COMMONWEALTH OF MASSACHUSETTS

DEPARTMENT OF PUBLIC UTILITIES

Petition of NSTAR Electric Company and	**)**	
Western Massachusetts Electric Company	**)**	**D.P.U. 15-122/123**
d/b/a Eversource Energy for Approval of their	**)**	
Grid Modernization Plans	**)**	

DIRECT TESTIMONY OF

KARL R. RÁBAGO

ON BEHALF OF

THE CAPE LIGHT COMPACT

MARCH 10, 2017

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I. INTRODUCTION AND OVERVIEW

Q. Please state your name and business address.

A. My name is Karl R. Rábago. I am the Executive Director of the Pace Energy and Climate Center at the Elizabeth Haub School of Law (the "Pace Center"). My business address is 78 North Broadway, White Plains, New York.

Q. What is the Pace Center?

A. The Pace Center is a project of the Elisabeth Haub School of Law at Pace University. As a non-partisan legal and policy think tank, the Pace Center develops cost-effective solutions to complex energy and climate challenges and transforms the way society supplies and consumes energy. For more than twenty-five years, the Pace Center has been providing legal, policy, and stakeholder engagement leadership in New York, the Northeast, and other jurisdictions. Located on the campus of the Elisabeth Haub School of Law, the Pace Center engages and leverages a strong legal faculty and student body in its work, particularly through the internationally recognized Environmental Law Program and the Pace Land Use Law Center. The Pace Center has many years of success in working with and supporting the New York State Energy Research and Development Authority, the New York Public Service Commission ("NYPSC"), and the New York Department of Environmental Conservation. The Pace Center's work also includes strategic engagement with state legislative and executive officials, as well as in key NYPSC proceedings. In these capacities, the Pace Center has had the opportunity to form long-lasting partnerships within the community of non-governmental organizations that work in the field of energy.

Q. Please summarize your background and experience.

A. I have some twenty-five years' experience in electric utility regulation, the electricity business, technology development, and markets. I am an attorney with degrees from Texas A&M University and the University of Texas School of Law, and post-doctorate degrees in military and environmental law from the U.S. Army Judge Advocate General's School and Pace School of Law, respectively. Of note, my previous employment experience includes serving as a 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 of Regulatory Affairs with AES Corporation. I am also principal of Rábago Energy LLC, a consulting practice operating in New York. A detailed resume is attached as Exhibit CLC-KRR-2.

Q. Do you have any specific experience relating to grid modernization?

A. Yes. I have been engaged in studying, advancing, developing, and implementing smart grid, grid modernization, and utility transformation policies and practices for more than 20 years. This experience includes regulatory oversight as a public utility commissioner, research and development management as a federal executive, and management and implementation as a utility executive at Austin Energy with responsibility for distributed energy services for a utility serving about 400,000 customers. At Austin Energy, I played a lead role in establishing the Pecan Street Smart Grid Demonstration Project, in managing a portfolio of energy efficiency, demand management, and distributed generation ("DG") programs, and in launching the utility's "Bring Your Own Thermostat" infrastructure. At the Pace Center, we manage a technical advisory program

for combined heat and power funded by the U.S. Department of Energy. The Pace Center is an active participant as a public interest intervenor in a wide range of regulatory proceedings relating to the New York's Reforming the Energy Vision process.

Q. Have you previously testified before this or any other regulatory commission?

A. I have not testified before the Massachusetts Department of Public Utilities (the "Department"). In the past four years, I have submitted testimony, comments, or presentations in proceedings in New Hampshire, Virginia, New York, Hawaii, Iowa, Indiana, Ohio, Rhode Island, Georgia, Massachusetts (legislature), Minnesota, Michigan, Missouri, Louisiana, North Carolina, Kentucky, Arizona, Wisconsin, Vermont, California, and the District of Columbia. A listing of my recent previous testimony is attached as Exhibit CLC-KRR-3.

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to review and respond to the proposed Incremental Grid Modernization Plan (the "Revised IGMP") submitted by NSTAR Electric Company and Western Massachusetts Electric Company doing business as Eversource Energy ("Eversource") on February 3, 2017, in this proceeding before the Department. I will address the extent to which the Revised IGMP: (1) responds to Department guidance and direction; (2) would meaningfully modernize electric service in the Eversource territory; and (3) would establish or provide a foundation for enhanced customer choices and options for customers to exercise control over their use of utility and third-party

services—customer engagement. My testimony provides recommendations to the Department on a path forward.

Q. On whose behalf are you appearing in this proceeding?

A. I am appearing on behalf of the Cape Light Compact (the "Compact").

Q. Has the Cape Light Compact filed any other testimony in the instant proceeding?

A. The Compact has filed additional testimony in this proceeding from Margaret T. Downey, Austin T. Brandt, and Kevin F. Galligan setting forth the Compact's issues and positions in greater detail. The Compact has also sponsored testimony by: (1) Frank Lacey of Electric Advisors Consulting LLC on the implications of the Revised IGMP for customer engagement and competitive supply markets; (2) Jordan R. Gerow, also with the Pace Center, that identifies the benefits of distributed energy resources ("DER"), especially DER configured in microgrids; and (3) Jonathan F. Wallach of Resource Insight, Inc., on cost recovery and allocation issues.

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

A. I reviewed the initial Grid Modernization Proposal dated August 19, 2015, as updated on June 16, 2016 (the "Initial Filing"), and the Revised IGMP, and relevant prefiled testimony of Eversource witnesses, Eversource schedules and tables, relevant Eversource responses to information requests, and other relevant discovery in this proceeding. I have also reviewed the Department's orders relating to grid modernization.

Given the interrelation between the Revised IGMP and Eversource's proposals in D.P.U. 17-05, including the Grid Modernization Base Commitment, which is referenced in Eversource's transmittal letter with the Revised IGMP filing, I necessarily refer to Eversource's proposals in D.P.U. 17-05 at times throughout my testimony.

Q. **Has the Pace Center considered other aspects of Eversource's testimony in greater detail?**

A. Yes. As referenced above, my associate, Jordan R. Gerow, has recommended that Eversource propose microgrid demonstration projects in order to better advance the integration of DER. I have reviewed his testimony and join in this conclusion.

II. SUMMARY OF RECOMMENDATIONS AND FINDINGS

Q. What are your recommendations to the Department?

A. Based on my review of the evidence in this case, I make several recommendations to modify and improve the Revised IGMP and to bring it in line with the Department's guidance and directives in its Order in D.P.U. 12-76-B ("12-76-B Order"). While this testimony does not address every issue that I have with Eversource's Revised IGMP, I find that there are several fundamental problems with that plan, which cumulatively warrant disapproval of the Revised IGMP. In summary, I recommend that Eversource be ordered to submit a substantially modified and improved Revised IGMP that addresses the following:

- A plan for education and engagement of all customers that focuses on technology options and services available for managing consumption of energy, energy demand, rates, and bills.
- A plan for achieving full advanced meter functionality ("AMF") in Eversource's service territory.
- An entirely new approach to time varying rates ("TVR") built on a foundation of and compatibility with AMF.
- A plan for providing grid modernization benefits to low- and moderate-income customers.

