**Rhode Island Public Utilities Commission**

# The Narragansett Electric Co. d/b/a Rhode Island Energy's Annual Energy Efficiency Plan for 2025

**Division Of Public Utilities & Carriers**

**Pre-Filed Direct Testimony of**

**Tim Woolf**

**Synapse Energy Economics**

**November 15, 2024**

# Table of Contents

## I. INTRODUCTION AND QUALIFICATIONS

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

**A** My name is Tim Woolf. I am a Senior Vice President at Synapse Energy Economics (Synapse), located at 485 Massachusetts Avenue #3, Cambridge, MA 02139.

**Q Please describe Synapse Energy Economics.**

**A** Synapse 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 attorneys general, offices of consumer advocates, 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 35 professional staff with extensive experience in the electricity industry.

**Q Please summarize your professional and educational experience.**

**A** I have over 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 energy efficiency, 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 DPU, 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 Bachelor of Science in Mechanical Engineering and a Bachelor of Arts in English from Tufts University. My resume, attached as Schedule TW-1, presents additional details of my professional and educational experience.

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

**A** I am testifying on behalf of the Division of Public Utilities and Carriers (the Division).

**Q Have you previously testified before the Rhode Island Public Utilities Commission?**

**A** Yes. I have testified before the Commission on behalf of the Division in several energy-efficiency-related dockets. Most recently, I testified before the PUC on the *2023 Annual EE Plan*, (Docket 22-23-EE), on the *2022 Annual EE Program Plan* (Docket 5189), and on the *2021-2023 EE Program Plan* and the *2021 Annual EE Program Plan* (Docket 5076). In addition, I participated on behalf of the Division in the Docket 4600 Working Group that established the Rhode Island Test for cost-effectiveness.

I also testified before the Commission in 2018 on behalf of the Division on several issues in National Grid's rate case (Docket 4770 and Docket 4780).

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

**A** The purpose of my testimony is to describe the method that Rhode Island Energy (RIE or the Company) uses to value greenhouse gas (GHG) emissions in the *2025 EE Plan*.

## II. SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

**Q Please summarize RIE's assumptions regarding the value of GHG emissions in 2033 and beyond.**

**A** In its *2025 EE Plan*, RIE assumes that there will be GHG benefits from energy efficiency programs for 2033 and beyond, even after it reaches the 100 percent Renewable Energy Standard (RES) target in 2033. This differs from the assumption in the *2024 EE Plan* that there would be no GHG benefits from energy efficiency programs in 2033 and beyond. RIE also proposes that these benefits should be valued using the electricity-sector marginal abatement cost (MAC).

**Q Please summarize your primary conclusions.**

**A** I agree that the energy efficiency programs will reduce New England GHG emissions in 2033 and beyond, despite the fact that RIE will be achieving the 100 percent RES target by then. However, I have three concerns with the Company's method:

- There is likely to be some double counting of the value of renewable energy credits (REC) and the full value of GHG emissions.
- The electricity-sector MAC represents costs that will eventually be incurred by the Company and passed on to customers, and therefore should perhaps be considered embedded GHG costs.

- The electricity-sector MAC might understate the full value of GHG in 2033 and beyond because of all the other GHG abatement options that will likely be undertaken in the Rhode Island electricity, gas, and other sectors to meet the state's GHG goals.

**Q Please summarize your recommendations.**

**A** I recommend that the Commission require the Company, during the development of the *2026 EE Plan,* to address the concerns I raise in this testimony because they will be increasingly relevant to the cost-effectiveness of future electricity and gas energy efficiency programs.

**Q Please define the terms that you will be using in this testimony regarding the value of GHG impacts.**

**A** I use the term "full value" of GHG emissions to refer to the total value that society places on reducing GHG emissions. The full value of GHG emissions is the sum of the "embedded" GHG costs and the "non-embedded" GHG costs. The "embedded" GHG costs represent those costs that are included in electricity costs and are passed on the electricity customers.[1] The "non-embedded" GHG costs represent the costs that are not included in electricity costs but are nonetheless considered of value to society. There are

[1] This testimony focuses on the GHG values for the electricity impacts for simplicity. Comparable concepts and conclusions can be applied to natural gas and delivered fuels as well.

several ways to represent and estimate the full value of GHG emissions, as described in Section V of my testimony.

## III. THE COMPANY'S METHOD FOR VALUING GHG EMISSIONS

**Q Please describe how the Company is valuing GHG emissions in the 2025 EE Plan.**

RIE assumes that the full value of GHG emissions should be based on the New England MAC for the electricity-sector. This value is provided in the 2024 Avoided Energy Supply Component study (AESC 2024), and is described further in Section V of my testimony. RIE assumes that the embedded cost of electricity includes the cost of complying with the Regional Greenhouse Gas Initiative (RGGI). This cost is included in the avoided energy costs provided by AESC 2024. RIE determines the value of non-embedded GHG costs by subtracting the value of embedded impacts (RGGI) from the full value of GHG emissions (the electricity-sector MAC).[2]

**Q Does the Rhode Island Renewable Energy Standard (RES) have implications for the value of GHG emissions from energy efficiency programs?**

**A** Potentially. The RES target increases annually and reaches 100 percent in 2033. In the *2024 EE Plan*, RIE assumed that once it reached the 100 percent RES target, there would be no more non-embedded GHG benefits because future GHG emissions would be offset

[2] 2025 EE Plan, Attachment 4, page 13, Bates page 310.

by purchases of RECs. Therefore, the Company assumed that the value of non-embedded GHG emissions in 2033 and beyond was zero.

In the *2025 EE Plan*, RIE now assumes that the energy efficiency programs will continue to provide GHG emission benefits after RIE has achieved its RES requirement of 100 percent by 2033. The Company justifies this assumption by noting that "the New England MAC in AESC 2024 reflects the regional grid and regional average emissions rate, which is not tied to any particular state's RES requirement, and which will not be 100 percent renewable by 2023 [2033]."[3]

**Q Do you have concerns with RIE's method for valuing GHG emissions after 2033?**

Yes. While I agree with the Company that the RI energy efficiency programs will result in GHG emissions reductions after RIE achieves the 100 percent RES target, I believe that there are additional reasons why this is so and I question whether those GHG emission reductions should be valued at the electricity-sector MAC. I address this concern in Section VI below. Further, I have concerns with the method that RIE uses to treat the relationship between REC benefits and GHG benefits. I address this concern in Section VI below.

[3] 2025 EE Plan, Attachment 4, page 13, Bates page 310, footnote 17. The final word in the footnote contains a typographical error: 2023 should read 2033.

## IV. THE ACT ON CLIMATE

**Q Please summarize the key provisions of the *Act on Climate* that affect the electricity sector.**

**A** There are two key provisions in the *Act on Climate* that are relevant to the value of GHG emissions for the electricity sector. First, the RES requires Rhode Island load-serving entities to procure increasing amounts of renewable generation each year, up to 100 percent of retail sales by 2033 and beyond. This requirement can be met by procuring renewable power directly from developers or by purchasing RECs. Second, the *Act on Climate* establishes economywide emission reduction targets relative to 1990 levels of 45 percent by 2030, 80 percent by 2040, and 100 percent 2050.

**Q Please summarize some of the activities that Rhode Island is undertaking in response to the *Act on Climate*.**

**A** I am aware of several activities. The *Act on Climate* established the Rhode Island Executive Climate Change Coordinating Council (RIEC4), which issued an *Update to the 2016 Greenhouse Gas Emissions Reduction Plan* in December 2022 (2022 update) and is due to submit a *2025 Climate Strategy* by December 2025. The 2022 update identifies many priority actions for the electricity sector including the 100 percent RES requirement, modernizing the electricity grid, deploying advanced meters, procuring offshore wind resources, continuing with the energy efficiency initiatives, and reviewing

the RGGI program for revisions.[4] The 2022 update also identifies priority actions for the transportation and thermal sectors, many of which encourage electrification of end uses in those sectors.[5]

In addition, the Commission has opened Docket 22-01-NG to examine how the requirements of the *Act on Climate* should impact the "conduct, regulation, ratemaking, and the future of gas supply and gas distribution in Rhode Island."[6] This docket is still ongoing, with a final report from the Commission not yet issued. On August 27, 2024, the Commission issued a draft outline of the report for comment, and received comments in October 2024.[7] The draft outline and the comments received clearly indicate that the Rhode Island gas sector will need to significantly increase its decarbonization initiatives to comply with the requirements of the *Act on Climate*, that this will require expansion of RIE's electric and gas energy efficiency programs, and that this will have other impacts on the Rhode Island electricity sector.

