Before the
New Hampshire Public Utilities Commission

Proceeding on Public Service Company of New Hampshire d/b/a Eversource Energy 2020 Least Cost Integrated Resource Plan	)))	Docket No. DE 20-161

DIRECT TESTIMONY OF
TIM WOOLF
AND
BEN HAVUMAKI

ON BEHALF OF
OFFICE OF CONSUMER ADVOCATE

ON THE TOPIC OF
EVERSOURCE'S LEAST-COST INTEGRATED RESOURCE PLAN

August 19, 2022

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1. INTRODUCTION AND QUALIFICATIONS

Q. Please state your name, title, and employer.

A. **Mr. Woolf:** My name is Tim Woolf. I am a Vice President at Synapse Energy Economics, located at 485 Massachusetts Avenue, Suite 3, Cambridge, MA 02139.

A. **Mr. Havumaki:** My name is Ben Havumaki. I am a Senior Associate at Synapse Energy Economics, located at 485 Massachusetts Avenue, Suite 3, Cambridge, MA 02139

Q. Please describe Synapse Energy Economics.

A. 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, the U.S. Department of Energy, the U.S. Department of Justice, the Federal Trade Commission, and the National Association of Regulatory Utility Commissioners. Synapse has over 30 professional staff with extensive experience in the electricity industry.

Q. Please summarize your professional and educational experience.

A. **Mr. Woolf:** I have 40 years of experience analyzing technical, economic, and policy aspects of electric utility planning and regulation. In recent years, I have focused on many topics related to power sector transformation, including distributed energy resources, performance-based regulation, new utility business models, grid modernization, and distribution system planning. I also address a variety of related ratemaking issues, such as rate design, net metering rates, decoupling, and dynamic pricing.

Before joining Synapse Energy Economics, I was a commissioner at the Massachusetts Department of Public Utilities (DPU) from 2007 through 2011. 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.

I have testified as an expert witness in more than 45 state regulatory proceedings and have authored more than 60 reports on electricity industry regulation and restructuring. I represent clients in collaboratives, task forces, and settlement negotiations, and I have published articles on electric utility regulation in Energy Policy, Public Utilities Fortnightly, The Electricity Journal, Local Environment, Utilities Policy, Energy and Environment, and The Review of European Community and Environmental Law.

I hold a Master's in Business Administration from Boston University, a Diploma in Economics from the London School of Economics, as well as a BS in Mechanical Engineering and a BA in English from Tufts University. My resume is attached as Exhibit TW/BH-1.

A. **Mr. Havumaki:** I have five years of experience in the energy field. At Synapse, I focus on a range of related regulatory topics, including ratemaking and rate design, performance-based regulation, and grid modernization. I am also regularly engaged in benefit-cost analysis (BCA) work, including in the development of guidance for emerging areas of practice such as grid modernization, and in reviewing utility analyses in the context of litigated proceedings. Prior to being hired by Synapse, I worked for the World Bank on a consulting team that authored a field manual on benefit-cost analysis for practitioners in the developing world. I have sponsored testimony before the Public Utilities Commission of New Hampshire, the Georgia Public Service Commission, the Illinois Commerce Commission, the West Virginia Public Service Commission, and the Rhode Island Public Utilities Commission. I hold a Master of Arts in Applied Economics from the University of Massachusetts. My resume is attached as Exhibit TW/BH-2.

Q. On whose behalf are you testifying in this case?

A. We are testifying on behalf of the Office of Consumer Advocate (OCA).

Q. Have you previously testified before the New Hampshire Public Utilities Commission?

A. **Mr. Woolf:** Yes. I have testified before this Commission on one previous occasion, in Docket 99-099 Phase II on January 14, 2000.

A. **Mr. Havumaki:** Yes, I have sponsored written testimony before the New Hampshire Public Utilities Commission on two previous occasions. I filed testimony in Docket DE 21-030 on November 23, 2021, and I filed testimony in Docket DG 21-104 on April 1, 2022.

Q. What is the purpose of your testimony?

A. The purpose of our testimony is to review and comment on Eversource's 2020 least-cost integrated resource plan (LCIRP) filing and supplemental appendices. We evaluate whether the Company has complied with filing requirements established by statute and subsequent Commission Orders, identify required information that is missing from the Company's filings, and then recommend actions that the Company should take to redress these gaps. We recommend that that Commission not accept the Company's LCIRP and suggest several steps that the Commission can take to encourage more useful LCIRPs from Eversource and the other subject utilities in the future.

Q. Are you sponsoring any attachments with your testimony?

A. Yes. we are sponsoring the following exhibits:

- Resume of Tim Woolf
- Resume of Ben Havumaki

2. SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

Q. Please summarize your conclusions.

A. Our primary conclusion is that Eversource's LCIRP does not comply with the LCIRP statute in many important respects.

- The LCIRP is too narrow in scope, despite the broad requirements of the LCIRP statute.
  - It does not address or evaluate opportunities for optimizing generation resource options.
  - It does not address or evaluate environmental impacts of any electricity consumption.
- The LCIRP does not sufficiently evaluate several important electricity resource options, despite clear requirements in the LCIRP statute to do so.
  - It does not evaluate incremental energy efficiency and demand response resources beyond those provided through NH-Saves.
  - It does not evaluate incremental distributed generation resources beyond those supported by New Hampshire net energy metering programs.
  - It does not evaluate opportunities from distributed storage, building electrification, or electric vehicles (EVs).
  - It does not adequately evaluate smart grid, or grid modernization, opportunities.[1]
  - It does not evaluate utility-scale renewable resources beyond those required by the New Hampshire renewable portfolio requirements.
  - It does not evaluate opportunities to reduce the costs and risks of default energy services procurements.

[1] Throughout this testimony we use the term "grid modernization" synonymously with "smart grid."

Q. What are your primary recommendations?

A. We recommend that the Commission:

- Reject Eversource's LCIRP.
- Direct Eversource to prepare, and file with the Commission, a new LCIRP that is consistent with the LCIRP statute, Commission directives, and the recommendations in our testimony.
- Convene a stakeholder group to provide meaningful input to Eversource's new LCIRP.

3. LEAST COST PLANNING REQUIREMENTS IN NEW HAMPSHIRE

3.1. Overview of the Least Cost Energy Planning Statute

Q. Please describe New Hampshire's least cost planning statute.

A. In 1990, New Hampshire enacted its least cost energy planning law. The first section, RSA 378:37, establishes that it is the "energy policy" of the state that energy needs be met "at the lowest reasonable cost" while ensuring that energy sources are reliable and diverse; that cost effective energy efficiency and demand response resources are utilized to the maximum extent; and that safety, public health, the physical environment of the state, the future supply of resources, and the financial integrity of utilities are all safeguarded.[2]

Q. How are utilities expected to comply with this least cost standard?

A. Each public utility is required to file a LCIRP.[3] This comprehensive filing is designed to provide the Commission and other stakeholders with sufficiently detailed information about current operations, future needs, and the range of options for meeting these needs to ensure that resource choices comport with the state's energy policy priorities, as set forth in in RSA 378:37.

[2] RSA 378:37.
[3] RSA 378:38.

Q. What specific information are utilities required to provide in their LCIRPs?

A. RSA 378:38, which was amended in 2014,directs utilities to provide comprehensive information about all facets of the grid, covering supply, demand-side alternatives, and transmission and distribution. Specifically, utilities must provide:

I. A forecast of future demand for the utility's service area.

II. An assessment of demand-side energy management programs, including conservation, efficiency, and load management programs.

III. An assessment of supply options including owned capacity, market procurements, renewable energy, and distributed energy resources.

IV. An assessment of distribution and transmission requirements, including an assessment of the benefits and costs of "smart grid" technologies, and the institution or extension of electric utility programs designed to ensure a more reliable and resilient grid to prevent or minimize power outages, including but not limited to, infrastructure automation and technologies.

Q. Are utilities supposed to account for policy goals in their LCIRPs?

A. Yes. Policy goals underpin the LCIRP planning framework, and RSA 378:38 directs utilities on how these goals should be evaluated in the context of their filings. To this end, each utility is directed to provide within its LCIRP:

V. An assessment of plan integration and impact on state compliance with the Clean Air Act of 1990, as amended, and other environmental laws that may impact a utility's assets or customers.

VI. An assessment of the plan's long- and short-term environmental, economic, and energy price and supply impact on the state.

VII. An assessment of plan integration and consistency with the state energy strategy under RSA 12-P.

Q. How is the Commission instructed to evaluate utility proposals in LCIRPs?

A. The statute explains that the Commission should apply the criteria from RSA 378:37 in its assessment of utility LCIRPs, considering the "environmental, economic, and health-related impacts of each proposed option" within the filed plans. The Commission is also advised to consult with a range of stakeholders and constituencies in support of its review.[4]

Q. Does the statute indicate any preference for specific resource types?

A. Yes. As noted above, the statute directs the Commission first to consider alternatives based on key policy dimensions. However, should alternatives be "equivalent" across the key dimensions of cost, reliability, and environmental, economic, and health-related impacts, the Commission is required to favor energy efficiency and demand-side management resources over renewable energy sources, which in turn are to be preferred over all other energy sources.[5]

3.2. Procedural History and Additional Directions from the Commission on LCIRP

Q. Have Eversource's past LCIRPs provided all information required by the current, amended version of RSA 378:38?

A. No. The Company has filed two LCIRPs since RSA 378:38 was amended, in 2015 and 2019, but in both instances, the Commission granted the Company a waiver on its obligation to provide a complete filing.

Q. Please describe the first waiver from the Commission.

A. The Commission issued a waiver to the Company for its 2015 LCIRP in Order 25,828 in Docket DE 15-248, permitting the Company to exclude generation from its analysis because of the anticipated divestiture of the Company's generation assets.

[4] RSA 378:38
[5] RSA 378:38

Q. Should this first waiver be taken to signify that the Company is forever exempt from addressing generation in its LCIRPs?

A. No. While it is true that Eversource no longer holds generation assets, it is important to recognize that the Commission's 2015 Order was a one-off directive with no explicit bearing on future LCIRPs. Moreover, the Commission subsequently expressed its expectation that the Company *would* address generation in its next LCIRP (i.e., the 2019 LCIRP), which suggests that the Commission did not view divestiture of generation as necessarily relieving the Company of the obligation to consider the costs and environmental impacts of generation.[6]

Q. Please describe the second waiver from the Commission.

A. In Order 26,262 in Docket DE 19-139, the Commission again issued a waiver, directing the Company to provide in its 2019 LCIRP only an update on its compliance with commitments that had emerged from its previous LCIRP. This second waiver was motivated by the Commission's investigation into grid modernization in Docket IR 15-296, which was then still in process. In granting this dispensation, the Commission also clarified its expectations for the Company's 2020 LCIRP, indicating that it expected that the Company would include greater detail in this next filing. In this Order, the Commission also further fleshed out some of the statutory filing requirements for LCIRP.[7]

Q. What was the result of the Commission's Investigation into Grid Modernization?

A. The Commission issued Order 26,358 in May 2020, recommending a more robust LCIRP filing that would include "[a] granular load forecast, DER forecast, and detailed description of foreseeable distribution system needs over the next five years, including five-year capital and operating expenditure plans," and "[a] comparison of solutions to meet those needs and potential alternatives, and non-wire solutions where appropriate." This Order also recommended that each LCIRP include a ten-year capital investment

[6] DE 15-248, Order 25,050, pg. 6.
[7] DE 19-139, Order 26,362, pg. 5.

forecast and expressed that utilities should account for all stakeholder input and describe how input has been incorporated or why it has not been.[8]

Q. Did Order 26,358 provide for ongoing stakeholder engagement?

A. Yes. Order 26,358 directed Commission Staff to convene a Grid Modernization Stakeholder Group that would meet within 60 days of the Order and subsequently on a monthly basis for the following two years.[9]

Q. Do the Commission's findings in Order 26,358 amount to additional filing requirements?

A. No. While this Order appeared to articulate more expansive expectations for the Company's next LCIRP, the Commission subsequently clarified that these findings were intended just as "guidance."[10] This clarification came in Order 26,575, which was issued in May 2020—nearly two years after Order 26,358. However, in this latter Order, the Commission also emphasized that it still wished to see utilities implement these recommendations, stating, "[t]he guidance will instruct the utilities and stakeholders in all pending and future LCIRP dockets of the goals and expectations for these dockets."[11]

Q. What further direction did the Commission provide in Order 26,362.

A. The directives in this Order were largely consistent with the "guidance" provided in the grid modernization docket, as follows:

- In line with Order 26,358, which called for a "granular load forecast," Order 26,362 mandated the Company to include "a ten-year, substation break-level loading criteria and forecast."[12]

[8] IR 15,296, Order 26,358, pg. 21.
[9] IR 15,296, Order 26,358, pg. 78.
[10] IR 15, 296, Order 26,575, pg. 1.
[11] IR 15-296, Order 26,575, pg. 6.
[12] DE 19-139, Order 26,362, pg. 6.

