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**VIA ELECTRONIC FILING**

Mr. Joel H. Peck, Clerk  
c/o Document Control Center  
State Corporation Commission  
Tyler Building – First Floor  
1300 East Main Street  
Richmond, Virginia 23219

**RE: *In re: Application of Appalachian Power Company for a 2014 biennial review of the rates, terms and conditions for the provision of generation, distribution and transmission services pursuant to § 56-585.1 A of the Code of Virginia***

**Case No. PUE-2014-00026**

Dear Mr. Peck:

Attached for filing in the above-referenced matter is the Direct Testimony and nine Attachments of Karl R. Rabago, which is being filed on behalf of the Chesapeake Climate Action Network, Appalachian Voices, and the Virginia Chapter of the Sierra Club (collectively, "Environmental Respondents"). This Testimony and the Attachments are being filed electronically, pursuant to the Commission's Electronic Document Filing system.

If you should have any questions regarding this filing, please contact me at (434) 977-4090.

Sincerely,

A handwritten signature in black ink that reads "Cale Jaffe".

Cale Jaffe, Southern Environmental Law Center

cc: Parties on Service List  
Commission Staff

**DIRECT TESTIMONY OF KARL R. RÁBAGO  
ON BEHALF OF ENVIRONMENTAL RESPONDENTS**

**BEFORE THE  
STATE CORPORATION COMMISSION OF VIRGINIA**

**APPLICATION OF APPALACHIAN POWER COMPANY  
FOR A 2014 BIENNIAL REVIEW OF THE RATES, TERMS,  
AND CONDITIONS FOR THE PROVISION OF GENERATION,  
DISTRIBUTION, AND TRANSMISSION SERVICES  
PURSUANT TO § 56-585.1 A OF THE CODE OF VIRGINIA**

**CASE NO. PUE-2014-00026**

**AUGUST 6, 2014**

1 **Introduction**

2 Q. **Please state your name, business name and address.**

3 A. My name is Karl R. Rábago. I am the principal of Rábago Energy LLC, a New York  
4 limited liability company. My office is located at 44 Briary Road, Dobbs Ferry, New  
5 York.

6 Q. **On whose behalf are you testifying?**

7 A. I am testifying on behalf of the Chesapeake Climate Action Network, Appalachian  
8 Voices, and the Virginia Chapter of the Sierra Club (collectively, “Environmental  
9 Respondents”), who are being represented by the Southern Environmental Law Center  
10 (“SELC”).

11 Q. **Please summarize your experience and expertise in the field of electric utility  
12 regulation and the renewable energy field.**

13 A. I have worked for more than 20 years in the electricity industry and related fields. Of  
14 note, my previous employment experience includes Commissioner with the Public Utility  
15 Commission of Texas, Deputy Assistant Secretary with the U.S. Department of Energy,  
16 Vice President with Austin Energy, and Director of Regulatory Affairs with AES  
17 Corporation. I am currently the Executive Director of the Pace Energy and Climate  
18 Center, at the Pace Law School in White Plains, New York. My testimony today,  
19 however, has been developed exclusively in my role as principal of Rábago Energy LLC,  
20 and is unrelated to my work at Pace Law School.<sup>1</sup>

21 Q. **Have you previously testified before the Virginia State Corporation Commission or  
22 other regulatory agencies?**

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<sup>1</sup> I have included a detailed resume as Attachment KRR-1.

1 A. Yes. In the past two years, since forming Rábago Energy LLC, I have submitted  
2 testimony, comments, or presentations in proceedings in Virginia, Georgia, Minnesota,  
3 Michigan, Missouri, Louisiana, North Carolina, Kentucky, Arizona, Florida, and the  
4 District of Columbia.<sup>2</sup>

5 Q. **Please describe your experience with solar energy and regulation.**

6 A. I have more than 20 years of experience working with the regulatory, technology, and  
7 business issues associated with solar energy. As a public utility commissioner in the early  
8 1990s, I worked with utilities in Texas to craft line extension rules and supported utility  
9 pilot and demonstration projects in Texas. I worked with stakeholders around the country  
10 as NARUC Energy Conservation Committee Vice Chair to establish the Photovoltaic  
11 Collaborative Market Project to Accelerate Commercial Technology (“PV-COMPACT”),  
12 a supporting organization to the Utility PhotoVoltaic Group (“UPVG”). As Deputy  
13 Assistant Secretary at the U.S. Department of Energy, I was responsible for the solar  
14 photovoltaic research, development, and demonstration, and supervised research  
15 programs conducted at the National Renewable Energy Laboratory, Sandia National  
16 Laboratory, universities, and other organizations. I have testified before and worked with  
17 Congress to grow solar research programs funded at the Department of Energy. While  
18 with CH2M HILL, I co-authored electricity industry restructuring studies for both  
19 Colorado and Alaska that addressed, among many other things, potential for solar energy  
20 development in those states. At Austin Energy, the 8<sup>th</sup> largest municipal utility located in  
21 Austin, Texas, I led the utility’s \$5 million annual capital program for solar project  
22 development on public buildings, and managed commercial and residential rebate and net

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<sup>2</sup> A list of my appearances before state regulatory commissions is set forth in Attachment KRR-2.

1 metering programs as well. While there, I developed a new Performance Based Incentive  
2 program for commercial customers, and created the award winning “Value of Solar  
3 Tariff” now used in Austin for residential customers. I worked with the Minnesota  
4 Department of Commerce, Public Utilities Commission, and legislature to secure  
5 adoption and successful implementation of a Value of Solar tariff alternative to net  
6 metering in that state. Working with the Interstate Renewable Energy Council (“IREC”),  
7 I co-authored “A Regulator’s Guidebook: Calculating the Benefits and Costs of  
8 Distributed Solar Generation.”

9 **Q. Please describe the IREC Report and its relevance to your recommendations.**

10 A. In October 2013, IREC published a paper authored by Jason Keyes and myself, entitled  
11 “A Regulator’s Guidebook: Calculating the Benefits and Costs of Distributed Solar  
12 Generation” (“Guidebook”).<sup>3</sup> The Guidebook draws on many distributed solar valuation  
13 studies to recommend a framework for a methodology to perform a benefit/cost  
14 evaluation for distributed solar. The Guidebook’s recommended approach differs greatly  
15 from the incomplete approach taken by the Appalachian Power Company (“Appalachian  
16 Power” or the “Company”). Key principles underlying the methodology that my co-  
17 author and I recommended include reliance on data, transparency, reasonable evaluation  
18 of costs and benefits, and consistency in approach.

19 **Q. What materials did you review in preparing this testimony?**

20 A. I reviewed applicable sections of the Code of Virginia, the Company’s filings in this  
21 docket, and the Company’s responses to interrogatories and requests for information from  
22 Environmental Respondents and other parties in this docket. Several of the interrogatory

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<sup>3</sup> I also serve on the Board of Directors for IREC. A full list of Board members is available online at <http://www.irecusa.org/about-irec/board-of-directors/>.

1 responses from the Company are included with my testimony. They can be found in  
2 Attachments KRR-3 through KRR-9. In addition, I reviewed my previous testimony and  
3 generally available evidence, as cited below, relating to solar energy technology  
4 performance, valuation, and market conditions.

5 **Q. Do you have any business relationships with the Company?**

6 **A.** I do not have any direct business relationships with the Company, its parent company, or  
7 any affiliates. I sit as Chair of the Board of Directors for the Center for Resource  
8 Solutions (“CRS”). CRS is a not-for-profit California corporation that offers certification  
9 services to green pricing and green power products throughout the U.S., under the  
10 certification mark called the “Green-e.” Certain AEP subsidiaries offer products that are  
11 certified under the Green-e Energy program, and pay a fee to the CRS for use of the  
12 certification mark. I have no direct involvement with the certification of programs under  
13 the Green-e Energy program and I will have no involvement with matters directly  
14 relating to product certification. Consistent with the conflict of interest policy adopted by  
15 the CRS Board, I have notified my fellow board members of my participation in this  
16 proceeding as an expert witness.

17 **PURPOSE AND SUMMARY OF RECOMMENDATIONS**

18 **Q. What is the purpose of your testimony?**

19 **A.** My testimony explains why the Company’s proposed standby charge would constitute an  
20 unjust, unreasonable, and improper discriminatory rate charged on solar customer-  
21 generators. The proposed charge, which would be for customer-generators with a  
22 renewable generating capacity that is greater than 10 kW and less than or equal to 20 kW,  
23 is inadequately supported and fails to meet the requirements of Virginia Code § 56-594 F.

1 Under the statute, the Company must prove that its proposed charge would recover “*only*  
2 the portion of the supplier’s infrastructure costs that are properly associated with serving”  
3 solar customer-generators (emphasis added). Because the Company has failed to meet its  
4 burden here, the charge, if approved, would be nothing more than a punitive tariff  
5 imposed on one class of customers. This is why some opponents of solar standby charges  
6 have labeled them as taxes on the sun.

7 **Q. As a result of your analysis, what are your recommendations to the Commission?**

8 **A.** I recommend that the Commission determine that the Company has failed in meeting its  
9 burden to produce and substantiate costs that support its proposed standby charge.

