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List of Acronyms

ACEEE - American Council for an Energy-Efficient Economy

C&I - Commercial and Industrial

CARD - Conservation Applied Research and Development

CEE - Center for Energy and the Environment

CIP - Conservation Improvement Program

Commerce - Minnesota Department of Commerce

Commission - Minnesota Public Utilities Commission

DRG - Distributed and Renewable Generation

Dth - Dekatherm

GDP - Gross Domestic Product

IOU - Investor-Owned Utility

IRP - Integrated Resource Plan

kWh - Kilowatt Hour

LEED - Leadership in Energy and Environmental Design

MERC - Minnesota Energy Resource Corporation

MWh - Megawatt Hours

NEB - Non-Energy Benefits

NESP - National Efficiency Screening Project

NGEA - The Next Generation Energy Act

NSPM - National Standard Practice Manual

PCT - Participant Cost Test

RIM - Ratepayer Impact Measure test

RPS - Renewable Portfolio Standard

RVF - Resource Value Framework

SCT - Societal Cost Test

TRM - Technical Reference Manual

TRMAC - TRM Advisory Committee

UCT - Utility Cost Test

WACC - Weighted Average Cost of Capital

1. Executive Summary

Objective and Approach

Synapse Energy Economics (Synapse) was awarded a Conservation Applied Research and Development (CARD) grant by the Minnesota Department of Commerce (Commerce) to produce this white paper. The objective of this project is to describe how the key elements of the National Standard Practice Manual (NSPM)[1] could be applied to energy efficiency cost-effectiveness analyses in Minnesota.

The NSPM provides a comprehensive framework for assessing the cost-effectiveness of energy efficiency resources. It begins with six principles that should be used to guide the development and application of energy efficiency cost-effectiveness tests. These include:

1. Energy efficiency is a resource and should be compared with other resources in a consistent and comprehensive manner.
2. A state's primary cost-effectiveness test should account for its energy and other applicable policy goals.
3. Cost-effectiveness practices should account for all relevant, substantive impacts, even those that are difficult to quantify and monetize.
4. Cost-effectiveness practices should be symmetrical, where both costs and benefits are included for each relevant type of impact.
5. Cost-effectiveness practices should be forward-looking, incremental, and long-term.
6. Cost-effectiveness practices should be completely transparent.

The NSPM also makes an important distinction between the primary and secondary tests used to evaluate energy efficiency. The primary test should account for all applicable state policy goals, because this is the main test regulatory authorities use when evaluating whether or not to approve energy efficiency programs for implementation. The NSPM provides a framework, the Resource Value Framework, to help each state determine its primary cost-effectiveness test. The NSPM also provides guidance on how to develop and apply some of the key inputs for a state's cost-effectiveness test.

To determine how the NSPM's principals could be applied to Minnesota's cost-effectiveness framework, Synapse first examined Minnesota's current energy efficiency screening practices, policies, and goals.

[1] National Efficiency Screening Project, "National Standard Practice Manual for Assessing Cost-Effectiveness of Energy Efficiency Resources." 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). Coordination of the final document was completed by Julie Michals (E4TheFuture). The NSPM also benefited from an extensive review committee, which included representatives form utilities, low-income advocacy groups, regional energy efficiency organizations, the U.S. Department of Energy, public utility commissions, energy policy consultants, among others.

We interviewed key stakeholders. We also reviewed laws, statutes, rules, and orders regarding the application and evaluation of cost-effectiveness in Minnesota.

We then reviewed the key elements of Minnesota practices to determine how well they are aligned with the principles and concepts in the NSPM. Finally, we developed recommendations for how Minnesota practices can be modified to better align with the NSPM.

Current Practices in Minnesota

Minnesota's energy policy history is extensive, dating back as far as 1980 for energy efficiency. Since then, Minnesota has developed comprehensive policy goals and specific rules and targets for energy efficiency resources. Interviewees frequently cited achieving energy savings equivalent to 1.5 percent of sales as the most applicable policy in the state. Minnesota also has many broad policy goals that support increasing fuel diversity, providing least-cost service to consumers, and protecting the environment, among other goals.

The Next Generation Energy Act (NGEA) dictates that Minnesota utilities and stakeholders examine the costs and benefits to society, the utility, the participant, and ratepayers.[2] In practice, this has resulted in the use of four traditional benefit-cost tests: the Societal Cost Test (SCT), the Utility Cost Test (UCT), the Participant Cost Test (PCT), and the Ratepayer Impact Measure Test (RIM). While the utilities calculate results for all four tests in their energy efficiency plans and reports, the SCT is the primary determinant of cost-effectiveness. The other three tests are provided for informational purposes, to inform program design, and to determine performance incentives.

A New Primary Cost-Effectiveness Test

The NSPM articulates the importance of distinguishing between primary and secondary cost-effectiveness tests. Many jurisdictions use several tests to determine the cost-effectiveness of energy efficiency resources, but also use a *primary* test that has priority over other tests. This primary test informs the final decision on which energy efficiency resources should be funded by utility customers through utility-run programs.

Other tests can be used in assessing the cost-effectiveness of energy efficiency resources. These *secondary* tests can provide additional cost-effectiveness information from different perspectives and can help guide regulators' and stakeholders' overall understanding of efficiency resource impacts.

[2] Minn. Stat. § 216B.241, (f).

We use the Resource Value Framework (RVF) described in the NSPM to identify what would be the most appropriate primary test for use in Minnesota.[3] The RVF is intended to construct a state's primary cost-effectiveness test, without being confined to one of the traditional tests. This practice of working through the RVF might lead to a conclusion that one of the traditional tests is appropriate for a state, but the exercise itself is an important way to consider and articulate what the primary cost-effectiveness test should include.[4]

Our application of the RVF suggests that the primary test in Minnesota should not be either of the traditional tests. We instead identify a different test, which we refer to as the "Minnesota Test," to distinguish it from the traditional tests.

The first step of the RVF is to articulate the key Minnesota policy goals relevant to energy efficiency. Minnesota has developed comprehensive and specific rules for energy efficiency practices. In addition, it has other energy policies that are relevant to energy efficiency resources, such as a state energy plan, regulations for integrated resource plans (IRPs) and RPS, and ongoing avoided environmental cost dockets. We considered these policies in the remaining steps for determining the Minnesota Test.

The second step of the RVF is to ensure that the Minnesota Test includes all utility system impacts. As noted above and in Chapter 5, several utility system benefits should be added to the current practices in Minnesota to ensure that all utility system impacts are included.

Third, we consider whether to include participant impacts in the Minnesota Test. These impacts warrant special attention and are often the most challenging question in designing a primary test. We have not come across specific policies in Minnesota that articulate whether participant impacts should be included in the primary test in Minnesota. Further, historical practice offers slightly inconsistent guidance for how to account for participant impacts. The Total Resource Cost Test (which is often used to account for participant impacts) has not been used historically, but a Societal Cost Test (which includes participant impacts) has been used historically as the primary cost-effectiveness test.

Participant non-energy benefits (NEBs) are one of the most challenging and contentious participant impacts. Through our interviews with Minnesota stakeholders, we heard little support for including participant NEBs in the cost-effectiveness tests. These stakeholder positions are important because they indicate a policy preference in this context where there is little legislative or regulatory guidance yet, at least for those parties we interviewed.

Nonetheless, one of the fundamental principles of the NSPM is that if participant costs are included in any one cost-effectiveness test, then participant benefits must be included as well in order to have

[3] Note that our recommendation for the Minnesota Test is offered as a straw proposal to promote discussion of these issues. The decisions regarding what to include in the Minnesota Test should be based on robust stakeholder input and should ultimately be made by Commerce.

[4] National Efficiency Screening Project, pages viii–x.

symmetry.[5] This means that Minnesota stakeholders face an important decision regarding participant NEBs in the primary cost-effectiveness test. The Minnesota Test could either:

a) Include participant costs and benefits because there is a policy rationale for including them. In this case, the Minnesota Test should somehow account for all costs and benefits, including participant NEBs.

b) Not include participant costs and benefits because there is insufficient policy rationale for including them and insufficient support for including participant NEBs. In this case, the Minnesota Test should include neither participant costs nor participant benefits.

Either outcome would be consistent with the NSPM's principles. Continuation of the current Minnesota practice of including participant costs but excluding participant NEBs would not be consistent with these principles and would result in a primary test that is asymmetrical and misleading.

We recommend that the Minnesota Test not include participant impacts. Given the feedback we received from our interviews and given the lack of clear policy directive to include participant impacts, we conclude that excluding these impacts from the primary test seems to be the most reasonable approach for Minnesota.

Fourth, we consider whether to include low-income participant benefits in the Minnesota Test. There is clear support for recognizing the low-income participant NEBs, based on the current practice of approving low-income efficiency programs regardless of whether they pass the cost-effectiveness tests. We recommend that this current practice be continued, unless and until the values of low-income participant NEBs are monetized and included in the Minnesota Test.

Fifth, we consider whether to include other fuel impacts in the Minnesota Test. While we did not find any specific policy directive to include other fuel benefits, there are several policy goals regarding the reduction of greenhouse gases, the reduction in the use of fossil fuels, and the promotion of strategic electrification, all of which require multi-fuel programs and the consideration of other fuel benefits in the cost-effectiveness tests. Further, there was strong support from interviewees to account for other fuel benefits of the energy efficiency programs. Therefore, we recommend that these benefits be included in the Minnesota Test.

Finally, we consider whether to include additional societal impacts in the Minnesota Test. There is clearly support to include environmental impacts, given multiple policy directives in the state and the fact that they are already included in the primary test in Minnesota. There is also legislative support for considering public health, economic development, and energy security impacts when evaluating energy efficiency cost-effectiveness. Therefore, we recommend that all these societal impacts be included in the Minnesota Test.

[5] National Efficiency Screening Project, page 66.

Table 1 presents a summary of our recommendations for what to include in the Minnesota Test. The rationale for these recommendations is provided in more detail in Chapter 6, and quantification options are explained in Table 5.

Table 1. Impacts Included in the Minnesota Test

Impacts	Description	Rationale for Inclusion	Quantification
Utility System Impacts	All utility system costs and benefits	Included in any cost-effectiveness test	Jurisdiction-specific values
Other Fuel Impacts	Changes in fuels that are not provided by the utility energy offering efficiency	Supports Minnesota's emission reduction goals, consistent with best practices, and stakeholder support	Jurisdiction-specific values
Environmental Impacts	Net impacts on CO_2 and other emissions	Supports Minnesota's emission reduction goals	Jurisdiction-specific values
Water Savings	Net impacts on water consumption	Impacts to participants and society	Jurisdiction-specific values
Jobs and Economic Development	Net impacts on jobs or gross state product	Supports Minnesota's goals for economic prosperity and job creation	Studies from other jurisdictions, proxies, quantitative and qualitative information
Public Health	Reduced morbidity and mortality from fossil fuel generation	Supports Minnesota's goals related to the protection of life, safety, and financial security for citizens in an energy crisis	Studies from other jurisdictions, proxies, quantitative and qualitative information
Energy Security	Reduced fuel imports	Supports Minnesota's goals related to increased fuel diversity and reliability	Proxy

Table 2 presents our high-level assessment of how much priority to give to the different elements of the Minnesota Test. For each of the key impacts we indicate the potential magnitude, based on estimates of these impacts that we have seen in other states. We also indicate how challenging it might be to develop monetary estimates for each of the impacts, again based on our experience in other states. Based on these two considerations, we indicate how much priority Minnesota utilities and other stakeholders should give to each type of impact.

Table 2. Priority of Impacts in the Minnesota Test

Impacts	Potential Magnitude	Challenge in Developing	Priority
Utility System Impacts	Very High	Low	High
Other Fuel Impacts	High for some programs	Low	High
Environmental Impacts	High	Moderate	High
Water Savings	Moderate for some programs	Low	Medium
Jobs Economic Development	Moderate to high	High	Medium
Public Health	Low to moderate	High	Low
Energy Security	Low	High	Low

The Traditional Cost-Effectiveness Tests

Our review indicates that the four tests currently used in Minnesota are not entirely consistent with the theoretical definition of each test as there are some key impacts that are not included in some of the tests. In general, the theoretical definition of each test is based on accounting for all costs and benefits associated with the perspective that the test is intended to represent.