- Order 26,362 was also consistent with Order 26,358 in imposing a requirement for the Company to provide a five-year evaluation of planned investments and alternatives.[13]

However, the Commission was even more prescriptive in directing the Company to consider alternatives in Order 26,362, specifying that Eversource needed to provide "an assessment of demand side management programs and their potential to defer or avoid the need for capacity-related investments" and also including a new series of requirements related to evaluation of non-wires solutions (NWS).[14]

Q. What specific requirements concerning NWS did Order 26,362 impose on Eversource?

A. This Order required the Company to adopt a new set of criteria to identify potential capital projects for deferral or avoidance, make modifications to its planning processes to place greater emphasis on NWS options, and work with the settling parties to select one candidate project for a detailed NWS analysis.

Q. Did Eversource support these efforts to improve planning processes?

A. Yes. In its motion requesting a waiver for its 2019 LCIRP, the Company stated that it "acknowledges that times have changed and that adapting to that change by updating the means by which investment plans are developed and reviewed is worthwhile."[15]

Q. Should the LCIRP comply with all additional requirements and guidance from Order 26,362 and Order 26,358?

A. Yes, the Company should comply with both the LCIRP statute and these Orders. For reference, Table 1 documents the incremental guidance and requirements from Order 26,358 and Order 26,362 alongside the related provisions in RS 378:38.

[13] DE 19-139, Order 26,362, pg. 6.
[14] DE 19-139, Order 26,362, pg. 6.
[15] DE 15-248. Eversource's Motion for Waiver.

Table 1. Filing Requirements from RSA 378 Addressed in PUC Orders

Least Cost Energy Planning Statute	Order 26,362	Order 26,358
"A forecast of future demand for the utility's service area." (RSA 378:38-I)	"[t]en-year, substation breaker-level loading criteria and forecast."	"[A] granular load forecast, [and] DER forecast."
"An assessment of demand-side energy management programs, including conservation, efficiency, and load management programs." (RSA:378:38-II)	"An assessment of demand side management programs and their potential to defer or avoid the need for capacity-related investments."	
"An assessment of distribution and transmission requirements, including an assessment of the benefits and costs of "smart grid" technologies, and the institution or extension of electric utility programs designed to ensure a more reliable and resilient grid to prevent or minimize power outages, including but not limited to, infrastructure automation and technologies." (RSA 378:38-IV)	"[f]ive-year forward-looking evaluation of planned system investments and alternatives that were considered, including any area planning studies and solution selections forms."	"[A] detailed description of foreseeable distribution system needs over the next five years, including five-year capital and operating expenditure plans." "A comparison of solutions to meet those needs and potential alternatives, including non-wire solutions where appropriate." "[A] description of foreseeable system investments planned for the next 10 years."

Q. The Commission issued two LCIRP Orders recently: one for Northern Utilities (Order No. 26,664) and one for Unitil Energy Systems (Order No. 26,666). Please summarize some of the highlights of those orders as they might pertain to this Eversource LCIRP docket.

A. We recognize that these two orders have no bearing on this Eversource LCIRP docket because they were issued well after the Eversource LCIRP was prepared and relatively late in the instant proceeding. Nonetheless, the Commission provides some guidance that is apparently meant to apply to all future reviews of utility LCIRPs.

In particular, both recent LCIRP orders refer to the Commission's concern about the large growth in utilities' capital costs and rate bases.[16] The Commission is clear that it views an LCIRP as "the opportunity for the utilities it regulates to work with interested parties to evaluate capital plans that secure reliable and least-cost service for ratepayers."[17] The

[16] DE 20-002, Order 26,666, pgs. 6-7, and DE 19-126, Order 26,664, pgs. 11-12.
[17] DE 20-002, Order 26,666, pg.11, and DE 19-126, Order 26,664, pg. 16.

Commission puts Northern Utilities on notice that going forward, as part of each rate case, the Commission will "consider how its [Northern Utilities'] capital investments align with its approved LCIRP and thus support the goal of securing the least-cost resources and minimizing the rate impacts for customers."[18] Similarly, it puts Unitil on notice that going forward, as part of each rate case, the Commission will "hold Unitil to the capital plans developed through the LCIRPs and will expect sufficient notice and justification for any material deviations from those plans."[19] Further, the Commission interprets RSA 378:39 to require "its review of specific investment options in a capital investment plan as opposed to a more limited review of planning criteria.[20]

We are encouraged by the Commission's renewed emphasis on (a) the LCIRP statute, (b) the importance of using the LCIRP as a means to reduce costs, and (c) the results of the LCIRP as being more important than the process.

4. SUMMARY OF EVERSOURCE'S 2020 LCIRP

Q. Please summarize the contents of Eversource's 2020 LCIRP.

A. The Company has filed its 2020 LCIRP in two stages. The Company filed its plan and appendices on October 1, 2020. On March 31, 2021, Eversource provided additional documents as appendices to the original plan. These filings are summarized below.

1. Plan: This document provides a high-level overview of the Company's system, summarizes its distribution and transmission planning processes (including joint planning processes with other utilities) and anticipated changes to these processes, provides a load forecast, and offers a general view of Eversource's vision for maintaining the grid in the future. The plan also briefly addresses several specific issues in a generally qualitative way, including consideration of NWS, DER integration, demand-side management programs, and smart grid investments.

[18] DE 19-126, Order 26,664, pg. 16.
[19] DE 20-002, Order 26,666, pg.11.
[20] DE 20-002, Order 26,666, pg.12.

2. Appendices: This initial set of appendices provides supporting data and additional detail related to the topics addressed in the plan. The Company begins in Appendix A with an explanation of why it believes that it's LCIRP complies with statutory LCIRP requirements. Appendix A also lists additional requirements to comply with recent Commission directives. The Company provides load forecasts in Appendices B and C; furnishes its Distribution System Planning Guide in Appendix D; and presents more detail on its planning and decision-making processes in Appendices F-1, F-2, and F-3. Then, the Company provides the results of these planning processes, including recommendations for investments, in Appendix L. Additional information about distribution system needs and recommended solutions are provided in Appendices H and I, which provide the results of joint planning exercises, and in Appendix K, which provides a "Grid Needs Assessment." Eversource discusses reliability performance in Appendix G. Lastly, there is an overview of smart grid technologies, with high-level reference to Company initiatives and future goals, in Appendix K.

3. Additional appendices: Eversource filed additional appendices in March 2021. These materials address NWS opportunities and associated analyses (Appendices A, B, and C), and also provide greater detail system needs and potential solutions (Appendices D, E, and F).

Q. Does Eversource's 2020 LCIRP meet all statutory and PUC requirements?

A. No. The 2020 LCIRP is too narrow, in that it does not properly address distribution system needs, generation resource options, or environmental impacts. Further, the LCIRP does not sufficiently evaluate distributed energy resources, smart gird options, renewable resources, or default energy services. We address these shortcomings in the remainder of our testimony.

5. THE LCIRP IS TOO NARROW IN SCOPE

5.1. Generation Resource Options

Q. Does the LCIRP evaluate generation resource options?

A. No. Eversource does not evaluate or attempt to optimize generation resource options in its LCIRP. The Company claims that since it does not own generation capacity, its LCIRP will not have any meaningful impact on the cost of supply.[21] The Company also claims that it does not have meaningful influence over the energy that its customers consume, since it merely solicits supply for its default service customers through RFPs to wholesale market participants.[22] (Eversource notes that it does accommodate its customers' renewable generation projects through its distribution planning process.[23])

Q. Should the LCIRP evaluate generation resource options?

A. Yes, as noted previously, the statute clearly requires utilities to provide "[a]n assessment of supply options including owned capacity, market procurements, renewable energy, and distributed energy resources."[24]

Q. Do you agree with Eversource' claim that it should not be required to evaluate generation resource options because it does not own generation capacity?

A. No. Eversource is uniquely situated to help reduce the cost of energy generation. First, it can improve the way it procures default energy services. The opportunities for such improvements are described in Section 6.4 of our testimony.

Second, Eversource can procure contracts for renewable resources, which can reduce electricity price volatility and help meet New Hampshire's environmental goals. The opportunities for such procurement are discussed in Section 6.3 of our testimony.

Third, Eversource can influence the implementation of distributed energy resources, which in turn will affect the supply of, and the cost of, electricity generation. The

[21] Appendix A, pg. 2.
[22] Id. at pg 1.
[23] Id.
[24] RSA 378:38(III)

opportunities for influencing distributed energy resources are discussed in Section 6.1 of our testimony.

Fourth, New Hampshire's cost-effectiveness practices clearly require utilities to account for electricity generation when evaluating the costs and benefits of energy efficiency and demand response resources. The Granite State test, and the Total Resource Cost test that was used before it, require utilities to account for all the costs and benefits associated with generation resources, as well as transmission and distribution resources. Cost-effectiveness analysis lies at the heart of LCIRP resource assessment. Therefore, the LCIRP methods should be consistent with those cost-effectiveness methods.

Fifth, it is standard industry practice to authorize, encourage, or require electricity distribution utilities to seek to optimize and reduce costs of generation resources. We are not aware of any states that allow electricity distribution utilities to completely ignore opportunities for reducing the cost of generation.

Q. Why is it so important for Eversource to try to reduce the cost of energy generation and capacity?

A. The recent increase in the cost of Eversource's default energy services makes clear the importance of efforts to reduce the cost of electricity generation. The residential customer default energy services rate is currently 10.7 cents per kilowatt-hour and is scheduled to increase to 22.6 cents on August 1. When this increased rate comes into effect, the total residential electricity rate will be 32.1 ¢/kWh. Before this increase, the default energy services represented roughly one-half of total residential retail electricity rates, and after the increase, default energy services will represent two-thirds of total residential retail electricity rates.[25,26]

[25] The information about expected rate changes is from: *Direct Testimony of Marisa B. Paruta*, Petition of Eversource Energy Reconciliation of Default Energy Service for the Period August 1, 2021 to July 31, 2022, Docket No. DE 22-021, Exhibit 1, Attachment MBP-4, June 16, 2022, page 1.

[26] The information about current rates is sourced from Eversource "Rates and Tariffs." See: https://www.eversource.com/content/nh/residential/account-billing/manage-bill/about-your-bill/rates-tariffs

Default energy services clearly offer one of the greatest opportunities for reducing customers' electricity bills. This is an opportunity that should not simply be swept aside on the grounds that it is outside the scope of Eversource's responsibilities.

Q. Is Eversource exempt from addressing generation in its LCIRP?

A. No. Though the Company was granted a waiver on addressing generation in its 2015 LCIRP in deference to the potential divestiture of its generation units, the Commission, in its Order approving the settlement agreement on the same LCIRP, supported the agreement between Eversource and Staff that the next LCIRP (i.e., the 2019 LCIRP) would include "a full consideration of all elements of RSA 378:38."[27] It would therefore appear that, while the Commission did grant a waiver based on the impending change in ownership of the Company's generation fleet, this waiver did not amount to a determination that the Company, divested of its generation assets, would never again have to address supply.