[4] RIEC4, pages 5-6.

[5] RIEC4, pages 6-8.

[6] Rhode Island Public Utilities Commission, *Notice of Commencement of Docket*, In Re: Investigation into the Future of the Regulated Gas Distribution Business in Rhode Island in Light of the Act on Climate, Docket No. 22-01-NG, June 9, 2022.

[7] Colleagues of mine at Synapse Energy Economics has been offering technical consulting services to the Rhode Island Attorney General's office in this docket.

**Q Please explain why the *Act on Climate* requirements and Rhode Island's response to them are relevant to determining the value of GHG emissions for assessing the cost-effectiveness of energy efficiency resources.**

**A** When an energy efficiency resource in Rhode Island avoids electricity generation, it will reduce GHG emissions from generators in the New England electricity system. This effect will occur well past 2033, until the New England electricity system is composed of 100 percent non-emitting resources. The full value of GHG emissions reductions in Rhode Island will be equal to the marginal cost of avoiding those emissions, which will very much depend upon the actions that Rhode Island undertakes to comply with the *Act on Climate* and similar requirements.

## V. THE FULL VALUE OF GHG IN RHODE ISLAND

**Q Please provide an overview of the methods for estimating the full value of GHG emissions.**

**A** There are many methods for estimating the value of GHG emissions. Many of them fall into two categories:[8]

- *Cost-based* methods identify the marginal technology, resource, or policy option that can be used to abate GHG emissions to a specified target. The MAC is determined by ranking all the potential abatement options from lowest to highest

[8] These methods are described in more detail in National Efficiency Screening Project, *Methods, Tools, and Resources: A Handbook for Quantifying Distributed Energy Resource Impacts for Benefit-Cost Analysis*, March 2022 (MTR Handbook). See Section 7.1.2.

cost and identifying the last, i.e., marginal, abatement option needed to reduce GHG emissions to the specified GHG target.

- *Damage-based methods* estimate the monetary value of the damage to society as a result of climate change. The social cost of carbon (SCC) is a damaged-based estimate prepared by the U.S. Environmental Protection Agency (EPA).[9] It is based on damages that might occur around the world over the next 300 years including impacts related to extreme weather events, floods, droughts, wildfires, agricultural productivity, human health, property, energy systems, political conflict, environmental migration, ecosystems, and more. The EPA's value is the most widely accepted SCC calculation in the United States.[10]

AESC 2024 provides several estimates of the full value of GHG emissions based on both of these methods, described briefly below.

**The Marginal Abatement Cost**

**Q Please describe how MACs are estimated.**

**A** Ideally, MACs should be estimated using a comprehensive, statewide, economywide decarbonization plan that identifies all the potential GHG abatement options, ranks them from lowest to highest cost, and identifies the marginal abatement option for meeting that

[9] AESC 2024, page 203.
[10] AESC 2024, page 208.

state's GHG goals in each year. To my knowledge, there is no such study for Rhode Island. Consequently, more simplistic methods must be used to estimate MACs for Rhode Island.

**Q Please describe how AESC 2024 estimates MACs for New England states.**

**A** AESC 2024 provides two MAC estimates that can be used in Rhode Island. First, it provides an electricity-sector MAC that represents the cost of the most expensive non-emitting electricity resource necessary to meet GHG goals. AESC 2024 assumes that offshore wind is likely to represent the marginal electricity resource for reducing GHG emissions in New England and therefore proposes that as the electricity-sector MAC value.[11]

Second, AESC 2024 provides an all-sector MAC that represents the cost of the most expensive resource necessary to meet GHG goals for all sectors of the economy in New England. An all-sector MAC tends to be significantly higher than an electricity-sector MAC because the electricity-sector tends to have many more low-cost options for reducing GHG emissions than other sectors. AESC 2024 assumes that renewable natural gas (RNG) as a replacement for current natural gas is likely to represent the marginal

[11] AESC 2024, page 211.

resource for reducing GHG emissions across all sectors and therefore proposes that as the all-sector MAC value.

**Q What are the advantages of using a MAC to determine the full value of GHG emissions?**

**A** One advantage is that a MAC is based on actual GHG abatement options available in the state, and therefore can provide a more accurate, more understandable value of GHG than an estimate based on global damage costs. Another advantage is that a MAC provides an estimate of the costs that might actually be incurred to meet GHG goals, either by electricity and gas customers or customers in other sectors. In sum, the MAC is much more closely tied to the specific GHG requirements, abatement options, and costs in the state, relative to the SCC.

**Q What are the disadvantages of using a MAC to determine the full value of GHG emissions?**

**A** The primary disadvantage is that it requires a comprehensive analysis involving numerous assumptions on available technologies, costs, potential, emission reduction targets, and timescales.[12]

[12] AESC 2024, page 216.

## The Social Cost of Carbon

**Q Please describe how AESC 2024 presents the SCC.**

**A** AESC 2024 presents the EPA's estimates of SCC. The EPA provides estimates using three discount rates: 2.5 percent, 2.0 percent, and 1.5 percent. The SCC values vary significantly between these discount rates because the damage costs are estimated for 300 years into the future and then discounted to today's dollars using these discount rates. AESC 2024 recommends using either the 1.5 percent or 2.0 percent discount rate, based on EPA and other recommendations.[13] Further, AESC 2024 notes that states with relatively ambitious climate policies might prefer the lower discount rate because this suggests a greater weight on future damages and a greater emphasis on intergenerational equity.[14]

**Q What are the advantages of using an SCC to determine the full value of GHG emissions?**

**A** The primary advantage is that the SCC provides a relatively credible estimate of GHG emissions that can be applied easily to emissions from any fuel type or sector. Further, the SCC can also be used without a specific GHG reduction target.

[13] AESC 2024, page 208.
[14] AESC 2024, page 208.

**Q What are the disadvantages of using an SCC to determine the full value of GHG emissions?**

**A** The primary disadvantage is that SCC estimates require sophisticated climate and economic modeling, depend on many complex algorithms and inputs, and are very sensitive to many long-term, global assumptions that are highly uncertain.[15] Further, the SCC value is not tied in any way to the costs that might actually be incurred in Rhode Island to meet its GHG goals.

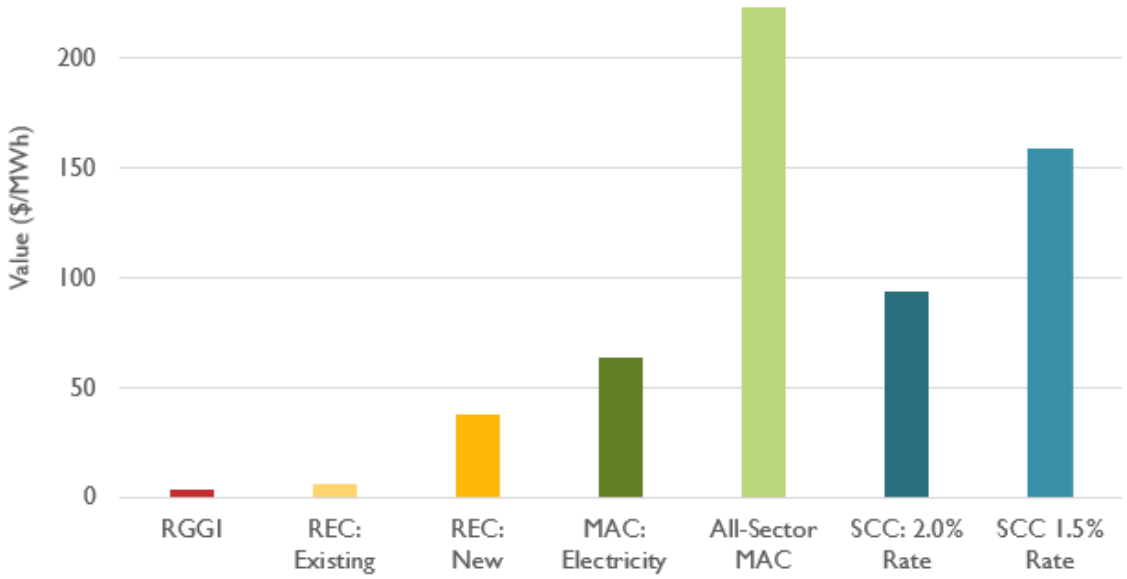
## Options for Indictors of the Value of GHG in Rhode Island

**Q Please provide a summary of the options available for determining the full value of GHG emissions in Rhode Island.**

**A** Figure 1 below presents a summary of the options provided in AESC 2024 for assigning the full value to GHG emissions in Rhode Island. AESC 2024 does not recommend any one of these options. Instead, it provides options for policymakers to choose from depending on the context and the goals in their state.