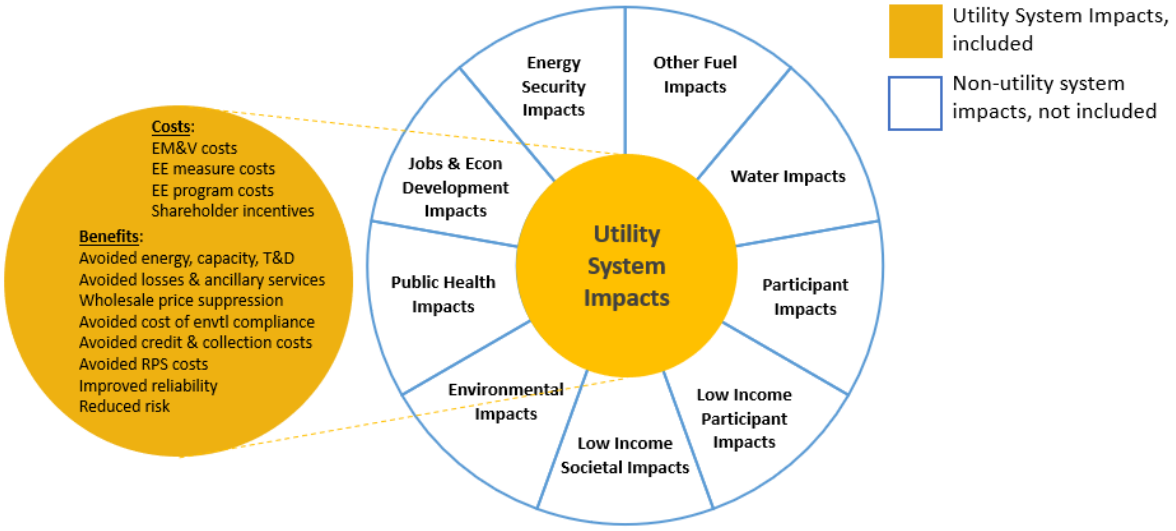
We recommend that Minnesota modify the current tests to be consistent with their theoretical foundations, as described in the following sections.

Utility Cost Test

The UCT should theoretically include all costs and benefits that affect the operation of the utility system and the provision of electric and gas services to customers. Figure 1 depicts the UCT according to its theoretical definition. The circle on the left (shaded in gold) indicates all the costs and benefits that should be included in this test. These costs and benefits should be included as the foundation for any cost-effectiveness test.[6] The circle on the right shows how the UCT compares with other tests, by indicating that none of the non-utility system costs (shaded in white) are included in this test.

[6] National Efficiency Screening Project, page 12.

Figure 1. The Utility Cost Test in Theory



Minnesota utilities generally include all the relevant utility system costs in their UCTs. However, they omit several important utility system benefits, including: (a) wholesale price suppression effects; (b) avoided costs of complying with the renewable portfolio standards (RPS); (c) some avoided environmental compliance costs; (d) avoided credit and collection costs; (e) reduced risk; (f) increased reliability; and (g) market transformation benefits.

We recommend that Minnesota utilities expand their UCT to include all these impacts, in order to be consistent with the theoretical definition of the test. Some impacts—such as avoided environmental compliance costs—are likely to be significant and reasonably monetizable, and therefore should be included as soon as practical. Other impacts—such as increased reliability—might be less significant and harder to monetize, and therefore may be a lower priority for Minnesota stakeholders.

Participant Cost Test

The PCT indicates whether the benefits of an energy efficiency program will exceed its costs from the perspective of the energy efficiency program participant. Minnesota utilities typically include all relevant participant costs in their PCTs However, they omit several important participant benefits, including: (a) other fuel benefits; (b) water benefits; (c) some participant non-energy benefits.

We recommend that Minnesota utilities expand their PCT to include all of these impacts, in order to be consistent with the theoretical definition of the test. Some impacts—such as other fuel savings and water savings—are likely to be significant and reasonably monetized, and therefore should be included as soon as practical. Other participant impacts might be less significant and harder to monetize, and therefore may be a lower priority for Minnesota stakeholders.

Participant non-energy benefits—such as benefits specific to low-income customers, reduced operation costs, or improved comfort—can be challenging to develop, uncertain, and contentious. One option to

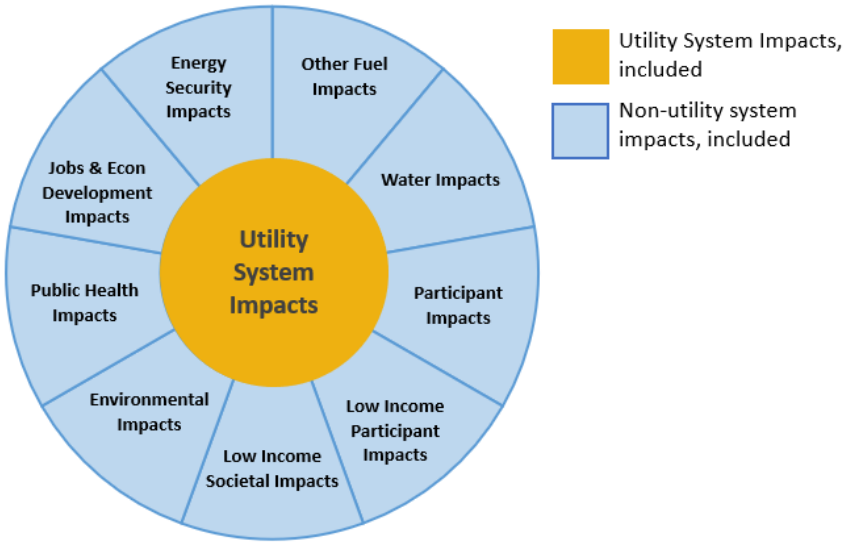
address these concerns is to use proxy values for those impacts that are likely to be most significant, such as low-income benefits, participant health benefits, and increased productivity. Another shortcut is to limit these proxies to those programs that are expected to have the greatest amount of participant non-energy benefits, such as residential retrofit and residential new construction programs.

If stakeholders are satisfied with the current practice of allowing low-income programs to be implemented without passing a cost-effectiveness test, then there is no need to expend the time and resources to develop estimates of the low-income participant benefits.

Societal Cost Test

The SCT should theoretically include all utility system impacts, all participant impacts, and all relevant societal impacts. This is indicated in Figure 2, which shows that test includes all utility system impacts (shaded in gold) as well as all the non-utility system impacts (shaded in blue).

Figure 2. The Societal Cost Test in Theory



In Minnesota, the utility system and participant impacts that are not included in the UCT and the PCT tests (see above) are also not included in the way that Minnesota currently applies the SCT. Further, Minnesota does not include some societal benefits when applying this test, including: other fuel impacts, public health benefits, economic development benefits, and energy security benefits.

We recommend that the Minnesota utilities expand their SCT to include all the utility, participant, and societal impacts that are not currently included. Otherwise, this test will not provide a complete picture of the societal impacts of the energy efficiency programs, as required by NGEA.

Rate Impact Measure Test

The RIM test is not appropriate for cost-effectiveness analysis and does not provide meaningful information on rate impacts.[7] The RIM test provides an indication of the potential for cost-shifting between participants and non-participants, but cost-shifting is a fundamentally different issue from cost-effectiveness. As stated in the NSPM, states should conduct a more holistic assessment of the trade-offs associated with rate impacts.[8]

Therefore, we recommend that Minnesota utilities not use this test for cost-effectiveness purposes. It appears that this recommendation is consistent with the current practice in Minnesota where the RIM test is calculated but not used as the primary determinant of program approval.

However, if Minnesota utilities continue to report the results of the RIM test, then the test should properly account for all the utility system costs and benefits that are relevant for that test. This would require modifying the RIM test inputs to include all those utility system benefits that are not currently included: (a) wholesale price suppression effects; (b) avoided costs of complying with the RPS; (c) some avoided environmental compliance costs; (d) avoided credit and collection costs; (e) reduced risk; (f) increased reliability; and (g) market transformation benefits. If these utility system benefits are not included in the RIM test, then the RIM test results will overstate rate increases or understate rate decreases.

Further, if stakeholders or Commerce ever wish to fully understand the impacts of Minnesota energy efficiency programs on customer rates and bills, then they should adopt the NSPM recommendations for how to do so. This includes conducting separate cost-effectiveness and cost-shifting analyses; properly estimating the long-term rate impacts, bill impacts, and participation rates; and seeking opportunities to increase participation rates. Any such cost-shifting analysis should account for all utility system costs and benefits.

Summary

Table 3 summarizes for each test the impacts that should be included in theory, and the impacts as currently included in Minnesota.[9] (We recommend that Minnesota utilities not use the RIM test for cost-effectiveness purposes because it indicates the potential for cost-shifting between participants and non-participants, which is a fundamentally different issue from cost-effectiveness. Thus, it is not included in the table.)

[7] National Efficiency Screening Project, page 122.

[8] National Efficiency Screening Project, page 114, App. C.

[9] "na" indicates that the impact is not included in the cost-effectiveness test.

Table 3. Cost-effectiveness tests in theory and practice

Impacts	Utility Cost Test		Participant Cost Test		Societal Cost Test	
	Theory	MN Practice	Theory	MN Practice	Theory	MN Practice
Utility system costs						
Measure costs (utility portion)	✓	Included	na	na	✓	Included
Other financial or technical support costs	✓	Included	na	na	✓	Included
Program administration costs	✓	Included	na	na	✓	Included
Evaluation, measurement, and verification	✓	Included	na	na	✓	Included
Shareholder incentive costs	✓	Sometimes included	na	na	✓	Included
Utility system benefits						
Avoided marginal energy costs	✓	Included	na	na	✓	Included
Avoided capacity costs	✓	Included	na	na	✓	Included
Avoided T&D costs	✓	Included	na	na	✓	Included
Avoided line losses	✓	Included	na	na	✓	Included
Avoided ancillary services	✓	Possibly included	na	na	✓	Possibly included
Wholesale price suppression effects	✓	Not included	na	na	✓	Not included
Avoided costs of complying with RPS	✓	Not included	na	na	✓	Not included
Avoided environmental compliance costs	✓	Not included	na	na	✓	Not included
Avoided credit and collection costs	✓	Not included	na	na	✓	Not included
Reduced risk	✓	Not included	na	na	✓	Not included
Increased reliability	✓	Not included	na	na	✓	Not included

Impacts	Utility Cost Test		Participant Cost Test		Societal Cost Test	
	Theory	MN Practice	Theory	MN Practice	Theory	MN Practice
Market transformation	✓	Not Included	na	na	✓	Not Included
Participant costs						
Measure costs (participant portion)	na	na	✓	Included	✓	Included
Bill savings from utility's primary fuel	na	na	✓	Included	na	na
Participant benefits						
Measure costs (utility portion)	na	na	✓	Included	na	na
Low-income customer costs and benefits	na	na	✓	Recognized	✓	Recognized
Other fuel costs and benefits	na	na	✓	Not included	✓	Partially included
Water resource costs and benefits	na	na	✓	Not included	✓	Not included
Participant non-energy costs and benefits	na	na	✓	Partially included	✓	Partially included
Societal costs and benefits						
Environmental impacts					✓	Included
Public health impacts	na	na	na	na	✓	Not included
Economic development and job impacts	na	na	na	na	✓	Not included
Energy security impacts	na	na	na	na	✓	Not included

Discount Rates

It is important the discount rate used in a state's cost-effectiveness tests is consistent with the objectives of the cost-effectiveness analysis and the jurisdiction's applicable policy goals. Because the discount rate is a key policy decision, we highlight our discount rate recommendations here.

Minnesota utilities currently use two types of discount rates for the energy efficiency cost-effectiveness analyses. The utility weighted average cost of capital (WACC) is used for most purposes, and the societal discount rate is used for residential customers under the Societal Cost and the Participant Cost Tests.

