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December 4, 2019

VIA E-FILE & OVERNIGHT MAIL

Mr. Walter L. Thomas, Jr., Secretary
Alabama Public Service Commission
RSA Union Building
100 North Union Street, Suite 950
Montgomery, AL 36104

RE: Alabama Power Company Petition for Certificate of Convenience and Necessity; Docket No. 32953

Dear Secretary Thomas:

On behalf of Intervenors Energy Alabama and Gasp, Inc., in Docket No. 32953, please find the enclosed, redacted and public version of the testimony of Karl R. Rábago, an expert witness in this matter. This testimony, along with supporting evidence, is being filed in accordance with the Alabama Public Service Commission's October 9, 2019 Ruling Establishing Procedural Schedule and a subsequent procedural ruling, dated November 26, 2019, altering that schedule. The original and one copy of this public filing are being delivered to the Commission via overnight mail.

A confidential version, with all supporting information, is being sent via overnight mail to the Commission's Legal Division. Both versions will be served on counsel for Alabama Power Company, and a service copy of the public testimony will be served on parties on the service list in this matter.

We are resubmitting this testimony because we inadvertently left off the Certificate of Service. It has now been included.

Please contact me if you have any questions or concerns.

Sincerely,

Keith Johnston

Keith Johnston
Southern Environmental Law Center

Enclosures
KAJ

Public Version

BEFORE THE

ALABAMA PUBLIC SERVICE COMMISSION

MONTGOMERY, ALABAMA

IN RE:	)	
	)	
ALABAMA POWER COMPANY	)	Docket No. 32953
	)	
Petition for a Certificate of Convenience and Necessity	)	
	)	

DIRECT TESTIMONY OF
KARL R. RÁBAGO
ON BEHALF OF
ENERGY ALABAMA AND GASP
DECEMBER 4, 2019

I. INTRODUCTION & OVERVIEW

Q. Please state your name, business name and address, and role in this matter.

A. My name is Karl R. Rábago. I am the principal of Rábago Energy LLC, a Colorado limited liability company, located at 2025 E. 24th Avenue, Denver, Colorado. I appear here in my capacity as an expert witness on behalf of Energy Alabama and Gasp in Docket No. 32953.

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

A. I have worked for more than 28 years in the electricity industry and related fields. I am actively involved in a wide range of electric utility issues across the United States, as an expert witness; and in my capacity as Senior Policy Advisor for the Pace Energy and Climate Center, as a party in New York rate cases and in Reforming the Energy Vision proceedings. My previous employment experience includes Commissioner with the Public Utility Commission of Texas, Deputy Assistant Secretary with the U.S. Department of Energy, Vice President with Austin Energy, and Director with AES Corporation, among others. A detailed resume is attached as Exhibit KRR-1.

Q. Do you have a specific experience relating to electric utility resource planning and acquisition?

A. Yes. I have extensive experience working in the field of electric utility resource planning and acquisition, as well as regulatory issues relating to generation development, demand-side resources, and renewable energy development. That experience includes regulation of electric utilities in Texas, including review and approval of rates, tariffs, plans, and programs proposed by electric utilities. I have also published several articles and essays

relating to the topic, as detailed in my resume. As a vice president for Distributed Energy Services for Austin Energy, I had responsibility for all of the utility's customer-facing programs relating to distributed solar generation, energy efficiency, demand management, low-income weatherization, energy storage, electric transportation, building energy ratings and codes, and the utility's electric vehicle initiatives. At the U.S. Department of Energy, I was the federal executive responsible for the nation's research, development, and deployment programs relating to renewable energy, energy efficiency, energy storage, and other advanced energy technologies in the Department's Office of Utility Technologies. In my former position with the Pace Energy and Climate Center, based at the Pace University Elisabeth Haub School of Law in White Plains, New York, I led a team that is actively engaged as a public interest intervenor in the ground-breaking "Reforming the Energy Vision" process administered by the New York Public Service Commission. I am a frequent speaker, commentator, and expert witness across the country on issues relating to electric utility regulation, distributed energy resource markets and technologies, and electricity sector market reform.

Q. Have you ever testified before the Alabama Public Service Commission ("Commission") or other regulatory agencies?

A. I submitted testimony and appeared before the Commission in Docket Nos. U-4226 and 32767. In the past six years, I have also submitted testimony, comments, or presentations in proceedings in Arkansas, Arizona, California, Colorado, Connecticut, Florida, Georgia, Guam, Hawaii, Indiana, Iowa, Kansas, Kentucky, Louisiana, Massachusetts, Michigan, Minnesota, Missouri, New Hampshire, New York, North Carolina, Ohio, Pennsylvania, Rhode Island, Vermont, Virginia, and Wisconsin, and before the U.S.

Congress, the Federal Energy Regulatory Commission, and the Federal Trade Commission. A listing of my recent testimony, which includes testimony in a wide range of public service commission proceedings relating to solar tariffs, distributed energy resources, grid modernization, electric utility transformation, and utility planning and rate making, is attached as Exhibit KRR-2.

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

A. I reviewed applicable provisions of Alabama law, the testimony, documents, and discovery responses by Alabama Power Company ("APC" or the "Company") in this proceeding, prior related Commission actions and proceedings, and other related materials.

Q. What is the purpose of this testimony?

A. In this testimony, I review the Company's Petition for a Certificate of Convenience and Necessity ("Petition") proposing to build and acquire new generation resources and a small amount of demand side management ("DSM") resources and distributed energy resources ("DER"), and the Company's justifications for those proposals. My testimony identifies major flaws in the planning and justification processes used by the Company and the resulting proposals. I conclude with recommendations for the Commission in ruling on the Company's Petition.

Q. How is this testimony organized?

A. My testimony is organized as follows:

I. Introduction and Overview

II. Issues with the Company's Resource and Reserve Margin Planning

III. Conclusions and Recommendations

Q. What do you conclude in this testimony?

A. Based on my review of the Company's proposals and the justifications offered for those proposals, I conclude that APC has continued a long-standing effort to build rate base and revenue requirements through excessive, unnecessary, and expensive new central station fossil-fired generation. This means that electric service in Alabama will be more expensive in the near future, more expensive in terms of environmental damages, and more expensive in terms of long-run future costs, including stranded costs. It means that the Company will enrich itself and its shareholders at the expense of the well-being and health of Alabama citizens.

Q. What impact would approval of the Company's proposals have on residential customer rates?

A. The Company estimated the 2024 retail revenue requirement of its proposals and the impact of that spending on residential customer rates.[1] According to the Company estimate, which does not constitute a full bill impacts study and does not appear to address full lifetime costs for the proposed generation resources, residential Rate FD customers would see a monthly bill increase of between $[redacted] and $[redacted] per customer per month depending on gas prices. A bill impacts analysis, which would map the added revenue requirements associated with the Company's proposals by class and consumption level, would enable the Commission to more fully understand the implications of those proposals. In addition, while the Company provided a 2024 retail revenue requirement estimate in response to a discovery request, the long-lived nature of the assets proposed

[1] Ex. KRR-3, CONFIDENTIAL Company response to Sierra DR-1 I-13, Att. A.

merits an estimate of the total costs and the way they will change over time—essentially the mortgage that the Company proposes that its customers carry.

Q. What do you recommend based on your conclusions?

A. I recommend that the Commission deny and indefinitely defer the Company's proposals to construct and acquire new gas-fired generation, specifically the Barry Unit 8, Hog Bayou Energy Center, and Central Alabama Generating Station generation projects. I recommend that the Commission approve the Company's proposal to move forward with the proposed power purchase agreements ("PPAs") for solar plus storage resources. I further recommend that the Commission order the Company to immediately conduct a solicitation for additional solar and solar plus storage resources in order to take advantage of the superior economics of solar generation and the improving economics of storage technologies. Finally, I recommend that the Commission order the Company to develop a plan for identifying and procuring all cost-effective DSM and DER resources that pass a total resource cost test (including incentives), with a priority on those that address summer and winter peak demand. I also offer recommendations regarding the IRP process used by the Company.

II. ISSUES WITH THE COMPANY'S RESOURCE & RESERVE MARGIN PLANNING

Q. Please summarize the Company's Petition and proposals in this case.

A. The Company seeks approval of a certificate of convenience and necessity ("CCN") for a number of supply-side generation plant additions and a small increment of unspecified DSM and DER resources, summarized in the table below:[2]

Table KRR-1: Company Proposals

Facility	Owner	Rated Capacity (MW) Winter/Summer[3]	Start Date (Yr.)	Life (Yrs.)	Technology	$/kW NPV (Avg.)
Fossil Units						
Barry Unit 8	APC	743/685	2023	40	CT/CC	$157
Hog Bayou Energy Center	PPA	238/222	2020	19	CC	$410
Central Alabama Generating Station	APC	915/890	2023	23	CC	$433
Renewable Units						
Dothan Solar	PPA	68/68	2024	28	Solar/BESS	($39)
Anniston Solar	PPA	68/68	2022	20	Solar/BESS	($30)
Dallas County Solar	PPA	68/68	2024	28	Solar/BESS	($40)
Talladega Solar	PPA	68/68	2024	28	Solar/BESS	$6
AL Solar C	PPA	68/68	2023	20	Solar/BESS	$33
Demand Side Resources						
		200	TBD	TBD	TBD	TBD

The Company proposes to recover the costs of this spending from customers through Rate CNP, Rate ECR, and Rate RSE, and not through base rates set in a general rate case, as would be a more typical rate making treatment to ensure against the potential adverse and inappropriate inter-class and intra-class impacts of piece-meal rate making. Company witness Christine M. Baker details the Company's proposed rate treatment for the spending.[4] The Company estimates that as a result of this spending, the Company's annual revenue requirement will increase by about $[redacted] each year starting in

[2] Source: Direct testimony of Company witness M. Brandon Looney, Ex. MBL-1; Ex. KRR-3, CONFIDENTIAL Company response to Sierra DR-1 I-13, Att. A.
[3] Direct Testimony of Company witness M. Brandon Looney, Ex. MBL-1.
[4] Direct testimony of Company witness Christine M. Baker.

