virginia State Corporation Commission. Case No. PUE960296. Testimony related to the restructuring proposal of Virginia Power and associated stranded cost issues.

107-Federal Energy Regulatory Commission. Dockets No. ER97-1523-000 and OA97-470-000, Analyses related to the restructuring of the New York Power Pool and the implementation of locational marginal cost pricing.

106-Federal Energy Regulatory Commission Dockets No. OA97-261-000 and ER97-1082-000 Analyses and testimony related to the restructuring of the PJM Power Pool and the implementation of locational marginal cost pricing.

105-Missouri Public Service Commission. Case No. ET-97-113. Testimony related to the proper definition and rate design for standby, supplemental and maintenance service for Qualifying facilities.

104-American Arbitration Association. Case 79 Y 199 00070 95. Testimony and analyses related to the proper conditions necessary for the curtailment of Qualifying Facilities and the associated calculations of negative avoided costs.

103-Virginia State Corporation Commission. Case Number PUE960117 Testimony related to proper implementation of the differential revenue requirements methodology for the calculation of avoided costs.

102-New York Public Service Commission. Case 96-E-0897, Analyses related to the restructuring of Consolidated Edison Company of New York and New York Power Pool proposed Independent System Operator and related transmission tariffs.

1996

101-Florida Public Service Commission. Docket No. 950110-EI. Testimony related to the correct calculation of avoided costs using the Value of Deferral methodology and its implementation.

100-Federal Energy Regulatory Commission Dockets No. EL94-45-001 and QF88-84-006. Testimony and Analyses related to the estimation of historic market rates for electricity in the Virginia Power service territory.

99-Circuit Court of the City of Richmond Case No. LA-2266-4. Analyses related to the incurrence of actual and estimated damages associated with the outages of an electric generation facility.

98-New Hampshire Public Utility Commission, Docket No. DR96-149. Analyses related to the requirements of light loading for the curtailment of Qualifying Facilities, and the compliance of a utility with such requirements.

97-State of New York Supreme Court, Index No. 94-1125. Testimony related to system planning criteria and their relationship to contract performance specifications for a purchased power facility.

96-United States District Court for the Western District of Pennsylvania, Civil Action No. 95-0658. Analyses related to anti-competitive actions of an electric utility with respect to a power purchase agreement.

95-United States District Court for the Northern District of Alabama, Southern Division. Civil Action Number CV-96-PT 0097-S. Affadavit on behalf of TVA and LG&E Power regarding displacement in wholesale power transactions.

1995

94-American Arbitration Association. Arbitration No. 14 198 012795 H/K. Report concerning the correct measurement of savings resulting from a commercial building cogeneration system and associated contract compensation issues.

93-Circuit Court City of Richmond. Law No. LX-2859-1. Analyses related to IPP contract structure and interpretation regarding plant compensation under different operating conditions.

92-Federal Energy Regulatory Commission. Case EL95-28-000. Affidavit concerning the provisions of the FERC regulations related to the Public Utility Regulatory Policies Act of 1978, and relationship of estimated avoided cost to traditional rate based recovery of utility investment.

91-New York Public Service Commission, Case 95-E-0172, Testimony on the correct design of standby, maintenance and supplemental service rates for qualifying facilities.

90-Florida Public Service Commission, Docket No. 941101-EQ. Testimony related to the proper analyses and procedures related to the curtailment of purchases from Qualifying Facilities under Florida and FERC regulations.

89-Federal Energy Regulatory Commission, Dockets ER95-267-000 and EL95-25-000. Testimony related to the proper evaluation of generation expansion alternatives.

1994

88-American Arbitration Association, Case Number 11 Y198 00352 94 Analyses related to contract provisions for milestones and commercial operation date and associated termination and damages related to the construction of a NUG facility.

87-United States District Court, Middle District Florida, Case No. 94-303 Civ-Orl-18. Analyses related to contract pricing interpretation other contract matters in a power purchase agreement between a qualifying facility and Florida Power Corporation.

86-Florida Public Service Commission Docket 94037-EQ. Analyses related to a contract dispute between Orlando Power Generation and Florida Power Corporation.

85-Florida Public Service Commission Docket 941101-EQ. Testimony and analyses of the proper procedures for the determination and measurement for the need to curtail purchases from qualifying facilities.

84-New York Public Service Commission Case 93-E-0272, Testimony regarding PURPA policy considerations and the status of services provided to the generation and consuming elements of a qualifying facility.