10 **APPLICABLE LEGAL AND REGULATORY STANDARDS**

11 **Q. What standards apply to determine the reasonableness of the Company’s proposed**  
12 **standby charge?**

13 **A.** The proposed standby charge is governed by Virginia Code § 56-594 F, which states, in  
14 relevant part: “The Commission shall approve a supplier’s proposed standby charge  
15 methodology if it finds that the standby charges collected from all such eligible customer-  
16 generators and eligible agricultural customer-generators allow the supplier to recover  
17 only the portion of the supplier’s infrastructure costs that are properly associated with  
18 serving such eligible customer-generators or eligible agricultural customer-generators.”  
19 In my opinion, the law requires a narrowly-tailored charge that has been explicitly  
20 demonstrated to be tied to the specific costs that are properly associated with the cost of  
21 service for customer-generators.

22 Even more, the Company agrees when it comes to a generation-related standby  
23 charge or credit. In response to Staff Interrogatory 34-402, Appalachian Power states,

1 “[t]he Company’s current thinking is that a generation related standby charge should be  
2 developed using cost causation principles.” The Company then explains that it is not  
3 proposing a standby charge or credit to customer-generators because it simply lacks the  
4 data. In response to Staff Interrogatory 34-401, the Company states, “Due to the limited  
5 number of qualifying customer-generators, the Company is still in the process of  
6 evaluating the information necessary to develop a generation related standby charge and  
7 can not provide a specific length of time to develop a generation related standby charge.”

8 The Company completely fails to meet this standard when seeking to establish a  
9 T&D standby charge. In its answer to Staff Interrogatory 52-525, which asked about  
10 distinctions between the distribution-related standby charge and the transmission-related  
11 standby charge, the Company responded that it “is not in a position to determine whether  
12 the impacts of eligible customer generators taken as [a] whole have a positive or negative  
13 impact to the distribution cost of service.”<sup>4</sup> But any standby charge proposed under  
14 Virginia Code § 56-594 F must adhere to cost causation principles under the plain  
15 reading of that provision, because it is the Company’s job to show that it is collecting  
16 “only” what it is owed.

17 **Q. Does the Company meet its burden of producing evidence of costs associated with**  
18 **customer-generators and of proving that it only seeks to charge customer-**  
19 **generators for those costs?**

20 **A.** No. As I will explain, the entire foundation for the proposed standby charge is an un-  
21 studied and unproven assumption that customer-generators create infrastructure costs—in  
22 this application, transmission and distribution (“T&D”) costs—exactly as if they were not

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<sup>4</sup> The responses to Staff Interrogatories 34-402, 52-525, and 34-401 are included as Attachments KRR-3, KRR-4, and KRR-5, respectively.

1 hosting distributed generation facilities, and that they are avoiding paying all of their fair  
2 T&D costs. In response to interrogatories from the Environmental Respondents, the  
3 Company provides no documentation that it measured, studied, or evaluated any actual or  
4 modeled data regarding T&D costs for solar customer-generators in the Company’s  
5 service territory. As a result, the Company has not met its burden of showing which  
6 infrastructure costs are “properly associated with serving such eligible customer-  
7 generators” as Virginia law requires.

8 **Q. Do you find that the Company’s approach is consistent with the rest of Virginia**  
9 **Code § 56-594, which regulates net energy metering?**

10 **A.** No. Virginia Code § 56-594 defines net energy metering as “measuring the difference,  
11 over the net metering period, between (i) *electricity* supplied to an eligible customer-  
12 generator or eligible agricultural customer-generator from the electric grid and (ii) the  
13 *electricity* generated and fed back to the electric grid by the eligible customer-generator  
14 or eligible agricultural customer-generator” (emphasis added). As explained below, the  
15 Company’s methodology proposes to use only the *energy* value of customer-generator  
16 electricity, as represented by the AEP average LMP, as the foundation for its proposed  
17 standby charge, and not the full costs and benefits of the electricity flows (including, for  
18 example, line losses and transmission and distribution capacity and energy) and the  
19 additional generation capacity provided by net metered operations in the Company’s  
20 service territory. This is an unreasonably narrow and unsubstantiated foundation for  
21 evaluating the cost to serve customer generators and the appropriate magnitude, if any, of  
22 a standby charge. Simply stated, energy is only one component of electricity service, and  
23 the Code does not limit the net metering calculation to energy alone.

1 Q. **Are there other provisions of Virginia law that you considered?**

2 A. Yes. Virginia law contains additional provisions that govern the setting of rates. Virginia  
3 Code § 56-234 requires that utilities furnish “reasonably adequate service and facilities *at*  
4 *reasonable and just rates.*”<sup>5</sup> The Code notes that rates are just and reasonable only if:

5 (1) the public utility has demonstrated that such rates, tolls, charges or  
6 schedules in the aggregate provide revenues *not in excess of the aggregate actual*  
7 *costs* incurred by the public utility in serving customers within the jurisdiction of  
8 the Commission, including such normalization for nonrecurring costs and  
9 annualized adjustments for future costs as the Commission finds reasonably can  
10 be predicted to occur during the rate year, and a fair return on the public utility’s  
11 rate base used to serve those jurisdictional customers, which return shall be  
12 calculated in accordance with § 56-585.1 for utilities subject to such section;

13 \* \* \*

14 (2) *the public utility has demonstrated that such rates, tolls, charges or*  
15 *schedules contain reasonable classifications of customers.*”<sup>6</sup>

16 Virginia law also requires that utilities “charge uniformly therefor all persons,  
17 corporations or municipal corporations using such service under like conditions.”<sup>7</sup> These  
18 additional provisions of Virginia law establish the foundational requirements that utilities  
19 proposing rates must meet a burden of demonstrating that a rate is cost-based, only  
20 applied to reasonably-classified customers, and not excessive.

21 Q. **In your opinion, is the Company’s proposal for a standby charge cost-based, applied**  
22 **to reasonably-classified customers, and not excessive?**

23 A. No. I will explain the shortcomings in the Company’s proposal in the following section.

24 Q. **Does federal law and regulation provide additional guidance that the Commission**  
25 **should consider in evaluating the Company’s proposal?**

<sup>5</sup> Va. Code Ann. § 56-234 A (emphasis added).

<sup>6</sup> Va. Code Ann. § 56-235.2 (emphasis added).

<sup>7</sup> Va. Code Ann. § 56-234 B.

1 A. Yes. Under the federal Public Utility Regulatory Policy Act of 1978 (“PURPA”) and  
2 related federal regulations, utilities bear a responsibility to charge only just and  
3 reasonable rates to “qualifying facilities,” such as solar customer-generators that would  
4 be impacted by the Company’s proposed standby charge.

5 Federal Energy Regulatory Commission (“FERC”) regulations implementing  
6 PURPA require that utilities sell power to qualifying facilities, and that the rates for such  
7 sales “(i) . . . be just and reasonable and in the public interest; and (ii) . . . not discriminate  
8 against any qualifying facility in comparison to rates for sales to other customers served  
9 by the electric utility.”<sup>8</sup> Utilities are also required to offer back-up power to qualifying  
10 facilities, on the condition that the rates for sales of such back-up or maintenance power  
11 cannot be “based upon an assumption (*unless supported by factual data*) that forced  
12 outages or other reductions in electric output by all qualifying facilities on an electric  
13 utility’s system will occur simultaneously, or during the system peak, or both....”<sup>9</sup>

14 The Supreme Court has stated that power sales to qualifying facilities must follow  
15 traditional utility ratemaking principles—namely, cost-of-service rate regulation. *Am.*  
16 *Paper Inst. Inc. v. Am. Elec. Power Serv. Corp.*, 461 U.S. 402, 415 (1983) (citing H.R.  
17 Rep. No. 95-1750, at 98 (1978) (Conf. Rep.)); *see also FERC Order No. 69*, 45 Fed. Reg.  
18 12,214, 12,228 (Feb. 25, 1980) (“This section contemplates formulation of rates on the  
19 basis of traditional ratemaking (*i.e.*, cost-of-service) concepts.”). The House conference  
20 report cited by the Supreme Court elaborated on this principle:

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<sup>8</sup> 18 C.F.R. § 292.305(a) (2014); *see also* 16 U.S.C. § 824d(a) (2012) (“All rates and charges made, demanded, or received by any public utility for or in connection with the transmission or sale of electric energy subject to the jurisdiction of the Commission, and all rules and regulations affecting or pertaining to such rates or charges shall be just and reasonable....”).

<sup>9</sup> 18 C.F.R. § 292.305(c)(1) (emphasis added).

1 Here the phrase “just and reasonable” is intended to refer to traditional  
2 utility ratemaking concepts. The conferees do not intend that the  
3 cogenerator or small power producer pay any more or any less than is  
4 otherwise just and reasonable in terms of the utility receiving the  
5 reasonable rate of return for providing service to those kinds of users.  
6 However, unreasonable rate structure impediments, such as  
7 unreasonable hook up charges or other discriminatory practices, would  
8 not be allowed.

9 The conferees use the phrase “not discriminate against  
10 cogenerators or small power producers” because they were concerned  
11 that the electric utility’s obligations to purchase and sell under this  
12 provision might be circumvented by the charging of unjust and non-  
13 cost based rates for power solely to discourage cogeneration or small  
14 power production.

15  
16 H.R. Rep. No. 95-1750, at 98 (1978) (Conf. Rep.).

