New Hampshire Cost-Effectiveness Review

Application of the National Standard Practice Manual to New Hampshire

Prepared for the New Hampshire Evaluation, Measurement, and Verification (EM&V) Working Group

October 14, 2019

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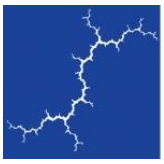

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1. EXECUTIVE SUMMARY

Background

In December 2018, New Hampshire stakeholders and the New Hampshire Public Utilities Commission (Commission or PUC) agreed that the Benefit/Cost Working Group (B/C Working Group) should review issues related to the cost-effectiveness test for energy efficiency programs in accordance with the framework established in the National Standard Practice Manual (NSPM).[1]

The NSPM is a publication of the National Efficiency Screening Project (NESP), a group of organizations and individuals working to update and improve the way that utility customer-funded electric and gas energy efficiency resources are assessed for cost-effectiveness.[2] The NSPM includes a set of fundamental principles for cost-effectiveness analysis and provides a comprehensive framework for developing a cost-effectiveness test tailored to a jurisdiction's energy policy goals. In this report, we apply those principles to assess New Hampshire cost-effectiveness practices.

During Spring and Summer 2019, Commission Staff facilitated a working group process with technical assistance from Synapse Energy Economics, Inc. (Synapse) that included identifying New Hampshire's existing energy efficiency program policy to help inform their efforts. The B/C Working Group discussed an energy efficiency cost-effectiveness framework that is intended to more fully reflect those policies.

In this report, Synapse explains that process, summarizes B/C Working Group members' views, and recommends modifications to New Hampshire energy efficiency cost-effectiveness practices for the Commission's consideration.

The recommendations in this report are Synapse's recommendations to the Commission on cost-effectiveness practices for New Hampshire, based on the NSPM and B/C Working Group discussions. All parties reserve the right to provide alternative opinions and recommendations to the Commission during their review of this report.

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1 The B/C Working Group is comprised of parties who typically participate in the Commission's review and oversight of the energy efficiency programs administered by the state's electric and natural gas utilities.

The scope of the B/C Working Group is defined in Commission Order Nos. 26,095 and 26,207 in Docket DE 17-136. See, "2018-2020 New Hampshire Statewide Energy Efficiency Plan, 2019 Update, Settlement Agreement," Docket No. DE 17-136, December 13, 2018, pages 11-12, available at https://www.puc.nh.gov/Regulatory/Docketbk/2017/17-136/LETTERS-MEMOS-TARIFFS/17-136_2018-12-13_EVERSOURCE_SETTLEMENT_AGREEMENT.PDF.

See, "2018-2020 New Hampshire Statewide Energy Efficiency Plan, Settlement Agreement," Docket No. DE 17-136, December 8, 2017, pages 11-12, available at https://www.puc.nh.gov/Regulatory/Docketbk/2017/17-136/LETTERS-MEMOS-TARIFFS/17-136_2017-12-08_LIBERTY_SETTLEMENT_AGREEMENT.PDF

2 NESP, "National Standard Practice Manual for Assessing Cost-Effectiveness of Energy Efficiency Resources," Edition 1 Spring 2017, available at https://nationalefficiencyscreening.org/wp-content/uploads/2017/05/NSPM_May-2017_final.pdf.

The Primary Cost-Effectiveness Test

The purpose of a *primary* cost-effectiveness test is to answer the threshold question of: what is the universe of resources whose benefits exceed their costs and therefore merit acquisition (in lieu of acquiring other supply- or demand-side resources)? When applying a primary test, regulators should weigh its results alongside many factors, including but not limited to: the results of any secondary tests; least-cost planning imperatives; rate, bill, and participation impacts; economic development and job impacts; customer equity; and any other important policy goals.

B/C Working Group members discussed each utility and non-utility system impact that could be included in a primary test. As discussed in the NSPM, the decision of whether to include a non-utility system impact in the primary cost-effectiveness test should be based on state policy goals. Stakeholders supported including non-utility system impacts in the primary test when doing so would align with the state's policy goals.

The decision of whether to include a non-utility system impact in a cost-effectiveness test should be based on state policy goals.

Utility system impacts. According to the NSPM, all utility system impacts should be included in a state's primary test.[3] Utility system impacts do not need to be justified by a state-specific policy to support their inclusion in a state's cost-effectiveness tests because they represent the direct costs and benefits to the customers that provide the funds for the energy efficiency resources. B/C Working Group members agreed and supported including all utility system impacts in the primary and secondary tests. Several members noted that hard-to-quantify impacts, including market transformation and increased reliability, should be accounted for on a qualitative basis until values with an acceptable level of rigor and confidence are developed for them.

Other fuels, water, income eligible participant impacts, and New Hampshire-specific environmental fossil fuel impacts. B/C Working Group members unanimously supported inclusion of these non-utility system impacts in the primary test—all of which are currently included in the New Hampshire Total Resource Cost (TRC) test.[4]

Participant impacts, income eligible societal impacts, other environmental externalities, public health, and energy security impacts. B/C Working Group members generally supported excluding these non-utility system impacts from the primary test. Stakeholders arrived at this conclusion after weighing New Hampshire's policies with program goals and practical implementation issues.

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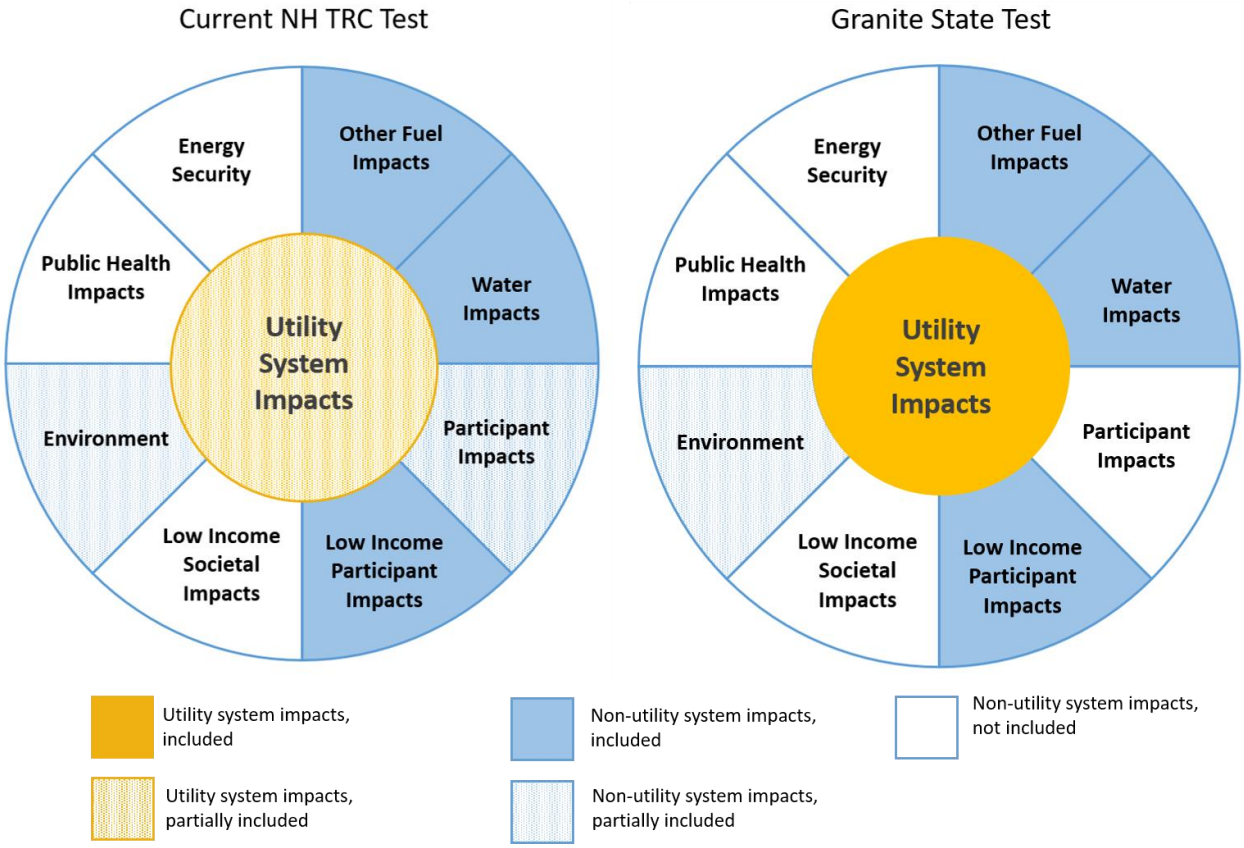
3 Utility system impacts represent the entire utility structure used to provide electric or gas service to retail customers. Utility system impacts can include, for example, the utility's portion of measure costs, utility program administration costs, and avoided costs associated with energy, capacity, transmission, distribution, and line losses.

4 The TRC test generally accounts for a program's costs and benefits to the utility and the customers participating in the program. The New Hampshire TRC test is a modification of a theoretical application of the TRC test because the New Hampshire TRC test does not include all utility system impacts.

Synapse recommends the Commission adopt the Granite State Test as the primary test to screen energy efficiency resources in New Hampshire. The Granite State Test is a modification of the current New Hampshire TRC test and reflects state policy goals as interpreted by members of the B/C Working Group. The proposed Granite State Test includes all the impacts in the current New Hampshire TRC test, except for participant impacts. In Figure 1 we summarize the current New Hampshire TRC test and the Granite State Test impacts.

Figure 1. Current and NH TRC test and Granite State Test impacts



Source: 2019 B/C Working Group discussions.
Notes: The utilities partially account for participant non-energy benefits through a percentage adder in the current New Hampshire TRC Test. The utilities partially account for environmental externalities through a New Hampshire-specific fossil fuel proxy.

Secondary Cost-Effectiveness Tests

Secondary tests help guide regulators' and stakeholders' overall understanding of energy efficiency resource impacts by answering questions that address how best to invest ratepayer funding in energy efficiency resources.

The NSPM recommends that a state customize a secondary test based on the state's policies and stakeholders' interpretation of those policies. A state-specific secondary test should start from the

primary test and add or subtract those impacts that are implied by policy goals and/or are important to stakeholders. The NSPM also suggests states consider a range of secondary tests to inform public debate, in addition to any state-specific secondary tests.[5]

In New Hampshire, B/C Working Group members deliberated on several impacts, uncertain whether the impacts should be included in the primary test but not convinced the impacts should be ignored and excluded entirely from cost-effectiveness testing. Synapse recommends including these impacts in a New Hampshire-specific secondary cost-effectiveness test, called the Secondary Granite State Test. This test would include all the impacts in the Granite State Test, plus the following impacts: participant, income eligible societal, and other environmental externalities.

Synapse recommends the Commission adopt two secondary tests: the Secondary Granite State Test and the Utility Cost Test. The Secondary Granite State Test provides the most comprehensive picture of energy efficient investments in New Hampshire, because it includes all impacts that some stakeholders currently consider important and relevant to New Hampshire's policies. The Utility Cost Test includes all utility system impacts, and only those impacts. The Utility Cost Test indicates whether the benefits of an energy efficient resource will exceed its costs from the perspective of the customers who are funding implementation of the energy efficiency programs.

B/C Working Group members generally agreed to the structure of a primary test with supporting secondary tests but did not completely agree on the application of secondary tests. It is important the Commission understand that stakeholders agreed to the Granite State Test and secondary tests as a package. Some stakeholders indicated that if the Commission rejects the Secondary Granite State Test or the Utility Cost Test, then they would not support the solitary use of the Granite State Test as currently presented in this report and would request the opportunity to revisit the inclusion of certain non-utility system impacts in the primary Granite State Test, namely environmental externality and participant impacts.

There are no hard-and-fast rules for applying secondary tests. The secondary tests would likely be used by utilities, regulators, and other stakeholders as one of the many data points that inform program design and resource allocation decisions, as well as treatment of energy efficiency programs that are marginally cost-effective. In these cases, the secondary tests provide more information about the likely impacts on utility customers (in the case of the Utility Cost Test) and on additional energy policy goals (in the case of Secondary Granite State Test). If the secondary tests indicate that a program provides enough value to customers or otherwise supports state policy goals, the utilities and stakeholders could support implementing the program. Alternatively, if the secondary tests do not indicate that a program provides enough value to customers or otherwise supports state policy goals, then stakeholders could consider an alternative allocation of resources. In either case, neither the utility nor the regulator is obligated to reject or accept a marginal program. Instead, the secondary tests (a) allow for a better-informed consideration of the value of marginal programs and (b) provide a framework to help assess

5 NESP, 2017, page 46.

that value. The secondary tests should not be considered or used as simple backstops or replacements of the primary test.

Using the Cost-Effectiveness Tests

Each test provides different information, which guides stakeholders in their use of the tests:

- *Primary Granite State Test*. Indicates the costs and benefits as defined by the B/C Working Group and members' interpretation of New Hampshire policies related to energy efficiency. If approved by the Commission, the Granite State Test will represent the regulatory perspective in New Hampshire and should be used as the primary test. This primary test can be useful when comparing different types and scenarios of efficiency resources. If an energy efficiency investment results in a net benefit to ratepayers under the primary test, there is a presumption that the efficiency investment is a prudent investment of ratepayer dollars resulting in just and reasonable rates.
- *Utility Cost Test.* Indicates the impact on revenue requirements for the regulated utility implementing the energy efficiency programs. The Utility Cost Test can inform decisions on relative program priorities, program design, and whether and how to place limits on program spending. If an efficiency resource passes the Utility Cost Test, then the utility customers who pay for the resource will see benefit from the resource through reduced utility system costs that are equal to or greater than their contribution to the resource.
- *Secondary Granite State Test.* Indicates the universe of impacts that are considered by some stakeholders to be relevant to New Hampshire policies and for energy efficiency resources. It can be used when stakeholders are interested in a range of considerations beyond the utility system, unregulated fuels, and income eligible participant impacts included in the primary test, such as environmental, participant, or income eligible societal impacts.

In Table 1 we summarize the impacts included in the current New Hampshire TRC test, the Granite State Test, the Utility Cost Test, and the Secondary Granite State Test.

Table 1. Current and recommended cost-effectiveness test impacts for New Hampshire

Impact	*Current NH TRC Test*	*Granite State Test*	*Secondary Test: Utility Cost Test*	*Secondary Test: Secondary Granite State Test*
Utility System Costs				
Measure costs (utility portion)	✓	✓	✓	✓
Other financial or technical support costs	✓	✓	✓	✓
Other program and administrative costs	✓	✓	✓	✓
EM&V costs	✓	✓	✓	✓
Performance incentives	✓	✓	✓	✓
Utility System Benefits				
Avoided energy costs	✓	✓	✓	✓
Avoided generating capacity costs	✓	✓	✓	✓
Avoided reserves	✓	✓	✓	✓
Avoided transmission costs	✓	✓	✓	✓
Avoided distribution costs	✓	✓	✓	✓
Avoided T&D line losses	✓	✓	✓	✓
Avoided ancillary services		✓	✓	✓
Intrastate price suppression effects (DRIPE)	✓	✓	✓	✓
Interstate price suppression effects (DRIPE)				
Avoided compliance with RPS requirements	✓	✓	✓	✓
Avoided environmental compliance costs (embedded)	✓	✓	✓	✓
Avoided credit and collection costs		✓	✓	✓
Reduced risk	✓	✓	✓	✓
Increased reliability		✓	✓	✓
Market transformation		✓	✓	✓
Non-Utility System Impacts				
Other fuel	✓	✓		✓
Water resource	✓	✓		✓
Income eligible (participant)	✓	✓		✓
Income eligible (societal)				✓
Participant costs	✓			✓
Participant non-energy benefits	✓			✓
Environmental, NH fossil fuel proxy	✓	✓		✓
Environmental, other externalities				✓
Public health				
Energy security				

Source: 2019 B/C Working Group discussions.
Notes: The utilities partially account for participant non-energy benefits through a percentage adder in the current New Hampshire TRC Test.

Methodologies to Account for Impacts

The NSPM recommends that utilities monetize all energy efficiency impacts included in state-specific cost-effectiveness tests. Implementing this recommendation poses challenges because impacts can be difficult to monetize, it may not be appropriate to monetize all impacts included in a secondary test, and evaluation and policies evolve overtime.

It is beyond the original scope of this study for Synapse to provide recommendations on the methodologies that should be used to measure specific impacts. However, B/C Working Group members frequently stressed the importance of considering how to measure impacts. Because this topic was central to members, we offer suggestions in Table 2 to help stakeholders understand how utilities could account for certain impacts in the Granite State and Secondary Granite State Tests. We do not suggest methodologies for all impacts; just those impacts that are either not included in the New Hampshire TRC test or are included but could be modified.

The EM&V Working Group is currently overseeing New Hampshire-specific, evidence-based studies on cost-effectiveness test inputs pursuant to Commission order, and stakeholders will have the opportunity to review results once completed.[6] In Table 2 we have tried to account for the forthcoming evaluation and study results where applicable, and we encourage stakeholders and the Commission to continue the discussion on the most appropriate methodology to estimate each impact.

[6] See, "2018-2020 New Hampshire Statewide Energy Efficiency Plan, Settlement Agreement," Docket No. DE 17-136, December 8, 2017, pages 3-5, 11, available at https://www.puc.nh.gov/Regulatory/Docketbk/2017/17-136/LETTERS-MEMOS-TARIFFS/17-136_2017-12-08_LIBERTY_SETTLEMENT_AGREEMENT.PDF; see also EERS Working Groups, EM&V, available at http://www.puc.state.nh.us/EESE%20Board/EERS_Working_Groups.html#em&v.

Table 2. Suggested methodologies to account for certain impacts

Impact	Test	Suggested Methodology
Utility System Impacts		
Avoided Ancillary Services	Primary + Secondary	In the short term, value at $0. Over time, determine whether this impact is enough of a priority to monetize.
Avoided Credit and Collection Costs	Primary + Secondary	Use the values expected to be provided in the forthcoming non-energy impact studies.
Reduced Risk	Primary + Secondary	In the short term, continue to use the wholesale risk premium and a low-risk discount rate and review practices used by utilities in other states to account for risk. Over time, investigate whether developing state-specific monetization methods is appropriate.
Increased Reliability	Primary + Secondary	Use the avoided cost values in AESC to monetize reliability once those values are developed using recent, local data.
Market Transformation	Primary + Secondary	In the short term, continue using adjusted gross savings to estimate energy efficiency impacts and consider impacts qualitatively in cost-effectiveness screening. Over time, re-evaluate the use of adjusted gross savings and consider methodologies that isolate and estimate market transformation impacts, spillover, and free ridership.
Non-Utility System Impacts		
Income Eligible Participant Impacts	Primary + Secondary	Use the values expected to be provided in the forthcoming Home Energy Assistance Program Evaluation or a proxy value such as a benefit adder informed by that study, or reliable values readily adapted from literature.
Participant Non-Energy Impacts	Secondary Only	Use the values expected to be provided in the forthcoming cross-cutting non-energy impact studies, or a proxy value such as a benefit adder informed by that study, or reliable values readily adapted from literature.
Income Eligible Societal Impacts	Secondary Only	In the short term, consider using a benefit-cost ratio threshold of less than 1.0 for income eligible programs. Over time, investigate whether developing state-specific monetization methods is appropriate or whether reliable values can be readily adapted from literature.
Other Environmental Externalities	Secondary Only	Use the avoided cost values in AESC to monetize environmental externalities (i.e., use the non-embedded avoided costs, likely the localized marginal abatement cost).

Rate, Bill, and Participant Impacts

Rate, bill, and participant impacts are key components to assessing energy efficiency resources. Like the Utility Cost Test, the end results of a rate, bill, and participant impact analysis can help inform program priorities, program design, and whether and how to place limits on program spending. According to the NSPM, New Hampshire utilities should analyze rate, bill, and participant impacts separately from the cost-effectiveness analysis.

The EM&V Working Group has contracted with Synapse to develop a model that can be used by each of New Hampshire's regulated utilities to inform energy efficiency program planning, design, and budgets. We expect to complete the analysis by Spring 2020 and will incorporate into that analysis our recommendations in this report on rate, bill, and participant impacts.

Economic Development and Jobs Impacts

Synapse recommends stakeholders and the Commission consider economic development benefits when assessing energy efficiency programs. Energy efficiency programs can lower energy costs for consumers and businesses, increasing productivity for businesses and creating jobs.

Synapse also recommends that economic development benefits be considered separately from the benefit-cost analysis results. In other words, the economic development benefits of energy efficiency investments should be considered alongside other benefits but should not be added to them. To do this, the New Hampshire utilities should use the number of jobs (in job-years) as the best indicator of economic development benefits.

A job-year is equivalent to a full-time employment opportunity for one person for one year (e.g., five job-years could be five jobs for one year or one job for five years). Job-years is easiest to understand, provides information that is most useful for policymakers, and can be easily presented alongside the results of the energy efficiency benefit-cost analysis. The number of jobs should be estimated for the portfolio of efficiency programs as a general indication of economic development benefits of the energy efficiency resource, as opposed to estimating them for each efficiency program or each sector. This approach is similar to how New Hampshire utilities currently quantify job impacts.

Other Inputs and Assumptions

The NSPM authors provide guidance to stakeholders for developing relevant inputs for energy efficiency cost-effectiveness tests. Synapse's recommendations are provided below and are based on the NSPM.

Discount rate. Utilities should continue the current practice of using a low-risk discount rate. This discount rate should be applied to the Granite State Test as well as any secondary tests.

Assessment level. Utilities should continue the current practice of screening for cost-effectiveness at the program level.[7] Utilities should have the ability to implement efficiency measures and projects with a benefit-cost ratio less than 1.0, provided the program including those measures and projects remains cost-effective with a benefit-cost ratio greater than 1.0. For certain programs with a benefit-cost ratio less than 1.0—for example, income eligible programs, education programs, or a program which is in its start-up phase and is likely to become cost-effective in later years—utilities should have the ability to implement those programs so long as there is adequate justification to do so and the overall portfolio of programs remains cost-effective.