2024, and that residential Rate FD customers will bear about $[redacted] of those annual costs for the added generation.[5]

Q. What are the primary drivers of the rate increases from the Company's proposals?

A. The drivers of the rate increases are the costs of long-term mortgages on fossil generation plants fueled by methane gas. Based on the Company's data, the weighted average net present value of costs for the proposed fossil units is $322 per kilowatt for the nearly 1,900 MW in gas capacity proposed. In comparison, and using the values in Table KRR-1, above, the weighted average net present value of costs for the solar plus storage plants is negative—a minus $14 per kilowatt for the 340 MW of added solar.

The Growing Share of Fossil Resources in the Company Mix and the Consequences

Q. How do the proposed generation additions impact the Company's generation resource mix?

A. Astoundingly, in an era of rapidly falling costs for clean energy resources of many kinds, the Company actually seeks to increase its dependence on fossil fuel resources and to increase its customers' long-term exposure to the costs and consequences of carbon dioxide emissions, including the potential for stranded costs. The table below shows how the Company's resource mix would change if its Petition were to be approved:[6]

Table KRR-2: Resource Mix

[5] Ex. KRR-3, CONFIDENTIAL Company response to Sierra DR-1 I-13, Att. A.
[6] CONFIDENTIAL 2019 Ala. Power Co. IRP Summary Report at App. 1 (Direct testimony of Company witness Kelley, Ex. JBK-1).

Alabama Power Current and Proposed Generation Resource Mix

	Capacity MW	Percent of Total	Proposed Resources (MW)	Percent of Additions	Existing Plus Proposed	Percent of Proposed Total
Fossil	8,537	68.7%	1,896	82.6%	10,433	70.9%
Nuclear	1,720	13.8%			1,720	11.7%
Hydro	1,668	13.4%			1,668	11.3%
Renewable	502	4.0%	400	17.4%	902	6.1%
Grand Total	12,427	100%	2,296	100%	14,723	100%

Source: Direct Testimony of Company witness John B. Kelley, Exh. JBK-1, at App. 1.

Q. What issues and problems do you identify with the Company's Resource and Reserve Margin Planning processes?

A. The Company seeks to support its proposal on a foundation that it needs to begin planning to meet a winter demand peak. This rationalization, and the Company's unreasonable bias toward solving its perceived winter capacity problems with more rate-based fossil generation, drives everything else in the Petition. The combination effect of "solving for" a winter peak problem and doing so overwhelmingly with fossil generation (methane gas) resources will compound excess generation and unnecessary costs and excess pollution for decades to come. That is, excessive dependence on utility-scale gas resources in the winter triggers the need for high winter reserve margins. Increasing the winter reserve margin with more utility-scale resource additions triggers the need for even larger reserve margins to cover the inadequacies and vulnerabilities of the incremental resources. And on and on.

Q. How does the winter target reserve margin translate into the request for approval to build and acquire new generation resources?

A. The winter peak planning in turn drives the expansion planning process and development of a benchmark plan in the Company's Integrated Resource Plan ("IRP"), setting the stage for the Petition in this proceeding.

Q. Is it your position that the Company is currently over-dependent on fossil generation and that adding more gas-fired generation will create financial problems for the Company and its customers?

A. Absolutely. Instead of proposing an additional resources portfolio overwhelmingly weighted with utility-scale gas resources, the Company should have pursued a clean energy portfolio that did not include *any* additional utility-scale gas-fired resources. An aggressive mix of additional large-scale renewables, solar with storage, DSM, and DER would have been less costly and less financially risky. I would direct the Commission's attention to a recent study from the Rocky Mountain Institute ("RMI") titled "The Growing Market for Clean Energy Portfolios."[7] In that study, which built on earlier work relating to modeling of Clean Energy Portfolios ("CEPs")—optimized combinations of wind, solar, and storage technologies—RMI demonstrates the superior economics of CEPs for utilities today and in the future.

Q. How is a Clean Energy Portfolio superior to the Company's proposal to dramatically increase dependence on and investment in gas-fired generation?

A. As the RMI study demonstrates, CEPs are lower cost than the vast majority of new gas resources.[8] The Company's data, summarized in the column on Net Present Value costs in Table KRR-1, above, confirms that fact for itself. RMI identifies a tipping point in the relative costs of a CEP and of building and operating a new gas plant.[9] That means a permanent cost advantage to clean energy and disadvantage for gas. As a result, RMI finds that CEPs out-compete 90% of new combined-cycle gas turbines ("CCGT") on a

[7] C. Teplin, et al., "The Growing Market for Clean Energy Portfolios," Rocky Mountain Institute (Sept. 2019). Available at: https://rmi.org/insight/clean-energy-portfolios-pipelines-and-plants/.
[8] *Id.* at 7.
[9] *Id.* at 8.

cost basis by 2035. This means a clear risk of stranded costs for all of the gas units proposed by the Company in this proceeding.[10] The growing likelihood of carbon pricing, and at levels higher than those modeled by the Company, only makes the case for a CEP more compelling and the risks of stranded costs even greater.[11] The RMI report closes with a series of detailed recommendations that the Commission should consider seriously. Most significantly, the RMI report squares with the market realities that even the Company is seeing today in its Net Present Value costs, growing rate base and customer costs unnecessarily.

The Reserve Margin Studies Underpinning the Company Proposals

Q. Did you review the 2018 Target Reserve Margin study for the Company?

A. Yes. The 2018 reserve margin study,[12] prepared by APC's holding company, Southern Company, and dated January 2019, is the key document that seeks to make the case for the dual season reserve margin targets for both summer and winter, a departure from the Company's traditional summer peak focus. I also reviewed the Company's reserve margin study prepared in 2015, and dated January 2016.[13]

Q. How did the reserve margin analysis change between the 2015 and 2018 studies?

A. The studies are very similar in many respects, but they differ in the recommendations made. Both studies recognize that winter peak demands are more volatile than summer peak demands with potential for greater variation from normal year values. Both studies recognize the risk of high forced outage rates in the winter season. Both studies recognize that there is significant market availability risk—the risk that short term supply will not

[10] *Id.* at 9.
[11] *Id.* at 11.
[12] Direct testimony of Company witness Jeffrey B. Weathers, Ex. JBW-1 (2018 Reserve Margin Study).
[13] Ex. KRR-4, CONFIDENTIAL Company response to Sierra DR-1 DPR-10, Att. A.

be available. And both recognize that increased reliance on gas increases exposure to gas delivery constraints. Of course, both studies recommended increases in the target reserve margin, though the 2015 study stopped short of recommending a winter reserve margin planning target.

Q. What do you conclude from reading the 2015 and 2018 reserve margin studies together?

A. I conclude that since at least 2015 the Company has been acutely aware of the clear and present danger that it could face a winter peak planning requirement and that it has failed to act responsibly in addressing or preventing that outcome. Later in this testimony I will lay out the Company's historic and projected failures to aggressively pursue DSM. The Company's overall proposed solution is to add more of the resources that make, under its methods, more central station generation necessary.

Q. Has the Company been exposed to rapid and unanticipated growth in peak demand or for energy over the course of recent years?

A. No. As shown in the Company's 2019 IRP Summary Report,[14] summer peak demand has declined on average over the past 14 years. Winter peak demand has risen somewhat over that period but has also fallen dramatically during that time. Looking forward, the Company predicts that winter peak demand will [redacted] by about [redacted] between 2019 and 2031, and that summer peak will [redacted] by more than [redacted] over the same period.[15] As for energy sales, the Company has experienced relatively flat energy sales over the past

[14] CONFIDENTIAL Alabama Power Company 2019 IRP Summary Report, Fig. III-B-1 (Exhibit JBK-1 to the direct testimony of Company witness John B. Kelley).
[15] *Id.*

decade or more, with [redacted] in sales per customer over the same period.[16] Dramatic increases in energy sales or demand are not drivers of resource inadequacy for the Company. The Company saw the winter peaks coming and did nothing effective to forestall the adverse consequences.

Q. How, then, does the Company use winter reserve margin planning to justify the generation acquisition proposals developed in the IRP?