The choice of discount rate is a policy decision that should be informed by a state's applicable policy objectives. The choice of discount rate should reflect the regulatory perspective, which recognizes the time preference of current and future customers, as well as applicable policy goals. Further, the choice of a discount rate should recognize the objective of the efficiency 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.[10]

We recommend that the utility WACC not be used as the discount rate for any of the cost-effectiveness tests in Minnesota. The utility WACC represents the time preference of utility investors, but this is different from the time preference of customers and the time preference of regulators. The goal of the cost-effectiveness analysis is not to maximize investor value; instead the goal is to maximize the net benefits to customers. The discount rate must be consistent with the regulatory time preference in order to achieve this goal.

We also recommend that a societal discount rate be used for the Minnesota Test. A societal discount rate is consistent with the regulatory perspective in Minnesota, as articulated in the large array of regulatory policies in Minnesota, and the fact that Minnesota policies generally place relatively high priority on long-term impacts. Furthermore, the societal discount rate should also be used for the secondary cost-effectiveness tests in Minnesota, again because this rate is consistent with the regulatory perspective and policy goals in Minnesota.

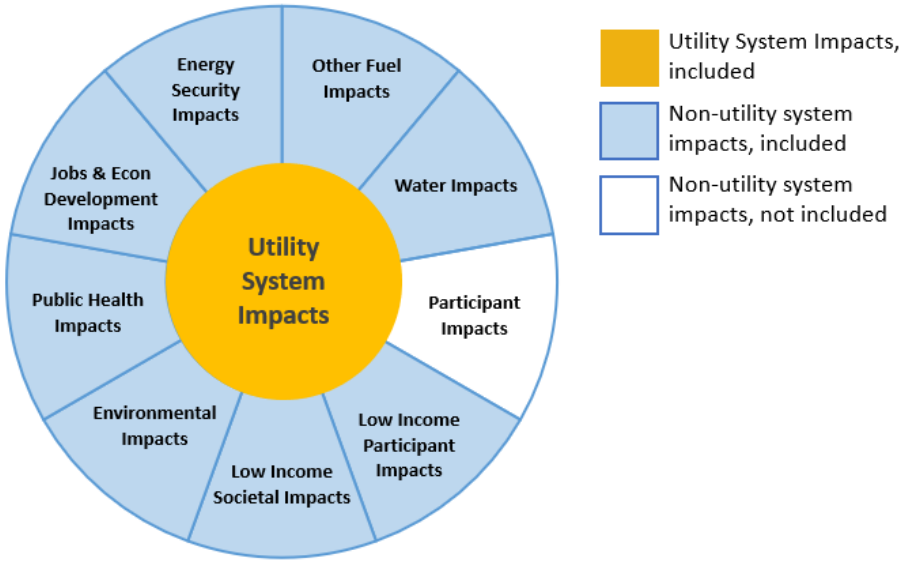
Summary of Recommendations

We recommend that the Minnesota Test be used as the primary test for evaluating energy efficiency cost-effectiveness in Minnesota. We developed this test using the RVF to reflect Minnesota policy goals and be consistent with the fundamental principles of the NSPM.

Figure 3 indicates the different elements included in the Minnesota Test. This test should include all the utility system impacts and all non-utility system impacts except for participant impacts.

[10] National Efficiency Screening Project, page 72.

Figure 3. Impacts Included in the Minnesota Test



We recommend that the four current tests used by utilities in Minnesota be used as secondary tests. These tests comply with the requirements of NGEA and provide useful cost-effectiveness information from different perspectives. We further recommend that the tests currently used in Minnesota be modified to be consistent with their theoretical definitions, as follows:

- The UCT should be expanded to include all utility system costs and benefits, including: wholesale price suppression effects, avoided costs of complying with the RPS, some avoided environmental compliance costs, avoided credit and collection costs, reduced risk, increased reliability, and market transformation benefits.
- The PCT should be expanded to include all participant costs and benefit, including participant NEBs.
- The SCT should be expanded to include additional societal benefits, including: public health benefits, economic development impacts, and energy security benefits.
- The RIM test, if it is used at all, should be modified to include the same additional utility system costs and benefits as the UCT.

2. Introduction

Synapse Energy Economics (Synapse) was awarded a Conservation Applied Research and Development (CARD) grant by the Minnesota Department of Commerce (Commerce) to produce this white paper. Specifically, this project describes how the key elements of the National Standard Practice Manual (NSPM) could be applied to energy efficiency cost-effectiveness analyses in Minnesota through an examination of the current cost-effectiveness framework and practices in Minnesota and by providing recommendations for how to improve them consistent with the guidance provided in the NSPM.[11]

The National Standard Practice Manual

Overview

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 electricity and natural gas energy efficiency resources are assessed for cost-effectiveness and compared to other resource investments.

The NSPM provides a comprehensive framework for assessing the cost-effectiveness of energy efficiency resources. It incorporates lessons learned over the past 20 years, responds to current needs, and addresses the relevant policies and goals of each jurisdiction undertaking efficiency investments.

Universal Principles

The NSPM focuses on six principles that encompass the perspective of a jurisdiction's applicable policy objectives, and it includes and assigns value to all relevant impacts (costs and benefits) related to those objectives. Table 4 summarizes these six universal principles.

[11] National Efficiency Screening Project.

Table 4. NSPM's universal principles

Principle	Explanation
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.

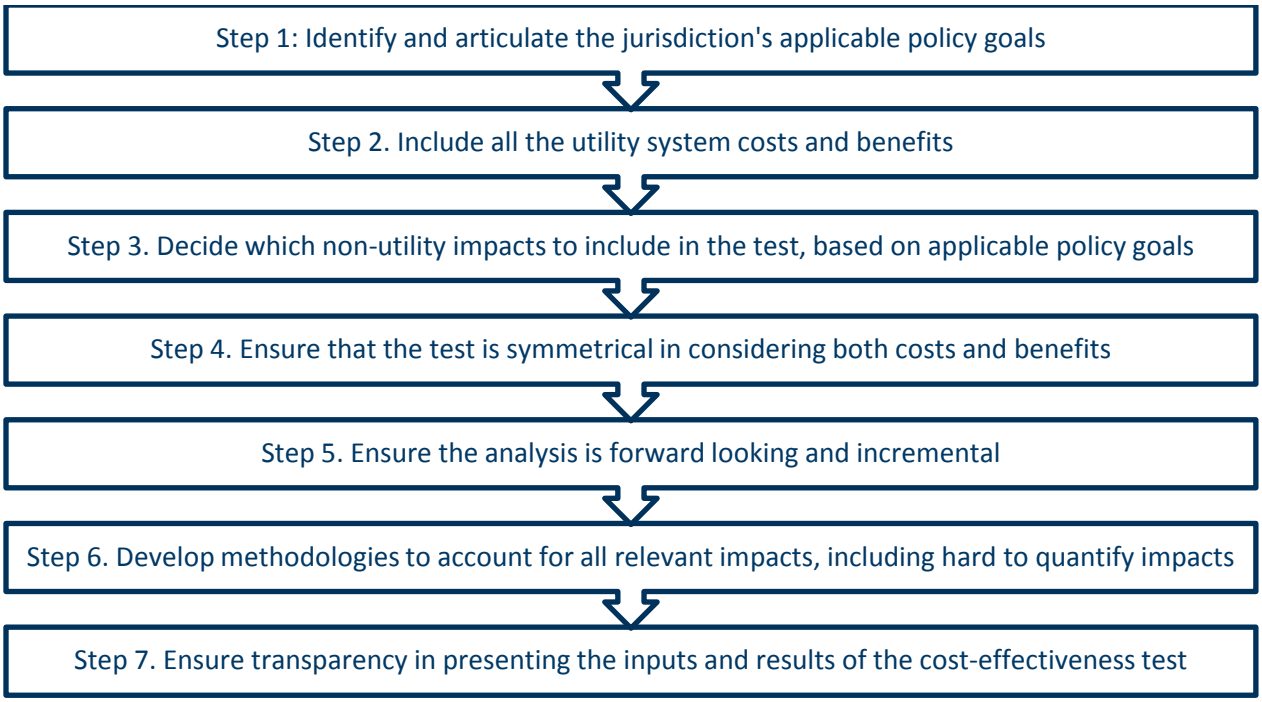
The Resource Value Framework

At the heart of the NSPM is the Resource Value Framework (RVF), which is an objective and neutral framework that can be used to define a jurisdiction's primary cost-effectiveness test.[12] The NSPM also addresses the use of secondary tests in addition to a primary test.[13]

The RVF is used to construct a jurisdiction's primary cost-effectiveness test using a series of seven steps that define the framework. In some cases, the steps align directly with one of the universal principles. The seven steps of the RVF are:

[12] The primary test should answer the fundamental question: Which efficiency resources have benefits that exceed costs, where the benefits and costs are defined by the jurisdiction's applicable policy goals?

[13] Secondary tests can help 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/or if there should be constraints on key program design features (e.g., financial incentive levels). Secondary tests can also help clarify sensitivities to and/or inform decisions regarding which categories of impacts to include in the primary test.



Hard-to-Quantify Impacts

Ideally, all relevant energy efficiency impacts should be estimated in monetary terms so they can be readily compiled and directly compared. In practice, some energy efficiency impacts are difficult to quantify in monetary terms. This is either due to the nature of the impact or the lack of information available about the impacts.

Substantive efficiency resource costs and benefits that are relevant to a jurisdiction's applicable policy goals should not be excluded or ignored because they are difficult to quantify and monetize. Approximating hard-to-quantify impacts using a reasonable method, such as those identified in Table 5, is preferable to assuming that those substantive costs and benefits do not exist or have no value. 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.

There are different approaches available to account for all impacts of energy efficiency resources that a jurisdiction has chosen to include in its cost-effectiveness test. Table 5 from the NSPM summarizes five approaches, listed in order of technical rigor and preference.

Table 5. Different approaches to account for all relevant impacts[14]

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 jurisdictions	If jurisdiction-specific studies are not available, studies from other jurisdictions or regions—as well as national studies—can be used for estimating and monetizing relevant impacts.
Proxies	If monetized impacts are not available, well-informed and well-designed proxies can be used as simple substitutes.
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 thresholds for benefit-cost ratios that are different from one (1.0) can be used as a simplistic way to account for relevant impacts that are not otherwise assessed.

By its own appraisal, the Minnesota Public Utilities Commission (the Commission) regularly encounters uncertainty and difficulty when assessing values and investment decisions. This is seen most clearly in the context of evaluating resource plans and in quantifying environmental costs. In relation to quantifying environmental costs, the Commission previously stated:

> [A]ll forecasts entail a degree of doubt. This fact, however, is only tangentially relevant to the Commission's decision. The future is uncertain. The need to plan for the future is not. The degree of uncertainty regarding future CO_2 regulation and future technology makes the task of estimating regulatory costs more difficult; it does not make the task any less necessary. And it certainly does not lead the Commission to conclude that the most likely estimate of CO_2 costs is effectively $0.[15]

To address uncertainty associated with environmental costs, the Commission has adopted a range of environmental cost values based on documentation and modeling assumptions that best account for inherent uncertainty. We recommend the Commission continue to adopt alternative approaches when faced with hard-to-quantify impacts for energy efficiency resources.

Synapse's Methodology

Synapse examined Minnesota's current energy efficiency screening practices, policies, and goals to better understand the existing successes and challenges within cost-effectiveness testing. We reviewed

[14] National Efficiency Screening Project, Table 12, page 34.

[15] See In the Matter of the Further Investigation into Environmental and Socioeconomic Costs Under Minnesota Statutes Section 216B.2422, Subdivision 3 at 8, citing Minnesota Public Utilities Commission, In the Matter of Establishing an Estimate of the Costs of Future Carbon Dioxide Regulation on Electricity Generation Under Minnesota Statues 216H.06 at 5.

laws, statutes, and rules related to the creation and development of Minnesota's efficiency program, as well as decisions and orders regarding the application and evaluation of cost-effectiveness.