Analysis period and end effects. Utilities could consider extending the screening model analysis period to account for measures with measure lives longer than 25 years. Some measures could extend past 25

[7] If the Commission adopts the Performance Incentive Working Group's forthcoming recommendation that utilities should be eligible for performance incentives based on portfolio-wide cost-effectiveness, it should still require the utilities to include sector and program level cost-effectiveness values in any annual filings for the purpose of transparency.

years, and the model would truncate the savings and benefits from those measures, thereby artificially reducing energy efficiency benefits.

Early replacement. Utilities could consider adopting dual baselines when calculating savings from measures replaced before the end of their useful life to ensure savings are accurate. In considering such a decision, utilities should balance the incremental improvement in savings accuracy with the incremental cost to evaluate and implement a dual baseline approach to savings.

Free-ridership and spillover. In the short term, utilities should monitor free-ridership, spillover, and market transformation through New Hampshire-specific EM&V studies and through similar studies from other states. Over time, utilities should re-evaluate their approach to free-ridership, spillover, and market transformation and decide whether and how to better account for these impacts in their cost-effectiveness analyses.

2. INTRODUCTION

2.1. Background

Energy efficiency programs have existed in New Hampshire since the 1980s. In 2017, New Hampshire utilities jointly prepared, and the Commission approved, the state's first three-year energy efficiency plan to meet the energy efficiency resource standard, covering 2018 through 2020 (2018–2020 Plan).[8] New Hampshire utilities are required to file annual updates to the three-year plans. In 2018, they updated the 2019 plan year of the 2018–2020 Plan (2019 Update), and stakeholders entered into a settlement agreement to resolve issues pertaining to the update (2019 Settlement).[9] The utilities submitted an update for program year 2020 (2020 Update) to the Commission in September 2019.[10]

The 2019 Settlement included a requirement to analyze the cost-effectiveness test applied to energy efficiency resources. Through the agreement, the signatories stipulated:[11]

> In early 2019, the EM&V [Evaluation, Measurement, and Verification] Working Group will solicit and hire a consultant to conduct a review of issues relating to the cost-effectiveness test for energy efficiency programs in accordance with the framework established in the National Standard Practice Manual ("NSPM"). The NSPM, and more specifically the Resource Value Framework, is intended to provide a standardized method for analyzing energy efficiency costs and benefits in light of state policy goals. The NSPM consultant will be charged with reviewing the application of such methods in New Hampshire. The consultant will be selected and managed by the EM&V Working Group. Discussions regarding stakeholder input to the NSPM review and its findings, as well as whether or how to incorporate those findings in New Hampshire, shall be

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8 New Hampshire's utilities are Liberty Utilities (Granite State Electric) Corp. d/b/a Liberty Utilities (Liberty or LU), New Hampshire Electric Cooperative, Inc. (NHEC), Public Service Company of New Hampshire d/b/a Eversource Energy (Eversource or ES), Unitil Energy Systems, Inc. (Unitil or UES), and EnergyNorth Natural Gas, Inc. d/b/a Liberty Utilities and Northern Utilities, Inc.

See Docket DE 17-136, available at https://www.puc.nh.gov/Regulatory/Docketbk/2017/17-136.html.

Note that 2017 was a one-year transition of the EERS to the three-year plan.

9 "New Hampshire Statewide Energy Efficiency Plan, 2019 Update," Docket DE 17-136, September 14, 2018, available at https://www.puc.nh.gov/Regulatory/Docketbk/2017/17-136/LETTERS-MEMOS-TARIFFS/17-136_2018-09-14_EVERSOURCE_UPDATED_EE_PLAN.PDF.

10 "New Hampshire Statewide Energy Efficiency Plan, 2020 Update," Docket DE 17-136, September 13, 2019, available at http://www.puc.state.nh.us/Regulatory/Docketbk/2017/17-136/LETTERS-MEMOS-TARIFFS/17-136_2019-09-13_EVERSOURCE_UPDATED_EE_PLAN.PDF.

11 "2018-2020 New Hampshire Statewide Energy Efficiency Plan, Settlement Agreement," Docket No. DE 17-136, December 13, 2018, pages 11-12, available at https://www.puc.nh.gov/Regulatory/Docketbk/2017/17-136/LETTERS-MEMOS-TARIFFS/17-136_2018-12-13_EVERSOURCE_SETTLEMENT_AGREEMENT.PDF

The scope of the B/C Working Group is defined in Commission Order Nos. 26,095 and 26,207 in Docket DE 17-136.

In a Secretary letter dated September 5, 2019, the Commission approved an extension of the filing deadline to October 31, 2019.

> undertaken in the B/C Working Group meetings... The Settling Parties anticipate the B/C Working Group will submit a report to the Commission which will include recommendations for incorporation of any relevant findings from the NSPM review. The Settling Parties agree to cooperate in good faith to complete the work of the B/C Working Group and to seek a Commission decision on the recommendation of the B/C Working group for issuance in August 2019. No Settling Party shall be bound by the recommendations of the B/C Working Group and each Settling Party may make its own recommendations to the Commission concerning the findings of the NSPM review.

After a competitive solicitation, the EM&V Working Group selected Synapse to review issues relating to the cost-effectiveness test. During Spring and Summer 2019, Commission Staff facilitated a working group process with technical assistance from Synapse that identified New Hampshire's existing energy efficiency policy and developed an energy efficiency cost-effectiveness screening framework that more accurately reflects those policies. In this report, Synapse explains that process, summarizes B/C Working Group members' views, and recommends modifications to New Hampshire energy efficiency cost-effectiveness practices.

2.2. The National Standard Practice Manual

Released in May 2017, the NSPM is a publication of the National Efficiency Screening Project (NESP), a group of organizations and individuals working to update and improve the way that utility customer-funded electric and gas energy efficiency resources are assessed for cost-effectiveness and compared to other resource investments.[12]

The NSPM provides a comprehensive framework for assessing the cost-effectiveness of energy efficiency resources. It incorporates lessons learned in the nearly two decades since the last update to its precursor, the California Standard Practice Manual, responds to current needs, and addresses the relevant policies and goals of each state undertaking efficiency investments.

Universal Principles

The NSPM focuses on six principles that encompass the perspective of a state's applicable policy objectives and are consistent with sound economic and regulatory practices. Table 3 summarizes these six universal principles.

[12] The NSPM was prepared by Tim Woolf (Synapse Energy Economics), Chris Neme (Energy Futures Group), Marty Kushler (American Council for an Energy-Efficient Economy), Steven R. Schiller (Schiller Associates), and Tom Eckman (Consultant, formerly with Northwest Power & Conservation Council). The NSPM was reviewed by a stakeholder committee of approximately 50 representatives, including public utilities commission staff, U.S. Department of Energy staff, U.S. Environmental Protection Agency staff, consulting firms, efficiency program implementers, and several non-profit organizations.

Table 3. NSPM's universal principles

Efficiency as a resource	Energy efficiency is one of many resources that can be deployed to meet customers' needs, and therefore should be compared with other energy resources (both supply-side and demand-side) in a consistent and comprehensive manner.
Policy goals	A jurisdiction's primary cost-effectiveness test should account for its energy and other applicable policy goals and objectives. These goals and objectives may be articulated in legislation, commission orders, regulations, advisory board decisions, guidelines, etc., and are often dynamic and evolving.
Hard-to-quantify impacts	Cost-effectiveness practices should account for all relevant, substantive impacts (as identified based on policy goals), even those that are difficult to quantify and monetize. Using best-available information, proxies, alternative thresholds, or qualitative considerations to approximate hard-to-monetize impacts is preferable to assuming those costs and benefits do not exist or have no value.
Symmetry	Cost-effectiveness practices should be symmetrical, where both costs and benefits are included for each relevant type of impact.
Forward-looking analysis	Analysis of the impacts of resource investments should be forward-looking, capturing the difference between costs and benefits that would occur over the life of the subject resources as compared to the costs and benefits that would occur absent the resource investments.
Transparency	Cost-effectiveness practices should be completely transparent and should fully document all relevant inputs, assumptions, methodologies, and results.

Source: NESP, 2017, page 9.

The Resource Value Framework

At the heart of the NSPM is the Resource Value Framework, which can be used to define a state's primary cost-effectiveness test for energy efficiency resources. The primary test should answer this fundamental question: Which efficiency resources have benefits that exceed costs, where the benefits and costs are defined by the state's applicable policy goals?

The NSPM also addresses the use of secondary tests in addition to a primary test. Secondary tests can help stakeholders address other important questions such as how much utility customers should be expected to pay for a resource that is cost-effective under the primary test, which programs to prioritize if it is not possible to pursue all cost-effective efficiency, and if there should be constraints on key program design features (e.g., financial incentive levels).

The Resource Value Framework provides a series of seven steps to help construct a state's primary cost-effectiveness test. In some cases, the steps—shown in Table 4—align directly with one of the universal principles.

Table 4. The Resource Value Framework steps

1	Identify and articulate the jurisdiction's applicable policy goals
2	Include all the utility system costs and benefits
3	Decide which non-utility impacts to include in the test, based on applicable policy goals
4	Ensure that the test is symmetrical in considering both costs and benefits
5	Ensure the analysis is forward-looking and incremental
6	Develop methodologies to account for all relevant impacts, including hard-to-quantify impacts
7	Ensure transparency in presenting the inputs and results of the cost-effectiveness test

Source: NESP, 2017, Figure 2, page 18.

2.3. Methodology

The Resource Value Framework is intended to define a state's primary cost-effectiveness test. Therefore, applying the NSPM's framework is likely to result in a new cost-effectiveness test, or at least a modified version of the current cost-effectiveness test. Throughout this report we refer to this potential new test as the Granite State Test, as dubbed by B/C Working Group members.

B/C Working Group Process

Synapse and the B/C Working Group worked closely on the application of the Resource Value Framework to develop recommendations for New Hampshire's primary cost-effectiveness test. The B/C Working Group met once a month from March through September 2019.

The cost-effectiveness evaluation process was open to all B/C Working Group participants, other interested stakeholders, and members of the public. Members who actively engaged in the process included representatives from Commission Staff and their consultants, the Office of Consumer Advocate (OCA), the Department of Environmental Services (DES), Eversource Energy, Liberty Utilities, Unitil Energy Systems, the New Hampshire Electric Cooperative, New Hampshire Legal Assistance (NHLA), Conservation Law Foundation (CLF), and Acadia Center. Each of these stakeholders provided viewpoints regarding the value of efficiency resources in the context of New Hampshire's policy goals.

B/C Working Group discussions focused on which costs and benefits to include in a primary and/or secondary cost-effectiveness test. Synapse created a policy and impact matrix to organize stakeholder feedback on policies, cost and benefit impacts, and other test inputs. Synapse developed the tool based on frameworks provided in NSPM and NESP's Database of State Efficiency Screening Practices (DSESP),[13] but we modified those frameworks to incorporate New Hampshire's policies related to, or which impact, energy efficiency. This tool was particularly helpful in implementing Steps 1 through 3 of the Resource Value Framework.

[13] Available at https://nationalefficiencyscreening.org/state-database-dsesp/.

Summarizing Recommendations and Next Steps

In this report, Synapse provides its recommendations to the Commission on cost-effectiveness practices for New Hampshire. Synapse bases its recommendations on the NSPM and the B/C Working Group's input and discussions. Where stakeholders unanimously agreed on an aspect of the cost-effectiveness framework, Synapse supports the B/C Working Group's decision and recommends the Commission also agree with stakeholders. Where stakeholders disagreed on a decision, we summarize the arguments supporting and opposing the contested decision, then provide Synapse's recommendations on the issue. Stakeholders' opinions and responses are presented anonymously throughout the report.

New Hampshire stakeholders provided important viewpoints regarding the value of energy efficiency in the context of the state's policy goals.

In conjunction with this report, the B/C Working Group is expected to provide the Commission with recommendations for incorporation of any relevant findings from this NSPM review. All parties reserve the right to provide alternative opinions and recommendations to the Commission during its review of the report.

This report is expected to be submitted to the Commission in October 2019, followed by a determination by the Commission in advance of the 2021–2023 Plan development, a draft of which is due in April 2020 with a final draft due in July 2020.

2.4. Current Cost-Effectiveness Test

New Hampshire utilities currently apply a modified version of the Total Resource Cost (TRC) test to evaluate the cost-effectiveness of energy efficiency programs.[14,15] The TRC test generally accounts for a program's costs and benefits to the utility and the customers participating in the programs. In Figure 2 we summarize the costs and benefits currently included in the New Hampshire TRC test.

Most utility system avoided costs in the New Hampshire TRC test are based on statewide values, calculated via the Avoided Energy Supply Components (AESC) study, including energy, capacity,

[14] The New Hampshire TRC test is a modification of a theoretical application of the TRC test because the New Hampshire TRC test does not include all utility system impacts. The utility system impacts not included in the New Hampshire TRC test are avoided ancillary services, avoided credit and collection costs, increased reliability, and market transformation.

[15] See 1999 New Hampshire Energy Efficiency Working Group, "Report to the New Hampshire Public Utilities Commission on Ratepayer-Funded Energy Efficiency Issues in New Hampshire," Docket No. DR 96-150, July 6, 1999, available at https://www.puc.nh.gov/Electric/96-150%20%20NH%20Energy%20Efficiency%20Working%20Group%20Final%20Report%20(1999).pdf, which was adopted by the Commission in Public Utilities Commission of New Hampshire, "Order Establishing Guidelines for Post-Competition Energy Efficiency Programs," Order No. 23,574, November 1, 2000, page 14, available at https://www.puc.nh.gov/Regulatory/Orders/2000ords/23574e.pdf.

transmission, and other avoided costs.[16] The avoided energy costs account for the avoided cost of complying with environmental regulations by accounting for the impact of Regional Greenhouse Gas Initiative's (RGGI) on energy prices. The few utility system avoided costs not included in AESC are avoided distribution costs and line losses for transmission and distribution (T&D), which the utilities calculate based on utility-specific values.[17] The Commission approves the avoided costs when it approves the energy efficiency plan.[18]

Since 2018, the utilities have accounted for participant non-energy impacts (NEIs) using a 10 percent adder applied to total benefits excluding water benefits. The adder is intended to capture "the full value of a multitude of known NEIs."[19] For income eligible programs, the utilities apply an additional 10 percent adder (for a total of 20 percent) to energy benefits to reflect benefits unique to income eligible participants. The utilities included this additional low-income adder for the first time in the 2019 Update. Studies are currently underway to determine evidence-based, New Hampshire-specific NEIs (see Chapter 8.3).

In addition to participant benefits associated with regulated fuels, New Hampshire utilities incorporate participant benefits from saving water, oil, propane, wood, and kerosene using avoided costs from AESC to monetize the values.

The utilities also adopted the RGGI dollar per ton carbon dioxide value for electricity generation as a proxy for environmental impacts from end-uses that are fueled by natural gas, oil, or propane. Synapse considers this benefit an environmental impact (i.e., an environmental externality) rather than an embedded utility system cost for fossil fuel end-uses, although it does not capture the full range of environmental impacts associated with fossil fuel end-uses.[20]

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16 Synapse Energy Economics, "Avoided Energy Supply Components in New England: 2018 Report," amended October 24, 2018, Appendix B, available at https://www.synapse-energy.com/sites/default/files/AESC-2018-17-080-Oct-ReRelease.pdf (AESC 2018).

17 NH Utilities, "2017 New Hampshire Statewide Energy Efficiency Plan," Docket DE 14-216, September 23, 2016, Attachment C, page 2 of 3, available at http://puc.nh.gov/Regulatory/Docketbk/2014/14-216/LETTERS-MEMOS-TARIFFS/14-216_2016-09-26_NH_UTILITIES_2017_NH_STATEWIDE_EE_PLAN.PDF.

18 NH Utilities, "2018-2020 New Hampshire Statewide Energy Efficiency Plan," Docket DE 17-136, January 12, 2018, page 147, available at https://www.puc.nh.gov/Regulatory/Docketbk/2017/17-136/LETTERS-MEMOS-TARIFFS/17-136_2018-01-12_NH_UTILITIES_REV_EERS_PLAN.PDF.

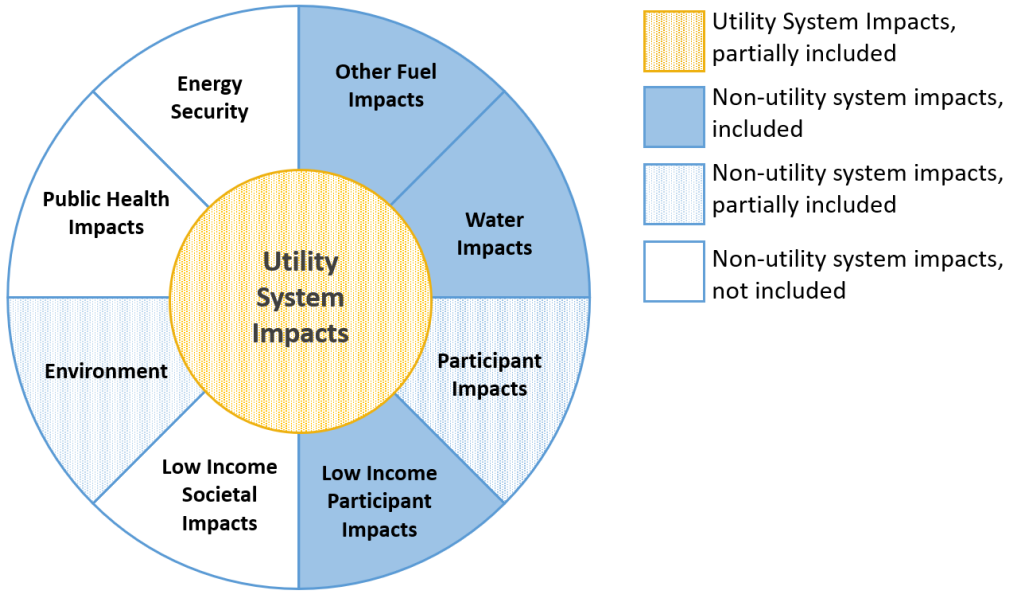
19 NH Utilities, "2018-2020 New Hampshire Statewide Energy Efficiency Plan," Docket DE 17-136, January 12, 2018, page 144.

20 As stated in the 2019 Settlement: "the value of environmental benefits from fossil fuel savings shall be included as an avoided cost of the program, and will be a function of: (1) the amount of carbon emissions by fuel type; and (2) the value per ton of avoided carbon emissions associated with the Regional Greenhouse Gas Initiative ("RGGI") auction estimates included in AESC 2018."

"2018-2020 New Hampshire Statewide Energy Efficiency Plan, Settlement Agreement," Docket No. DE 17-136, December 13, 2018, pages 16, available at https://www.puc.nh.gov/Regulatory/Docketbk/2017/17-136/LETTERS-MEMOS-TARIFFS/17-136_2018-12-13_EVERSOURCE_SETTLEMENT_AGREEMENT.PDF

The utilities calculate the benefits of each measure throughout its measure life, with a maximum evaluation period of 25 years. The utilities apply a low-risk real discount rate throughout the evaluation period, which was 2.4 percent for the 2018–2020 Plan.

Figure 2. Current New Hampshire TRC test impacts



Source: 2019 B/C Working Group discussions.
Notes: The utilities partially account for participant non-energy benefits through a percentage adder in the current New Hampshire TRC Test. The utilities partially account for environmental externalities through a New Hampshire-specific fossil fuel proxy.

2.5. Application to Other Types of Distributed Energy Resources

B/C Working Group members discussed how the cost-effectiveness tests for energy efficiency would or should influence the cost-effectiveness tests for other types of distributed energy resources (DERs). The B/C Working Group agreed that it is beyond the scope of this report to answer DER cost-effectiveness questions. Nonetheless, we offer some thoughts to help stakeholders understand how cost-effectiveness tests for energy efficiency could be related to tests for other types of DERs in *Appendix C: Other Distributed Energy Resources*.

3. Application of the Resource Value Framework to New Hampshire

In this chapter, guided by the NSPM and based on discussions and feedback from the B/C Working Group, we apply the seven steps of the Resource Value Framework.

3.1. Identify Applicable Policy Goals

New Hampshire has many laws, statutes, rules, and Commission orders related to the creation and development of efficiency programs, the application and evaluation of cost-effectiveness, and broader state energy policy goals. These policies have evolved over time to reflect changing conditions and priorities for New Hampshire lawmakers and stakeholders.

B/C Working Group members gathered a comprehensive list of New Hampshire's current energy laws and statutes, Commission orders, and other policies related to energy goals and energy efficiency resources. Members then indicated which policy goals they felt were reflected in each of the gathered state policies. *Appendix A: Policies Reviewed by the B/C Working Group* provides the list of policies identified and reviewed by stakeholders during this step. In Table 5, we present the policy goals related to energy efficiency resources.

This documentation process identified the relevance of certain policy goals to efficiency cost-effectiveness assessment. The exercise provided a platform from which members could identify priorities and gaps and determine appropriate costs and benefits to include in the primary test. The resulting discussion of New Hampshire's applicable policy goals was key to stakeholders identifying the relevant costs and benefits for the Granite State Test and Secondary Granite State Test.[21]

Table 5. Policy goals reviewed by B/C Working Group members

Policy Goal	Definition
Least-cost	Implement resources with the lowest costs; or, prioritize energy efficiency because it is a least-cost resource
Affordability	Reductions in the magnitude and volatility of customers' rates and bills
Fuel diversity	Multiple fuels and resources to meet the supply and demand of the electric grid
Risk	Utility system risk reduction resulting from efficiency resources
Reliability	Reduced probability and/or duration of customer service interruptions
Income eligible	Programs and mechanisms that assist customers with low incomes to manage and afford energy
Customer choice	Markets and products that provide customers with multiple options for electricity goods and services
Environment	The range of environmental costs and benefits that result from efficiency resources

[21] NESP, 2017, pages 19-20.

Policy Goal	Definition
Economic development	Economic development and jobs that are associated with investment in energy efficiency, including job creation and increases in disposable income resulting from energy bill savings for customers
Public health	The range of public health impacts resulting from efficiency resources
Competitive markets	Markets with multiple, competing providers of goods and services, with few barriers for new entry into the market

Source: 2019 B/C Working Group discussions. See also NESP, DSESP.