A. The core thesis of the winter reserve margin planning requirement is that reserve margins must be higher in winter in order to provide the same amount of resource adequacy as in summer. That is, while the Company would like a healthy 16.25% long-term Target Reserve Margin, and a 14.89% long-term diversified reserve margin when accounting for system purchase opportunities in the *summer*, it argues that it must have an even higher 26% long term Target Reserve Margin and a 25.25% long-term diversified reserve margin in *winter*.[17] Each 1% increase in reserve margin results in an increase in capacity requirement of [redacted] MW.[18]

Q. Why does the Company feel that winter reserve capacity is so much less useful in providing reserve margin in winter than in summer?

[16] Ex. KRR-5, CONFIDENTIAL Company response to SELC DR-1 DPR-5, Att. Commercial History; Ex. KRR-6, CONFIDENTIAL Company response to SELC DR-1 DPR-5, Att. Residential History. *See also* Ex. KRR-7, CONFIDENTIAL Company response to Sierra DR-1 I-04, Att. A.
[17] CONFIDENTIAL Alabama Power Company 2019 IRP Summary Report, at 25 (Direct testimony of Company witness John B. Kelley, Ex. JBK-1).
[18] Ex. KRR-8, CONFIDENTIAL Company response to Sierra DR-1 I-01, Att. O, Response to Staff 1-17.

A. The Company has been building its case for extremely high winter reserve margins for several years. The reasons that the Company identifies as justification for its position include:[19]

- Winter peaks have greater variance than summer peaks. Because the Company has allowed winter peak demand to grow almost uncontrolled, there is now a higher likelihood that a winter peak in a given year will be higher than that year's summer peak. In a summer year, the Company has observed that a very high summer peak could be 6.6% higher than normal, while a cold winter peak could be 22% higher than normal.
- The Company finds it difficult to accurately predict seasonal peaks, with year-to-year variations—load forecast errors—of as much as a [redacted] under-forecast or a [redacted] over-forecast over a four-to five-year period.
- Severe winter weather is more likely to produce extremely large forced outage levels—more than 10% in a single event in some occasions. And combustion turbines, relied upon for capacity, have twice the forced outage rate of the system as a whole.
- Since cold weather can impact entire regions and greatly impair gas deliverability, neighboring utilities cannot be counted on as much for short-term sales of energy and capacity. This is what the Company calls "market availability risk."
- While planned outages are seldom scheduled for peak summer months, there is a significantly high probability that planned outages will be scheduled for some winter months—notably November and December.

Q. Do you agree with the Company that these factors justify higher winter reserve margins?

A. In general, yes. While there are several ways in which the Company's reserve margin studies appear to exaggerate the need for higher reserve margins, the indicators cited do argue for more options for meeting increased demand in the winter.

Q. How does the Company's winter target reserve margin compare with that of other utilities in the Southeast United States?

[19] *See generally* CONFIDENTIAL 2018 Reserve Margin Study (Direct testimony of Company witness Jeffrey B. Weathers, Ex. JBW-1); Ex. KRR-4, Company response to Sierra DR-1 DPR-10, Att. A, 2015 Reserve Margin Study. *See also* Ex. KRR-9, CONFIDENTIAL Company response to Sierra DR-1 I-01, Att. B, at 7.

A. The Company's survey of twelve other non-Southern Company utilities in the Southeast U.S. shows an average [redacted] winter target reserve margin,[20] which appears much more reasonable than the 26% the Company wants to use.

Q. Is there any way to validate the need for higher reserve margins asserted by the Company?

A. All we have so far is the self-interested assertions of the Company and its holding company—Southern Company. The public interest merits a more objective analysis. The goal of a reserve margin study is to identify the economically optimal level or range of reserve margins for the utility. The Company's target reserve margins, especially for the winter, are high—higher than those for peer group utilities—and are based on recommendations from Southern Company's reserve margin studies. The utility and its holding company are obviously strongly biased toward adopting very high, even excessive reserve margins as a means for justifying capital investments that lead to increased utility profits and shareholder returns. The Commission should decline to support massive new gas-fired generation proposals that are based on the excessive reserve margins proposed by the Company and should order an independent and unbiased economic reserve margin study for the Company.

Q. If you generally agree that the factors cited in the reserve margin studies support higher winter reserve margins, why do you take issue with the Company's proposed fossil generation additions?

A. I agree that the factors analyzed in the reserve margin studies make a case for higher reserve margins in the winter, though not as high as that proposed by the Company. But

[20] Ex. KRR-8, CONFIDENTIAL Company response to Sierra DR-1 I-01, Att. O, Response to Staff 1-19; *see also id.* Response to Staff 2-18.

the Company's reserve margin studies lack any meaningful assessment of why winter reserve margins are higher. A review of the cited factors shows that the primary reason winter reserve margins must be higher is because of the resource mix in place today and the kinds of resources that the Company assumes will be needed to meet the reserve margins. Excessive past dependence on large, "chunky" utility-scale generation that runs on fossil fuels like coal and gas is why large reserve margins are required in winter and why large utility-scale fossil generation is exactly the wrong resource for meeting the need going forward.

Q. Please explain.

A. Extreme winter weather reduces the availability of interruptible gas supplies, freezes coal piles, reduces gas availability, deliverability, and transportation efficiency. Plants that rely on coal and gas are more prone to cold weather forced outages than other supply resources. Stop-gap measures to obtain residential and commercial heat services—electric resistance heaters—are notoriously inefficient, imposing additional outsized demand on generation resources. Coal and gas plants are complicated machines with many moving parts that are subject to fatigue and breakdowns; they require maintenance and since scheduled maintenance is seldom done in the summer, there is a good chance it must done during cold-weather months. In all, utility-scale fossil-fueled plants are subject to high winter production costs, high reliability costs, and high capacity costs.

Q. What message should high winter reserve margins send to the Company and the Commission?

A. The Company should recognize in the reserve margin studies that the very resources historically proposed by the Company to provide adequate reserves are exactly the

resources that drive higher reserve requirements. A new, more economically and operationally efficient approach is required to break the co-dependent relationship of reserve margins and utility-scale gas-fired generation. Again, excessive dependence on utility-scale gas resources in the winter triggers the need for high winter reserve margins. Increasing the winter reserve margin with more utility-scale resource additions triggers the need for even larger reserve margins to cover the inadequacies and vulnerabilities of the incremental resources. The high winter reserve margins necessitated by excessive reliance on utility-scale fossil resources should alert the Company that its business-as-usual approach to planning should be ended and replaced with a financially responsible and more reliable clean energy portfolio approach that relies on renewable energy generation, distributed energy resources, and demand side resources of all kinds.

Issues with the Company's Approach to Integrated Resource Planning

Q. Did you review the Company's 2019 IRP Summary Report?

A. Yes, I did. I reviewed the Company's previous 2016 IRP Summary Report as well.

Q. What are your key findings from reviewing the last two IRP summary reports?

A. First, I must note that the IRP summary reports are the least transparent and most poorly documented IRP documents that I can recall ever reading. The IRP reports do not contain a comprehensive assessment of demand, resource alternatives, and methods for comparing those resources on an integrated basis in order to meet the demand for energy services over the planning horizon. Instead, the Company's IRP documents are opaque black boxes that primarily state conclusions. Even though the Company has produced voluminous data in response to requests for documentation support the IRP summary reports, that data is unorganized and unsupported by details about how assumptions

impacted resource choices or the selection of the benchmark plan. Almost every number in the Company filings and responses to discovery have been marked as CONFIDENTIAL, including resources available from third parties and on the internet. As a result of the Company's literal "black box" approach to its filings, the public and other interested and affected parties have no real ability to review and comment on the Company's planning process and to recommend improvements. It also means that the Commission cannot hold the Company responsible and accountable for its planning process.

Q. How has the Company's identified need for new gas-fired capacity evolved between 2016 and 2019?

A. Comparing the two Company IRP reports for 2016 and 2019 reveals that the new winter reserve margin planning criteria are the overwhelming driver for the proposed new generation resources proposed in this proceeding. In 2016, the Company forecasted adequate reserves out to the year [redacted].[21] In the 2019 IRP, because of the new 26% winter reserve margin target, the Company suddenly finds itself in need of 2,400 MW of new resources—an increase of about 20% over its current capacity—of which nearly 1,900 MW is proposed as gas-fired generation.

Q. Does the Company's 2019 IRP evaluate alternative plans to the benchmark plan?

A. The Company does not provide enough explanation of how it develops its benchmark plan to discern whether alternatives were constructed and/or evaluated. There is some evidence that the Company used a modest sensitivity analysis to review its resource

[21] Ex. KRR-10, CONFIDENTIAL Company response to Sierra DR-1 DPR-11, Att. A, at 49.

addition decisions.[22] But even this analysis is difficult to understand. The Company sensitivities are "low" or "moderate" gas prices and carbon costs at zero or $20 per ton. But the Company offers no details about what its "low" and "moderate" gas price forecasts involve, or any independent justification of their reasonableness. Likewise, the Company provides no explanation about why it constrained its carbon analysis to only two price points and why those two points were chosen. It is important to note that these sensitivity analyses are not in any way the kind of portfolio alternatives that the Company should have prepared and contrasted to its preferred benchmark plan. Portfolio alternatives that the Company could have evaluated would include those with accelerated retirements of coal units, accelerated acquisition of renewable resources, higher levels of demand response and other demand side resources, higher adoption of storage resources, and higher levels of net metering adoption, for example. Additional sensitivity analyses should have included a high gas price analysis, much higher carbon prices, and lower prices for renewables and storage.