[15] AESC 2024, page 216.

**Figure 1. AESC 2024 options for determining the full value of GHG emissions**




*Source: AESC 2024 Counterfactual #3 for Rhode Island.*

**Q Please summarize what the *REC price* implies regarding the full value of GHG emissions in Rhode Island.**

**A** The cost of procuring RECs represents the costs to RIE of complying with the RES. Once Rhode Island's RES reaches 100 percent, this value could be used to represent the full value of GHG emissions under the assumption that RIE will not have to undertake any other carbon abatement options to comply with the *Act on Climate*. This cost is already included in the avoided energy costs used by RIE in the *2025 EE Plan*. In the *2024 EE Plan*, RIE assumed that this represents the full value of GHG emissions after 2033 when the 100 percent RES target is reached.

However, the cost of procuring RECs does not account for many other actions that RIE and others might need to take to reduce GHG emissions from the electricity sector. For example, it does not account for procurement of offshore wind, decarbonization of the natural gas sector, grid modernization, distributed energy resources, battery storage, electrification of transportation, and electrification of buildings—some of which might cost more than the cost of RECs.

**Q Please summarize what the electricity-sector MAC implies regarding the full value of GHG emissions in Rhode Island.**

**A** The electric sector MAC is an estimate of the actual costs that RIE might have to incur to comply with some portions of the *Act on Climate*. Because the AESC 2024 electricity-sector MAC is based on the cost of procuring offshore wind, it represents that one priority action identified by RIEC4 for meeting Rhode Island's GHG requirements.

However, this value does not account for many other actions that RIE and others might need to take to reduce GHG emissions from the electricity sector. For example, it does not account for decarbonization of the natural gas sector, grid modernization, distributed energy resources, battery storage, electrification of transportation, and electrification of buildings—some of which might cost more than the cost of offshore wind.

**Q Please summarize what the all-sector *MAC* implies regarding the full value of GHG emissions in Rhode Island.**

**A** The all-sector MAC is an estimate of the actual costs that RIE and other sectors of the economy might have to incur to comply with all requirements of the *Act on Climate*. The AESC 2024 all-sector MAC is based on the assumption that RNG and all the lower-cost GHG abatement options will be utilized to comply with *Act on Climate*. The full cost of RNG will not necessarily be borne by electricity customers, but it might be borne by natural gas customers and other sectors of the economy.

**Q Please summarize what the SCC implies regarding the full value of GHG emissions in Rhode Island.**

**A** The SCC represents the global damages that are likely to occur from climate change. It does not represent a cost that will be incurred by electricity, gas, or other customers. Nor does it represent a cost that could be incurred to abate GHG emissions or prevent climate change. Instead, it represents costs that would be experienced from the damages caused by climate change over many years into the future.

The SCC calculated using the 1.5 percent discount rate places greater weight on the future damages and the intergenerational equity associated with climate change, relative to the SCC calculated at the 2.0 percent discount rate.

**Q Do you have any recommendations for which option should be used to assign a value of GHG emissions in Rhode Island?**

**A** Not at this time. This decision requires more research, more input from relevant state agencies, and more input from relevant stakeholders. Further, the value of GHG emissions should account for many of the ongoing activities in Rhode Island to comply with the *Act on Climate*. This is why I recommend that this important issue be researched and discussed next year in the development of the *2026 EE Plan*.

## VI. EMBEDDED AND NON-EMBEDDED GHG VALUES

**Q How does RIE estimate the non-embedded value of GHG in the *2025 EE Plan*?**

**A** As noted above, RIE subtracts the embedded value, in the form of RGGI costs, from the full value (represented by the electricity-sector MAC) to determine the non-embedded value of GHG.

**Q Are RGGI costs the only form of embedded costs in Rhode Island?**

**A** Not necessarily. There are two other types of GHG costs that could be considered embedded GHG costs: the costs of complying with the RES, and additional electricity-sector costs needed to comply with the *Act on Climate*.

**Q Please explain why the costs of complying with the RES could be considered an embedded GHG cost.**

**A** The Rhode Island RES was created for several reasons. These include reducing GHG emissions, reducing other environmental impacts of electricity generation, promoting

economic development and jobs in Rhode Island, and helping to promote and commercialize renewable technologies.[16] Therefore, a portion of the cost of complying with the RES is for the purpose of reducing GHG emissions. Since RECs represent the cost of complying with the RES, then it follows that a portion of the value of RECs represents a portion of the costs of reducing GHG emissions. In other words, a portion of the RECs could be considered an embedded cost of GHG.

**Q Does AESC 2024 address this question of whether RECs should be considered an embedded GHG cost?**

**A** Yes, briefly. AESC 2024 notes that the costs of RECs have not conventionally been considered an embedded GHG cost because RES are implemented for multiple reasons beyond GHG abatement. AESC 2024 notes that this convention might lead to some overstating of GHG emission benefits, but that it is impractical to determine how much of the REC value is due to the goal of reducing GHG emissions and therefore does not subtract REC costs from the non-embedded costs of GHG emissions.[17]

[16] The RI RES was created on 6/29/2004, see R.I. Gen Laws § 39-26-1 et seq., available here: http://webserver.rilin.state.ri.us/Statutes/title39/39-26/index.htm It states that "The purposes of this chapter are to define renewable energy resources and to facilitate the development of new renewable energy resources to supply electricity to customers in Rhode Island with goals of stabilizing long-term energy prices, enhancing environmental quality, and creating jobs in Rhode Island in the renewable energy sector."

[17] AESC 2024, page 216, footnote 279.

**Q Do you think that the value of RECs should be considered an embedded cost for the purposes of cost-effectiveness testing in Rhode Island?**

**A** I think this point deserves some discussion. The RES targets were increased to 100 percent by 2033 in the *Act on Climate*, and therefore are clearly intended to reduce GHG emissions. Therefore, it is reasonable to assume that the main reason for the current version of the Rhode Island RES is to reduce GHG emissions, at least by 2033, if not sooner. Consequently, the value of complying with the RES, as represented by RECs, could be considered an embedded GHG cost.