3.2. Include All Utility System Impacts

Utility system impacts represent the entire utility structure used to provide electric or gas service to retail customers. In the case of electric utilities, this includes the generation, transmission, and distribution of electricity services. In the case of gas utilities, this includes the transportation, storage, and distribution of gas services.

As the NSPM authors indicate, utility system impacts provide the foundation for any cost-effectiveness test. A test that includes all utility system impacts indicates the extent to which total utility system costs will be reduced (or increased) by efficiency resources. This approach is consistent with the NSPM's first universal principle to treat energy efficiency as a resource.

Utility system avoided costs are one of the most important inputs to any cost-effectiveness analysis of energy efficiency resources and will significantly affect results. It is essential to ensure avoided cost estimates are comprehensive, up-to-date, informed by stakeholders, and ultimately reviewed and approved by regulators.[22]

B/C Working Group Discussion

In Table 6, we define the utility system impacts identified in the NSPM and reviewed by the B/C Working Group. This list is from the NSPM and may not represent the full range of utility system impacts that energy efficiency programs produce.

Ultimately, the B/C Working Group supported inclusion of all utility system impacts in the Granite State Test, including those impacts not included in the New Hampshire TRC test (e.g., avoided ancillary services, avoided credit and collection costs, increased reliability, and market transformation).

Some B/C Working Group members initially hesitated to support inclusion of avoided ancillary services, increased reliability, and market transformation impacts. The New Hampshire utilities do not include these impacts in the current New Hampshire TRC test, and some stakeholders preferred to first understand how their values would be determined before they could support their inclusion in the

[22] NESP, 2017, pages 21-22.

primary test. Some stakeholders rationalized that the impacts are difficult to quantify and/or too small and not worth the expenditures to study.[23]

Table 6. Definition of utility system impacts reviewed by B/C Working Group members

Impact	Definition
Utility System Costs	
Measure costs (utility portion)	The utility's share of the incremental cost of energy efficient measures relative to baseline measures (e.g., the incentive, rebates, or markdowns received by participating customers).
Other financial or technical support costs	Includes payments to support trade ally reporting on sales of efficient products or funding/co-funding of marketing of efficient products by trade allies.
Other program and administrative costs	Includes the additional costs of utility outreach to trade allies, technical training, other forms of technical support, marketing, and the administration and management of efficiency programs and/or portfolios of programs.
EM&V costs	The costs of the analysis of markets for efficiency products and services to inform design of efficiency reform and/or the costs of retrospective assessment of effectiveness of efficiency programs.
Performance incentives	Payments utilities in regulated utility systems receive for meeting specific performance metrics related to success of efficiency programs.
Utility System Benefits	
Avoided energy costs	Value of avoiding generation or purchase of electric energy and/or natural gas resulting from investments in efficiency.
Avoided generating capacity costs	Value of reduction due to savings from efficiency resources of money invested in electric generating capacity.
Avoided reserves	Value of reduction in reserve capacity requirements due to efficiency resources.
Avoided transmission costs	Value of load reduction on transmission system due to efficiency resources.
Avoided distribution costs	Value of load reduction on distribution system due to efficiency resources.
Avoided T&D line losses	Value of avoided line losses realized from efficiency resources.
Avoided ancillary services	Value of reduction in services required to maintain electric grid stability and security.
Price suppression effects (DRIPE)	Reduced market clearing prices resulting from efficiency resources; because of the regional nature of the wholesale markets, this impact may extend beyond state boundaries (interstate) or be within state boundaries (intrastate).
Avoided compliance with RPS requirements	Reduction in absolute amount of renewable resources that must be purchased resulting from efficiency.

[23] These impacts can be accounted for in several different ways. For example, risk impacts can be calculated through wholesale market risk premiums, discount rates, probabilistic forecasting techniques, and more. For the purpose of developing a cost-effectiveness test, the key decision is *whether* to account for an impact. Determining the appropriate methodologies to account for the impact, including the need to prevent double-counting or under-counting, is a separate step in the Resource Value Framework process and is discussed in Chapter 3.6.

Impact	Definition
Avoided environmental compliance costs (embedded)	Reduction in future costs of complying with environmental regulations from efficiency, which reduces the amount of energy that needs to be generated.
Avoided credit and collection costs	Value of reduced probability of customers falling behind or defaulting on bill payment obligations as a result of lowered energy use and customer energy bills from efficiency programs.
Reduced risk	Efficiency resources can reduce utility system risk in several ways. Key among them are: creating a more diverse portfolio of resources that can meet customers' energy needs (all other things being equal, diversity reduces risk); reducing uncertainty in forecasts of future loads and related capital investment needs; and reducing exposure to potential future fuel price volatility associated with other resource types (particularly natural gas, oil, and/or coal-fired generation). Also, as a resource that can be implemented in many relatively small increments, efficiency resources provide more optionality than large supply-side facilities.
Increased reliability	Value of reduced probability and/or likely duration of customer service interruptions from efficiency, which lowers loads on the grid.
Market transformation	Value of a reduction in market barriers resulting from a market intervention, as evidenced by market effects that last after the intervention has been withdrawn, reduced, or changed. Strategic market interventions targeting improvements in energy efficiency can successfully change the utility system and other markets by reducing energy and demand. Market transformation can include spillover and free-rider impacts.[24]

Sources: NESP, DSESP; 2019 B/C Working Group discussions; ACEEE, "Transforming Energy Efficiency Markets: Lessons Learned and Next Steps," December 2017, available at https://aceee.org/research-report/u1715.

Recommendations

Consistent with the B/C Working Group's discussion, Synapse recommends utilities include all utility system impacts in the Granite State Test. According to the NSPM, all utility system impacts should be included as part of a state's primary and secondary tests. Utility system impacts do not need to be justified by a state-specific policy to support its inclusion in a state's cost-effectiveness tests because they represent the direct costs and benefits to the customers that provide the funds for the energy efficiency resources.

[24] Market transformation can potentially affect the utility system, participants, and society. An energy efficiency resource that is implemented as a result of market transformation will affect the utility system, participants, and society in much the same way as if it were directly implemented through an energy efficiency program. We choose to include market transformation among the utility system impacts to be clear that at least the utility system impacts of market transformation should be included in the Utility Cost Test. The other impacts should be included in the other tests, to the extent that they exist, and the participant and societal impacts are included in other tests.

Some B/C Working Group members raised concerns about whether to account for impacts such as market transformation and increased reliability because they are difficult to quantify, or likely to be small, or both. According to the NSPM, the fact that an impact is likely to be small or is hard to quantify does not justify excluding it from the primary test. *How* to include an impact is a separate question from *whether* to include an impact in a cost-effectiveness test. In Chapter 3.6 we address methodologies for how to account for impacts in the primary test, including those impacts not currently included in the New Hampshire TRC test.

How to include an impact is a separate question from *whether* to include an impact in a cost-effectiveness test.

3.3. Decide on Non-Utility System Impacts

Step 3 of the Resource Value Framework recommends that stakeholders consider which non-utility costs and benefits to include in the primary test, based on applicable, state-specific policy goals.[25]

Throughout this section, it is important to remember that the decision of whether to include a non-utility system impact in the primary cost-effectiveness test should be based on the state's existing policy guidance. Where B/C Working Group members unanimously or almost unanimously interpreted existing policy guidance to suggest that a non-utility system impact should be included in the primary test, Synapse recommends those impacts be included in the Granite State Test.

B/C Working Group Discussion

Consistent with the NSPM, B/C Working Group members took a similar approach to Step 3 as Step 1. Each member indicated which non-utility system costs and benefits they felt were reflected in the gathered list of state policies provided in *Appendix A: Policies Reviewed by the B/C Working Group*.[26]

In Table 7 we present the non-utility system impacts reviewed by the B/C Working Group. This list is from the NSPM and is not intended to represent the full range of non-utility system impacts that energy efficiency programs produce, especially for participant non-energy impacts.[27]

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25 NESP, 2017, page 23.

26 B/C Working Group members discussed New Hampshire's precedent for including certain non-utility system impacts, especially participant impacts. Stakeholders agreed that precedent is important and relevant when applying the Resource Value Framework. However, this study is intended to review the primary test starting with a "fresh slate" within the constraints of relevant statutes. Stakeholders agreed to consider what makes the most sense going forward based on the state's current statutory and policy framework.

27 In some cases, especially with income eligible projects, the New Hampshire utilities implement SBC-funded programs in conjunction with programs funded through other revenue streams, such as federal weatherization assistance programs. In such instances, the utilities only claim the portion of savings attributable to the SBC-funded program. For example, if federal weatherization assistance funding covers 20 percent of attic insulation and a utility pays the remaining 80 percent using SBC funds, then the utility claims 80 percent of the measure's savings.

Table 7. Non-utility system impacts reviewed by B/C Working Group members

Non-Utility System Impact	Definition
Other fuels	Lifetime costs and benefits from changes in consumption of energy sources other than the energy source through which the efficiency program is funded.
Water resource	Costs and benefits associated with changes in water consumption and wastewater treatment resulting from efficiency resources.
Income eligible impacts (participant)	Similar in category but often different in value and magnitude to the participant non-energy benefits for non-income eligible residential customers.
Income eligible impacts (societal)	Range of low-income community or societal impacts that go beyond those realized by program participants resulting from efficiency programs, could stop at state borders or extend beyond them. Impacts can include, but are not limited to, poverty alleviation, improving income eligible community strength and resiliency, fewer home foreclosures, and reduced Medicaid payments.
Participant costs	The efficiency programs participant's share of the incremental cost of the energy efficiency measure relative to the baseline measure cost.
Participant non-energy benefits	Efficiency program participants experience several types of costs and benefits beyond electric and gas bill savings. A sample of commonly referenced participant non-energy benefits are provided below, although participants may accrue additional benefits.
	Asset value – includes equipment functionality/performance improvement, equipment life extension, change in building value, change in ease of selling building.
	Productivity – includes changes in labor costs and productivity, waste streams, spoilage/defects, operations and maintenance, and impacts of changes in aesthetics, comfort, etc. on product sales.
	Economic well-being – includes fewer bill-related calls to utility, reduced foreclosures, fewer moves, greater sense of "control" over economic situation.
	Comfort – includes thermal comfort, noise reduction, improved light quality.
	Health and safety – includes improved "well-being" due to reduced incidence of illness, reduced medical costs, fewer sick days, reduced deaths, reduced insurance costs (e.g. from reduced fire risk).
	Satisfaction/pride – includes improved sense of self-sufficiency, contribution to addressing environmental/other societal concerns.
Environmental, NH fossil fuel proxy	This impact is specific to New Hampshire. The New Hampshire utilities adopt the Regional Greenhouse Gas Initiative's dollar per ton carbon dioxide value for electricity generation and use it as a proxy for environmental impacts from fossil fuel end-uses. The impact is calculated as the product of (1) the amount of carbon emissions by fuel type, and (2) the value per ton of avoided carbon emissions associated with RGGI estimates. This value does not capture any environmental externality impacts of electricity end-uses, nor does it capture the full range of environmental externality impacts of fossil fuel end-uses. B/C Working Group members explained that, even though RGGI represents an embedded cost and the proxy is meant to represent a non-embedded cost, New Hampshire stakeholders added this impact to better ensure symmetry in the benefits for electric and other fuel savings.[28]

[28] "2018-2020 New Hampshire Statewide Energy Efficiency Plan, Settlement Agreement," Docket No. DE 17-136, December 13, 2018, pages 16, available at https://www.puc.nh.gov/Regulatory/Docketbk/2017/17-136/LETTERS-MEMOS-TARIFFS/17-136_2018-12-13_EVERSOURCE_SETTLEMENT_AGREEMENT.PDF

Non-Utility System Impact	Definition
Environmental, other externalities	The range of environmental impacts that energy efficiency resources provide, which are above and beyond the avoided costs of complying with existing or expected environmental regulations which are embedded in AESC's avoided energy costs. There are a wide range of environmental impacts, including reductions in air emissions associated with fossil fuel combustion; the disposal costs of waste from various energy sources (nuclear, coal ash, etc.); the amount of water needed for cooling electric generating stations, extracting natural gas (e.g., "fracking") and other purposes; the amount of land that must be cleared or developed for new generating facilities; and adverse impacts on land, air, and water from fossil fuel mining or extraction. Negative environmental impacts include additional waste streams and/or emissions from the production, use, and disposal of efficient products. When estimating values for environmental externalities, it is important to ensure impacts are not double counted with participant impacts or public health impacts.
Public health	The range of public health impacts resulting from efficiency resources. Such impacts are distinct from participant non-energy impacts and environmental impacts. Energy efficiency resources can reduce the frequency and/or severity of health problems of populations impacted by pollution from supply-side resources (including fuel extraction and combustion), which can reduce society's investment in medical facility infrastructure and the health, well-being, and economic productivity of the impacted population. Examples include, but are not limited to, reducing the number of premature deaths, incidences of respiratory and cardiovascular illnesses, and missed work and school days for society. When estimating values for public health impacts, it is important to ensure impacts are not double counted with participant impacts or environmental impacts.
Energy security	Energy efficiency resources can reduce imports of various forms of energy, which can increase state and national energy independence and energy security.

Sources: NESP, DSESP; 2019 B/C Working Group discussions.

After reviewing state policy and discussing at B/C Working Group meetings, stakeholders indicated their support for including or excluding each non-utility system impact in a primary or secondary cost-effectiveness test. We summarize that review in Table 8.

- *Strong* support indicates that stakeholders found clear policy evidence in New Hampshire statutes to support including the impact, and they unanimously agreed to include the impact in the primary and secondary tests.

- *Moderate* support indicates that stakeholders found enough policy evidence to support including the impact in a secondary test but could not agree or justify including it in a primary test. Stakeholders favored this approach because New Hampshire policy was not explicit enough to include the impact in a primary test or there was a lack of justification to shift from historical practice.

"2018-2020 New Hampshire Statewide Energy Efficiency Plan, Settlement Agreement," Docket No. DE 17-136, December 13, 2018, pages 16, available at https://www.puc.nh.gov/Regulatory/Docketbk/2017/17-136/LETTERS-MEMOS-TARIFFS/17-136_2018-12-13_EVERSOURCE_SETTLEMENT_AGREEMENT.PDF

- *Insufficient* support indicates that stakeholders did not find policy evidence to include the impact in a primary or secondary test.

Table 8. Stakeholder support for including non-utility system impacts in primary or secondary tests

Non-Utility System Impact	Stakeholder Support	Test to Include the Impact
Other fuel	Strong	Primary and secondary
Water resource	Strong	Primary and secondary
Income eligible impacts (participant)	Strong	Primary and secondary
Environmental, NH fossil fuel proxy	Strong	Primary and secondary
Income eligible impacts (societal)	Moderate	Secondary only
Participant costs and non-energy benefits	Moderate	Secondary only
Environmental, other externalities	Moderate	Secondary only
Economic development and jobs	Moderate	Account for separately
Public health	Insufficient	Do not include
Energy security	Insufficient	Do not include

Source: 2019 B/C Working Group discussions.

Non-Utility System Impact Discussion

This section summarizes the B/C Working Group discussions regarding the non-utility system impacts that received either moderate or insufficient support from stakeholders.

Throughout the B/C Working Group discussions, stakeholders raised arguments related to calculating certain impacts (e.g., the impact is too difficult to quantify and thus should not be included in the primary test). As the NSPM authors maintain, the fact that an impact is likely to be small or is hard to quantify does not justify excluding it from a cost-effectiveness test. We have removed those arguments from this summary and address calculation methodologies in Chapter 3.6.

Participant costs and non-energy benefits

In general, deciding whether to include participant impacts in the primary cost-effectiveness test can be one of the most challenging decisions stakeholders face. State policy directives rarely provide explicit guidance on whether to include participant costs and benefits, which is the case in New Hampshire. It is important that stakeholders and regulators recognize two overarching points when considering whether to include participant impacts in the primary test:

1. The decision of whether to include participant impacts in the primary cost-effectiveness test is a policy-driven decision that should be based on the state's statutory and policy framework. Stakeholders and regulators may choose to include participant impacts in the primary test if they determine that doing so is consistent with the state's policy goals.
2. If stakeholders decide to include participant costs in any cost-effectiveness test, the test must also include participant benefits, including non-energy benefits, and vice versa. This is necessary to ensure symmetrical treatment of participant impacts.

The following arguments were presented by some stakeholders to support including participant impacts in the Granite State Test.

- Energy efficiency programs are funded by customers and the utilities design the programs to best serve participating customers. The participating customers' perspective should be reflected in the primary test.
- There is value to stakeholders in knowing how participants are impacted by energy efficiency programs.
- The Commission has a long history of requiring utilities to include participant impacts in the primary test. Stakeholders will need strong justification for deviating from past precedent.
- If participant impacts are not included in the primary test, stakeholders will be less motivated to study participant impacts and will prioritize other research.
- If participant impacts are removed, stakeholders could send the wrong message to the broader energy efficiency community that they no longer value participant benefits.

The following arguments were presented by some stakeholders to support excluding participant impacts from the Granite State Test.

- Stakeholders should consider all customers who fund energy efficiency programs and benefit from utility system impacts. The utilities would better serve all customers—program participants *and* non-participants—by focusing on utility system costs and benefits.
- Ratepayer funding should not be used to achieve participant or societal benefits that are too far attenuated from the source of that funding.
- Participant impacts should not determine whether ratepayers fund an energy efficiency program.
- Few New Hampshire statutes clearly indicate that utilities should include participant impacts in the primary test. No New Hampshire statute requires that programs funded by a system benefits charge (SBC) consider participant impacts.[29]
- It takes more time for utilities to quantify participant benefits than it does to quantify participant costs, especially for new measures or technologies. Without a full accounting of benefits when a measure is first offered, test results can be biased. If costs are correctly and quickly calculated but benefits are not, that violates the NSPM's symmetry principle.

[29] RSA 374-G requires consideration of participant impacts for utility-owned DERs, which are not funded by the SBC or administered as part of the energy efficiency programs.

- Participants should be responsible for weighing the costs and benefits of their participation in energy efficiency programs. Participants are best suited to estimate the value of non-energy benefits and can determine whether those benefits outweigh the cost to participate. Utilities are better suited to determining utility system costs and benefits because they have the best understanding of those values; it is not the utilities' role to place a value on participant benefits.

- Energy efficiency programs are essentially always cost-effective for participating customers, otherwise the customer would not implement the efficiency measures. Therefore, there is no need to ensure net benefits to participants through the primary cost-effectiveness test.

- If B/C Working Group members supported excluding participant impacts, it does not mean those impacts are no longer valued by stakeholders nor does it prevent stakeholders from valuing participant impacts separately for other analyses.

Income eligible (societal)

The following arguments were presented by some stakeholders to support including income eligible societal impacts in the Granite State Test.

- New Hampshire statutes mention protection of income eligible customers. This could be interpreted to mean both participant and societal impacts.

The following arguments were presented by some stakeholders to support excluding income eligible societal impacts from the Granite State Test.

- New Hampshire statutes do not specifically refer to societal benefits for income eligible customers from energy efficiency programs.

- Such impacts are too far attenuated from the revenue source that pays for them. Should ratepayers pay for reducing a burden on society? Taxes are a better funding source for such a policy goal.

- It is not the utilities' role to place a value on such benefits.

Environmental externalities

The following arguments were presented by some stakeholders to support including other environmental externality impacts in the Granite State Test.

- New Hampshire's statutes and orders mention environmental impacts frequently, providing policy support to include them in a primary test.

- Rising greenhouse gas emissions directly attributable to utility systems affect the climate in New England in a way that imposes costs on those system. More frequent and larger storms lead to costly investments to maintain system reliability. Increasing daily average temperature drives peak load growth and leads to costly system investment.

- Energy efficiency is one of the cheapest resources to avoid environmental damages. If utilities included environmental impacts in the primary test, it would encourage greater implementation of this inexpensive resource to reduce greenhouse gas emissions.
- Environmental impacts provide substantial benefits to society and should be accounted for when evaluating cost-effectiveness.

The following arguments were presented by some stakeholders to support excluding other environmental externality impacts from the Granite State Test.

- Ratepayers should not pay to avoid environmental externalities because environmental externalities are global in nature and a reduction in New Hampshire's emissions alone without reciprocity on a global scale will provide limited direct benefits to the utility system and therefore New Hampshire ratepayers.
- Ratepayers should not be required to pay for something like this that is a societal responsibility.

Public health

The following arguments were presented by some stakeholders to support including public health impacts in the Granite State Test.

- New Hampshire's statutes and orders mention public health frequently, providing policy support to include them in a primary test.
- Public health impacts are similar to environmental externality impacts and should be treated consistently in cost-effectiveness testing.
- The New Hampshire legislature recently had the opportunity to remove air impacts from proposed legislation, and chose not to, indicating it is an important consideration to legislatures.

The following arguments were presented by some stakeholders to support excluding public health impacts from the Granite State Test.

- Such impacts are too far attenuated from the revenue source that pays for them. Should ratepayers pay for reducing a burden on society? Taxes are a better funding source for achieving such a policy goal.

Energy security

The following arguments were presented by some stakeholders to support including energy security impacts in the Granite State Test.

- New Hampshire's statutes and orders mention energy security, providing policy support to include them in a primary test.

The following arguments were presented by some stakeholders to support excluding energy security impacts from the Granite State Test.

- Ratepayers should not pay to promote energy security. Such impacts are too far attenuated from the revenue source that pays for them.

Recommendations

Synapse agrees with the B/C Working Group's review of non-utility system impacts based on state policies and the NSPM. Synapse recommends non-utility system impacts be incorporated into the Granite State Test and Secondary Granite State Test as summarized in Table 8.

Strongly supported impacts

B/C Working Group members unanimously agreed to include other fuel, water, income eligible participant, and the New Hampshire-specific environmental fossil fuel impacts in the primary test—all of which are currently included in the New Hampshire TRC test. Because stakeholders agreed there is extensive statutory support for doing so, Synapse recommends these impacts be included in the Granite State Test and Secondary Granite State Test.

Moderately supported impacts

Stakeholders had mixed opinions on whether to include certain non-utility system impacts in the Granite State Test. After weighing New Hampshire's policies with program goals and practical implementation issues, B/C Working Group members did not support including the following impacts in the Granite State Test: participant impacts,[30] income eligible societal impacts, and other environmental externalities impacts. Without robust stakeholder support, Synapse recommends that these impacts not be included in the Granite State Test.