Q. How does the IRP use the information from the reserve margin study?

A. The Company tabulates its available generation capacity over the years of the planning horizon (2020 through 2038) and calculates the additional capacity required to meet the winter and summer target reserve margins.[23]

Q. How does the Company select from the universe of resources that can meet the need for energy services in its IRP process?

[22] *See* CONFIDENTIAL Direct testimony of Company witness M. Brandon Looney, at 7-8, Ex. MBL-1.
[23] CONFIDENTIAL Alabama Power Company 2019 IRP Summary Report, at 26-28 (Direct testimony of Company witness John B. Kelley, Ex. JBK-1).

A. It is not clear how the utility characterizes resource options or selects from those options to meet the need identified as a result of the new higher reserve margins. The IRP Summary Report includes only a brief narrative description of the screening and comparison processes, but none of the relevant data.[24] The Company says that it then further screens candidate technology options using a busbar analysis to identify "economic" options over a range of capacity factors.[25] Variable renewable resources—wind and solar—are not included in the analysis.[26]

Q. In the end, what does the Company's IRP process select?

A. The entire Company IRP process seems oriented toward selecting one or more gas-fired combustion turbines or combined-cycle generators in order to fashion the benchmark plan. The process appears designed to produce the Company's desired result, nothing more. That means that the Company's proposals, if approved, will saddle customers with higher costs, dirtier air, and potentially stranded costs as well. Alabama will be denied jobs, economic development, a more resilient economy, and more affordable energy services.

Q. Did the Company evaluate potential resources against the kinds of risks, identified in the reserve margin studies, that arise with excessive dependence on utility-scale fossil-fired plants?

A. There is no evidence that the Company addressed the vulnerability of gas-fired resources to extreme cold as part of its IRP process.

[24] *Id.* at 29-30. The Company did provide an unorganized data "dump" of spreadsheets and other information in response to requests for information and production of documents. In almost every case, the Company did not provide any responses that provided the detailed explanations requested.
[25] *Id.* at 31.
[26] *Id.* at 31, n.9.

Q. Did the Company address the increasing dependence on fossil resources that would result from its benchmark plan or effect of its proposals in this proceeding?

A. The Company does not acknowledge that it is actually increasing its dependence on fossil resources and the resources that are vulnerable to extreme cold in this proceeding.

Q. In the end, how would you characterize the Company's IRP process?

A. The Company's IRP process appears unreasonably and specifically designed to deliver a pre-determined outcome of justifying new gas-fired generation additions.

Solar plus Storage Proposals

Q. How did the solar plus storage and DSM and DER resources end up in the Company's Petition?

A. The Company does not evaluate solar or wind resources in its IRP as a busbar resource. However, as explained by Company witness John B. Kelley,[27] the Company had conducted a separate renewable energy solicitation in 2018 for potential acquisition under the Commission's order in Docket No. 32382. The Company worked with some bidders in that process to develop five solar plus storage projects for inclusion in this proceeding. In combination with the gas-fired resources the Company identified as needed in its IRP and the solar plus storage projects, the Company found itself nearly 200 MW short of its 2,400 MW target. The 200 MW of DSM and DER resources is the after-thought filler that the Company selected to close that gap.

Q. What does the Company's evaluation tell us about the economics of the solar plus storage resources?

[27] CONFIDENTIAL Direct testimony of Company witness John B. Kelley, at 18-19.

A. As previously discussed, the solar plus storage resources have vastly superior economic and other characteristics compared to gas-fired resources. Due to this pairing, the solar plus storage projects provide a cumulative winter capacity of 340 MW[28]—a sizable resource for meeting winter peak that effectively shifts and cumulates off-peak solar production. Solar systems are not adversely impacted by cold weather; in fact, they are more efficient when temperatures are lower. Batteries do require thermal management, which represents an effective decrease in output in very cold weather. Neither are impacted by gas deliverability or affordability. The smaller system sizes of the solar plus storage systems diversifies operating risks, as does their geographic dispersion across the Company's service territory. In sum, solar plus storage resources meet the demand for energy and capacity at lower cost and in a way that does not drive higher winter reserve margin requirements.

Q. Given these benefits, why did the Company limit its proposal in this proceeding to five 80 MW solar plus storage plants?

A. It is not clear why the Company limited its procurement to five 80 MW solar plus storage plants. The Company had received more than [redacted] MW in unsolicited solar generation proposals at an average levelized PPA price of $[redacted] per megawatt-hour.[29] There appears to be no shortage of opportunities for more cost-effective clean energy resources in the Company's service territory.

Q. Did the Company evaluate stand-alone solar generation, without storage, as a resource in this proceeding?

[28] *Id.* at 19, ll. 15-16.
[29] Ex. KRR-11, CONFIDENTIAL Company response to Sierra DR-1 I-10, Att. H.

A. It does not appear that the Company evaluated the ability of solar *without* storage to help reduce either summer or winter peak demand, or as a cost-effective alternative to gas-fired generation. The only reason that the Company provides for insisting on the solar plus storage option is [redacted].[30]

DSM and DER Resources

Q. What kind of DER resources does the Company propose in this proceeding?

A. The Company offers no specifics on potential DER resources beyond stating that it "envisions . . . the potential for deployments both at a utility-scale level as well as smaller scale facilities (e.g., less than 1 MW), all at customer locations."[31]

Q. What kinds of DSM resources does the Company propose to acquire?

A. The Company offers no specific proposals for DSM programs, stating that, at this time, it does not know the mix of programs it will seek to implement,[32] citing only examples of potential programs.[33]

Q. What is your view of the Company's proposal to acquire 200 MW in incremental DSM resources?

A. The only resource with better economics than solar and wind is DSM. The question is why the Company is not and has not made a more serious effort to rely on demand-side resources in meeting its customers' needs for energy services.

Q. What is Alabama and the Company's track record in pursuing energy efficiency and other DSM resources?

[30] Ex. KRR-8, CONFIDENTIAL Company response to Sierra DR-1, I-01, Att. O, Response to Staff DR 1-10.
[31] Direct testimony of Company witness Kelley at 24, ll. 1-3.
[32] Direct testimony of Company witness Kelley at 23, ll. 13-14.
[33] *Id.* at 23, ll. 16-23.

A. The Company's record is poor. According to the not-for-profit, non-partisan American Council for an Energy Efficient Economy,[34] Alabama as a whole consistently ranks at the bottom of ACEEE's annual State Energy Efficiency Scorecard report.[35] In 2019, ACEEE stated, regarding Alabama's utility energy efficiency programs, that:

> *Alabama reports low levels of electricity savings and does not run natural gas efficiency programs. Budgets for electricity programs were some of the lowest in the country, which means customers generally do not have access to a range of energy efficiency services for their utilities. Opportunities are available for the state to pursue new utility business models that encourage investments in energy efficiency.*[36]

According to ACEEE's report, Alabama as a whole consistently ranks in the bottom fifth of states in energy efficiency performance. Since the Company serves nearly 60% of all Alabama electricity customers and accounts for slightly more than 60% in statewide electricity sales, it is a major contributor to those low marks. Indeed, Alabama earns zero points in the ACEEE Scorecard report in 2019, 2018, 2017, and 2015. It earned two of twenty possible points in 2016. Alabama Power Company was ranked in last place among 51 utilities evaluated based on 2015 data in ACEEE's 2017 Utility Energy Efficiency Scorecard report.[37]

Q. Are the Company projections of incremental DSM reasonably aggressive?

A. No. The Company's proposed and projected DSM efforts are inconsistent with the challenge and opportunity presented by the Company's resource planning and peak demand outlooks. Demand-side resources, especially passive measures like building

[34] The American Council for an Energy-Efficient Economy (ACEEE), a nonprofit, 501(c)(3) organization, acts as a catalyst to advance energy efficiency policies, programs, technologies, investments, and behaviors. ACEEE believes that the United States can harness the full potential of energy efficiency to achieve greater economic prosperity, energy security, and environmental protection for all its people. More information is available at the ACEEE website at: https://aceee.org.
[35] ACEEE, The State Energy Efficiency Scorecard (2019), available at: https://aceee.org/state-policy/scorecard.
[36] ACEEE, Alabama State Scoresheet (2019), available at: https://aceee.org/state-policy/scorecard.
[37] G. Relf, B. Baatz, S. Nowak, *2017 Utility Energy Efficiency Scorecard*, ACEEE (Jun. 2017), available at: https://aceee.org/sites/default/files/publications/researchreports/u1707.pdf.