5.2. Environmental Impacts

Q. Does the LCIRP account for the environmental impacts of electricity resources?

A. No. Eversource claims that since it no longer owns generation and merely procures supply from the wholesale market, it should not have to account for the environmental impacts of its customers' energy consumption.[28]

Q. Should the LCIRP account for the environmental impacts of electricity resources?

A. Yes, as noted previously, the statute clearly requires that utilities address "plan integration and impact on state compliance with the Clean Air Act of 1990, as amended, and other environmental laws that may impact a utility's assets or customers,"[29] and that each LCIRP include "[a]n assessment of the plan's long- and short-term environmental, economic, and energy price and supply impact on the state."[30]

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[27] DE 15-248. Order 25,828, pg. 9.
[28] Appendix A, pg 2.
[29] NH RSA 378:38(V)
[30] NH RSA 378:38(VI)

Q. Do you agree with Eversource's claim that it should not have to account for the environmental impacts of generation resources because it does not own generation resources?

A. No. As noted in Section5.2, Eversource can influence electricity generation in multiple ways, including improved default energy supply procurement practices, procurement of renewable resources, and improved promotion of distributed energy resources. Each of these options for influencing electricity generation can have significant environmental implications. It is incorrect to claim that Eversource cannot influence the environmental impacts of electricity generation in New Hampshire simply because it does not own that generation.

6. THE LCIRP DOES NOT SUFFICIENTLY EVALUATE RESOURCE OPTIONS

6.1. Standards for Evaluating Electricity Resource Options

Q. Does the LCIRP statute require utilities to evaluate a broad range of electricity resource options?

A. Yes. As noted above, RSA 378:38 requires utilities to evaluate a variety of electricity resource options, including demand-side options (including conservation, efficiency, and demand response), supply-side options (including owned capacity, market procurements, renewable energy, and distributed energy resources), and smart grid options.

Q. Is the evaluation of a broad range of resource options consistent with industry practice in integrated resource planning, integrated distribution planning, and grid modernization planning?

A. Yes. In fact, the evaluation of a broad range of electricity resources has been one of the central purposes of Integrated Resource Plan (IRP) for many years.[31] It continues to be one of the central purposes of integrated distribution planning and grid modernization planning. The logic behind the concept of evaluating a broad range of resource options is

[31] See, for example, Synapse Energy Economics, *Best Practices in Electric Utility Integrated Resource Planning: Examples of State Regulations and Recent Utility Plans*, June 2013, page 7, prepared for the Regulatory Assistant Project (funding provided by the Southern Alliance for Clean Energy).

simple and obvious: in order to optimize the resources used to provide electricity services, it is necessary to comprehensively evaluate the full range of resource options available.

Q. Does Eversource's 2020 LCIRP evaluate a broad range of electricity resource options?

A. No. The LCIRP does consider many types of conventional distribution options for maintaining system engineering and reliability standards. These are discussed in detail in Appendix L of the LCIRP and in Supplemental Appendices B and F.

However, the LCIRP does not consider some key resources options that are required by New Hampshire statute or that are typically considered in IRPs and Integrated Distribution Plans (IDP). It does not consider any alternative energy efficiency or demand response resources beyond what is already included in the NH-Saves program, it does not consider any supply-side resource options, and it considers grid modernization options in only a cursory fashion. We address each of these resource types further in the subsections below.

Q. Before turning to those different types of resource options, please explain what you mean by evaluating electricity resource options. How would a robust LCIRP evaluate resource options?

A. There are several ways that electricity resource options should be considered and addressed in a robust LCIRP. The load forecasts in the LCIRP should account for all resources that are likely to affect electricity sales, either by increasing or reducing sales. This should include all types of distributed energy resources, including those that could potentially be implemented or supported by the electric utility and those that are expected to be implemented regardless of utility initiatives.

The LCIRP should also identify the full range of potential supply-side and demand-side resource options. As noted above, this is a necessary step in order to find the optimal mix of resources.

The LCIRP should also assess the economic and policy implications of each of those identified resources. This requires using a consistent cost-effectiveness test, or set of

tests, to properly assess the relevant costs and benefits of each option. The LCIRP should use those cost-effectiveness results to determine the preferred, i.e., optimal, mix of resource options.

The LCIRP should clearly present the findings of the economic and policy analysis and explain how those findings were used to determine the optimal mix of resource options.

Finally, the LCIRP should include an action plan that describes how and when the utility will follow-through with the decisions in the LCIRP and implement the optimal mix of resources.

Q. As noted above in Section 3.2, the Commission has recently expressed concern about the increasing capital costs of electric and gas utilities in New Hampshire. Does a robust evaluation of resource options in an LCIRP help address those concerns?

A. Yes. In fact, rising capital costs are precisely why it is important to thoroughly evaluate all resource options. Increased use of DERs, grid modernization technologies, and non-wires alternatives can, in many situations, help reduce capital costs. One of the key reasons for a broad, robust evaluation of resource options is to identify those that might help reduce capital costs relative to conventional options.

Q. Should the Commission and the utilities be concerned with more than just the utilities' rising capital costs?

A. Yes. Both capital and operating costs have important implications for revenue requirements, rates, and customer bills. In its recent order on the Unitil LCIRP, the Commission points out that the utility's operating revenues rose by roughly 57% from 2010 to 2020, even though the number of customers rose by only roughly 5%.[32] While the operating revenues are much lower than the rate base revenues, they are still significant. Further, there are some situations where capital expenditures can be used instead of operating expenditures, and *vice versa*. Thus it is important to consider options to reduce both types of costs.

[32] DE 20-002, Order 26,666, pg. 7.

Q. Should the Commission and the utilities be concerned with more than just capital and operating costs?

A. Yes. The Commission and utilities should be concerned about the default energy service costs that are passed on to electricity customers. As descried above in Section 5.1, Eversource's default energy service price recently rose from 10.7 to 22.6 ¢/kWh, resulting in a total residential electricity rate of 32.1 ¢/kWh. This is a roughly 60% increase in residential rates.[33] Default energy services now represent two-thirds of the bills of Eversource's residential customers that rely on default energy services. Ignoring these default energy service costs would mean forgoing significant opportunities to reduce electricity costs and customer bills.

There are several ways that electric utilities in New Hampshire can reduce the costs and the risks that these default energy services impose on customers. While the Commission and utilities have relatively little control over *the prices* of the wholesale New England energy and capacity markets, they have a lot of control over *the quantity* of default energy services that is purchased by electricity customers. In the following sections, we describe how distributed energy resources and renewable procurements can reduce quantity of default energy services procured and therefore the risks and the costs of those services.

6.2. Distributed Energy Resources

Q. What does the term "distributed energy resources" refer to?

A. We use the term distributed energy resources to refer to the range of technologies that can be implemented at the retail customer level to modify electricity consumption and provide lower-cost, cleaner, more efficient, or new electricity services. These typically include energy efficiency, demand response, distributed generation, storage technologies,

[33] As one point of reference, the NH Saves energy efficiency programs are expected to increase Eversource's residential customers' long-term average rates by only 0.3%. See: *2022-2023 New Hampshire Statewide Energy Efficiency Plan*, Attachment M. Further, if the recent increase in gas costs were to be accounted for, the rate impact from the energy efficiency programs would be much lower than this. While this is not an even comparison because the NH Saves program is so small compared with default energy services, it nonetheless indicates that cost and rate impact concerns should be applied consistently across utility services.

building electrification, and electric vehicles. Further, non-wires solutions are a combination of multiple DERs that are integrated and coordinated in order to reduce or eliminate the need for conventional distribution investments such as new substations or substation upgrades.

Q. Does Eversource's 2020 LCIRP evaluate opportunities for implementing energy efficiency or demand response?

A. No, not adequately. The LCIRP assumes the efficiency savings from the NHSaves program will reduce electricity loads, but it does not consider the potential for efficiency savings beyond those in the NHSaves program. It is likely that there are many more cost-effective energy efficiency and demand response savings than what is included in the NHSaves program, but the LCIRP does not even consider any such opportunities.

Q. House Bill 549 places a cap on the energy efficiency system benefits charge used to fund energy efficiency programs.[34] Given this cap, what would be the purpose of evaluating energy efficiency and demand response resources beyond those included in the NHSaves program?

A. There are several reasons why Eversource's LCIRP should evaluate energy efficiency and demand response resources beyond those in the NHSaves program. First, as noted above, the RSA 378:38 requires an "assessment of demand-side energy management programs, including conservation, efficiency, and load management programs." This statute does not qualify this requirement by stating that the LCIRP should be constrained by system benefit charge limits. Further, RSA 378:37 states that "it shall be the energy policy of this state...to maximize the use of cost-effective energy efficiency and other demand-side resources."

Second, it is likely that there are additional energy efficiency and demand response resources that will allow Eversource to reduce electricity costs. Eversource could implement any such additional resources simply for the purpose of lowering its costs. Such incremental energy efficiency or demand response resources might be especially

[34] NH HB549(d)(2-3)

important for non-wires alternatives, for example, where targeted programs can achieve a significant amount of cost savings. Eversource could then ask the Commission to recover the incremental costs of the additional energy efficiency or demand response programs in a base rate case or some other cost recovery mechanism beside the system benefits charge.

Third, the results of an LCIRP analysis of additional energy efficiency and demand response resources will provide important information for the New Hampshire Legislature or the Commission to use in future deliberations and policies regarding energy efficiency and demand response resources. If, for example, the LCIRP indicated that there was a large amount of additional cost-effective energy efficiency and demand response resources available and that these resources would significantly reduce costs and help meet other important energy policy goals, the New Hampshire Legislature might be encouraged to increase the cap on the system benefit charge.

Q. Does Eversource's 2020 LCIRP evaluate opportunities for increasing implementation of distributed generation resources on the grid?

A. No. We did not find any explicit evaluation of opportunities for increasing distributed generation resources in New Hampshire.

Q. The Commission has been investigating the potential for alternative distributed generation programs as part of Docket DE 16-576. What would be the purpose of evaluating distributed generation resources beyond what is being addressed in Docket DE 16-576?

A. There are several reasons for evaluating distributed generation resources beyond what is being addressed in Docket DE 16-576. First, as noted above, RSA 378:38 requires an assessment of supply options including "distributed energy resources." Distributed generation is clearly a type of distributed energy resources that should be assessed in an LCIRP.

Second, Eversource's 2020 LCIRP might be able to provide information that can be used in Docket DE 16-576 to modify the utility distributed generation programs in order to reduce costs, increase savings, or both.

Over the long term, after Docket DE 16-576 is complete, LCIRPs should be used as a forum for investigating ways to improve distributed generation programs as market conditions, avoided costs, and distributed generation technology options change over time.

Q. Does Eversource's 2020 LCIRP evaluate opportunities for implementing distributed storage technologies?

A. No. We did not find any explicit evaluation of distributed storage opportunities in the LCIRP, except in the context of NWS, which we discuss later in our testimony.

Q. Is there likely to be cost-effective distributed storage available in the Eversource system?

A. It is difficult to answer this question without an assessment of distributed storage opportunities in the Eversource system, either in an LCIRP or in an independent assessment. Nonetheless, there are likely to be cost-effective storage opportunities available based on analyses and practices in other states. For example, a 2016 study of storage potential in Massachusetts found an optimized storage deployment in the state could produce about $2.3 billion in utility system savings.[35] As another example, Connecticut has a program offering incentives for distributed storage technologies.[36]

Q. Does Eversource' 2020 LCIRP evaluate opportunities for implementing building electrification technologies?

A. No. We did not find any explicit evaluation of building electrification technologies in the LCIRP. It appears as though Eversource treated building electrification technologies the same way that it treated energy efficiency and demand response resources. It presumably assumed a fixed amount based upon the most recent NHSaves program. This approach is not consistent with the LCIRP statute or sound resource planning practices, for all the

[35] MA DOER. 2016. State of Charge: Massachusetts Energy Storage Initiative Study, pg. xii. See: https://files.masscec.com/uploads/attachments/2016StateofChargeExecutiveSummary.pdf

[36] CT PURA. Energy Storage Solutions Program. See: https://portal.ct.gov/pura/electric/office-of-utility-programs-and-initiatives/cae-unit/cae-clean-and-renewable-energy.

reasons we have previously stated in our discussion of energy efficiency and demand response resources.