17  
18 For qualifying facilities with a generation capacity of 100 kW or less, FERC  
19 regulation requires that each utility have a standard rate of purchase.<sup>10</sup> This provision  
20 encompasses the net-metering-eligible customers under Virginia law, including  
21 customers generating between 10-20 kW that are subject to standby charges.<sup>11</sup>

## 22 THE COMPANY’S PROPOSAL

23 **Q. How did the Company construct its proposed standby charge and what were the**  
24 **flaws in the Company’s approach?**

25 **A.** The Company used a simplistic and flawed methodology in devising its proposed standby  
26 charge. Step 1: The Company made a fundamental, unsupported assumption about the  
27 costs and benefits of customer-generator electricity—that is, that solar electricity only has  
28 energy value equal to the AEP average locational marginal price (“LMP”).

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<sup>10</sup> 18 C.F.R. § 292.304(c)(1) (2014).

<sup>11</sup> Va. Code Ann. § 56-594 B, F.

1           Step 2: The Company assumed without justification that for a customer in  
2           Appalachian Power’s service territory, his or her solar PV system has a peak demand  
3           exactly coincident with that depicted in a graph posted in an “issue brief” from an  
4           industry trade group, which proposes to estimate the typical energy production and  
5           consumption for a generic solar PV customer without reference to any geographic region  
6           of the country.

7           Step 3: Following the first two assumptions, the Company assumed that customer-  
8           generators are fully responsible and therefore should be fully charged for class-allocated  
9           transmission and distribution charges as if they had no generation facilities operating on  
10          their premises. To make this jump, the Company had to assume that customer-generators’  
11          solar facilities contribute absolutely no value whatsoever to transmission and distribution  
12          services.

13          Stacked neatly on this house of flawed assumptions, the Company then simply  
14          performed arithmetic calculations using data that is in no way tied to actual costs imposed  
15          by customer-generators, and used those unsupported calculations to propose a  
16          distribution standby charge of \$1.94 per kilowatt per month, and a transmission standby  
17          charge of \$1.83 per kilowatt per month.

18    **Q. As to Step 1, how does the Company calculate the costs and benefits of electricity**  
19    **supplied by customer-generators?**

20    **A.** The total basis for the Company’s calculation of the costs and benefits of electricity lies  
21    in the fundamental—and fundamentally flawed—assumption that net metering credit for  
22    customer-generated electricity is a subsidy to the extent that it exceeds the AEP LMP  
23    Zone average price of energy. As Company witness Sebastian states (at 6), “[t]he value of

1 this net metering energy equates to over 11 cents a kilowatt hour, while the price of  
2 generation sold in the PJM market at the AEP LMP Zone averaged about 3.5 cents a  
3 kilowatt hour in 2013. Clearly the customer is receiving a benefit that far exceeds the  
4 value of energy generation.” When asked to substantiate the assumption, the Company  
5 offered as a justification, in its response to SELC Interrogatory 1-006, only that “11 cents  
6 per kilowatt hour is greater than 3.5 cents per kilowatt hour.”

7 Moreover, the Company responds to SELC Interrogatory 1-006 by conceding that  
8 “[it] has not attempted to quantify value to the utility and its customer due to avoided  
9 distribution or transmission costs/investments created by customer owned solar energy  
10 resource operations.” The Company reaffirmed the fact that it had not done any studies to  
11 quantify the portion of its infrastructure costs that would be properly associated with  
12 serving renewable customer-generators in response to the Alliance For Solar Choice’s  
13 interrogatory, ASC 2-004, which asked for “*all* studies that [the Company] performed or  
14 relied upon in assessing the impact of net metered renewable generation upon your  
15 distribution and transmission system” (emphasis added).<sup>12</sup>

16 Instead of doing the necessary work to quantify those costs and benefits as  
17 required by Virginia law, the Company offers a series of unsubstantiated assumptions  
18 about solar’s “limited opportunity to reduce the capacity of the distribution network,” and  
19 dismisses solar’s value as “highly dependent on the location of the distributed  
20 resource.”<sup>13</sup> In other words, the Company proposes to impose a charge on renewable  
21 energy generators and qualifying facilities solely on the basis of suppositions, and not  
22 upon any fact-specific analysis of the costs and value of solar in its own service territory.

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<sup>12</sup> The Company’s response to SELC Interrogatory 1-006 is included as Attachment KRR-6. The Company’s response to ASC Interrogatory 2-004 is included as Attachment KRR-7.

<sup>13</sup> See Attachment KRR-6.

1 Q. **Why are the Company’s assumptions flawed as they relate to the costs and benefits**  
2 **of electricity produced by solar customer generators?**

3 A. First, the Company candidly concedes in its application and in response to specific  
4 interrogatories that it has no data or analysis to support its conclusion that customers are  
5 receiving an un-earned benefit for net metering credit in excess of the AEP LMP Zone  
6 average price in 2013. This is a surprising failure on the part of the Company, since  
7 Virginia Code § 56-594 permits the Company to recover “*only* the portion of the  
8 supplier’s infrastructure costs that are properly associated with serving such eligible  
9 customer-generators or eligible agricultural customer-generators” (emphasis added). The  
10 burden is on the Company to prove that its proposed solar standby charge is collecting  
11 the appropriate costs and nothing more. This burden is on top of the more general  
12 requirement in Virginia Code § 56-235.2, which requires the utility to “demonstrate[] that  
13 such rates, tolls, charges or schedules in the aggregate provide revenues *not in excess of*  
14 *the aggregate actual costs* incurred by the public utility in serving customers...”  
15 (emphasis added). Overall, the lack of data is a critical omission, conceded by the  
16 Company, which should require the Commission to reject the proposed standby charge.

17 Second, the Company provides no explanation as to why the 2013 AEP LMP  
18 Zone average price reflects the full value of solar electricity. In effect, the Company is  
19 assuming that the avoided cost value of customer-generator electricity is the AEP LMP  
20 Zone price, an assumption inconsistent with the Company’s Virginia and federal law  
21 obligations to set a reasonable rate for avoided costs from qualifying facilities, and to  
22 ensure that the basis of any proposed standby charge is narrowly tailored and expressly  
23 tied to costs imposed by the customer-generator. The Company is essentially trying to

1 make an end run on its obligation to assess only cost-based rates and to calculate true  
2 avoided costs.

3 **Q. What are the consequences of the Company's assumptions as applied in this**  
4 **proposed charge?**

5 A. The result of the Company's unsubstantiated approach is a proposal for standby charges  
6 that has failed to even attempt to evaluate the benefits the solar customer-generators  
7 provide to the Company.

8 **Q. What category of benefits from solar generation should be assessed?**

9 A. The Company's standby charge proposal is based, as discussed above, on the  
10 unsubstantiated assumption that the only benefit of customer generation is displaced  
11 energy at the AEP LMP Zone average value of "about 3.5 cents [per] kilowatt hour." In  
12 making this assumption, the Company never considered several generation-side and T&D  
13 benefits of solar, such as:

- 14 • Energy savings based on not having to purchase or generate energy from the most  
15 expensive units in the Company's system at peak or near-peak times of the day;
- 16 • Reduced system losses based on a reduction in marginal losses;
- 17 • Generation capacity savings – the ability to defer or avoid the need for new,  
18 expensive fossil fuel-fired power plants – from using effective load carrying  
19 capability or similar analysis;
- 20 • Reduced strain on the Company's transmission and distribution capacity;
- 21 • Grid support services, which would require an evaluation of the ancillary services  
22 value of solar;
- 23 • Financial benefits, including a fuel price hedge and market price response benefits;

- 1 • Grid security benefits from increased stability and resiliency on the grid;
- 2 • Quantifiable environmental benefits, such as reduced carbon intensity in the
- 3 Company's Virginia service territory and other residual (beyond environmental
- 4 compliance) benefits; and
- 5 • Quantifiable societal benefits, such as increased tax revenues and economic
- 6 development wherever solar installations occur.

7

8 **Q. Aren't many of these benefits found with any generation investment? These factors**  
9 **aren't part of the evaluation in granting or denying a CPCN for a new gas-fired**  
10 **power station. Why should they be considered when evaluating the benefits of**  
11 **customer-owned solar generation?**

12 A. To differing degrees, different types of generation resources provide many of these same  
13 benefits. Comprehensively addressing these benefits, and the embedded or alternative  
14 resource costs that they can help the utility avoid, is required in order to make more  
15 informed and economically efficient resource planning and deployment decisions. I have  
16 used value of solar analysis as a utility executive at Austin Energy to inform resource  
17 pricing decisions, incentive-setting decisions, and rate design decisions. This kind of  
18 analysis should be part of the integrated resource planning processes that precede a  
19 CPCN application, and in the full evaluation of avoided costs, as I previously described.

20 My point in this testimony is that the consideration of the full range of benefits  
21 and costs associated with customer behavior such as self-generation with solar PV is also  
22 essential to the proper design of a standby charge proposed under the justification of  
23 holding non-solar customers harmless. That is, rates applicable to distributed solar

1 customers should not improperly discriminate against the solar customer, the non-solar  
2 customer, or the utility. Actual full cost and benefit analysis is the best defense against  
3 such an undesirable result, just as it informs economically efficient ratemaking and  
4 resource planning decisions.

5 Even more, it is specifically required in the context of a solar standby charge  
6 under Virginia Code § 56-594, which states that the utility may “only” recover the costs  
7 that are properly associated with serving eligible customer-generators.