envelope and HVAC improvements, provide significant benefits during peak winter demand events. Active DSM measures also offer potential benefits. But as set forth in its IRP Summary Report, the Company is planning [redacted] in DSM efforts over the next [redacted]. For summer peaks, the Company projects [redacted], in [redacted] and [redacted], in achieved peak reduction through its 600-hour interruptible service of about [redacted] MW per year. The Company projects no additional [redacted] in summer resource deferral amounts under any other active DSM programs between [redacted] and [redacted].[38] Despite the Company's new-found attention to winter peaks, it projects even [redacted] in resource deferral in the winter, with [redacted] MW increases in the 600-hour interruptible program in [redacted] and [redacted]. The Company projects no other resource deferral growth due to any other DSM program between [redacted] and [redacted].[39] For passive DSM programs, the Company projects only [redacted] MW in increased passive DSM winter and summer peak reduction between [redacted] and [redacted], almost all of it in the [redacted] sector, and none in the [redacted] sector.[40]

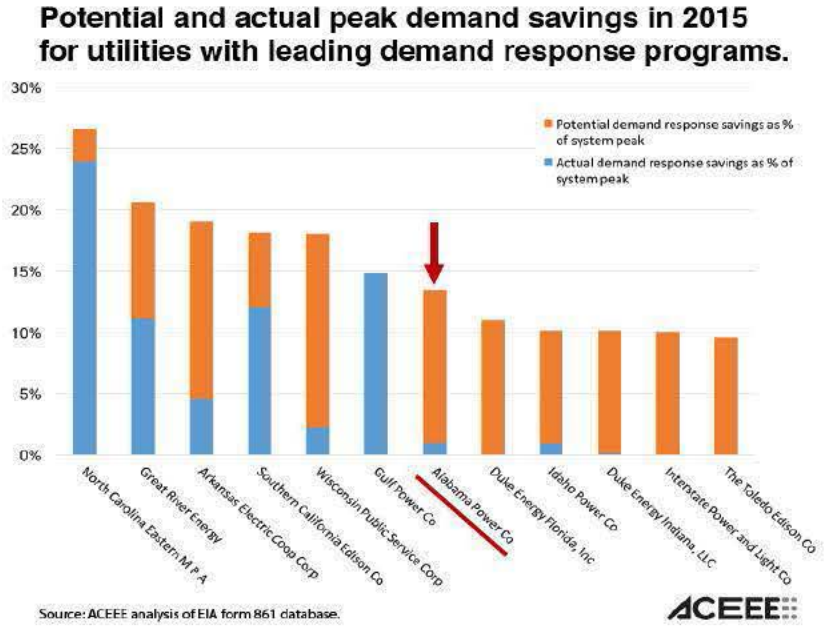
Q. How does Alabama Power's projected performance in peak reduction compare to the potential resource of demand reductions?

A. The Company has barely tapped into enormous potential to reduce peaks and customer costs through targeted DSM. An ACEEE report from 2015, issued around the time that the Company was preparing its 2016 reserve margin study summarized the unrealized

[38] CONFIDENTIAL Alabama Power Company 2019 IRP Summary Report, at Fig. A2-1 Summer (Direct testimony of Company witness John B. Kelley, Ex. JBK-1).
[39] *Id.* at Fig. A2-1 Winter.
[40] *Id.* at Fig. A2-2 Winter & Summer.

potential for peak reductions just in demand response programs.[41] The figure below shows that high-performing utilities, including Gulf Power, can and have realized double-digit peak demand savings from demand response programs; Alabama Power barely performed and plans to do little in the future.

Figure KRR-1 Potential and Actual Peak Savings at Selected Utilities



Q. Are there other factors besides lack of effort keeping the Company from increasing its reliance on cost-effective DSM resources?

A. Yes. Most importantly, the Company appears to constrain its DSM program efforts to those that pass the "Ratepayer Impacts Test."[42] This approach unreasonably constrains program adoption based on the biased view that DSM programs that increase rates for non-participant customers in the short term, but are still cost effective in reducing costs for all customers over the life of the measure, should not be adopted. Of course, the

[41] S. Nadel, Demand response programs can reduce utilities' peak demand an average of 10%, complementing savings from energy efficiency programs, ACEEE Blog Post (Feb. 9, 2017), https://aceee.org/blog/2017/02/demand-response-programs-can-reduce.
[42] Ex. KRR-12, CONFIDENTIAL Company response to Sierra DR-1 I-26, Att. A at 11.

Company does not take this approach with the generation resources it proposes in this proceeding. The Company should adopt an approach that uses the Utility Cost test and the Total Resource Cost test to screen and select demand side resources. These tests are superior to the Ratepayer Impacts Test because they allow evaluation of the full resource value of DSM resources in reducing or avoiding utility costs. In addition, the Company's plans are based on only calling upon one-third of interruptible service customers at a time.[43] Both of these approaches constrain DSM opportunities to help reduce winter and summer peak demand.

Q. Are there significant DSM resources available to the Company in its service territory?

A. There are strong indications that there are abundant DSM resources in the Company's service territory that the Company has failed to exploit. The Company has access to a residential saturation survey for the residential customer class that was conducted in 2017 by Southern Company Services.[44] [redacted]. The

[43] CONFIDENTIAL 2018 Reserve Margin Study, at 29 (Direct testimony of Company witness Jeffrey B. Weathers, Ex. JBW-1).
[44] Ex. KRR-13, CONFIDENTIAL Company response to SELC DR-1 DPR-17, Att. A.

study contains a wealth of detailed data that could support more aggressive active and passive DSM in the residential sector. In contrast, the Company projects almost [redacted] in residential efficiency programs between [redacted] and [redacted]. This is unconscionable in the face of the spending on power plants the Company proposes in this proceeding.

Q. What other indicator of DSM potential is available to the Company?

A. The Company contracted with the [redacted] firm in 2014 to produce an energy efficiency potential study.[45] While the study is now somewhat dated and should be updated, it showed that on a Total Resource Cost test basis, the Company had the potential opportunity to reduce energy use in 2019 by nearly [redacted] megawatt-hours, or [redacted] of load, and to reduce demand by [redacted] megawatts. The opportunity is only about one-tenth as large if the Ratepayer Impact Measure test is used as a screening tool. The study shows that the Company is leaving huge potential and cost-effective savings on the table—savings that could reduce the need for expensive, polluting generation resources.

Q. What do you conclude about the Company's solar plus storage and DSM proposals?

A. The Company's solar plus storage and incremental DSM proposals are good, but clearly not enough. The Company's failure to more aggressively pursue these resources means that the gas resources the Company seeks to procure will only add to, rather than reduce winter and summer peak requirements. The result of the Company's proposed approach is higher rates for its customers. And, as addressed previously, given the long operational lives and depreciation schedules for such resources, the result includes long-term exposure to these high costs and the risk of stranded costs.

[45] Ex. KRR-14, CONFIDENTIAL Company response to Sierra DR-1 I-05, Att. AL.

III. RECOMMENDATIONS

Q. What do you recommend to the Commission based on your analysis of the evidence?

A. I recommend that the Commission deny and indefinitely defer the Company's proposals to construct and acquire new gas-fired generation, specifically the Barry 8, Hog Bayou, and Central Alabama generation projects. I recommend that the Commission approve the Company's proposal to move forward with the proposed PPA arrangements for solar plus storage resources. I further recommend that the Commission order the Company to immediately conduct a solicitation for additional solar and solar plus storage resources in order to take advantage of the superior economics of solar generation and the improving economics of storage technologies. Finally, I recommend that the Commission order the Company to develop a plan for identifying and procuring all cost-effective demand-side management resources that pass a total resource cost test (including incentives), with a priority on those that address summer and winter peak demand.

Q. Do you have any recommendations regarding the IRP process used by the Company?

A. Yes. I also recommend that the Commission consider developing and adopting Integrated Resource Planning rules to apply to the Company. The Company's IRP Summary Reports are opaque and riddled with preferred-outcome-based analysis. It is obvious and expected that the Company has a bias toward exaggerating the need for excess capacity in order to enrich its shareholders. But the Company's IRP process ignores basic facts—like the fact that conventional resources are increasingly likely to fail simultaneously. A system that relies on increasing fractions of fossil resources is less secure and more

expensive. A robust IRP process would reflect that "capacity" and "reliability" are not the same and that mindless overbuilding will not improve reliability or affordability. As a starting point only, I recommend the Commission's consideration of the Virginia Corporation Commission's Integrated Resource Planning Guidelines, which set forth data and analysis requirements and include helpful data submission templates.[46] The question the Company asks in its planning processes should no longer be "How many megawatts of new gas generation do we need?," but instead "What resources should we use to meet the demand for energy services under a wide range of possible futures and at the lowest total cost?"

Q. Does this conclude your testimony?

A. Yes, it does.

[46] Virginia State Corporation Commission Order Adopting IRP Guidelines, Case No. PUE-2008-00099 (Dec. 23, 2008), available at: https://www.scc.virginia.gov/pur/guide.aspx.

BEFORE THE
ALABAMA PUBLIC SERVICE COMMISSION

In re: Petition for a Certificate of Convenience and Necessity by Alabama Power Company	)	**Docket No. 32953**

TESTIMONY OF KARL R. RÁBAGO

State of CA)

County of sanfrancisco)

Karl R. Rábago, being first duly sworn, deposes and says that he has read the foregoing prepared testimony and that the matters and things set forth therein are true and correct to the best of his knowledge, information and belief.

Karl R. Rábago

Subscribed and sworn to before me
this 03 day of December, 2019.