Q. Does Eversource's 2020 LCIRP consider electric vehicles as a resource option?

A. No. We did not find any explicit evaluation of EV opportunities in the LCIRP.

Q. EVs generally cause in increase in electricity demand. Why do you refer to them as an electricity "resource?"

A. EVs will clearly have an impact on electricity demand, and therefore it is important to fully assess the impact of EVs on a utility's energy and capacity demand forecasts.

In addition, utilities can take steps to advance the adoption of EVs in their service territories by providing the necessary infrastructure to support them, such as installing charging stations or providing sufficient make-ready equipment to support charging stations installed by others.

Further, utilities can offer rate designs to help optimize customer charging patterns to minimize the impacts on peak demands or during periods of high electricity prices. LCIRP's can be used to evaluate rate design options so that EVs will result in the lowest-cost impacts on the electricity system.

Q. Are there other ways in which the LCIRP does not adequately address DERs?

A. Yes. As noted above, the Company's NWS screening is not comprehensive. Thus, DERs may not have been considered in all cases in which they could provide potential benefits. Nor does Eversource systematically consider how both prudent smart grid investments and well-crafted programs could enable it to promote increased levels of cost-effective DERs to reduce system costs. The Company indicates that it will provide a grid modernization plan that will "encompass the steps necessary to allow for the integration of DER,"[37] but it is not clear when this plan will materialize.

[37] LCIRP, pg. 33.

6.3. Grid Modernization

Q. Does the LCIRP statute require utilities to evaluate grid modernization opportunities as part of their LCIRPs?

A. Yes. As we previously noted, RSA 378:38 clearly requires an assessment of distribution and transmission requirements, including an assessment of the benefits and costs of "smart grid" technologies.

Q. Has the Commission addressed the relationship between grid modernization planning and LCIRP?

A. Yes. The Commission found that "grid modernization planning is a natural evolution of the LCIRP process and that the LCIRP statutes should be viewed as the foundation upon which grid modernization planning will be built." Further, the Commission recommended that future LCIRP filings include detailed a description of all investments, including both grid modernization and traditional investments.[38]

Q. Does Eversource's 2020 LCIRP evaluate opportunities for implementing grid modernization technologies?

A. No, not adequately. The Company's plan discusses grid modernization in an abstract and general fashion, but it does not provide any detail about the "benefits and costs" of these technologies, as required by RSA 378:38. Nor does the Company specifically present any record of its past grid modernization investments or its intended future ones. This grid modernization discussion is clearly inadequate because the Company has stated that it continues to make grid modernization investments, and it is also clear that grid modernization is a lynchpin in achieving the state's policy goals for the energy sector.[39]

Q. What information does the Company provide about grid modernization?

A. The Company dedicates two sections of its LCIRP to grid modernization. In Section 10 of the plan, the Company provides a single paragraph narrative that reflects on the

[38] IR 15,296, Order 26,358, pg. 54.
[39] See, for example, Appendix G, pg. 10.

potential benefits of grid modernization but deals only in generalities. Here, the Company indicates that "[s]mart grid technologies have the potential to transform the grid into a customer-centric platform that enables a cleaner energy future while continuously improving the safety, security, reliability, resiliency and cost effectiveness of the electric power system in New Hampshire," and states that "[t]he costs of smart grid technologies and programs will vary based on the nature and extent of the programs." [40] However, Eversource stops short of quantifying or otherwise capturing any specific benefits or costs for grid modernization on its system.

Appendix J also addresses grid modernization. This section includes a more detailed description of various technologies and makes reference to Company plans in non-specific fashion. For example, in this section, the Company states that "[p]lans to deploy a distribution management system ("DMS") are amplifying the importance of real-time telemetry.[41] However, Eversource does not appear to provide any more detail about this planned DMS deployment.

Q. Does the Company address grid modernization elsewhere in its filings?

A. Yes, there are other references to grid modernization plans scattered throughout. For example, in Appendix G, which covers reliability, Eversource indicates that additional SCADA devices "are planned for deployment in future years."[42]

Q. What information on grid modernization should be included in this plan?

A. The Company should provide clear and transparent grid modernization plans, consistent with the guidance provided in Order 26,358. Further, it is critical that the Company account for the potential impacts from its future grid modernization investments so far, as they affect other aspects of planning and maintaining the electricity grid. Grid modernization investments may obviate the need for investments in traditional distribution plants, and a smart grid may also be able to accommodate greater levels of DER with potential downstream savings on T&D, energy, and generation capacity.

[40] Section 10.
[41] Appendix J, pg. 1.
[42] Appendix G, pg. 10.

Q. Is grid modernization important for achieving New Hampshire energy policy goals?

A. Yes. Some grid modernization elements can facilitate the implementation of DERs, which are necessary to achieve certain energy policy goals. Some grid modernization elements can be useful in directly addressing certain goals such as improving reliability, improving resilience, and making grid operations more efficient.

6.4. Renewable Resources

Q. Does Eversource's 2020 LCIRP provide any analysis of the opportunities for implementing renewable resources?

A. No. We did not see any analysis of utility-scale renewable resource opportunities in the LCIRP.

Q. New Hampshire has a renewable portfolio standard (RPS) that requires energy service companies, including Eversource, to procure renewable resources or qualifying renewable energy credits (RECs). Given this, what should Eversource evaluate regarding utility-scale renewable resource opportunities?

A. The LCIRP should consider procuring *additional* renewable resources, beyond the renewable generation required by the RPS. There may be additional renewable resources that are cost-effective or that help to achieve other state energy goals.

Q. Why should Eversource's 2020 LCIRP include an assessment of additional renewable resources beyond the requirements of the RPS?

A. There are several reasons why the LCIRP should evaluate utility-scale renewable resources beyond those in the NHSaves program. First, as noted above, the RSA 375:38 requires an assessment of supply options, including renewable energy.

Second, it is likely that there are additional utility-scale renewable resources, beyond the RPS requirements, that would help achieve some of New Hampshire's energy policy goals. As noted above, RSA 378:37 establishes energy policy goals including the safety and health of the citizens, as well as the physical environment of the state. Further, RSA:378:38 requires LCIRPs to include an "assessment of the plan's long- and short-

term environmental, economic, and energy price and supply impact on the state." Renewable resources represent an important opportunity help achieve these goals.

Third, the results of an LCIRP analysis of additional renewable resources will provide important information for the New Hampshire Legislature or the Commission to use in future deliberations and policies regarding renewable resources. If, for example, the LCIRP indicated that there was a large amount of additional cost-effective renewable resources available and that these resources would help meet important energy policy goals, the New Hampshire Legislature might be encouraged to modify the future RPS requirements.

6.5. Default Energy Services

Q. Does Eversource's 2020 LCIRP provide any analysis of the opportunities for reducing the cost of default energy services?

A. No. We did not see any analysis in the LCIRP of opportunities for reducing the cost of default energy services.

Q. Eversource is a distribution utility and does not own electricity generation resources. Why should Eversource's LCIRP analyze opportunities for reducing the cost of default energy services?

A. There are several reasons why the LCIRP should evaluate opportunities for reducing the cost of default energy services. First, as noted above, RSA 378:38 requires an assessment of supply options including market procurements. Eversource obtains default energy services from independent generators through a competitive bidding process, which clearly is a market procurement.

Second, there may be opportunities for improving Eversource's practices for procuring default energy services, thereby significantly reducing costs to customers. There are several ways that Eversource can reduce the cost, and the risks, associated with default energy services. For example, rather than procuring 100 percent of its default energy supply each time it procures power, Eversource could procure a broader range of short-medium- and long-term contracts in order to reduce risk and create a hedge against

electricity price volatility.[43] Eversource could procure some renewable generation through fixed price, long-term contracts in order to lock in fixed prices as one component of its default energy services. This would reduce risk and create a hedge against electricity price volatility. This concept of procuring a diverse set of supply-side options is consistent with how financial advisors create a diverse portfolio of financial investments in order to reduce risk and optimize long-term returns. Similar to the financial community, this approach to optimizing default energy services is referred to as "portfolio management."[44]

Third, the results of an LCIRP analysis of opportunities for reducing the cost of default energy services will provide important information for the New Hampshire Legislature or the Commission to use in future deliberations and policies regarding default energy services. As noted above, default energy services costs represent roughly one-half to two-thirds of electricity costs and therefore represent an important opportunity to help reduce customers' electricity bills.

6.6. Distribution System Needs and Alternatives

Q. Has the Company satisfied the filing requirements concerning distribution information?

A. The Company has provided a large amount of information across its two filings in 2020 and 2021, and it does appear that the Company has satisfied the core standard from RSA 378:38 that requires that it provide an "assessment" of distribution system requirements. It is less clear, however, whether the Company has met the requirements from Order 26,362 and Order 26,358 concerning consideration of alternatives including NWS. Moreover, the information that has been provided on the distribution system is somewhat disjointed, which makes the task of assessing the Company's plans difficult.

[43] In Massachusetts, for example, Eversource purchases fifty percent of its default energy supply for a year every six months. This reduces the risk of procuring one hundred percent of default services at one time when market prices are high. This approach could be expanded to include contracts of multiple lengths.

[44] For more information on this concept, see: Biewald, B, Woolf, T., Roschelle, A., Steinhurst, W. 2003. *Portfolio Management: How to Procure Electricity Resources to Provide Reliable, Low-Cost, and Efficient Electricity Services to All Retail Customers*, prepared by Synapse Energy Economics, Inc. for the Regulatory Assistance Project and the Energy Foundation.

Q. Please describe the distribution system information provided by the Company in its 2020 filings.

A. The Company addresses distribution needs in different capacities in many places throughout its initial filing, as noted above. In its initial filing, the Company provides an overview of anticipated distribution system needs five years into the future in the "Grid Needs Assessment" in Appendix K. In Appendices H and I, the Company provides the results of joint planning with Unitil and New Hampshire Electric Cooperative, respectively, where system needs are also identified. Then, in Appendices L-1 through L-6, the Company presents documentation for specific distribution system projects anticipated over the next five years in the form of Solution Selection Forms, Project Authorization Forms, and Initial Funding Request Forms. The Company also discusses projects to improve reliability in Appendix G.

Q. Please describe the distribution system information provided by the Company in its supplemental filings.

A. The Company provides a set of updated planning studies in Appendices B-1 and B-2 that use the revised planning methodologies and include reference to numerous system needs and potential solutions. Appendix B-1 also includes a list of projects that are presumed to come online during the analysis period. Eversource provides detailed evaluations of specific substations that require upgrade in Appendices B-3 through B-5, with explicit consideration of alternatives, and then, in Appendix C, the Company presents proposed reliability investments. In Appendix D, E, and F, the Company details specific projects in a fashion similar to the presentation of specific project information in Appendices L-1 through L-6 in the 2020 filing.

Q. Why do you characterize as "disjointed" Eversource's presentation of distribution information?

A. The Company discusses its needs in a diffuse fashion, and so it is not entirely clear how the materials provided in 2021 relate to those furnished in 2020—including, for example, which of the plans provided in the earlier filing have been superseded by those provided in 2021. Furthermore, there is a lack of any comprehensive view of needs, options, and

alternatives. Instead, in the supplemental filing, the Company discusses needs and potential options in Appendices B-1 through B-2 in a generalized vein. The Company also provides far more detail about specific needs in Appendices B-3 through B-5, and Appendices D, E, and F. The separate presentation of reliability projects in Appendix C further complicates review. While it is clear that the Company's plans for addressing the various needs are at different stages of development—and that the Company may be able to provide more comprehensive details about only certain needs—there should still be a consolidated presentation of all needs, with options and proposed solutions provided alongside to the extent that these have been identified.