As part of our review, we conducted interviews with relevant stakeholders. We spoke with representatives from the Commerce, Xcel Energy, CenterPoint Energy, Center for Energy and Environment, and Great River Energy.[16] Additionally, we received written comments from Fresh Energy, Otter Tail Power, and the Energy CENTS Coalition.[17, 18] These interviews were instrumental to our understanding of current energy efficiency practices, program strengths, and potential areas for improvement. Most importantly, the interviews informed us of state and stakeholder policy goals that could be better achieved through improved screening practices. Appendix B lists the questions we provided to each stakeholder, and Appendix C summarizes the interview themes.

[16] Department of Commerce Staff; Xcel Energy; CenterPoint Energy; Center for Energy and Environment; Great River Energy.

[17] Fresh Energy; Otter Tail Power; Energy CENTS Coalition.

[18] We also attempted written interviews with Minnesota Power and the Chamber of Commerce but were unsuccessful.

3. Current Minnesota Energy Efficiency Practices

Overview

Minnesota has a successful, longstanding energy efficiency framework, known today as the Conservation Improvement Program (CIP). The state's demand-side management efforts began in the 1980s and evolved through several key pieces of legislation and statewide collaboration. Most recently, the Next Generation Energy Act of 2007 (NGEA) established the state's overall energy policy goals and structure. Because of these sustained improvements, Minnesota has consistently ranked within the top ten best states in the country in the American Council for an Energy-Efficient Economy (ACEEE) annual State Energy Efficiency Scorecard.[19]

One example of Minnesota's innovative approach to achieving savings goals is that NGEA authorizes Commerce to assess utilities $3.6 million annually for grants for applied research and development projects. Most of this funding is allocated to the CARD program, which is used for projects to identify new energy-saving technologies, improve the effectiveness of existing energy conservation programs, and document CO_2 reductions.[20] Indeed, this white paper is the product of a CARD grant.

For context on the scale of Minnesota's current energy efficiency programs, as included in the ACEEE 2017 State Energy Efficiency Scorecard, in 2016 Minnesota spent $162 million dollars on electric efficiency programs. This amount is about 2.5 percent of utility revenue and about $30 per capita. Electric utilities saved over 847 GWh in 2016 and have maintained an average cost of saved energy of $0.20 per kWh. On the natural gas side, in 2016 Minnesota spent $54 million dollars on gas efficiency programs and saved over 31 million therms.[21] This spending amounts to about $36 per residential customer.

We provide historical costs and savings for electric and natural gas utilities in Figure 4 and Figure 5, respectively. Electric utilities have achieved relatively constant levels of savings and costs, with savings between 1.4 and 1.7 percent of sales. Natural gas utilities have steadily increased their costs and savings over time, with savings starting at 0.9 percent of sales in 2010 and reaching 1.3 percent of sales in 2016.

[19] See, Berg et al., "The 2017 State Energy Efficiency Scorecard, Report U1710."

[20] Minnesota Department of Commerce, "Applied Research and Development."

[21] Berg et al., "The 2017 State Energy Efficiency Scorecard, Report U1710."

Figure 4. CIP electric results 2010–2016[22]

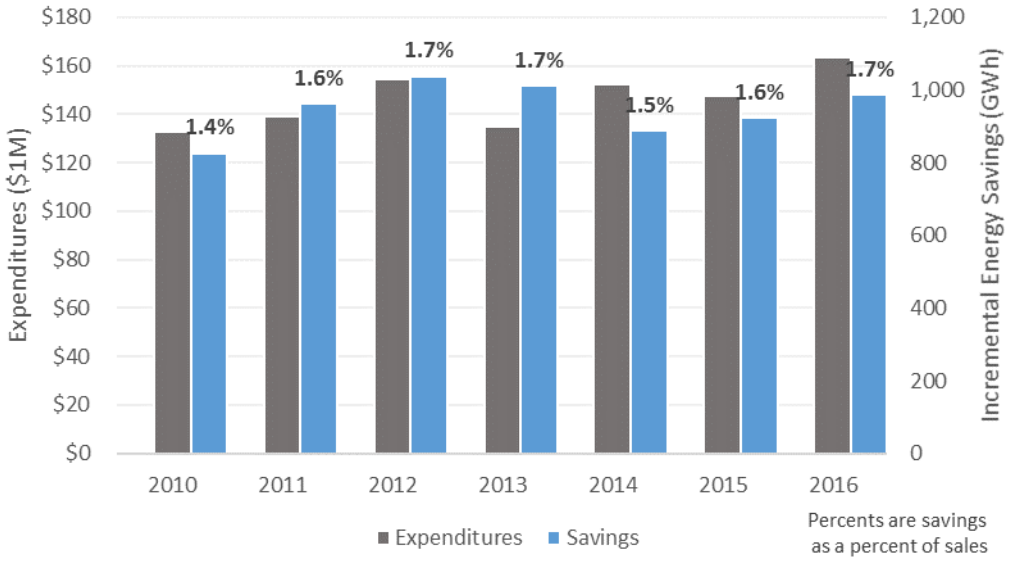
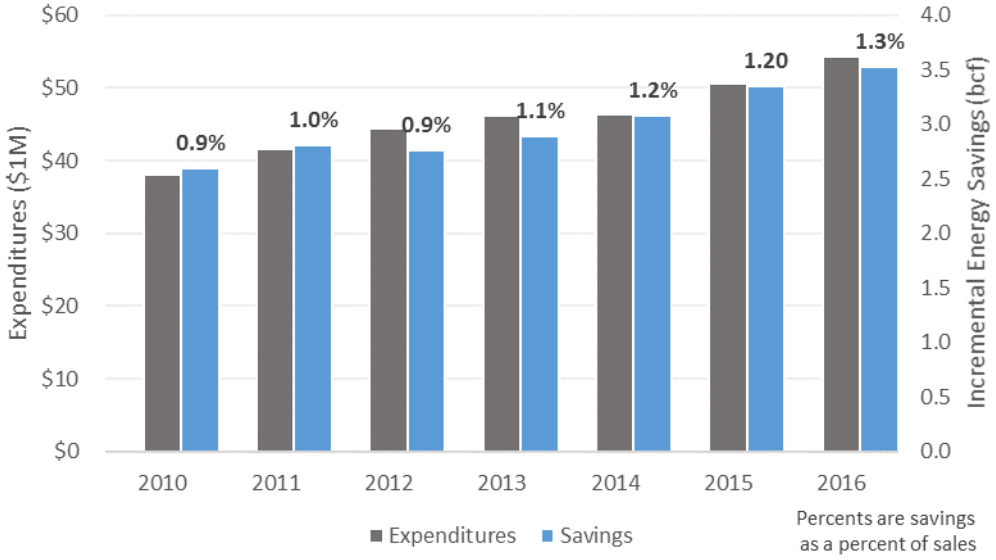


Figure 5. CIP natural gas results 2010–2016[23]



Appendix A provides details on Minnesota's CIP, including regulatory review, utility cost recovery and incentives, and evaluation.

[22] Burdette, Fryer, and Zoet, "2017 Conservation Improvement Update."

[23] Burdette, Fryer, and Zoet.

CIP Goals and Requirements

The NGEA established statewide savings goals equivalent to 1.5 percent gross annual retail energy sales. This number is calculated based on the most recent three-year weather-normalized average, less sales for exempt customers. The savings goal applies to both electric and natural gas utilities. Utilities may carry forward energy savings greater than 1.5 percent for a year to the succeeding three calendar years.[24] The utilities may reach their annual goals directly through their CIPs or indirectly through energy codes, appliance standards, behavioral, and other market transformation programs.

The utilities also have certain spending requirements, including minimum spending on low-income programs and maximum spending on research and development (R&D) initiatives. Table 6 summarizes the statutory saving and spending requirements for both natural gas and electric utilities.

Table 6. CIP utility statutory requirements[25]

Requirement	Metric
Natural gas CIP requirements	
Energy savings (Dth)	1.5% of average weather-normalized retail sales at the generator, less sales to exempt customers
Total spending	0.5% of retail gross operating revenue, less revenues from exempt customers
Low-income spending	0.4% of residential gross operating revenue
Electric CIP requirements	
Energy savings (kWh)	1.5% of average weather-normalized retail sales at the generator, less sales to exempt customers
Total spending	1.5% of retail gross operating revenue, less revenues from exempt customers
Low-income spending	0.2% of residential gross operating revenue
Natural gas and electric CIP spending caps	
R&D spending cap	10% of minimum spending
Distributed and renewable generation (DRG) spending cap	5% of minimum spending

The NGEA established incremental greenhouse gas reduction targets, which the state intends to reach through its energy conservation standards as well as RPS. Through emission reductions across all

[24] Minn. Stat. § 216B.241, Subd. 1c.

[25] Minn. Stat. § 216B.241, subd. 1a, 1c, 2(c), 7(a).

sectors, Minnesota aims to achieve at least 15 percent emission reductions below 2005 levels by 2015, 30 percent below 2005 levels by 2025, and 80 percent below 2005 levels by 2050.[26] Regarding renewable energy resources, Minnesota must meet 25 percent of electric utilities' total retail sales from renewable energy resources by 2025.[27]

[26] Minn. Stat. § 216H.02.

[27] Minn. Stat. § 216C.05.

4. Primary and Secondary Cost-Effectiveness Tests

Current Practice

Many jurisdictions, like Minnesota, use several tests to determine the cost-effectiveness of energy efficiency resources. Each jurisdiction, like Minnesota, uses a *primary* test that has priority over other tests. This primary test informs the final decision on which energy efficiency resources should be funded by utility customers through utility-run programs.

Other tests can be used in assessing the cost-effectiveness of energy efficiency resources. These *secondary* tests can provide additional cost-effectiveness information from a different perspective and can help guide regulators' and stakeholders' overall understanding of efficiency resource impacts.

It is critical to understand and articulate the difference between primary and secondary cost-effectiveness tests. The primary test should answer the fundamental question: Which efficiency resources have benefits that exceed costs, where the benefits and costs are defined by the jurisdiction's applicable policy goals? The answer to this question will indicate how much ratepayer funding to spend on energy efficiency resources.

The secondary tests can answer different questions, for example:

- The Utility Cost Test indicates how efficiency resources will reduce total utility system costs and thereby reduce average customer bills.
- The Participant Cost Test Indicates how efficiency resources will affect total energy costs to customers who participate in the program.
- The Societal Cost Test indicates whether efficiency programs will provide net benefits to society.

While these are all interesting questions that Minnesota stakeholders and utilities might want answers to, the information they provide is secondary to the key information regarding how much ratepayer funding to spend on energy efficiency resources.

In Minnesota, the NGEA states, "in determining cost-effectiveness, the commissioner shall consider the costs and benefits to ratepayers, the utility, participants, and society."[28] In practice, this has led to the use of four traditional cost-effectiveness tests: the Societal Cost Test (SCT), the Utility Cost Test (UCT), the Participant Cost Test (PCT), and the Ratepayer Impact Measure Test (RIM). Further, the SCT has become the primary test used to determine cost-effectiveness in Minnesota.

However, our review indicates that these four tests as used in Minnesota are not in alignment with the key principles of the NSPM. In particular, the primary test does not necessarily reflect all relevant state

[28] Minn. Stat. § 216B.241, Subd. 1c(f).

energy policies, the tests do not include all relevant utility system costs, some of the tests do not adhere to the principle of symmetry, and some of the tests do not include some relevant impacts because they are hard to quantify. These points are described in more detail in Chapter 5.

The Primary Test for Minnesota

The NSPM provides an RVF that a state can use to identify what would be the most appropriate primary test.[29] The new primary test should reflect the state's policy goals and adhere to the key principles in the NSPM.

In Chapter 6, we apply the RVF to develop the primary energy efficiency cost-effectiveness test for Minnesota. In order to be clear about the role of this test, and to distinguish it from the secondary tests, we will refer to this primary test as the "Minnesota Test."

Using a primary test that differs from the four statutory tests is not inconsistent with the NGEA, as the four tests are performed as secondary tests, thus satisfying the policy requirement to "consider" these tests. In fact, a primary test that more completely captures additional policy goals included in NGEA and in other Minnesota policies should provide a better reflection of the overall intent of Minnesota policymakers than one that does not.

Secondary Tests for Minnesota

We recommend that the four tests currently used by utilities in Minnesota be considered secondary tests. These tests comply with the requirements of NGEA by indicating impacts on society, the utility, participants, and ratepayers. They also provide useful cost-effectiveness information from different perspectives, particularly the UCT and the SCT.