Q. How would you summarize your findings regarding Eversource's Revised IGMP?

A. My findings in this testimony, which are addressed in detail below, can be summarized as follows:

- The Department has provided clear guidance and requirements for the grid modernization planning process and the content of a grid modernization plan, as well as for the development TVR.
- Eversource has proposed to amend its Initial Filing by moving about $300 million in utility-facing grid modernization investments, infrastructure upgrade investments, "enabling" investments, and other spending into its base rate case in D.P.U. 17-05.
- Eversource's Revised IGMP in this case is heavily weighted to its proposal for an opt-in TVR program.
- Eversource characterizes its opt-in TVR program as its customer engagement effort in its Revised IGMP.

- The proposed TVR program is expected to reach only about 5% of Eversource's customers and is not expected to be cost-effective.
- Eversource evaluates the benefits of full AMF deployment solely in terms of whether an opt-out version of its TVR program proposal would justify AMF deployment expense.
- Eversource does not evaluate the business case for full AMF deployment against the full range of benefits, programs, and services that would be enabled by such deployment.
- Eversource relies on seven guiding principles in constructing its Revised IGMP, but does not articulate a vision for its modern electric grid that embraces actively engaged customers maximizing value through enhanced products, services, and technologies.
- Eversource did not design its TVR program to be focused on customer needs, to be innovative, to be cost-effective, or to engage the vast majority of customers in a meaningful manner.
- Eversource's proposed TVR program outreach and education plan takes an overly broad and unfocused approach to reaching customers.
- Eversource had the benefit of stakeholder input in the development of the Revised IGMP that is not reflected in the content of that plan.
- Eversource's proposed research and development ("R&D") program is not innovative or likely to generate new advances in customer engagement in grid modernization.

Q. Based on your findings, what do you conclude regarding Eversource's Revised IGMP in this proceeding?

A. Based on my review of the evidence in this proceeding, I conclude that Eversource's Revised IGMP:

- is fatally flawed and should not be approved.
- fails to honor the spirit and direction of the Department's guidance for grid modernization and TVR.
- will not advance grid modernization in its service territory in a meaningful way.

III. EVALUATION OF THE REVISED IGMP AGAINST THE DEPARTMENT'S 12-76-B ORDER

Q. What are Eversource's obligations under the Department's 12-76-B Order that you address in this testimony?

A. In its 12-76-B Order, the Department envisioned a "modern electric system" that will be "cleaner, more efficient and reliable, and will empower customers to manage and reduce their energy costs." (12-76-B Order at 1.) Under this vision, the electric system in Massachusetts will "maximiz[e] the integration of solar, wind, and other local and renewable sources of power," "minimize outages by automatically re-routing power when lines go down, and immediately alert the utility when customers have lost power," and "because customers will have new tools and information to enable them to use less electricity when prices spike, the electric system will be appropriately sized and less expensive." (12-76-B Order at 1.)

The Department order provides that:

"[E]ach electric distribution company [is required] to submit a ten-year grid modernization plan outlining how the company proposes to make measureable progress

towards the following grid modernization objectives: (1) reducing the effects of outages; (2) optimizing demand, which includes reducing system and customer costs; (3) integrating distributed resources; and (4) improving workforce and asset management.

"In their [grid modernization plans], companies must outline their timing and priorities for all their grid modernization planning and investment over the ten-year period. In addition, a company's [grid modernization plan] must include a marketing, education, and outreach plan with a component that is common to all the companies, as well as a company-specific, local component; a research, development, and deployment plan; and proposed infrastructure and performance metrics to measure progress in achieving grid modernization objectives, including common statewide and also company-specific metrics. Because customer education, marketing, and outreach are crucial to enabling the successful implementation of grid modernization, companies' marketing and outreach should begin early in the grid modernization process." 12-76-B Order at 2.

"In its first [grid modernization plans] filing, a company also must include a five-year short-term investment plan ("STIP"), which applies only to a company's capital investments. A company's STIP must include an approach to achieving advanced metering functionality within five years of the Department's approval of the [grid modernization plans]. Capital investments included in the STIP must be supported by a comprehensive business case analysis. If the business case analysis does not justify deployment of advanced metering functionality within five years, the company may include an alternative proposal to achieve that functionality within a longer timeframe,

together with a business case analysis that justifies the alternative. ... The STIP may include a proposal for grid modernization capital investments other than those associated with advanced metering functionality, again including a business case analysis." (12-76-B Order at 3 (footnotes omitted).)

Q. How do you summarize the 12-76-B Order and how it should be reflected in a compliant grid modernization plan?

A. The Department's order emphasizes outcomes: more clean and distributed resources; more high-intelligence, self-healing networks; and more customer empowerment. A compliant grid modernization plan should:

- take a 10-year view and include a 5-year investment plan.
- include metrics that can be used to track progress toward achieving the four objectives.
- result in new grid investments, an information-rich service environment, new tools and services for customers, and growth in the deployment of DG against baseline conditions.
- be customer-facing, and reflect engagement with and empowerment of customers, either directly or through aggregators like the Compact or through competitive suppliers.

Q. Where should Eversource's priorities lie under the stated grid modernization objectives?

A. Grid modernization is complex and, for most customers, novel. Both technology deployment and customer education will take time. The Department's guidance is clear: the grid modernization plan must be measured against all four of the objectives. A reasonable grid modernization plan will therefore take a system view and pursue all four objectives in balance. Customer education and deployment of technologies that enable customer services and engagement in enhanced energy services must begin at the same time that Eversource initiates a plan to deploy AMF and associated distribution infrastructure. Measures to reduce the effects of outages should be integrated into a holistic plan that assesses costs as well as opportunity costs. Because of the dynamic nature of the process of grid modernization, as well as the rapid evolution of technology, the grid modernization plan must also include a research, development, and deployment ("RD&D") plan.

Q. How do customer-facing investments and initiatives relate to the development of the modern grid?

A. Grid modernization generally involves both utility-facing and customer-facing investments and initiatives. Utility-facing investments relate to modernizing systems, improving information technology-based functionalities, and developing the utility workforce. Grid modernization also involves customer-facing investments and initiatives that are ultimately about how customers can engage with the modern grid and its enhanced capabilities and services.

Q. What are Eversource's customer-facing proposals in this proceeding?

A. Eversource originally proposed about $300 million in utility-facing grid modernization and infrastructure upgrade investments as part of this proceeding. Eversource now proposes to address those investments in its base rate case in D.P.U. 17-05. The proposals that remain in its Revised IGMP are categorized as "customer engagement," and "customer education and outreach plan" spending and investments. (Revised IGMP at 15 (Eversource also proposes to spend $11 million on incremental cyber security efforts related to proposals in the Revised IGMP)).

Q. How did the Department envision the role of customers in the modern grid in D.P.U. 12-76-B?

A. The Department envisioned an exciting new relationship between customers and their electric service providers. The Department stated in its 12-76-B Order that one key overall purpose of the grid modernization effort is to "empower customers to manage and reduce their energy costs." (12-76-B Order at 1.) The Department envisioned this empowerment resulting from "new tools and information to enable them to use less electricity" based on real time grid condition information. Moreover, the Department recognized that empowered customers engaging with the grid to reduce their energy bills would likewise contribute to savings for all customers because "the electric system will be appropriately sized and less expensive." (12-76-B Order at 1.)