Q. Does the Company adequately consider alternatives?

A. It is difficult to tell, given the diffuse presentation of system needs. However, we have concerns about at least some instances where consideration of alternatives is indicated. For example, in Appendix L-1, which concerns the project that is titled "Amherst S/S – PLC Automation and Projection and Controls Update," the Company appears to consider just a single alternative in perfunctory fashion.[45] The Company may have in fact considered additional alternatives, or the single alternative that was considered may be the only viable one, but neither of these conclusions is supported by the documentation. As another example of potentially inadequate consideration of alternatives, in Appendix L-2, which relates to the project titled "Substation Animal Protection," the Company identifies a "Do nothing" option as the lone alternative.[46] But the Company then indicates that this alternative is infeasible since the station operation has "requested a proactive approach." On first blush, this does not appear to be a sufficiently robust assessment of options, nor does it seem to be an adequate justification for proceeding with the proposed investment.

Q. Has the Company adequately considered NWS?

A. It is not clear. The Company should aim to screen all viable projects for NWS, consistent with the directives of Order 26,362 and Order 26,358. To the extent that investments in

[45] Appendix L-1, pg. 5.
[46] Appendix L-2, pg. 6.

other distribution infrastructure beyond substations may be avoided, the Company should evaluate all such opportunities. The Company's practice of considering distribution line needs over just the forthcoming year may compromise its ability to consider alternatives.[47] More generally, Eversource should ensure that it screens future anticipated needs early enough to guarantee there is time to deploy an NWS; it appears that the imminency of need was a factor in excluding NWS from consideration for at least some of the substations that were considered in Supplemental Appendices B-3 through B-6.

7. RECOMMENDATIONS

Q. What do you recommend in light of your findings above?

A. We recommend that the Commission reject Eversource's 2020 LCIRP. The LCIRP does not comply with most of the key requirements of the LCIRP statute, rendering it essentially useless for the purpose of decision-making.

We recommend that the Commission direct Eversource to prepare and submit a new LCIRP that is consistent with the LCIRP statute, Commission directives, and the findings in our testimony. This new LCIRP should include the following elements:

- A better organized and consolidated inventory of all distribution system needs over the next five years, with information about options to the degree available.
- A comprehensive evaluation of opportunities for avoiding or deferring distribution system investments through implementation of DERs.
- Detailed information about smart grid opportunities and plans, including detail on anticipated costs and benefits.
- A comprehensive evaluation of opportunities for reducing the costs of, or otherwise improve the use of, generation resources that serve New Hampshire customers.
- A comprehensive evaluation of opportunities for addressing state environmental goals.

[47] Appendix K, pg. 1.

- A comprehensive evaluation of opportunities for expanding or modifying programs supporting distributed energy resources, including energy efficiency and demand response resources beyond those included in NH-Saves.
- A comprehensive evaluation of grid modernization opportunities, consistent with the Commission's grid modernization order.
- A comprehensive evaluation of opportunities for procuring renewable resources, beyond those required under the New Hampshire RPS.
- A comprehensive evaluation of opportunities for reducing the costs and the risks of default energy supply.
- Comprehensive documentation of the costs and benefits of each of the opportunities listed above, as well as the justification for investment decisions regarding each one.

We recommend that the Commission require Eversource to comply with a standard set of filing requirements that includes all past Commission directives on LCIRP that are still in force and any new directives established in the instant proceeding.

We recommend that the Commission convene a stakeholder workgroup to provide meaningful input to Eversource's new LCIRP. The stakeholder workgroup should be organized and facilitated by an independent non-utility party, such as the New Hampshire Department of Energy. The workgroup should be authorized to address the new directives from the Commission in this docket. The workgroup should include procedures allowing stakeholders to document their input and communicate to the Commission issues where input was not adequately addressed by Eversource. Ideally, the workgroup should be given access to experts that can provide independent advice on some of the more complex aspects of LCIRP, such as the engineering aspects of grid modernization and conventional distribution technologies.

Q. Does this conclude your direct testimony?

A. Yes, it does.

Exhibits

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PROFESSIONAL EXPERIENCE

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Provides expert consulting on the economic, regulatory, consumer, environmental, and public policy implications of the electricity and gas industries. The primary focus of work includes technical and economic analyses, electric power system planning, climate change strategies, energy efficiency programs and policies, renewable resources and related policies, power plant performance and economics, air quality, and many related aspects of consumer and environmental protection.

Massachusetts Department of Public Utilities, Boston, MA. *Commissioner*, 2007 – 2011.

Oversaw a significant expansion of clean energy policies as a consequence of the Massachusetts Green Communities Act, including an aggressive expansion of ratepayer-funded energy efficiency programs; the implementation of decoupled rates for electric and gas companies; an update of the DPU energy efficiency guidelines; the promulgation of net metering regulations; review of smart grid pilot programs; and review of long-term contracts for renewable power. Oversaw six rate case proceedings for Massachusetts electric and gas companies. Played an influential role in the development of price responsive demand proposals for the New England wholesale energy market. Served as President of the New England Conference of Public Utility Commissioners from 2009-2010. Served as board member on the Energy Facilities Siting Board from 2007-2010. Served as co-chair of the Steering Committee for the Northeast Energy Efficiency Partnership's Regional Evaluation, Measurement and Verification Forum.

Synapse Energy Economics Inc., Cambridge, MA. *Vice President*, 1997 – 2007.

Tellus Institute, Boston, MA. *Senior Scientist, Manager of Electricity Program*, 1992 – 1997.

Association for the Conservation of Energy, London, England. *Research Director*, 1991 – 1992.

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Massachusetts Office of Energy Resources, Boston, MA. *Policy Analyst*, 1987 – 1989.

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Boston University, Boston, MA
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New York Public Service Commission (Cases 19-E-0065 and 19-G-0066): Direct testimony of Tim Woolf and Alice Napoleon regarding energy efficiency targets and incentives in Con Edison rate case. On behalf of the Natural Resources Defense Council. May 24, 2019.

Virginia State Corporation Commission (Case No. PUR-2018-00168): Direct testimony of Tim Woolf and Erin Malone regarding Virginia Electric and Power Company's application for approval to implement demand-side management programs and for approval of two updated rate adjustment clauses. On behalf of the Sierra Club. February 6, 2019.

Rhode Island Public Utilities Commission (Docket No. 4780): Direct testimony of Tim Woolf and Melissa Whited regarding National Grid's Power Sector Transformation proposals. On behalf of the Rhode Island Division of Public Utilities and Carriers. April 28, 2018.

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New York Public Service Commission (Case 17-E-0459): Direct testimony of Tim Woolf regarding Energy Efficiency Earnings Adjustment Mechanisms proposed by Central Hudson Gas & Electric Company. On behalf of Natural Resources Defense Council. November 21, 2017.

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Utah Public Service Commission (Docket No. 14-035-114): Direct and rebuttal testimony of Tim Woolf regarding the Pacificorp's analysis of the benefits and costs associated with distributed generation resources. On behalf of Utah Clean Energy. June 8, 2017 and July 25, 2017.

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Massachusetts Department of Public Utilities (D.P.U. 15-120, D.P.U. 15-121, D.P.U. 15-122/15-123): Direct testimony of Tim Woolf and Ariel Horowitz, PhD, regarding the petitions by National Grid, Unitil, NSTAR, and Eversource Energy for approval of their grid modernization plans. On behalf of Conservation Law Foundation. March 10, 2017.

Massachusetts Department of Public (D.P.U. 16-169): Direct testimony of Tim Woolf and Erin Malone regarding Nation Grid's petition for ruling regarding the provision of gas energy efficiency services. On behalf of the Cape Light Compact. November 2, 2016.

New Jersey Board of Public Utilities (Docket No. ER16060524): Direct testimony regarding Rockland Electric Company's proposed advanced metering program. On behalf of the New Jersey Division of Rate Counsel. September 9, 2016.

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Georgia Public Service Commission (Docket No. 40161 and Docket No. 40162): Direct testimony regarding the demand-side management programs proposed by Georgia Power Company in its Certification, Decertification, and Amended Demand-Side Management Plan and its 2016 Integrated Resource Plan. On behalf of Sierra Club. May 3, 2016.

Massachusetts Department of Public Utilities (Docket No. 15-155): Joint direct and rebuttal testimony with M. Whited regarding National Grid's rate design proposal. On behalf of Energy Freedom Coalition of America, LLC. March 18, 2016 and April 28, 2016.

Maine Public Utilities Commission (Docket No. 2015-00175): Direct testimony on Efficiency Maine Trust's petition for approval of the Triennial Plan for Fiscal Years 2017-2019. On behalf of the Natural Resources Council of Maine and the Conservation Law Foundation. February 17, 2016.

Nevada Public Utilities Commission (Docket Nos. 15-07041 and 15-07042): Direct testimony on NV Energy's application for approval of a cost of service study and net metering tariffs. On behalf of The Alliance for Solar Choice. October 27, 2015.

New Jersey Board of Public Utilities (Docket No. ER14030250): Direct testimony on Rockland Electric Company's petition for investments in advanced metering infrastructure. On behalf of the New Jersey Division of Rate Counsel. September 4, 2015.

Utah Public Service Commission (Docket No. 14-035-114): Direct, rebuttal, and surrebuttal testimony on the benefit-cost framework for net energy metering. On behalf of Utah Clean Energy, the Alliance for Solar Choice, and Sierra Club. July 30, 2015, September 9, 2015, and September 29, 2015.

Nova Scotia Utility and Review Board (Matter No. M06733): Direct testimony on EfficiencyOne's 2016-2018 demand-side management plan. On behalf of the Nova Scotia Utility and Review Board. June 2, 2015.

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Florida Public Service Commission (Dockets No. 130199-EI et al.): Direct testimony on the topic of setting goals for increasing the efficiency of energy consumption and increasing the development of demand-side renewable energy systems. On behalf of the Sierra Club. May 19, 2014.

Massachusetts Department of Public Utilities (Docket No. DPU 14-86): Direct and rebuttal Testimony regarding the cost of compliance with the Global Warming Solution Act. On behalf of the Massachusetts Department of Energy Resources and the Department of Environmental Protection. May 16, 2014.

Kentucky Public Service Commission (Case No. 2014-00003): Direct testimony regarding Louisville Gas and Electric Company and Kentucky Utilities Company's proposed 2015-2018 demand-side management and energy efficiency program plan. On behalf of Wallace McMullen and the Sierra Club. April 14, 2014.

Maine Public Utilities Commission (Docket No. 2013-168): Direct and surrebuttal testimony regarding policy issues raised by Central Maine Power's 2014 Alternative Rate Plan, including recovery of capital costs, a Revenue Index Mechanism proposal, and decoupling. On behalf of the Maine Public Advocate Office. December 12, 2013 and March 21, 2014.

Colorado Public Utilities Commission (Docket No. 13A-0686EG): Answer and surrebuttal testimony regarding Public Service Company of Colorado's proposed energy savings goals. On behalf of the Sierra Club. October 16, 2013 and January 21, 2014.

Kentucky Public Service Commission (Case No. 2012-00578): Direct testimony regarding Kentucky Power Company's economic analysis of the Mitchell Generating Station purchase. On behalf of the Sierra Club. April 1, 2013.

Nova Scotia Utility and Review Board (Matter No. M04819): Direct testimony regarding Efficiency Nova Scotia Corporation's Electricity Demand Side Management Plan for 2013 – 2015. On behalf of the Counsel to Nova Scotia Utility and Review Board. May 22, 2012.