83-Circuit Court for the City of Richmond. Case Number LW 730-4. Analyses of the historic avoided costs of Virginia Power, related procedures and fixed fuel transportation rate design.

82-New York Public Service Commission, Case 93-E-0958 Analyses of Stand-by, Supplementary and Maintenance Rates of Niagara Mohawk Power Corporation for Qualifying Facilities .

81-New York Public Service Commission, Case 94-E-0098. Analyses of cost of service and rate design of Niagara Mohawk Power Corporation.

80-American Arbitration Association, Case 55-198-0198-93, Arbitrator in contract dispute regarding the commercial operation date of a qualifying small power generation facility.

1993

79-U.S. District Court, Southern District of New York Case 92 Civ 5755. Analyses of contract provisions and associated commercial terms and conditions of power purchase agreements between an independent power producer and Orange and Rockland Utilities.

78-State Corporation Commission, Virginia. Case No. PUE920041. Testimony related to the appropriate evaluation of historic avoided costs in Virginia and the inclusion of gross receipt taxes.

77-Federal Energy Regulatory Commission. Docket ER93-323-000. Evaluations and analyses related to the financial and regulatory status of a cogeneration facility.

76-Federal Energy Regulatory Commission. Docket EL93-45-000; Docket QF83-248-002. Analyses related to the qualifying status of cogeneration facility.

75-Circuit Court of the Eleventh Judicial Circuit, Dade County, Florida. Case No. 92-08605-CA-06. Analyses related to compliance with electric and thermal energy purchase agreements. Damage analyses and testimony.

74-Board of Regulatory Commissioners, State of New Jersey. Docket EM 91010067. Testimony regarding the revised GPU/Duquesne 500 MW power sales agreement and associated transmission line.

73-State of North Carolina Utilities Commission. Docket No. E-100 Sub 67. Testimony in the consideration of rate making standards pursuant to Section 712 of the Energy Policy Act of 1992.

72-State of New York Public Service Commission. Cases 88-E-081 and 92-E-0814. Testimony regarding appropriate procedures for the determination of the need for curtailment of qualifying facilities and associated proper production cost modeling and measurement.

71-Pennsylvania Public Utility Commission. Docket No. A-110300f051. Testimony regarding the prudence of the revised GPU/Duquesne 500 MW power sales agreement and associated transmission line.

1992

70-Pennsylvania Public Service Commission. Dockets No. P-870235,C-913318,P-910515,C-913764. Testimony regarding the calculation of avoided costs for GPU/Penelec.

69-Public Service Commission of Maryland. Case No. 8413,8346. Testimony on the appropriate avoided costs for Pepco, and appropriate procedures for contract negotiation.

1991

68-Board of Regulatory Commissioners, State of New Jersey. Docket EM-91010067. Testimony regarding the planned purchase of 500 MW by GPU from Duquesne Light Company.

67-Public Service Commission of Wisconsin. Docket 05-EP-6. State Advance Plan. Testimony on the calculation of avoided costs and the structuring of payments to qualifying facilities.

66-State Corporation Commission, Virginia. Case No. PUE910033. Testimony on class rate of return and rate design for delivery point service. Northern Virginia Electric Cooperative.

65-State Corporation Commission, Virginia. Case No. PUE910048 Testimony on proper data and modeling procedures to be used in the evaluation of the annual Virginia Power fuel factor.

64-State Corporation Commission, Virginia. Case No. PUE910035. Evaluation of the differential revenue requirements method for the calculation of avoided costs.

63-Public Service Commission of Maryland. Case Number 8241 Phase II. Testimony related to the proper determination of avoided costs for Baltimore Gas and Electric.

62-Public Service Commission of Maryland. Case Number 8315. Evaluation of the system expansion planning methodology and the associated impacts on marginal costs and rate design, PEPCO.

1990

61-Public Utility Commission, State of California, Application 90-12-064. Analyses related to the contractual obligations between San Diego Gas and Electric and a proposed QF.

60-Montana Public Service Commission. Docket 90.1.1 Testimony and analyses related to natural gas transportation, services and rates.

59-State Corporation Commission, Virginia. Case No. PUE890075. Testimony on the calculation of full avoided costs via the differential revenue requirements methodology.

58-District of Columbia Public Service Commission. Formal Case 834 Phase II. Analyses and development of demand side management programs and least cost planning for Washington Gas Light.

57-State Corporation Commission, Virginia. Case No. PUE890076. Analyses related to administratively set avoided costs. Determination of optimal expansion plans for Virginia Power.

