COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF PUBLIC UTILITIES

Petition of Massachusetts Electric Company and Nantucket Electric Company d/b/a National Grid for Approval of its Grid Modernization Plan.	)	D.P.U. 15-120
Petition of Fitchburg Gas and Electric Light Company d/b/a Unitil for Approval of its Grid Modernization Plan.	)	D.P.U. 15-121
Petition of NSTAR Electric Company and Western Massachusetts Electric Company d/b/a Eversource Energy for Approval of their Grid Modernization Plans.	)	D.P.U. 15-122/15-123

Direct Testimony of
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On Behalf of
Conservation Law Foundation

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1. INTRODUCTION AND QUALIFICATIONS

Q Please state your names, titles, and employer.

A Woolf: My name is Tim Woolf. I am a Vice President at Synapse Energy Economics, located at 485 Massachusetts Avenue, Cambridge, MA 02139.

Horowitz: My name is Ariel Horowitz, PhD. I am a Senior Associate at Synapse Energy Economics, located at 485 Massachusetts Avenue, Cambridge, MA 02139.

Synapse Energy Economics is a research and consulting firm specializing in electricity and gas industry regulation, planning, and analysis. Our work covers a range of issues, including economic and technical assessments of demand-side and supply-side energy resources; energy efficiency policies and programs; integrated resource planning; electricity market modeling and assessment; renewable resource technologies and policies; and climate change strategies. Synapse works for a wide range of clients, including state attorneys general, offices of consumer advocates, trade associations, public utility commissions, environmental advocates, the U.S. Environmental Protection Agency (EPA), U.S. Department of Energy (DOE), U.S. Department of Justice, the Federal Trade Commission, and the National Association of Regulatory Utility Commissioners. Synapse has over 25 professional staff with extensive experience in the electricity industry.

Q Please summarize your professional and educational experience.

A Woolf: Before joining Synapse Energy Economics, I was a commissioner at the Massachusetts Department of Public Utilities (DPU) for four years. In that capacity, I was responsible for overseeing a substantial expansion of clean energy policies, including significantly increased ratepayer-funded energy efficiency programs; an update of the DPU energy efficiency guidelines; the implementation

of decoupled rates for electric and gas companies; the promulgation of net metering regulations; review and approval of smart grid pilot programs; and review and approval of long-term contracts for renewable power. I was also responsible for overseeing a variety of other dockets before the Commission, including several electric and gas utility rate cases.

Prior to being a commissioner at the Massachusetts DPU, I was employed as the Vice President at Synapse Energy Economics; a Manager at Tellus Institute; the Research Director at the Association for the Conservation of Energy; a Staff Economist at the Massachusetts Department of Public Utilities; and a Policy Analyst at the Massachusetts Executive Office of Energy Resources.

I hold a Masters in Business Administration from Boston University, a Diploma in Economics from the London School of Economics, and a BS in Mechanical Engineering and BA in English from Tufts University. My resume, attached as Exhibit CLF-TW/AH-2, presents additional details of my professional and educational experience.

Horowitz: At Synapse, I have worked extensively on issues related to energy system planning, data analysis, and the use of new technologies. My work has included comments on integrated resource plans, as well as reports on and modeling of policy-driven changes to the energy sector pertaining to Oregon, Michigan, Puerto Rico, Connecticut, and the Regional Greenhouse Gas Initiative member state region. I have provided consulting services for clients including: the Energy Commission of Puerto Rico, U. S. EPA, the District of Columbia Office of the People's Counsel, the Michigan Public Service Commission and Department of Environmental Quality, multiple renewable energy developers, and the Sierra Club.

I have provided expert analysis and testimony on issues related to utility planning, revenue requirement, forecasting, and operations on behalf of the Energy Commission of Puerto Rico.

I hold a Doctorate in Chemical Engineering from Tufts University as well as a BS in Engineering from Swarthmore College. My research focused on design and use of electrochemical energy storage technologies. My resume, attached as Exhibit CLF-TW/AH-2, presents additional details of my professional and educational experience.

Q On whose behalf are you testifying in this case?

A We are testifying on behalf of the Conservation Law Foundation (CLF).

Q Have you testified previously in this docket?

A No, we have not.

Q What is the purpose of your testimony?

A The purpose of our testimony is to address whether the Grid Modernization Plans filed by Massachusetts Electric Company and Nantucket Electric Company d/b/a National Grid (National Grid or the Company, in the National Grid-specific chapter), Fitchburg Gas and Electric Light Company d/b/a Unitil (Unitil or the Company, in the Unitil-specific chapter), NSTAR Electric Company and Western Massachusetts Electric Company d/b/a Eversource Energy (Eversource or the Company, in the Eversource-specific chapter) (together, the Companies) comport with the Department's goals and directives for grid modernization.

2. SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

Q Please summarize your primary conclusions.

A In its orders on grid modernization which presaged these proceedings, the Department indicated a clear preference for a broad and transformative modernization of the electricity grid. The Department's goals for grid modernization are far-reaching and are clearly reflected in its filing requirements for the present Grid Modernization Plans (GMPs).

However, we find that the Companies' GMPs are not consistent with the Department's grid modernization goals and directives. The GMPs demonstrate a range of understanding of, enthusiasm for, and commitment to the Department's goals for grid modernization on the part of the three Companies. Despite this, all three GMPs are too narrowly focused on technological improvements, and do not account for the potential for distributed energy resources (DER) and customer engagement to meet system needs and reduce electricity costs.

Consequently, the Companies' GMPs do not provide sufficient information to justify the grid modernization investments proposed by the Companies. Department approval of any such investments should be justified with significantly more detailed business plans with thorough analysis of costs, benefits, and other implications for customers.

Q Please summarize your primary recommendations.

A First and foremost, we recommend that the Department decline to approve utility grid modernization investments based on the Companies' incomplete and insufficient Grid Modernization Plans. Instead, we recommend that the Department require the Companies to submit new GMPs before making any findings on the cost recovery of the grid modernization investments. Given the importance of grid modernization and the rapidity with which technologies develop and change, these new plans should be filed no later than a year from the Department's issuance of a final resolution in these proceedings.

In recognition of the Department's clear expectation that grid modernization will, going forward, be a part of each Company's normal business practice, we recommend that the scope of these new GMPs explicitly include all distribution system needs rather than focusing only on those that can be separately parsed as "grid modernization." These new GMPs should, therefore, serve as comprehensive, forward-looking distribution system planning documents. The GMPs should contemplate a twenty-year planning period, with a focus on the first

five years of the plan. Each revised plan should include several elements that are necessary to fully respond to the Department's goals for grid modernization and GMPs but nonetheless are lacking from the current filings. These elements include:

- An investigation and description of the Company's distribution system needs throughout the planning period, including both the need to satisfy sales and peak demand at the system and substation levels, and the need for modernization to enable use of a greater diversity of resources and, ultimately, lower system costs;
- A clear and comprehensive description of the resources available to meet distribution system needs and objectives throughout the planning period. These resources should include all conventional distribution investments as well as all potential DERs. Detailed forecasts of the costs, capabilities, and availabilities of all resources should be key aspects of these descriptions;
- A clear and comprehensive description of the resources that the Company proposes to use to meet distribution system needs and objectives throughout the planning period, with details regarding both conventional distribution investments and DERs. These details should include the expected capabilities or size of each resources—for example, expected MWh of generation, MW of capacity, or MVAr of compensation;
- A clear and comprehensive business case analysis of the key resources that the Company proposes to use to meet distribution needs throughout the planning period. This should include all relevant costs, benefits, and qualitative factors considered in the business case, as well as a detailed narrative justification of proposed investments;

- Forecasts of key system outcomes and indicators, for example DER penetration rates, annual distribution system revenue requirements, annual system CO_2 emission rates, and measures of customer and third-party activity and engagement;

- A customer engagement plan, indicating how the Company will educate customers, provide them with access to DERs, and otherwise provide them with the means to optimize their consumption patterns.

- A third-party engagement plan, indicating what steps the Company will take to encourage third-parties (including DER developers and customer aggregators) to provide technologies and services to customers and to the Company; including draft requests for proposals to procure non-wires alternatives (NWAs) to conventional distribution investments.

Without this type of information in the GMPs, the Department will not have sufficient information to approve grid modernization investments before they are made.

In addition, we recommend that the Department require each Company to collect additional metrics reflective of these priorities. We recommend that all performance metrics be published on a publicly-accessible web dashboard for the benefit of stakeholders and the public. The Department should eventually establish targets for these metrics, and a process for evaluating the Companies' performance relative to those targets.

3. GRID MODERNIZATION

Q What is "grid modernization" and why would the grid need to be "modernized"?

A In recent years, major advances in technology have led to transformative change in many different industries and infrastructure systems. With respect to the

electricity industry in particular, advances in distributed energy resources as well as sensor, control, and communication technologies have progressed to the point where they can enable significant changes in the way the grid is operated and interacted with—if accompanied by appropriate changes in business practice. The implementation of these technologies and the accompanying changes in operations are referred to as "grid modernization."

Q What sorts of changes fall under the definition of "grid modernization"?

A Generally speaking, "grid modernization" can be narrowly defined or broadly defined. Narrow definitions of grid modernization tend to focus on the incorporation of technological improvements only, while broad definitions entail a conceptual reimagining of the electric grid itself and of the roles of the electric utility, electricity customer, and third-party providers of grid- or grid-adjacent services. In the broad definition of grid modernization, technological change is accompanied by increased customer engagement and a focus on integration of distributed energy resources. These, in turn, enable the achievement of overarching policy goals concerning the electricity system, and can reduce system costs by allowing increasing reliance on distributed resources to satisfy demand and optimize load shapes..

Q What improvements are enabled by grid modernization, as narrowly defined?