Q. How did the Department translate its vision for engaged customers into direction and guidance in D.P.U. 12-76-B?

A. To secure the benefits of engagement with the grid for both customers and society, the Department directed that AMF should be the basic technology platform for grid

modernization, and therefore a priority area for utility investment in their grid modernization plans. 12-76-B at 13-14. The Department directed that each utility include an approach to achieving AMF within five years of its approval of the grid modernization plan. The Department made allowances for the situation where the business case did not justify AMF deployment within the five-year target period, in which case it directed the submission of an alternative proposal with a longer timeframe and a second business case justification. (*Id.* at 17.) Recognizing the fundamental changes in the relationships that would follow from successful grid modernization, the Department recognized that it is vital that customers "are well informed about and engaged in: (1) their options for managing their energy consumption; (2) the tools and technologies that will assist them; and (3) the benefits associated with reductions in consumption and/or shifting consumption away from high-cost times." (*Id.* at 26.) To that end, the Department directed that: "Each electric distribution company should include a marketing, education, and outreach plan in its [grid modernization plans], with a timeline and strategies, for educating customers and motivating them to become full participants in grid modernization." (*Id.*)

Q. How well does Eversource's Revised IGMP comply with Department guidance?

A. Eversource's Revised IGMP is at best partially compliant with the Department's overall grid modernization plan guidance. Eversource does seem to recognize what is required by the Department, and translates the requirements into seven key principles. Eversource's seven key principles appear superficially reasonable. However, the overall Revised IGMP is heavily dominated by capital spending on utility-facing distribution system

infrastructure and management systems. Eversource proposes more than $400 million in spending on incremental capital investments in two major categories: "smart and integrated" grid investments ($250 million), and "resilient grid" investments ($150 million). The smart grid investments are primarily intended to serve functions of grid situational awareness, analytics, and automated feeder reconfiguration. "Resilient grid" investments are related to safety and reliability, enhancing and expanding business-as-usual spending on inspections, pole-replacements, vegetation management, and other functions. Through its filing of the Revised IGMP, Eversource has shifted about $300 million in grid modernization spending to its base rate filing in D.P.U. 17-05.

Q. What else is in the Revised IGMP?

A. At a high level, Eversource also proposes to spend more than $100 million on an opt-in TVR program, which it calls the "customer engagement" part of the overall Revised IGMP. Eversource expects that 5% of its customers could enroll in the TVR program over five years of the STIP. Eversource also characterizes about $40 million of its capital investment and about $25 million of its total $30 million operating and maintenance spending as "enabling investments." These enabling investments represent: (1) communications investments that extend and increase fiber and radio communications between distribution infrastructure elements, enhancing current SCADA systems; (2) increased cybersecurity spending to integrate grid modernization investments into existing cybersecurity programs; and (3) a customer education program ($19 million) that is basically marketing for the TVR program and promotional communications about the benefits of Eversource's spending on the Revised IGMP. Eversource has shifted about

$36 million in communications-related "enabling investments" to its base rate case in D.P.U. 17-05.

Q. Did the Department provide any guidance directly related to TVR programs?

A. Yes. The Department issued D.P.U. 14-04-C, "Order Adopting Policy Framework for Time Varying Rates," on November 5, 2014 ("D.P.U. 14-04-C Order"). The Department characterized TVR as integral to its policy objective and vision of advancing grid modernization under D.P.U. 12-76-B.

Q. What provisions of the D.P.U. 14-04-C Order are relevant to your testimony?

A. In its D.P.U. 14-04-C Order, the Department ordered that "following the deployment of advanced metering functionality, electric distribution companies will offer to basic service customers: (1) a default time of use ("TOU") rate with a critical peak price ("CPP") component; and (2) an option to opt out of the default rate and choose a flat rate with a peak time rebate ("PTR") component." (D.P.U. 14-04-C Order at 2.) The Department concluded that "[t]he introduction of time varying rates for basic service is necessary and appropriate to advance our grid modernization objectives. Time varying rates will empower customers to shift their demand and decrease their electric bills …" (D.P.U. 14-04-C Order at 20.)

Q. Do Eversource's proposals in the Revised IGMP satisfy the Department's requirements regarding customer education and engagement?

A. No. Eversource directs virtually all its customer engagement efforts, and customer funds, to the opt-in TVR program that is expected to reach about 5% of residential and small

commercial customers. Eversource also uses a flawed approach in evaluating the benefits and costs of full AMF deployment. Eversource's approach fails to meet the Department's requirements regarding AMF and customer engagement.

Q. Does Eversource's overall Revised IGMP reasonably address the objectives established by the Department?

A. Eversource's Revised IGMP is neither reasonable or balanced, does not serve the objectives set out by the Department, and will not support transition to the Department's vision of a modern electric system.

Q. Please explain why Eversource's Revised IGMP does not meet the Department's objectives.

A. As I just described, the Revised IGMP is primarily a capital-intensive program to invest in distribution and communications infrastructure. Even if these proposed investments are reasonable and appropriate, now an issue to be determined in the base rate case, Eversource should make these investments in isolation from, and in addition to, customer-facing investments. Broad-based customer engagement is a tool and intended outcome of grid modernization, and should proceed in parallel with distribution automation, communications, sensing, and other investments. The so-called "customer engagement" proposal to offer a TVR program rate fails as a customer engagement plan. The TVR program proposal is limited in its effective reach to a small fraction of customers because it relies on an opt-in approach and creates savings opportunities only for a subset of residential and small commercial customers. The overall proposal is a utility-centric approach that does not prepare customers for grid modernization, and does

not work to engage third-party providers and aggregators. Eversource does not translate its Initial Filing or Revised IGMP into measures that optimize demand by reducing system and customer costs. Eversource has not proposed a plan that directly empowers, benefits, and engages customers through grid modernization investments, and instead defers such benefits to an unknown date in an un-envisioned future. Eversource has not proposed any measures or investments in either the Initial Filing or Revised IGMP to accelerate the deployment of clean DG, or to harness the forces of competition to support grid modernization goals.

Q. Do you have additional concerns regarding Eversource's decision not to propose a plan for full AMF deployment for its customers?

A. Yes. I address the lack of customer engagement in Eversource's Revised IGMP later. In addition, while Eversource conducted a business case analysis through its consultants, it did not evaluate full AMF deployment in light of outcome-based goals for grid modernization. As a result, I conclude that it is very likely that Eversource's business case analysis significantly undervalues the potential benefits of AMF deployment.

Q. What are your concerns with Eversource's assessment of an opt-out TVR option in the Revised IGMP?

A. Eversource's assessment of an opt-out option is under-developed and deeply flawed. Most importantly, Eversource uses the narrowly cast assessment of an opt-out configuration for a TVR program as an inadequate and insufficient alternative to evaluation and development of a plan to provide customers with full AMF.