**Q What are the implications of treating RECs as an embedded GHG cost?**

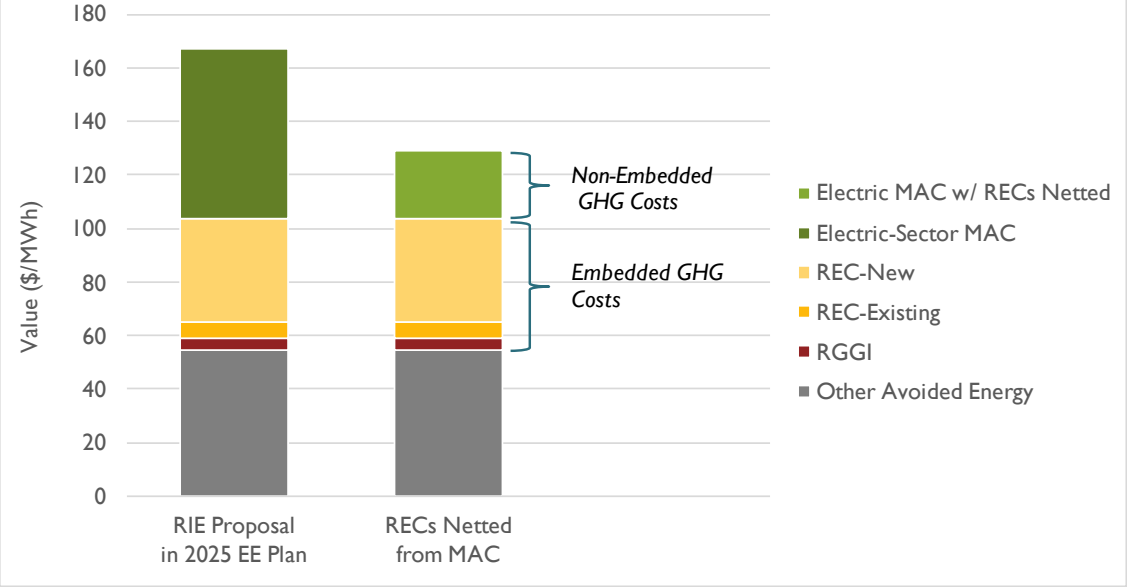
**A** AESC 2024 includes the cost of procuring RECs within the avoided energy costs. In other words, the benefits of energy efficiency from avoiding REC purchases are already included in the benefits of avoided energy costs. Therefore, in order to avoid any double counting of GHG benefits, the value of RECs should be subtracted from the full value of GHG emissions to determine the non-embedded value of GHG, in the same way that the embedded RGGI costs are subtracted from the full value of GHG. This would reduce the value of non-embedded GHG emissions.

**Q Please illustrate this implication of treating RECs as an embedded GHG cost.**

**A** Figure 2 illustrates this implication. It presents several types of avoided costs in 15-year levelized terms from AESC 2025. The bar on the left presents the way that RIE is currently treating RECs in the *2025 EE Plan*. Note that the REC prices, for both new and

existing RECs, are included in the avoided energy costs. The RGGI costs are also included in the avoided energy costs. The bar on the right indicates how the avoided costs would change if the REC values were netted out from the non-embedded GHG costs.[18] As indicated the non-embedded GHG costs would be reduced by the amount of the REC values.

**Figure 2. Treating RECs as an embedded GHG cost**




[18] For this illustration, the value of the RECs for existing renewables is not subtracted from the non-embedded GHG costs because the renewables represented by these RECs were not necessarily procured for the primary purpose of reducing GHG emissions.

**Q Does your point about treating RECs as an embedded GHG cost apply to all years of the energy efficiency benefit-cost analysis?**

**A** Yes. This characterization of RECs as an embedded GHG cost is relevant regardless of whether the RES target has reached 100 percent.

**Q Moving on to the other type of GHG cost that you mention above that is potentially embedded, please explain what you mean by additional electricity-sector costs needed to comply with the *Act on Climate*, and why they could be considered an embedded GHG cost.**

**A** As noted above, RIE will need to undertake many initiatives to comply with the *Act on Climate*, including implementing electricity and gas energy efficiency programs, procurement of RECs, procurement of offshore wind resources, installation of storage technologies, supporting the decarbonization of the natural gas sector, supporting the electrification of the transportation sector, supporting the electrification of the thermal sector, and more. These initiatives will require costs that will be incurred by RIE and therefore could be considered embedded GHG costs.[19]

**Q How should these embedded costs of complying with the *Act on Climate* be determined?**

**A** As explained above, these costs of complying with the *Act on Climate* can be represented by an electricity-sector MAC. An electricity-sector MAC would ideally be estimated by

[19] Many of these measures will help reduce costs as well by avoiding generation, transmission, and distribution cost that would have otherwise been needed.

conducting a comprehensive, statewide, economywide assessment of carbon abatement options to determine the marginal GHG abatement cost required of the electricity sector in Rhode Island to comply with the *Act on Climate*. In the absence of such a study, AESC 2024 provides an electricity-sector MAC assuming that offshore wind represents the marginal resource for meeting GHG goals in New England.

**Q What are the implications for the cost-effectiveness of the energy efficiency programs of categorizing the electricity-sector MAC as an embedded GHG cost instead of a non-embedded GHG cost?**

**A** The Rhode Island Test and the Cost of Energy Supply Test include both embedded and non-embedded GHG costs as part of the benefits of energy efficiency. Therefore, changing the categorization from non-embedded to embedded will not affect the results of the cost-effectiveness analysis, all else being equal.

However, recognizing that the electricity-sector MAC as an embedded GHG cost raises a critical question: Does the electricity-sector MAC represent the full value of GHG emissions? In other words, are there some additional non-embedded costs of GHG emissions beyond those captured by the marginal cost of complying with the *Act on Climate* in the electricity sector alone? This question is addressed in Section V of my testimony.

**Q Does categorizing the electricity-sector MAC as embedded GHG costs instead of a non-embedded GHG cost have any implications for rate impact forecasts?**

**A** Yes. Embedded GHG costs will affect electricity and gas costs and rates, but non-embedded GHG costs will not. Therefore, what is categorized as embedded versus non-embedded GHG costs will have implications for estimates of rate impacts of RIE's energy efficiency programs. As more GHG costs are correctly considered embedded, the rate impacts of the energy efficiency programs will more accurately reflect electricity and gas rates needed to comply with the *Act on Climate*.

Energy efficiency rate impact forecasts compare two scenarios: one with the energy efficiency programs and one without them. When the electricity-sector MAC is considered an embedded GHG cost, then the forecasted rates in both scenarios will be correspondingly higher. Consequently, any rate increase from the energy efficiency programs will be a smaller percentage of rates.

**Q Why is it so important to develop more accurate estimates of rate impacts from RIE's energy efficiency programs?**

**A** The rate impacts of energy efficiency programs have always been a concern for the Division, the Commission, and other stakeholders. As the requirements of complying with the *Act on Climate* become increasingly more stringent, understanding the rate impacts on electricity and gas customers will become increasingly more important. Therefore, it is critical to prepare robust, accurate rate impact estimates, especially if

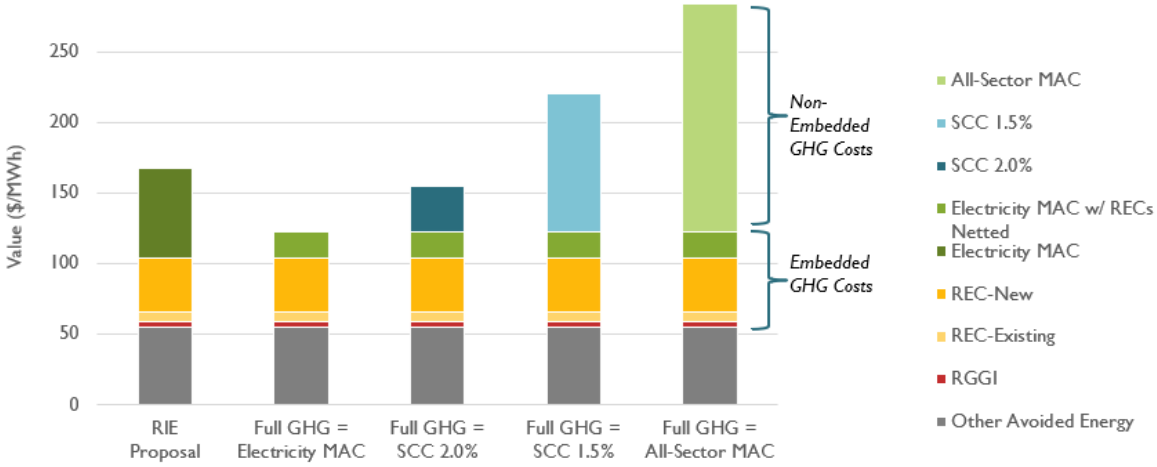
concerns about rate impacts are used as a reason to curtail cost-effective energy efficiency programs.