8 **Q. What costs should be assessed?**

9 A. As discussed in the Interstate Renewable Energy Council’s Guidebook<sup>14</sup> for calculating  
10 the costs and benefits of distributed solar generation, I believe it is appropriate to assess  
11 utility costs as well. These costs include direct utility costs and may include an  
12 assessment of lost revenues. I note that assumptions about administrative costs (such as  
13 billing costs) should reflect automated billing systems. Interconnection costs incurred  
14 solely by the customer should not be included. And finally, I reiterate that any integration  
15 costs should not be based on unrealistic assumptions about solar generation penetration  
16 rates.

17 **Q. Are there any recent precedents in other states to support adopting this kind of**  
18 **analysis, which consider the benefits and costs that you have outlined?**

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<sup>14</sup> Environmental Respondents have copies of the IREC Guidebook, which will be made available to all parties, the Commission Staff, and the Commission at the evidentiary hearing beginning on September 16, 2014. If the parties or the Commission would like copies of the Guidebook in advance of the hearing, Environmental Respondents are ready and able to provide it via U.S. mail or electronic delivery.

1 A. Yes. In 2013, the State of Minnesota enacted a law that required the Minnesota  
2 Department of Commerce to develop a methodology for valuing solar.<sup>15</sup> After a widely-  
3 praised stakeholder process that was transparent and that engaged dozens of utilities,  
4 business and government representatives, advocates and concerned citizens, the  
5 Minnesota Department of Commerce published its solar valuation methodology on  
6 January 30, 2014.

7 **Q. What are the major features of the Minnesota Value of Solar Methodology?**

8 A. Key aspects of the methodology include:

- 9 • A standard solar photovoltaic rating convention;
- 10 • Methods for creating an hourly solar production time-series, representing the  
11 aggregate output of all solar systems in the service territory per unit capacity  
12 corresponding to the output of a solar resource on the margin;
- 13 • Requirements for calculating the electricity losses of the transmission and distribution  
14 systems;
- 15 • Methods for performing technical calculations for avoided energy, effective  
16 generation capacity and effective distribution capacity;
- 17 • Economic methods for calculating each value component (e.g., avoided fuel cost,  
18 capacity cost, etc.); and
- 19 • Requirements for summarizing input data and final calculations in order to facilitate  
20 Commission and stakeholder review.

21 **Q. Why do you recommend the Commission's attention to the methodology?**

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<sup>15</sup> Environmental Respondents have copies of the Minnesota Value of Solar Methodology, which will also be made available to all parties, the Commission Staff, and the Commission at the evidentiary hearing. As with the IREC Guidebook, if the parties or the Commission would like copies of the Minnesota Methodology in advance of the hearing, Environmental Respondents are ready and able to provide it via U.S. mail or electronic delivery.

1 A. The methodology stands in stark contrast to the approach used by the Company in its  
2 standby charge proposal. The Minnesota Value of Solar Methodology demonstrates the  
3 comprehensive, objectively verifiable approach that can be developed when a broad  
4 range of stakeholder and expert opinions are focused on the solar valuation issue. A  
5 properly derived standby charge should include valuation of all resources options,  
6 including solar. The Minnesota Methodology represents a detailed and well-documented  
7 example that the Company could use to guide its work in correcting the deficiencies in its  
8 current processes.

9 **Q. Is there any process underway in Virginia that might attempt a similar analysis?**

10 A. Yes, the Virginia Department of Mines, Minerals and Energy, in coordination with the  
11 Department of Environmental Quality, has convened a Distributed Solar Generation and  
12 Net Metering Stakeholder Group, which is discussing whether to employ a methodology  
13 along the lines of what was adopted in Minnesota. This DMME/DEQ working group has  
14 the potential to yield the very kind of data that is missing from the Company's proposal  
15 for a T&D standby charge.

16 **Q. Why is it error for the Company, in Step 2, to assume that all customer-generators  
17 in its service territory have an output and demand profile that matches the graphic  
18 in an Edison Foundation "issue brief" article?**

19 A. On page 5 of her direct testimony, Company witness Sebastian claims that "a residential  
20 solar generator customer can be expected to hit their system peak around 7 p.m."  
21 Through SELC Interrogatory 1-005(a), Environmental Respondents asked the Company  
22 to "explain the basis for this conclusion." Instead of providing Company-specific data,  
23 the Company simply cited a figure from an "issue brief" from the Edison Foundation, a

1 trade organization whose membership is comprised of investor-owned utilities, including  
2 AEP.<sup>16</sup>

3 The issue brief is titled “the Value of the Grid to DG Customers,” and is available  
4 for download on the Edison Foundation’s website. I have reviewed the brief, which is an  
5 eight-page document that argues for solar standby charges with generic information that  
6 is not specific to Appalachian Power’s Virginia service territory. The specific chart relied  
7 upon by the Company in its response to SELC Interrogatory 1-005(a) lacks any citations  
8 at all. It proposes to illustrate a “typical hourly pattern of energy production and  
9 consumption” that is not specific to any region of the country.

10 The Company provided no factual information supporting the assumption that  
11 solar customer-generators in Appalachian Power’s Virginia service territory hit their  
12 system peaks at the same time as plotted in the Edison Foundation graphic. The  
13 assumption that the graphic would suffice is problematic, and fatally flaws the proposed  
14 standby charge because it has absolutely no tie to data relating to customer-generators in  
15 the Company’s service territory, and therefore, cannot be cost based. This is an especially  
16 glaring error considering that the Company concedes, in its response to SELC  
17 Interrogatory 1-006, that “the savings associated with distribution investments is highly  
18 dependent on the location of the distributed resource.”<sup>17</sup> I am at a loss as to why, since  
19 the Company recognizes this fact, it relied on a generic trade association “issue brief”  
20 instead of conducting the kind of analysis that would be required to confirm that its  
21 proposed standby charge would capture “only the portion of the supplier’s infrastructure

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<sup>16</sup> The Company’s response to SELC Interrogatory 1-005(a) is included as Attachment KRR-8.

<sup>17</sup> As stated previously, the Company’s response to SELC Interrogatory 1-006 is included as Attachment KRR-6.

1 costs that are properly associated with serving” solar customer-generators as required by  
2 Virginia Code § 56-594.

3 **Q. As to Step 3, why is it problematic to assume that customer-generators completely**  
4 **avoid paying their fair share of transmission and distribution costs as a result of net**  
5 **metering?**

6 A. First, based on the data that I have reviewed to date from the Company, the assumption  
7 does not appear to be grounded in a fact-specific analysis, but instead rests on the flawed  
8 assumption that customer-generator electricity is only worth the AEP LMP average  
9 *energy* value for 2013. This assumption is flawed because, as previously discussed, it is  
10 limited to the LMP *energy* value and not the full value of the *electricity*, as required by  
11 law. It is also flawed because the Company provides no data or analysis to justify the  
12 presumption that the AEP LMP average energy value is the right value to apply to solar  
13 PV energy.

14 Second, the assumption ignores a growing body of analysis that demonstrates that  
15 customer-owned solar generation does indeed provide transmission and distribution value  
16 *to* the utility and other ratepayers that should be accounted for in setting avoided costs  
17 and in calculating costs and benefits from distributed customer-owned solar generation. I  
18 provide information about valuation of costs and benefits in my recommendations that  
19 follow. Overall, the Company’s assumptions on the solar standby charge are out of line  
20 with best practices and are not based on real-world, actual data in the Company’s  
21 Virginia service territory.

22 **Q. As to the final Step, what are the problems with the Company’s calculations?**

1 A. I find no errors in the simple arithmetic of the Company's calculations. The problem lies  
2 in the fact that none of the numbers used by the Company have been demonstrated to  
3 bear any factual relevance to solar customer-generators, and therefore, they fail to meet  
4 the standard of the law. I fully understand that the Company is charged with a difficult  
5 burden of proof and must perform an immense amount of work to prepare for a biennial  
6 review of rates. But it appears that on this standby charge to be applied to very few actual  
7 solar customer-generators, the Company simply dropped the ball. The Company  
8 completely failed in adducing factual evidence that demonstrates that its proposed charge  
9 is based on actual costs related to the operation of solar customer generation facilities.

10 In response to interrogatories from Environmental Respondents, the Company  
11 offers no cost of service data, no data associated with actual solar generators, no data  
12 associated with transmission and distribution benefits of solar generators, and no  
13 reasonable justification for imposing standby charges on those customers. It is an  
14 astounding failure of basic ratemaking.

#### 15 ADMINISTRATIVE EFFICIENCY

16 Q. **What is the revenue impact of the proposed standby charge?**

17 A. My understanding is that, if approved, the standby charge would generate in the  
18 aggregate just \$1,500 per year in additional revenues to the Company. According to  
19 Schedule 42B, this amount compares to total residential revenues of \$616,000,000—  
20 about 0.00000244 of total residential revenue. According to the Company's response to  
21 Staff Interrogatory 34-400, these revenues would come from just three customers with a  
22 total combined generation capacity of less than 40 kilowatts.<sup>18</sup> To state the obvious, all  
23 ratepayers could very easily pay more in the administration for processing the standby

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<sup>18</sup> The Company's response to Staff Interrogatory 34-400 is included as Attachment KRR-9.