> The decision of whether to include a non-utility system impact in a cost-effectiveness test should be based on the state's existing policy guidance.

Several members of the B/C Working Group supported including the moderately supported impacts as part of a secondary cost-effectiveness test in New Hampshire. Synapse agrees that this is a reasonable way to consider the implications of these impacts in light of New Hampshire policy, and that such an approach is consistent with the NSPM. Secondary cost-effectiveness tests are discussed in Chapter 6.

<u>Environmental externalities</u>

Synapse recommends including other environmental externality impacts in a secondary test, consistent with stakeholder discussions. If at some point in the future New Hampshire policymakers were to

[30] Some stakeholders initially preferred to include participant impacts but after extensive discussion acquiesced to the majority interpretation of that issue.

provide more explicit direction relative to the value of avoided emissions and their role in New Hampshire's least-cost planning process, the Commission should recognize that evolution of policy guidance and consider including those impacts in the primary Granite State Test. Recognizing when an environmental externality affects electricity and gas avoided costs will ensure that the lowest-cost resources, including energy efficiency, will be chosen to minimize costs to ratepayers.

Insufficiently supported impacts

Where stakeholders were not persuaded to include an impact in the primary or secondary test due to lack of clear policy support—for public health and energy security impacts—Synapse recommends excluding those impacts from cost-effectiveness testing in New Hampshire.

3.4. Ensure Impact are Treated Symmetrically

Step 4 of the Resource Value Framework is to ensure the cost-effectiveness tests includes all costs and all benefits associated with each category of impacts. If some costs are inappropriately excluded, the test will be unduly biased in favor of efficiency; if some benefits are inappropriately excluded, the test will be unduly biased against efficiency. If the primary test results in a bias either in favor of or against energy efficiency resources, utilities and stakeholder will misallocate resources, with utility customers incurring higher than necessary costs. This step reflects the importance of applying the NSPM's symmetry principle.[31]

Utility system impacts. The NSPM's first principle is to treat energy efficiency as a resource, which necessitates that a state's primary test includes all utility system impacts. Therefore, the minimum requirement for ensuing symmetry is for utilities to apply all utility system costs and benefits symmetrically in the cost-effectiveness tests.

Participant impacts. Symmetry is especially important when considering participant costs and benefits. Often in states that use the TRC test, utilities include participant costs but either ignore or do not fully account for participant benefits. This leads to benefit-cost results that are skewed against efficiency because benefits are understated, leading to higher utility costs than necessary.

Other non-utility system impacts. The symmetry principle requires that cost-effectiveness tests include both the costs and benefits for each type of non-utility system impact included in the test. For example, if a test accounts for reduced consumption of other fuels, then it should also account for any increased consumption of other fuels. As another example, if a test accounts for increased economic development from the implementation of energy efficiency programs, then it should also account for the reduced economic development from the avoided supply-side investments.

[31] NESP, 2017, page 31.

B/C Working Group members did not discuss symmetry explicitly, although the group considered it during conversations on non-utility system impacts.

Recommendations

All impacts included in the primary or secondary tests should include both positive and negative impacts.

Utility system impacts. Based on the discussion in Chapter 3.2, B/C Working Group members agreed to include all utility system costs and benefits in the Granite State Test and Secondary Granite State Test. This means the New Hampshire utilities should account for avoided ancillary services, avoided credit and collection costs, increased reliability, and market transformation in the Granite State Test, in addition to the utility system costs and benefits the utilities already include in the New Hampshire TRC test.

Participant impacts. Based on the discussion in Chapter 3.3, B/C Working Group members supported excluding participant costs and benefits from the Granite State Test. This results in symmetrical treatment, since both participant costs and benefits will be excluded. However, B/C Working Group members supported including (1) income eligible participant impacts in the primary test and (2) participant impacts in a secondary test. Those impacts should be accounted for symmetrically by including both the participant costs and participant benefits in the relevant tests.[32]

Other non-utility impacts. Synapse recommends the utilities and stakeholders remain cognizant that any non-utility system impacts included in the primary or any secondary tests should be applied symmetrically.

3.5. Account for Long-Term, Forward-Looking, Incremental Impacts

Step 5 of the Resource Value Framework applies the NSPM's principle that cost-effectiveness analyses should be long-term, forward-looking, and incremental. This requires accounting for future, long-run, marginal costs and benefits.

Forward-looking impacts. Cost-effectiveness analyses should only consider forward-looking impacts. Historical (or "sunk") costs should not be included when estimating the impacts of future investment decisions. Historical costs cannot be changed; they will remain in place under any future scenario and therefore are not relevant when comparing future investment scenarios. The lost revenues from energy efficiency resources are not a new cost created by investments in efficiency resources. Lost revenues are therefore considered a sunk cost and should not be included in cost-effectiveness analyses.[33] Instead,

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[32] Because the New Hampshire utilities currently provide a full incentive to income eligible participants in the Home Energy Assistance Program, there are no direct costs to participants. The utilities account for all incremental costs through their contribution to measure costs. However, the New Hampshire utilities should still be cognizant to account for the net impacts of participant non-energy impacts to ensure symmetry.

[33] NESP, 2017, pages 32-33 and Appendix C.

lost revenues should be assessed separately through the rate and bill impact analysis. The New Hampshire utilities do not include lost revenue or other sunk costs in the New Hampshire TRC test.

Long-run impacts. Cost-effectiveness analyses should include long-run impacts. Electric and gas resources can last for 40 or even 60 years. Utilities have a responsibility to meet customer needs in a safe, reliable, and low-cost way over the long term. Regulators have a responsibility to protect customers over both the short term and the long term. Over-emphasis on short-term costs could unduly increase long-term costs for customers.[34] The screening model used by New Hampshire utilities for energy efficiency measures has a 25-year analysis period.[35] Each measure within the screening model has a measure life, typically ranging from five years to 25 years. If a measure were expected to provide savings longer than 25 years, the model would not be able to estimate that measure's benefits past 25 years.

Incremental impacts. Cost-effectiveness analyses should consider only incremental impacts. These are defined as the changes that will occur because of the energy efficiency resource, relative to a scenario where the resource is not in place.[36] The New Hampshire utilities consider marginal impacts by calculating the incremental cost of energy efficiency resources. The avoided costs in AESC are marginal in that they isolate a future scenario in which there are no new energy efficiency investments.

B/C Working Group members did not discuss lost revenue, avoided costs, or incremental costs in detail.

Recommendations

Forward-looking impacts. Synapse recommends the Commission continue the current practice of excluding lost revenues from all cost-effectiveness analyses. This approach is consistent with the NSPM's guidance, and there is no rationale or policy to change the current approach. Instead, lost revenues should be assessed through a rate and bill impact analysis.

Long-run impacts. Synapse recommends the utilities consider extending the screening model to allow for longer-term measure lives. See Chapter 4.3 on analysis periods and end effects for more information.

Marginal impacts. Synapse recommends the B/C Working Group continue the current practice of calculating marginal impacts for all cost-effectiveness analyses. This approach is consistent with the NSPM's guidance, and there is no rationale or policy to change the current approach.

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34 NESP, 2017, pages 32-33.

35 NESP, DSESP.

36 NESP, 2017, pages 32-33.

3.6. Develop Methodologies to Account for Relevant Impacts

The NSPM authors recommend that utilities monetize all energy efficiency impacts that the state has chosen to assess via its cost-effectiveness test. In this way, impacts can be readily compiled and directly compared. However, there are several reasons why this goal can pose challenges to stakeholders implementing cost-effectiveness tests.

- *Difficult to monetize impacts.* Some energy efficiency impacts are difficult to quantify in monetary terms, either due to the nature of the impact or lack of information available about the impacts. Participant non-energy benefits are often cited as difficult to monetize impacts. Such benefits should not be ignored because they are difficult to monetize. If hard-to-quantify impacts are not estimated in some monetary or quantitative fashion, then they should at least be expressed and discussed qualitatively as part of the cost-effectiveness analysis.

- *Secondary tests.* A state may include some impacts in a secondary test but not in the primary test. Stakeholders may prefer less rigorous and less expensive evaluation methods to value impacts that are included in the secondary test but not included in the primary test because regulators and stakeholders are likely to give less weight to the secondary test results. In such cases, stakeholders should balance the incremental benefit of more accurately monetizing an impact with the incremental cost of evaluating and monetizing the impact.

- *Evolution.* Impacts that were once difficult to monetize may become easier to monetize due to changes in evaluation methodologies or because more detailed data is available. Stakeholders may realize new benefits within a category of impacts as literature evolves. Similarly, stakeholders may change their need for accurately monetized values over time. This could be because new studies indicate a higher than expected value on the impact or new statutes require stakeholders to place a stronger emphasis on certain impacts.

There are different approaches utilities can use to account for all impacts of energy efficiency resources that a state has chosen to include in its cost-effectiveness tests. In Table 9 we summarize five different approaches states can adopt to account for energy efficiency impacts that are difficult to monetize. We list the approaches in order of technical rigor and preference.[37]

Table 9. Approaches to account for all relevant impacts

Approach	Description
Jurisdiction-specific studies	Jurisdiction-specific studies on energy efficiency costs and avoided costs offer the best approach for estimating and monetizing relevant impacts.
Studies from other states	If state-specific studies are not available, studies from other states or regions, as well as national studies, can be used for estimating and monetizing relevant impacts.

[37] NESP, page 33.

Approach	Description
Proxies	If monetized impacts are not available, well-informed and well-designed proxies can be used as a simple substitute.
Quantitative and qualitative information	Relevant quantitative and qualitative information can be used to consider impacts that cannot or should not be monetized.
Alternative thresholds	Pre-determined benefit/cost thresholds that are different from 1.0 can be used as a simplistic way to account for relevant impacts that are not otherwise accounted for.

Source: NESP, page 34, Table 12.

B/C Working Group Discussion

B/C Working Group members frequently discussed the importance of identifying how stakeholders should consider and estimate certain impacts in the Granite State Test and Secondary Granite State Test.

It is beyond the original scope of this study for Synapse to provide recommendations on the methodologies that should be used to measure specific impacts. The NSPM focuses on which impacts to include in a primary or secondary test, not how to monetize them, and Synapse was tasked with applying the NSPM framework to New Hampshire. Once stakeholders determine the impacts to include in their state-specific cost-effectiveness test, they can then focus on how to monetize or otherwise calculate impacts.

However, B/C Working Group members stressed the importance of considering how to evaluate impacts throughout the working group meetings. Because this topic was central to members, we offer some thoughts below to help stakeholders understand how the utilities could account for impacts in the Granite State and Secondary Granite State Tests. Synapse encourages stakeholders and the Commission to continue discussing the best methods to account for each impact.

Method for Determining How to Account for Impacts

As we discuss above, monetizing every energy efficiency impact can pose challenges to program implementers. To guide New Hampshire stakeholders through these challenges, Synapse developed the flow chart in Figure 3. There are three primary steps for determining how to account for an impact:

1. First, stakeholders should determine whether an impact should be included in a cost-effectiveness test based on state policy. That is the purpose of this report.

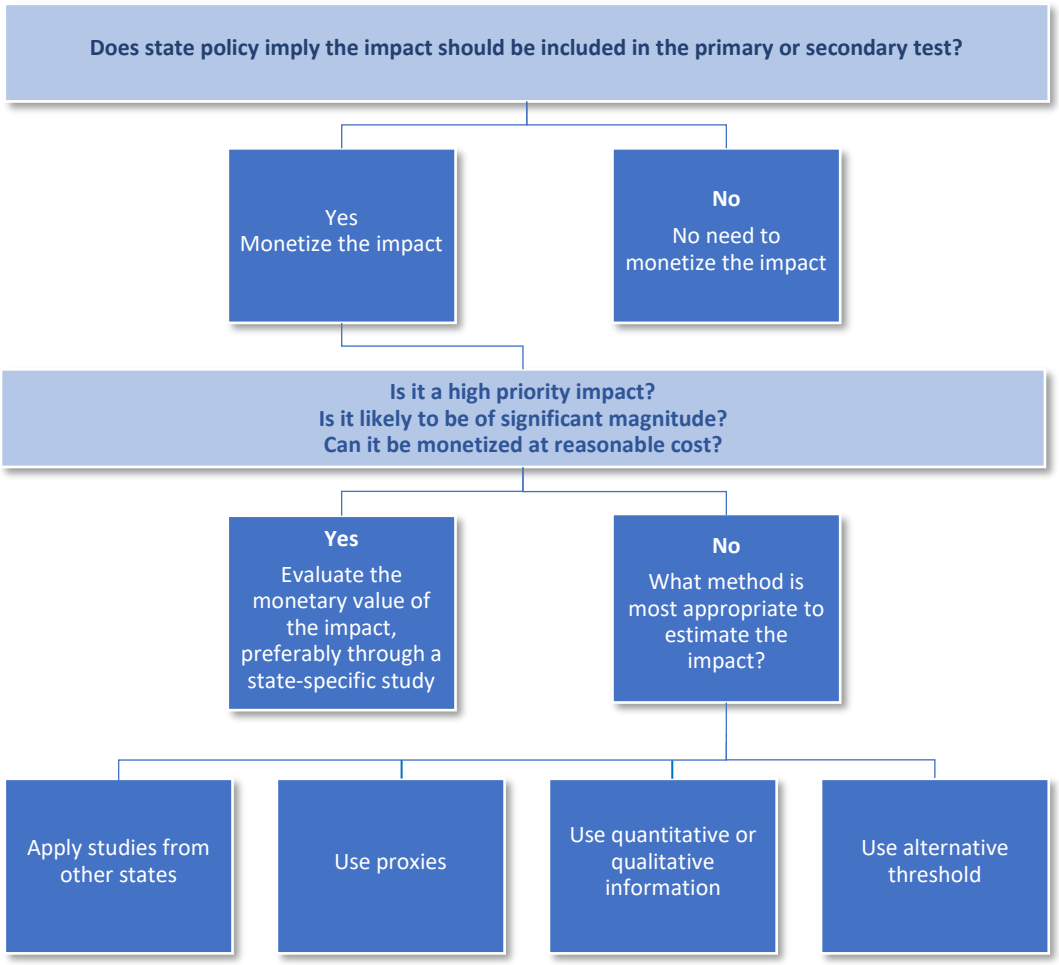
2. Stakeholders should then assess the relative importance and priority of monetizing the impact, the potential magnitude of the monetized impact, and the evaluation effort required to monetize the impact. The answers to those questions will indicate whether utilities should monetize an impact.

3. Finally, stakeholders should decide on and implement the most appropriate method to account for the impact in the cost-effectiveness test. Depending on the discussions in the second step, the impact could be monetized or calculated using one of the methods described in Table 9.

Stakeholders and the Commission should periodically reassess whether the utilities' methods of accounting for impacts are appropriate. When making this assessment, stakeholders should re-evaluate the importance, magnitude, and evaluation efforts of the impact. Evaluation methods and state policy can evolve, providing new answers to these questions.

In assessing impacts, utilities and evaluators must ensure that the impacts are not double counted across impacts. This is especially important for certain impacts, including income eligible societal impacts, environmental externalities, and public health impacts because these impacts can occasionally overlap with each other.

Figure 3. Determining how to account for energy efficiency impacts



Recommendations

For the utility system impacts, other fuel impacts, and water impacts that the utilities account for in the New Hampshire TRC test, Synapse recommends the utilities continue calculating long-term, incremental costs and benefits for the Granite State Test and Secondary Granite State Test. The utilities' current practices are sound without need for change. The utilities should also continue to calculate the environmental impacts from fossil fuel savings using the Regional Greenhouse Gas Initiative as a proxy because this process has been vetted and approved by stakeholders and the Commission.

There are several utility system impacts and non-utility system impacts that the B/C Working Group supported including in the Granite State Test or Secondary Granite State Test that are either (a) not currently included in the New Hampshire TRC test or (b) included but could be modified over time. Using the flow chart from Figure 3, Synapse suggests how stakeholders could consider these impacts in the tests.

Synapse provides short-term options that utilities and stakeholders can implement relatively easily into their current screening models and practices. The utilities could apply the short-term methods in the 2021–2023 Plan. We also provide long-term options for better estimating each impact, to ensure accurate and complete test results. These long-term methods could be developed and applied to energy efficiency programs during or after the 2021–2023 Plan. With all impacts, utilities should periodically reassess methods for accounting for each impact, even those impacts not addressed below.

For the first step, stakeholders have supported including the impacts below in the primary or secondary test, answering the question of whether to include the impacts in a state-specific test.

- *Avoided Ancillary Services* (primary and secondary tests). The monetary magnitude of this impact is likely to be small relative to other utility system impacts. In the short term, Synapse suggests a value of $0. Over time, stakeholders could determine whether this impact is enough of a priority to monetize, and whether the cost to monetize this impact, perhaps through the AESC process, is worth paying given the expected improvement in the cost-effectiveness analysis.

- *Avoided Credit and Collection Costs* (primary and secondary tests). The EM&V Working Group is currently undertaking two studies on non-energy impacts. One of those evaluations, which covers the Home Energy Assistance Program, addresses utility avoided credit and collection costs. As such, stakeholders have already determined that the impacts are worth evaluating, are a priority, and potentially of a substantive magnitude. Once the evaluation is complete, the utilities can use the values from the study in the primary and secondary tests.

- *Reduced Risk* (primary and secondary tests). Synapse suggests that risk is an important impact that should ideally be monetized. In the short term, utilities in New Hampshire could continue to utilize the wholesale risk premium and low-risk discount rate for the purpose of cost-effectiveness screening. Over time, stakeholders could review practices

used by utilities in other states to account for risk[38] and investigate whether developing a state-specific monetization method is appropriate given the expected benefit.

- *Increased Reliability* (primary and secondary tests). Reliability is likely to have a small monetary value relative to other utility system impacts. However, the authors of AESC have already calculated state-specific values for increased reliability, and New Hampshire ratepayers have already paid for the evaluation.[39] The utilities' screening models already calculate the benefits of increased reliability using AESC avoided costs, but do not add the benefits to the cost-effectiveness test. While Synapse prefers that New Hampshire utilities include those monetized benefits in their cost-effectiveness tests, we recognize this was a point of contention during the last plan update. As such, Synapse recommends New Hampshire stakeholders participate actively in the next update of the AESC study to ensure the reliability values are calculated using recent data based on experience local to New England and/or New Hampshire to bolster New Hampshire stakeholders' confidence in the estimated reliability values.[40]

- *Market Transformation* (primary and secondary tests). Market transformation can take many forms and can be difficult to isolate and estimate. Further, there can be significant overlap between market transformation and program spillover, but there may be market transformation benefits that exceed the benefits of spillover.[41] In the short term, we recommend the utilities continue using adjusted gross savings to estimate energy efficiency impacts, and consider market transformation impacts qualitatively in cost-effectiveness screening. In Chapter 4.5 we recommend that New Hampshire utilities re-evaluate their use of adjusted gross savings in their cost-effectiveness analyses at a relevant point in the future. We recommend that any such re-evaluation consider methodologies for isolating and estimating market transformation impacts. For this purpose, state-specific studies would be ideal but there may be studies from other states that would provide reasonable estimates.

- *Income Eligible Participant Impacts* (primary and secondary tests). The EM&V Working Group is currently undertaking two studies on non-energy impacts, which are expected to address participant impacts for income eligible programs. Stakeholders have already determined that the impacts are worth evaluating, are a priority, and potentially of a substantive magnitude. Once the evaluations are complete, the utilities can use the values from the studies in the primary and secondary tests. If for some reason the impact associated with those studies are not accepted by the Commission, the utilities

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[38] For example, Vermont energy efficiency providers account for risk by applying a 10 percent "subtractor" to the cost of energy efficiency measures. See, e.g., State of Vermont Public Service Board, "Order Re: EEU Avoided Costs for 2016-2017 Time Period," EEu-2015-04, December 22, 2015, pages 9-11, available at: https://puc.vermont.gov/sites/psbnew/files/doc_library/order-re-eeu-avoided-cost-2016-2017.pdf

[39] AESC 2018, Chapter 11.

[40] See, "Direct Testimony of Elizabeth R. Nixon," in Docket DE 17-136, November 2, 2018, pages 6-7, available at https://www.puc.nh.gov/Regulatory/Docketbk/2017/17-136/TESTIMONY/17-136_2018-11-02_STAFF_DTESTIMONY_NIXON.PDF

[41] For example, spillover is typically calculated for a given year of efficiency program implementation but does not necessarily account for market transformation benefits that might occur in future years.

could continue to use the NEI adder they currently utilize or another proxy that is informed by the forthcoming study, or they could use reliable values that can be readily adapted from relevant literature.

- *Participant Non-Energy Impacts* (secondary test only). Similar to income eligible participant impacts, the cross-cutting NEI evaluation mentioned above is expected to address participant impacts. Stakeholders have already determined that the impacts are worth evaluating, are priorities, and are potentially of a substantive magnitude. Once the evaluations are complete, the utilities can use the values from the studies in the secondary test. If for some reason the impacts associated with those studies are not accepted by the Commission, the utilities could continue to use the NEI adder they currently utilize or another proxy that is informed by the forthcoming study, or they could use reliable values that can be readily adapted from relevant literature.

- *Income Eligible Societal Impacts* (secondary test only). Income eligible societal impacts might have a significant magnitude but could be costly to monetize. Further, for some income eligible impacts it is important to avoid double-counting participant and societal impacts.[42] In the short term, Synapse suggests utilities qualitatively consider income eligible societal impacts. This could be accomplished by using a benefit-cost ratio threshold of less than 1.0 for income eligible programs in recognition that these impacts exist but are not accounted for in monetary terms. Income eligible programs in New Hampshire have historically not been required to exceed a benefit-cost ratio of 1.0 in recognition that income eligible customers face greater hurdles to investment in energy efficiency than other customers.[43] An alternative cost-effectiveness threshold in recognition of income eligible societal impacts would be a new consideration, separate from the historical rationale. Over time, stakeholders could investigate whether developing state-specific monetization methods is appropriate for income eligible societal impacts, or whether utilities could use reliable values that can be readily adapted from relevant literature.