A Under the narrow definition of grid modernization, installation of new technologies can facilitate improved provision of utility services. For example, investments in distribution system sensors and controls may improve reliability and enable the utility to integrate more distributed generation. Under this narrow definition, utility services are enhanced, but the fundamental role of the utility remains unchanged.

Q What improvements are enabled by the broad conception of grid modernization?

A Broader approaches to grid modernization tend to focus on technologies, practices, and actions that will transform the role of the electric utility. In today's grid, electricity is transmitted from centralized generators to passive customers who have minimal ability to access information concerning their usage or to alter their consumption patterns. In a modern grid, a diverse range of resources and resource types can interact with the grid, and interactions (such as purchases and sales of energy or ancillary services) may occur anywhere in the grid structure. The range of interactions between utilities, customers, and third parties is larger and more flexible than in today's grid. Customers may both manage their electric bills and contribute to high-quality electrical service by consuming, generating, storing, and conditioning power using distributed resources. The increased diversity of resources on the grid and enhanced abilities of customers to optimize their consumption patterns can lead to reductions in peak loads, improvements in power quality, and, ultimately, lower system costs.

As we mentioned, these changes are enabled not just by technology, but also by accompanying changes in business practices and customer behavior. Technology allows the modern grid to be information-rich but is not sufficient by itself to empower customers to become active decision-makers and co-participants on the grid. For that to occur, customers must have both the ability to act on the information that is available and the tools necessary to do so.

In the most complete vision of a modern grid, therefore, utilities facilitate third party and customer use of such tools, and to optimize customer consumption patterns utilizing both distributed resources and utility-owned investments. All parties interacting with the modern grid are envisioned to have access to both data and insights built on that data, as well as the ability to act—and ability to benefit from acting—on those insights.

Q What is necessary to achieve this broad vision of a modern grid?

A There are several components that together can contribute to achievement of a modern grid. Technology is one—but, importantly, not all technologies are appropriate for every jurisdiction or application. Furthermore, technology is not, in and of itself, an end of grid modernization. Rather, grid modernization technologies can enable far-reaching changes in the capabilities and behavior of grid participants in ways that may provide significant benefits to grid users. Like any other grid investment, technology investments directed at modernization must provide benefits that outweigh their costs. Unlike other investments, however, the cost-effectiveness of grid modernization technologies often depends on these behavior changes on the part of both customers and the utility.

As such, changes in policy, utility incentives, and price signals to customers are all necessary to achieve transformative grid modernization. Regulators should ensure that utilities are fully exploiting cost-effective investments in new technologies (both behind and in front of the meter) to provide high-quality service at low cost. Utilities must consider modern grid technologies and strategies as some of the primary tools for meeting system needs, meaning that grid modernization must be integrated with utilities' overall distribution system planning processes.

Regulators must also prompt utilities to empower customers to better optimize their consumption patterns and manage their bills. In order to allow this, utilities must provide information, rate options, and appropriate grid access to both customers themselves and to third-party service providers. While capital investments may enable these interactions between utility, customer, and third-party, utilities must also cooperate in fostering customer engagement and creating new markets for provision of modern grid services.

Q Please expand on the role of capital investments in a broad vision of grid modernization.

A In general, utilities make capital investments to meet system needs. Grid modernization investments are no exception—ultimately, all capital investments must be directed at providing high-quality service at low cost. The particular role of the sorts of new or incremental capital investments at issue in a broad vision of grid modernization is to enable customers, service providers, and utilities to collect data, glean insights from those data, and exert new forms of control over the flow of real and reactive power on the system as informed by those data and insights. Importantly, simply collecting data or enabling control is insufficient in a broad view of grid modernization; insights into system and customer needs are key to guiding all parties' interactions with the modernized grid. Data collected through capital improvements can allow determination of where system upgrades are needed to enable integration of greater amounts of DER—or, conversely, of where integration of DER may allow deferral of traditional system upgrades. Data may reveal business opportunities for third-party service providers. Most crucially for a broad vision of grid modernization, data and controls are essential to promoting active customer participation (through use of DER or other means) in a modernized grid.

Q Do capital investments into advanced metering functionality, distribution system automation, and similar modernization initiatives provide these benefits by default?

A No. Like any other capital investment, grid modernization investments may be undertaken effectively or wastefully. Rigorous and comprehensive planning studies are necessary to fully justify such investments. These studies should include an evaluation of system needs, an assessment of the resources available to meet those needs, a determination of a resource plan that appropriately balances

cost with other priorities, and a clear forecast of key system outcomes in the presence and absence this resource plan.

Initial efforts at grid modernization, often funded through the Department of Energy, have conclusively demonstrated that investments in technology are insufficient to provide transformative change if unaccompanied by customer engagement and use of appropriate incentives for all parties.[1] As stated by DOE, "success hing[es] on the ability of…utilities to effectively engage customers."[2] Further, broad grid modernization was found to necessitate "new utility business models, system architectures, and planning requirements."[3] These comments reflect the clear conclusion that installation of new technologies is not, in and of itself, sufficient to accomplish a modern grid. Indeed, we observe that sound and thorough planning is perhaps most important in situations where capital investments must be matched with other efforts to effect transformative change, as in broad grid modernization. Thorough planning is crucial in such situations exactly due to the uncertainty and complexity associated with making such changes.

Q Please expand on the role of distribution system planning in a broad vision of grid modernization.

A Utilities routinely make investments to maintain or augment the distribution system as necessary to satisfy demand by customers. These needs are dictated by actual customer consumption patterns on the level of the system as a whole as well as individual substations. In a modern grid, many of these investments can be avoided or deferred using "non-wires alternatives" (NWAs). For example, customer adoption of energy storage can reduce substation peak loads. As such,

[1] U.S. Department of Energy, "Final Report on Customer Acceptance, Retention, and response to Time-Based Rates from the Consumer Behavior Studies," pp. 68-69 (Nov. 2016), https://www.smartgrid.gov/files/CBS_Final_Program_Impact_Report_20161107.pdf.
[2] *Id.*, p. 70.
[3] U.S. Department of Energy, "Smart Grid Investment Grant Program Final Report," p. 14 (Dec. 2016), https://energy.gov/sites/prod/files/2017/01/f34/Final%20SGIG%20Report%20-%202016-12-20_clean.pdf.

grid modernization has an impact on both distribution system needs and the range of resources available to meet those needs. A holistic view of distribution system planning is therefore necessary for modernized grids (or those undergoing modernization) to ensure that the lowest cost or most beneficial resource is used to meet system needs.

Q Has the need for thorough planning and justification of grid modernization investments been recognized by utility regulators?

A Yes. Utility regulators in New York,[4] California,[5] and Hawaii[6] have all set forth clear and comprehensive requirements for distribution-system planning processes aimed at accomplishing broad and transformative grid modernization. For example, the New York Reforming the Energy Vision (REV) process requires all utilities to submit both initial and supplemental plans for transforming their distribution systems as a whole into "platforms" for engagement and innovation.[7] These plans explicitly meant to be both comprehensive and transparent.[8] Similarly, in California, utilities are required to submit whole-system "Distribution Resource Plans" for modernization of the grid, animating opportunities for DER, and enabling customer choice.[9] The Massachusetts Department of Public Utilities' own orders on this subject also reflect such a recognition, as we discuss below.

[4] NY DPS Staff, "Staff Proposal Distributed System Implementation Plan Guidance," Case 14-M-0101, *Proceeding on Motion of the Commission in Regard to Reforming the Energy Vision* (Oct. 15, 2015).
[5] California Public Utilities Commission, Rulemaking 14-08-013, "Order Instituting Rulemaking Regarding Policies, Procedures and Rules for Development of Distribution Resources Plans Pursuant to Public Utilities Code Section 769" (Aug. 14, 2014).
[6] Hawaii Public Utilities Commission, "Order No. 34281, Dismissing Application Without Prejudice and Providing Guidance for Developing a Grid Modernization Strategy" (Jan. 4, 2017).
[7] NY DPS Staff, p. 1.
[8] *Id.*, p. 4.
[9] California Public Utilities Commission, "Assigned Commissioner's Ruling on Guidance for Public Utilities Code Section 769 - Distribution Resource Planning," Rulemaking 14-08-013, *Order Instituting Rulemaking Regarding Policies, Procedures and Rules for Development of Distribution Resources Plans Pursuant to Public Utilities Code Section 769*, p. 3 (Feb. 6, 2015).

In all of these jurisdictions, regulators have recognized the potential of grid modernization to reduce distribution system costs, contribute to the achievement of overarching policy goals, enable integration of distributed resources, and open new avenues for customer engagement and empowerment—as well as the need to pursue grid modernization based on careful and comprehensive planning.

Q How can grid modernization reduce distribution system costs?

A As above, grid modernization can allow for deferral of, avoidance of, or lower-cost alternatives to traditional distribution system investments. Broad grid modernization takes advantage of new technologies and innovative uses for those technologies to improve power quality, fully utilize existing assets, and enable more rapid detection of and response to outages. DER integration, in particular, can promote a more resilient and efficient distribution system. Increases in customer engagement can allow customers more control over their consumption patterns, leading to improvements in load factor. Third-party service providers, in particular, are often well-equipped to contribute to these benefits given their greater agility than utilities and ability to leverage new and innovative core competencies and business models.

Q How can grid modernization contribute to the achievement of policy goals?

A The broad and transformative vision of grid modernization can enable achievement of a wide variety of energy policy goals. For example, the Hawaii PUC has stated that the modernized grid is "the 'backbone' necessary to advance the State's RPS goals, support integration of additional levels of renewables, encourage competition, empower consumers to make their own choices concerning the level and types of electric service they desire, and leverage customer-sited resources to assist in grid operation."[10]

[10] Hawaii Public Utilities Commission, "Order Dismissing Application Without Prejudice and Providing Guidance for Developing a Grid Modernization Strategy," Docket No. 2016-0087, *In the Matter of the*

Q How can grid modernization enable greater use of DERs?