In Chapter 5, we offer suggestions for how each of the four secondary tests can be modified to be in alignment with the NSPM by applying the key cost-effectiveness principles to each test. Our recommendations focus on ensuring that each test is designed and applied to properly reflect the four perspectives required by NGEA. In other words, we focus on ensuring that the tests used in *practice* in Minnesota are consistent with the *theoretical* definitions of the societal, utility, participant, and RIM tests. In several instances where the Minnesota practice is not consistent with theory, we make recommendations to achieve consistency.

[29] Note that our recommendation for the Minnesota Test is offered as a straw proposal to promote discussion of these issues. The decisions regarding what to include in the Minnesota Test should be based on robust stakeholder input and should ultimately be made by Commerce.

5. Secondary Cost-Effectiveness Tests for Minnesota

Utility Cost Test

The Role of the Utility Cost Test in General

The purpose of the UCT is to indicate whether the benefits of an energy efficient resource will exceed its costs from the perspective of only the utility system. The UCT includes all costs and benefits that affect the operation of the utility system and the provision of electric and gas services to customers. For vertically integrated utilities such as those in Minnesota, this test includes all the costs and benefits that affect utility revenue requirements.[30]

The UCT is not well named because it does not represent the perspective of the "utility" per se (i.e., in terms of the interests of utility investors or utility management). This test includes all the costs and benefits within the scope of the "utility system" that is used to serve customers.[31] It is more accurate to say that the UCT represents the perspective of all ratepayers, because it includes all the utility system impacts that affect revenue requirements, which are paid by all ratepayers.

The UCT is useful for identifying the impact of energy efficiency on utility system costs and average customer bills. If an efficiency resource passes the UCT, then total utility costs and average customers' bills will be reduced over the long term. This test indicates if an efficiency resource will provide net benefits to customers in terms of the present value of revenue requirements—a standard metric for assessing utility investments. The utility system costs and benefits are also useful for assessing the potential rate impacts on customers, as discussed in more detail in the section below on the RIM test.

In addition, the UCT is useful for identifying the extent to which customer-funded efficiency resources will result in reduced costs to that same overall group of utility customers. If an efficiency resource passes the UCT, then the group of customers who pay for the resource is the same group of customers who benefit from the resource. Thus, this test can help inform decisions on relative program priorities, program design, and whether and how to place limits on program spending.

For these reasons, we recommend that Minnesota utilities and stakeholders place a high priority on the results of the UCT, even as a secondary cost-effectiveness test. The impacts on utility system costs and average customer bills is a very important consideration when approving energy efficiency funding.

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[30] National Efficiency Screening Project, pages 112–114.

[31] The savings of fuels other than the fuel delivered by the utility providing energy efficiency services should not be included in the theoretical application of the utility cost test. For example, an electric utility that installs weatherization in a home that heats with natural gas should only claim the electric saving and not any resulting natural gas savings. The natural gas savings are not part of the electric utility's system and should therefore not be claimed. While natural gas savings may result as a real and significant benefit, they are not part of the electric utility's perspective.

The primary limitation of the UCT is that it does not account for all of a state's applicable energy policy goals. If a state wishes to use energy efficiency to, for example, address low-income concerns, reduce the use of fossil fuels, reduce water consumption, reduce environmental impacts, or promote economic development, the UCT does not provide any information on these potential benefits.

Utility System Impacts

The UCT should include all the material utility system impacts that will be affected by the efficiency resource. Figure 6 depicts the UCT according to this theoretical definition. The circle on the left (shaded in gold) indicates all the costs and benefits that should be included in this test. These costs and benefits should be included as the foundation for any cost-effectiveness test.[32] The circle on the right shows how the UCT compares with other tests, by indicating that none of the non-utility system costs (shaded in white) are included in this test.

Figure 6. The Utility Cost Test in Theory

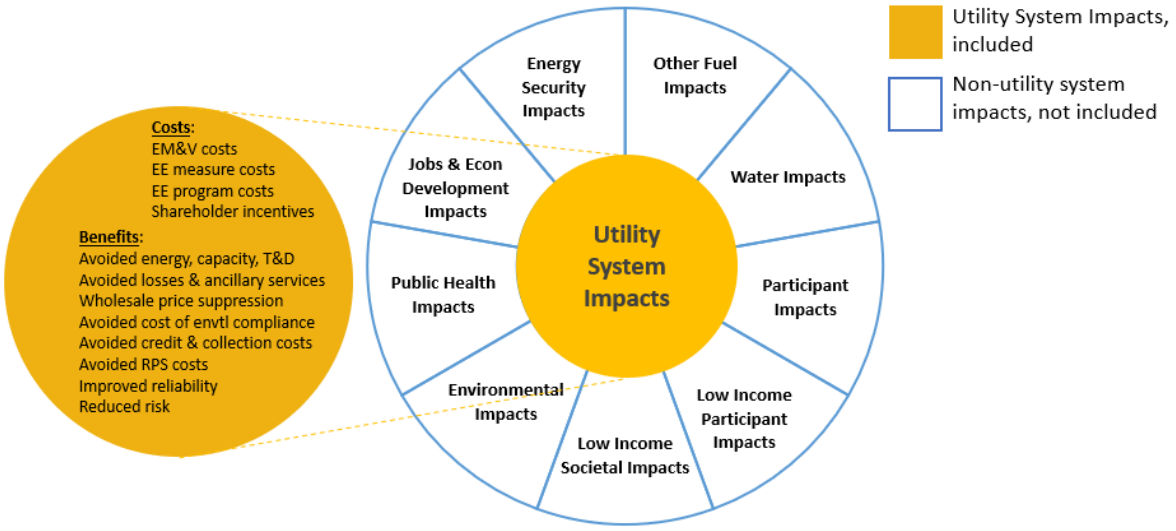


Table 7 summarizes all the utility system costs and benefits that should theoretically be included in the UCT, based on the impacts included in the NSPM.[33] The table indicates whether Minnesota currently includes the utility system impact in its tests and any comments on Minnesota's current practices. The impacts are listed by how important they are to include in the test.

It is important that the UCT applied in Minnesota account for all material utility system costs and benefits, even if it is not the primary test for cost-effectiveness screening. As noted above, this test can provide useful information regarding reduced revenue requirements, reduced bills, prioritization across programs, and potential rate impacts. Further, NGEA requires Minnesota utilities to consider the utility

[32] National Efficiency Screening Project, page 12.

[33] National Efficiency Screening Project, page 22.

impacts, thus it is important that they are properly considered. Therefore, our overall recommendation is that the Minnesota utilities include all the utility system impacts that are not currently included and are expected to have a material effect on the cost-effectiveness results.

Table 7. Utility system impacts

Impacts	MN Practice	Comments	Quantification
Utility system costs			
Measure costs (utility portion)	Included	Consistent across all utilities and aligns with NSPM	Jurisdiction-specific values
Other financial or technical support costs	Included	Consistent across all utilities and aligns with NSPM	Jurisdiction-specific values
Program administration costs	Included	Consistent across all utilities and aligns with NSPM	Jurisdiction-specific values
Evaluation, measurement, and verification	Included	Consistent across all utilities and aligns with NSPM	Jurisdiction-specific values
Shareholder incentive costs	Sometimes included	Costs are sometimes rolled into "other costs."[34] Assessing whether this cost is included was not transparent.	Jurisdiction-specific values
Utility system benefits			
Avoided marginal energy costs	Included	Consistent across all utilities and aligns with NSPM Electric: Each utility establishes its own avoided costs, which are reviewed by Commerce.[35] Gas: Commerce establishes all avoided costs assumptions.	Jurisdiction-specific values
Avoided capacity costs	Included	Consistent across all utilities and aligns with NSPM	Jurisdiction-specific values

[34] Minnesota Department of Commerce, In the Matter of Inputs to BENCOST for Natural Gas 2017-2019 Conservation Improvement Program.

[35] Minnesota Department of Commerce, In the Matter of Avoided Electric Cost Assumptions For 2017-2019 CIP Triennials.

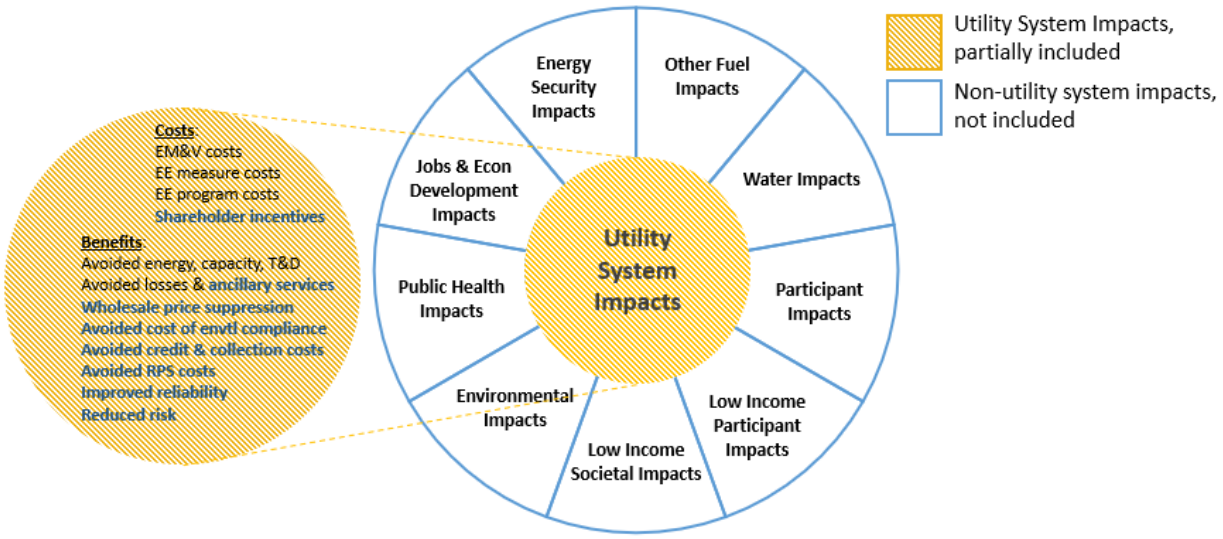
Impacts	MN Practice	Comments	Quantification
Avoided T&D costs	Included	Consistent across all utilities and aligns with NSPM	Jurisdiction-specific values
Avoided line losses	Included	Utilities appear to include line losses in their benefit-cost models, but assessing whether they are applied was not transparent.	Jurisdiction-specific values
Avoided environmental compliance costs	Not included	Policies and utility filings are silent on this benefit	Jurisdiction-specific values
Avoided costs of complying with RPS	Not included	Policies and utility filings are silent on this benefit	Jurisdiction-specific values
Wholesale price suppression effects	Not included	Policies and utility filings are silent on this benefit	Jurisdiction-specific values
Reduced risk	Not included	Policies and utility filings are silent on this benefit	Studies from other jurisdictions, proxies, quantitative and qualitative information
Increased reliability	Not included	Policies and utility filings are silent on this benefit	Studies from other jurisdictions, proxies, quantitative and qualitative information
Avoided credit and collection costs	Not included	Policies and utility filings are silent on this benefit	Studies from other jurisdictions, proxies
Market transformation	Not Included	Policies and utility filings are silent on this benefit	Proxies, quantitative and qualitative information, for relevant programs
Avoided ancillary services	Possibly included	Avoided ancillary services appear to be included in the recent T&D study, although it is unclear if they are being included in the test.	Jurisdiction-specific values

As indicated, there are several utility system impacts that are missing from Minnesota's UCT. In addition, some impacts are included but the methodology for valuing the input is inconsistent across utilities or could otherwise be improved. Our recommendations for how to include these impacts in the UCT are below. In addition, we discuss each of these impacts in more detail in the subsections that follow.