56-State Corporation Commission, Virginia. Case No. PUE900052. Analyses supporting arbitration of a power purchase agreement with Virginia Power. Determination of expansion plan and avoided costs.

55-Public Service Commission of Maryland. Case Number 8251. Analyses of system expansion planning models and marginal cost rate design for PEPCO.

54-State Corporation Commission, Virginia. Case No. PUE900054. Evaluation of fuel factor application and short term avoided costs.

53-Federal Energy Regulatory Commission. Northeast Utilities Service Company Docket Nos. EC90-10-000, ER90-143-000, ER90-144-000,ER90-145-000 and El90-9-000. Analyses of the implications of Northeast Utilities and Public Service Company of New Hampshire merger on electric supply and pricing.

52-Public Service Commission of Maryland. Re: Southern Maryland Electric Cooperative Inc. Contract with Advanced Power Systems, Inc. and PEPCO.

51-Puerto Rico Electric Power Authority, Office of the Governor of Puerto Rico. Independent evaluation for PREPA of avoided costs and the evaluation of competing QF's.

50-State Corporation Commission, Virginia. Case No. PUE890041. Testimony on the proper determination of avoided costs with respect to Old Dominion Electric Cooperative.

1989

49-Oklahoma Corporation Commission. Case Number PUD-000586. Analyses related to system planning and calculation of avoided costs for Public Service of Oklahoma.

48-Virginia State Corporation Commission. Case Number PUE890007. Testimony relating to the proper determination of avoided costs to the certification evaluation of new generation facilities.

47-Federal Energy Regulatory Commission. Docket RP85-50. Analyses of the gas transportation rates, terms and conditions filed by Florida Gas Transmission.

46-Circuit Court of the Fifth Judicial Circuit, Dade County, Florida. Case No. 88-48187. Analyses related to compliance with electric and thermal energy purchase agreements.

45-Florida Public Service Commission. Docket 880004-EU. Analysis of state wide expansion planning procedures and associated avoided unit.

1988

44-Virginia State Corporation Commission. Case No. PUE870081. Testimony on the implementation of the differential revenue requirements avoided costmethodology recommended by the SCC Task Force.

43-Virginia State Corporation Commission. Case No. PUE880014. Testimony on the design and level of standby, maintenance and supplemental power rates for qualifying facilities.

42-Virginia State Corporation Commission. Case No. PUE99038. Testimony on the natural gas transportation rate design and service provisions.

41-Montana Public Service Commission. Docket 87.8.38. Testimony on Natural Gas Transmission Rate Design and Service Provisions.

40-Oklahoma Corporation Commission. Cause Pud No. 00345. Testimony on estimation and level of avoided cost payments for qualifying facilities.

39-Florida Public Service Commission. Docket No.8700197-EI. Testimony on the methodology for establishing non-firm load service levels.

38-Arizona Corporation Commission. Docket No. U-1551-86-300. Analysis of cost-of-service studies and related terms and conditions for material gas transportation rates.

1987

37-Virginia State Corporation Commission. Case No. PUE870028. Analysis of Virginia Power fuel factorapplication and relationship to avoided costs.

36-District of Columbia Public Service Commission. Formal Case No. 834 Phase II. Analysis of the theory and empirical basis for establishing cost effectiveness of natural gas conservation programs.

35-Virginia State Corporation Commission. Case No. PUE860058. Testimony on the relationship of small power producers and cogenerators to the need for power and new generation facilities.

34-Virginia State Corporation Commission. Case No. PUE870025. Testimony addressing the proper design of rates for standby, maintenance and supplement power sales to cogenerators.

33-Florida Public Service Commission. Docket No. 860004 EU. Testimony in the 1986 annual planning hearing on proper system expansion planning procedures.

1986

32-Florida Public Service Commission. Docket No. 860001 EI-E. Testimony on the proper methodology for the estimation of avoided O&M costs.

31-Florida Public Service Commission. Docket No. 860786-EI. Testimony on the proper economic analysis for the evaluation of self-service wheeling.

30-U.S. Bankruptcy Court, District of Ohio. Testimony on capabilities to develop and operate wood-fired qualifying facility.

29-Public Utility Commission, New Hampshire Docket No. DR-86-41. Testimony on pricing and contract terms for power purchase agreement between utility and QFs. (Settlement Negotiations)

28-Florida Public Service Commission, Docket No. 850673-EU. Testimony on generic issues related to the design of standby rates for qualifying facilities.