A Under a broad approach to grid modernization the focus is not only on the safe and reliable operation of the grid under growing quantities of DERs, but also on how DER resources can best serve as a resource for the grid. For example, New York envisions that "distributed energy resources . . . will be integrated into the planning and operation of electric distribution systems, to achieve optimal system efficiencies, secure universal, affordable service, and enable the development of a resilient, climate-friendly energy system."[11]

The role of the utility is then expanded to include the facilitation of additional DER development in areas where such resources can provide the most value to the grid. This might take the form of leveraging DER investments to avoid or defer traditional infrastructure investments, better forecast DER growth, and direct DER development to areas where such growth may be most beneficial to the grid.

Q How can grid modernization empower customers?

A Customer empowerment is a central component of broad approaches to grid modernization. A common example of customer empowerment is implementation of rate designs that enable customers to have greater control over their bills through shifting the timing of their electricity consumption. Such rate designs may also be accompanied by significant efforts on behalf of the utility to help customers choose the rate designs that are most appropriate and provide the customers with in-home technologies to help customers respond to price signals.

Customer empowerment may also mean providing customers with more accessible and timely information regarding their usage (e.g., through web portals

Application of HECO, HELCO, and MECO for Approval to Commit Funds for the Smart Grid Foundation Project, p. 2 (Jan. 4, 2017).

[11] New York Public Service Commission, "Order Adopting Regulatory Policy Framework and Implementation Plan," Case 14-M-0101, *Proceeding on Motion of the Commission in Regard to Reforming the Energy Vision* (Feb. 26, 2015).

or mobile applications) or even enabling customers to provide ancillary services to the utility system. For example, emerging vehicle-to-grid (V2G) technology provides compensation to electric vehicle owners for enabling the utility to use a small portion of their vehicle batteries for providing balancing services to the grid.[12]

Broad forms of grid modernization also seek to facilitate the ability of DER providers to connect with customers through greater sharing of customer data (with appropriate customer privacy protections).

To summarize, a broader approach to grid modernization seeks to fully exploit the opportunities provided by new technologies to engage customers and DER providers and to reduce distribution system costs and realize a wide variety of energy policy goals. While incremental capital investments in new technologies may contribute to and enable this approach, they are by no means sufficient to achieve it.

4. THE MASSACHUSETTS DPU'S VISION FOR GRID MODERNIZATION

Q How did the Department of Public Utilities articulate its vision for grid modernization in Massachusetts?

A The Department described its vision and goals for grid modernization in a Notice of Investigation (NOI) and three resulting Orders. The first Order (12-76-A) describes the Department's goals and objectives for grid modernization in a broad sense and outlines a straw proposal for the structure of the Grid Modernization Plans (GMP) ultimately filed by the Companies in these dockets. The straw

[12] *See, e.g,* Doug Peeples, "Vehicle-to-Grid Technology: It Could Be a Smart Idea for Smart Cities," SmartCitiesCouncil, (Sept. 2, 2016), https://www.enel.it/en/media/press/d201608-nissan-enel-and-nuvve-operate-worlds-first-fully-commercial-vehicle-to-grid-hub-in-denmark.html; U.S. Air Force, "AF Partners with Army, Industry to Successfully Develop, Test Vehicle-to-Grid Technology," (Oct. 22, 2015), http://www.af.mil/News/ArticleDisplay/tabid/223/Article/625606/af-partners-with-army-industry-to-successfully-develop-test-vehicle-to-grid-tec.aspx.

proposal was refined in the Department's second Order (12-76-B), which defined the necessary components of the Companies' GMPs. The DPU set forth a structure for the GMPs that includes a description and business case justification of a short-term investment plan (STIP) directed at achieving advanced metering functionality (AMF) and other grid modernization improvements, as well as a comprehensive plan for customer marketing, education, and outreach (MEO). Finally, the Department detailed its requirements further and directed the Companies to prepare and file GMPs in its last Order (12-76-C).

Q Did the Massachusetts Department of Public Utilities indicate that it sought a broad approach to grid modernization or a narrow approach?

A Unquestionably, the Department indicated interest in a broad approach. The Department's vision for grid modernization is the focus of its first Order on the matter. The Department's identification of the capabilities of a modern grid in this Order was expansive and based in a vision of empowered consumers interacting with an increased diversity of resources on the grid, in accordance with the Commonwealth's "statutory directives and policy goals."[13] Under the Department's framework a modern grid "empower[s] customers to adopt new electricity technologies and better manage their use of electricity."[14] The Department further described a modern grid as one that "can support further development of energy efficiency, demand response, distributed generation, storage, electric vehicles ('EVs'), renewable energy resources, and *innovations that we have yet to imagine*."[15]

Q What are the Department's goals for grid modernization?

A The Department set out four distinct objectives for grid modernization:

1. Reducing the effects of outages;

[13] 12-76-A, p. 1.
[14] *Id.*
[15] *Id.*, pp. 1-2 (emphasis added).

2. Optimizing demand, including reducing system and customer costs;
3. Integrating distributed resources; and
4. Improving workforce and asset management.[16]

Q Did the Department intend for the accomplishment of these goals to entail transformative change?

A Yes. The Department indicated clearly that, while business as usual approaches may be valuable, they do not constitute grid modernization *per se*. For example, with respect to outages, the Department stated that "while we agree that outage prevention is an important function for electric distribution companies, it does not require advanced technologies or new practices."[17] Rather, the Department described decentralization and automation efforts to "reduce the effects of outages" as "transformative."[18] Similarly, the Department recognized the importance of customer action in particular in optimizing demand and the necessity of appropriate incentive structures to prompt that action.[19]

Q Did the Department focus only on the technological aspect of grid modernization?

A No. The Department rightly describes new technology, such as advanced metering infrastructure (AMI), as "a basic . . . platform for grid modernization" rather than constituting modernization in and of itself.[20] The Department also recognizes that "it is appropriate for the Department to identify goals and objectives, but not specific technologies," making clear that technology is not the end goal of grid modernization but a means to accomplish the goals and objectives thereof.[21]

[16] 12-76-B, p. 2.
[17] 12-76-A, p. 11.
[18] *Id.*
[19] *Id.*, p. 14.
[20] *Id.*, p. 12
[21] *Id.*, p. 10.

Q Did the Department recognize the importance of customer engagement to the realization of a modern grid?

A Yes. The Department recognized that "successful implementation of grid modernization will require fundamental changes in the relationship between the companies and their customers,"[22] specifically stating that "customer participation is necessary to realize many of the benefits of grid modernization."[23]

Q Did the Department discuss the necessity of changes to utility practices and incentives?

A Yes. The Department clearly envisioned grid modernization becoming a central part of utility operations, and noted that "initially, it will involve some changes to [utilities'] traditional planning and practices."[24] The Department identified the GMPs as an integral part of this shift in the Companies' planning processes, as we discuss below. The Department also recognized the need to "align an electric distribution company's investment priorities with the interests and needs of its customers."[25]

Q Did the Department reiterate its broad and transformative vision in its subsequent Orders?

A Yes. The Department's second and third Orders refine the filing requirements for the Companies' GMPs and do not reduce the scope or vision of the Department's grid modernization goals. Indeed, the Department describes its subsequent Orders as establishing "the platform and the incentives for utilities and other businesses to innovate."[26]

[22] *Id.*, p. 19.
[23] *Id.*
[24] 12-76-A, p. 9.
[25] *Id.*, p. 27.
[26] 12-76-B, p. 1.

Q How is the Department's vision reflected in the GMP filing requirements?

A The Department made clear in several ways that it crafted its filing requirements for the Companies' GMPs specifically to reflect the vision it originally set forth. First and foremost, the Department specifically identified the GMPs as the main component of "a comprehensive approach to addressing the various, interrelated aspects of modernizing the electric grid"[27] and noted that the plans should describe both "investment *and operational* strategies for achieving grid modernization."[28] These statements make the broad intent of the GMPs clear.

Moreover, while the GMPs require the Companies to propose a plan and a business case for installation of modern grid technologies (including but not limited to those that provide advanced metering functionality), the Department included special provisions that would not normally be part of utility investment plans. For example, with regards to the business case for such investments, the Department *obligated* the Companies to include "all difficult to quantify or unquantifiable benefits and costs"[29] in its business case analysis.

Q Did the Department emphasize DER integration in its filing requirements?

A Yes. In addition to including DER integration as one of the primary objectives for grid modernization, the Department set out specific metrics for measuring the Companies' progress in achieving this objective.[30]

Q Did the Department recognize the importance of customer engagement in its filing requirements?

A Yes. The Department included a customer MEO plan as one of the four key components of the GMP, explicitly stating that "customer education, marketing,

[27] 12-76-A, p. 9.
[28] *Id.*
[29] 12-76-B, p. 17.
[30] *Id.*, p. 32.

and outreach are crucial to enabling the successful implementation of grid modernization."[31]

Q Did the Department refer to the Commonwealth's policy goals in its filing requirements?

A Yes. The Department required the Companies to devote a section of the business case analysis to a demonstration of how their proposed investment plants "will impact . . . state policy goals."[32] The Department also specifically instructed the Companies to assess the extent to which their plans would provide "benefits of avoided [Global Warming Solutions Act] compliance costs."[33]

Q Did the Department note potential changes to utility incentive structures in its filing requirements?