- For avoided marginal energy cost impacts, we recommend developing a uniform method for both fuels to improve consistency and transparency.
- For avoided ancillary services, wholesale price suppression effects, avoided costs of complying with RPS, avoided environmental compliance costs, avoided credit and collection costs, and increased reliability impacts, we recommend studying values through jurisdiction-specific evaluations to the extent the benefits are expected to be material.
- For both reduced risk and market transformation impacts, we recommend applying a reasonable methodology to account for the impacts such as jurisdiction-specific studies, studies from other jurisdictions, proxies, quantitative and qualitative information, or alternative thresholds.

Figure 7. The Utility Cost Test as Currently Applied in Minnesota Figure 7 depicts the UTC as it is currently applied in Minnesota. The utility system impacts circle is partially shaded to indicate that these impacts are only partially included in the test.

Figure 7. The Utility Cost Test as Currently Applied in Minnesota



Avoided marginal energy costs

Utility system avoided energy costs are the values of avoiding the generation or the purchase of electric energy and/or natural gas resulting from investments in efficiency.

Minnesota electric and gas utilities have distinct processes for establishing avoided marginal energy costs. Electric utilities derive their own avoided energy costs, with methodologies varying between utilities. [36] Meanwhile, avoided gas costs are provided by Commerce.[37]

As part of their 2017–2019 CIP triennial review, Commerce staff took a deeper look into the methodologies and values used by electric utilities for estimating avoided costs. As a result, in a 2016 decision, the Deputy Commissioner of Commerce directed Commerce staff to evaluate whether methodologies should be standardized in the 2020–2022 CIP Triennial plan. [38]

We agree with the Deputy Commissioner's assessment that methodology standardization should be explored. We recommend a consistent methodology across electric utilities, similar to the consistent approach taken by the natural gas utilities. If needed, the common, consistent methodology could allow utilities to enter utility-specific input values reflective of their territory.

Almost every interviewee expressed the desire for avoided energy costs that better reflect locational and temporal differences in savings. Interviewees recognize that such avoided costs are likely to require significant levels of data to calculate accurately, which may not be feasible yet. We recommend Minnesota further investigate calculating avoided costs that better reflect locational and temporal differences in savings.

Other utility system benefits

Based on our review, it seems Minnesota utilities exclude the benefits defined below as utility system impacts. These utility system benefits should be included in the UCT to be consistent with the theoretical construct of the test and to ensure that the test provides meaningful and accurate information. Minnesota could calculate values for these impacts through jurisdiction-specific studies.

If jurisdiction-specific studies are not feasible, we recommend adopting values from similar jurisdictions, developing proxies, or considering the benefits on a qualitative basis. These impacts should be not included in the UCT if stakeholders and Commerce determine that they are not likely to have a material effect on the cost-effectiveness results.

- **Avoided ancillary services** - Ancillary services are those services required to maintain electric grid stability and security. They include frequency regulation, voltage regulation, spinning reserves, and operating reserves. Efficiency resources may reduce the need for these services by reducing loads on the T&D system.
- **Wholesale price suppression effects** - In jurisdictions with competitive wholesale energy markets, prices will be a function primarily of the magnitude of demand. Thus, increased

[36] Minnesota Department of Commerce.

[37] Minnesota Department of Commerce, In the Matter of Inputs to BENCOST for Natural Gas 2017-2019 Conservation Improvement Program.

[38] Minnesota Department of Commerce, In the Matter of Avoided Electric Cost Assumptions For 2017-2019 CIP Triennials.

investment in efficiency resources is likely to benefit all consumers through reduced market clearing prices (at least to some extent and for some period).

- **Avoided costs of complying with RPS** - Minnesota has adopted an RPS expressed as a percentage of electric generation.[39] Therefore, new efficiency resources, by reducing sales, will reduce the amount of renewable resources that must be purchased to fulfill the RPS requirements. When those required renewable resources are forecast to cost more than other sources of electric generation, their avoided purchase represents avoided RPS compliance costs. Thus, the efficiency resources provide an additional utility system benefit, provided the avoided costs are not already reflected in the avoided energy, capacity, and T&D costs.

- **Avoided environmental compliance costs** - Minnesota has thoroughly investigated environmental externalities, which are included in the utilities' SCT.[40] However, the cost of compliance with current and future environmental regulations is a separate benefit distinct from environmental externalities. Reducing the cost of complying with environmental regulations provides *utility system* benefits, by reducing costs that are eventually passed on to electricity and gas customers. Environmental externalities are the *societal* impacts that remain after environmental regulations have been complied with. This distinction may not be important for a cost-effectiveness test that includes all environmental impacts (internal and external impacts), but it is very important for the Utility Cost Test, the RIM Test, and any analysis of rate and bill impacts. The cost of meeting Minnesota's carbon reduction goals could be significant, and these costs will be passed on to electricity and gas customers. If these impacts are not properly accounted for when considering the results of these analyses, then results will be skewed against energy efficiency.

- **Avoided credit and collection costs** - All utilities incur some costs associated with customers who are not keeping up with their energy bill payments. Those costs can take a variety of forms, including costs of notices and support provided to customers in arrears, costs associated with shutting off service and turning it back on, carrying costs associated with arrears, and costs of writing off bad debt. Because efficiency programs lower customers' energy use and energy bills, they can reduce the probability of customers falling behind or defaulting on bill payment obligations. That can be a particularly important benefit of efficiency programs targeted to low-income customers.

- **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

[39] Minn. Stat. § 216B.2411.

[40] See Minnesota Public Utilities Commission, In the Matter of the Further Investigation into Environmental and Socioeconomic Costs Under Minnesota Statutes Section 216B.2422, Subdivision 3.

generation). Also, as a resource that can be implemented in many relatively small increments, efficiency resources provide more optionality than large central generation facilities.

- **Increased reliability** - By lowering loads on the grid, efficiency can reduce the probability and/or likely duration of customer service interruptions. The magnitude of the value of this benefit will vary, with less value to systems that are projected to be in a good state of reliability for years into the future and more value to systems that are not. There could be some overlap between this benefit and the benefits of reduced risk, avoided capacity costs and/or avoided T&D costs. Thus, any assessment of the value of increased reliability would need to ensure that there is no "double-counting" of overlap with such other benefits.
- **Market transformation** - Ratepayer-funded energy efficiency programs are designed to overcome inherent market barriers that prevent customers from implementing efficient technology on their own. Utilities should receive credit for moving the market in the right direction. Market transformation benefits are sometimes considered through spillover analyses, although they are rarely quantified directly.

Societal Cost Test

The Role of the Societal Cost Test

The purpose of the SCT is to indicate whether the benefits of an energy efficient resource will exceed its costs from the perspective of society. This test provides the most comprehensive picture of the total impacts of an energy efficient resource. This test includes all the impacts of the efficiency resource on the utility system, participants, and society.

The SCT is useful for identifying the total universe of impacts of energy efficiency resources. It is particularly apt for jurisdictions that have interest in a range of societal considerations. Such considerations can include environmental or economic development concerns, in addition to minimizing utility system and efficiency program participant costs. For these reasons, we recommend that Minnesota utilities and stakeholders place a high priority on the results of the SCT, even as a secondary cost-effectiveness test.

The primary limitation of the SCT is that it does not provide much information on how the energy efficiency resource will directly benefit the utility customers who pay for it.

Utility System Impacts

The utility system impacts that should be included in the SCT are the same as those impacts that should be included in the UCT (see Table 7). Synapse's recommendations for how to account for utility impacts in the UCT should be applied to the SCT as well.

Participant Impacts

The participant impacts that should be included in the SCT are the same as those impacts that should be included in the PCT (see Table 9), with some differences discussed below. Synapse's recommendations for how to account for participant impacts in the PCT should be applied to the SCT as well. The primary differences between the PCT and SCT are indicated below.

- The PCT uses participant bill savings to reflect energy and capacity benefits, while the SCT uses future avoided costs to reflect energy and capacity benefits.
- The SCT does not include bill savings, because that would double-count the energy savings.
- The SCT does not include the utility's portion of the measure cost as a benefit—just a cost.

Societal Impacts

Figure 8 depicts the SCT according to its theoretical definition. This test includes all utility system impacts (shaded in gold) as well as all the non-utility system impacts (shaded in blue).

Figure 8. The Societal Cost Test in Theory

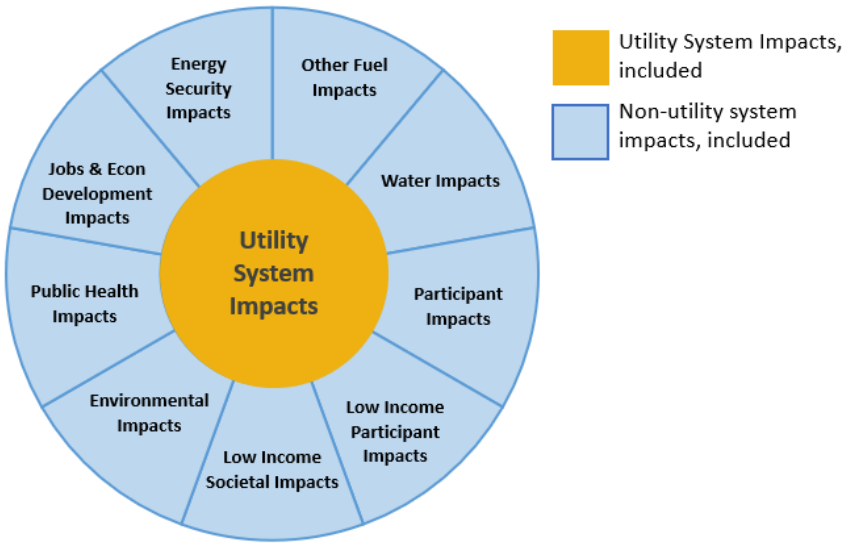


Table 8 presents all the societal costs and benefits that should theoretically be included in the SCT. The table also indicates whether Minnesota currently includes the impact in application of the SCT. The impacts are listed by how much priority Minnesota should give to including them in the test, based on our assessment of the potential magnitude and the challenges associated with developing estimates.

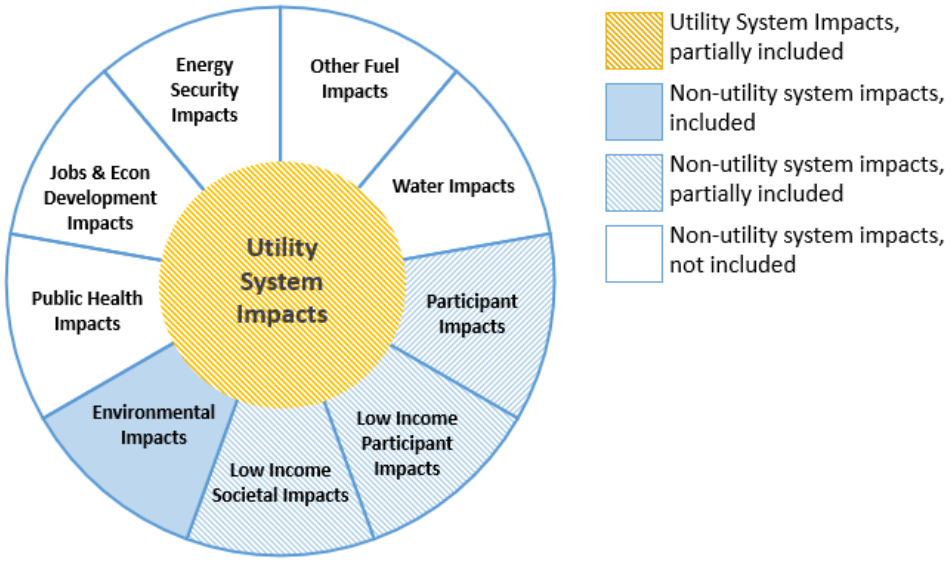
Table 8. Societal impacts

Impacts	MN Practice	Comments	Quantification
Environmental costs and benefits	Included	The Commission estimates environmental costs that Commerce then applies to the SCT[41]	Jurisdiction-specific values
Public health costs and benefits	Not included	Utilities do not include this cost or benefit	Studies from other jurisdictions, proxies, quantitative and qualitative information
Economic development and job costs and benefits	Not included	Utilities do not include this cost or benefit	Studies from other jurisdictions, proxies, quantitative and qualitative information
Energy security costs and benefits	Not included	Utilities do not include this cost or benefit	Studies from other jurisdictions, proxies, quantitative and qualitative information

[41] Minnesota Public Utilities Commission, In the Matter of the Further Investigation into Environmental and Socioeconomic Costs Under Minnesota Statutes Section 216B.2422, Subdivision 3.