1 charge and litigating it before the Commission than the Company would collect from  
2 solar customer-generators under the charge. This fact further supports the claim that the  
3 solar standby charge proposed here is a punitive “tax on the sun” aimed exclusively at  
4 chilling the behavior of customers who choose to invest their own money to install a solar  
5 generating resource on their own private property, and in doing so, reduce their reliance  
6 on the Company and their use of the Company’s energy and infrastructure.

7 **Q. In your opinion, is it prudent for the Commission to adopt the proposed standby**  
8 **charge under the facts that exist today?**

9 **A.** No. First, and most fundamentally, Appalachian Power has failed to prove that the  
10 proposed standby charge would recover “*only* the portion of the supplier’s infrastructure  
11 costs that are properly associated with serving such eligible customer-generators” as  
12 required by Virginia Code § 56-594 F. Its proposal also is not consistent with the general  
13 ratemaking requirement, in Virginia Code § 56-235.2, that the proposed solar standby  
14 charge “provide[s] revenues not in excess of the aggregate actual costs incurred by the  
15 public utility in serving customers.” Rather, the Company has had to make numerous  
16 unsupported assumptions in order to justify its proposal. This course seems to stem from  
17 the lack of actual cost-based data in the Company’s possession. Second, the very fact that  
18 the Company is proposing the standby charge in the complete absence of factual data, as  
19 required by the law, and for an adjustment so small suggests that the Company’s motives  
20 are not related to equity, but instead to stifling the development of customer-owned solar  
21 generation.

22 **RECOMMENDATIONS**

23 **Q. Based on your findings, what is your recommendation to the Commission?**

1 A. For the reasons discussed above, I recommend that the Company's proposed standby  
2 charge be rejected as inadequately substantiated, and as unjust and unreasonably  
3 discriminatory toward solar customer-generators. The Company has simply failed to meet  
4 the requirements of Virginia Code § 56-594 F to prove that the charge it seeks to impose  
5 is equivalent to only the portion of the supplier's infrastructure costs that are properly  
6 associated with serving such eligible customer-generators, and is not in excess of actual  
7 costs incurred by the utility. Without this proof, the Company's proposed solar standby  
8 charge is simply a punitive and unduly discriminatory tariff applied only to one class of  
9 customers.

10 Q. **Does this conclude your testimony?**

11 A. Yes.

**Attachment KRR-1**  
**Résumé of Karl R. Rábago**

**PUE-2014-00026**

## Summary

Nationally recognized leader and innovator in electricity and energy law, policy, and regulation. Experienced as a public utility regulatory commissioner, educator, research and development program manager, utility executive, business builder, federal executive, corporate sustainability leader, consultant, and advocate. National and international contacts through experience with Austin Energy, AES Corporation, US Department of Energy, Texas Public Utility Commission, Jicarilla Apache Tribal Utility Authority, Cargill Dow LLC (now NatureWorks, LLC), Rocky Mountain Institute, CH2M HILL, Houston Advanced Research Center, Environmental Defense Fund, and others. Skilled attorney, negotiator, and advisor with more than twenty years' experience working with diverse stakeholder communities in electricity policy and regulation, emerging energy markets development, clean energy technology development, electric utility restructuring, smart grid development, and the implementation of sustainability principles. Extensive regulatory practice experience. Developed and managed budgets in excess of \$300 million. Law teaching experience at University of Houston Law Center and U.S. Military Academy at West Point. Trial experience as a Judge Advocate. Post doctorate degrees in environmental and military law. Military veteran.

## Employment

### **PACE ENERGY AND CLIMATE CENTER, PACE UNIVERSITY SCHOOL OF LAW**

Executive Director: May 2014—Present.

Leader of a team of professional and technical experts in energy and climate law, policy, and regulation. Secure funding for and manage execution of research, market development support, and advisory services for a wide range of funders, clients, and stakeholders. Supervise a team of employees, consultants, and adjunct researchers. Provide learning and development opportunities for law students. Coordinate efforts of the Center with and support the Environmental Law Faculty. Additional activities:

- Chairman of the Board, Center for Resource Solutions (1997-present). CRS is a not-for-profit organization that has developed and manages the Green-e Renewable Electricity Brand, a nationally and internationally recognized branding program for green power and green pricing products and programs. Past chair of the Green-e Governance Board (formerly the Green Power Board).
- Director, Interstate Renewable Energy Council (IREC) (2012-present). IREC focuses on issues impacting expanded renewable energy use such as rules that support renewable energy and distributed resources in a restructured market, connecting small-scale renewables to the utility grid, and developing quality credentials that indicate a level of knowledge and skills competency for renewable energy professionals.

### **RÁBAGO ENERGY LLC**

Principal: July 2012—Present. Consulting practice dedicated to providing expert witness and policy formulation advice and services to organizations in the clean and advanced energy sectors. Recognized national leader in development and implementation of award-winning "Value of Solar" methodology.

### **AUSTIN ENERGY – THE CITY OF AUSTIN, TEXAS**

Vice President, Distributed Energy Services: April 2009—June 2012. Executive in 8<sup>th</sup> largest public power electric utility serving more than one million people in central Texas. Responsible for management and oversight of energy efficiency, demand response, and conservation programs; low-income weatherization; distributed solar and other renewable energy technologies;

green buildings program; key accounts relationships; electric vehicle infrastructure; and market research and product development. Executive sponsor of Austin Energy's participation in an innovative federally-funded smart grid demonstration project led by the Pecan Street Project. Led teams that successfully secured over \$39 million in federal stimulus funds for energy efficiency, smart grid, and advanced electric transportation initiatives. Additional activities included:

- Director, Renewable Energy Markets Association. REMA is a trade association dedicated to maintaining and strengthening renewable energy markets in the United States.
- Membership on Pedernales Electric Cooperative Member Advisory Board. Invited by the Board of Directors to sit on first-ever board to provide formal input and guidance on energy efficiency and renewable energy issues for the nation's largest electric cooperative.

#### **THE AES CORPORATION**

Director, Government & Regulatory Affairs: June 2006—December 2008. Government and regulatory affairs manager for AES Wind Generation, one of the largest wind companies in the country. Manage a portfolio of regulatory and legislative initiatives to support wind energy market development in Texas, across the United States, and in many international markets. Active in national policy and the wind industry through work with the American Wind Energy Association as a participant on the organization's leadership council. Also served as Managing Director, Standards and Practices, for Greenhouse Gas Services, LLC, a GE and AES venture committed to generating and marketing greenhouse gas credits to the U.S. voluntary market. Authored and implemented a standard of practice based on ISO 14064 and industry best practices. Commissioned the development of a suite of methodologies and tools for various greenhouse gas credit-producing technologies. Also served as Director, Global Regulatory Affairs, providing regulatory support and group management to AES's international electric utility operations on five continents. Additional activities:

- Director and past Chair, Jicarilla Apache Nation Utility Authority (1998 to 2008). Located in New Mexico, the JAUA is an independent utility developing profitable and autonomous utility services that provides natural gas, water utility services, low income housing, and energy planning for the Nation. Authored "First Steps" renewable energy and energy efficiency strategic plan.

#### **HOUSTON ADVANCED RESEARCH CENTER**

Group Director, Energy and Buildings Solutions: December 2003—May 2006. Leader of energy and building science staff at a mission-driven not-for-profit contract research organization based in The Woodlands, Texas. Responsible for developing, maintaining and expanding upon technology development, application, and commercialization support programmatic activities, including the Center for Fuel Cell Research and Applications, an industry-driven testing and evaluation center for near-commercial fuel cell generators; the Gulf Coast Combined Heat and Power Application Center, a state and federally funded initiative; and the High Performance Green Buildings Practice, a consulting and outreach initiative. Developed and launched new and integrated program activities relating to hydrogen energy technologies, combined heat and power, distributed energy resources, renewable energy, energy efficiency, green buildings, and regional clean energy development. Additional activities:

- President, Texas Renewable Energy Industries Association. As elected president of the statewide business association, leader and manager of successful efforts to secure and implement significant expansion of the state's renewable portfolio standard as well as other policy, regulatory, and market development activities.

- Director, Southwest Biofuels Initiative. The Initiative acts as an umbrella structure for a number of biofuels related projects, including emissions evaluation for a stationary biodiesel pilot project, feedstock development, and others.
- Advisory Board Member, Environmental & Energy Law & Policy Journal, University of Houston Law Center.

**CARGILL DOW LLC (NOW NATUREWORKS, LLC)**

Sustainability Alliances Leader: April 2002—December 2003. Integrated sustainability principles into all aspects of a ground-breaking biobased polymer manufacturing venture. Responsible for maintaining, enhancing and building relationships with stakeholders in the worldwide sustainability community, as well as managing corporate and external sustainability initiatives. NatureWorks is the first company to offer its customers a family of polymers (polylactide – “PLA”) derived entirely from annually renewable resources with the cost and performance necessary to compete with packaging materials and traditional fibers; now marketed under the brand name “Ingeo.”

- Successfully completed Minnesota Management Institute at University of Minnesota Carlson School of Management, an alternative to an executive MBA program that surveyed fundamentals and new developments in finance, accounting, operations management, strategic planning, and human resource management.

**ROCKY MOUNTAIN INSTITUTE**

Managing Director/Principal: October 1999–April 2002. In two years, co-led the team and grew annual revenues from approximately \$300,000 to more than \$2 million in annual grant and consulting income. Co-authored “Small Is Profitable,” a comprehensive analysis of the benefits of distributed energy resources. Worked to increase market opportunities for clean and distributed energy resources through consulting, research, and publication activities. Provided consulting and advisory services to help business and government clients achieve sustainability through application and incorporation of Natural Capitalism principles.