A Yes. For example, the Department required the Companies to collect and report on a variety of metrics related to grid modernization. While the current purpose of those metrics is "to record and report information", the Department recognized that they may inform "incentives or penalties" in the future.[34]

The Department's decision to allow a targeted cost recovery mechanism for certain grid modernization investments was also explicitly described as a means to address the concern that the Companies would not pursue such investments because "the benefits will accrue in large part to customers and not to the electric distribution company[ies]."[35] The Department recognized that, although "grid modernization…is a core component of an electric distribution company's obligation to provide safe and reliable service,"[36] the initial investments required

[31] 12-76-B, p. 2.
[32] 12-76-C, p. 8.
[33] *Id.*, p. 16.
[34] 12-76-B, p. 34
[35] *Id.*, Appendix 1, p. 12.
[36] 12-76-C, p. 26.

to effect transformative change may go "beyond what [the Companies] deem necessary"[37] for this purpose. As such, the Department allowed a targeted cost recovery mechanism to be used "*only* until such time as the costs are incorporated into companies' base distribution rates."[38]

These components of the Department's filing requirements indicate that the Department recognizes the need to align utility incentives with the goals and objectives of grid modernization, and that the mechanisms employed for this purpose may change over time as grid modernization becomes a normal—and integral—part of the Companies' business practices.

Q Do the filing requirements overall require a broad and transformative approach?

A Yes. The Department's GMP filing requirements indicate that it envisions a broad approach to grid modernization, one that would significantly increase the role of distributed energy resources and change how customers interact with the grid. The required structure and components of the GMP were designed as the first step in accomplishing this transformation.

5. NATIONAL GRID'S GMP

Q Please summarize the goals and approach of National Grid's GMP.

A According to National Grid, the Company formulated its GMP to "move operation of the distribution grid towards greater levels of efficiency and reliability, while enabling a cleaner and more environmentally-friendly electric system."[39] The Company presents four different investment scenarios, each presumably designed to allow it to meet this goal. However, the Company hedges its language when it comes to its GMP and the investment plans contained

[37] *Id.*, p. 25.
[38] *Id.*, p. 26 (emphasis added).
[39] National Grid GMP, p. 7.

therein. Rather than committing to a transformative vision, of which the GMP would be a crucial first step, the Company describes its GMP as simply "begin[ning] a discussion."[40] As we discuss below, while National Grid has demonstrated enthusiasm for modernization, its tentative approach informs the entire structure of the Company's GMP.

Q Is National Grid's GMP a roadmap to grid modernization? Does it serve as a comprehensive planning document, suitable to guide a broad and transformative modernization of the grid?

A No. As discussed below, the Company's GMP lacks a comprehensive description of distribution system needs and the resources available to meet those needs, an evaluation of those resources, or a well-justified proposal of a resource plan that appropriately balances cost with other system considerations. Instead, the Company has presented a plan to receive pre-approval for millions of dollars of spending on distribution system upgrades, without a sound justification based on a detailed discussion of costs, outcomes, and alternatives.

While the Company was able to detail four separate capital spending plans, its GMP fails to comply with the vision set forth by the DPU. As we describe below, the Company's GMP does not devote appropriate attention and effort to the DPU's goal of furthering DER integration, provides an insufficient plan to engage customers (and third-parties interested in providing enabling services to those customers), and proposes to rely on a set of metrics that would not allow the DPU and stakeholders adequate visibility of the Company's progress towards achieving a broad transformation. Ultimately, we find that the Company's GMP is not the comprehensive planning document required by the Department, and does not provide the Department with evidence sufficient to justify significant spending on grid modernization investments.

[40] *Id.*

Q Does National Grid's GMP propose significant grid modernization investments?

A Yes. The Company proposes four separate scenarios.[41] These include:

1. Balanced – maximum deployment of both AMI and distribution system upgrades, with training and improved mobility tools for workforce management.
2. AMI-focused – an opt-out AMI deployment plan, with distribution system upgrades as necessary and limited workforce training.
3. Grid-focused – the inverse of the AMI scenario, this plan focuses only on distribution system upgrades and relies primarily on an opt-in system for AMI
4. Opt-in – the most modest of the plans, this scenario envisions opt-in participation only in AMI and limited distribution system upgrades.

All four scenarios include significant capital investments: the costs of the four scenarios range from $235.4 to $980.6 million, with the Balanced plan having the highest costs and the Opt-in plan having the lowest.[42]

Q Does National Grid's GMP discuss the Company's distribution system investment needs?

A National Grid presents a cost summary of its baseline capital plan[43] in order to define its grid modernization investments as fully incremental to its business-as-usual investments. This baseline capital plan is based on system repair or upgrade needs. As the Company makes clear in its description, its proposed grid modernization investments are not *necessary* to enable the Company to "meet its obligation to provide safe and reliable service, and to meet its service quality

[41] *Id.*, p. 9.
[42] *Id.*, p. 13.
[43] *Id.*, p. 24.

goals."[44] However, the extent to which the Company's STIP is *able* contribute to satisfying these needs in the present and over the future is left undetermined.

Indeed, National Grid states only that "it is possible" that its proposed investments could take the place of conventional capital investments in responding to system needs.[45] National Grid explicitly intends to defer investigation of this topic, stating that "while the Company expects to observe and study" these effects, "for now [they are] unquantified."[46] As such, in addition to being *incremental* to the Company's baseline capital plan, the STIP is also positioned as being *independent* of it: these investments are not targeted towards or justified on the basis of their ability to meet the needs of the system now or in the future.

Q How did National Grid select and justify the proposed investments, if it did not do so based on system needs?

A National Grid's description of how it selected its investments is very limited, consisting almost entirely of one paragraph identifying the various internal working groups convened to "evaluate the elements that the Company could include in its GMP."[47] As such, although input from stakeholders was considered by the working groups, stakeholders themselves have little insight into the formation of plans. For example, the GMP does not describe the potential investments that were considered and rejected by the Company or how the Company determined the appropriate investment level for different technologies.

The Company's STIP is justified primarily on the basis of its business case cost-benefit analysis. However, of these four scenarios, the Company finds only the AMI-focused scenario to provide net benefits to customers over a 15-year

[44] *Id.*, p. 27.
[45] *Id.*, p. 48.
[46] National Grid GMP, p. 115.
[47] *Id.*, p. 175.

period.[48] The Company refrains from recommending that the Department approve any of the scenarios in particular, instead positioning its GMP as an opportunity "for the Department and other interested stakeholders to engage in a robust discussion about the range of options and benefits"[49] of these scenarios.

Q Has the Company provided sufficient information regarding the outcomes of its scenarios to foster such a discussion?

A No. While we commend National Grid on its commitment to grid modernization and to stakeholder involvement in its grid modernization planning processes, the Company's discussion of the outcomes and benefits of its various scenarios does not provide a clear or comprehensive picture of the anticipated impacts on the Department's grid modernization objectives from each scenario. Cost-benefit ratios are important, but the Company acknowledges that they are not sufficient to capture the entire picture in this case—describing the "AMI-focused" scenario as prioritizing near-term cost savings at the expense of "longer-term qualitative benefits" that include "facilitating promotion of renewable and other types of DG" and "creating the best platform for enabling the distribution system and customers to take advantage" of grid modernization.[50] However, the Company has not provided any forecast or estimation of the differences in these outcomes between scenarios. Without such forecasts, it is impossible for stakeholders or the Department to evaluate the Company's claims in this matter.

Q Should the Department expect the Company to include a concrete discussion of outcomes in its GMP?

A Yes. The Department clearly indicated that it wanted the Companies to discuss the expected outcomes of their GMPs in a clear and concrete manner. The

[48] *Id.* p. 11.
[49] Exhibit PTZ-1, p. 5, line 13.
[50] National Grid GMP, pp. 123-124.

Department repeatedly instructs the Companies to outline how they "propose to make *measurable* progress" towards the achievement of the Department's objectives for grid modernization.[51] While the Companies' actual progress towards these objectives during and after implementation of its grid modernization plan should be visible to the Department and stakeholders through the use of metrics, as discussed below, the inclusion of metrics does not excuse the Company from demonstrating an expectation of such progress in the plan itself.

Q Does National Grid's GMP comprehensively address how the proposed investments will enable achievement of the DPU's goals for grid modernization?

A No. As described above, the Company provides estimations of several different types of benefits but no quantitative basis for those estimations within the body of the GMP. This deficiency is particularly pronounced with respect to the Department's goal of integrating DERs, which stands in contrast to the Company's decision to devote a separate section of its GMP specifically to the question of distributed generation.

Q What are the particular deficiencies of the plan with respect to integration of DER?

A There are two main deficiencies with respect to the Company's treatment of DER integration. First, the Company failed to consider and promote DER integration—as both a means to grid modernization, and as an end thereof, and as a key strategy for reducing distribution system costs and customer bills. Second, the Company failed to demonstrate that its GMP would lead to increased DER integration, which is one of the Department's primary goals for grid modernization.

[51] 12-76-B, p. 2.

Q You stated that the Company did not appropriately consider DER as a resource for reducing distribution system costs and customer bills. Please explain.

A DER and other "non-wires alternatives" are not among the technologies considered by the Company to meet future distribution system needs. We note here that the Department explicitly did not limit the scope of GMPs to capital investments. Rather, the DPU clearly described the scope of GMPs to include "*all* grid modernization planning and investments," including but not limited to the STIP. [52] Distributed generation, energy efficiency, demand response, storage, and electric vehicles all fall within this scope and would be expected to impact the Company's distribution system needs and costs. . A sound GMP should include a thorough economic analysis of the extent to which each of these resource types could help improve distribution system efficiency and reduce distribution system costs.

Q Did the Company show that its planned investments will further the Department's goal of integrating of distributed resources?

A No. The Company's GMP includes no quantitative evaluation of DER adoption with and without implementation of the plan. Such a forecast is absent even in a special chapter devoted entirely to distributed generation—although that section proposes additional investments specifically intended to increase penetration of distributed generation. Nor did the Company provide a forecast of other distributed resources, such as storage and demand response. "Integrating DERs" is listed as an "unquantifiable benefit"[53] that may or may not accrue as a result of investments in data collection technologies. The Company claims that these

[52] 12-76-B, p. 17; emphasis original.
[53] National Grid GMP, p. 115.

investments "should support…the integration of distributed resources and storage" but does not attempt to forecast the impact of such support.[54]

While the Department was clear that the Companies should consider "unquantifiable" benefits,[55] we disagree with National Grid's implication that DER integration is among these. Utilities routinely forecast DER adoption rates under different sets of assumptions. Indeed, when ISO New England convened a Distributed Generation Forecast Working Group, representatives from National Grid made up an eighth of the membership.[56] As such, we see no reason as to why the Company could not perform such an analysis with regards to the impacts of its GMP.