Missouri Office of Public Counsel (Docket No. EO-2011-0271): Rebuttal testimony regarding IRP rule compliance. On behalf of the Missouri Office of the Public Counsel. October 28, 2011.

Nova Scotia Utility and Review Board (Matter No. M03669): Direct testimony regarding Efficiency Nova Scotia Corporation's Electricity Demand Side Management Plan for 2012. On behalf of the Counsel to Nova Scotia Utility and Review Board. April 8, 2011.

Rhode Island Public Utilities Commission (Docket No. 3790): Direct testimony regarding National Grid's Gas Energy Efficiency Programs. On behalf of the Division of Public Utilities and Carriers. April 2, 2007.

North Carolina Utilities Commission (Docket E-100, Sub 110): Filed comments with Anna Sommer regarding the Potential for Energy Efficiency Resources to Meet the Demand for Electricity in North Carolina. Synapse Energy Economics on behalf of the Southern Alliance for Clean Energy. February 2007.

Rhode Island Public Utilities Commission (Docket No. 3765): Direct and Surrebuttal testimony regarding National Grid's Renewable Energy Standard Procurement Plan. On behalf of the Division of Public Utilities and Carriers. January 17, 2007 and February 20, 2007.

Minnesota Public Utilities Commission (Docket Nos. CN-05-619 and TR-05-1275): Direct testimony regarding the potential for energy efficiency as an alternative to the proposed Big Stone II coal project. On behalf of the Minnesota Center for Environmental Advocacy, Fresh Energy, Izaak Walton League of America, Wind on the Wires and the Union of Concerned Scientists. November 29, 2006.

Rhode Island Public Utilities Commission (Docket No. 3779): Oral testimony regarding the settlement of Narragansett Electric Company's 2007 Demand-Side Management Programs. On behalf of the Division of Public Utilities and Carriers. November 24, 2006.

Nevada Public Utilities Commission (Docket Nos. 06-04002 & 06-04005): Direct testimony regarding Nevada Power Company's and Sierra Pacific Power Company's Renewable Portfolio Standard Annual Report. On behalf of the Nevada Bureau of Consumer Protection. October 26, 2006

Nevada Public Utilities Commission (Docket No. 06-06051): Direct testimony regarding Nevada Power Company's Demand-Side Management Plan in the 2006 Integrated Resource Plan. On behalf of the Nevada Bureau of Consumer Protection. September 13, 2006.

Nevada Public Utilities Commission (Docket Nos. 06-03038 & 06-04018): Direct testimony regarding the Nevada Power Company's and Sierra Pacific Power Company's Demand-Side Management Plans. On behalf of the Nevada Bureau of Consumer Protection. June 20, 2006.

Nevada Public Utilities Commission (Docket No. 05-10021): Direct testimony regarding the Sierra Pacific Power Company's Gas Demand-Side Management Plan. On behalf of the Nevada Bureau of Consumer Protection. February 22, 2006.

South Dakota Public Utilities Commission (Docket No. EL04-016): Direct testimony regarding the avoided costs of the Java Wind Project. On behalf of the South Dakota Public Utilities Commission Staff. February 18, 2005.

Rhode Island Public Utilities Commission (Docket No. 3635): Oral testimony regarding the settlement of Narragansett Electric Company's 2005 Demand-Side Management Programs. On behalf of the Division of Public Utilities and Carriers. November 29, 2004.

British Columbia Utilities Commission. Direct testimony regarding the Power Smart programs contained in BC Hydro's Revenue Requirement Application 2004/05 and 2005/06. On behalf of the Sierra Club of Canada, BC Chapter. April 20, 2004.

Maryland Public Utilities Commission (Case No. 8973): Oral testimony regarding proposals for the PJM Generation Attributes Tracking System. On behalf of the Maryland Office of People's Counsel. December 3, 2003.

Rhode Island Public Utilities Commission (Docket No. 3463): Oral testimony regarding the settlement of Narragansett Electric Company's 2004 Demand-Side Management Programs. On behalf of the Division of Public Utilities and Carriers. November 21, 2003.

California Public Utilities Commission (Rulemaking 01-10-024): Direct testimony regarding the market price benchmark for the California renewable portfolio standard. On behalf of the Union of Concerned Scientists. April 1, 2003.

Québec Régie de l'énergie (Docket R-3473-01): Direct testimony with Philp Raphals regarding Hydro-Québec's Energy Efficiency Plan: 2003-2006. On behalf of Regroupment national des Conseils régionaux de l'environnement du Québec. February 5, 2003.

Connecticut Department of Public Utility Control (Docket No. 01-10-10): Direct testimony regarding the United Illuminating Company's service quality performance standards in their performance-based ratemaking mechanism. On behalf of the Connecticut Office of Consumer Counsel. April 2, 2002.

Nevada Public Utilities Commission (Docket No. 01-7016): Direct testimony regarding the Nevada Power Company's Demand-Side Management Plan. On behalf of the Bureau of Consumer Protection, Office of the Attorney General. September 26, 2001.

United States Department of Energy (Docket Number-EE-RM-500): Comments with Bruce Biewald, Daniel Allen, David White, and Lucy Johnston of Synapse Energy Economics regarding the Department of

Energy's proposed rules for efficiency standards for central air conditioners and heat pumps. On behalf of the Appliance Standards Awareness Project. December 2000.

US Department of Energy (Docket EE-RM-500): Oral testimony at a public hearing on marginal price assumptions for assessing new appliance efficiency standards. On behalf of the Appliance Standards Awareness Project. November 2000.

Connecticut Department of Public Utility Control (Docket No. 99-09-03 Phase II): Direct testimony regarding Connecticut Natural Gas Company's proposed performance-based ratemaking mechanism. On behalf of the Connecticut Office of Consumer Counsel. September 25, 2000.

Mississippi Public Service Commission (Docket No. 96-UA-389): Oral testimony regarding generation pricing and performance-based ratemaking. On behalf of the Mississippi Attorney General. February 16, 2000.

Delaware Public Service Commission (Docket No. 99-328): Direct testimony regarding maintaining electric system reliability. On behalf of Delaware Public Service Commission Staff. February 2, 2000.

Delaware Public Service Commission (Docket No. 99-328): Filed expert report ("Investigation into the July 1999 Outages and General Service Reliability of Delmarva Power & Light Company," jointly authored with J. Duncan Glover and Alexander Kusko). Synapse Energy Economics and Exponent Failure Analysis Associates on behalf the Delaware Public Service Commission Staff. February 1, 2000.

New Hampshire Public Service Commission (Docket No. 99-099 Phase II): Oral testimony regarding standard offer services. On behalf of the Campaign for Ratepayers Rights. January 14, 2000.

West Virginia Public Service Commission (Case No. 98-0452-E-GI): Rebuttal testimony regarding codes of conduct. On behalf of the West Virginia Consumer Advocate Division. July 15, 1999.

West Virginia Public Service Commission (Case No. 98-0452-E-GI): Direct testimony regarding codes of conduct and other measures to protect consumers in a restructured electricity industry. On behalf of the West Virginia Consumer Advocate Division. June 15, 1999.

Public Service Commission of West Virginia (Case No. 98-0452-E-GI): Filed expert report ("Measures to Ensure Fair Competition and Protect Consumers in a Restructured Electricity Industry in West Virginia," jointly authored with Jean Ann Ramey and Theo MacGregor) in the matter of the General Investigation to determine whether West Virginia should adopt a plan for open access to the electric power supply market and for the development of a deregulation plan. Synapse Energy Economics and MacGregor Energy Consultancy on behalf of the West Virginia Consumer Advocate Division. June 1999.

Massachusetts Department of Telecommunications and Energy (DPU/DTE 97-111): Direct testimony regarding Commonwealth Electric Company's energy efficiency plan, and the role of municipal aggregators in delivering demand-side management programs. On behalf of Cape and Islands Self-Reliance Corporation. January 1998.

Delaware Public Service Commission (DPSC 97-58): Direct testimony regarding Delmarva Power and Light's request to merge with Atlantic City Electric. On behalf of Delaware Public Service Commission Staff. May 1997.

Delaware Public Service Commission (DPSC 95-172): Oral testimony regarding Delmarva's integrated resource plan and DSM programs. On behalf of the Delaware Public Service Commission Staff. May 1996.

Colorado Public Utilities Commission (5A-531EG): Direct testimony regarding the impact of proposed merger on DSM, renewable resources and low-income DSM. On behalf of the Colorado Office of Energy Conservation. April 1996.

Colorado Public Utilities Commission (3I-199EG): Direct testimony regarding the impacts of increased competition on DSM, and recommendations for how to provide utilities with incentives to implement DSM. On behalf of the Colorado Office of Energy Conservation. June 1995.

Colorado Public Utilities Commission (5R-071E): Oral testimony on the Commission's integrated resource planning rules. On behalf of the Colorado Office of Energy Conservation. July 1995.

Colorado Public Utilities Commission (3I-098E): Direct testimony on the Public Service Company of Colorado's DSM programs and integrated resource plans. On behalf of the Colorado Office of Energy Conservation. April 1994.

Delaware Public Service Commission (Docket No. 96-83): Filed comments regarding the Investigation of Restructuring the Electricity Industry in Delaware (Tellus Institute Study No. 96-99). On behalf of the Staff of the Delaware Public Service Commission. November 1996.

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State of Vermont Public Service Board (Docket No. 5854): Filed expert report (Tellus Institute Study No. 95-308) regarding the Investigation into the Restructuring of the Electric Utility Industry in Vermont. On behalf of the Vermont Department of Public Service. March 1996.

Pennsylvania Public Utility Commission (Docket No. I-00940032): Filed comments (Tellus Institute Study No. 95-260) regarding an Investigation into Electric Power Competition. On behalf of The Pennsylvania Office of Consumer Advocate. November 1995.

New Jersey Board of Public Utilities (Docket No. EX94120585Y): Initial and reply comments ("Achieving Efficiency and Equity in the Electricity Industry Through Unbundling and Customer Choice," Tellus Institute Study No. 95-029-A3) regarding an investigation into the future structure of the electric power industry. On behalf of the New Jersey Division of Ratepayer Advocate. September 1995.

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PRESENTATIONS

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Woolf, T. 2019. "Benefit-Cost Analysis for Utility-Facing Grid Modernization Investments." Distribution Systems and Planning Training for Mid-Atlantic Region and NARUC-NASEO Task Force on Comprehensive Electricity Planning. March 7-8, 2019.

Woolf, T. 2018. Stakeholder presentation on “Updating the Energy Efficiency Cost-Effectiveness Framework in Minnesota: Application of the National Standard Practice Manual to Minnesota.” Synapse Energy Economics project for Minnesota Department of Commerce, Division of Energy Resources, supported by the Conservation Applied Research and Development (CARD) Program. St. Paul, Minnesota. September 2018.

Woolf, T. 2018. "Benefit-Cost Analysis for Investments in the Modern Grid: Recent trends in how to determine whether grid modernization investments will deliver value to customers." Smart Money Panel, NARUC Summer Policy Summit. Scottsdale, Arizona.

Woolf, T. 2018. "Benefit-Cost Analysis for New York Energy Investments." Training Session for Earthjustice.

Woolf, T. 2018. "National Standard Practice Manual for Energy Efficiency Cost-Effectiveness." Presentation at the NASUCA 2018 Mid-Year Meeting.

Woolf, T. 2018. "The National Standard Practice Manual and the Value of Energy Efficiency in New York." Presentation on behalf of the Natural Resources Defense Council at the Stakeholder Forum, Case 18-M-0084.

Woolf, T., M. Whited. 2016. “Show Me the Numbers: A Framework for Balanced Distributed Solar Policies.” Presentation for Consumers Union Webinar, December 2016.

Woolf, T. 2016. “Show Me the Numbers: Balancing Solar DG with Consumer Protection.” Public workshop on solar distributed generation for the Federal Trade Commission, June 2016.