- President of the Board, Texas Ratepayers Organization to Save Energy. Texas R.O.S.E. is a non-profit organization advocating low-income consumer issues and energy efficiency programs.
- Co-Founder and Chair of the Advisory Board, Renewable Energy Policy Project-Center for Renewable Energy and Sustainable Technology. REPP-CREST was a national non-profit research and internet services organization.

**CH2M HILL**

Vice President, Energy, Environment and Systems Group: July 1998–August 1999. Responsible for providing consulting services to a wide range of energy-related businesses and organizations, and for creating new business opportunities in the energy industry for an established engineering and consulting firm. Completed comprehensive electric utility restructuring studies for the states of Colorado and Alaska.

**PLANERGY**

Vice President, New Energy Markets: January 1998–July 1998. Responsible for developing and managing new business opportunities for the energy services market. Provided consulting and advisory services to utility and energy service companies.

**ENVIRONMENTAL DEFENSE FUND**

Energy Program Manager: March 1996–January 1998. Managed renewable energy, energy efficiency, and electric utility restructuring programs. Led regulatory intervention activities in Texas and California. In Texas, played a key role in crafting Deliberative Polling processes. Initiated and managed nationwide collaborative activities aimed at increasing use of renewable energy and energy efficiency technologies in the electric utility industry, including the Green-e Certification Program, Power Scorecard, and others. Participated in national environmental and energy advocacy networks, including the Energy Advocates Network, the National Wind Coordinating Committee, the NCSL Advisory Committee on Energy, and the PV-COMPACT Coordinating Council. Frequently appeared before the Texas Legislature, Austin City Council, and regulatory commissions on electric restructuring issues.

**UNITED STATES DEPARTMENT OF ENERGY**

Deputy Assistant Secretary, Utility Technologies: January 1995–March 1996. Manager of the Department's programs in renewable energy technologies and systems, electric energy systems, energy efficiency, and integrated resource planning. Supervised technology research, development and deployment activities in photovoltaics, wind energy, geothermal energy, solar thermal energy, biomass energy, high-temperature superconductivity, transmission and distribution, hydrogen, and electric and magnetic fields. Developed, coordinated, and advised on legislation, policy, and renewable energy technology development within the Department, among other agencies, and with Congress. Managed, coordinated, and developed international agreements for cooperative activities in renewable energy and utility sector policy, regulation, and market development between the Department and counterpart foreign national entities. Established and enhanced partnerships with stakeholder groups, including technology firms, electric utility companies, state and local governments, and associations. Supervised development and deployment support activities at national laboratories. Developed, advocated and managed a Congressional budget appropriation of approximately \$300 million.

**STATE OF TEXAS**

Commissioner, Public Utility Commission of Texas. May 1992–December 1994. Appointed by Governor Ann W. Richards. Regulated electric and telephone utilities in Texas. Laid the groundwork for legislative and regulatory adoption of integrated resource planning, electric utility restructuring, and significantly increased use of renewable energy and energy efficiency resources. Appointed by Governor Richards to co-chair and organize the Texas Sustainable Energy Development Council. Served as Vice-Chair of the National Association of Regulatory Utility Commissioners (NARUC) Committee on Energy Conservation. Member and co-creator of the Photovoltaic Collaborative Market Project to Accelerate Commercial Technology (PV-COMPACT), a nationwide program to develop domestic markets for photovoltaics. Member, Southern States Energy Board Integrated Resource Planning Task Force. Member of the University of Houston Environmental Institute Board of Advisors.

**LAW TEACHING**

**Associate Professor of Law:** University of Houston Law Center, 1990–1992. Full time, tenure track member of faculty. Courses taught: Criminal Law, Environmental Law, Criminal Procedure, Environmental Crimes Seminar, Wildlife Protection Law. Provided *pro bono* legal services in administrative proceedings and filings at the Texas Public Utility Commission. Launched a student clinical effort that reviewed and made recommendations on utility energy efficiency program plans.

**Assistant Professor:** United States Military Academy, West Point, New York, 1988–1990. Member of the faculty in the Department of Law. Honorably discharged in August 1990, as

Major in the Regular Army. Courses taught: Constitutional Law, Military Law, and Environmental Law Seminar. Greatly expanded the environmental law curriculum and laid foundation for the concentration program in law. While carrying a full time teaching load, earned a Master of Laws degree in Environmental Law. Established a program for subsequent environmental law professors to obtain an LL.M. prior to joining the faculty.

#### LITIGATION

Trial Defense Attorney and Prosecutor, U.S. Army Judge Advocate General's Corps, Fort Polk, Louisiana, January 1985–July 1987. Assigned to Trial Defense Service and Office of the Staff Judge Advocate. Prosecuted and defended over 150 felony courts-martial. As prosecutor, served as legal officer for two brigade-sized units (approximately 5,000 soldiers), advising commanders on appropriate judicial, non-judicial, separation, and other actions.

#### NON-LEGAL MILITARY SERVICE

Armored Cavalry Officer, 2d Squadron 9<sup>th</sup> Armored Cavalry, Fort Stewart, Georgia, May 1978–August 1981. Served as Logistics Staff Officer (S-4). Managed budget, supplies, fuel, ammunition, and other support for an Armored Cavalry Squadron. Served as Support Platoon Leader for the Squadron (logistical support), and as line Platoon Leader in an Armored Cavalry Troop. Graduate of Airborne and Ranger Schools. Special training in Air Mobilization Planning and Nuclear, Biological and Chemical Warfare.

#### Formal Education

**LL.M., Environmental Law, Pace University School of Law, 1990:** Curriculum designed to provide breadth and depth in study of theoretical and practical aspects of environmental law. Courses included: International and Comparative Environmental Law, Conservation Law, Land Use Law, Seminar in Electric Utility Regulation, Scientific and Technical Issues Affecting Environmental Law, Environmental Regulation of Real Estate, Hazardous Wastes Law. Individual research with Hudson Riverkeeper Fund, Garrison, New York.

**LL.M., Military Law, U.S. Army Judge Advocate General's School, 1988:** Curriculum designed to prepare Judge Advocates for senior level staff service. Courses included: Administrative Law, Defensive Federal Litigation, Government Information Practices, Advanced Federal Litigation, Federal Tort Claims Act Seminar, Legal Writing and Communications, Comparative International Law.

**J.D. with Honors, University of Texas School of Law, 1984:** Attended law school under the U.S. Army Funded Legal Education Program, a fully funded scholarship awarded to 25 or fewer officers each year. Served as Editor-in-Chief (1983–84); Articles Editor (1982–83); Member (1982) of the Review of Litigation. Moot Court, Mock Trial, Board of Advocates. Summer internship at Staff Judge Advocate's offices. Prosecuted first cases prior to entering law school.

**B.B.A., Business Management, Texas A&M University, 1977:** ROTC Scholarship (3–yr). Member: Corps of Cadets, Parson's Mounted Cavalry, Wings & Sabers Scholarship Society, Rudder's Rangers, Town Hall Society, Freshman Honor Society, Alpha Phi Omega service fraternity.

**Selected Publications**

- “The Value of Solar Tariff: Net Metering 2.0,” The ICER Chronicle, Ed. 1, p. 46 [International Confederation of Energy Regulators] (December 2013)
- “A Regulator’s Guidebook: Calculating the Benefits and Costs of Distributed Solar Generation,” co-author, Interstate Renewable Energy Council (October 2013)
- “The ‘Value of Solar’ Rate: Designing An Improved Residential Solar Tariff,” Solar Industry, Vol. 6, No. 1 (Feb. 2013)
- “A Review of Barriers to Biofuels Market Development in the United States,” 2 Environmental & Energy Law & Policy Journal 179 (2008)
- “A Strategy for Developing Stationary Biodiesel Generation,” Cumberland Law Review, Vol. 36, p.461 (2006)
- “An Energy Resource Investment Strategy for the City of San Francisco: Scenario Analysis of Alternative Electric Resource Options,” contributing author, Prepared for the San Francisco Public Utilities Commission, Rocky Mountain Institute (2002)
- “Small Is Profitable: The Hidden Economic Benefits of Making Electrical Resources the Right Size,” co-author, Rocky Mountain Institute (2002)
- “Socio-Economic and Legal Issues Related to an Evaluation of the Regulatory Structure of the Retail Electric Industry in the State of Colorado,” with Thomas E. Feiler, Colorado Public Utilities Commission and Colorado Electricity Advisory Panel (April 1, 1999)
- “Study of Electric Utility Restructuring in Alaska,” with Thomas E. Feiler, Legislative Joint Committee on electric Restructuring and the Alaska Public Utilities Commission (April 1, 1999)
- “New Markets and New Opportunities: Competition in the Electric Industry Opens the Way for Renewables and Empowers Customers,” EEBA Excellence (Journal of the Energy Efficient Building Association) (Summer 1998)
- “Building a Better Future: Why Public Support for Renewable Energy Makes Sense,” Spectrum: The Journal of State Government (Spring 1998)
- “The Green-e Program: An Opportunity for Customers,” with Ryan Wisser and Jan Hamrin, Electricity Journal, Vol. 11, No. 1 (January/February 1998)
- “Being Virtual: Beyond Restructuring and How We Get There,” Proceedings of the First Symposium on the Virtual Utility, Klewer Press (1997)
- “The Regulatory Environment for Utility Energy Efficiency Programs,” Proceedings of the Meeting on the Efficient Use of Electric Energy, Inter-American Development Bank (May 1993)
- “An Alternative Framework for Low-Income Electric Ratepayer Services,” with Danielle Jaussaud and Stephen Benenson, Proceedings of the Fourth National Conference on Integrated Resource Planning, National Association of Regulatory Utility Commissioners (September 1992)
- “What Comes Out Must Go In: The Federal Non-Regulation of Cooling Water Intakes Under Section 316 of the Clean Water Act,” Harvard Environmental Law Review, Vol. 16, p. 429 (1992)
- “Least Cost Electricity for Texas,” State Bar of Texas Environmental Law Journal, Vol. 22, p. 93 (1992)
- “Environmental Costs of Electricity,” Pace University School of Law, Contributor–Impingement and Entrainment Impacts, Oceana Publications, Inc. (1990)