## VII. OPTIONS FOR VALUING GHG EMISSIONS

**Q Please illustrate the implications of different options for valuing GHG emissions in Rhode Island.**

**A** Figure 3 presents the options available for valuing GHG emissions in Rhode Island, using levelized values of the options presented in annual terms from Figure 1 above. The first two bars on the left present the same information from Figure 2 above. The three bars on the right present the non-embedded GHG costs under three different values of the full value of GHG emissions: using the SCC at a 2.0 percent discount rate, using the SCC at a 1.5 percent discount rate, and using the all-sector MAC. In all cases except the RIE proposal, the value of RECs is netted out from the full value of GHG emissions. Further, in all cases except the RIE proposal, the electricity-sector MAC is considered to be an embedded GHG cost and is netted out of the full value of GHG emissions to determine the non-embedded GHG costs.

**Figure 3. Options for valuing GHG emissions**




## VIII. RECOMMENDATIONS

**Q Please summarize your recommendations.**

I recommend that the Commission require the Company, during the development of the *2026 EE Plan,* to address the concerns I raise in this testimony. The value of GHG emissions is likely to be increasingly relevant to cost-effectiveness of electricity and gas energy efficiency programs with each passing year.

**Q Does this conclude your testimony?**

**A** Yes, it does.

**Tim Woolf,** Senior Vice President

Synapse Energy Economics I 485 Massachusetts Avenue, Suite 3 I Cambridge, MA 02139 I 617-453-7031
twoolf@synapse-energy.com

## PROFESSIONAL EXPERIENCE

**Synapse Energy Economics Inc.,** Cambridge, MA. *Senior Vice President*, 2019 – Present, *Vice President*, 2011 – 2019.

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, distributed energy resources, renewable resources and related policies, benefit-cost analysis, 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, including 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.

**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.

**Massachusetts Department of Public Utilities,** Boston, MA. *Staff Economist*, 1989 – 1990.

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

**Energy Systems Research Group,** Boston, MA. *Research Associate*, 1983 – 1987.

**Union of Concerned Scientists,** Cambridge, MA. *Energy Analyst*, 1982-1983.

## EDUCATION

**Boston University,** Boston, MA
Master of Business Administration, 1993

**London School of Economics,** London, England

Diploma, Economics, 1991

**Tufts University,** Medford, MA
Bachelor of Science in Mechanical Engineering, 1982

**Tufts University,** Medford, MA
Bachelor of Arts in English, 1982

## REPORTS

Woolf, T., A. Napoleon, D. Goldberg, E. Carlson, C. Mattioda. 2024. *Distributed Equity Analysis for Energy Efficiency and Other Distributed Energy Resources.* Synapse Energy Economics for Lawrence Berkley National Lab and E4TheFuture.

Synapse Energy Economics, Climable, Brown University Climate and Development Lab. 2023. *Power Play: Actions for New England's Equitable Energy Transition.* Full report. Climable.org.

Woolf, T., C. Lane, D. Goldberg, E. Camp, A. Takasugi, M. Chang, M. Whited, K. Parmenter, D. Violette. 2022. *Methods, Tools, and Resources: A Handbook for Quantifying Distributed Energy Resource Impacts for Benefit-Cost Analysis*. Synapse Energy Economics for the National Energy Screening Project.

Malone, E., D. Goldberg, S. Kwok, T. Woolf. 2022. *The Cape Light Compact's Low-Income Energy Efficiency Programs: Challenges and Opportunities*. Synapse Energy Economics for The Cape Light Compact.

Kallay, J., A. Napoleon, K. Takahashi, E. Sinclair, T. Woolf. 2021. *Opportunities for Evergy Kansas to Address Energy Equity Within its Integrated Resource Plan and Other Planning Processes*. Synapse Energy Economics for Union of Concerned Scientists.

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.

Liburd, S., E. Sinclair, T. Woolf, C. Roberto. 2021*. Hosting Capacity Analysis and Distribution Grid Data Security.* Synapse Energy Economics for the Northern Plains Resource Council.

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.

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.

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.

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., 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.

National Energy Screening Project. 2020. *National Standard Practice Manual for Benefit-Cost Analysis of Distributed Energy Resources*. E4TheFuture, Synapse Energy Economics, Energy Futures Group, ICF, Pace Energy and Climate Center, Schiller Consulting, Smart Electric Power Alliance.

Glick, D., D. Bhandari, C. Roberto, T. Woolf. 2020. *Review of benefit-cost analysis for the EPA's proposed revisions to the 2015 Steam Electric Limitations Guidelines.* Synapse Energy Economics for Earthjustice and Environmental Integrity Project.

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.

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.

Malone, E., T. Woolf, S. Letendre. 2019. *New Hampshire Cost-Effectiveness Review: Application of the National Standard Practice Manual to New Hampshire.* Synapse Energy Economics for the New Hampshire Evaluation, Measurement, and Verification Working Group.

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.

Napoleon, A., D. Goldberg, K. Takahashi, T. Woolf. 2019. *An Assessment of Prince Edward Island Energy Corporations' 2018 - 2021 Energy Efficiency and Conservation Plan*. Synapse Energy Economics for Carr, Stevenson and MacKay as Counsel to the Island Regulatory and Appeals Commission.

Camp, E., B. Fagan, J. Frost, D. Glick, A. Hopkins, A. Napoleon, N. Peluso, K. Takahashi, D. White, R. Wilson, T. Woolf. 2018. *Phase 1 Findings on Muskrat Falls Project Rate Mitigation.* Synapse Energy Economics for Board of Commissioners of Public Utilities, Province of Newfoundland and Labrador.

Malone, E., T. Woolf, D. Goldberg. 2018. *Updating the Energy Efficiency Cost-Effectiveness Framework in Minnesota: Application of the National Standard Practice Manual to Minnesota.* Conservation Applied Research and Development (CARD) Report. Synapse Energy Economics for Minnesota Department of Commerce, Division of Energy Resources.

White, D., K. Takahashi, A. Napoleon, T. Woolf. 2018. *Value of Energy Efficiency in New York: Assessment of the Range of Benefits of Energy Efficiency Programs*. Synapse Energy Economics for Natural Resources Defense Council.

Fisher, J., M. Whited, T. Woolf, D. Goldberg. 2018. *Utility Investments for Market Transformation: How Utilities Can Help Achieve Energy Policy Goals.* Synapse Energy Economics for Energy Foundation.

Woolf, T., A. Hopkins, M. Whited, K. Takahashi, A. Napoleon. 2018. *Review of New Brunswick Power's 2018/2019 Rate Case Application.* In the Matter of the New Brunswick Power Corporation and Section 103(1) of the Electricity Act Matter No. 375. Synapse Energy Economics for the New Brunswick Energy and Utilities Board Staff.

Woolf, T., C. Neme, M. Kushler, S. R. Schiller, T. Eckman. 2017. *National Standard Practice Manual for Assessing Cost-Effectiveness of Energy Efficiency Resources*. Edition 1, Spring 2017. Prepared by the National Efficiency Screening Project.

Whited, M., A. Horowitz, T. Vitolo, W. Ong, T. Woolf. 2017. *Distributed Solar in the District of Columbia: Policy Options, Potential, Value of Solar, and Cost-Shifting*. Synapse Energy Economics for the Office of the People's Counsel for the District of Columbia.

Raab Associates and Synapse Energy Economics. 2017. *Grid Modernization in New Hampshire: Report to the New Hampshire Public Utilities Commission*. Prepared by the New Hampshire Grid Modernization Working Group. March 20, 2017.

Woolf, T. 2016. *Expert Report: Rate Mechanism, Reconciliation of Provisional Rates, Energy Efficiency Rider*. Prepared for Puerto Rico Energy Commission regarding Matter No. CEPR-AP-2015-0001, November 21, 2016.

Woolf, T., M. Whited, P. Knight, T. Vitolo, K. Takahashi. 2016. *Show Me the Numbers: A Framework for Balanced Distributed Solar Policies*. Synapse Energy Economics for Consumers Union.

Fisher, J., A. Horowitz, J. Migden-Ostrander, T. Woolf. 2016. *Puerto Rico Electric Power Authority's 2015 Integrated Resource Plan*. Synapse Energy Economics for Puerto Rico Energy Commission.

Woolf, T., A. Napoleon, P. Luckow, W. Ong, K. Takahashi. 2016. *Aiming Higher: Realizing the Full Potential of Cost-Effective Energy Efficiency in New York.* Synapse Energy Economics for Natural Resources Defense Council, E4TheFuture, CLEAResult, Lime Energy, Association for Energy Affordability, and Alliance for Clean Energy New York.