- *Other Environmental Externalities* (secondary test only). Other environmental externalities are likely to have a substantial monetary impact on cost-effectiveness. The 2018 AESC calculates values for environmental externalities for non-embedded greenhouse gas impacts and the cost of NO_X emissions. The non-embedded greenhouse gas impacts are calculated using a marginal abatement cost method, which asserts that the value of environmental damages avoided, at the margin, must be at least as great as the cost of the most expensive abatement technology used in a comprehensive strategy

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42 NESP, 2017, page 58. For example, the income eligible societal benefit of reduced home foreclosures attributable to program interventions might overlap with the participant benefits of reduced home foreclosures. In such a case, care must be taken not to double-count that benefit.

43 Public Utilities Commission of New Hampshire, "Energy Efficiency Resource Standard, Order Approving Settlement Agreement." Order No. 25,932, DE 15-137, August 2, 2016, page 64, available at https://www.puc.nh.gov/Regulatory/Orders/2016orders/25932e.pdf.

Public Utilities Commission of New Hampshire, "Order Establishing Guidelines for Post-Competition Energy Efficiency Programs," Order No. 23,574, November 1, 2000, pages 4-5, available at https://www.puc.nh.gov/Regulatory/Orders/2000ords/23574e.pdf.

for emissions reductions.[44] Massachusetts and Rhode Island utilize the localized marginal abatement cost of $68 per ton of CO_2 equivalent set forth in AESC, which is based on a projection of future costs of offshore wind energy.[45] In New Hampshire, the utilities' screening models already calculate the benefits of environmental externalities using the AESC non-embedded greenhouse gas values, but do not add the benefits to the cost-effectiveness test. Synapse suggests the New Hampshire utilities include those monetized benefits in their cost-effectiveness tests.

3.7. Ensure Transparency

Policy Articulation

Transparency is critical to supporting successful application of the Resource Value Framework, particularly in how a state articulates its energy and other applicable policy goals. Including statutes and a long history of regulatory decisions, New Hampshire has an extensive number of policies relating to energy efficiency and energy resources.

B/C Working Group members synthesized this policy information during Step 1 of the Resource Value Framework (see Chapter 3.1).[46] *Appendix A: Policies Reviewed by the B/C Working Group* provides a detailed list of the policies reviewed by B/C Working Group members. Synapse recommends that stakeholders and the Commission update this table when a new relevant statute or order is issued to maintain a comprehensive repository of all goals and requirements in New Hampshire.

Inputs and Assumptions

Transparency is critical for documenting the inputs, assumptions, and results of any cost-effectiveness analyses. The NSPM authors recommend states use a reporting template to provide clear and consistent information for all interested parties.[47]

New Hampshire has a robust planning and reporting structure through the three-year plans, annual plan updates, annual and quarterly reporting, and the forthcoming technical reference manual (TRM). The Microsoft Excel model used by utilities to screen energy efficiency resources is detailed by measure, with measure-level inputs and assumptions. Formulas within the model indicate how benefits are calculated from AESC avoided cost values.

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44 AESC 2018, Chapter 8.

45 Massachusetts Department of Public Utilities, Order in D.P.U. 18-110 through D.P.U. 18-119, January 29, 2019, page 68, available at https://fileservice.eea.comacloud.net/FileService.Api/file/FileRoom/10317061.
National Grid, "2020 Energy Efficiency Program Plan, 2020 Rhode Island Test Description," Attachment 4, at 12, available at http://rieermc.ri.gov/wp-content/uploads/2019/09/2020-eepp-attachment-4-ri-test-third-draft.pdf

46 NESP, 2017, page 34.

47 NESP, 2017, pages 34-35.

New Hampshire's current screening structure is comprehensive, but there is always room for improvement. Synapse offers the following recommendations to increase transparency, some of which the utilities are actively working on and which will continue to be an ongoing effort by utilities and stakeholders into the future.

- The New Hampshire utilities could improve citations and notation for measure- and non-measure-specific model inputs. The utilities have been making such improvements to the model over the past two years, including a review by Synapse of the 2019 Update screening model to ensure AESC avoided costs were accurately applied and calculated.
- Some stakeholders may find the screening model complicated and overwhelming to navigate. To address such considerations, the utilities plan to train stakeholders on the models for the 2020 Update.
- The screening models could be made available publicly in Microsoft Excel format with all formulas and cell references intact, either hosted on the Commission's website as in Maine and Massachusetts or on an EM&V Working Group website.

4. OTHER INPUTS AND ASSUMPTIONS

The NSPM authors provide guidance to stakeholders for developing relevant inputs for energy efficiency cost-effectiveness tests. In this section, we identify and discuss those inputs addressed in the NSPM. B/C Working Group members did not discuss these inputs and assumptions in much detail. As such, this chapter reflects Synapse recommendations, noting stakeholder input where available.

4.1. Discount Rate

National Standard Practice Manual

The NSPM explains that a discount rate reflects a particular "time preference," which is the relative importance of short-term versus long-term costs and benefits. A higher discount rate gives more weight to short-term impacts, while a lower discount rate gives more weight to long-term impacts.

As described in the NSPM, the choice of discount rate is a decision that should be informed by a state's applicable policy objectives. This choice should reflect the regulatory perspective, which recognizes the time preference of all customers, current and future. Further, the choice of a discount rate should recognize the objective of a cost-effectiveness analysis, which is to identify those utility resources that will provide safe, reliable, low-cost service to customers over the short, medium, and long terms.

The NSPM notes that the discount rate used for the primary cost-effectiveness test should be consistent with, and ideally identical to, the rate used in any secondary tests.[48]

Current Practice in New Hampshire

New Hampshire utilities have historically used the prime rate to calculate costs and benefits in present value terms. A working group report from 1999 stated:[49]

> Projected costs and benefits should be stated in present value terms. The Group agrees to use the Prime Rate adjusted annually (on or around June 1; i.e., 7.75% for the year 2000 programs). Program benefits should be calculated over the useful life of the program's energy efficiency measures. The costs and benefits of market effects should be treated consistently, and the estimates of such effects should be appropriate to the

[48] NESP, 2017, Chapter 9. The one exception is the Participant Cost test, which should use a discount rate that reflects a time preference for participating customers. Different customers tend to have different discount rates, so an average customer discount rate can be used for this purpose.

[49] New Hampshire Energy Efficiency Working Group, "Report to the New Hampshire Public Utilities Commission on Ratepayer-Funded Energy Efficiency Issues in New Hampshire," Docket No. DR 96-150, July 6, 1999, pages 17-18, available at https://www.puc.nh.gov/Electric/96-150%20%20NH%20Energy%20Efficiency%20Working%20Group%20Final%20Report%20(1999).pdf

> program design and time horizon over which it is reasonable to predict such effects. The level of precision of estimates should reflect a reasonable balance between the cost of obtaining various levels of precision, and the importance of long-term market effects to a program's cost effectiveness and design.

For the 2019 Update, the New Hampshire utilities used a nominal discount rate of 4.75 percent and a general inflation rate of 1.86 percent, resulting in a real discount rate of 2.84 percent.[50] The utilities used the real discount rate and inflation rate to discount estimated future benefits.[51]

Recommendations

Synapse recommends that New Hampshire stakeholders continue the current practice of using a low-risk discount rate. The low-risk discount rate gives more weight to long-term impacts, reflects the regulatory perspective in the Granite State Test, and is consistent with the objectives of cost-effectiveness analyses. We find this is an appropriate approach to valuing energy efficiency benefits, and there is no rationale or new policy for utilities to alter their current practices. This discount rate should be applied to the Granite State Test as well as any secondary tests.

4.2. Assessment Level

National Standard Practice Manual

The NSPM explains that cost-effectiveness assessment at all levels—measure, project, program, sector, and portfolio—can provide valuable insight into program design and implementation. Efficiency planners and other stakeholders may want to analyze efficiency resources at several, if not all, of these levels.

For the primary cost-effectiveness test, the NSPM recommends regulators and efficiency planners rely on program-level, sector-level, or portfolio-level cost-effectiveness results. At these levels, costs and benefits are aggregated, allowing for flexibility in implementation if a measure or project proves not cost-effective. The NSPM authors recommend not relying on measure-level or project-level cost-effectiveness results as such an approach is too restrictive and can have perverse impacts, thereby

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[50] The nominal discount rate is based on the June 2018 Prime Rate in accordance with the Final Energy Efficiency Group Report, dated July 6, 1999 in DR 96-150. Retrieved from http://www.moneycafe.com/personal-finance/prime-rate/. "New Hampshire Statewide Energy Efficiency Plan, 2019 Update," Docket DE 17-136, September 14, 2018, page 36, available at https://www.puc.nh.gov/Regulatory/Docketbk/2017/17-136/LETTERS-MEMOS-TARIFFS/17-136_2018-09-14_EVERSOURCE_UPDATED_EE_PLAN.PDF.

[51] "New Hampshire Statewide Energy Efficiency Plan, 2019 Update," Docket DE 17-136, September 14, 2018, page 36, available at https://www.puc.nh.gov/Regulatory/Docketbk/2017/17-136/LETTERS-MEMOS-TARIFFS/17-136_2018-09-14_EVERSOURCE_UPDATED_EE_PLAN.PDF.

reducing net economic benefits of efficiency investments. Any advantages of measure-level or project-level application are typically outweighed by the disadvantages.[52]

Current Practice in New Hampshire

For determining cost-effectiveness, the New Hampshire utilities currently apply—and the Commission approves—the New Hampshire TRC test at the program level. In addition, the utilities use the following assessment levels for other purposes.

- The utilities currently calculate sector-level cost-effectiveness for performance incentive purposes and are proposing to change to the portfolio-level starting with the 2020 Update.[53]
- The utilities calculate portfolio cost-effectiveness for informational purposes.
- The utilities calculate cost-effectiveness for each energy efficiency project to determine whether to proceed with the project. The New Hampshire TRC test is used for this purpose.
- Income eligible programs, education, and start-up programs are exempt from the requirement to exceed a benefit-cost ratio of 1.0; however, in practice, the utilities screen income eligible projects to determine whether to proceed with the project.[54]

Recommendations

Assessing resources at the program-level means that the measures and/or projects within a program must be cost-effective collectively. Some individual measures and projects may not be cost-effective on their own, but utilities could still include them in the program if the overall program remains cost-effective.

We find New Hampshire's current practice of screening for cost-effectiveness at the program-level appropriate and consistent with the NSPM. With program-level screening, utilities have the flexibility to implement measures and projects that may not be cost-effective, but that may still provide benefits to participants and learning opportunities to the utility.

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[52] NESP, 2017, Chapter 10.

[53] See New Hampshire Performance Incentive Working Group, "New Hampshire Energy Efficiency Calculation of Performance Incentive Beginning in 2020," Docket No. DE17-136, July 31, 2019, page 9.

[54] NH Utilities, "New Hampshire Statewide Energy Efficiency Plan, 2019 Update," Docket DE 17-136, September 14, 2018, page 36, available at https://www.puc.nh.gov/Regulatory/Docketbk/2017/17-136/LETTERS-MEMOS-TARIFFS/17-136_2018-09-14_EVERSOURCE_UPDATED_EE_PLAN.PDF, citing New Hampshire Energy Efficiency Working Group, "Report to the New Hampshire Public Utilities Commission on Ratepayer-Funded Energy Efficiency Issues in New Hampshire," Docket No. DR 96-150, July 6, 1999, page 17, available at https://www.puc.nh.gov/Electric/96-150%20%20NH%20Energy%20Efficiency%20Working%20Group%20Final%20Report%20(1999).pdf

Synapse recommends utilities implement efficiency measures and projects with a benefit-cost ratio less than 1.0, provided the program including those measures and projects remains cost-effective with a benefit-cost ratio greater than 1.0. Otherwise, the screening level is effectively the measure and project-level and not the program-level, and the utilities may not capture all cost-effective program resources. As projects are planned and completed throughout the year, the utilities should monitor program-level cost-effectiveness to ensure projects that are less than 1.0 do not reduce a program's cost-effectiveness to below 1.0. Further, the utilities should design projects to be cost-effective and to avoid paying any more than necessary to achieve the desired savings.[55]

If the utilities require every energy efficiency project to have a benefit-cost ratio greater than 1.0, it could reduce the overall net economic benefits of efficiency investments.

Synapse also recommends that for certain programs with a benefit-cost ratio less than 1.0—for example, income eligible programs, education programs, and programs in the start-up phase that are likely to become cost-effective in later years—utilities should have the ability to implement those programs so long as there is adequate justification to do so and the overall portfolio of programs remains cost-effective.

4.3. Analysis Period and End Effects

National Standard Practice Manual

Analysis period refers to the number of years over which stakeholders forecast and compare the costs and benefits of a resource investment. The analysis period should be long enough to capture the full stream of costs and benefits associated with the efficiency resources.

Because most energy efficiency resource costs are incurred immediately while benefits accrue for several years into the future, failing to use an analysis period that covers the full life of the resource creates an "end effects" problem that biases cost-effectiveness assessments against efficiency resources. An end-effects problem is created when the analysis captures the full cost of an efficiency resource, but not all benefits.[56]

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55 If the Commission adopts the Performance Incentive Working Group's forthcoming recommendation that utilities should be eligible for performance incentives based on portfolio-wide cost-effectiveness, it should still require the utilities to include sector and program level cost-effectiveness values in any annual filings for the purpose of transparency. Cost-effectiveness screening is different from performance incentive assessments, and each analysis has a distinct purpose. While cost-effectiveness tests can be applied consistently for cost-effectiveness screening and performance incentive purposes, they do not have to be the same.

56 NESP, 2017, Chapter 11.

Current Practice in New Hampshire

The screening model used by New Hampshire utilities for energy efficiency measures has a 25-year analysis period.[57] Each measure within the screening model has a measure life, typically ranging from five years to 25 years. If a measure were expected to provide savings longer than 25 years, the model would not be able to estimate that measure's benefits past 25 years.

Recommendations

The current model cap at 25 years is generally sufficient for considering long-run impacts and is generally consistent with the NSPM recommendations. However, some measures could extend past 25 years, and the model would truncate the savings and benefits from those measures, thereby artificially reducing energy efficiency benefits. We recommend the utilities consider extending the screening model analysis period to account for measures with measure lives potentially longer than 25 years. The model should extend as far into the future as is reasonable. The 2018 AESC extends to 30 years, which could be a reasonable limit for the screening model as well.

4.4. Analysis of Early Replacement

National Standard Practice Manual

Early replacement occurs when a functioning piece of equipment is replaced with a more efficient model before it normally would have been replaced or failed. In this section only, when we refer to a measure, its costs, or its savings, we mean an early replacement measure.

Costs. Under cost-effectiveness tests that do not include participant impacts, the measure cost is simply the cost the utility incurs to promote the installation of the measure. Under cost-effectiveness tests that include participant impacts, the initial cost of a measure is partially offset by the benefit of deferring the replacement cost that would otherwise have been incurred several years later (i.e., by delaying the date when the next replacement piece of equipment will have to be purchased much farther into the future).

Benefits. The benefits of a measure are partially a function of the efficiency of the equipment that would have been installed later in the baseline scenario. If the future baseline replacement efficiency is the same as that of the measure, there is simply one stream of benefits for just the duration of the early replacement period. In other instances, the measure is more efficient than the new equipment that would otherwise have been purchased in several years (the future baseline replacement efficiency). If this is the case, cost-effectiveness analysis should account for two different streams of impacts: one for

[57] NESP, DSESP.

the duration of the early replacement period and another for remaining useful life of the early replacement measure (i.e., "dual baselines").[58]

Current Practice in New Hampshire

Costs. The utilities include participant costs in the New Hampshire TRC test, but do not adjust the costs to account for the benefit of deferring the measure replacement.

Benefits. New Hampshire utilities currently do not claim early retirement savings in the New Hampshire TRC test using a dual baseline method. When certain measures such as lighting and appliances are replaced near the end of their useful life, the utilities use the existing equipment as the baseline and reduce the measure life for the new equipment to reflect that the existing equipment would have been replaced earlier than the full life of the new equipment.[59]

Recommendations

Costs. The B/C Working Group supported excluding participant impacts from the Granite State Test. Therefore, the measure cost is simply the cost the utility incurs to promote the installation of the measure. However, the B/C Working Group members supported including participant impacts in the Secondary Granite State Test. In the secondary test, utilities could adjust the costs to account for the benefit of deferring the measure replacement.

Benefits. The New Hampshire utilities do not account for dual baselines when they calculate energy saved from measures replaced before the end of their useful life. The New Hampshire utilities could consider adopting dual baselines when calculating savings from such measures to ensure savings are accurate. In considering such a decision, the utilities should balance the incremental improvement in savings accuracy with the incremental cost to evaluate and implement a dual baseline approach to savings.

4.5. Free-Ridership and Spillover

Free-ridership refers to energy efficiency program savings that would have occurred in the absence of the incentives provided through the energy efficiency program. Spillover refers to the installation of energy efficiency measures or adoption of energy efficiency practices by customers who did not directly participate in an efficiency program but were nonetheless influenced by the program to make the efficiency improvement.[60] Market transformation benefits are one type of spillover effect. Note that

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58 NESP, Chapter 12.

59 Personal communications with New Hampshire utilities.

60 NESP, 2017, page 100.

free-ridership and spillover have significant implications for utility system costs and benefits, and therefore should ideally be accounted for in primary cost-effectiveness tests.

New Hampshire utilities currently use adjusted gross savings in their cost-effectiveness analyses and therefore do not incorporate values for free-ridership or spillover into the New Hampshire TRC test.[61] Stakeholders previously concluded that the methodological challenges and associated costs of accurately assessing free-ridership did not justify the effort required to net out these impacts from cost-effectiveness analyses. However, utilities are required to design programs to reduce free-ridership.[62]

B/C Working Group members agreed that it might make sense to reevaluate the state's current approach to net savings in the future. However, B/C Working Group members concluded that such a reevaluation was beyond the scope of this report and not enough of a priority to reevaluate prior to the next three-year plan.

Recommendations

Synapse agrees with the B/C Working Group conclusion that free-ridership and spillover should not be reevaluated at this time. For the short-term, Synapse recommends that utilities monitor free-ridership, spillover, and market transformation through New Hampshire specific EM&V studies and through studies from other states. For the long-term, we recommend that utilities re-evaluate their approach to free-ridership, spillover, and market transformation and decide whether and how to better account for these impacts in their cost-effectiveness analyses.

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61 New Hampshire utilities calculate adjusted gross savings by accounting for in-service rates and realization rates.

62 New Hampshire Energy Efficiency Working Group, "Report to the New Hampshire Public Utilities Commission on Ratepayer-Funded Energy Efficiency Issues in New Hampshire," Docket No. DR 96-150, July 6, 1999, available at https://www.puc.nh.gov/Electric/96-150%20%20NH%20Energy%20Efficiency%20Working%20Group%20Final%20Report%20(1999).pdf

5. THE GRANITE STATE TEST

Based on the B/C Working Group's discussions, Synapse recommends the Commission adopt the Granite State Test as the primary test to screen energy efficiency resources in New Hampshire. The Granite State Test is a modification of the current New Hampshire TRC test and reflects state policy goals as interpreted by members of the B/C Working Group.

In Table 10 we summarize the utility system and non-utility system impacts we recommend including in the Granite State Test, as well as the current New Hampshire TRC test for comparison. Compared to current practices, the Granite State Test should include all utility system impacts and remove participant impacts.

Table 10. New Hampshire TRC test and Granite State Test impacts

Impact	*Current NH TRC Test*	*Granite State Test*
Utility System Costs		
Measure costs (utility portion)	✓	✓
Other financial or technical support costs	✓	✓
Other program and administrative costs	✓	✓
EM&V costs	✓	✓
Performance incentives	✓	✓
Utility System Benefits		
Avoided energy costs	✓	✓
Avoided generating capacity costs	✓	✓
Avoided reserves	✓	✓
Avoided transmission costs	✓	✓
Avoided distribution costs	✓	✓
Avoided T&D line losses	✓	✓
Avoided ancillary services		✓
Intrastate price suppression effects (DRIPE)	✓	✓
Avoided compliance with RPS requirements	✓	✓
Avoided environmental compliance costs (embedded)	✓	✓
Avoided credit and collection costs		✓
Reduced risk	✓	✓
Increased reliability		✓
Market transformation		✓
Non-Utility System Impacts		
Other fuel	✓	✓
Water resource	✓	✓
Income eligible (participant)	✓	✓
Environmental, NH fossil fuel proxy	✓	✓
Participant costs	✓	
Participant non-energy benefits	✓	

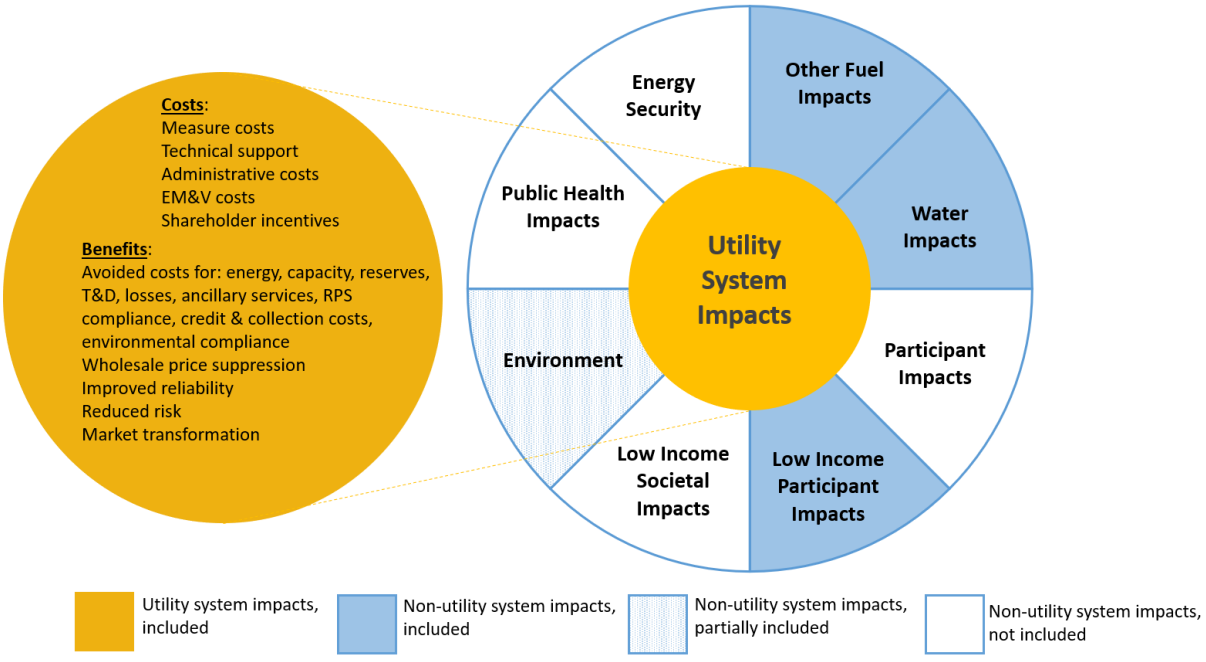
Source: 2019 B/C Working Group discussions.
Notes: The utilities partially account for participant non-energy benefits through a percentage adder in the current New Hampshire TRC Test. The utilities partially account for environmental externalities through a New Hampshire-specific fossil fuel proxy.