## **Attachment KRR-2**

### **List of Prior Testimony of Karl R. Rábago**

**PUE-2014-00026**

Table of Testimony Submitted by Karl R. Rábago, Rábago Energy LLC (as of 28 July 2014)

Date	Proceeding	Case/Docket #	On Behalf Of:
Dec. 21, 2012	VA Electric & Power Special Solar Power Tariff	Case # PUE-2012-00064	Environmental Respondents
May 10, 2013	Georgia Power Company 2013 IRP	Docket # 36498	Georgia Solar Energy Industries Association
Jun. 23, 2013	Louisiana Public Service Commission Re-examination of Net Metering Rules	Docket # R-31417	Gulf States Solar Energy Industries Association
Aug. 29, 2013	DTE (Detroit Edison) 2013 Renewable Energy Plan Review (Michigan)	Case # U-17302	Environmental Law and Policy Center
Sep. 5, 2013	CE (Consumers Energy) 2013 Renewable Energy Plan Review (Michigan)	Case # U-17301	Environmental Law and Policy Center
Sep. 27, 2013	North Carolina Utilities Commission 2012 Avoided Cost Case	Docket # E-100, Sub. 136	North Carolina Sustainable Energy Association
Oct. 18, 2013	Georgia Power Company 2013 Rate Case	Docket # 36989	Georgia Solar Energy Industries Association
Nov. 4, 2013	PEPCO Rate Case (District of Columbia)	Formal Case # 1103	Grid 2.0 Working Group & Sierra Club of Washington, D.C.
Apr. 24, 2014	Dominion Virginia Electric Power 2013 IRP	Case # PUE-2013-00088	Environmental Respondents
May 7, 2014	Arizona Corporation Commission Investigation on the Value and Cost of Distributed Generation	Docket No. E-00000J-14-0023	Rábago Energy LLC (invited presentation and workshop participation)
Jul. 10, 2014	North Carolina Utilities Commission 2014 Avoided Cost Case	Docket # E-100, Sub. 140	Southern Alliance for Clean Energy
Jul. 23, 2014	Florida Energy Efficiency and Conservation Act, Goal Setting – FPL, Duke, TECO, Gulf	Docket Nos. 130199-EI, 130200-EI, 130201-EI, 130202-EI	Southern Alliance for Clean Energy
In Progress	Ameren Missouri's Application for Authorization to Suspend Payment of Solar Rebates	File No. ET-2014-0350, Tariff No. YE-2014-0494	Missouri Solar Energy Industries Association
In Progress	Appalachian Power Company 2014 Biennial Rate Review	Case No. PUE-2014-00026	Environmental Respondents
In Progress	Joint Application of Wisconsin Electric Power Company and Wisconsin Gas LLC, both d/b/a We Energies, for Authority to Adjust Electric, Natural Gas, and Steam Rates)	Docket 5-UR-107	RENEW Wisconsin

**Attachment KRR-3**  
**Appalachian Power Response**  
**To Staff Interrogatory 34-402**

**PUE-2014-00026**

**COMMONWEALTH OF VIRGINIA  
STATE CORPORATION COMMISSION  
APPLICATION OF APPALACHIAN POWER  
SCC CASE NO. PUE-2014-00026  
Interrogatories and Requests for the Production  
of Documents by the Staff of the  
State Corporation Commission (Thirty-Fourth Set)  
To Appalachian Power Company**

Interrogatory Staff 34-402:

Reference Page 4 of Company Witness Sebastian's testimony. Has the Company considered using an estimated net metering generation profile, for example the PVWatts model, in conjunction with PJM's historical Locational Marginal Prices and Reliability Pricing Model capacity auction results to examine the appropriateness of a generation related standby charge or credit?

- a. If not, why not?
- b. If so, what were the results?

Response Staff 34-402:

See the response to Staff 34-401. In this case, the Company did not use an estimated net metering generation profile (ie the PV Watts model) in conjunction with the historical Locational Marginal Prices and Reliability Pricing Model capacity auction results to examine the appropriateness of a generation related standby charge or credit. The Company's current thinking is that a generation related standby charge should be developed using cost causation principles.

**Attachment KRR-4**  
**Appalachian Power Response**  
**To Staff Interrogatory 52-525**

**PUE-2014-00026**

**COMMONWEALTH OF VIRGINIA  
STATE CORPORATION COMMISSION  
APPLICATION OF APPALACHIAN POWER  
SCC CASE NO. PUE-2014-00026  
Interrogatories and Requests for the Production  
of Documents by the Staff of the  
State Corporation Commission (Fifty-Second Set)  
To Appalachian Power Company**

Interrogatory Staff 52-525:

Reference Company witness Sebastian's testimony. Please explain why the Company does not discount the distribution standby charge.

Response Staff 52-525:

Unlike the transmission system, the individual distribution circuits can peak at times that are different than the system peak. The Company is not in a position to determine whether the impacts of eligible customer generators taken as whole have a positive or negative impact to the distribution cost of service.

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The foregoing response is made by Jennifer B. Sebastian, Regulatory Consultant, on behalf of Appalachian Power Company, Inc.

**Attachment KRR-5**  
**Appalachian Power Response**  
**To Staff Interrogatory 34-401**

**PUE-2014-00026**

**COMMONWEALTH OF VIRGINIA  
STATE CORPORATION COMMISSION  
APPLICATION OF APPALACHIAN POWER  
SCC CASE NO. PUE-2014-00026  
Interrogatories and Requests for the Production  
of Documents by the Staff of the  
State Corporation Commission (Thirty-Fourth Set)  
To Appalachian Power Company**

Interrogatory Staff 34-401:

Reference Page 4 of Company witness Sebastian's testimony. Company witness Sebastian states, "At this time, the Company requires additional time and experience to examine and develop a generation related standby charge given the few qualifying customer-generators."

- a. What specific information does the Company require in order to develop a generation related standby charge?
- b. What is the length of time that the Company will require in order to examine and develop a generation related standby charge?

Response Staff 34-401:

Due to the limited number of qualifying customer-generators, the Company is still in the process of evaluating the information necessary to develop a generation related standby charge and can not provide a specific length of time to develop a generation related standby charge.

**Attachment KRR-6**  
**Appalachian Power Response**  
**To SELC Interrogatory 1-006**

**PUE-2014-00026**

COMMONWEALTH OF VIRGINIA  
STATE CORPORATION COMMISSION  
APPLICATION OF APPALACHIAN POWER  
SCC CASE NO. PUE-2014-00026  
Interrogatories and Requests for the Production  
of Documents by the SOUTHERN ENVIRONMENTAL LAW CENTER  
(First Set)  
To Appalachian Power Company

Interrogatory SELC 1-006:

Company witness Sebastian testifies (at 6:9-13) that “[t]he value of this net metering energy equates to over 11 cents a kilowatt hour, while the price of generation sold in the PJM market at the AEP LMP Zone averaged about 3.5 cents a kilowatt hour in 2013. Clearly the customer is receiving a benefit that far exceeds the value of energy generation.”

- a. Please provide any analysis, cost-of-service data, calculations, or other materials that support the statement that “the customer is receiving a benefit that far exceeds the value of energy generation.”
- b. Please provide any analysis conducted by the Company concerning the value to the utility and its customers of the following aspects of solar energy resource operation:
  - energy generation,
  - generation capacity,
  - transmission and distribution energy-related impacts,
  - transmission and distribution capacity-related impacts,
  - line losses,
  - environmental regulatory costs and savings,
  - fuel price fluctuation management benefits (e.g. hedging), and
  - any other impacts associated with customer solar generation.

Response SELC 1-006:

- a. The support for the second sentence in the quoted testimony is specifically identified in the first sentence in the same quotation. 11 cents per kilowatt hour is greater than 3.5 cents per kilowatt hour.
- b. Please see the Company's March 2014 Integrated Resource Plan Update especially Section 6 and Section 9.

With respect to transmission and distribution impacts, the Company has not attempted to quantify value to the utility and its customers due to avoided distribution or transmission costs/investments created by customer owned solar energy resource operations. APCo's distribution system is designed to meet its customers' maximum demands on a localized basis. As APCo reaches its highest load level in winter, and solar energy output primarily reduces summer peaks, there is limited opportunity to reduce the capacity of the distribution network due to distributed solar resources. Additionally, the savings associated with distribution investments is highly dependent on the location of the distributed resource. For example, if a distributed resource is located on a distribution circuit that is not experiencing any load growth, a distributed resource will not avoid any incremental capital spend.