Lowry, M. N., T. Woolf, M. Whited, M. Makos. 2016. *Performance-Based Regulation in a High Distributed Energy Resources Future*. Pacific Economics Group Research and Synapse Energy Economics for Lawrence Berkley National Laboratory.

Woolf, T., M. Whited, A. Napoleon. 2015-2016. *Comments and Reply Comments in the New York Public Service Commission Case 14-M-0101: Reforming the Energy Vision*. Comments related to Staff's (a) a benefit-costs analysis framework white paper, (b) ratemaking and utility business models white paper, and (c) Distributed System Implementation Plan guide. Synapse Energy Economics on behalf of Natural

Resources Defense Council and Pace Energy and Climate Center. August 21, 2015, September 10, 2015, October 26, 2015, November 23, 2015, December 7, 2015, and January 6, 2016.

Kallay, J., K. Takahashi, A. Napoleon, T. Woolf. 2015. *Fair, Abundant, and Low-Cost: A Handbook for Using Energy Efficiency in Clean Power Plan Compliance.* Synapse Energy Economics for the Energy Foundation.

Woolf, T., K. Takahashi, E. Malone, A. Napoleon, J. Kallay. 2015. *Ontario Gas Demand-Side Management 2016-2020 Plan Review.* Synapse Energy Economics for the Ontario Energy Board.

Whited, M., T. Woolf, A. Napoleon. 2015. *Utility Performance Incentive Mechanisms: A Handbook for Regulators*. Synapse Energy Economics for the Western Interstate Energy Board.

Woolf, T., E. Malone, F. Ackerman. 2014. *Cost-Effectiveness Screening Principles and Guidelines for Alignment with Policy Goals, Non-Energy Impacts, Discount Rates, and Environmental Compliance Costs.* Synapse Energy Economics for Northeast Energy Efficiency Partnerships (NEEP) Regional Evaluation, Measurement and Verification Forum.

Woolf, T., E. Malone, C. Neme. 2014. *Regulatory Policies to Support Energy Efficiency in Virginia*. Synapse Energy Economics and Energy Futures Group for the Virginia Energy Efficiency Council.

Woolf, T., M. Whited, E. Malone, T. Vitolo, R. Hornby. 2014. *Benefit-Cost Analysis for Distributed Energy Resources: A Framework for Accounting for All Relevant Costs and Benefits.* Synapse Energy Economics for the Advanced Energy Economy Institute.

Woolf, T., E. Malone, J. Kallay. 2014. *Rate and Bill Impacts of Vermont Energy Efficiency Programs.* Synapse Energy Economics for the Vermont Public Service Department.

Woolf, T., C. Neme, P. Stanton, R. LeBaron, K. Saul-Rinaldi, S. Cowell. 2014. *The Resource Value Framework: Reforming Energy Efficiency Cost-Effectiveness Screening.* The National Efficiency Screening Project for the National Home Performance Council.

Malone, E., T. Woolf, K. Takahashi, S. Fields. 2013. "Appendix D: Energy Efficiency Cost-Effectiveness Tests." *Readying Michigan to Make Good Energy Decisions: Energy Efficiency*. Synapse Energy Economics for the Council of Michigan Foundations.

Stanton, E. A., S. Jackson, G. Keith, E. Malone, D. White, T. Woolf. 2013. *A Clean Energy Standard for Massachusetts.* Synapse Energy Economics for the Massachusetts Clean Energy Center and the Massachusetts Departments of Energy Resources, Environmental Protection, and Public Utilities.

Woolf, T., K. Saul-Rinaldi, R. LeBaron, S. Cowell, P. Stanton. 2013. *Recommendations for Reforming Energy Efficiency Cost-Effectiveness Screening in the United States.* Energy Efficiency Screening Coalition for the National Home Performance Council.

Woolf, T., E. Malone, J. Kallay, K. Takahashi. 2013. *Energy Efficiency Cost-Effectiveness Screening in the Northeast and Mid-Atlantic States.* Synapse Energy Economics for Northeast Energy Efficiency Partnerships, Inc. (NEEP).

Raab Associates and Synapse Energy Economics. 2013. *Massachusetts Electric Grid Modernization Stakeholder Working Group Process: Report to the Department of Public Utilities from the Steering Committee.* Prepared for the Massachusetts Department of Public Utilities. DPU 12-76.

Jackson, S., P. Peterson, D. Hurley, T. Woolf. 2013. *Forecasting Distributed Generation Resources in New England: Distributed Generation Must Be Properly Accounted for in Regional System Planning.* Synapse Energy Economics for E4 Group.

Woolf, T., E. Malone, L. Schwartz, J. Shenot. 2013. *A Framework for Evaluating the Cost-Effectiveness of Demand Response.* Synapse Energy Economics and Regulatory Assistance Project for the National Forum on the National Action Plan on Demand Response: Cost-effectiveness Working Group.

Woolf, T., W. Steinhurst, E. Malone, K. Takahashi. 2012. *Energy Efficiency Cost-Effectiveness Screening: How to Properly Account for 'Other Program Impacts' and Environmental Compliance Costs.* Synapse Energy Economics for Regulatory Assistance Project and Vermont Housing Conservation Board.

Woolf, T., M. Whited, T. Vitolo, K. Takahashi, D. White. 2012. *Indian Point Replacement Analysis: A Clean Energy Roadmap. A Proposal for Replacing the Nuclear Plant with Clean, Sustainable Energy Resource.* Synapse Energy Economics for Natural Resources Defense Council (NRDC) and Riverkeeper.

Keith, G., T. Woolf, K. Takahashi. 2012. *A Clean Electricity Vision for Long Island: Supplying 100% of Long Island's Electricity Needs with Renewable Power.* Synapse Energy Economics for Renewable Energy Long Island.

Woolf, T. 2012. *Best Practices in Energy Efficiency Program Screening: How to Ensure that the Value of Energy Efficiency is Properly Accounted For.* Synapse Energy Economics for National Home Performance Council.

Woolf, T., J. Kallay, E. Malone, T. Comings, M. Schultz, J. Conyers. 2012. *Commercial & Industrial Customer Perspectives on Massachusetts Energy Efficiency Programs.* Synapse Energy Economics for the Massachusetts Energy Efficiency Advisory Council.

Woolf, T., M. Wittenstein, R. Fagan. 2011. *Indian Point Energy Center Nuclear Plant Retirement Analysis.* Synapse Energy Economics for Natural Resources Defense Council (NRDC) and Riverkeeper.

Woolf, T., V. Sabodash, B. Biewald. 2011. *Equipment Price Forecasting in Energy Conservation Standards Analysis.* Synapse Energy Economics for Appliance Standards Awareness Project and Natural Resources Defense Council (NRDC).

Johnston, L., E. Hausman, A. Sommer, B. Biewald, T. Woolf, D. Schlissel, A. Rochelle, D. White. 2007. *Climate Change and Power: Carbon Dioxide Emission Costs and Electricity Resource Planning*. Synapse Energy Economics for Tallahassee Electric Utility.

Woolf, T. 2007. *Cape Light Compact Energy Efficiency Plan 2007-2012: Providing Comprehensive Energy Efficiency Services to Communities on Cape Cod and Martha's Vineyard*. Synapse Energy Economics for the Cape Light Compact.

Woolf, T. 2007. *Review of the District of Columbia Reliable Energy Trust Fund and Natural Gas Trust Fund Working Group and Regulatory Processes*. Synapse Energy Economics for the District of Columbia Office of People's Counsel.

Woolf, T. 2006. *Cape Light Compact Annual Report on Energy Efficiency Activities in 2005*. Synapse Energy Economics for the Cape Light Compact, submitted to the Massachusetts Department of Telecommunications and Energy and the Massachusetts Division of Energy Resources.

Steinhurst, W., T. Woolf, A. Sommer, K. Takahashi, P. Chernick, J. Wallach. 2006. *Integrated Portfolio Management in a Restructured Supply Market*. Synapse Energy Economics and Resource Insight for the Ohio Office of Consumer Counsel.