Below we provide a summary of Synapse's recommendations regarding the impacts, inputs, and application of the Granite State Test. In Chapters 3 and 4 and we provide the rationale for each recommendation. The Granite State Test is summarized in Figure 4.

- All utility system impacts should be included in the Granite State Test, including impacts not currently included in the New Hampshire TRC test (e.g., avoided ancillary services, avoided credit and collection costs, increased reliability, and market transformation).
- The following non-utility system impacts *should* be included in the Granite State Test: other fuel impacts, water impacts, income eligible participant benefits, and the New Hampshire environmental fossil fuel savings impact based on the Regional Greenhouse Gas Initiative values.
- The following non-utility system impacts should *not* be included in the Granite State Test: participant, income eligible societal, other environmental externalities, public health, and energy security.
- All non-utility system impacts should be treated symmetrically and include both costs and benefits.
- Some impacts in the Granite State Test are not currently included in the New Hampshire TRC test, or are included but could be modified over time. Synapse suggests utilities consider these impacts in the Granite State Test as follows:
    - *Avoided Ancillary Services*. In the short term, value at $0. Over the long term, determine whether this impact is enough of a priority to monetize.
    - *Avoided Credit and Collection Costs*. Once the two on-going NEI evaluations are complete, the utilities can use the results from the studies to inform how these costs are accounted for in the Granite State Test.
    - *Reduced Risk*. In the short term, apply the wholesale risk premium and the low discount rate, and review practices used by utilities in other states to account for risk. Over the long term, investigate whether developing state-specific monetization methods is appropriate.
    - *Increased Reliability*. Use the avoided cost values in AESC to monetize reliability once those values are developed using recent, local data.
    - *Market Transformation*. In the short term, continue using adjusted gross savings to estimate energy efficiency impacts and consider impacts qualitatively in cost-effectiveness screening. Over time, consider re-evaluating the use of adjusted gross savings and consider methodologies that isolate and estimate market transformation impacts, spillover, and free ridership.
    - *Income Eligible Participant Impacts*. Once the two on-going NEI evaluations are complete, the utilities can use the results from the studies to inform how these impacts are accounted for in the Granite State Test.

- The utilities should maintain the following current practices:
    - Exclude lost revenues (sunk costs) from cost-effectiveness tests.
    - Calculate long-term, marginal impacts for all cost-effectiveness analyses.
    - Use a low-risk discount rate, determined by current practices.
    - Screen for cost-effectiveness at the program level. The utilities should implement projects with a benefit-cost ratio less than 1.0, provided the program maintains a benefit-cost ratio greater than 1.0.
    - Monitor free-ridership and spillover rates and modify program design as needed to ensure programs are optimized to serve participants.
- The utilities could consider extending the benefit-cost screening model analysis period to account for measures with lives longer than 25 years.
- The utilities should strive to continually improve the transparency of the inputs and assumptions within the benefit-cost screening model, including to improve model references and notes, train stakeholders on how to use the model, and make the models publicly available in Microsoft Excel.
- The utilities could consider using dual baselines when calculating savings from early replacement measures.

Figure 4. Granite State Test impacts



Source: 2019 B/C Working Group discussions.
Note: The utilities partially account for environmental externalities through a New Hampshire-specific fossil fuel proxy.

6. SECONDARY TESTS

B/C Working Group members discussed whether secondary tests are appropriate for New Hampshire. Some stakeholders felt secondary tests could be useful and would bolster the Granite State Test as the primary test. Other stakeholders were concerned that secondary tests could create additional work for utilities and increase evaluation costs without providing useful information. Stakeholders emphasized that, should the Commission adopt secondary test(s), the tests' purposes should be transparent, calculations across tests should be consistent, and application of the secondary tests should be clear.

As we explain below, Synapse recommends the B/C Working Group adopt two secondary tests: the Utility Cost Test and the Secondary Granite State Test.

6.1. Purpose of Secondary Tests

The purpose of a *primary* cost-effectiveness test is to answer the threshold question of: what is the universe of resources whose benefits exceed their costs and therefore merit acquisition (in lieu of acquiring other supply or demand-side resources)? The primary test should not necessarily be considered in a vacuum. In some instances, regulators may wish to weigh the primary test results alongside other factors, including but not limited to: the results of secondary tests; least-cost planning imperatives; rate, bill, and participation impacts; jobs and economic development impacts; customer equity; and any other important policy goals.

A secondary test can provide a different perspective from the primary test, enhancing regulators' understanding of efficiency impacts.

Secondary tests can help enhance regulators' and stakeholders' overall understanding of efficiency resource impacts by answering other questions that address how best to use ratepayer funding on energy resources. Among the potential purposes of using secondary tests are:

- To inform decisions regarding how much ratepayer funding could or should be invested to acquire efficiency savings and achieve policy goals;
- To inform decisions regarding which efficiency programs to prioritize if not all cost-effective resources will be acquired;
- To inform efficiency program design, including instances when an investment is marginally cost-effective; and
- To inform public debate regarding efficiency resource acquisition.[63]

[63] NESP, page 16.

By looking at cost-effectiveness through the different perspectives provided by secondary tests (perspectives that may be favored by different stakeholders), stakeholders can assess the merits of different levels or types of efficiency resource acquisition.[64]

6.2. Secondary Tests for New Hampshire

B/C Working Group members had mixed opinions on whether to include certain non-utility system impacts in the Granite State Test (e.g., other environmental externalities impacts and income eligible societal impacts). B/C Working Group members hesitated on these impacts because New Hampshire policy was not explicit, calculating the impact would require incremental administrative and/or evaluation costs, or they found insufficient justification to shift from historical practice. There is still value in considering the impacts over which stakeholders deliberated, and that value can be assessed through secondary cost-effectiveness tests. Through secondary tests, stakeholders can better understand the sensitivity of results to—and therefore the implications of—those impacts.

Synapse recommends the utilities apply two secondary tests: the Utility Cost Test and the Secondary Granite State Test. These two tests provide two ends of the cost-effectiveness "spectrum": one test including impacts to the utility system only, the other test including the full universe of impacts that are considered relevant to New Hampshire. In Figure 5 we summarize the impacts included in the current New Hampshire TRC, the Granite State Test, the secondary Utility Cost Test, and the Secondary Granite State Test.

Utility Cost Test

Synapse recommends the New Hampshire utilities calculate the Utility Cost Test, which includes all utility system impacts, and only those impacts. The purpose of the Utility Cost Test is to indicate whether the benefits of an energy efficient resource will exceed its costs from the perspective of the customers who are funding the energy efficiency programs. The Utility Cost Test indicates the extent to which the utility's revenue requirements—the bedrock of utility rate making and the justification for utility investments since the beginning of utility regulation—are impacted by energy efficiency resources.

Further, utility system impacts are the inputs to a rate and bill impact analysis because they indicate how customers' rates will be affected by energy efficiency resources. If an efficiency resource passes the Utility Cost Test, total utility costs and average customers' bills will be reduced over the long term. The Utility Cost Test is the most simple and direct cost-effectiveness test for assessing the influence of energy efficiency on utilities and customers, and New Hampshire stakeholders would benefit from understanding this impact in conjunction with the Granite State Test.

[64] NESP, Chapter 5.

The Granite State Test will include all utility system costs and benefits, so the utilities can easily calculate the Utility Cost Test results using the same impacts and inputs.

Secondary Granite State Test

The NSPM recommends that a state customize a secondary test based on the state's policies and stakeholders' interpretation of those policies. A state-specific secondary test should start from the primary test and add or subtract those impacts that are implied by policy goals and/or are important to stakeholders. Using this method, a state could apply a secondary test that is consistent with the traditional cost-effectiveness tests (Utility Cost, TRC, or Societal Cost tests), or the test could be unique to the state. The NSPM also suggests states consider a range of secondary tests to inform public debate, in addition to any state-specific secondary tests.[65]

> The NSPM recommends that a state customize a secondary test based on the its policies and stakeholders' interpretation of those policies.

In New Hampshire, B/C Working Group members deliberated on several impacts, uncertain whether the impacts should be included in the primary test but not convinced the impacts should be ignored and excluded entirely from cost-effectiveness testing. Synapse recommends including these impacts in a New Hampshire-specific secondary cost-effectiveness test. This test would include all the impacts in the Granite State Test, plus the following impacts: participant, income eligible societal, and other environmental externalities. This secondary test provides the most comprehensive picture of energy efficient investments in New Hampshire, because it includes all impacts that are currently considered relevant to New Hampshire's policies and important to New Hampshire's stakeholders.

To implement the Secondary Granite State Test, the B/C Working Group will need to develop methodologies to calculate the non-utility system impacts not included in the Granite State Test. For these impacts, stakeholders can balance the desire to minimize incremental evaluation and implementation costs with the need for accurate and complete impact values, at least in the short term. See Chapter 3.6 for more information on methods to account for impacts in the secondary test.

Synapse's recommendations for the primary Granite State Test generally apply to the Secondary Granite State Test as well, except where impacts included in each test differ. More specifically:

- All utility system impacts should be included in the Secondary Granite State Test, including impacts not currently included in the New Hampshire TRC test (e.g., avoided ancillary services, avoided credit and collection costs, increased reliability, and market transformation). Certain hard-to-quantify impacts, including market transformation and increased reliability should be considered on a qualitative basis until values with an acceptable level of rigor and confidence are developed for those impacts.

[65] NESP, 2017, page 46.

- The following non-utility system impacts *should* be included in the Secondary Granite State Test: other fuels, water, income eligible participant, the New Hampshire environmental fossil fuel saving impact based on the Regional Greenhouse Gas Initiative values, participant, income eligible societal, and other environmental externalities.

- The following non-utility system impacts should *not* be included in the Secondary Granite State Test: public health and energy security.

- All non-utility system impacts should be treated symmetrically and include both costs and benefits.

- Some impacts in the Secondary Granite State Test are not included in the primary Granite State Test or the New Hampshire TRC test. Others are included but could be modified over time. Synapse suggests utilities consider these impacts in the Secondary Granite State Test as follows:

    - *Participant Non-Energy Impacts.* Once the two on-going NEI evaluations are complete, the utilities can use the results from the studies to inform how these impacts are accounted for in the Granite State Test. Utilities could use the values expected to be provided in the forthcoming studies, or a proxy value such as a benefit adder informed by that study, or reliable values readily adapted from literature.

    - *Income Eligible Societal Impacts*. In the short term, consider using a benefit-cost ratio threshold of less than 1.0 for income eligible programs. Over time, investigate whether developing state-specific monetization methods is appropriate, or whether reliable values can be readily adapted from literature.

    - *Other Environmental Externalities*. Use the avoided cost values in AESC to monetize environmental externalities (i.e., use the non-embedded avoided costs, likely the localized marginal abatement cost).

- When applying the Secondary Granite State Test, the utilities should maintain the following current practices:

    - Exclude lost revenues (sunk costs) from cost-effectiveness tests.

    - Calculate long-term, marginal impacts for all cost-effectiveness analyses.

    - Use a low-risk discount rate, determined by current practices.

    - Screen for cost-effectiveness at the program level. The utilities should implement projects with a benefit-cost ratio less than 1.0, provided the program maintains a benefit-cost ratio greater than 1.0.

    - Monitor free-ridership and spillover rates and modify program design as needed to ensure programs are optimized to serve participants.

- The utilities could consider extending the benefit-cost screening model analysis period to account for measures with lives longer than 25 years.

- The utilities should strive to continually improve the transparency of the inputs and assumptions within the benefit-cost screening model, including to improve model references and notes, train stakeholders on how to use the model, and make the models publicly available in Microsoft Excel format.
- The utilities could consider using dual baselines when calculating savings from early replacement measures.

Figure 5. Current and recommended cost-effectiveness test impacts for New Hampshire

Source: 2019 B/C Working Group discussions.
Notes: The utilities partially account for participant non-energy benefits through a percentage adder in the current New Hampshire TRC Test. The utilities partially account for environmental externalities through a New Hampshire-specific fossil fuel proxy.

6.3. Applying Secondary Tests

B/C Working Group members generally agreed to the structure of a primary test with supporting secondary tests. Stakeholders had mixed opinions on when and how the secondary tests should be applied. In this section, Synapse provides recommendations on secondary tests to inform the Commission's decision on New Hampshire's cost-effectiveness framework.

It is important for the Commission to understand that stakeholders generally agreed to the Granite State Test and Secondary Granite State Test as a package of tests. If the Secondary Granite State Test is not approved for use in some capacity by the Commission, then not all stakeholders support the solitary use of the Granite State Test as currently presented in this report. Some stakeholders agreed to the primary test with the understanding that secondary tests would play a valuable role in reviewing program cost-effectiveness, albeit without a firm determination on how the secondary test would be used. If the Commission rejects the Secondary Granite State Test or Utility Cost Test, some stakeholders indicated they would request the opportunity to revisit arguments regarding the inclusion of environmental impacts, participant impacts, and potentially other non-utility system impacts in the primary Granite State Test.

When to consider secondary tests

When evaluating energy efficiency programs, stakeholders should focus on the results of the Granite State Test. During the B/C Working Group discussions, stakeholders adopted the phrase "go-no go test" to describe the idea of the primary test being the paramount factor to determine whether a program should be implemented. However, there are several instances when a secondary test can provide stakeholders with useful information.

In cases where a program is marginally cost-effective or fails the Granite State Test, utilities and stakeholders can consider the implications of the two secondary tests before deciding whether to accept or reject the program. The secondary test results provide the Commission, utilities, and stakeholders with the flexibility and information to decide how to proceed with programs that are borderline cost-effective. This is the main purpose for secondary tests.

In addition, secondary tests can provide valuable information even when a program passes the Granite State Test. For example, the Utility Cost Test can help utilities and stakeholders prioritize across energy efficiency programs that pass the primary test, which can be especially important when total energy efficiency funding is capped at a pre-determined amount.

Each test provides different information, which guides stakeholders in their use of the tests:

- *Primary Granite State Test*. Indicates the costs and benefits as defined by the B/C Working Group and members' interpretation of New Hampshire policies related to energy efficiency. If approved by the Commission, the Granite State Test will represent the regulatory perspective in New Hampshire and should be used as the primary tool for deciding whether efficiency programs merit investment. This primary test can be useful when comparing many different types and scenarios of efficiency resources. If an energy efficiency investment results in a net benefit to ratepayers under the primary test, there

is a presumption that the efficiency investment is a prudent investment of ratepayer dollars resulting in just and reasonable rates.

- *Utility Cost Test.* Indicates the impact on revenue requirements for the regulated utility implementing the energy efficiency programs. The Utility Cost Test can help inform decisions on relative program priorities, program design, and whether and how to place limits on program spending. If an efficiency resource passes the Utility Cost Test, then the utility customers who pay for the resource will see benefits from the resource through reduced utility system costs that are equal to or greater than their contribution to the resource.

- *Secondary Granite State Test.* Indicates the universe of impacts that are considered by some stakeholders to be relevant to New Hampshire policies and for energy efficiency resources. It can be used when stakeholders are interested in a range of considerations beyond the utility system, unregulated fuel, and income eligible participant impacts included in the primary test, such as environmental, participant, or income eligible societal impacts.

How to consider secondary tests

The secondary tests can be used by the utilities, regulators, and other stakeholders, as one of the many data points that inform program design and resource allocation decisions, as well as treatment of energy efficiency programs that are marginally cost-effective. In these cases, the secondary tests provide more information about the likely impacts on utility customers (in the case of the Utility Cost Test) and on additional energy policy goals (in the case of the Secondary Granite State Test). If the secondary tests indicate a program provides enough value to customers, or otherwise support state policy goals, the utilities and stakeholders could support implementing the program. Alternatively, if the secondary tests do not indicate that a program provides enough value to customers or otherwise supports state policy goals, then stakeholders could consider an alternative allocation of resources. In either case, neither the utility nor the regulator is obligated to reject or accept a marginal program. Instead, the secondary tests (a) allow for a better-informed consideration of the value of marginal programs and (b) provide a framework to help assess that value. The secondary tests should not be considered or used as a simple backstop or replacement of the primary test.

This general approach of considering secondary tests in addition to the primary test is not unlike using rate and bill impact analyses or economic development and job impacts (see Chapter 7) through which stakeholders consider the results from the different analyses as a package rather than a single, hard-and-fast rule. Refer to Chapter 8.3 for an example on how secondary tests can be used to evaluate fuel switching activities.

Synapse recommends not adopting specific criteria on how to apply the secondary tests.[66] This is something that stakeholders and the Commission might clarify over time as needed. We caution that specific criteria could defeat one of the goals of secondary tests, which is to provide flexibility in situation-specific circumstances. The Commission, utilities, and stakeholders will need to use their judgment depending on the situation to decide whether an energy efficiency program provides value and therefore should be implemented, and secondary tests provide information to support that decision.

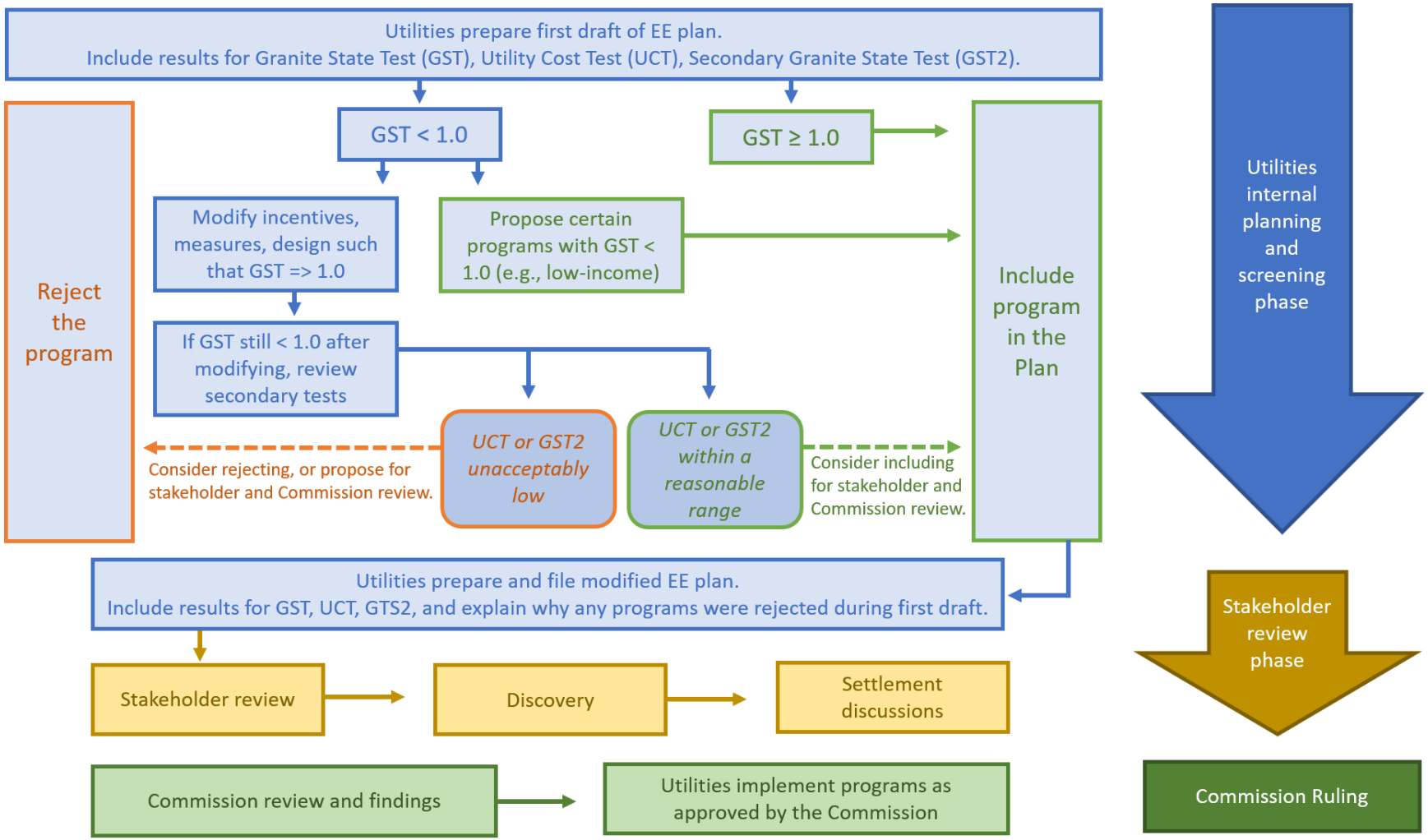
Nonetheless, we offer several considerations for how to apply secondary tests:

- Each utility should calculate and present all three tests for all energy efficiency programs: Granite State Test, Utility Cost Test, and the Secondary Granite State Test. The utilities should use the same calculation methods for each impact and input.
- However, the results of the secondary tests need only be considered on a limited basis, to minimize administrative burden and uncertainty in the efficiency planning process. In general, the results should only be considered for efficiency programs whose cost-effectiveness is estimated to be marginal or less than 1.0 under the Granite State Test.
- Each utility should be charged with making recommendations based on the secondary tests for those limited instances where programs are marginal and warrant a secondary test. These recommendations should be made transparent in energy efficiency planning documents. Stakeholders should then have an opportunity to comment on the utility recommendations. The Commission should ultimately decide which programs merit investment based on the cost-effectiveness findings, the utility recommendations, and the stakeholder comments.
- The utilities can use the secondary test results to scale program investments, alter program designs, or otherwise inform achievement of program goals.