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The foregoing response is made by Jennifer B. Sebastian, Regulatory Consultant, on behalf of Appalachian Power Company, Inc.

**Attachment KRR-7**  
**Appalachian Power Response**  
**To ASC Interrogatory 02-004**

**PUE-2014-00026**

**COMMONWEALTH OF VIRGINIA  
STATE CORPORATION COMMISSION  
APPLICATION OF APPALACHIAN POWER  
SCC CASE NO. PUE-2014-00026  
Interrogatories and Requests for the Production  
of Documents by the ALLIANCE FOR SOLAR CHOICE  
(Second Set)  
To Appalachian Power Company**

Interrogatory ASC 02-004:

Please provide all studies that you performed or relied upon in assessing the impact of net metered renewable generation upon your distribution and transmission system.

Response ASC 02-004:

See response to SELC 1-006, part "b."

**Attachment KRR-8**  
**Appalachian Power Response**  
**To SELC Interrogatory 1-005**

**PUE-2014-00026**

**COMMONWEALTH OF VIRGINIA  
STATE CORPORATION COMMISSION  
APPLICATION OF APPALACHIAN POWER  
SCC CASE NO. PUE-2014-00026  
Interrogatories and Requests for the Production  
of Documents by the SOUTHERN ENVIRONMENTAL LAW CENTER  
(First Set)  
To Appalachian Power Company**

Interrogatory SELC 1-005:

Company witness Sebastian testifies (at 5:10-11) that "a residential solar generator customer can be expected to hit their system peak around 7 p.m."

- a. Please explain the basis for this conclusion and provide any data or analysis that supports such conclusion.
- b. For each month beginning in January 2011, please identify the date and time, to the nearest hour, at which the Company experienced its monthly peak load for the Company's Virginia service territory.

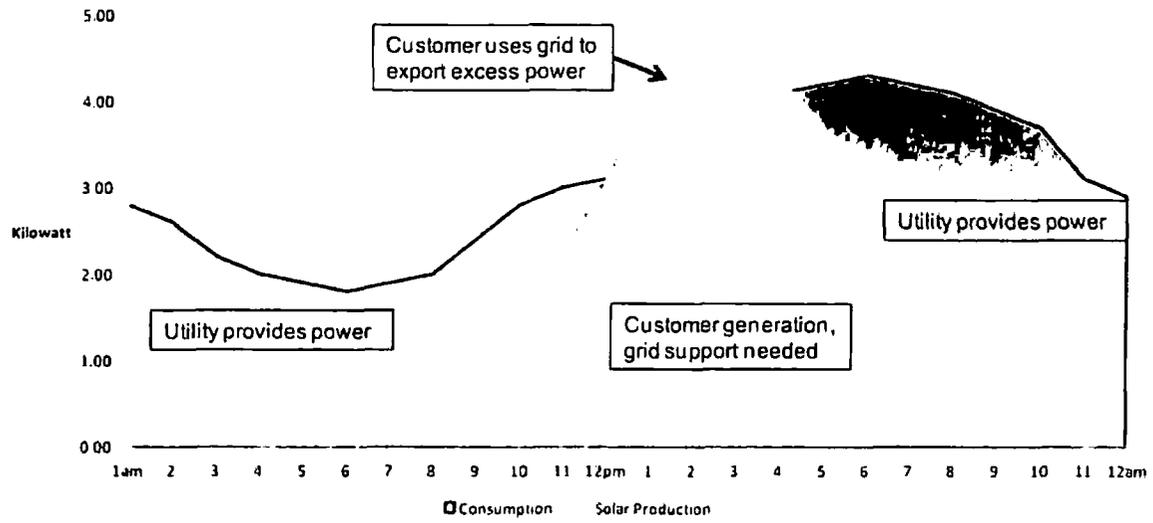
Response SELC 1-005:

- a. SELC 1-005 Attachment 1 Figure 1 as discussed in the article "Value of the Grid to DG Customers", an IEE issue brief, supports the conclusion "a residential solar generator customer can be expected to hit their peak around 7 p.m."
- b. See SELC 1-005 Attachment 2 for the requested information.

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The foregoing response is made by Jennifer B. Sebastian, Regulatory Consultant, on behalf of Appalachian Power Company, Inc.

Figure 1: Typical Energy Production and Consumption for a Small Customer with Solar PV



CUSTOMER_NAME	LOAD_TYPE	year	month	Day of Peak	Hour of Peak
APPALACHIAN POWER - VIRGINIA	State Load	2011	1	14	8
APPALACHIAN POWER - VIRGINIA	State Load	2011	2	11	8
APPALACHIAN POWER - VIRGINIA	State Load	2011	3	29	8
APPALACHIAN POWER - VIRGINIA	State Load	2011	4	6	8
APPALACHIAN POWER - VIRGINIA	State Load	2011	5	31	17
APPALACHIAN POWER - VIRGINIA	State Load	2011	6	9	15
APPALACHIAN POWER - VIRGINIA	State Load	2011	7	22	15
APPALACHIAN POWER - VIRGINIA	State Load	2011	8	4	17
APPALACHIAN POWER - VIRGINIA	State Load	2011	9	2	16
APPALACHIAN POWER - VIRGINIA	State Load	2011	10	31	8
APPALACHIAN POWER - VIRGINIA	State Load	2011	11	18	8
APPALACHIAN POWER - VIRGINIA	State Load	2011	12	12	8
APPALACHIAN POWER - VIRGINIA	State Load	2012	1	4	8
APPALACHIAN POWER - VIRGINIA	State Load	2012	2	13	8
APPALACHIAN POWER - VIRGINIA	State Load	2012	3	6	8
APPALACHIAN POWER - VIRGINIA	State Load	2012	4	12	8
APPALACHIAN POWER - VIRGINIA	State Load	2012	5	29	16
APPALACHIAN POWER - VIRGINIA	State Load	2012	6	29	18
APPALACHIAN POWER - VIRGINIA	State Load	2012	7	26	17
APPALACHIAN POWER - VIRGINIA	State Load	2012	8	27	22
APPALACHIAN POWER - VIRGINIA	State Load	2012	9	7	17
APPALACHIAN POWER - VIRGINIA	State Load	2012	10	29	19
APPALACHIAN POWER - VIRGINIA	State Load	2012	11	29	8
APPALACHIAN POWER - VIRGINIA	State Load	2012	12	14	8
APPALACHIAN POWER - VIRGINIA	State Load	2013	1	23	8
APPALACHIAN POWER - VIRGINIA	State Load	2013	2	18	8
APPALACHIAN POWER - VIRGINIA	State Load	2013	3	22	8
APPALACHIAN POWER - VIRGINIA	State Load	2013	4	4	20
APPALACHIAN POWER - VIRGINIA	State Load	2013	5	30	17
APPALACHIAN POWER - VIRGINIA	State Load	2013	6	12	18
APPALACHIAN POWER - VIRGINIA	State Load	2013	7	18	17
APPALACHIAN POWER - VIRGINIA	State Load	2013	8	29	17
APPALACHIAN POWER - VIRGINIA	State Load	2013	9	10	16
APPALACHIAN POWER - VIRGINIA	State Load	2013	10	26	9
APPALACHIAN POWER - VIRGINIA	State Load	2013	11	25	8
APPALACHIAN POWER - VIRGINIA	State Load	2013	12	11	8
APPALACHIAN POWER - VIRGINIA	State Load	2014	1	30	8
APPALACHIAN POWER - VIRGINIA	State Load	2014	2	12	19
APPALACHIAN POWER - VIRGINIA	State Load	2014	3	4	8
APPALACHIAN POWER - VIRGINIA	State Load	2014	4	16	8
APPALACHIAN POWER - VIRGINIA	State Load	2014	5	13	17

**Attachment KRR-9**  
**Appalachian Power Response**  
**To Staff Interrogatory 34-400**

**PUE-2014-00026**

**COMMONWEALTH OF VIRGINIA  
STATE CORPORATION COMMISSION  
APPLICATION OF APPALACHIAN POWER  
SCC CASE NO. PUE-2014-00026  
Interrogatories and Requests for the Production  
of Documents by the Staff of the  
State Corporation Commission (Thirty-Fourth Set)  
To Appalachian Power Company**

Interrogatory Staff 34-400:

Reference the Company's Response to Staff Interrogatory No. 08-132. What are the sizes (kW) of each of the three eligible customer generators who would be subject to the Company's proposed standby charge? When did these three eligible residential customer-generators begin taking service from the Company under the Net Metering Service Rider?

Response Staff 34-400:

The size (kW) of each of the three eligible customer generators subject to the Company's proposed standby charge and the respective starting month of the eligible residential customer-generator on the Net Metering Service Rider can be found in the table below:

**APCo- Virginia  
Eligible Customer Generators  
subject to Standby Service Charge**

<u>Generation Capacity (kW)</u>	<u>Net Metering Rider Start Month</u>
11.6	Jan-14
12.5	Mar-14
14.8	Mar-12

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The foregoing response is made by Jennifer B. Sebastian, Regulatory Consultant, on behalf of Appalachian Power Company, Inc.

CERTIFICATE OF SERVICE

I hereby certify that the following have been served with a true and accurate copy of the foregoing via first-class mail, postage pre-paid:

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