TINA QUACH
Notary Public

My commission expires: 3/24/22

NOTARY SEAL:

TINA QUACH
Notary Public - California
San Francisco County
Commission # 2235617
My Comm. Expires Mar 24, 2022

CERTIFICATE OF SERVICE

I certify that copies of the foregoing have been served on the following counsel and interested parties this the 4th day of December, 2019.

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Public Version

Direct Testimony of Karl Rábago
Exhibit KRR-1

Karl R. Rábago

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Nationally recognized leader and innovator in electricity and energy law, policy, and regulation. Experienced as a research and development manager, utility executive, business builder, sustainability leader, senior government official, consultant, and advocate. Highly proficient in advising, managing, and interacting with government agencies and committees, the media, citizen groups, and business associations. Successful track record of working with U.S. Congress, state legislatures, governors, regulators, city councils, business leaders, researchers, academia, and community groups. National and international contacts through experience with Pace Energy and Climate Center, 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-five years of 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. Nationally recognized speaker on energy, environment, and sustainable development matters. Managed staff as large as 250; responsible for operations of research facilities with staff in excess of 600. Developed and managed budgets in excess of $300 million. Law teaching experience at Pace University Elisabeth Haub School of Law, University of Houston Law Center, and U.S. Military Academy at West Point. Post-doctorate degrees in environmental and military law. Military veteran.

Employment

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. Prepared and submitted testimony in more than 26 states and 90 electricity and gas regulatory proceedings. Recognized national leader in development and implementation of award-winning "Value of Solar" alternative to traditional net metering. Additional information at www.rabagoenergy.com.

PACE ENERGY AND CLIMATE CENTER, PACE UNIVERSITY ELISABETH HAUB SCHOOL OF LAW

Senior Policy Advisor: September 2019—Present. Part-time advisor and staff member. Provide expert witness, project management, and business development support on electric and gas regulatory and policy issues and activities.

- Chairman of the Board, Center for Resource Solutions (1997-present). CRS is a not-for-profit organization based at the Presidio in California. CRS 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.
- Director, Solar United Neighbors (2018-present).

Executive Director: May 2014—August 2019. Leader of a team of professional and technical experts and law students 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 with the overall goal of advancing clean energy

deployment, climate responsibility, and market efficiency. Taught Energy Law. Provide learning and development opportunities for law students. Additional activities:

- Former Director, Alliance for Clean Energy – New York (2018-2019).
- Former Director, Interstate Renewable Energy Council (IREC) (2012-2018).
- Former Co-Director and Principal Investigator, Northeast Solar Energy Market Coalition (2015-2017). The NESEMC was a US Department of Energy's SunShot Initiative Solar Market Pathways project. Funded under a cooperative agreement between the US DOE and Pace University, the NESEMC worked to harmonize solar market policy and advance supportive policy and regulatory practices in the northeast United States.

AUSTIN ENERGY – THE CITY OF AUSTIN, TEXAS

Vice President, Distributed Energy Services: April 2009—June 2012. Executive in 8th 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.

JICARILLA APACHE NATION UTILITY AUTHORITY

Director: 1998—2008. Located in New Mexico, the JANUA was an independent utility developing profitable and autonomous utility services that provide natural gas, water utility services, low income housing, and energy planning for the Nation. Authored "First Steps" renewable energy and energy efficiency strategic plan with support from U.S. Department of Energy.

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. Secured funding for major new initiative in carbon nanotechnology applications in the energy sector. 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. Active participant in policy development and regulatory implementation in Texas, the Southwest, and national venues. Frequently engaged with policy, regulatory, and market leaders in the region and internationally. 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. Established 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.
- Member, Committee to Study the Environmental Impacts of Windpower, National Academies of Science National Research Council. The Committee was chartered by Congress and the Council on Environmental Quality to assess the impacts of wind power on the environment.
- 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. Frequent appearance in media at international, national, regional and local levels.

- 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 for a not-for-profit environmental group with a staff of 160 and over 300,000 members. 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. Co-chair and organizer of the Texas Sustainable Energy Development Council. 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). Member, Southern States Energy Board Integrated Resource Planning Task Force. Member of the University of Houston Environmental Institute Board of Advisors.

LAW TEACHING

Professor for a Designated Service: Pace University Elisabeth Haub School of Law, 2014-present. Non-tenured member of faculty. Courses taught: Energy Law. Supervise a student intern practice program that engages in a wide range of advocacy, analysis, and research activities in support of the mission of the Pace Energy and Climate Center.

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.

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 an LL.M. 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 more than 150 felony-level 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. Pioneered use of some forms of psychiatric and scientific testimony in administrative and judicial proceedings.

NON-LEGAL MILITARY SERVICE

Armored Cavalry Officer, 2d Squadron 9th 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.

Karl R. Rábago

Selected Publications

"Achieving 100% Renewables: Supply-Shaping through Curtailment," with Richard Perez, Marc Perez, and Morgan Putnam, PV Tech Power, Vol. 19 (May 2019).

"A Radical Idea to Get a High-Renewable Electric Grid: Build Way More Solar and Wind than Needed," with Richard Perez, The Conversation, online at http://bit.ly/2YjnM15 (May 29, 2019).

"Reversing Energy System Inequity: Urgency and Opportunity During the Clean Energy Transition," with John Howat, John Colgan, Wendy Gerlitz, and Melanie Santiago-Mosier, National Consumer Law Center, online at www.nclc.org (Feb. 26, 2019).

"Revisiting Bonbright's Principles of Public Utility Rates in a DER World," with Radina Valova, The Electricity Journal, Vol. 31, Issue 8, pp. 9-13 (Oct. 2018).

"Achieving very high PV penetration – The need for an effective electricity remuneration framework and a central role for grid operators," Richard Perez (corresponding author), Energy Policy, Vol. 96, pp. 27-35 (2016).

"The Net Metering Riddle," Electricity Policy.com, April 2016.

"The Clean Power Plan," Power Engineering Magazine (invited editorial), Vol. 119, Issue 12 (Dec. 2, 2015)

"The 'Sharing Utility:' Enabling & Rewarding Utility Performance, Service & Value in a Distributed Energy Age," co-author, 51st State Initiative, Solar Electric Power Association (Feb. 27, 2015)

"Rethinking the Grid: Encouraging Distributed Generation," Building Energy Magazine, Vol. 33, No. 1 Northeast Sustainable Energy Association (Spring 2015)

"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)

"Jicarilla Apache Nation Utility Authority Strategic Plan for Energy Efficiency and Renewable Energy Development," lead author & project manager, U.S. Department of Energy First Steps Toward Developing Renewable Energy and Energy Efficiency on Tribal Lands Program (2008)

"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)

"Evaluating Fuel Cell Performance through Industry Collaboration," co-author, Fuel Cell Magazine (2005)

"Applications of Life Cycle Assessment to NatureWorks™ Polylactide (PLA) Production," co-author, Polymer Degradation and Stability 80, 403-19 (2003)

"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 Wiser 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)

"Information Technology," Public Utilities Fortnightly (March 15, 1996)

"Better Decisions with Better Information: The Promise of GIS," with James P. Spiers, Public Utilities Fortnightly (November 1, 1993)

"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)

Public Version

Direct Testimony of Karl Rábago
Exhibit KRR-2

Testimony Submitted by Karl R. Rábago, on behalf of Pace Energy and Climate Center, or through Rábago Energy LLC

(as of 17 Oct. 2019)

Date	Proceeding	Case/Docket #	On Behalf Of:
Dec. 21, 2012	VA Electric & Power Special Solar Power Tariff	Virginia SCC Case # PUE-2012-00064	Southern Environmental Law Center
May 10, 2013	Georgia Power Company 2013 IRP	Georgia PSC Docket # 36498	Georgia Solar Energy Industries Association
Jun. 23, 2013	Louisiana Public Service Commission Re-examination of Net Metering Rules	Louisiana PSC Docket # R-31417	Gulf States Solar Energy Industries Association
Aug. 29, 2013	DTE (Detroit Edison) 2013 Renewable Energy Plan Review (Michigan)	Michigan PUC Case # U-17302	Environmental Law and Policy Center
Sep. 5, 2013	CE (Consumers Energy) 2013 Renewable Energy Plan Review (Michigan)	Michigan PUC Case # U-17301	Environmental Law and Policy Center
Sep. 27, 2013	North Carolina Utilities Commission 2012 Avoided Cost Case	North Carolina Utilities Commission Docket # E-100, Sub. 136	North Carolina Sustainable Energy Association
Oct. 18, 2013	Georgia Power Company 2013 Rate Case	Georgia PSC Docket # 36989	Georgia Solar Energy Industries Association
Nov. 4, 2013	PEPCO Rate Case (District of Columbia)	District of Columbia PSC Formal Case # 1103	Grid 2.0 Working Group & Sierra Club of Washington, D.C.
Apr. 24, 2014	Dominion Virginia Electric Power 2013 IRP	Virginia SCC Case # PUE-2013-00088	Environmental Respondents
May 7, 2014	Arizona Corporation Commission Investigation on the Value and Cost of Distributed Generation	Arizona Corporation Commission Docket # E-00000J-14-0023	Rábago Energy LLC (invited presentation and workshop participation)
Jul. 10, 2014	North Carolina Utilities Commission 2014 Avoided Cost Case	North Carolina Utilities Commission 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	Florida PSC Docket # 130199-EI, 130200-EI, 130201-EI, 130202-EI	Southern Alliance for Clean Energy
Sep. 19, 2014	Ameren Missouri's Application for Authorization to Suspend Payment of Solar Rebates	Missouri PSC File No. ET-2014-0350, Tariff # YE-2014-0494	Missouri Solar Energy Industries Association
Aug. 6, 2014	Appalachian Power Company 2014 Biennial Rate Review	Virginia SCC Case # PUE-2014-00026	Southern Environmental Law Center (Environmental Respondents)