Q. Please detail your concerns.

A. Eversource's Revised IGMP starts by asserting that the opt-out TVR option requires full AMF deployment. Rather than conduct a thorough review of the costs, benefits, and opportunities associated with full AMF deployment, with one benefit being the ability to implement the TVR program on an opt-out basis, Eversource constrains its evaluation of AMF deployment to whether it would improve the TVR program as proposed in the Revised IGMP. (Revised IGMP at 61-64.) Eversource's approach is too narrow. Put another way, Eversource asks itself whether full AMF deployment is worth doing just to get the benefits of its TVR rates. Unsurprisingly, the benefits of Eversource's flawed TVR program do not justify full AMF deployment. Eversource's assertions, findings, and conclusions are lacking in several additional ways:

- In the Revised IGMP (at 36), Eversource states that its cost estimates for advanced metering infrastructure ("AMI") meters ($281 million) did not factor the possibility of reduced meter prices associated with mass purchases of hardware. (See Eversource Response to Information Request CLC 4-10.)
- The Revised IGMP (at 36) does not address the extent to which its proposed grid modernization investments could offset or be integrated with the stated costs for AMI deployment. For example, Eversource asserts that AMI deployment would necessitate a new Customer Information System, which in turn could provide a wide range of benefits to customers above and beyond the TVR-related demand reductions. Eversource reports that the customer billing system remains essentially unchanged under the opt-in TVR program design, only delaying and increasing the costs

associated with changes that will be needed to support a modern electric system. (See Eversource Response to Information Request CLC 4-14.)

- Eversource asserts that stranded costs associated with automated meter reading infrastructure would add $165 million to the cost of AMI deployment. (Revised IGMP at 35-36.) The actual cost would likely be lower, as it is not necessary or likely that Eversource will replace all meters at once. Eversource reports that the more than $100 million of ratepayer funds to be spent for the opt-in TVR program technologies would likely be incompatible with the technology that would be used under a full AMF deployment plan, and therefore stranded. (See Eversource Responses to Information Request CLC 2-4, 2-13, 2-14, 4-21, and 4-25(a).)
- Eversource asserts, without substantiation, that AMI meters and the networks to support them are more expensive to maintain, and hints that it believes its customers will have higher AMI meter opt-out rates. (Revised IGMP at 36.) Given the growing national experience with AMI infrastructure, which is largely solid-state in nature, the assertions about maintenance costs are somewhat dubious. Growing pervasiveness of AMI meters and targeted education programs would likely reduce opt-out behavior.
- Eversource lists a range of "back-office support" problems that it asserts would make the opt-out TVR option more expensive than the opt-in version. (Revised IGMP at 37.) This parade of horribles epitomizes the false contrast in Eversource's analysis. Full AMF deployment would support a much broader range of customer services and programs than just TVR, spreading costs and increasing the range of benefits. Eversource offers no support for the proposition that full AMF deployment would

increase mechanical failures, customer complaints and dissatisfaction, and billing inquiries and problems.

- Eversource implies that demand reductions associated with an opt-out TVR program would skew away from the ISO-New England peak because the general population of customers that did not opt-out would not be as focused on reducing use during TVR hours as those who self-selected into an opt-in program. (Revised IGMP at 38-39.) Eversource's assertion ignores the fact that full AMF deployment could enable many more customer programs and services than just TVR; that third-party aggregation and services could target many kinds of customers with, for example, "Bring Your Own Technology" programs;[1] and that there are many costs other than ISO-New England peak-related costs that can be targeted effectively in a modern electric system. Full AMF deployment would also provide capability to low- and moderate-income customers to engage with the modern electrical grid, something not likely under the opt-in TVR program design.
- Eversource asserts that many residential customers do not have sufficient discretionary load that they can shift so as to benefit from an opt-out TVR program. (Revised IGMP at 38-39.) This tautological argument obscures the fact that these customers would also not benefit from an opt-in TVR program. That is not the issue in grid modernization or customer engagement. Eversource does not refute the fact

[1] See K. Tweed, "One Demand Response Platform to Rule Them All in Austin," Greentech Media (Aug. 5, 2013), available at: https://www.greentechmedia.com/articles/read/one-demand-response-platform-to-rule-them-all-in-austin. A "bring your own" program involves the utility building and operating a customer interface and/or enterprise bus to which third-party service providers and aggregators can interact to participate in demand reduction programs and pricing.

that with full AMF deployment, many more services and products could be offered that would provide benefits to customers that engage with the modern electric grid.

- Eversource offers evidence that customer interest in opt-in smart grid programs—TVR pilots—has been low, and that it expects even lower interest among its residential customers in the Eversource East territory. (Revised IGMP at 40-42.) Eversource points out that small commercial customers have limited ability to participate in load shifting, and that medium and large commercial customers and industrials customers already have options for benefitting from load shifting. (Revised IGMP at 42.) These are arguments for full AMF and a broader range of products and services that can meet the needs of all kinds of customers; they do not argue for opt-in TVR. This Eversource argument also points out the weakness and limitations of the opt-in TVR program as a vehicle for spending over $100 million in ratepayer funds under the category of "customer engagement."
- Eversource takes a very narrow and limited view of the benefits available from full AMF deployment. In its view, the main benefits of AMF are (1) the ability to remotely disconnect customers who do not pay their bills, and (2) workforce savings from reducing meter-reading staff. (Revised IGMP at 43-44.) Eversource's extremely narrow view of the benefits of AMF is out of alignment with the Department's vision of the opportunities and benefits available from a modern electric system.

Q. Does Eversource quantify its analysis of the opt-in TVR program benefits and costs?

A. Eversource's benefit-cost analysis, conducted by Navigant Consulting ("Navigant"), confirms that the opt-in TVR program is not a cost-effective use of customer revenues.

(Revised IGMP at 61-64.) Even at a customer participation rate four times greater than anticipated, the TVR program would still reach only one in five residential and small commercial customers, and still not achieve cost-effectiveness.

Q. Does the Eversource evaluation of cost effectiveness for the opt-in TVR program inform the development of full AMF deployment in its service territory?

A. The Navigant benefit cost analysis of the opt-in TVR program provides very little information about the business case associated with full AMF deployment, focused as it is on TOU rates only. Nonetheless, Eversource reiterates its misleading analysis that compares opt-in TVR to opt-out TVR as a basis for failing to submit any plan for full AMF deployment. (See Revised IGMP Table 12 at 63 (comparing opt-in and opt-out TVR scenarios).)

Q. Does Eversource's proposed opt-in TVR program establish the groundwork for further grid modernization and full AMF deployment in the years beyond the STIP period?

A. The proposed TVR program provides little or no support to broader grid modernization beyond the period covered by the STIP. The TVR program and technology are not compatible with full AMF deployment. Eversource offers no evidence that the population of customers that could benefit from TVR would substantially increase, even though it asserts that "it is conceivable that as many as 20 percent of the customer base" might be in the program. (Revised IGMP at 82.) Eversource provides a list of new optional program offerings that could be considered for years 6-10 of the Revised IGMP. It is important to note that none of these are dependent on the existence or operation of the

proposed TVR program. In fact, program ideas like new TVR programs, new pricing programs, and behavioral campaigns are all more likely to succeed in a world of full AMF deployment—a world not envisioned in Eversource's Revised IGMP.

Q. Does Eversource's TVR program proposal meet the Department's guidance regarding customer engagement with the grid?

A. No. Eversource's opt-in TVR program is its purported vehicle for customer engagement. I discuss the customer engagement issues relating to the proposed TVR program in Part IV of this testimony.

IV. EVERSOURCE'S REVISED IGMP AS A VEHICLE FOR ELECTRIC SERVICE MODERNIZATION

Q. What larger trends are emerging in the provision of electric service because of grid modernization in other jurisdictions?