In Figure 6, we summarize the above ideas and recommendations in a flow chart.

66 For example, one stakeholder suggested an approach along the following lines: If the secondary test shows less than 50 percent of the net benefits of the primary test at the program level, the utility should provide justification for including the program in the portfolio. Synapse finds such an approach would be overtly prescriptive and restrictive.

Figure 6. Cost-effectiveness tests flow chart



Hypothetical examples

Some hypothetical examples help illustrate how the secondary tests could be used.

1. A residential home energy retrofit program is estimated to have a benefit-cost ratio of 0.98 under the Granite State Test.[67] In addition to being below the 1.0 threshold, a stakeholder expresses concern that this program spends too much money saving other fuels such as oil and propane that are not relevant to the utility.

    - If the benefit-cost ratio under the Utility Cost Test is relatively high, e.g., 0.91, this implies that only a small portion of the benefits are due to other fuels and that this program offers reasonable utility system benefits for the customers that are funding it. In this case, the utility could recommend investing in this program based on the results of both tests.

    - If the benefit-cost ratio under the Utility Cost Test is relatively low, e.g., 0.65, this implies that a large portion of the benefits are due to other fuels and that this program offers relatively small benefits to the customers that are funding it. In this case, the utility could recommend not investing in this program, based on the results of both tests.

2. A small business direct install retrofit program is estimated to have a benefit-cost ratio of 0.96 under the Granite State test. The benefit-cost ratio under the Secondary Granite State Test is 1.40, and the employment impacts are estimated to be 500 job-years. This result implies that this program offers significant environmental and economic development benefits that are not captured in the Granite State Test.

    - The utility could recommend investing in this program because of the additional benefits that are not considered in the primary test. Customer equity is another important factor to consider when reviewing efficiency programs; serving this important customer class may be justified despite the benefit-cost ratio of less than one.

    - The Utility Cost Test might also help in deciding on this program. A relatively high benefit-cost ratio under this test would support investing in this program, while a relatively low result would support not investing in it.

3. A utility has limited energy efficiency program funding and needs to prioritize funding across several programs, all of which pass the Granite State Test. The utility could review the results of the Utility Cost Test and give more weight to those programs with higher benefit-cost ratios under this secondary test. This important decision to prioritize funding should also account for other factors such as customer equity, market coverage, and lost opportunities.

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[67] In general, utilities should investigate program design improvements to make marginal programs more cost-effective under the primary test. These examples are suggestions for how to proceed after such measures have been taken.

7. ADDITIONAL CONSIDERATIONS

7.1. Rate, Bill, and Participation Impacts

Rate, bill, and participation impacts are key components to assessing energy efficiency resources. Like the Utility Cost Test, the end results of a rate, bill, and participant impact analysis can help inform program priorities, program design, and whether and how to place limits on program spending. According to the NSPM, New Hampshire utilities should analyze rate, bill, and participation impacts separately from the cost-effectiveness analysis.[68]

The EM&V Working Group has contracted with Synapse to develop a model that can be used by each of New Hampshire's regulated utilities to inform energy efficiency program planning, design, and budgets. We expect to complete the analysis by Spring 2020 and will incorporate the ideas and recommendations below.

National Standard Practice Manual

Efficiency resources can increase rates as a result of program cost recovery and lost revenues and decrease rates as a result of avoided utility system costs. However, in general, energy efficiency resources will result in lower average customer bills, despite any increase in rates. Those customers that participate in an efficiency program will typically experience lower bills, while those that do not participate may experience higher rates and consequently higher bills. Therefore, the rate impacts of energy efficiency resources are not a matter of cost-effectiveness. Instead, they are a matter of customer equity between customers who participate in efficiency programs and those who do not.

A thorough understanding of the implications of energy efficiency resources requires analysis of three important factors: rate impacts, bill impacts, and participation impacts.

- *Rate impacts* provide an indication of the extent to which rates for all customers might increase due to utility support for energy efficiency resources.
- *Bill impacts* provide an indication of the extent to which customer bills might be reduced for those customers that install efficiency resources and how bills will be impacted for non-participating customers.
- *Participation impacts* provide an indication of the portion of customers that will experience bill reductions or increases. Participating customers will generally experience bill reductions while non-participants might see rate increases leading to bill increases.

Taken together, these three factors indicate the extent to which customers will benefit from efficiency resources and the extent to which efficiency resources may lead to distributional equity concerns. It is

[68] NESP, Appendix C.

critical to estimate the rate, bill, and participant impacts properly and to present them in terms that are meaningful for considering distributional equity issues.

Relationship to Cost-Effectiveness

Regulators and energy efficiency planners may wish to consider both cost-effectiveness and rate, bill, and participant analyses to determine whether to invest ratepayer funds in those energy efficiency resources. There is no bright line that stakeholders can use to determine the balance across these different analyses. Instead, stakeholders will need to determine a balance, with guidance and final approval by the Commission.

Stakeholders could qualitatively compare the trade-offs between cost-effectiveness and rate impacts. For example, stakeholder could assess whether any long-term rate impacts are warranted considering the cost-effectiveness results, the bill reductions, and the participation rates.

If the rate impacts of a proposed set of efficiency programs are deemed to be undesirable or unacceptable, stakeholders may choose to modify proposed energy efficiency programs to strike a better balance between cost-effectiveness and equity. There are many options for addressing customer equity issues, including: [69]

- Expand efficiency programs and budgets to serve more participants.
- Identify customer classes and types that have not participated in recent years and design programs to reach those customers.
- Shift priority from programs that have low participation rates to those that have higher participation rates.
- Set customer participation targets alongside the energy savings targets when developing energy efficiency plans.
- Require customers to pay a larger portion of the incremental efficiency costs, for example through on-bill financing.
- Seek third-party sources of funding to support energy efficiency programs.

Either way, Synapse recommends that New Hampshire utilities continue collecting information on customer participation in energy efficiency programs to help inform decisions about addressing customer equity. Such information should include whether customers participate in multiple programs within a year, whether customers participate in programs across multiple years, and the number of customers that are eligible to participate in each program each year.

[69] NESP, 2017, Appendix 5.C.

7.2. Economic Development and Job Impacts

Energy efficiency investments can increase disposable income, increase the number of jobs, and expand economic development as a result of customer energy bill savings. New Hampshire statutes frequently mention the importance of economic benefits, providing policy support to analyze them when considering energy efficiency investment levels. By calculating economic development and job impacts, utilities provide transparency on program impacts, especially to the New Hampshire legislature.

Synapse recommends that economic development benefits be considered separately from the benefit-cost analysis results. The economic development benefits should be considered alongside the other energy efficiency benefits but should not be added to them.

> Economic development benefits should be considered quantitatively in job-years alongside other energy efficiency benefits and not added to them.

Economic development benefits can be presented using several indicators, including state gross domestic product (GDP) (in dollars), state personal income (in dollars), state tax revenues (in dollars), and number of jobs (in job-years). These different indicators show different aspects of economic development and are all inter-related. Each indicator has some advantages and disadvantages in terms of portraying economic development benefits. These indicators should not be added to each other because that could lead to double-counting and would be misleading. Which indicator to use for the purpose of energy efficiency cost-effectiveness analysis depends upon the policy goal that the analysis is trying to achieve.

Synapse recommends the New Hampshire utilities use the number of jobs (in job-years) as the best indicator of economic development benefits. A job-year is equivalent to a full-time employment opportunity for one person for one year (e.g., five job-years could be five jobs for one year or one job for five years). This indicator is easiest to understand, provides information that is most useful for policymakers, and can be easily presented alongside the results of the energy efficiency benefit-cost analysis. Further, we recommend that the number of jobs be estimated for the portfolio of efficiency programs as a general indication of economic development benefits of the energy efficiency resource, as opposed to estimating them for each efficiency program or each sector. This approach is similar to how New Hampshire utilities currently quantify job impacts.[70]

[70] New Hampshire utilities estimate job impacts by applying a multiplier from a national study to their energy efficiency investments. The national multiplier determines the number of jobs created for every million dollars invested. See, Political Economy Research Institute, "Analysis of Job Creation and Energy Cost Savings From Building Energy Rating and Disclosure Policy," March 2012 available at https://www.peri.umass.edu/fileadmin/pdf/other_publication_types/PERI-IMT-2012-Analysis_Job_Creation.pdf.

We provide a more complete explanation of job impacts, including why it is more appropriate to consider these impacts separately rather than within cost-effectiveness testing, in *Appendix B: Economic Development Impacts.*

8. COST-EFFECTIVENESS IN OTHER CONTEXTS

8.1. Potential Study

Demand-side management potential studies often represent the economic potential case using a TRC test. Such potential studies typically include all costs to utilities and participants, but generally do not include participant benefits. This is because potential study authors calculate incremental energy efficiency costs, which can be funded through utility programs or the participating customer, but it is typically outside of the potential study author's scope to calculate participant benefits. As a result, these benefits are ignored. This can lead to results that are not symmetrical and are skewed against energy efficiency (see Chapter 3.4 on symmetry).

The New Hampshire utilities have hired a consultant to conduct a study that estimates and characterizes the remaining achievable energy efficiency potential that might be realized from ratepayer-funded energy efficiency programs during 2021–2023. The study is expected to be completed by May 2020.

Synapse recommends the potential study authors use the same primary cost-effectiveness test that the New Hampshire utilities use for screening energy efficiency resources in regulatory proceedings. If the Commission approves the Granite State Test for use by the New Hampshire utilities, then the potential study authors should evaluate energy efficiency resource potential using the Granite State Test. This approach ensures consistency with how the utilities design and implement energy efficiency programs and therefore ensures the potential study results reflect the full range of program potential.

8.2. Energy Optimization Study

The EM&V Working Group contracted with Navigant to study energy optimization through fuel switching. As part of the study, Navigant was tasked with evaluating how energy optimization activities should be treated in cost-effectiveness practices. Navigant identified three energy efficiency program changes to cost-effectiveness practices that relate to energy optimization. The changes Navigant identified for cost-effectiveness practices are that utilities could count:

1. Savings from unregulated fuel (oil or propane) when switching to electric measures and increases in peak load from the fuel-to-electric measures;

2. Reductions in greenhouse gas emissions as a non-energy impact, with an associated avoided cost value; and

3. Site and source savings.[71]

The first two recommendations relate directly to the B/C Working Group's discussion on two non-utility system impacts: other fuel impacts and environmental impacts (see Chapter 3.2). On other fuel impacts,

[71] Navigant, "Energy Optimization through Fuel Switching Study," August 5, 2019.

all parties agreed to include increases and decreases in consumption of other fuels and electricity, consistent with the NSPM's symmetry principle.

For environmental impacts, B/C Working Group members supported including the New Hampshire-specific fossil fuel end-use environmental benefits in the primary test, and other environmental externalities impacts within a secondary test. To the extent that stakeholders and the Commission adopt Navigant's recommendations, as well as the recommendations of this report, the Secondary Granite State Test can be used for fuel switching and fuel optimization programs.

Fuel switching presents an example of how utilities can apply secondary tests. If programs that encourage fuel switching have a benefit-cost ratio less than 1.0 using the Granite State Test, but have a benefit-cost ratio greater than 1.0 using a secondary test that includes environmental impacts, then stakeholders and the Commission can determine whether the environmental benefits support implementing fuel switching. Further, the Utility Cost Test might be helpful in making this determination. If the fuel switching program has a Utility Cost Test benefit-cost ratio that is close to or greater than 1.0, then this might justify supporting the program; but if the fuel switching program has a Utility Cost Test result that is much less than 1.0, then stakeholders and the Commission may not wish to support such a program or limit its scale.

8.3. Current Non-Energy Impact Evaluation

Income Eligible Participant Impacts

Opinion Dynamics is evaluating the Home Energy Assistance program, with a final report expected by year-end 2019. Opinion Dynamics is evaluating income eligible impacts, including utility system impacts such as reduced arrearages and bad debt write offs, as well as participant NEIs such as improved health, safety, and comfort.

The B/C Working Group supported including income eligible participant impacts within the primary test (see Chapter 3.3). The results of the NEI study will be important for calculating accurate and complete income eligible participant impacts. New Hampshire utilities can use the results of the NEI study to inform the income eligible participant impacts that might be included in the Granite State Test. If for some reason the impacts associated with the study are not accepted by the Commission, the utilities could continue to use the NEI adder they currently utilize or another proxy that is informed by the forthcoming study, or they could use reliable values that can be readily adapted from relevant literature.

Non-Energy Impacts

The EM&V Working Group contracted with DNV GL to review participant, utility, and societal non-energy impacts from energy efficiency programs. DNV GL is in the process of constructing a database of NEI values identified in published literature and adjusting those impacts to make them New Hampshire-specific. The types of impacts DNV GL is studying for residential and commercial customers include, as

examples, bad debt write-offs and shutoffs and reconnections for utility impacts, property value and indoor air quality for participant impacts, and national security and waste disposal for social impacts.

New Hampshire utilities can use the results of this study to inform the utility NEI values included in the primary test (e.g., avoided credit and collection costs).

The B/C Working Group supported including participant impacts within a secondary test rather than the primary test (see Chapter 6). The results of the NEI study will be important for calculating accurate and complete participant impacts, and may inform how participant impacts are included in the Secondary Granite State Test.

The B/C Working Group supported including environmental and income eligible societal impacts within a secondary test rather than the primary test (see Chapter 6). New Hampshire utilities can use the societal NEI results of this study to inform the impacts included in the Secondary Granite State Test.

If for some reason the impacts associated with the study are not accepted by the Commission, the utilities could: (1) continue to use the NEI adder they currently utilize for participant impacts and develop new adders for utility NEIs, environmental impacts, and income eligible societal impacts; (2) use other proxies that are informed by the forthcoming study; or (3) use reliable values that can be readily adapted from relevant literature.

APPENDIX A: POLICIES REVIEWED BY THE B/C WORKING GROUP

In Table 11 we provide all the policies identified and reviewed by B/C Working Group members during Steps 1 and 3 of the Resource Value Framework (see Chapter 3).

Table 11. Policies reviewed by the B/C Working Group

Citation	Policy Summary / Paraphrase
Laws and Statutes	
RSA 4-E:1, II	Policies should "ensure the reliability, safety, fuel diversity, and affordability of New Hampshire's energy sources, while protecting natural, historic, and aesthetic resources and encouraging local and renewable energy resources."
RSA 125-O:1, I	Three cornerstones of NH's quality of life: public health, environmental quality, and economic well-being.
RSA 125-O:1, IV	Reducing air pollutant emissions returns substantial economic benefit to the state.
RSA 125-O:1, VII	Energy efficiency benefits all citizens and ratepayers.
RSA 125-O:5	Promote energy efficiency and conservation.
RSA 125-O:5-a	Develop a plan for economic and environmental sustainability of the state's energy system.
RSA 125-O:5-a	Ensure that all customers participating in programs for low-income customers and the Low Income Home Energy Assistance Program (LIHEAP) have access to energy efficiency improvements.
RSA 125-O:5-a, I	A sustainable energy board is created to support sustainable energy programs.
RSA 125-O:5-a, I(b)	Develop a plan to achieve the state's energy efficiency potential for all fuels.
RSA 125-O:5-a, I(e)	Programs should target more than one fuel resource, including conversion to renewable resources.
RSA 125-O:5-a, I(i)	All low-income customers should have access to energy efficiency improvements and renewable energy resources to reduce their energy bills.
RSA 125-O:23, III	At least 15% of RGGI revenue shall be allocated to low-income energy efficiency programs.
RSA 362-A:1	It is found to be in the public interest to provide for small-scale and diversified sources of supplemental electrical power to lessen the state's dependence upon other sources which may, from time to time, be uncertain.
RSA 362-F:1	Renewable energy generation technologies can provide fuel diversity through use of local renewable fuels and resources that serve to displace and thereby lower regional dependence on fossil fuels.
RSA 369-B:1, XIII	Low-income programs should be designed to maximize participant benefits.
RSA 374-F:1, I	The overall public policy goal of restructuring is to develop a more efficient industry structure and regulatory framework that results in a more productive economy by reducing costs to consumers while maintaining safe and reliable electric service with minimum adverse impacts on the environment.
RSA 374-F:3, I	Reliable electricity service must be maintained while ensuring public health, safety, and quality of life.
RSA 374-F:3, V	Programs that enable residential customers with low incomes to manage and afford essential electricity requirements should be included.
RSA 374-F:3, VI	Restructuring of the electric utility industry should be implemented in a manner that benefits all consumers equitably.
RSA 374-F:3, VIII	As generation becomes deregulated, innovative market-driven approaches are preferred to regulatory controls to reduce adverse environmental impacts.

Citation	Policy Summary / Paraphrase
RSA 374-F:3, IX	Renewable energy resources can have significant environmental, economic, and security benefits. Customers should have the option to pay a premium for renewable energy.
RSA 374-F:3, X	Restructuring should be designed to reduce market barriers to investments in energy efficiency.
RSA 374-F:3, XI	Given New Hampshire's higher than average regional prices for electricity, utilities should, in the near term, work to reduce rates for all customers.
RSA 374-F:4, VII, e	Program costs can be included in the distribution charge or the system benefits charge.
RSA 374-F:4, VIII-a	Efficiency programs should maximize benefits to public schools.
RSA 374-F:6	Electric restructuring committee to review energy efficiency programs to determine what barriers exist to providing all-fuels, comprehensive savings.
RSA 374-G:2	Distributed energy resources definition.
RSA 374-G:5, II	Public interest considers a number of factors, including the costs and benefits to any participating customer.
RSA 378:7	Rates should be just and reasonable.
RSA 378:28	Reasonable rates of return.
RSA 378:37	The state should meet the energy needs of customers at the lowest reasonable cost and maximize use of cost-effective energy efficiency and other DERs, and to protect the safety and health of the citizens and the physical environment of the state.
RSA 378:38	Least Cost Integrated Resource Plans (LCIRP) shall include an assessment of the plan's long- and short-term environmental, economic, and energy price and supply impact on the state, and consideration of grid resilience and reliance.
RSA 378:39	The following order of energy policy priorities shall guide the commission's evaluation: energy efficiency and other demand-side management resources; renewable energy sources; all other energy sources. The Commission must consider potential environmental, economic, and health-related impacts of each option proposed by a utility to meet its customers' needs.
Commission Orders	
Order No. 26,207, p 13	NEI benefits and adders included in plan.
Order No. 26,207, p 17	Energy efficiency will provide benefits to participants and non-participants and the utility system.
Order No. 26,095, p 18	Energy efficiency will provide benefits to participants and non-participants and the utility system.
Order No. 26,095, p 10	Summary of benefit and avoided cost detail in Plans.
Order No. 26,095, p 14-15	Both NEIs and price suppression impacts (DRIPE) will be studied by a Benefit/Cost Working Group that will further examine cost-effectiveness.
Order No. 25,932, p 54	Any short-term rate impacts will be outweighed by the benefits to customers, the grid, and the New Hampshire economy.
Order No. 25,932, p 54	Customer bills will decrease when their energy consumption decreases and when the impact of consumption decreases is reflected in reduced grid and power procurement costs.
Order No. 25,932, p 54	Commission supports the increased low-income budget.
Order No. 25,932, p 54	Failing to increase the funding to support higher savings goals fails to capture benefits for customers.
Order No. 25,932, p 54	Participants will see reduced gas and electric bills, and all utility customers should see reduced costs for electric and gas supply in the long run.
Order No. 25,932, p 54	Commission supports the increased low-income budget.
Order No. 25,932, p 56	The proposed costs appear to be just and reasonable and consistent with the legislative mandate to consider energy efficiency a first priority resource.
Order No. 25,932, p 50	Cost-effective energy efficiency is a lower cost resource than other energy supply.

Citation	Policy Summary / Paraphrase
Order No. 25,976, p 13	Energy efficiency will provide benefits to participants and non-participants and the utility system.
Order No. 25,747, p 11-12	Energy efficiency programs constitute public benefits.
Order No. 25,747, p 14	Commission supports the increased low-income budget.
Order No. 25,402, p 22	The CORE programs have consistently demonstrated their cost-effectiveness by generating electric savings at a cost less than the cost of electricity that otherwise would have been produced.
Order No. 25,402, p 22	It has been getting harder to maintain a cost-effective program without broadening the program to include non-electric energy savings.
Order No. 25,402, p 22	Programs that isolate and target energy efficiency to a single fuel source, such as electricity, have proved less cost-effective than energy efficiency measures delivered as a comprehensive package. Comprehensive packages are the overall most cost-effective approach to achieving energy efficiency and conservation of all fuel sources.
Order No. 25,402, p 23	The Commission finds that allowing the Home Performance with ENERGY STAR (HPwES) program to be included in the upcoming CORE energy efficiency program cycle is in the public interest and is consistent with the overall intent of RSA Chapter 374-F.
Order No. 25,402, p 24	Fuel-neutral measures that save both electric and non-electric should be included in the plans. Non-electric savings such as those realized from weatherization do lead to electric savings.
Order No. 24,930, p 19	The Commission supports fuel-blind programs.
Order No. 24,109, p 897	For gas programs, there are certain non-quantified environmental/other benefits associated with the delivery of energy efficiency programs.
Order No. 24,109, p 897	Low-income costs will be paid by all customers.
Order No. 24,109, p 898	Gas low-income programs merit separate consideration.
Order No. 24,109, p 899	Low-income program budgets are dedicated and those budgets cannot be siphoned away to other programs.
Order No. 24,109, p 899	Companies and stakeholders shall collaborate to ensure the needs of the low-income community are met.
Order No. 23,982, p 18	Energy efficiency is a crucial and key element of the electric industry.
Order No. 23,982, p 18	Energy efficiency programs are consistent with the public good.
Order No. 23,982, p 24	Gas utilities have a role to play in energy efficiency.
Order No. 23,574, p 13-14	Commission approval of 219 Working Group report.
Order No. 23,574, p 17	Low-income programs should be well designed and can be funded from general energy efficiency budget.
Other Policies	
State Energy Plan, p 5	State goals include, among other things, prioritizing cost-effective energy policies.
State Energy Plan, p 14	Efficiency is cheap and provides benefits. New Hampshire should prioritize capturing cost-effective energy efficiency in all sectors.
State Energy Plan, p 14, 39	Reducing energy use, especially during expensive peak times saves money for everyone on our energy systems.
State Energy Plan, p 9	Energy efficiency is the cheapest and cleanest energy resource. New Hampshire should prioritize capturing cost-effective energy efficiency in all sectors, including buildings, manufacturing, and transportation.
1999 Working Group Report, p 14	Cost-effectiveness tests are a means to evaluate the relative value of ratepayer-funded energy efficiency programs, but not the only means.
1999 Working Group Report, p 16	Participants includes all customers who save electricity. Free-riders need to be netted out.