Testimony Submitted by Karl R. Rábago, on behalf of Pace Energy and Climate Center, or through Rábago Energy LLC

(as of 17 Oct. 2019)

Aug. 13, 2014	Wisconsin Public Service Corp. 2014 Rate Application	Wisconsin PSC Docket # 6690-UR-123	RENEW Wisconsin and Environmental Law & Policy Center
Aug. 28, 2014	WE Energies 2014 Rate Application	Wisconsin PSC Docket # 05-UR-107	RENEW Wisconsin and Environmental Law & Policy Center
Sep. 18, 2014	Madison Gas & Electric Company 2014 Rate Application	Wisconsin PSC Docket # 3720-UR-120	RENEW Wisconsin and Environmental Law & Policy Center
Sep. 29, 2014	SOLAR, LLC v. Missouri Public Service Commission	Missouri District Court Case # 14AC-CC00316	SOLAR, LLC
Jan. 28, 2016 (date of CPUC order)	Order Instituting Rulemaking to Develop a Successor to Existing Net Energy Metering Tariffs, etc.	California PUC Rulemaking 14-07-002	The Utility Reform Network (TURN)
Mar. 20, 2015	Orange and Rockland Utilities 2015 Rate Application	New York PSC Case # 14-E-0493	Pace Energy and Climate Center
May 22, 2015	DTE Electric Company Rate Application	Michigan PSC Case # U-17767	Michigan Environmental Council, NRDC, Sierra Club, and ELPC
Jul. 20, 2015	Hawaiian Electric Company and NextEra Application for Change of Control	Hawai'i PUC Docket # 2015-0022	Hawai'i Department of Business, Economic Development, and Tourism
Sep. 2, 2015	Wisc. PSCo Rate Application	Wisconsin PSC Case # 6690-UR-124	ELPC
Sep. 15, 2015	Dominion Virginia Electric Power 2015 IRP	Virginia SCC Case # PUE-2015-00035	Environmental Respondents
Sep. 16, 2015	NYSEG & RGE Rate Cases	New York PSC Cases 15-E-0283, -0285	Pace Energy and Climate Center
Oct. 14, 2015	Florida Power & Light Application for CCPN for Lake Okeechobee Plant	Florida PSC Case 150196-EI	Environmental Confederation of Southwest Florida
Oct. 27, 2015	Appalachian Power Company 2015 IRP	Virginia SCC Case # PUE-2015-00036	Environmental Respondents
Nov. 23, 2015	Narragansett Electric Power/National Grid Rate Design Application	Rhode Island PUC Docket No. 4568	Wind Energy Development, LLC
Dec. 8, 2015	State of West Virginia, et al., v. U.S. EPA, et al.	U.S. Court of Appeals for the District of Columbia Circuit Case No. 15-1363 and Consolidated Cases	Declaration in Support of Environmental and Public Health Intervenors in Support of Movant Respondent-Intervenors' Responses in Opposition to Motions for Stay

Testimony Submitted by Karl R. Rábago, on behalf of Pace Energy and Climate Center, or through Rábago Energy LLC

(as of 17 Oct. 2019)

Dec. 28, 2015	Ohio Power/AEP Affiliate PPA Application	PUC of Ohio Case No. 14-1693-EL-RDR	Environmental Law and Policy Center
Jan. 19, 2016	Ohio Edison Company, Cleveland Electric Illuminating Company, and Toledo Edison Company Application for Electric Security Plan (FirstEnergy Affiliate PPA)	PUC of Ohio Case No. 14-1297-EL-SSO	Environmental Law and Policy Center
Jan. 22, 2016	Northern Indiana Public Service Company (NIPSCO) Rate Case	Indiana Utility Regulatory Commission Cause No. 44688	Citizens Action Coalition and Environmental Law and Policy Center
Mar. 18, 2016	Northern Indiana Public Service Company (NIPSCO) Rate Case – Settlement Testimony	Indiana Utility Regulatory Commission Cause No. 44688	Joint Intervenors – Citizens Action Coalition and Environmental Law and Policy Center
Mar. 18, 2016	Comments on Pilot Rate Proposals by MidAmerican and Alliant	Iowa Utility Board NOI-2014-0001	Environmental Law and Policy Center
May 27, 2016	Consolidated Edison of New York Rate Case	New York PSC Case No. 16-E-0060	Pace Energy and Climate Center
June 21, 2016	Federal Trade Commission: Workshop on Competition and Consumer Protection Issues in Solar Energy	Invited workshop presentation	Pace Energy and Climate Center
Aug. 17, 2016	Dominion Virginia Electric Power 2016 IRP	Virginia SCC Case # PUE-2016-00049	Environmental Respondents
Sep. 13, 2016	Appalachian Power Company 2016 IRP	Virginia SCC Case # PUE-2016-00050	Environmental Respondents
Oct. 27, 2016	Consumers Energy PURPA Compliance Filing	Michigan PSC Case No. U-18090	Environmental Law & Policy Center, "Joint Intervenors"
Oct. 28, 2016	Delmarva, PEPCO (PHI) Utility Transformation Filing – Review of Filing & Utilities of the Future Whitepaper	Maryland PSC Case PC 44	Public Interest Advocates
Dec. 1, 2016	DTE Electric Company PURPA Compliance Filing	Michigan PSC Case No. U-18091	Environmental Law & Policy Center, "Joint Intervenors"
Dec. 16, 2016	Rebuttal of Unitil Testimony in Net Energy Metering Docket	New Hampshire Docket No. DE 16-576	New Hampshire Sustainable Energy Association ("NHSEA")
Jan. 13, 2017	Gulf Power Company Rate Case	Florida Docket No. 160186-EI	Earthjustice, Southern Alliance for Clean Energy, League of Women Voters-Florida

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(as of 17 Oct. 2019)

Jan. 13, 2017	Alpena Power Company PURPA Compliance Filing	Michigan PSC Case No. U-18089	Environmental Law & Policy Center, "Joint Intervenors"
Jan. 13, 2017	Indiana Michigan Power Company PURPA Compliance Filing	Michigan PSC Case No. U-18092	Environmental Law & Policy Center, "Joint Intervenors"
Jan. 13, 2017	Northern States Power Company PURPA Compliance Filing	Michigan PSC Case No. U-18093	Environmental Law & Policy Center, "Joint Intervenors"
Jan. 13, 2017	Upper Peninsula Power Company PURPA Compliance Filing	Michigan PSC Case No. U-18094	Environmental Law & Policy Center, "Joint Intervenors"
Mar. 10, 2017	Eversource Energy Grid Modernization Plan	Massachusetts DPU Case No. 15-122/15-123	Cape Light Compact
Apr. 27, 2017	Eversource Rate Case & Grid Modernization Investments	Massachusetts DPU Case No. 17-05	Cape Light Compact
May 2, 2017	AEP Ohio Power Electric Security Plan	PUC of Ohio Case No. 16-1852-EL-SSO	Environmental Law & Policy Center
Jun. 2, 2017	Vectren Energy TDSIC Plan	Indiana URC Cause No. 44910	Citizens Action Coalition & Valley Watch
Jul. 28, 2017	Vectren Energy 2016-2017 Energy Efficiency Plan	Indiana URC Cause No. 44645	Citizens Action Coalition
Jul. 28, 2017	Vectren Energy 2018-2020 Energy Efficiency Plan	Indiana URC Cause No. 44927	Citizens Action Coalition
Aug. 1, 2017	Interstate Power & Light (Alliant) 2017 Rate Application	Iowa Utilities Board Docket No. RPU-2017-0001	Environmental Law & Policy Center, Iowa Environmental Council, Natural Resources Defense Council, and Solar Energy Industries Assoc.
Aug. 11, 2017	Dominion Virginia Electric Power 2017 IRP	Virginia SCC Case # PUR-2017-00051	Environmental Respondents
Aug. 18, 2017	Appalachian Power Company 2017 IRP	Virginia SCC Case # PUR-2017-00045	Environmental Respondents
Aug. 25, 2017	Niagara Mohawk Power Co. d/b/a National Grid Rate Case	New York PSC Case # 17-E-0238, 17-G-0239	Pace Energy and Climate Center
Sep. 15, 2017	Niagara Mohawk Power Co. d/b/a National Grid Rate Case	New York PSC Case # 17-E-0238, 17-G-0239	Pace Energy and Climate Center

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(as of 17 Oct. 2019)