Peterson, P., D. Hurley, T. Woolf, B. Biewald. 2006. *Incorporating Energy Efficiency into the ISO-New England Forward Capacity Market*. Synapse Energy Economics for Conservation Services Group.

Woolf, T., D. White, C. Chen, A. Sommer. 2005. *Potential Cost Impacts of a Renewable Portfolio Standard in New Brunswick*. Synapse Energy Economics for New Brunswick Department of Energy.

Woolf, T., K. Takahashi, G. Keith, A. Rochelle, P. Lyons. 2005. *Feasibility Study of Alternative Energy and Advanced Energy Efficiency Technologies for Low-Income Housing in Massachusetts.* Synapse Energy Economics and Zapotec Energy for the Low-Income Affordability Network, Action for Boston Community Development, and Action Inc.

Woolf, T. 2005. *The Cape Light Compact Energy Efficiency Plan: Phase III 2005-2007: Providing Comprehensive Energy Efficiency Services to Communities on Cape Cod and Martha's Vineyard*. Synapse Energy Economics for the Cape Light Compact.

Woolf, T. 2004. *Review of Avoided Costs Used in Minnesota Electric Utility Conservation Improvement Programs*. Synapse Energy Economics for the Minnesota Office of Legislative Auditor.

Woolf, T. 2004. *NEEP Strategic Initiative Review: Qualitative Assessment and Initiative Ranking for the Residential Sector*. Synapse Energy Economics for Northeast Energy Efficiency Partnerships, Inc.

Woolf, T. 2004. *A Balanced Energy Plan for the Interior West*. Synapse Energy Economics, West Resource Advocates, and Tellus Institute for the Hewlett Foundation Energy Series.

Steinhurst, W., P. Chernick, T. Woolf, J. Plunkett, C. Chen. 2003. *OCC Comments on Alternative Transitional Standard Offer*. Synapse Energy Economics for the Connecticut Office of Consumer Counsel.

Woolf, T. 2003. *Potential Cost Impacts of a Vermont Renewable Portfolio Standard*. Synapse Energy Economics for Vermont Public Service Board, presented to the Vermont RPS Collaborative.

Biewald, B., T. Woolf, A. Rochelle, W. Steinhurst. 2003. *Portfolio Management: How to Procure Electricity Resources to Provide Reliable, Low-Cost, and Efficient Electricity Services to All Retail Customers*. Synapse Energy Economics for Regulatory Assistance Project and Energy Foundation.

Woolf, T., G. Keith, D. White, M. Drunsic, M. Ramiro, J. Ramey, J. Levy, P. Kinney, S. Greco, K. Knowlton, B. Ketcham, C. Komanoff, D. Gutman. 2003. *Air Quality in Queens: Cleaning Up the Air in Queens County and Neighboring Regions*. Synapse Energy Economics, Konheim & Ketcham, and Komanoff Energy

Associates for Natural Resources Defense Council (NRDC), Keyspan Energy, and the Coalition Helping to Organize a Kleaner Environment.

Chen, C., D. White, T. Woolf, L. Johnston. 2003. *The Maryland Renewable Portfolio Standard: An Assessment of Potential Cost Impacts*. Synapse Energy Economics for the Maryland Public Interest Research Group.

Woolf, T. 2003. *The Cape Light Compact Energy Efficiency Plan: Phase II 2003 – 2007: Providing Comprehensive Energy Efficiency Services to Communities on Cape Cod and Martha's Vineyard*. Synapse Energy Economics, Cort Richardson, Vermont Energy Investment Corporation, and Optimal Energy Incorporated for the Cape Light Compact.

Woolf, T. 2002. *Green Power and Energy Efficiency Opportunities for Municipalities in Massachusetts: Promoting Community Involvement in Energy and Environmental Decisions*. Synapse Energy Economics for the Massachusetts Energy Consumers Alliance.

Woolf, T. 2002. *The Energy Efficiency Potential in Williamson County, Tennessee: Opportunities for Reducing the Need for Transmission Expansion*. Synapse Energy Economics for the Harpeth River Watershed Association and the Southern Alliance for Clean Energy.

Woolf, T. 2002. *Electricity Restructuring Activities in the US: A Survey of Selected States*. Synapse Energy Economics for Arizona Corporation Commission Utilities Division Staff.

Woolf, T. 2002. *Powering the South: A Clean and Affordable Energy Plan for the Southern United States*. Synapse Energy Economics with and for the Renewable Energy Policy Project and a coalition of Southern environmental advocates.

Johnston, L., G. Keith, T. Woolf, B. Biewald, E. Gonin. 2002. *Survey of Clean Power and Energy Efficiency Programs*. Synapse Energy Economics for the Ozone Transport Commission.

Woolf, T. 2001. *Proposal for a Renewable Portfolio Standard for New Brunswick.* Synapse Energy Economics for the Conservation Council of New Brunswick, presented to the New Brunswick Market Design Committee.

Woolf, T., G. Keith, D. White, F. Ackerman. 2001. *A Retrospective Review of FERC's Environmental Impact Statement on Open Transmission Access*. Synapse Energy Economics and the Global Development and Environmental Institute for the North American Commission for Environmental Cooperation, with the Global Development and Environment Institute.

Woolf, T. 2001. *Repowering the Midwest: The Clean Energy Development Plan for the Heartland*. Synapse Energy Economics for the Environmental Law and Policy Center and a coalition of Midwest environmental advocates.

Woolf, T. 2000. *The Cape Light Compact Energy Efficiency Plan: Providing Comprehensive Energy Efficiency Services to Communities on Cape Cod and Martha's Vineyard*. Synapse Energy Economics for the Cape Light Compact.

Woolf, T., B. Biewald. 1999. *Market Distortions Associated With Inconsistent Air Quality Regulations*. Synapse Energy Economics for the Project for a Sustainable FERC Energy Policy.

Woolf, T., B. Biewald, D. Glover. 1998. *Competition and Market Power in the Northern Maine Electricity Market*. Synapse Energy Economics and Failure Exponent Analysis for the Maine Public Utilities Commission.

Woolf, T. 1998. *New England Tracking System.* Synapse Energy Economics for the New England Governors' Conference, with Environmental Futures and Tellus Institute.

Woolf, T., D. White, B. Biewald, W. Moomaw. 1998. *The Role of Ozone Transport in Reaching Attainment in the Northeast: Opportunities, Equity and Economics*. Synapse Energy Economics and the Global Development and Environment Institute for the Northeast States for Coordinated Air Use Management.

Biewald, B., D. White, T. Woolf, F. Ackerman, W. Moomaw. 1998. *Grandfathering and Environmental Comparability: An Economic Analysis of Air Emission Regulations and Electricity Market Distortions*. Synapse Energy Economics and the Global Development and Environment Institute for the National Association of Regulatory Utility Commissioners.

Biewald, B., T. Woolf, P. Bradford, P. Chernick, S. Geller, J. Oppenheim. 1997. *Performance-Based Regulation in a Restructured Electric Industry*. Synapse Energy Economics, Resource Insight, and the National Consumer Law Center for the National Association of Regulatory Utility Commissioners.

Biewald, B., T. Woolf, M. Breslow. 1997. *Massachusetts Electric Utility Stranded Costs: Potential Magnitude, Public Policy Options, and Impacts on the Massachusetts Economy*. Synapse Energy Economics for the Union of Concerned Scientists, MASSPIRG, and Public Citizen.

Woolf, T. 1997. *The Delaware Public Service Commission Staff's Report on Restructuring the Electricity Industry in Delaware.* Tellus Institute for The Delaware Public Service Commission Staff. Tellus Study No. 96-99.

Woolf, T. 1997. *Preserving Public Interest Obligations Through Customer Aggregation: A Summary of Options for Aggregating Customers in a Restructured Electricity Industry*. Tellus Institute for The Colorado Office of Energy Conservation. Tellus Study No. 96-130.

Woolf, T. 1997. *Zero Carbon Electricity: the Essential Role of Efficiency and Renewables in New England's Electricity Mix*. Tellus Institute for The Boston Edison Settlement Board. Tellus Study No. 94-273.