Q How can the Department and stakeholders assess the Company's progress towards achievement of the goal of integrating DER?

A The Department clearly intends for newly-required metrics to provide visibility into the Company's actual future success in integrating DER, regardless of whether a forecast is presented in the GMP.

Q Do the Company's proposed metrics allow the Department and stakeholders to perform such an assessment?

A No. The Company proposes to use only the statewide metrics to measure its progress on integrating DER. These metrics include the total number of grid-connected DG facilities, as well as the nameplate capacity, estimated output, and technology type of each resource. These metrics are a good start but do not provide a comprehensive picture of the role of DER in National Grid's system over time. We recommend additional metrics that will allow the Department and stakeholders to assess the role of DER in National Grid's system, including:

[54] *Id.*
[55] 12-76-B, p. 17.
[56] *See* Attendance list of the December 8, 2015 meeting, https://www.iso-ne.com/static-assets/documents/2016/04/dgfwg_minutes_20151208.pdf.

1. The percentage of distribution system annual retail sales that is satisfied by DER, by type of DER (energy efficiency, demand response, distributed generation, storage technologies, and electric vehicles) and, ideally, by substation;
2. The percentage of distribution system annual peak demand that is satisfied by DER, by type of DER (energy efficiency, demand response, distributed generation, storage technologies, and electric vehicles) and, ideally, by substation;
3. The rate of DER adoption among customers of different rate classes.

Q The DPU recognized that customer engagement is key to successful modernization of the grid. Does National Grid's GMP include a comprehensive customer engagement plan, sufficient to enable customers to act as empowered grid participants?

A No. The Company's Marketing, Engagement, and Outreach (MEO) plan focuses primarily on customer education rather than on increasing opportunities for customers to actively participate on the grid. For example, while the Company includes data and analytics in its MEO, the purpose of these analytics is to allow National Grid to target customers, rather than allowing customers to target their own energy usage.[57] Similarly, the Company proposes to build online tools to "facilitate [customer] consideration and adoption of DG"[58]—but leaves out provision of tools to allow customers to actively employ distributed generation and other DER to control their load after installation.

[57] National Grid GMP, p. 162.
[58] *Id.*, p. 138.

Q Does the Company's customer engagement plan recognize the role of third parties in empowering customer actions?

A To some extent. The Company does identify third party vendors as an important part of the ecosystem of a modern grid and describes plans to improve third parties' access to customer[59] and system[60] data. However, provision of data is not sufficient to create a robust market of third-party vendors.

Q Are the Company's proposed metrics sufficient to enable the Department and stakeholders to assess the Company's progress in engaging customers?

A No. The Company proposes only a report describing its MEO activities and "high level results" of these activities.[61] At the very least, the Company should report a measure of the frequency with which customers access (or third parties access on customers' behalf) grid modernization touch points, such as its proposed enterprise analytics platform.[62]

Q The Department identified achievement of the Commonwealth's policy goals as one of the most important outcomes of grid modernization. Does the Company's GMP clearly set forth the extent to which it will facilitate achievement of these goals?

A To a limited extent. Although the Department referred to nine different relevant policies,[63] the Company quantified the outcomes of its GMP for only two: the Department's service quality standards and the Commonwealth's Global Warming Solutions Act (GWSA).

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[59] *Id.*, p. 57.
[60] *Id.*, p. 67.
[61] *Id.*, p. 174.
[62] Such measures could include metrics common in the technology industry such as monthly active users and bounce rate (a measure of the extent to which visitors engage with a website such as the Company's proposed "education and engagement" website).
[63] 12-76-C, p. 7.

With regards to GWSA compliance, National Grid claims that its proposed GMP will result in avoidance of 950,000 tons of greenhouse gas emissions over the 15-year GMP planning horizon.[64] The Company claims this benefit based on an expectation of reduced energy consumption resulting from its STIP investments and adoption of time-varying rates. However, the Company's publicly-available GMP does not describe how it arrived at this value—for example, how much energy National Grid actually expects these investments to avoid is unspecified, as are any assumptions regarding the carbon intensity of the New England electricity grid over the planning horizon. As such, we are unable to evaluate the validity of this value.

The Company's expected emissions reductions equate to an average of only 63,300 tons of emissions per year—or less than one percent of the Commonwealth's allowed emissions from electric generating units under either the Regional Greenhouse Gas Initiative program[65] or the Department of Environmental Protection's recently-proposed emissions rules.[66] Given the lack of evidence supporting this value and its marginality with respect to the emissions reductions required by the relevant policy goals, the Company has not demonstrated that its GMP will substantively contribute to achievement of the Commonwealth's policy goals.

Q Has the Company demonstrated an ability to provide and implement a comprehensive plan such as that you describe here?

A Yes. National Grid is also a participant in the New York REV process, as described above. In this process, the Company has submitted a more

[64] National Grid GMP, p. 113.
[65] Author's calculation based on 2017 CO_2 Allowance Base Budget for Massachusetts, http://www.rggi.org/docs/CO2AuctionsTrackingOffsets/Allocation/2017_Allowance-Allocation.xls.
[66] Author's calculation based on 2020 emissions caps for new and existing units, http://www.mass.gov/eea/docs/dep/air/climate/gwsa-tsd-12-16-16.docx.

comprehensive planning document[67] and begun to partner with third parties to provide enhanced grid services and reduce system costs.[68] The Department should expect the Company to demonstrate the same level of thoroughness and commitment to transformative grid modernization in Massachusetts as it does in New York or any other jurisdiction.

Q Please summarize your evaluation of National Grid's GMP.

A In sum, National Grid's GMP focuses too narrowly on the technologies available to the Company to support grid modernization (e.g., field area network communications systems, feeder monitors, or volt/VAR optimization), as opposed to changes in practice that enable customers to take advantage of such technologies. The Company's GMP fails to comprehensively assess how its proposed investments will promote DERs to satisfy system needs or contribute in a concrete way to achievement of the Department's goals for grid modernization.

While National Grid's GMP shows a strong interest in grid modernization, it cannot serve as a comprehensive planning document, suitable to act as a roadmap for transformative change. The Company's proposals for customer engagement and DER integration are modest at best and make no attempt to open opportunities for customers and DER to play more prominent and active roles on the grid. Additionally, the Company's proposed metrics provide relatively poor visibility of its progress on empowering customers and integrating DER. Ultimately, we find that the Company's GMP is, as it stated, only the beginning of the conversation. A more comprehensive plan is necessary to justify the level of investment proposed in the plan and serve as a guide to transformative modernization of the grid.

[67] National Grid DSIP, http://nyssmartgrid.com/wp-content/uploads/National-Grid-DSIP.pdf.
[68] Utilidata. "Utilidata and National Grid Announce Reforming the Energy Vision Project," (Feb. 13, 2017), https://utilidata.com/wp-content/uploads/2017/02/Utilidata-National-Grid-REV-release-FINAL-FINAL.pdf.

Q Given this evaluation, do you have recommendations to the Department regarding the disposition of National Grid's GMP?

A Yes. First and foremost, we recommend that the Department decline to approve spending based on the Company's current GMP. Instead, we recommend that the Department require a new GMP that corrects the deficiencies described above and can serve as a comprehensive, forward-looking distribution system planning document. This revised plan should include the following:

- An investigation and description of the Company's distribution system needs throughout the planning period, including both the need to satisfy sales and peak demand at the system and substation levels, and the need for modernization to enable use of a greater diversity of resources and, ultimately, lower system costs;
- A clear and comprehensive description of the resources available to meet distribution system needs and objectives throughout the planning period. These resources should include all conventional distribution investments as well as all potential DERs. Detailed forecasts of the costs, capabilities, and availabilities of all resources should be key aspects of these descriptions;
- A clear and comprehensive description of the resources that the Company proposes to use to meet distribution system needs and objectives throughout the planning period, with details regarding both conventional distribution investments and DERs. These details should include the expected capabilities or size of each resources—for example, expected MWh of generation, MW of capacity, or MVAr of compensation;
- A clear and comprehensive business case analysis of the key resources that the Company proposes to use to meet distribution needs throughout the planning period. This should include all relevant costs, benefits, and

qualitative factors considered in the business case, as well as a detailed narrative justification of proposed investments;

- Forecasts of key system outcomes and indicators, for example DER penetration rates, annual distribution system revenue requirements, annual system CO_2 emission rates, and measures of customer and third-party activity and engagement;

- A customer engagement plan, indicating how the Company will educate customers, provide them with access to DERs, and otherwise provide them with the means to optimize their consumption patterns.

- A third-party engagement plan, indicating what steps the Company will take to encourage third-parties (including DER developers and customer aggregators) to provide technologies and services to customers and to the Company; including draft requests for proposals to procure non-wires alternatives (NWAs) to conventional distribution investments.

In addition, we recommend that the Department require the Company to collect additional metrics, as enumerated above. We further recommend that the Department require these metrics to be published on a publicly-accessible web dashboard for the benefit of stakeholders and the public, and that the Department establish targets for these metrics and a process for evaluating the Companies' performance regarding these targets.

Q Does this conclude your testimony regarding National Grid's GMP?

A It does.

6. UNITIL'S GMP

Q Please summarize the goals and approach of Unitil's GMP.