Oct. 20, 2017	Missouri PSC Working Case to Explore Emerging Issues in Utility Regulation	Missouri PSC File No. EW-2017-0245	Renew Missouri
Nov. 21, 2017	Central Hudson Gas & Electric Co. Electric and Gas Rates Cases	New York PSC Case # 17-E-0459, -0460	Pace Energy and Climate Center
Jan. 16, 2018	Great Plains Energy, Inc. Merger with Westar Energy, Inc.	Missouri PSC Case # EM-2018-0012	Renew Missouri Advocates
Jan. 19, 2018	U.S. House of Representatives, Energy and Commerce Committee	Hearing on "The PURPA Modernization Act of 2017," H.R. 4476	Rábago Energy LLC
Jan. 29, 2018	Joint Petition of Electric Distribution Companies for Approval of a Model SMART Tariff	Massachusetts D.P.U. Case No. 17-140	Boston Community Capital Solar Energy Advantage Inc. (Jointly authored with Sheryl Musgrove)
Feb. 21, 2018	Joint Petition of Electric Distribution Companies for Approval of a Model SMART Tariff	Massachusetts D.P.U. Case No. 17-140 - Surrebuttal	Boston Community Capital Solar Energy Advantage Inc. (Jointly authored with Sheryl Musgrove)
Apr. 6, 2018	Narragansett Electric Co., d/b/a National Grid Rate Case Filing	RI PUC Docket No. 4770	New Energy Rhode Island ("NERI")
Apr. 25, 2018	Narragansett Electric Co., d/b/a National Grid Power Sector Transformation Plan	Rhode Island PUC Docket No. 4780	New Energy Rhode Island ("NERI")
Apr. 26, 2018	U.S. EPA Proposed Repeal of Carbon Pollution Emission Guidelines for Existing Stationary Stories: Electric Utility Generating Units, 82 Fed. Reg. 48,035 (Oct. 16, 2017) – "Clean Power Plan"	U.S. EPA Docket No. EPA-HQ-OAR-2016-0592	Karl R. Rábago
May 25, 2018	Orange & Rockland Utilities, Inc. Rate Case Filing	New York PSC Case Nos. 18-E-0067, 18-G-0068	Pace Energy and Climate Center
Jun. 15, 2018	Orange & Rockland Utilities, Inc. Rate Case Filing	New York PSC Case Nos. 18-E-0067, 18-G-0068 – Rebuttal Testimony	Pace Energy and Climate Center
Aug. 10, 2018	Dominion Virginia Electric Power 2018 IRP	Virginia SCC Case # PUR-2018-00065	Environmental Respondents
Sep. 20, 2018	Consumers Energy Company Rate Case	Michigan PSC Case No. U-20134	Environmental Law & Policy Center

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(as of 17 Oct. 2019)

Sep. 27, 2018	Potomac Electric Power Co. Notice to Construct Two 230 kV Underground Circuits	District of Columbia Public Service Commission Formal Case No. 1144	Solar United Neighbors of D.C.
Sep. 28, 2019	Arkansas Public Service Commission Investigation of Policies Related to Distributed Energy Resources	Arkansas PSC Docket No. 16-028-U	Arkansas Audubon Society & Arkansas Advanced Energy Association
Nov. 7, 2018	DTE Detroit Edison Rate Case	Michigan PSC Case No. U-20162	Natural Resources Defense Council, Michigan Environmental Council, Sierra Club
Mar. 26, 2019	Guam Power Authority Petition to Modify Net Metering	Guam PUC Docket GPA 19-04	Micronesia Renewable Energy, Inc.
Apr. 4, 2019	Community Power Network & League of Women Voters of Florida v. JEA	Circuit Court Duval County of Florida Case No. 2018-CA-002497 Div: CV-D	Earthjustice
Apr. 25, 2019	Georgia Power 2019 IRP	Georgia PSC Docket No. 42310	GSEA & GSEIA
May 10, 2019	NV Energy NV GreenEnergy 2.0 Rider	Nevada PUC Docket Nos. 18-11015, 18-11016	Vote Solar
May 24, 2019	Consolidated Edison of New York Electric and Gas Rate Cases – Misc. Issues	New York PSC Case Nos. 19-E-0065, 19-G-0066	Pace Energy and Climate Center
May 24, 2019	Consolidated Edison of New York Electric and Gas Rate Cases – Low- and Moderate-Income Panel	New York PSC Case Nos. 19-E-0065, 19-G-0066	Pace Energy and Climate Center
May 30, 2019	Connecticut DEEP Shared Clean Energy Facility Program Proposal	Connecticut Department of Energy and Environmental Protection Docket No. 19-07-01	Connecticut Fund for the Environment
Jun. 3, 2019	New Orleans City Council Rulemaking to Establish Renewable Portfolio Standards	New Orleans City Council Docket No. UD-19-01	National Audubon Society and Audubon Louisiana
Jun. 14, 2019	Consolidated Edison of New York Electric and Gas Rate Cases – Rebuttal Testimony	New York PSC Case Nos. 19-E-0065, 19-G-0066	Pace Energy and Climate Center

Testimony Submitted by Karl R. Rábago, on behalf of Pace Energy and Climate Center, or through Rábago Energy LLC

(as of 17 Oct. 2019)

Jun. 24, 2019	Program to Encourage Clean Energy in Westchester County Pursuant to Public Service law Section 74-a; Staff Investigation into a Moratorium on New Natural Gas Services in the Consolidated Edison Company of New York, Inc. Service Territory	New York PSC Case Nos. 19-M-0265, 19-G-0080	Earthjustice and Pace Energy and Climate Center
Jul. 12, 2019	Application of Virginia Electric and Power Company for the Determination of the Fair Rate of Return on Common Equity	Virginia SCC Case # PUR-2019-00050	Virginia Poverty Law Center
Jul. 15, 2019	New Orleans City Council Rulemaking to Establish Renewable Portfolio Standards – Reply Comments	New Orleans City Council Docket No. UD-19-01	National Audubon Society and Audubon Louisiana
Aug. 1, 2019	Interstate Power and Light Company – General Rate Case	Iowa Utilities Board Docket No. RPU-2019-0001	Environmental Law & Policy Center and Iowa Environmental Council
Aug. 19, 2019	Consolidated Edison of New York Electric and Gas Rate Cases – Surrebuttal	New York PSC Case Nos. 19-E-0065, 19-G-0066	Pace Energy and Climate Center
Aug. 21, 2019	Connecticut Department of Energy and Environmental Protection and Public Utility Regulatory Authority Joint Proceeding on the Value of Distributed Energy Resources - Comments	Connecticut DEEP/PURA Docket No. 19-06-29	Connecticut Fund for the Environment and Save Our Sound
Sep. 10, 2019	Interstate Power and Light Company – General Rate Case - Rebuttal	Iowa Utilities Board Docket No. RPU-2019-0001	Environmental Law & Policy Center and Iowa Environmental Council
Sep. 18, 2019	Connecticut Department of Energy and Environmental Protection and Public Utility Regulatory Authority Joint Proceeding on the Value of Distributed Energy Resources – Comments and Response to Draft Study Outline	Connecticut DEEP/PURA Docket No. 19-06-29	Connecticut Fund for the Environment, Save Our Sound, E4theFuture, NE Clean Energy Council, NE Energy Efficiency Partnership, and Acadia Center
Sep. 20, 2019	Connecticut Department of Energy and Environmental Protection and Public Utility Regulatory Authority Joint Proceeding on the Value of Distributed Energy Resources – Participation in Technical Workshop 1	Connecticut DEEP/PURA Docket No. 19-06-29 http://www.ctn.state.ct.us/ctnplayer.asp?odID=16715	Connecticut Fund for the Environment and Save Our Sound

Testimony Submitted by Karl R. Rábago, on behalf of Pace Energy and Climate Center, or through Rábago Energy LLC

(as of 17 Oct. 2019)

Oct. 4, 2019	Connecticut Department of Energy and Environmental Protection and Public Utility Regulatory Authority Joint Proceeding on the Value of Distributed Energy Resources – Participation in Technical Workshop 2	Connecticut DEEP/PURA Docket No. 19-06-29 http://www.ctn.state.ct.us/ctnplayer.asp?odID=16766	Connecticut Fund for the Environment and Save Our Sound
Oct. 15, 2019	Electronic Consideration of the Implementation of the Net Metering Act (KY SB 100)	Kentucky Public Service Commission Case No. 2019-00256	Kentuckians for the Commonwealth & Mountain Association for Community Economic Development
Oct. 15, 2019	New Orleans City Council Rulemaking to Establish Renewable Portfolio Standards – Comments on City Council Utility Advisors' Report	New Orleans City Council Docket No. UD-19-01	National Audubon Society and Audubon Louisiana, Vote Solar, 350 New Orleans, Alliance for Clean Energy, PosiGen, and Sierra Club
Oct. 17, 2019	Indiana Michigan Power Co. General Rate Case	Michigan Public Service Company Case No. U-20359	Environmental Law & Policy Center, The Ecology Center, the Solar Energy Industries Association, and Vote Solar

Public Version

Direct Testimony of Karl Rábago
Exhibits KRR-3 through KRR-14

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