A. Grid modernization is a categorical term that captures a wide range of technology and service changes that ultimately can transform the basic "operating system" of the electric utility services business. This larger trend is toward a more transactional electric service system that measures, accounts for, and compensates for the creation of value by the utility, third-party providers, and even customers themselves. Rather than merely being rate-paying consumers of undifferentiated energy, customers will become directly or indirectly much more active in their use of energy. With the help of third-party service providers, aggregators, DG, and information-based technologies – all deployed, managed, and operated as an integrated whole – customers can enjoy a wider range of usage

options, and can create value that the distribution system operator can compensate on a transactional basis.

Q. What kinds of investments does the modern electric system require?

A. A data-rich and transaction-rich environment will require substantial investments of the kinds proposed by Eversource in its Revised IGMP, and now, in its base rate case. These include enhanced sensing and management systems, more precise modeling and monitoring of the grid, and greater opportunity to take advantage of customer-originated value and services. Well-planned investments in such smart systems can also yield resiliency and reliability benefits. The modern electric system can anticipate and respond to variability in grid conditions, and at the same time, deploy customer-sited functionality as a grid management resource.

Q. How does Eversource's Revised IGMP comport with this vision of a more reliable, resilient, and transactive energy grid?

A. Eversource's Revised IGMP reflects a limited, utility-centric vision of the modern grid. The Revised IGMP is not a plan where the central focus is on evolving the grid into a system where highly controllable and manageable load and DG are integrated into the resource base for Eversource as a grid platform operator and optimizer. Rather, the Eversource plan primarily adds new, expensive technology to a top-down model of the distribution system operator of the last century. For example:

- In the face of increasing DG, Eversource wants to invest in systems to monitor and model DG, but not to integrate DG as a resource.

- Rather than seeking to segment customers and offer them tailored energy management solutions, Eversource proposes a TVR program that sends price signals to a widely undifferentiated customer base and leaves it to customers to determine if the rate might save them money.
- Eversource proposes to enrich its moment-by-moment awareness of grid conditions and its ability to predict outages. But it does not propose, as discussed in Jordan R. Gerow's testimony for the Compact, to develop reliability-enhancing microgrid systems or approaches for incentivizing the deployment of distributed energy resources into system hot-spots to avoid more costly infrastructure investments (so called "non-wires alternatives").

Q. How should Eversource approach grid modernization planning?

A. In addition to honoring the requirements and the spirit of the Department's guidance, Eversource should develop a strategic view about how technology deployment and investments advance a transformation from the distribution company of the past into a modern electric system. In developing such a strategic view, extensive analysis and planning is required. A recently published white paper from Energy Innovation entitled "Getting the Most Out of Grid Modernization" offers a useful step-by-step process that I would recommend to Eversource and the Department.[2]

Q. What does this step-by-step process entail?

[2] S. Aggarwal & M. O'Boyle, "Getting the Most Out of Grid Modernization," Energy Innovation Policy & Technology LLC (Feb. 2017). Available at: http://energyinnovation.org/publication/getting-grid-modernization/. An article about the paper was published in ElectricityPolicy.com, and is available at: https://electricitypolicy.com/images/2017/February/13Feb2017/Aggarwal/Aggarwal22Feb2017.pdf.

A. The Energy Innovation paper recommends the following five steps, which I endorse:

1. *Conduct an Integrated Assessment of the Distribution and Transmission Systems* - Assess the costs and benefits of distributed resources and a modern grid in the context of existing and planned generation and transmission. This process is essentially a local integrated resource planning, or "integrated distribution planning," exercise, and it is critical in identifying needs and resources that can meet those needs on a least cost basis. In this planning exercise, Eversource can inventory and evaluate customer-sited resources that can help meet the need for grid services, and the technology and systems investments needed to take advantage of those resources.
2. *Define the Goals of a Grid Modernization Program* - Clearly define policy goals based on assessment of costs and benefits, focusing on desired outcomes. It is important to recognize that the Department objectives provide direction and categorization, but the ultimate outcomes are lower costs and customer bills, higher reliability, reduced outage impacts, etc. That is, the goal is not merely compliance. A time-based rate program is a mechanism for reducing peak demand, and only an indirect means for conducting a customer engagement and education effort.
3. *Choose Metrics for Each Goal* - Tie metrics as closely as is feasible to the goals and outcomes identified in Step 2. Ensure that metrics can be quantified and independently verified using reasonably available data, and avoid reliance on counterfactuals when measuring performance. Metrics that measure deployment numbers or dates for technology, or the number of customers contacted, for example, are metrics for process, but not for outcomes.

4. *Create an Open Process to Set Targets* - Set realistic targets that balance costs and benefits and incorporate stakeholder input. If a time-based rate program is to be proposed, for example, Eversource should conduct segmentation analysis, customer focus-groups, interviews with demand-side service providers, and meetings with aggregators (like the Compact) prior to proposing a program design.
5. *Consider Tying Utility Revenue to Performance* - Evaluate and propose options such as a conditional rate of return, earnings adjustment mechanisms, market-based earnings, and budget caps with shared savings. Eversource must present a plan that is bold and has consequences in terms of advancing the modern electric grid envisioned by the Department. Achievement of goals should have reasonable compensation and meaningful incentives; failure to achieve outcome-based objectives should have consequences as well.

Q. How does Eversource's Revised IGMP compare to this process?

A. The Revised IGMP and its capital spending now proposed in the base rate case is organized as a checklist exercise aimed at compliance with the language, but not the spirit of the Department's guidance. (Eversource provides its checklist in the Revised IGMP at 65.) Eversource's approach lacks an integrated vision organized around a least-cost, highest-benefit plan to address system needs through reliance on a wide range of distributed energy resources. Eversource needs to establish grid modernization goals that are outcome-based and can be measured objectively. Eversource should have "skin in the game" around achieving the outcome-based goals, not just completing the process of hardware deployment or customer contact. That is, there should ultimately be direct

correlation between Eversource's profitability and the extent to which it meets goals and advances the realization of the modern electric grid.

V. EVERSOURCE'S REVISED IGMP AS A MEANS FOR ENHANCING CUSTOMER ENGAGEMENT WITH THE GRID

Q. To what extent is Eversource's Revised IGMP a customer-facing plan that will enhance customer engagement with the grid and grid functions?

A. Eversource's Revised IGMP addresses customers in two main ways. First, Eversource proposes to spend more than $100 million to establish an opt-in TVR program that offers TOU rates. Customers will also be required to pay charges to participate in the program. Second, Eversource proposes a customer education and outreach plan, which has a proposed budget of $19 million. Eversource states that the TVR program will consume about 20-25% of the customer education plan budget. (Eversource Response to Information Request CLC 6-1.) The customer education plan focuses on the TVR program and on informing customers about what Eversource considers the benefits of the Revised IGMP. Of course, Eversource also proposes an additional $300 million in spending for distribution infrastructure, upgrades, information systems, and operating and maintenance costs, also to be paid for by customers in D.P.U. 17-05. Those investments are no longer a part of this proceeding.

Q. Does Eversource propose other customer engagement investments or spending?

A. Eversource took the position that much of its proposed spending—in this proceeding and in the rate case—is customer focused because customers value reliable and safe electric service and shorter outages.