A Unitil's GMP sets out a vision in which "grid operations will be more dynamic" and the Company's role will shift "towards enabling . . . new and evolving services to customers rather than directly providing them."[69] It seeks to accomplish this vision through a mix of sixteen capital investment projects and two other initiatives,[70] while balancing the need to meet the DPU's objectives, maintain aging infrastructure, respond to customer interests, and accommodate changes in the utility's role, business model, and regulatory obligations.[71]

Unitil is in a unique position in the Commonwealth because it has already implemented AMI in most of its territory.[72] The Company argues that it has therefore already achieved the majority of the benefits available from Advanced Metering Functionality (AMF). The Company claims on this basis that additional AMF and enrollment in TVR should be offered on an opt-in, rather than opt-out, basis,[73] despite the fact that its current level of AMI positions the Company to better offer opt-out service. Instead of AMF, Unitil's STIP focuses on distribution system control and stability upgrades and development of accompanying analytical platforms and tools.[74]

Q Is Unitil's plan a roadmap to grid modernization? Does it serve as a comprehensive planning document, suitable to guide a broad and transformative modernization of the grid?

A No. As discussed below, the Company's GMP lacks a comprehensive description of distribution system needs and the resources available to meet those needs, an

[69] Unitil GMP, p. 10.
[70] *Id.*
[71] *Id.*, p. 9.
[72] *Id.*, p. 11.
[73] *Id.*
[74] *Id.*, p. 34.

evaluation of those resources, or a well-justified proposal of a resource plan that appropriately balances cost with other system considerations. Instead, the Company has presented a plan to receive pre-approval for millions of dollars of spending on potentially unnecessary distribution system upgrades, with a justification that depends more on rhetoric than on a detailed discussion of costs, outcomes, and alternatives. The Company's GMP fails to mirror the vision set forth by the DPU. As we describe below, the Company's GMP does not devote appropriate attention and effort to the DPU's goal of furthering DER integration, provides insufficient incentives to promote engagement of customers (and third-parties interested in providing enabling services to those customers) in a modernized grid, and proposes to rely on a set of metrics that would not allow the DPU and stakeholders adequate visibility of the Company's progress towards achieving a broad transformation. Ultimately, we find that the Company's GMP is not the ambitious and comprehensive planning document requested by the Department and does not provide the Department with evidence sufficient to justify significant spending on grid modernization investments.

Q Does Unitil's GMP propose significant investments?

A Yes. The Company's STIP, as set forth in its GMP, comes at a cost of approximately $20.4 million over 15 years. Unitil's GMP fails to justify this level of investment, either on the basis of demonstrable progress towards the Department's grid modernization investment or on that of system needs.

Q Does Unitil's GMP discuss the Company's distribution system investment needs?

A Yes. In fact, Unitil suggests that it essentially has no baseline investment needs apart from system maintenance, claiming that "there is essentially no distribution system benefits…gained from reducing peak demand" because its "service area

has seen a persistent decline in peak power over the past ten years."[75] While this statement may be true for Unitil's service area as a whole, Unitil presented no evidence that the same holds true for each and every substation or feeder in its territory. As such, Unitil did not discuss whether and to what extent grid modernization investments could contribute to satisfying system needs on this more granular level.

Q How did Unitil select and justify the proposed investments?

A Unitil's GMP is the result of an iterative screening process, in which a large number of possible program components were whittled down based on various criteria (for example, some options were deemed to be part of normal business practice rather than grid modernization per se).[76] The Company argues that the resulting plan is low-cost and low-risk and argues that it provides net benefits to consumers.[77] While Unitil's discussion of how it arrived at the set of investments it proposes is clear, this discussion omits any description of how Unitil determined the appropriate level of investment for each plan component. Without such a description, it is impossible to connect the proposed investments and the claimed outcomes.

Q Did Unitil clearly describe the expected outcomes of its proposed investments and GMP?

A In general, no. With few exceptions, the Company's descriptions of outcomes from its proposed investments are vague. For example, the Company's expected outcome of the implementation of an advanced distribution management system (ADMS) is a reduction in customer energy consumption by "2-3% or more."[78] No justification of this figure is presented by Unitil in its GMP. Similarly, in

[75] *Id.*, p. 19.
[76] *Id.*, p.109.
[77] *Id.*, p. 78.
[78] *Id.*, p. 52.

discussing its plan to engage customers with gamification, Unitil claims that such a program may result in customers reducing energy consumption by "up to 5%," "based on industry reports for customers participating in this type of program."[79] Notably, no such reports are cited. Other descriptions are simply speculative: per Unitil, the Company "may also realize a lower peak" through AMF.[80] The Company presents no forecast of whether such peak savings are actually expected to occur and, if so, where and to what extent.

Q Should the Department expect the Company to include a concrete discussion of outcomes in its GMP?

A Yes, certainly. The Department clearly indicated that it wanted the Companies to discuss the expected outcomes of their GMPs in a clear and concrete manner. The Department repeatedly instructed the Companies to outline how they "propose to make *measurable* progress" towards the achievement of the Department's objectives for grid modernization.[81] While the Companies' actual progress towards these objectives should be visible to the Department and stakeholders through the use of metrics, as discussed below, the inclusion of metrics does not excuse the Company from demonstrating an expectation of such progress.

Q In particular, has the Company shown that its planned investments will enable integration of DER?

A No. Unitil's proposed plan has several components directed at enabling DER, including a circuit capacity study, analytics and an accompanying visualization platform, and relay and voltage controls. Of the benefits of these projects, the Company states, "[t]he benefits of DER Enablement ultimately depend on how much DER is installed in the FGE service territory."[82] However, the Company

[79] *Id.*, p. 56.
[80] *Id.*, p. 59.
[81] 12-76-B, p. 2.
[82] Unitil GMP, p. 35.

makes no attempt to forecast DER installations in the presence and the absence of its proposed investments, despite the fact that utilities routinely forecast DER adoption rates under different sets of assumptions. As such, the Company failed to demonstrate that its investments will allow it to make measurable progress towards achievement of one of the Department's primary goals for grid modernization.

Q How can the Department and stakeholders assess the Company's progress towards achievement of the goal of integrating DER?

A The Department clearly intends for newly-required metrics to provide visibility into the Company's actual future success in integrating DER, regardless of whether a forecast is presented in the GMP.

Q Do the Company's proposed metrics provide sufficient visibility to the Department and stakeholders to perform such an assessment?

A Unfortunately, they do not. The Company proposes to use the statewide metrics to measure its progress on integrating DER, as well as measuring the total number of DG customers and interconnected DG capacity by circuit and substation.[83] The statewide metrics include the total number of grid-connected DG facilities, as well as the nameplate capacity, estimated output, and technology type of each resource.[84] Collectively, these metrics are a good start but do not provide a comprehensive picture of the role of DER in Unitil's system over time. We recommend additional metrics that will allow the Department and stakeholders to assess the role of DER in Unitil's system, including:

1. The percentage of consumption that is satisfied by DER, by type of resource and, ideally, by substation

[83] Unitil GMP, p. 96.
[84] *Id.*, p. 91.

2. The percentage of peak that is satisfied by DER, by type of resource and, ideally, by substation
3. The rate of DER adoption among customers of different rate classes

Q The DPU recognized that customer engagement is key to successful modernization of the grid. Does Unitil's GMP include a comprehensive customer engagement plan, sufficient to enable customers to act as empowered grid participants?

A In part. The Company's Marketing, Engagement, and Outreach plan focuses primarily on customer education rather than on providing increased opportunities for customers to actively participate on the grid. However, Unitil does place a strong emphasis on transforming its role into that of a platform for third party services.

Q Does the Company's MEO plan recognize the role of third parties in empowering customer actions?

A To some extent. The Company does identify third-party vendors as an important part of the ecosystem of a modern grid, describing a vision of itself as a platform for "enabling new and evolving services to customers rather than directly providing them."[85] To this end, Unitil proposes to ease entry of third parties to the market through provision of aggregate, anonymized customer data[86] and use of a standard format for downloads of individual customer data (for example, to customer-facing apps, with customer permission).[87] However, provision of data is not sufficient to create a robust market of third-party vendors. A shift in incentives is necessary to create business opportunities for such service providers and the Company proposes no such shifts. While the Department did not require the Companies to explicitly contemplate such changes to the utility business

[85] *Id*., p. 25.
[86] *Id*., p. 89.
[87] *Id*., p. 88.

model in their GMPs, we note that Unitil took the independent initiative to propose changes to the way distributed generation is compensated as part of its GMP.[88] The Company clearly felt it had the latitude to broach such subjects—it simply chose to do so to the detriment of DER rather than to benefit of customers, who benefit from a robust marketplace of services provided by third parties.

Q Are the Company's proposed metrics sufficient to enable the Department and stakeholders to assess the Company's progress in engaging customers?

A Only in part. In addition to the statewide metrics, the Company proposes to measure the number of customers using its web portal and mobile app as well as the number of customers participating in time-varying rates.[89] The Company should also report a measure of the frequency with which customers and third parties access the proposed data infrastructure.[90]

Q The Department identified achievement of the Commonwealth's policy goals as one of the most important outcomes of grid modernization. Does the Company's GMP clearly set forth the extent to which these investments will facilitate easier achievement of these goals?

A No. Despite the Department's explicit instruction to include a description of how the Companies' proposed investment plans impact state policy goals,[91] Unitil simply does not address this question.

Q Please summarize your evaluation of Unitil's GMP.

A Of all three GMPs filed by the Commonwealth's electric distribution companies, Unitil's is the most forward-thinking in terms of its emphasis on opening opportunities for third-party involvement, customer engagement with data, and repositioning the Company as a platform for further innovation. However, as we

[88] *Id.*, pp. 104-107.
[89] *Id.*, p. 96.
[90] Such measures could include metrics common in the technology industry such as monthly active users.
[91] 12-76-C, p. 8.

discuss above, we have serious concerns with Unitil's treatment of DER; we find that the Company's metrics provide insufficient visibility of its ability to further integrate DER; and in general, we are concerned that the Company's GMP does not provide a clear commitment to outcomes that satisfy the Department's objectives for grid modernization and the Commonwealth's policy goals for the electricity system, nor does it serve as a roadmap to those outcomes. Ultimately, we find that the Company's GMP fails on the two fronts that are key to a grid modernization plan: it does not sufficiently justify the level of investment proposed in the plan, and it cannot serve as a guide to transformative modernization of the grid.