Figure 9 depicts the SCT as it is currently applied in Minnesota. The utility system and participant impacts are partially shaded to indicate that these impacts are only partially included in the test. The low-income impacts are partially shaded to indicate that these are indirectly addressed in Minnesota by not requiring low-income efficiency programs to pass cost-effectiveness tests.

Figure 9. The Societal Cost Test as Currently Applied in Minnesota



The societal benefits that are currently not included in Minnesota's application of the SCT are defined below. We recommend that these benefits be included in Minnesota's application of the SCT to adhere to the NGEA requirement to consider societal impacts. Further, these benefits should be included to adhere to the NSPM's principle to not exclude impacts because they are difficult to quantify. Minnesota could calculate them through jurisdiction-specific studies, adopting values from similar jurisdictions, developing proxies, or considering the benefits on a qualitative basis (such as using GDP or job-years for economic development impacts).

- **Public health costs and benefits** - Some environmental emission and waste reductions result in a reduction in the frequency and/or severity of health problems of populations impacted by fuel extraction and combustion. Such reductions can have positive implications for the level of societal investment required in medical facility infrastructure, as well as in the health, well-being, and economic productivity of the populace.

- **Economic development and job costs and benefits** - Investment in efficiency resources will result in additional jobs and economic development in several ways. There are jobs associated with managing and delivering the efficiency programs and jobs associated with the companies that implement the programs (such as contractors, vendors, product manufacturers, etc.). Further, efficiency savings provide consumers with more disposable income, which helps creates jobs and spurs economic development.

- **Energy security costs and benefits** - Energy efficiency investments that reduce imports of various forms of energy increase energy independence and/or energy security.

Finally, it is important to accurately account for the utility portion of the measure costs in the SCT. Minnesota utilities treat measure costs for the SCT inconsistently. One utility includes the utility portion of the measure cost as a benefit to participants and as a cost to the utility, thereby netting out the value.[42] Meanwhile, another utility does not include the utility portion of the measure cost in either side of the benefit-cost equation, treating the transaction as a transfer payment. The logic is slightly different, but the outcome is the same.

As indicated in Table 7, the utility portion of the measure costs should be included as a utility system cost in both the UTC and the SCT. The utility portion of the measure costs should be included in the SCT as a cost only, and not as a participant benefit or a transfer payment to participants. From the societal perspective, the full incremental costs are the costs imposed on society as a whole, and therefore both the utility and participant portion should be included in the SCT.[43]

Participant Cost Test

The Role of the Participant Cost Test in General

The purpose of the PCT is to indicate whether the benefits of an energy efficiency program will exceed its costs from the perspective of the energy efficiency program participant. This test includes all impacts on the program participants, but no other impacts.

The PCT is not appropriate for assessing the value of energy efficiency as a resource because, unlike the other traditional tests, it values benefits based on avoided electricity and gas *rates* rather than on avoided utility system *costs*. That violates the fundamental principle that cost-effectiveness analysis should be "forward-looking" because electric and gas rates are designed to recover both variable (i.e., avoidable) costs and fixed (unavoidable) costs, some of which were incurred in the past.[44]

For this reason, we recommend that Minnesota utilities and stakeholders place a low priority on the PCT for the purpose of approving funding for energy efficiency resources. Nonetheless, the PCT can be useful for informing efficiency program design by providing insight into energy bill impacts on participants. In designing efficiency programs, the test can inform the level of financial incentives to offer prospective participants and the need for better marketing to inform participants of the benefits of participating in efficiency programs.

[42] Xcel Energy, "2017 Status Report Executive Summary, Supporting Workbook."

[43] The utility portion of the measure costs can be considered a benefit to participants in the Participant Cost Test, consistent with that test's perspective (see Table 10).

[44] National Efficiency Screening Project, pages 113–114.

Participant Impacts

Table 9 summarizes the participant costs and benefits that should theoretically be included in the PCT, based on the impacts included in the NSPM.[45] The table indicates whether Minnesota includes the impact in the test in practice and any comments on Minnesota's current practices. The impacts are listed by how important they are to include in the test. Ultimately, Minnesota stakeholders should determine the priority for including impacts that are not currently included. Some impacts in the table include both costs and benefits. In such cases, it is important to consider the net impact.

Ideally, the PCT applied in Minnesota should account for all material participant costs and benefits, even if it is not the primary test for cost-effectiveness screening. As noted above, this test can provide useful information regarding program design. Further, NGEA requires Minnesota utilities to consider participant impacts, thus it is important that they are properly considered. Therefore, our overall recommendation is that the Minnesota utilities include all the participant impacts that are not currently included and are expected to have a material effect on the cost-effectiveness results.

Table 9. Participant impacts

Impacts	MN Practice	Comments	Quantification
Participant costs			
Measure costs (participant portion)	Included	Consistent across all utilities and aligns with NSPM	Jurisdiction-specific values
Bill savings from utility's primary fuel	Included	Consistent across all utilities and aligns with NSPM	Jurisdiction-specific values
Participant benefits			
Measure costs (utility portion)	Included	Consistent across all utilities and aligns with NSPM	Jurisdiction-specific values

[45] National Efficiency Screening Project, pages 24–25.

Impacts	MN Practice	Comments	Quantification
Low-income customer costs and benefits	Recognized	Due to their unique purpose and the spending requirement for low-income projects, the Commission has not required low-income programs to pass cost-effectiveness tests in previous triennials[46]	Studies from other jurisdictions, proxies, quantitative and qualitative information, or alternative thresholds
Other fuel costs and benefits	Partially included	Electric: not included Gas: The average additional non-gas fuel units per participant saved is an input that may be included in cost-effectiveness testing.[47] However, it is ignored in practice.	Jurisdiction-specific values
Water resource costs and benefits	Not included	Utilities do not include this cost	Jurisdiction-specific values
Participant non-energy costs and benefits	Partially included	Capital Savings: included in theory, but set to zero[48] O&M Savings: included in test O&M Costs: included in theory, but set to zero[49]	Studies from other jurisdictions, proxies, quantitative and qualitative information, or alternative thresholds

Some participant impacts are missing from Minnesota's PCT and should be included. Our recommendations for how to include these impacts in the PCT are provided below. In addition, we discuss each of these impacts in more detail in the subsections that follow.

- For measure costs impacts, we recommend including the incremental costs.
- For participant non-energy impacts, we recommend applying any methodology to account for the impacts such as jurisdiction-specific studies, studies from other jurisdictions, proxies, quantitative and qualitative information, or alternative thresholds.

[46] Minnesota Department of Commerce, In the Matter of the Implementation of Northern States Power Company, a Minnesota Corporation's 2013/2014/2015 Triennial Natural Gas and Electric Conservation Improvement Program (Petition).

[47] Minnesota Department of Commerce, In the Matter of Inputs to BENCOST for Natural Gas 2017-2019 Conservation Improvement Program.

[48] Xcel Energy, "MN Triennial 2017-2019, 2017 Status Report, Electric CBA."

[49] Xcel Energy.

- For low-income customer impacts, we recommend utilities continue current practice, or quantify impacts more specifically.
- For other fuel impacts and water resource impacts, we recommend studying values through jurisdiction-specific evaluations to the extent the impacts are expected to be material.

As discussed later in this chapter, many participant impacts should be included in both the PCT and the SCT. While this section focuses on the impacts included in the PCT, we mention the SCT where necessary to be complete without being repetitive.

Measure costs

When considering measure costs for energy efficiency, utilities should always consider the incremental costs; i.e., the difference in installation costs between a high efficiency measure and a baseline efficiency measure. The incremental cost is then split between the utility and the participant, depending on the rebate or incentive the utility provides to the customer.

The participant portion of the measure costs should be included in the PCT as a cost.

Participant non-energy costs and benefits

Non-resource participant costs and benefits can be divided into residential and business impacts. Residential efficiency measures can provide a wide variety of other non-resource benefits to customers. Some notable examples include improved comfort such as from sealing and insulating leaky homes, improved building durability such as eliminating creation of "ice dams" through sealing and insulating attics, improved health and safety, and improved aesthetics.

For businesses, non-resource benefits can come in a variety of forms but are commonly distilled down to improved productivity. Such benefits can apply to many types of C&I customers, including private business, schools, hospitals, government agencies, and more.

Table 10 is reproduced from the NSPM and provides a summary of different types of participant non-energy benefits.[50]

Table 10. Participant non-energy benefits

Category	Examples
Asset value	• Equipment functionality/performance improvement • Equipment life extension

[50] National Efficiency Screening Project, Table 18, page 55.

Category	Examples
	• Increased building value • Increased ease of selling building
Productivity	• Reduced labor costs • Improved labor productivity • Reduced waste streams • Reduced spoilage/defects • Impact of improved aesthetics, comfort, etc. on product sales
Economic well-being	• Fewer bill-related calls to utility • Fewer utility intrusions & related transactions costs (e.g., shut-offs, reconnects) • Reduced foreclosures • Fewer moves • Sense of greater "control" over economic situation • Other manifestations of improved economic stability
Comfort	• Thermal comfort • Noise reduction • Improved light quality
Health & safety	• Improved "well-being" due to reduced incidence of illness—chronic (e.g., asthma) or episodic (e.g., hypothermia or hyperthermia) • Reduced medical costs (emergency room visits, drug prescriptions) • Fewer sick days (work and school) • Reduced deaths • Reduced insurance costs (e.g., for reduced fire, other risks)
Satisfaction/pride	• Improved sense of self-sufficiency • Contribution to addressing environmental/other societal concerns

Minnesota only includes incremental participant O&M savings, which relates to the productivity category of benefits. As Table 10 shows, there are many other non-energy benefits that accrue to participants that Minnesota does not consider.

We recommend fully accounting for participant non-energy costs and benefits in the PCT as a participant impact. We recognize that determining the non-energy benefits of energy efficiency resources can be resource intensive, and that the results are often uncertain. Furthermore, it could be argued that utilities and other stakeholders should not invest much effort in developing inputs for a test that is not the primary test for deciding which utility programs to support and fund.

Nonetheless, it is important that Minnesota attempt to somehow recognize participant non-energy benefits because they are part of the participant and societal impacts of the resources. If participant costs are included in the PCT, as they should be in theory, then all material participant benefits should be included as well. Otherwise, the test will not adhere to the fundamental NSPM principle of symmetry

and will lead to results that are skewed against energy efficiency.[51] It will also not adhere to another NSPM principle that relevant, material impacts should not be ignored simply because they are difficult to quantify.[52]

One option to address this concern about the resource-intensive nature of participant non-energy benefits is to use proxy values for those impacts that are likely to be most significant. These proxies could be limited to those programs that are expected to have the greatest amount of participant non-energy benefits, such as residential retrofit and residential new construction programs.

If the stakeholders and Commerce nonetheless decide to continue with the current practice of not including participant non-energy benefits in the PCT or the SCT as discussed later, then at a minimum they should acknowledge this point and recognize that the results of the Minnesota version of the PCT and SCT will understate, perhaps by a large amount, the benefits of some efficiency programs.

Low-income customer costs and benefits

Low-income benefits can come in two forms:

1. Benefits include the same types of participant benefits as realized by non-low-income residential participants—the O&M savings, other fuel savings, water savings, and non-resource benefits described above—though the magnitude of some of these benefits are often greater for low-income customers than for non-low-income customers. This is because the condition of the low-income housing stock is often worse and/or because the economic stress under which low-income customers live can result in greater sacrifice of amenity (e.g., comfort) absent efficiency investments.

2. Some participant non-resource benefits—particularly those related to economic well-being—are unique, or largely unique, to this subset of residential customers. Examples include reduced home foreclosures and reduced need to move residence as a result of unpaid bills.