Q. Does Eversource's TVR program proposal constitute a reasonable customer engagement plan within the Revised IGMP?

A. No. The TVR program will have limited value, will reach a very narrow set of customers, requires a great deal of investment, has a huge opportunity cost, and will not engage the large majority of customers in the modern electric grid. It should not be approved as proposed because it is not a reasonable approach to increasing customer engagement with the grid and enhanced grid functionality. The opt-in TVR program would not constitute a good program investment even outside the context of the grid modernization plan. Taken as a whole, Eversource's Revised IGMP proposals in this proceeding and in the base rate case evidence over-spending on utility-facing investments and under-investment on customer-facing initiatives.

Q. Does Eversource assert that the TVR program will advance the policy goal of more efficient use of energy?

A. Yes. The TVR program is expected to encourage participating customers to shift energy use to off-peak periods. Although it asserts that 95% of customer are eligible to participate in the program, Eversource does not expect most customers to participate in the opt-in TVR program. Indeed, Eversource expects only about 5% of residential and commercial customers, mostly high energy users with the ability to shift significant load, to participate in the TVR program.

Q. Is the TVR program likely to serve as an incremental step toward broader customer engagement in advanced technology and dynamic rates?

A. No. The requirements and design characteristics of the proposed TVR program are such that the program is not likely to contribute to expanded customer engagement. First, the opt-in nature of the program design must overcome significant inertia among customers, especially since the primary behavior motivator in shifting load is high on-peak prices. Second, the pool of customers likely to participate and benefit from the TVR program is limited to those that have significant discretionary load that they can shift from on to off peak without significant business or lifestyle disruption. Third, the TVR program requires customers to pay $4 per month for communications services, creating a savings hurdle that must be overcome for the benefits to outweigh costs. Fourth, the program relies on deployment of technologies that cannot be cost-effectively scaled to full automated meter functionality for the entire population of customers. Finally, the TVR program is limited in reach only to the concept of on-peak load shifting or reduction. It is not designed to, nor does it, inform customer engagement in the full range of products and services that could be enabled by a modern electric gird.

Q. Does Eversource assert that the TVR program will advance customer engagement?

A. Eversource asserts that its opt-in TVR program is "focused on its customers' needs," is "innovative," will "engage customers in a meaningful manner," and achieves "the majority of the benefits of an opt-in program at a fraction of the costs." (Revised IGMP at 16.) As previously explained, Eversource uses an unrealistic comparison of opt-in and opt-out versions of the TVR program as the basis for an argument against investments, programs, and services in full AMF. As a result, Eversource has no plans for full AMF or

network meter reading implementation during the ten-year term of the Revised IGMP. (Eversource Responses to Information Request CLC 2-24 and 2-33.)

Q. Do you have other specific concerns about Eversource's proposed TVR program?

A. Yes. Information provided by Eversource in response to information requests reveals that Eversource has not designed the TVR program to be focused on customer needs, to be innovative, to be cost-effective, or to engage the vast majority of customers in a meaningful manner. Some examples of the flaws in the Eversource proposal include:

- Eversource provides no detail on access to smart meter data for third parties or aggregators, and no plan for customers served by competitive suppliers to participate in the TVR program. (Eversource Response to Information Request CLC 2-1.)
- Eversource is unable to know whether the TVR program net costs will be covered by participant customers or be shifted to non-participating customers because cost allocation will ultimately depend on levels of customer participation and savings. (Eversource Responses to Information Request CLC 2-7, 2-17, and 2-26.) That is, rather than identifying customer costs and needs, and then designing and targeting rate and program design to similarly-situated customer segments, Eversource proposes to wager more than $100 million in ratepayer funds on a program that it expects only 5% of customers to enroll in.
- Eversource has not evaluated what would be required to provide customers with real time data, instead of next-day interval data. Real time data would greatly enhance the

efficacy of the TVR program for customers. (Eversource Response to Information Request CLC 2-10.)

- Eversource has not evaluated whether customers on existing TOU rates would benefit from or be interested in participating in the TVR program. (Eversource Response to Information Request CLC 2-20.) Since the program is proposed on an opt-in basis, it would improve program success to engage with previous TOU rate customers to gain experience, perceptions, consumption patterns, and other information. Nor has Eversource evaluated what kind of customer energy usage patterns would be well-suited to the critical peak price rate option, how many such customers exist, or other aspects of the customer segments that would be good candidates for the rate. (Eversource Response to Information Request CLC 2-21.) Eversource has not performed any mining of usage data or segmentation of customers for the TVR program. (Eversource Response to Information Request CLC 2-21.)
- Eversource has performed no substantial evaluation of in-home energy information system options, (Eversource Responses to Information Request CLC 2-29, 2-30, and AG 4-33) and has not incorporated any analysis of independent customer adoption of in-home automation technologies in developing its opt-in TVR plan. (Eversource Response to Information Request CLC 2-42.) Eversource did not investigate Wi-Fi options for its TVR program because it had decided to use a cellular-based communications system for the program, and because no cellular metering system today uses Wi-Fi. (Eversource Response to Information Request CLC 4-24.) Eversource's position ignores the potential for improved customer savings and peak

reductions through "Bring Your Own Thermostat" and similar appliance control technologies.

- Eversource asserts that there is no likelihood of transmission and distribution system savings resulting from the opt-in TVR program because customer enrollments are anticipated to be geographically diverse. For the same reason, Eversource believes that an opt-out program design would also not generate transmission or distribution system savings. (Eversource Response to Information Request CLC 2-45.) Eversource did not propose any TVR program marketing element to target high marginal capacity cost areas within its grid, and to enable rates to support non-wires alternatives to infrastructure investments.
- Eversource reports that cyber-security costs associated with the TVR program are essentially unknown at this time. (Eversource Response to Information Request CLC 4-23.) These costs could impact program cost-effectiveness and create potential cost-shift from TVR customers to non-participant customers.
- Eversource reports no affirmative engagement with aggregators like the Compact in the design of the TVR program. (Eversource Response to Information Request CLC 4-40.) Since aggregators and third-party service providers bring new avenues of customer engagement, they are vital partners in the success of an opt-in program. A more reasonable approach would have been early and frequent engagement with aggregators like the Compact in the development of the TVR program.
- Eversource reports that it will communicate with customers about high ISO-NE prices that could impact bills under the TVR program, but has not performed any

evaluation of the best methods for communicating with customers. Nor does it intend to undertake such an evaluation until after a TVR program is approved. (See Eversource Response to Information Request CLC 6-12.) Since effective communication is essential to a TVR program based on price signals, and creates a significant program cost, this step should not have been delayed in developing the TVR program proposal.

- Eversource has proposed its TVR program without knowing how it will evaluate the level of response by low income customers. (See Eversource Response to Information Request CLC 6-13.) Nor has it determined how it will reach out to and communicate with low income customers. (See Eversource Response to Information Request CLC 6-20.) Many years of energy efficiency program implementation have taught that low income customers are often hard to reach and hard to serve. The evaluation metrics and communications methods for low income customers should be addressed prior to program approval.

Q. How does Eversource assert a connection between customer engagement and the proposed opt-in TVR program?

A. Eversource characterizes the overwhelming majority of its STIP spending on the TVR program as customer engagement. (Revised IGMP Table 1 at 15.) As a result, Eversource reports that "[t]argeted outreach to customers is a fundamental commitment of Eversource's customers outreach plan." (Revised IGMP at 58.)