Q Given this evaluation, do you have recommendations to the Department regarding the disposition of Unitil's GMP?

A Yes. First and foremost, we recommend that the Department decline to approve spending based on the Company's incomplete and insufficient GMP. Instead, we recommend that the Department require a new GMP that can serve as a comprehensive, forward-looking distribution system planning document—and that is responsive to the Department's goals and requirements for grid modernization. This revised plan should include the following:

- An investigation and description of the Company's distribution system needs throughout the planning period, including both the need to satisfy sales and peak demand at the system and substation levels, and the need for modernization to enable use of a greater diversity of resources and, ultimately, lower system costs;

- A clear and comprehensive description of the resources available to meet distribution system needs and objectives throughout the planning period. These resources should include all conventional distribution investments as well as all potential DERs. Detailed forecasts of the costs, capabilities,

and availabilities of all resources should be key aspects of these descriptions;

- A clear and comprehensive description of the resources that the Company proposes to use to meet distribution system needs and objectives throughout the planning period, with details regarding both conventional distribution investments and DERs. These details should include the expected capabilities or size of each resources—for example, expected MWh of generation, MW of capacity, or MVAr of compensation;
- A clear and comprehensive business case analysis of the key resources that the Company proposes to use to meet distribution needs throughout the planning period. This should include all relevant costs, benefits, and qualitative factors considered in the business case, as well as a detailed narrative justification of proposed investments;
- Forecasts of key system outcomes and indicators, for example DER penetration rates, annual distribution system revenue requirements, annual system CO_2 emission rates, and measures of customer and third-party activity and engagement;
- A customer engagement plan, indicating how the Company will educate customers, provide them with access to DERs, and otherwise provide them with the means to optimize their consumption patterns.
- A third-party engagement plan, indicating what steps the Company will take to encourage third-parties (including DER developers and customer aggregators) to provide technologies and services to customers and to the Company; including draft requests for proposals to procure non-wires alternatives (NWAs) to conventional distribution investments.

In addition, we recommend that the Department require the Company to collect additional metrics, as enumerated above. We further recommend that the

Department require these metrics to be published on a publicly-accessible web dashboard for the benefit of stakeholders and the public and that the Department establish standards for these metrics and a process for evaluating the Companies' performance.

Q Does this conclude your testimony regarding Unitil's GMP?

A It does.

7. EVERSOURCE'S GMP

Q Please summarize the goals and approach of Eversource's GMP.

A Eversource claims that the mission of its GMP is "to implement transformational change through innovation and escalation."[92] Eversource developed its GMP using seven guiding principles, including, among other things, the Department's four grid modernization objectives, a focus on customers and advancement in customer education, and implementing cost-effective investments.

To fulfill this mission, Eversource proposes two principal components. The first is its Grid Modernization Base Commitment (GMBC), which is presented in the Company's concurrent base rate case proceeding, D.P.U. 17-05. The GBMC addresses foundational investments needed to enable grid modernization initiatives. The second is the Incremental Grid Modernization Plan (IGMP), essentially its original GMP's STIP, which comprises the additional investments proposed in the current proceeding to advance a more modern grid. Our testimony only address the Company's IGMP; it does not discuss the GMBC at issue in the Company's rate case proceeding.

Unlike the other two Companies, Eversource has essentially declined to respond to the Department's directive to obtain advanced metering functionality in the near term. Instead, its planned investments are essentially limited to those

[92] Eversource IGMP, p. 6.

necessary to support an opt-in TVR program and accompanying marketing campaign.

Q Is Eversource's IGMP a roadmap to grid modernization? Does it serve as a comprehensive planning document, suitable to guide a broad and transformative modernization of the grid?

A No. As discussed below, the Company's IGMP lacks a comprehensive description of distribution system needs and the resources available to meet those needs, an evaluation of those resources, or a well-justified proposal of a resource plan that appropriately balances cost with other system considerations. Instead, the Company has presented a plan to receive pre-approval for millions of dollars of spending on investments that fail to comprehensively address the Department's goals and requirements for grid modernization. These proposed investments are supported by a justification that depends more on rhetoric than on a detailed discussion of costs, outcomes, and alternatives

As we describe below, the Company's IGMP does not devote appropriate attention and effort to the DPU's goal of furthering DER integration, provides a thin and insufficient plan to engage customers (and third-parties interested in providing enabling services to those customers) in a modernized grid, and proposes to rely on a set of metrics that would not allow the DPU and stakeholders adequate visibility of the Company's progress towards achieving a broad transformation. Ultimately, we find that the Company's IGMP is not the ambitious and comprehensive planning document requested by the Department, fails to respond to the Department's explicit directives regarding modernization in the near-term, and does not provide the Department with evidence sufficient to justify significant spending on grid modernization investments.

Q Does Eversource's IGMP propose significant investments?

A Yes. Despite its lukewarm approach to grid modernization, the Company's planned capital spending associated with its IGMP is estimated to cost $138.2 million. This investment is designed to support customer engagement (opt-in time-varying rates) and enabling technologies (cyber security and a customer education and outreach plan). The Company proposes to recover these investments through a new "GMP" factor in the Company's Performance Based Ratemaking Mechanism addressed in its base rate case proceeding. This recovery mechanism would apply to all the Company's grid modernization-related capital spending above $400 million; for spending below this amount the Company proposes simply to recover its costs as part of an overall performance-based ratemaking schema.[93] As we discuss below, Eversource's IGMP fails to justify these investments, either on the basis of demonstrable progress towards the Department's grid modernization investment or on that of system needs.

Q Does Eversource's IGMP discuss the Company's distribution system investment needs?

A Yes, in part. Most of the Company's original discussions regarding its distribution system investment needs have shifted to its GMBC in its base rate case proceeding. In its IGMP, Eversource focuses on distribution system investments only as they relate to implementing its opt-in time-varying rate program, including installation of more advanced meters, billing system upgrades, and data management and storage software. Of the Company's investment plan, $104.8 million (76 percent) is related to meters and information technology system upgrades to support time-varying rate structures.

[93] *Id.*, pp. 7-8, 12.

Q How did Eversource select and justify the proposed investments?

A Eversource's description of how it selected its investments is lofty. The Company states that its IGMP is "grounded on the grid modernization objectives identified by the Department and supported by the Company" and that it developed its "GMP vision by first identifying the key attributes that a grid modernization plan should strive to achieve in the long term."[94] Eversource also incorporated stakeholder feedback into the development of its GMP.[95] While a focus on goals and incorporating feedback from stakeholders are important first steps, the IGMP does not describe the potential investments that were considered and rejected by the Company, nor does it explain how the Company determined the appropriate investment level for different technologies.

The Company's IGMP is justified primarily on the basis of its business case cost-benefit analysis. However, the Company's analysis shows that the opt-in time-varying rate program at the core of its IGMP is not cost-effective, with a benefit-cost ratio of only 0.3.[96] Eversource provides no explanation for why it chose to focus its IGMP on an opt-in time-varying rate design as compared to other opportunities available for developing a modern grid, apart from including an extensive critique of opt-out time-varying rates.[97]

Q Did Eversource clearly describe the expected outcomes of its proposed investments and grid modernization plan?

A No. Eversource claims that its IGMP will achieve multiple objectives and will provide benefits to customers, yet provides no further evidence to support such statements.[98] The Company's simple mention of the outcomes and benefits of its

[94] *Id.*, p. 12.
[95] *Id.*, p. 69.
[96] *Id.*, p. 62.
[97] *Id.*, pp. 33-44.
[98] *Id.*, p. 14.

IGMP does not provide a clear or comprehensive picture of the anticipated impacts on the Department's grid modernization objectives.

Eversource expects that only five percent of customers will opt into its time-varying rate program.[99] The Company is silent regarding the expected system impacts of this level of adoption, presenting no forecast of whether peak savings are expected to occur from customer participation in the time-varying rate program and, if so, where and to what extent.

Q Should the Department expect the Company to include a concrete discussion of outcomes in its IGMP?

A Yes, certainly. The Department clearly indicated that it wanted the Companies to discuss the expected outcomes of their GMPs in a clear and concrete manner. The Department repeatedly instructed the Companies to outline how they "propose to make *measurable* progress" towards the achievement of the Department's objectives for grid modernization.[100] While the Company's actual progress towards these objectives should be visible to the Department and stakeholders through the use of metrics, as discussed below, the inclusion of metrics does not excuse the Company from demonstrating an expectation of such progress.

Q Does Eversource's IGMP comprehensively address how the proposed investments will enable achievement of the DPU's goals for grid modernization?

A No. The Company's attempt to "demonstrate" how its investments will enable achievement of the DPU's goals for grid modernization consists of a table of its investments with checkmarks for each of the Department's goals.[101] Even according to this table, the core of Eversource's IGMP—the opt-in time-varying

[99] *Id.*, p. 24.
[100] D.P.U. 12-76-B, p. 2.
[101] Eversource IGMP, p. 65.

rate program—is cited as contributing solely to the goal of optimizing demand, with no checkmarks for the other three objectives.

This deficiency is particularly pronounced with respect to the Department's goal of integrating DERs. The only mention of DERs in Eversource's IGMP is as a general goal unaccompanied by supporting investments or evidence, as a small component of its marketing campaign veiled as a customer outreach program, and as an area for potential improvement only *after* the five-year STIP provides more information on DER integration.[102] Eversource's IGMP proposes no capital improvements related to DER integration, and its operation and maintenance efforts are limited to general education and assistance provided to customers already looking to invest in DERs.