27-Virginia State Corporation Commission. Case No. 860024. Generic hearing on natural gas transportation rate design and tariff terms and conditions.

26-Virginia State Corporation Commission. Commonwealth Gas Pipeline Corporation. Case No. 850052. Testimony on natural gas transportation rate design and tariff terms and conditions.

25-Bonneville Power Administration. Case No. VI86. Testimony on the proposed Variable Industrial Power Rate for Aluminum Smelters.

24-Virginia Power. Case No. PUE860011. Testimony on the proper ex post facto valuation of avoided power costs for qualifying facilities.

23-Florida Public Service Commission. Docket No. 850004 EU. Testimony on proper analytic procedures for developing a statewide generation expansion plan and associated avoided unit.

1985

22-Virginia Natural Gas. Docket No. 85-0036. Testimony and cost of service procedures and rate design for natural gas transportation service.

21-Arkansas Louisiana Gas. Louisiana Docket No. U-16534. Testimony on proper cost of service procedures and rate design for natural gas service.

20-Connecticut Light and Power. Docket No. 85-08-08.
Assist in the development of testimony for industrial natural gas transportation rates.

19-Oklahoma Gas and Electric. Cause 29727. Testimony and system operations and the development of avoided cost measurements as the basis for rates to qualifying facilities.

18-Florida Public Service Commission. Docket No. 840399EU. Testimony on self-service wheeling and business arrangements for qualifying facilities.

17-Virginia Electric and Power Company. General Rate application No. PUE840071. Testimony on proper rate design procedures and computations for development of supplemental, maintenance and standby service for cogenerators.

16-Virginia Electric and Power Company. Fuel Factor
Proceeding No. PUE850001. Testimony on the proper use of the PROMOD model and associated procedures in setting avoided cost energy rates for cogenerators.

15-New York State Public Service Commission. Case No. 28962. Development of the use of multi-area PROMOD models to estimate avoided energy costs for six private utilities in New York State.

14-Vermont Rate Hearings on Payments to Small Power Producers. Case No. 4933. Testimony on proper assumptions, procedures and analysis for the development of avoided cost rates.

1984

13-Northern Virginia Electric Cooperative. Case No. PUE840041. Testimony on class cost-of-serviceprocedures, class rate of return and rate design.

12-BPA 1985 Wholesale Rate Proceedings. Analysis of Power 1985 Rate Directives. Testimony on theory and implementation of marginal cost rate design.

11-Virginia Electric Power Company. Application to Revise Rate Schedule 19 -- Power Purchases from Cogeneration and Small Power Production Qualifying Facilities. Case No. PUE830067. Testimony on proper PROMOD modeling procedures for power purchases and properties of PROMOD model.

10-Northern Virginia Electric Cooperative. Case No. PUE840041. Testimony on class cost-of-service procedures, class rate of return and rate design.

9-BPA 1985 Wholesale Rate Proceedings. Analysis of Power 1985 Rate Directives. Testimony on the theory and implementation of marginal cost rate design, financial performance of BPA; interactions between rate design, demand, system expansion and operation.

1983

8-Northern Virginia Electric Cooperative. Case No. PUE830040. Testimony on class cost-of-service procedures, class rate of return and rate design.

7-Vermont Rate Hearings to Small Power Producers. No.4804. Testimony on proper use and application of production costing analyses to the estimation of avoided costs.

6-BPA Wholesale Rate Proceedings. Testimony on the theory and implementation of marginal cost rate design; financial performance of BPA; interactions between rate design, demand, system expansion and operation.

5-Idaho Power Company, PUC-U-1006-185. Analysis of system planning/production costing model play of hydro regulation and associated energy costs.

1982

4-Generic Conservation Proceedings, New York State. Case No. 18223. Testimony on the economic criteria for the evaluation of conservation activities; impacts on utility financial performance and rate design.

3-PEPCO, Washington Gas Light. DCPSC-743. Financial evaluation of conservation activities; procedures for cost classification, allocation; rate design.

2-PEPCO, Maryland PSC Case Nos. 7597-I, 7597-II, and 7652. Testimony on class rates of return, cost classification and allocation, power pool operations and sales.

1981

1-Pacific Gas and Electric. California PSC Case No. 60153. Testimony on rate design; class cost-of-service and rate of return.

Previous testimony before the District of Columbia Public Service Commission, Maryland PSC, New York Public Service Commission, FERC; Economic Regulatory Administration