Woolf, T. 2016. “Rate Designs for Distributed Generation: State Activities & A New Framework.” Presentation at the NASUCA 2016 Mid-Year Meeting, June 2016.

Woolf, T., M. Whited. 2016. “3rd Annual 21st Century Electricity System Workshop – Implications of Different Rate Designs.” Presentation at the Advanced Energy Economy Institute, April 2016.

Woolf, T., M. Whited. 2016. “Decoupling in Pennsylvania: Advantages, Disadvantages, and Design Issues.” Presentation to Pennsylvania Decoupling Stakeholders, February 2016.

Woolf, T. 2016. “Earnings Impact Mechanisms: Energy Efficiency.” Presentation at the New York REV Technical Conference, January 2016.

Lowry, M. N., T. Woolf. 2015. “Performance-Based Regulation in a High Distributed Energy Resources Future.” Webinar on January 2016.

Woolf, T. 2015. “Performance Incentive Mechanisms: A Catalyst for Change.” Webinar for Power Sector Transformation Group, December 2015.

Woof, T. 2015. “Energy Efficiency Valuation: Boogie Men, Time Warps, and other Terrifying Pitfalls.” Presentation at ACEEE Conference on Energy Efficiency as a Resource, September 2015.

Woolf, T., M. Whited, A. Napoleon. 2015. “Thoughts on How to Design Clean Energy Performance Incentive Mechanisms.” Webinar for the Western Clean Energy Advocates, April 2015.

Woolf, T. 2015. “Properly Valuing the Benefits and Costs of Energy Efficiency.” Presentation at the 2015 National Efficiency Advocates Meeting, April 2015.

Woolf, T. 2015. “Non-Energy Benefits & Efficiency Program Screening.” Presentation for Georgia DSM Work Group, March 2015.

Woolf, T. 2014. “Performance Incentive Mechanisms And Their Role in New Regulatory Models.” Presentation at Acadia Center Conference, Envisioning Our Energy Future, December 2014.

Woolf, T., M. Whited., A. Napoleon. 2014. “Guiding Utility Performance: A Handbook for Regulators.” Webinar for the Western Interstate Energy Board, December 2014.

Woolf, T. 2014. “Planning for Distributed Energy Resources.” Presentation for Advanced Energy Economy Webinar, November 2014.

Woolf, T. 2014. “Benefit-Cost Analysis for Distributed Energy Resources in New York: A Framework for Accounting for All Relevant Costs and Benefits.” Presentation to NARUC ERE Committee, November 2014.

Woolf, T. 2014. “Presenting the Full Value of Energy Efficiency: Creating a Better Message.” Presentation at Sierra Club Beyond Coal Conference, October 2014.

Woolf, T., C. Neme. 2014. “Regulatory Policies to Support Energy Efficiency in Virginia.” Presentation for the 2014 Virginia Energy Efficiency Workshop, October 2014.

Woolf, T. 2014. “Benefit-Cost Analysis for Distributed Energy Resources in New York: A Framework for Accounting for All Relevant Costs and Benefits.” Presentation for Advanced Energy Economy Institute, October 2014.

Woolf, T. 2014. “Performance Incentive Mechanisms: Digging Deeper Into Performance-Based Regulation.” Presentation for National Governor’s Association Conference: Utility Business Models That Align with State Clean Energy Goals, September 2014.

Woolf, T. 2014. “The Resource Value Framework: Reforming Energy Efficiency Cost-Effectiveness Screening.” Presentation at the ACEEE Summer Study, August 2014.

Woolf, T. 2014. “Cost-Effectiveness of Demand Response.” Presentation at MADRI Working Group Meeting #34, July 2014.

Woolf, T. 2014. “Time to Overhaul Our Energy Efficiency Screening Practices.” Presentation for U.S. Environmental Protection Agency Energy Efficiency Cost-Effectiveness Webinar, January 2014.

Woolf, T. 2013. “Survey of Energy Efficiency Screening Practices in the Northeast and Mid-Atlantic.” Presentation for Northeast Energy Efficiency Partnerships EM&V Forum Annual Public Meeting, December 2013.

Woolf, T. 2013. “Recommendations for Reforming Energy Efficiency Cost-Effectiveness Screening in the United States.” Presentation at the National Association of Regulatory Commissioners Annual Meeting, November 2013.

Woolf, T. 2013. “Energy Efficiency Program Screening: Let’s Get Beyond the TRC Test.” Presentation for 7th Annual ENERGY STAR Certified Homes Utility Sponsor Meeting, October 2013.

Woolf, T. 2013. “Decoupling in Maine: Why Decoupling is in Consumers’ Interest.” Presentation for Office of Public Advocate- Decoupling Debate, October 2013.

Woolf, T. 2013. “NHPC Efficiency Screening Initiative: Unleashing the Potential for Energy Efficiency.” Presentation for Advocates Meeting, September 2013.

Woolf, T. 2013. “Energy Efficiency: Rate, Bill and Participation Impacts.” Presentation for ACEEE’s Energy Efficiency as a Resource Conference, September 2013.

Woof, T. 2013. “Energy Efficiency Screening: Challenges and Opportunities.” Presentation for NARUC Summer Meeting Consumer Affairs Panel, July 2013.

Woolf, T., R. Sedano. 2013. “Decoupling Overview.” Presentation for Finding Common Ground Meeting, July 2013.

Woolf, T. 2013. “Utility Incentives for Energy Efficiency.” Presentation for Finding Common Ground Meeting, July 2013.

Woolf, T. 2013. “Energy Efficiency: Rate, Bill and Participation Impacts.” Presentation for State Energy Efficiency Action Webinar, June 2013.

Woolf, T., B. Biewald, and J. Migden-Ostrander. 2013. “NARUC Risk Workshop for Regulators.” Presentation at the Mid-Atlantic Conference of Regulatory Utility Commissioners, June 2013.

Woolf, T. 2013. “Energy Efficiency Screening: Accounting for ‘Other Program Impacts’ & Environmental Compliance Costs.” Presentation for the Consortium for Energy Efficiency Summer Meeting, May 2013.

Woolf, T. 2013. “Best Practices in Energy Efficiency Program Screening.” Presentation at ACI National Home Performance Conference, May 2013.

Woolf, T. 2013. "Utility Shareholder Incentives to Support Energy Efficiency Programs." Presentation to Common Ground, May 2013.

Woolf, T. 2013. "Energy Efficiency Screening: Accounting for 'Other Program Impacts' & Environmental Compliance Costs." Presentation for Regulatory Assistance Project Webinar, March 2013.

Woolf, T. 2013. "Energy Efficiency: Rates, Bills, Participants, Screening, and More." Presentation at Connecticut Energy Efficiency Workshop, March 2013.

Woolf T. 2013. "Best Practices in Energy Efficiency Program Screening." Presentation for SEE Action Webinar, March 2013.

Woolf, T. 2013. "Energy Efficiency: Rates, Bills and Participants." Presentation for Rhode Island Energy Efficiency Collaborative, February 2013.

Woolf, T. 2013. "Energy Efficiency Screening: Application of the TRC Test." Presentation for Energy Advocates Webinar, January 2013.

Woolf, T. 2012. "Best Practices in Energy Efficiency Program Screening." Presentation for American Council for an Energy-Efficient Economy Webinar, December 2012.

Woolf, T. 2012. Indian Point Replacement Analysis: A Clean Energy Roadmap. Presentation for Natural Resource Defenses Council and Environmental Entrepreneurs, November 2012.

Woolf, T. 2012. "In Pursuit of All Cost-Effective Energy Efficiency." Presentation at Sierra Club Boot Camp, October 2012.

Woolf, T. 2012. "Best Practices in Energy Efficiency Program Screening." Webinar for Northeast Energy Efficiency Partnerships, September 2012.

Woolf, T., L. Schwartz. "What Remains to be Done with Demand Response? A National Forum from the FERC National Action Plan on Demand Response Tries to Give an Answer." Presentation at NARUC National Town Meeting on Demand Response, July 2012.

Woolf, T. 2012. "Best Practices in Energy Efficiency Program Screening." Presentation at NARUC Summer Meetings – Energy Efficiency Cost-Effectiveness Breakfast, July 2012.

Woolf, T. 2012. "Avoided Cost of Complying with Environmental Regulations in MA." Presentation for Mass Energy Consumer's Alliance, January 2012.

Woolf, T. 2011. "Energy Efficiency Cost-Effectiveness Tests." Presentation at the Northeast Energy Efficiency Partnerships Annual Meeting, October 2011.

Woolf, T. 2011. "Why Consumer Advocates Should Support Decoupling." Presentation at the 2011 ACEEE National Conference on Energy Efficiency as a Resource, September 2011.

Woolf, T. 2011. "A Regulator's Perspective on Energy Efficiency." Presentation at the Efficiency Maine Symposium *In Pursuit of Maine's Least-Cost Energy*, September 2011.

Woolf, T. 2010. “Bill Impacts of Energy Efficiency Programs: The Importance of Analyzing and Managing Rate and Bill Impacts.” Presentation at the Energy in the Northeast Conference, Law Seminar International, September 2010.

Woolf, T. 2010. “Bill Impacts of Energy Efficiency Programs: The Implications of Bill Impacts in Developing Policies to Motivate Utilities to Implement Energy Efficiency.” Presentation to the State Energy Efficiency Action Network, Utility Motivation Work Group, November 2010.

Woolf, T. 2010. “Bill Impacts of Energy Efficiency Programs.” Presentation to the Energy Resources and Environment Committee at the NARUC Winter Meetings, February 2010.

Woolf, T. 2009. “Price-Responsive Demand in the New England Wholesale Energy Market: Description of NECPUC’s Limited Supply-Side Proposal.” Presentation at the NEPOOL Markets Committee Meeting, November 2009.

Woolf, T. 2009. “Demand Response in the New England Wholesale Energy Market: How Much Should We Pay for Demand Resources?” Presentation at the New England Electricity Restructuring Roundtable, October 2009.

Woolf, T. 2008. “Promoting Demand Resources in Massachusetts: A Regulator’s Perspective.” Presentation at the Energy Bar Association, Northeast Chapter Meeting, June 2008.

Woolf, T. 2008. “Turbo-Charging Energy Efficiency in Massachusetts: A DPU Perspective.” Presentation at the New England Electricity Restructuring Roundtable, April 2008.

Woolf T. 2002. “A Renewable Portfolio Standard for New Brunswick.” Presentation to the New Brunswick Market Design Committee, January 10, 2002.

Woolf, T. 2001. “Potential for Wind and Renewable Resource Development in the Midwest.” Presentation at WINDPOWER 2001 in Washington DC, June 7, 2001.

Woolf T. 1999. “Challenges Faced by Clean Generation Resources Under Electricity Restructuring.” Presentation at the Symposium on the Changing Electric System in Florida and What it Means for the Environment in Tallahassee, FL, November 1999.

Woolf, T. 2000. “Generation Information Systems to Support Renewable Portfolio Standards, Generation Performance Standards and Environmental Disclosure.” Presentation at the Massachusetts Restructuring Roundtable on behalf of the Union of Concerned Scientists, March 2000.

Woolf, T. 1998. “New England Tracking System Project: An Electricity Tracking System to Support a Wide Range of Restructuring-Related Policies.” Presentation at the Ninth Annual Energy Services Conference and Exposition in Orlando, FL, December 1998.

Woolf, T. 2000. “Comments of the Citizens Action Coalition of Indiana.” Presentation at Workshop on Alternatives to Traditional Generation Resources, June 2000.

Woolf, T. 1996. “Overview of IRP and Introduction to Electricity Industry Restructuring.” Training session provided to the staff of the Delaware Public Service Commission, April 1996.

Woolf, T. 1995. “Competition and Regulation in the UK Electric Industry.” Presentation at the Illinois Commerce Commission's workshop on Restructuring the Electric Industry, August 1995.

Woolf, T. 1995. “Competition and Regulation in the UK Electric Industry.” Presentation at the British Columbia Utilities Commission Electricity Market Review, February 1995.