Q What are the particular deficiencies of the plan with respect to integration of DER?

A There are two main deficiencies with respect to the Company's treatment of DER integration. First, the Company failed to consider and promote DER integration as both a means to grid modernization and as an end thereof. Second, the Company failed to demonstrate that its IGMP would actually lead to increased DER integration, which is one of the Department's primary goals for grid modernization.

Q Has the Company shown that its planned investments will enable integration of DER?

A No. DER and other "non-wires alternatives" are not among the technologies considered by the Company to further the Department's grid modernization goals. We note here that the Department explicitly did not limit the scope of GMPs to capital investments. Rather, the DPU clearly described the scope of GMPs to

[102] *Id.*, p. 82.

include "all grid modernization planning and investments," including but not limited to the STIP.[103] Distributed generation, energy efficiency, demand response, storage, and electric vehicles all fall within this scope and would be expected to impact the Company's needs and plans. While the Department did not require a comprehensive alternatives analysis, we still find that the Company erred in not considering or discussing the potential of DER integration to serve as a means to achieving a modern grid.

Q Outside of capital investments, will the Company's planned implementation of grid modernization promote DER integration?

A No. The Company's IGMP includes no quantitative evaluation of DER adoption with and without implementation of the plan. Nor did the Company provide a forecast of other distributed resources, such as storage and demand response. Utilities routinely forecast DER adoption rates under different sets of assumptions. As such, we see no reason as to why the Company could not perform such an analysis with regards to the impacts of its IGMP.

Q How can the Department and stakeholders assess the Company's progress towards achievement of the goal of integrating DER?

A The Department clearly intends for newly-required metrics to provide visibility into the Company's actual future success in integrating DER, regardless of whether a forecast is presented in the GMP.

Q Do the Company's proposed metrics provide sufficient visibility to the Department and stakeholders to perform such an assessment?

A Unfortunately, they do not. The Company has removed metrics to measure progress on integrating DER from its IGMP; therefore, Eversource is not proposing any metrics regarding integration of DERs.

[103] 12-76-B, p. 15.

We recommend that Eversource, at a minimum, adopt the statewide metrics suggested by the Department and adopted by both National Grid and Unitil. These metrics include the total number of grid-connected DG facilities, as well as the nameplate capacity, estimated output, and technology type of each resource.[104] These metrics are a good start but do not provide a comprehensive picture of the role of DER in the Company's system over time. We suggest additional metrics that will allow the Department and stakeholders to assess the role of DER in Eversource's system, including:

1. The percentage of consumption that is satisfied by DER, by type of resource and, ideally, by substation
2. The percentage of peak that is satisfied by DER, by type of resource and, ideally, by substation
3. The rate of DER adoption among customers of different rate classes

Q The DPU recognized that customer engagement is key to successful modernization of the grid. Does Eversource's IGMP include a comprehensive customer engagement plan, sufficient to enable customers to act as empowered grid participants?

A No. The Company's customer engagement plan focuses primarily on customer education rather than on providing increased opportunities for customers to actively participate on the grid. Even the customer education components of the Company's plan are lacking, as the majority of the Company's plan is a glorified marketing scheme. Eversource proposes to educate customers through TV commercials, radio advertisements, bill inserts, billboards, and social networking investments. While it proposes limited community engagement efforts, the Company's customer engagement plan relies primarily on unidirectional

[104] 12-76-B, p. 32.

communications and advertisements *from* Eversource *to* customers—interactions that do not allow for interactive learning between the customer and the utility.[105]

Q Does the Company's customer engagement plan recognize the role of third parties in empowering customer actions?

A No. The Company makes little to no reference to third parties throughout its entire IGMP. Rather, the customer education and outreach plan is Eversource-centric, with objectives such as "help customers who have or are considering DER to get the information they need to make a decision or to manage their system from a reliable, trustworthy, partner like Eversource."[106]

Third party vendors are an important part of the ecosystem of a modern grid. Eversource should engage these market actors as allies in achieving the Department's grid modernization goals. A shift in incentives and market actors is necessary to engage customers and develop a modern grid.

Q Are the Company's proposed metrics sufficient to enable the Department and stakeholders to assess the Company's progress in engaging customers?

A No. The Company has removed any metrics relating to customer engagement from its IGMP. The only metrics in the Company's IGMP relate to optimizing demand. At a minimum, the Company should report a measure of the frequency with which customers access (or third parties access on customers' behalf) grid modernization touch points, as incorporated into Eversource's IGMP and GMBC.

Q The Department identified achievement of the Commonwealth's policy goals as one of the most important outcomes of grid modernization. Does the

[105] Eversouce IGMP., pp. 48-60.
[106] *Id.*, p. 50.

Company's IGMP clearly set forth the extent to which these investments will facilitate easier achievement of these goals?

A No. The Company has put little effort into demonstrating that its IGMP will support the Commonwealth's policy goals. Although the Department referred to nine different relevant policies, the Company simply mentioned that its opt-in time-varying rate program may lead to a reduction in total system costs and will reduce carbon emissions consistent with the Global Warming Solutions Act.[107]

The Company indicates that conservation effects from its time-varying rate program are "highly speculative" and that it did not estimate benefits related to energy consumption reduction associated with the Renewable Portfolio Standard or Demand Reduction Induced Price Effects.[108] Given the lack of evidence supporting its claims, we cannot agree that the Company has convincingly shown its IGMP will substantively contribute to achievement of the Commonwealth's policy goals

Q Please summarize your evaluation of Eversource's IGMP.

A Eversource's IGMP is, in sum, an opt-in time-varying rate program—a modest proposal for something that the Company could offer to customers independently of this proceeding. It provides little more than that. By shifting the majority of its original GMP to its base rate case proceeding, the Company has signaled that most of its grid modernization efforts are baseline investments that the Company should be making to improve reliability and are not germane to a grid modernization plan. The elements remaining in its IGMP are weak attempts to maintain some semblance of a GMP.

The Company's IGMP fails to comprehensively discuss how its proposed investments will satisfy system needs or contribute in a concrete way to achievement of the Department's goals for grid modernization. The Company's

[107] *Id.*, p. 66.
[108] Eversource's responses to AG-4-18, AG-4-19, and DPU-2-3.

proposal for customer engagement is modest at best and makes no attempt to open opportunities for customers to play more prominent and active roles on the grid. Integration of DER is completely lacking from the Company's IGMP.

Ultimately, we find that the Company's IGMP fails on the two fronts that are key to a grid modernization plan: it does not sufficiently justify the level of investment proposed in the plan, and it cannot serve as a guide to transformative modernization of the grid.

Q Given this evaluation, do you have recommendations to the Department regarding the disposition of the Eversource's IGMP?

A Yes. First and foremost, we recommend that the Department decline to approve spending based on the Company's incomplete and insufficient Incremental Grid Modernization Plan. Instead, we recommend that the Department require a new GMP that can serve as a comprehensive, forward-looking distribution system planning document—and that is responsive to the Department's goals and requirements for grid modernization. This revised plan should include the following:

- An investigation and description of the Company's distribution system needs throughout the planning period, including both the need to satisfy sales and peak demand at the system and substation levels, and the need for modernization to enable use of a greater diversity of resources and, ultimately, lower system costs;

- A clear and comprehensive description of the resources available to meet distribution system needs and objectives throughout the planning period. These resources should include all conventional distribution investments as well as all potential DERs. Detailed forecasts of the costs, capabilities, and availabilities of all resources should be key aspects of these descriptions;

- A clear and comprehensive description of the resources that the Company proposes to use to meet distribution system needs and objectives throughout the planning period, with details regarding both conventional distribution investments and DERs. These details should include the expected capabilities or size of each resources—for example, expected MWh of generation, MW of capacity, or MVAr of compensation;
- A clear and comprehensive business case analysis of the key resources that the Company proposes to use to meet distribution needs throughout the planning period. This should include all relevant costs, benefits, and qualitative factors considered in the business case, as well as a detailed narrative justification of proposed investments;
- Forecasts of key system outcomes and indicators, for example DER penetration rates, annual distribution system revenue requirements, annual system CO_2 emission rates, and measures of customer and third-party activity and engagement;
- A customer engagement plan, indicating how the Company will educate customers, provide them with access to DERs, and otherwise provide them with the means to optimize their consumption patterns.
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In addition, we recommend that the Department require the Company to collect additional metrics, as enumerated above. We further recommend that the Department require these metrics to be published on a publicly-accessible web dashboard for the benefit of stakeholders and the public, and that the Department

establish standards for these metrics and a process for evaluating the Companies' performance.

Q Does this conclude your testimony regarding Eversource's IGMP?

A It does.

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF PUBLIC UTILITIES

Petition of Massachusetts Electric Company and Nantucket Electric Company d/b/a National Grid for Approval of its Grid Modernization Plan.	D.P.U. 15-120
Petition of Fitchburg Gas and Electric Light Company d/b/a Unitil for Approval of its Grid Modernization Plan.	D.P.U. 15-121
Petition of NSTAR Electric Company and Western Massachusetts Electric Company d/b/a Eversource Energy for Approval of their Grid Modernization Plans.	D.P.U. 15-122/15-123

AFFIDAVIT OF TIM WOOLF

Tim Woolf does hereby depose and say as follows:

I, Tim Woolf, on behalf of Conservation Law Foundation, certify that testimony which bears my name was prepared by me or under my supervision and is true and accurate to the best of my knowledge and belief.

Signed under the pains and penalties of perjury this 9 day of March, 2017.

Tim Woolf

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AFFIDAVIT OF ARIEL HOROWITZ

Ariel Horowitz does hereby depose and say as follows:

I, Ariel Horowitz, on behalf of Conservation Law Foundation, certify that testimony which bears my name was prepared by me or under my supervision and is true and accurate to the best of my knowledge and belief.

Signed under the pains and penalties of perjury this 9th day of March, 2017.

Ariel Horowitz