Q. What does Eversource's customer education and outreach plan for the TVR program provide?

A. Eversource makes extremely broad representations about its TVR program customer education and outreach program that are significantly inconsistent with the actual TVR program proposal. Eversource asserts that the proposed TVR program will be available for all residential and small commercial customers, even though it also recognizes that the customer participation will likely be in the range of 5%, and that many customers will lack the discretionary load or lifestyle habits to save money through optional TVR.

Q. How does Eversource's TVR program outreach and education plan square with its decision not to plan for full AMF for all customers in this Revised IMGP?

A. In its Revised IGMP, Eversource states that its approach to customer education and outreach will provide customers with "fast access to tolls and information enable them to use more electricity when prices are lowest, and less when prices are highest," to make informed electricity use decisions throughout the day, and achieve the most cost-effective way to reduce peak demand. (Revised IGMP at 58.) Because Eversource is not proposing a plan for full AMF, its TVR program outreach and education plan description is misleading. Only customers that opt in to the program rates, commit to service under the rate for one year, and agree to pay additional charges will ultimately be able to receive the information and make use of the tools described. Eversource is not proposing any in-home technology, appliance control, behind-the-meter storage or DER/DG, or other technological options for customers to improve control of their electricity use.

Q. Isn't Eversource proposing broad outreach in TVR program communications plan?

A. Eversource proposes an extremely broad, multi-channel outreach plan in order to find the relatively few customers that would actually benefit from the TVR program rates. Eversource says its communications plan will "maximize reach," and provide tools and information. (Revised IGMP at 58-59.) Under a maximum reach strategy, Eversource messaging will therefore be designed to reach the 95% of customers unlikely to participate in the program. It is extremely likely that without the targeted customer engagement strategies described below, Eversource's TVR program communication plan will largely be a waste of customer money.

Q. Are better options available for TVR program customer engagement?

A. Yes. Given the narrow range of customers likely to benefit from the TVR program, a more prudent approach would be to engage with aggregators and third parties to identify prospective program participants and to support/conduct load research and analysis. This research and analysis could then be used by Eversource, aggregators, and third parties to communicate directly with the relatively few customers likely to benefit from TVR.

Q. What do these findings tell you about Eversource's approach to customer engagement?

A. Eversource's approach is not very engaging. As regards to pricing-based programs, there are really two major approaches, with gradation in between. A passive, and likely not very successful approach, is to post and advertise a price and leave it to customers to decide whether the price is worth responding to. An active, engaged approach would be to invest first in studying customer consumption, conducting segmentation research, and

then design rates that maximize utility and customer benefits. Eversource's proposed TVR program is much too passive, too poorly researched, and not engaging. It does not support the commitment of ratepayer funds proposed by Eversource.

Q. Did Eversource have the benefit of stakeholder input in developing its Initial Filing and Revised IGMP?

A. Yes. According to Eversource, it gathered input at one meeting held on April 14, 2015, and in unspecified follow up meetings. Eversource reports Key Outcomes and Key Strategies from the perspective Eversource and that of meeting participants in Table 16 of its proposed plan. (Revised IGMP at 70.)

Q. How does Eversource's view of grid modernization outcomes compare with those of customer participants in the stakeholder process?

A. Eversource takes a very utility-centric view of grid modernization outcomes, listing system peak reduction, improved power factor, reduced line losses, and improved power quality. On the other hand, customer stakeholders sought a customer-centric and systems perspective including reducing system costs for all customers, improving system utilization and efficiency, better integration of DER and reduction of outages, fairness in cost allocation, and a focus on peak reductions at the feeder level.

Q. How does Eversource's view of grid modernization key strategies compare with those of customer participants?

A. I have organized the information provided in Eversource's plan related to stakeholder feedback on "Key Strategies" in Table 16 of the Revised IGMP below. Table 1, below,

shows how customer feedback aligns with the strategies shared by Eversource at the stakeholder engagement meeting.

Table 1: Stakeholder Feedback to Eversource on Key Grid Modernization Strategies

Key Strategies	
Shared by Eversource	*Proposed by Meeting Participants*
• Manage peaks with time-varying rates	• Use automated metering for TVR • Use load control devices • Use demand management programs (e.g. storage cooling)
• Dynamic optimization of voltages to improve system efficiency	• Share information about state of the system with both users and DER • Enhance coordination between ISO-NE and Eversource • Incentivize DER • Manage short-term intermittency from DER • Enable more third-party DER
• Manage peak loads from electric vehicles	• Use storage provided by electric vehicles for peak load management
• Balance peak load with energy storage in areas with high DER penetration	• Use demand management programs (e.g. storage cooling)

Q. What findings can you draw from a review of Eversource's recitation of key strategies and the proposals from stakeholder meeting participants?

A. By setting participant responses against relevant Eversource strategies, it is apparent that there is a wide gap between how Eversource is proposing grid modernization and what

customer stakeholders want. Eversource strategies are all utility-centric and inward-facing. A few examples stand out:

- Eversource wants to "manage peaks with time-varying rates," while stakeholders want automated metering, load control devices, and demand management programs (including thermal storage).
- Eversource wants "dynamic optimization of voltages to improve system efficiency," while customer stakeholders want information sharing with users and DER/DG operators, enhanced coordination between Eversource and the ISO-NE, incentives for DER/DG, tools to manage DER/DG intermittency, and support for more third-party DER/DG.
- Eversource wants to "manage loads from electric vehicles," while customer stakeholders see an opportunity to use the storage provided by electric vehicles for peak load management ("V to Grid" configurations and operations).

Q. Was Eversource aware that customers wanted its grid modernization plan to take a broader system-wide and more customer-facing view when developing the Revised IGMP?

A. Eversource reports that "[i]n addition to the above input on key outcomes, strategies, and metrics for each of the four objectives, meeting participants provided the following cross-cutting comments:

- There are interdependencies between the objectives that should be recognized in the investment analysis. For example, increasing integration of distributed energy resources can help with demand optimization and improving resiliency.
- It would be useful to identify those strategies/investments that promote multiple outcomes across the four objectives.
- There are also interdependencies and interconnections between the outcomes and the strategies across the four objectives.
- Eversource should conduct a more granular analysis of costs and benefits (e.g., by customer class and by critical loads).
- It would be helpful to document the value of investments made. For example, quantifying the number of outages avoided as compared to present performance. (Revised IGMP at 71.)

Q. Does Eversource's Revised IGMP reflect the perspective and preferences of customer stakeholders?

A. Notwithstanding Eversource's assertion in its Revised IGMP (at 71) that "[e]ngagement with various stakeholders was an extremely useful exercise and helped inform Eversource's filing," the Revised IGMP fails to reflect and incorporate customer stakeholder perspectives and preferences. Eversource reports that stakeholders offered clear guidance on several cross-cutting issues.

Q. What do you conclude based on a review of customer stakeholder feedback to Eversource on the outcomes, strategies, and cross-cutting issues of the Revised IGMP?

A. Eversource's Revised IGMP is significantly out of step with the preferences of the customer stakeholders, who will ultimately pay for implementation of Eversource's plan in its excessive utility-centric focus and its narrowly constructed opt-in TVR program. As a whole, customers and stakeholders evidence a more systemic and customer focused understanding of the opportunities and operations of the modern electric grid than Eversource.