Resume updated November 2021

Ben Havumaki, Senior Associate

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PROFESSIONAL EXPERIENCE

Synapse Energy Economics, Inc., Cambridge, MA. *Senior Associate,* June 2021 – Present; *Associate,* July 2018 – June 2021.

- Provides research, analysis, and consulting services, frequently in the context of regulated proceedings, with expertise in the following topic areas:
    - Rate design and performance-based regulation: Evaluates utility proposals and formulates new recommendations based on best practices and informed by innovative emerging models. Evaluates rate designs for consistency with policy goals using quantitative modeling and jurisdictional data. Provides expert testimony and other formal input in the context of regulated proceedings.
    - Benefit-cost analysis: Evaluates utility BCAs with reference to best practices, including emerging standards for grid modernization and distributed energy resources. Engaged in the development of new BCA practices in the arenas of grid modernization and resilience.
    - Macroeconomic analysis: Uses the IMPLAN model in conjunction with primary research and analysis and core economic principles to evaluate the GDP, job, and income implications of major grid changes.
- Contributing author to reports covering a range of topics including plant decommissioning, transportation electrification, and distributed energy resources (DER) growth.

University of Massachusetts Boston, MA. *Graduate Teaching and Research Assistant,* 2017 – 2018

- Led ecosystem-valuation workshops for EPA-funded initiative to shape resilience policymaking in the Great Bay region of New Hampshire.
- Served as a teaching assistant in graduate econometrics course and undergraduate macroeconomics and urban economics courses.

Notre Dame Education Center and Jewish Vocational Service Boston, MA. *Math Instructor*, 2012 – 2017

- Taught foundational math to adult learners and standard high school math curriculum to students in non-traditional school program.

The City of New York New York, NY. *Senior Investigator*, 2007 – 2010

- Investigated complaints against officers of the New York City Police Department and issued disciplinary recommendations in formal reports to the agency board.

EDUCATION

University of Massachusetts, **Boston,** Boston, MA
Master of Arts in Applied Economics, 2018
Recipient of the Arthur MacEwan Award for Excellence in Political Economy

McGill University, Montreal, Quebec
Bachelor of Arts in History, 2007

PUBLICATIONS

Knight, P., B. Havumaki, A. Takasugi, J. Frost. 2022. *Transforming Transportation in Michigan: A Roadmap to the State's 2050 Climate Target*. Synapse Energy Economics for Sierra Club.

Takahashi, K., T. Woolf, B. Havumaki, D. White, D. Goldberg, S. Kwok, A. Takasugi. 2021. *Missed Opportunities: The Impacts of Recent Policies on Energy Efficiency Programs in Midwestern States.* Synapse Energy Economics for the Midwest Energy Efficiency Alliance.

Kallay, J., A. Napoleon, J. Hall, B. Havumaki, A. Hopkins, M. Whited, T. Woolf, J. Stevenson, R. Broderick, R. Jeffers, B. Garcia. 2021. *Regulatory Mechanisms to Enable Investments in Electric Utility Resilience.* Synapse Energy Economics for Sandia National Laboratories.

Kallay, J., S. Letendre, T. Woolf, B. Havumaki, S. Kwok, A. Hopkins, R. Broderick, R. Jeffers, K. Jones, M. DeMenno. 2021. *Application of a Standard Approach to Benefit-Cost Analysis for Electric Grid Resilience Investments*. Synapse Energy Economics for Sandia National Laboratories.

Kallay, J., A. Napoleon, B. Havumaki, J. Hall, C. Odom, A. Hopkins, M. Whited, T. Woolf, M. Chang, R. Broderick, R. Jeffers, B. Garcia. 2021. *Performance Metrics to Evaluate Utility Resilience Investments.* Synapse Energy Economics for Sandia National Laboratories.

Woolf, T., D Bhandari, C. Lane, J. Frost, B. Havumaki, S. Letendre, C. Odom. 2021. *Benefit-Cost Analysis of the Rhode Island Community Remote Net Metering Program.* Synapse Energy Economics for the Rhode Island Division of Public Utilities and Carriers.

Woolf, T., B. Havumaki, S. Letendre, C. Odom, J. Hall. 2021. *Macroeconomic Impacts of the Rhode Island Community Remote Net Metering Program.* Synapse Energy Economics for the Rhode Island Division of Public Utilities and Carriers.

Kallay, J., A. Hopkins, A. Napoleon, B. Havumaki, J. Hall, M. Whited, M. Chang., R. Broderick, R. Jeffers, K. Jones, M. DeMenno. 2021. *The Resilience Planning Landscape for Communities and Electric Utilities.* Synapse Energy Economics for Sandia National Laboratories.

Woolf, T., L. Schwartz, B. Havumaki, D. Bhandari, M. Whited. 2021. *Benefit-Cost Analysis for Utility-Facing Grid Modernization Investments: Trends, Challenges, and Considerations.* Prepared by Lawrence Berkeley National Laboratory and Synapse Energy Economics for the Grid Modernization Laboratory Consortium of the U.S. Department of Energy.

Letendre, S., E. Camp, J. Hall, B. Havumaki, A. Hopkins, C. Odom, S. Hackel, M. Koolbeck, M. Lord, L. Shaver, X. Zhou. 2020. *Energy Storage in Iowa: Market Analysis and Potential Economic Impact.* Prepared by Synapse Energy Economics and Slipstream for Iowa Economic Development Authority.

Camp, E., B. Havumaki, T. Vitolo, M. Whited. 2020. *Future of Solar PV in the District of Columbia: Feasibility, Projections, and Rate Impacts of the District's Expanded RPS.* Synapse Energy Economics for the District of Columbia Office of the People's Counsel.

Whited, M., J. Frost, B. Havumaki. 2020. *Best Practices for Commercial and Industrial EV Rates*. A guide prepared by Synapse Energy Economics for Natural Resources Defense Council.

Knight, P., E. Camp, D. Bhandari, J. Hall, M. Whited, B. Havumaki, A. Allison, N. Peluso, T. Woolf. 2019. *Making Electric Vehicles Work for Utility Customers: A Policy Handbook for Consumer Advocates.* Synapse Energy Economics for the Energy Foundation.

Camp, E., A. Hopkins, D. Bhandari, N. Garner, A. Allison, N. Peluso, B. Havumaki, D. Glick. 2019. *The Future of Energy Storage in Colorado: Opportunities, Barriers, Analysis, and Policy Recommendations.* Synapse Energy Office for the Colorado Energy Office.

Napoleon, A., B. Havumaki, D. Bhandari, T. Woolf. 2019. *Review of New Brunswick Power's Application for Approval of an Advanced Metering Infrastructure Capital Project: In the Matter of the New Brunswick Power Corporation and Section 107 of the Electricity Act; Matter No. 452.* Synapse Energy Economics for the New Brunswick Energy and Utilities Board Staff.

Whited, M., B. Havumaki. 2019. *GD2019 04 M: DC DOEE Comments Responding to Notice of Inquiry.* Synapse Energy Economics for the District of Columbia Department of Energy and Environment.

Timmons, D., A.Z. Dhunny, K. Elahee, B. Havumaki, M. Howells, A. Khoodaruth, A.K. Lema-Driscoll, M.R. Lollchund, Y.K. Ramgolam, S.D.D.V. Rughooputh, D. Surroop. 2019. *Cost Minimization for Fully Renewable Electricity Systems: A Mauritius Case Study.* Energy Policy. 133, 110895.

Napoleon, A., T. Woolf, K. Takahashi, J. Kallay, B. Havumaki. 2019. *Comments in the New York Public Service Commission Case 18-M-0084: In the Matter of a Comprehensive Energy Efficiency Initiative.* Comments related to NY Utilities report regarding energy efficiency budgets and targets, collaboration, heat pump technology, and low- and moderate-income customers and requests for approval. Synapse Energy Economics on behalf of Natural Resources Defense Council.

Havumaki, B., E. Camp, B. Fagan, D. Bhandari. 2019. *Planning for the Future at the CTGS Site: Report on the Decommissioning Proposal of Maritime Electric*. Synapse Energy Economics for Carr, Stevenson, and MacKay.

Havumaki, B., J. Kallay, K. Takahashi, T. Woolf. 2019. *All-Electric Solid Oxide Fuel Cells as an Energy Efficiency Measure.* Synapse Energy Economics for Bloom Energy.

Takahashi, K., B. Havumaki, J. Kallay, T. Woolf. 2019. *Bloom Fuel Cells: A Cost-Effectiveness Brief.* Synapse Energy Economics for Bloom Energy.

Havumaki, B., T. Vitolo. 2019. *Comments to the Mississippi Public Service Commission: In response to the report of Acadian Consulting LLC.* Synapse Energy Economics for Gulf States Renewable Energy Industries Association, Sierra Club, and 25 x '25.

Whited, M., J. Kallay, D. Bhandari, B. Havumaki. 2018. *Driving Transportation Electrification Forward in Pennsylvania: Considerations for Effective Transportation Electrification Ratemaking*. Synapse Energy Economics for Natural Resources Defense Council.

Havumaki, B. 2018. *Hydropower in the Decarbonized Mauritian Grid: A Prospective Study.* Master's Thesis.

Havumaki, B., G. Mavrommati, C. Makriyannis. 2018. *World Bank Water Management, Sanitation, and Conservation Projects in Developing Countries: A Guide to Cost-Benefit Analysis.* Report for the World Bank.

TESTIMONY

Public Service Commission of West Virginia (Case No. 21-0857-E-CN): Direct Testimony of Ben Havumaki regarding the petition of the Monongahela Power Company and the Potomac Edison Company for the issuance of a Certificate of Public Convenience and Necessity for Environmental Compliance and Modernization, Upgrade, and Improvement Program and Related Surcharge for Coal-fired Boilers at Electric Power Plants. On behalf of the Sierra Club. July 18, 2022.

Illinois Commerce Commission (Docket No. 22-0067): Direct and Rebuttal Testimony of Melissa Whited and Ben Havumaki regarding the performance incentive mechanisms and tracking metrics proposed by Commonwealth Edison Company and Ameren Illinois Company. On behalf of the State of Illinois. April 6, 2022.

Illinois Commerce Commission (Docket No. 22-0063): Direct Testimony of Melissa Whited and Ben Havumaki regarding performance incentive mechanisms and tracking metrics proposed by Ameren Illinois Company. On behalf of the State of Illinois. March 30, 2022 and May 25, 2022.

Public Utilities Commission of New Hampshire (Docket DG 21-104): Direct Testimony of Courtney Lane and Ben Havumaki regarding Northern Utilities Inc.'s proposed multi-year rate plan, which includes a proposed residential customer charge, the company's reliance on the minimum-system method for classifying distribution mains costs and its implication for rate design and class cost allocation. On behalf of The Office of Consumer Advocate. April 1, 2022.

Public Utilities Commission of New Hampshire (Docket No. DE 21-030): Direct testimony of Melissa Whited and Ben Havumaki regarding Until Energy Systems' multi-year rate plan, grid modernization proposal, overall rate increases for the residential class, allocation of costs among rate classes, increase to the residential customer charge, and revenue decoupling mechanism. November 23, 2021.

Rhode Island Division of Public Utilities & Carriers (Docket No. 5189): Direct Testimony of Tim Woolf and Ben Havumaki. November 17, 2021.

Hawaii Public Utilities Commission (Docket No. 2018-0088): Panel testimony by Ben Havumaki regarding performance incentive mechanisms. On behalf of the Division of Consumer Advocacy, Department of Commerce and Consumer Affairs. September 21, 2020.

Georgia Public Service Commission (Docket No. 42516): Direct Testimony of Melissa Whited and Ben Havumaki. On behalf of Sierra Club. October 17, 2019.

PRESENTATIONS

Woolf, T. B Havumaki. 2022. "Economic Assessment of Grid Modernization Plans." Presentation at the NASUCA 2022 Mid-Year Meeting.