Citation	Policy Summary / Paraphrase
1999 Working Group Report, p 16	Energy efficiency programs produce environmental and other benefits that are not otherwise captured in the direct avoided costs.
1999 Working Group Report, p 17	Low-income and educational programs that fall below a benefit to cost ratio of 1.0 may still be approved by the Commission if the programs are otherwise well-designed.
1999 Working Group Report, p 17	Projected costs and benefits should be stated in present value terms.
1999 Working Group Report, p 21	A utility will not earn on the cost-effectiveness component in a sector if the actual New Hampshire cost-effectiveness test for the combined programs is less than 1.0.
SBC Effectiveness Report, p 1	Efficiency programs will be implemented within the Energy Efficiency Resource Standard (EERS) framework.

Source: 2019 B/C Working Group discussions.

APPENDIX B: ECONOMIC DEVELOPMENT IMPACTS

Cost-effective energy efficiency investments provide a low-cost alternative to supply-side resources. There are additional benefits from energy efficiency that extend to the broader local economy by lowering energy costs for consumers and businesses, increasing productivity for businesses, and creating jobs. This appendix discusses this benefit category referred to as economic development impacts. Economic development impacts measure the increased local economic activity from energy efficiency program spending and savings, including job creation, increased local income, and the growth of local industries.[72]

There is a growing interest in some jurisdictions in accounting for the economic development impacts, particularly the jobs impact, as part of the energy efficiency program screening process. As an example, in 2017 the Rhode Island Public Utilities Commission revised its total resource cost-effectiveness standard to include economic development benefits while renaming the standard as the Rhode Island Test.[73]

Terminology

A variety of terms are used when discussing economic development impacts. To create a shared understanding of terminology, Table 12 provides definitions for key terms used when discussing energy efficiency program economic development impacts.

[72] American Council for an Energy Efficient Economy, "ACEEE State Policy Toolkit: Guidance on Measuring the Economic Development Benefits of Energy Efficiency," 2019.

[73] The Brattle Group, *Review of RI Test and Proposed Methodology*, prepared for National Grid, January 31, 2019.

Table 12. Energy efficiency program economic development impacts terminology

	Term	Definition
Periods when economic development benefits are created	Implementation Phase	The phase in which economic impacts result from the production and installation of energy efficiency equipment. This phase can vary from a few months to several years.
	Savings Phase	The second phase occurs once energy efficiency measures are installed and begin to return savings through reduced energy bills. The re-spending of the energy bill savings supports ongoing local economic impacts over time.
Types of economic development impacts	Direct Impacts	The jobs and local economic activity created from direct investments in energy efficiency equipment and services during the implementation phase. During the savings phase, the direct impacts result when households re-spend the bill savings in the local economy (e.g., retail or service sector firms).
	Indirect Impacts	The jobs and local economic activity created by firms in the supply chains that provide products and services to firms in the direct impacts category.
	Induced Impacts	The jobs and local economic activity created by the re-spending of the newly hired workers who gained employment in the direct or indirect impacts categories.
Indicators of economic development impacts	Job-Years[74]	A job-year is equivalent to a full-time employment opportunity for one person for one year (e.g., five job-years could be five jobs for one year or one job for five years).
	Personal Income	Personal income refers to all income collectively received by all individuals or households in a country (or state). Personal income includes compensation from several sources including salaries, wages, and bonuses received from employment or self-employment.[75]
	State Gross Domestic Product (GDP)	State GDP is the total monetary or market value of all the finished goods and services produced within a state's borders in a specific time period.[76]
	State Tax Revenue	State tax revenues increase in the form of property taxes, sales and gross receipts taxes, and individual income tax due to increased economic activity and employment within the state.

There are two distinct phases of an energy efficiency program's lifecycle that result in distinct economic development impacts. Jobs are created and local spending increases from the purchase of energy efficiency equipment and services during the implementation phase—sometimes referred to as the construction phase. The economic development impacts continue until the energy efficiency measures are completed, giving way to the savings phase. Energy bill savings continue throughout the useful life of the energy efficiency measures implemented. The economic development impacts during the savings

74 Studies present employment estimates in terms of various measures of labor, including jobs, job-years, and total wages. The term "jobs" is the least precise measure. Estimates of jobs typically do not distinguish between full-time and part-time employment.

75 From Investopedia: https://www.investopedia.com/terms/p/personalincome.asp.

76 From Investopedia: https://www.investopedia.com/terms/g/gdp.asp.

phase result from an increase in disposable income equal to the energy bill savings. The re-spending of the energy bill savings stimulates local economic activity in a variety of industries from hospitality to retail.

The economic impacts from spending in the implementation phase and the re-spending during the savings phase can be thought of in three distinct categories: direct, indirect, and induced. Economic models used to estimate economic impacts often produce estimates in each of these categories. Direct economic impacts result from the purchase of energy efficiency equipment and services from local businesses during the implementation phase and from businesses that are the direct recipients of the re-spending during the savings phase. The indirect economic impacts reflect the job growth and local spending associated with firms that supply goods and services to businesses in the direct economic impacts category. Finally, induced economic impacts reflect the economic activity of newly hired workers in the direct or indirect categories when they spend their earnings on goods and services.

Economic development impacts are reported using different indicators. Given the growing interest in job creation, energy efficiency program economic development impacts can be reported in the number of jobs created. As noted in Table 12 above, job-years is a term used to describe jobs impacts with each job-year representing a full-time job for one year. Three economic impact measures are denominated in dollars including personal income, state GDP, and state tax revenue. Personal income reflects the total wages paid to the newly hired workers due to the direct, indirect, and induced economic impacts. State GDP is measured over a specific timeframe, either quarterly or annually, representing the value of all goods and services produced in the state. Finally, spending and job growth increase local and state tax revenues representing an additional energy efficiency program economic development benefit.

Methodology

Estimating the local-level economic impacts of energy efficiency programs involves projecting likely changes in the flow of goods, services, and income, and then estimating the resulting economic benefits measured by the key economic indicators discussed above.[77] There are a variety of methods and models used for this purpose with varying degrees of complexity from simple and less costly rules-of-thumb factors to more detailed and costly econometric models. Table 13 lists the most common approaches and providing a brief description of each and its typical use.

[77] U.S. Environmental Protection Agency, *Estimating the Economic Benefits of Energy Efficiency and Renewable Energy*, Part 2, Chapter 5, 2018.

Table 13. Economic Development Impacts - Methods and Models

Type of Method or Model	Description	Typical Use
Rules-of-thumb factors*	Generic rules-of-thumb factors for economic impact analysis are simplified factors that represent relationships between key policy or program characteristics (e.g., financial spending, energy savings) and employment or output.	High-level screening analysis
Input-output models	Input-output models, also known as multiplier analysis models, can also be used to conduct analyses within a limited budget and timeframe, but provide more rigorous results than those derived from rules of thumb.	Short-term analysis of policies with a limited scope and impact
Econometric models	Econometric models use mathematical and statistical techniques to analyze economic conditions both in the present and in the future to forecast how energy efficiency initiatives might affect income, employment, gross state product, and other common output metrics.	Short- and long-term analysis of policies with an economy-wide impact
Computable general equilibrium models (CGE)	CGE models use equations derived from economic theory to trace the flow of goods and services throughout an economy and solve for the levels of supply, demand, and prices across a specified set of markets. When the baseline equilibrium is shifted from energy efficiency program spending and savings a new market equilibrium is created. This new equilibrium includes prices and output adjustments throughout the economy. In this way, CGE models can be useful for assessing the economy-wide impacts of an energy efficiency policy.	Long-term analysis of policies with an economy-wide impact
Hybrid models	Hybrid models typically combine aspects of CGE modeling with those of econometric models and may be based more heavily on one or the other.	Short- and long-term analysis of policies with a limited or economy-wide impact

Notes: Adapted from Table 5-1: Types of Methods and Models and Their Typical Uses, U.S. Environmental Protection Agency Estimating the Economic Benefits of Energy Efficiency and Renewable Energy, Part 2, Chapter 5. See this reference for a detailed discussion of the strengths and limitations of each approach.

**ACEEE's (2019) State Policy Toolkit: Guidance on Measuring the Economic Development Benefits of Energy Efficiency refers to adder and multiplier, which would fall under the broader rules-of-thumb factors.*

The two most common input-output models used to estimate the economic development impacts of energy efficiency policies and investments are:

- *REMI (Regional Economic Models Inc.) Model.* REMI is a dynamic forecasting and policy analysis tool. The model forecasts the future of a regional economy, and it predicts the effects on that same economy when the user implements a change. REMI models have been used throughout the world for a wide range of topic areas, including economic development, the environment, energy, transportation, and taxation, forecasting, and planning.
- *IMPLAN (Economic Impact Analysis for Planning, IMPLAN Group, LLC).* IMPLAN is an industry-standard input-output model that accounts for both the direct and indirect

economic impact of an industry. IMPLAN was developed by the U.S. Forest Service in the 1970s to deliver accurate and timely estimates of economic impacts of forest resources.

Estimates of local economic development impacts start by defining the geographic boundary of the study, which is typically a state. The next step is to establish a baseline from which to compare changes in economic activity resulting from energy efficiency investments. The baseline should reflect current conditions including the following:

- Population: Are the size and distribution across age categories accurate?
- Economic growth rate: Is the expected rate of growth in line with current projections for the region?
- Consumer behavior: Do the model's assumptions about how consumers change behavior in response to a change (i.e., elasticities) seem realistic?
- Rate of technological change: Do the model's assumptions seem in line with reality?
- Energy prices: Are they current?[78]

Energy efficiency program spending during the implementation phase impacts a variety of industries depending on the type of energy efficiency programs being implemented. Suppliers of energy efficiency equipment and ancillary materials experience increased sales. In addition, contractors providing energy efficiency construction and installation services see an increase in demand for their services. Information on the amount of spending by the industrial sector is required as a key input to simulate how energy efficiency program spending flows through the local economy.

It is important to recognize that a decrease in spending occurs in other sectors during the energy efficiency program implementation phase. The decreased spending in the energy supply sector, i.e., the avoided costs, represent a reduction in spending, some of which would have occurred within the state boundaries. To correctly model the net economic development benefit, the reduced economic activity associated with reduced supply-side spending must be subtracted from the economic development impacts due to increased energy efficiency spending.[79]

Initially, participant energy efficiency spending represents a decrease in disposable income. As the savings accumulate over time program participants experience a net increase in disposable income. Non-program participants may experience an increase in disposable income through demand reduction induced price effects (DRIPE). DRIPE occurs when a reduction in the demand for electricity places downward pressure on electricity prices that benefit all ratepayers. Accounting for changes in

78 U.S. Environmental Protection Agency, *Estimating the Economic Benefits of Energy Efficiency and Renewable Energy*, Part 2, Chapter 5, 2018.

79 The Brattle Group, *Review of RI Test and Proposed Methodology*, prepared for National Grid, January 31, 2019.

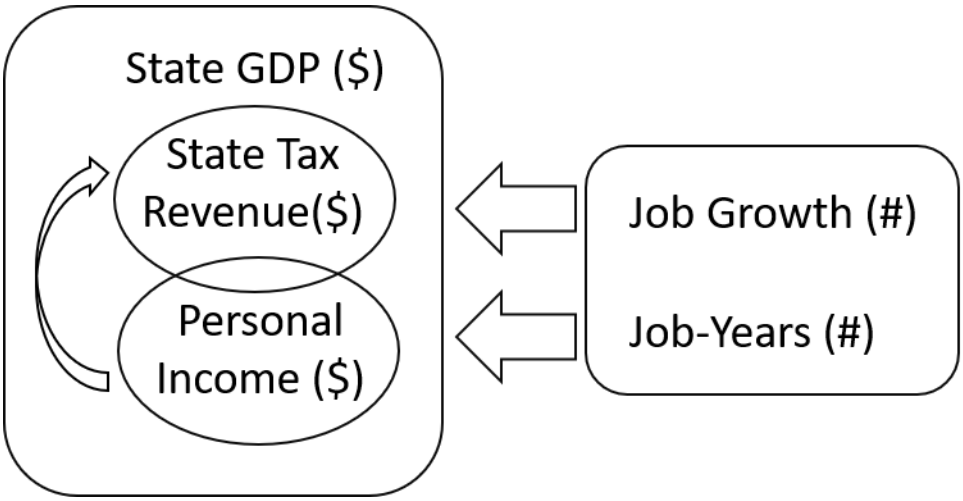
disposable income overtime and how households re-spend energy bill savings is accounted for in the economic model used to estimate economic development impacts.

Models to estimate economic development impacts compare the economic outcomes given the baseline scenario to the economic outcomes resulting from the changes in spending described above. The net increase in economic development indicators is thus attributed to the energy efficiency program.

Indicators of Economic Development

As discussed above, there are different indicators used to represent economic development impacts: job years, personal income, state GDP, and state tax revenue. It is important to note that there is a great deal of overlap between these indicators of economic activity (see Figure 7). For example, both personal income and state tax revenue are included within the broader state GDP metric. Personal income is reflected in the final price of goods and services, which is the basis for measuring GDP. Also, GDP includes government expenditures funded through tax revenues. As another example, job growth directly affects personal income. When new jobs are created those additional jobs increase personal income, by an amount equal to the number of jobs created times prevailing wages. While it is informative to present economic activity in all of these indicators, they should never be added together because of this overlap.

Figure 7. Indicators of Economic Development Impact Overlap



The benefit-cost (BCA) framework used to screen energy efficiency programs for cost-effectiveness is grounded in the theory of welfare economics.[80] Utilities should pursue investments that enhance the

[80] Welfare economics focuses on the optimal allocation of resources and goods and how the allocation of these resources affects social welfare. (From Investopedia: https://www.investopedia.com/terms/w/welfare_economics.asp)

general welfare of the population of interest. However, measures of economic activity do not necessarily represent social welfare. For example, increased pollution reduces social welfare but can lead to increased state GDP, increased personal income, and increased employment. Similarly, for all of the economic development indicators, there is also a trade-off between increased economic activity and reduced leisure time. Further, the state GDP includes profits that are earned by out-of-state shareholders. This is inconsistent with the rest of the economic development analysis that focuses on in-state impacts.

Cost-effectiveness analyses described in this report include costs and benefits that can be uniquely ascribed to either utility ratepayers (e.g., energy efficiency costs, energy and capacity savings), energy efficiency program participants (costs of measures, benefits of increased productivity), other resources (e.g., water or other fuel savings), or members of society (e.g., environmental externalities, public health benefits). Economic development benefits, on the other hand, cannot be so easily isolated from the other costs and benefits in the BCA. In other words, the economic development benefits are inter-related and overlap with the BCA impacts as discussed above.

These issues are reflected in concerns raised regarding the possibility of double-counting when the increased state GDP benefit is included in a cost-effectiveness test.[81] Double-counting occurs when the economic development impact in the form of increased state GDP is included in a cost-effectiveness test that already includes energy bills savings as a participant benefit. The dollar value of the energy bill savings represents an increase in disposable income for program participants, which is another way to describe a component of the stimulus that the energy efficiency program provides to state GDP during the savings phase.[82]

Economic development benefits should not be added to the cost-effectiveness analysis results, because they represent a different type of economic impact. The economic development benefits represent economic activity in the state, which is different from the customer and societal impacts included in an energy efficiency program BCA. The number of job-years is a potentially valuable metric to present alongside BCA results; job growth is easily understood and relatively easy to isolate from the other indicators.

Recommendations

Synapse recommends that economic development benefits be considered separately from the benefit-cost analysis results. In other words, the economic development benefits should be considered alongside the other energy efficiency benefits but should not be added to them.

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81 American Council for an Energy Efficient Economy, "ACEEE State Policy Toolkit: Guidance on Measuring the Economic Development Benefits of Energy Efficiency," 2019.

82 *Ibid.*

We also recommend that the economic development indicators, including state GDP (in dollars), state personal income (in dollars), state tax revenues (in dollars), and number of jobs (in job-years) never be added to each other because that would include double-counting and would be misleading. Which indicator to use for the purpose of energy efficiency cost-effectiveness analysis depends upon the policy goal that the analysis is trying to achieve.

Synapse also recommends the New Hampshire utilities use number of jobs (in job-years) as the best indicator of economic development benefits. This indicator is easiest to understand, provides information that is most useful for policymakers, and can be easily presented alongside the results of the energy efficiency benefit-cost analysis. Further, we recommend that the number of jobs be estimated for the portfolio of efficiency programs as a general indication of economic development benefits of the energy efficiency resource, as opposed to estimating them for each efficiency program or each sector.

APPENDIX C: OTHER DISTRIBUTED ENERGY RESOURCES

B/C Working Group Discussion

B/C Working Group members discussed how the cost-effectiveness tests for energy efficiency would or should influence the cost-effectiveness tests for other types of distributed energy resources (DERs).[83] The group discussed the following questions:

1. Would or should the energy efficiency cost-effectiveness test(s) set a precedent for other types of DERs?
2. Should the energy efficiency cost-effectiveness test(s) be developed to be applicable to other types of DERs?
3. Should the NSPM be used to develop the cost-effectiveness test(s) for other types of DERs?
4. Should all types of DERs be subject to the same cost-effectiveness test(s)?

The B/C Working Group had a relatively short, *ad hoc* discussion. B/C Working Group members did not explore these issues in depth, discuss them within their organizations, or reach agreement on them.

The B/C Working Group agreed that it is beyond the scope of the 2019 Settlement, and therefore beyond the scope of this report, to answer DER cost-effectiveness questions in this report. Nonetheless, we offer some thoughts below to help stakeholders understand how cost-effectiveness tests for energy efficiency could be related to tests for other types of DERs.

Considerations

The NSPM was developed specifically for energy efficiency resources cost-effectiveness. However, the principles and concepts in the NSPM can be used to develop tests for other types of DERs.[84] Therefore, stakeholders could apply to other types of DERs the principles and concepts from the NSPM that are being applied in New Hampshire for energy efficiency resources.

> The principles and concepts in the NSPM for energy efficiency resources can be used to develop tests for other types of DERs.

It is Synapse's understanding that the B/C Working Group and the Commission are not required to apply any of the recommendations from this energy efficiency process to other types of DERs. Stakeholders will discuss and decide on DER cost-effectiveness in different forums, perhaps with different parties or intervenors. Nonetheless, some of the

83 DERs include energy efficiency, demand response, distributed generation, storage, and load reduction and control programs.

84 NESP, 2017, Appendix B.

considerations and decisions made in this B/C Working Group process on energy efficiency cost-effectiveness might provide opportunities for other dockets or investigations on other types of DERs.

There are some elements of the energy efficiency cost-effectiveness test recommendations in this report that stakeholders could easily apply to other types of DERs, once stakeholders and the Commission turn to that question. For example:

- The NSPM universal principles on energy efficiency cost-effectiveness, or comparable principles, can be applied to other types of DERs (see Chapter 2.2).
- Some of the New Hampshire energy policy goals used to develop the energy efficiency cost-effectiveness tests can be considered when developing tests for other types of DERs.
- The concept of using primary and secondary tests for reviewing cost-effectiveness can be applied to other types of DERs.
- The approach to addressing energy efficiency rate impacts and cost-shifting through a separate analysis can be applied to other types of DERs.

In theory, all types of DERs should be subject to the same cost-effectiveness tests. This would allow for a consistent comparison across utility investments and resource types. It would also help utilities, stakeholders, and regulators identify the optimal mix of investments and resources. However, it is not always practical to develop tests in this way, and the B/C Working Group is charged with the task of developing cost-effectiveness tests only for energy efficiency. Further, there might be valid reasons for applying different cost-effectiveness tests to different types of DERs. For example, New Hampshire legislation or energy policy might require that certain impacts be considered for one type of DER but not for others.

Recommendations

Synapse recommends that the B/C Working Group propose cost-effectiveness tests that are appropriate only for energy efficiency, as dictated by the terms of the 2019 Settlement. This will include the primary Granite State Test, the secondary Utility Cost Test, and the Secondary Granite State Test, plus a separate rate, bill, and participation impact analysis to evaluate potential cost-shifting and a separate economic development and job impact analysis. The primary test will be used for most energy efficiency cost-effectiveness decisions, while the secondary tests will be used only as needed to resolve questions regarding marginally cost-effective efficiency programs. The rate, bill, and participation impact analysis will be used to consider cost-shifting implications for the portfolio of programs.

This same combination of tests can be used to evaluate the cost-effectiveness of other types of DERs: a primary test, two secondary tests, and a rate, bill, and participation impact analysis. In the context of DERs, it would be appropriate to use the Utility Cost Test as one of the secondary tests. This means that the difference between the energy efficiency approach and the approach for other types of DERs might be the state-specific primary and secondary tests, which could change across resources based on DER-specific policy and stakeholders' interpretation of that policy.

In the future, when developing a primary test for other types of DERs, stakeholders and the Commission should first consider whether all types of DERs should be subject to the same primary test.

- If the answer is yes, stakeholders and the Commission should walk through the steps of the Resource Value Framework to develop a new primary test that would be applied to *all* DERs.
- If the answer is no, stakeholders and the Commission should walk through the steps of the Resource Value Framework to develop a new primary test *for each* of the other types of DERs.

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