Q. Does Eversource address customer-related aspects of grid modernization anywhere else in its Revised IGMP?

A. Yes, but only to a limited extent. Eversource addresses some customer-related issues in its proposed R&D efforts. Eversource proposes to spend $1.5 million per year on R&D, and will focus on spending this money through research partnerships with local academic institutions. (Revised IGMP at 72-73.) While Eversource describes its R&D efforts to include pilot and demonstration projects, it proposes no such projects in its Revised IGMP. (*Id.*at 77.)

Q. Is Eversource's proposed R&D program innovative or likely to generate new advances in customer engagement in grid modernization?

A. No. Eversource's R&D program plan is basically a list of intended research and studies that have largely been conducted by other utilities in other parts of the country. As such, the proposed R&D program is unlikely to generate new understanding or insights, and will not substitute for programs, services, and rates that could have been proposed in this Revised IGMP. Eversource's R&D proposals include many activities that should have already been completed in preparing for this Revised IGMP, including: technologies and

analytics relating to DER integration; assessment of low-income customer issues related to grid modernization; new rate design and pricing options for a wide range of DER, including DG; the efficacy of home energy reports for demand response and load shifting; and microgrids.

Q. Based on your experience, what kinds of customer engagement initiatives and proposals should be included in a grid modernization plan that were not addressed by Eversource in its Revised IGMP?

A. A customer engagement plan for a grid modernization plan should include the following:

- A plan for continuous communications and engagement with customers about the opportunities for bill savings and energy management relating to grid modernization, including technical, financing, and other information about distributed energy resources of all kinds.
- Metrics that are outcome-based and relate to customer cost reductions and plans for how those cost savings will be created and allocated.
- A plan for bringing AMF to all customers.
- Customer segmentation analysis and rate program proposals, technology options, and services tailored to customer usage patterns by segment.
- A plan for providing customers and approved third parties with historical data, including data privacy protection and availability provisions.
- Tools for customers to analyze their consumption and billing information, including allowing access by third-party providers.

- Plans and programs designed to integrate with program and service offerings from aggregators and competitive suppliers.
- Plans for addressing the needs of low- and moderate-income customers.
- Plans for streamlining the interconnection of DG.
- Plans for developing microgrids.

In addition, and as discussed above, the grid modernization proposal should include a plan for Eversource to become, and enhance its role as, a platform for the customers to take advantage of DER and to receive compensation and/or bill credits for services provided back to the grid (such as demand response, ancillary services, etc.).

VI. CONCLUSIONS

Q. What are your conclusions regarding Eversource's Revised IGMP?

A. My overarching conclusion is that Eversource has proposed a Revised IGMP that fails to adequately address the objectives established by the Department. In my view and based on the information that I reviewed in this proceeding, I conclude that Eversource's Revised IGMP:

- is fatally flawed and should not be approved.
- fails to honor the spirit and direction of the Department's guidance for grid modernization and TVR.
- will not advance grid modernization in its service territory in a meaningful way.

Q. Based on your conclusions, what are your recommendations to the Department?

A. A better approach than that proposed by Eversource in this Revised IGMP would be to invest the $100 million proposed for the opt-in TVR program in programs and initiatives that serve and support all customers. The proposed spending would serve as an excellent start to an investment in full AMF functionality, and could be structured to complement prudent grid-related investments now proposed in Eversource's base rate case in D.P.U. 17-05. I recommend that the Department order Eversource to submit, within 180 days of an order in this proceeding, a substantially modified and improved Revised IGMP that addresses the deficiencies noted in this testimony and in the testimony of other witnesses appearing on behalf of the Compact. In developing the modified and improved Revised IGMP, Eversource should:

- Include a plan for customer education that focuses on technology options and services available for managing consumption of energy, energy demand, rates, and bills. The customer education program should be designed in consultation with third-party service providers and aggregators.
- Include a plan for achieving full AMF in Eversource's service territory over a timeframe not to exceed ten years.
- Withdraw the proposed TVR program and investments. Any replacement rate and technology programs should be designed around integration with the ultimate implementation of AMF.
- Include a plan for providing grid modernization benefits to low- and moderate-income customers.

Q. Does this conclude your testimony?

A. Yes.

Karl R. Rábago

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Summary

Nationally recognized leader and innovator in electricity and energy law, policy, and regulation. Experienced as a public utility regulatory commissioner, educator, research and development program manager, utility executive, business builder, federal executive, corporate sustainability leader, consultant, and advocate. 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 US 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 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

PACE ENERGY AND CLIMATE CENTER, PACE UNIVERSITY SCHOOL OF LAW

Executive Director: May 2014—Present.

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

- Co-Director and Principal Investigator, Northeast Solar Energy Market Coalition (2015-present). The NESEMC is 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 seeks to harmonize solar market policy and advance best policy and regulatory practices in the northeast United States.
- 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 (formerly the Green Power Board).

- Director, Interstate Renewable Energy Council (IREC) (2012-present). IREC focuses on issues impacting expanded renewable energy use such as rules that support renewable energy and distributed resources in a restructured market, connecting small-scale renewables to the utility grid, developing quality credentials that indicate a level of knowledge and skills competency for renewable energy professionals.

RÁBAGO ENERGY LLC

Principal: July 2012—Present. Consulting practice dedicated to providing expert witness and policy formulation advice and services to organizations in the clean and advanced energy sectors. Recognized national leader in development and implementation of award-winning "Value of Solar" alternative to traditional net metering. Additional information at www.rabagoenergy.com.

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. Additional activities:

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

Karl R. Rábago

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. Founded in 1997, NatureWorks, LLC is based in Minnetonka, Minnesota. 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 Law School, 2014-present. Non-tenured member of faculty. Courses taught: Energy Law. Supervise a student clinical effort 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 a Master of Laws degree in Environmental Law. Established a program for subsequent environmental law professors to obtain an LL.M. prior to joining the faculty.

LITIGATION

Trial Defense Attorney and Prosecutor, U.S. Army Judge Advocate General's Corps, Fort Polk, Louisiana, January 1985–July 1987. Assigned to Trial Defense Service and Office of the Staff Judge Advocate. Prosecuted and defended 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.

Karl R. Rábago

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 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)

"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)

Karl R. Rábago

"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)

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

(as of 13 January 2017)

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, 1203	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)

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(as of 13 January 2017)

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	VA 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	VA 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

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(as of 13 January 2017)

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	VA SCC Case # PUE-2016-00049	Environmental Respondents
Sep. 13, 2016	Appalachian Power Company 2016 IRP	VA 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 13 January 2017)

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"

COMMONWEALTH OF MASSACHUSETTS

DEPARTMENT OF PUBLIC UTILITIES

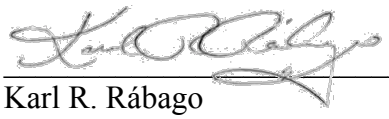
Petition of NSTAR Electric Company and Western Massachusetts Electric Company d/b/a Eversource Energy For Approval of their Grid Modernization Plan	)	D.P.U. 15-122/123

AFFIDAVIT OF KARL R. RÁBAGO

Karl R. Rábago does hereby depose and say as follows:

I, Karl R. Rábago, certify that the direct testimony and exhibits submitted on behalf of the Cape Light Compact in the above-captioned proceeding, which bear my name, were prepared by me or under my supervision and are true and accurate to the best of my knowledge and belief.

Signed under the pains and penalties of perjury.



Karl R. Rábago
Executive Director, Pace Energy and Climate Center

Dated: March 10, 2017