Woolf, T. 1997. *Regulatory and Legislative Policies to Promote Renewable Resources in a Competitive Electricity Industry*. Tellus Institute for The Colorado Governor's Office of Energy Conservation. Tellus Study No. 96-130-A5.

Woolf, T. 1996. *Can We Get There From Here? The Challenge of Restructuring the Electricity Industry So That All Can Benefit*. Tellus Institute for The California Utility Consumers' Action Network. Tellus Study No. 95-208.

Woolf, T. 1995. *Promoting Environmental Quality in a Restructured Electric Industry.* Tellus Institute for The National Association of Regulatory Utility Commissioners. Tellus Study No. 95-056.

Woolf, T. 1995. *Systems Benefits Funding Options*. Tellus Institute for Wisconsin Environmental Decade. Tellus Study No. 95-248.

Woolf, T. 1995. *Non-Price Benefits of BECO Demand-Side Management Programs*. Tellus Institute for Boston Edison Settlement Board. Tellus Study No. 93-174.

Woolf, T., B. Biewald. 1995. *Electric Resource Planning for Sustainability*. Tellus Institute for the Texas Sustainable Energy Development Council. Tellus Study No. 94-114.

## TESTIMONY

**Public Utilities Commission of New Hampshire (Docket No. DE 22-060):** Direct Testimony of Tim Woolf and Eric Borden regarding changes to the net metering tariff structure. On behalf of the Office of the Consumer Advocate. Dec 6, 2023.

**Rhode Island Public Utilities Commission (Docket No. 22-33-EE):** Direct testimony of Joel Munoz, Jennifer Kallay, and Tim Woolf regarding Rhode island Energy's 2023 Annual Energy Efficiency Plan. On behalf of the Rhode Island Division of Public Utilities and Carriers. November 4, 2022.

**Public Utilities Commission of New Hampshire (Docket No. DE 20-161):** Direct Testimony of Tim Woolf and Ben Havumaki regarding Eversource's 2020 least-cost integrated resource plan. On behalf of the Office of the Consumer Advocate. August 19, 2022.

**Colorado Public Utilities Commission (Proceeding No. 19AL-0687E):** Cross-answer testimony and attachments of Tim Woolf regarding the need for a customer opt-out provision in Public Service Company of Colorado's proposed TOU rates plan. On behalf of Energy Outreach Colorado. May 21, 2020.

**Colorado Public Utilities Commission (Proceeding No. 19AL-0687E):** Answer testimony and attachments of Tim Woolf regarding Public Service Company of Colorado's proposal to establish mandatory Modified RE-TOU rates for residential customers. On behalf of Energy Outreach Colorado. April 24, 2020.

**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.

**Rhode Island Public Utilities Commission (Docket No. 4770):** Direct testimony of Tim Woolf regarding National Grid's rate case. On behalf of the Rhode Island Division of Public Utilities and Carriers. April 6, 2018.

**Rhode Island Public Utilities Commission (Docket No. 4770):** Direct testimony of Tim Woolf and Melissa Whited regarding National Grid's proposed performance incentive mechanisms, benefit-cost analyses,

and request for recovery of costs for its Advanced Metering Functionality study and distributed energy resources enablement investments. On behalf of the Rhode Island Division of Public Utilities and Carriers. April 6, 2018.

**Rhode Island Public Utilities Commission (Docket No. 4783):** Direct testimony of Tim Woolf and Melissa Whited regarding National Grid's Advanced Metering Functionality Pilot. On behalf of the Rhode Island Division of Public Utilities and Carriers. February 22, 2018.

**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.

**New York Public Service Commission (Case 17-E-0238)**: Direct and rebuttal testimony of Tim Woolf and Melissa Whited regarding Earnings Adjustment Mechanisms proposed by National Grid. On behalf of Advanced Energy Economy Institute. August 25 and September 15, 2017.

**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.

**Massachusetts Department of Public Utilities (D.P.U. 17-05)**: Direct and surrebuttal testimony of Tim Woolf and Melissa Whited regarding performance-based regulation, the monthly minimum reliability contribution, storage pilots, and rate design in Eversource's petition for approval of rate increases and a performance-based ratemaking mechanism. On behalf of Sunrun and the Energy Freedom Coalition of America, LLC. April 28, 2017 and May 26, 2017.

**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.

**Colorado Public Utilities Commission (Proceeding No. 16AL-0048E)**: Answer testimony regarding Public Service Company of Colorado's rate design proposal. On behalf of Energy Outreach Colorado. June 6, 2016.

**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.

**Missouri Public Service Commission (Case No. ER-2014-0370):** Direct and surrebuttal testimony on the topic of Kansas City Power and Light's rate design proposal. On behalf of Sierra Club. April 16, 2015 and June 5, 2015.

**Missouri Public Service Commission (File No. EO-2015-0055):** Rebuttal and surrebuttal testimony on the topic of Ameren Missouri's 2016-2018 Energy Efficiency Plan. On behalf of Sierra Club. March 20, 2015 and April 27, 2015.

**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.

**Colorado Public Utilities Commission (Docket No. 96Q-313E):** Filed comments in response to the Questionnaire on Electricity Industry Restructuring (Tellus Institute Study No. 96-130-A3). On behalf of the Colorado Governor's Office of Energy Conservation. October 1996.

**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.

## ARTICLES

Malone, E., T. Woolf, D. Goldberg. 2019. "Assessing Resource Cost Effectiveness." *A.E.S.P. Magazine,* 2019 Edition, 8-10.

Woolf, T., E. Malone, C. Neme, R. LeBaron. 2014. "Unleashing Energy Efficiency." *Public Utilities Fortnightly,* October, 30-38.

Woolf, T., A. Sommer, J. Nielson, D. Berry, R. Lehr. 2005. “Managing Electricity Industry Risk with Clean and Efficient Resources.” *The Electricity Journal* 18 (2): 78–84.

Woolf, T., A. Sommer. 2004. “Local Policy Measures to Improve Air Quality: A Case Study of Queens County, New York.” *Local Environment* 9 (1): 89–95.

Woolf, T. 2001. “Clean Power Opportunities and Solutions: An Example from America’s Heartland.” *The Electricity Journal* 14 (6): 85–91.

Woolf, T. 2001. “What’s New With Energy Efficiency Programs.” *Energy & Utility Update, National Consumer Law Center*: Summer 2001.

Woolf T., B. Biewald. 2000. “Electricity Market Distortions Associated With Inconsistent Air Quality Regulations.” *The Electricity Journal* 13 (3): 42–49.

Ackerman, F., B. Biewald, D. White, T. Woolf, W. Moomaw. 1999. “Grandfathering and Coal Plant Emissions: the Cost of Cleaning Up the Clean Air Act.” *Energy Policy* 27 (15): 929–940.

Biewald, B., D. White, T. Woolf. 1999. “Follow the Money: A Method for Tracking Electricity for Environmental Disclosure.” *The Electricity Journal* 12 (4): 55–60.

Woolf, T., B. Biewald. 1998. “Efficiency, Renewables and Gas: Restructuring As if Climate Mattered.” *The Electricity Journal* 11 (1): 64–72.

Woolf, T., J. Michals. 1996. “Flexible Pricing and PBR: Making Rate Discounts Fair for Core Customers.” *Public Utilities Fortnightly,* July 1996.

Woolf, T., J. Michals. 1995. “Performance-Based Ratemaking: Opportunities and Risks in a Competitive Electricity Industry.” *The Electricity Journal* 8 (8): 64–72.

Woolf, T. 1994. “Retail Competition in the Electricity Industry: Lessons from the United Kingdom.” *The Electricity Journal* 7 (5): 56–63.

Woolf, T. 1994. “A Dialogue About the Industry's Future.” *The Electricity Journal* 7 (5).

Woolf, T., E. D. Lutz. 1993. “Energy Efficiency in Britain: Creating Profitable Alternatives.” *Utilities Policy* 3 (3): 233–242.

Woolf, T. 1993. “It is Time to Account for the Environmental Costs of Energy Resources.” *Energy and Environment* 4 (1): 1–29.

Woolf, T. 1992. “Developing Integrated Resource Planning Policies in the European Community.” *Review of European Community & International Environmental Law* 1 (2) 118–125.

## PRESENTATIONS

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

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 2024*