The value of low-income benefits can be substantial, potentially greater than the value of utility system and other energy benefits.[53]

Minnesota recognizes these low-income customer impacts by allowing for implementation of low-income programs even if the low-income segment has a benefit-cost ratio less than 1.0. Minnesota could continue this practice and it would be consistent with the NSPM, which notes that alternative thresholds are a reasonable approach to accounting for hard-to-quantify impacts.

However, this approach of using alternative thresholds only applies to the primary cost-effectiveness test, because that is the only test where a threshold is actually applied. For the purposes of a secondary

[51] National Efficiency Screening Project, page 12.

[52] National Efficiency Screening Project, page 11.

[53] National Efficiency Screening Project, page 56.

test, and for the purposes of fully complying with NGEA, it would be best to include some monetary or quantitative value to reflect the low-income participant benefits. Otherwise, the PCT and SCT as applied in Minnesota would not include all of the participant benefits and would thus be skewed against low-income energy efficiency programs.

As with participant non-energy benefits, Minnesota stakeholders should consider using proxy values for the low-income participant benefits, perhaps based on benefits estimated in other jurisdictions.

If stakeholders and Commerce nonetheless decide to continue with the current practice of not including low-income participant non-energy benefits in the PCT or SCT, then at a minimum they should acknowledge this point and recognize that the results of the Minnesota version of the PCT and SCT will understate the benefits of low-income efficiency programs, perhaps by a large amount.[54]

Other fuel costs and benefits

Many efficiency measures reduce consumption of both electricity and non-electric energy sources such as natural gas, fuel oil, propane, and wood. Conversely, some electric efficiency measures increase consumption of other fuels, such as efficient lighting causing an increase in home heating due to reductions in lighting waste heat.

In Minnesota, natural gas utilities could in theory include costs and benefits for non-gas fuel, consistent with BENCOST.[55] Each utility can calculate its own cost and savings factor per unit of non-gas fuel. However, neither Xcel Energy nor CenterPoint Energy included non-gas costs or benefits in their 2017-2019 Triennial Plans.[56,57] One interviewee noted that electric savings generally have minimal impact on program cost-effectiveness, and so they are excluded in the interest of simplicity. Electric utilities have not established a non-electric cost or savings factor.

Other fuel costs and benefits should be included in the PCT. These are real savings that can be of significant magnitude and represent important benefits to participants. Further, as utilities consider fuel-neutral programs and fuel-optimizing programs to address climate change, it will be necessary to include other fuel costs and benefits in the PCT and SCT.

[54] See, for example: National Efficiency Screening Project, page 32, Figure 3.

[55] BENCOST is the name given to the cost-effectiveness screening tool used by natural gas utilities in Minnesota. Commerce develops the inputs to the BENCOST model through a public proceeding. See Minnesota Department of Commerce, In the Matter of Inputs to BENCOST for Natural Gas 2017-2019 Conservation Improvement Program.

[56] CenterPoint Energy, "2017-2019 Conservation Improvement Program Triennial Plan."

[57] Xcel Energy, "2017 Status Report Executive Summary, Supporting Workbook."

Water resource costs and benefits

Water resource costs and benefits reflect the increase or decrease in water use from an energy efficiency measure. Indeed, in many cases energy is saved precisely because less water is needed.

Similar to other fuel impacts, water costs and benefits should be included in the PCT and SCT as a participant impact. Program participants experience the savings, which benefits society.

Ratepayer Impact Measure Test

The Role of the RIM Test in General

The purpose of this test is to indicate whether an energy efficiency resource will increase or decrease electricity or gas rates (i.e., prices). This test includes all the costs and benefits of the UCT, plus estimates of the utility lost revenues created by energy efficiency programs. When utilities recover the lost revenues of energy efficiency programs through rate cases, revenue decoupling, or other means, the recovery of these lost revenues will create upward pressure on rates. If this upward pressure on rates exceeds the downward pressure from reduced utility system costs, then rates will increase, and vice versa.[58]

As described in the NSPM, the RIM test is not appropriate for cost-effectiveness analyses. The RIM test provides an indication of the potential for cost-shifting between participants and non-participants, but cost-shifting is a fundamentally different issue from cost-effectiveness. Further, the RIM test (a) includes historical, i.e., sunk, costs when cost-effectiveness analyses should include only future costs; (b) does not result in the lowest cost to customers; (c) does not provide meaningful information for stakeholders on the impacts on ratepayers; (d) can frequently be misleading; and (e) can lead to perverse outcomes.[59]

Rate Impact Considerations in Minnesota

Given that the RIM test is not appropriate for cost-effectiveness analysis and does not provide meaningful information on rate impacts, we recommend that Minnesota utilities not use this test for cost-effectiveness purposes. It appears that this is consistent with the current practice.

However, if Minnesota utilities continue to report the results of the RIM test, it should properly account for all the utility system costs and benefits. This would require modifying the RIM test inputs to be consistent with our recommendations for the UCT.

Further, if stakeholders or Commerce ever wish to fully understand the impacts of Minnesota energy efficiency programs on customer rates and bills, they should adopt the NSPM recommendations for how

[58] National Efficiency Screening Project, pages 112–114.

[59] National Efficiency Screening Project, pages 122–124.

to do so. This includes: conducting separate cost-effectiveness and cost-shifting analyses; properly estimating the long-term rate impacts, bill impacts, and participation rates; and seeking opportunities to increase participation rates.[60]

[60] National Efficiency Screening Project, pages 124–126.

6. The Primary Cost-Effectiveness Test for Minnesota

In this chapter, we use the Resource Value Framework (RVF) described in the NSPM to identify what would be the most appropriate primary test for use in Minnesota.[61] The RVF is intended to construct a state's primary cost-effectiveness test, without being confined to one of the traditional tests. This practice of working through the RVF might lead to a conclusion that one of the traditional tests is appropriate for a state, but the exercise itself is an important way to consider and articulate what the primary cost-effectiveness test should include.[62]

State Policy Goals

The National Standard Practice Manual

One of the NSPM's universal principles is that a jurisdiction's primary cost-effectiveness test should account for its energy and other applicable policy goals and objectives. Articulating these goals at the outset of developing a framework helps ensure that the cost-effectiveness test is designed to properly account for them. Further, transparency of a jurisdiction's applicable policy goals is key to identifying the relevant costs and benefits to include in the jurisdiction's cost-effectiveness test.

A jurisdiction's applicable policy goals are formally stated policy objectives that provide the overall policy context, within which regulators and other agents make decisions regarding utility resource investments. These goals can take the form of overarching goals, such as to provide safe, reliable, low-cost electricity to customers. They can also be more specific, such as protecting low-income customers or reducing fossil fuel use.

Applicable policy goals can be stated in relevant statutes, regulations, commission orders, state energy plans, or other policy directives. A jurisdiction should review all policies holistically, not just the statute governing energy efficiency implementation. Often policies are found in statutes granting the public utility commission's authority, state energy plans, and/or rules for IRP, among other laws and regulations.

Identifying applicable policies for a jurisdiction is not a static process. It is likely to evolve over time to reflect changing conditions and governmental and public priorities. Stakeholder input and due process often inform such policy development. Ideally, applicable policy goals should be assessed and articulated with a process that is transparent and open to all relevant stakeholders. Key stakeholders

[61] Note that our recommendation for the Minnesota Test is offered as a straw proposal to promote discussion of these issues. The decisions regarding what to include in the Minnesota Test should be based on robust stakeholder input and should ultimately be made by Commerce.

[62] National Efficiency Screening Project, pages viii–x.

can provide important viewpoints regarding the value of energy efficiency in the context of the jurisdiction's policy goals.

Minnesota's Relevant Policies

In this section we identify Minnesota policy goals most applicable to energy efficiency resources, based on our reading of Minnesota statutes and regulations and as articulated during our stakeholder interviews. Ideally, the interpretation and application of Minnesota policy goals should be performed by relevant stakeholders and, ultimately, Commerce.

Minnesota's energy policy history is extensive, dating back as far as 1980 for energy efficiency. Since then, Minnesota has developed comprehensive and specific rules for energy efficiency practices. As recently as 2016, Commerce has regularly issued orders addressing assumptions and methodologies for avoided costs and other inputs to cost-effectiveness testing of energy efficiency resources. In addition, Minnesota's other energy policies could be applied to energy efficiency resources. For example, Minnesota has a state energy plan, regulations for IRPs and RPS, and ongoing avoided environmental cost dockets. Given the state's extensive history and many related energy policies, there is a large set of energy policies that could be applicable to the cost-effectiveness of energy efficiency resources in Minnesota. We focused on the most relevant policies we could find.

Minnesota has various detailed policy goals and targets. Interviewees frequently cited achieving energy savings equivalent to 1.5 percent of sales as the most applicable policy in the state. Minnesota also has many broad policy goals that support increasing fuel diversity, providing least-cost service to consumers, and protecting the environment, among other goals. In this section, Synapse focuses on Minnesota's broader policies driving the more detailed targets. For example, we view the 1.5 percent of sales savings requirement as a target to be achieved. However, the rationale for why Minnesota utilities should achieve such a savings target is addressed within the broader policy goals. Further, the state policy goals that are ultimately accounted for in the primary cost-effectiveness test will help inform which programs should be used to meet the 1.5 percent target.

Minnesota Statutes Chapter 216B on Public Utilities contains Minnesota's most applicable policy goals for energy resources.[63] The section most relevant to our analysis is 216B.2401, stating Minnesota's energy savings policy goal as follows:

> The legislature finds that energy savings are an energy resource, and that cost-effective energy savings are preferred over all other energy resources. The legislature further finds that cost-effective energy savings should be procured systematically and aggressively to reduce utility costs for businesses and residents, improve the competitiveness and profitability of businesses, create more energy-related jobs, reduce

[63] Note that the Next Generation Energy Act was codified in Minnesota Statute 216b.241 and specified in detail in Minnesota Rules 7690.

the economic burden of fuel imports, and reduce pollution and emissions that cause climate change.

Minnesota affirms that energy efficiency is the state's most valuable energy resource. Aggressive procurement of cost-effective energy efficiency resources is a clear, strong policy from which much of the state's cost-effectiveness screening practices should be founded.

We reviewed Minnesota's policy for similar goals, which are summarized in Table 11. In Appendix D, we provide a modified version of this table that includes the complete policy language. These policies include the following goals:

- Utilities should provide consumers with "adequate and reliable services at reasonable rates."[64]
- "[T]he protection of life, safety, and financial security for citizens during an energy crisis is of paramount importance."[65]
- Utilities should invest in energy conservation improvements that "result in energy savings at a total cost to the utility less than the cost to the utility to produce or purchase an equivalent amount of new supply of energy."[66]
- "The commissioner shall ensure that each utility and association provides low-income programs."[67]
- A utility shall use the environmental costs "values established by the commission in conjunction with other external factors, including socioeconomic costs, when evaluating and selecting resource options in all proceedings before the commission, including resource plan and certificate of need proceedings."[68]

Table 11. Summary of Minnesota policy goals

Policy	Citation	Policy Impacts Reflected in Policies						
		Least-Cost	Fuel Diversity	Risk	Reliability	Low-Income	Customer Choice	Environmental
Energy savings policy goal	Minn. Stat. § 216B.2401	X	X					X

[64] Minn. Stat. § 216B.01.
[65] Next Generation Energy Act, § 2, subd. 1.
[66] Minn. Stat. § 216B.241, subd. 2(b).
[67] Minn. Stat. § 216B.241, subd. 7(a).
[68] Minn. Stat. § 216B.2422, Subd. 3(a).

Policy	Citation	Policy Impacts Reflected in Policies						
		Least-Cost	Fuel Diversity	Risk	Reliability	Low-Income	Customer Choice	Environmental
Legislative findings	Minn. Stat. § 216B.01	X			X			
Next Generation Energy Act of 2007, general provisions	NGEA § 2, subd. 1		X	X	X			X
Next Generation Energy Act of 2007, per capita fossil fuel use	NGEA § 2, subd. 2		X					X
Greenhouse gas emissions control, greenhouse gas emissions-reduction goal	Minn. Stat. § 216H.02, Subd. 1							X
Energy conservation improvement, peak demand deficit	Minn. Stat. § 216B.241, subd. 1a (d)			X	X			
Energy conservation improvement, energy-savings goals	Minn. Stat. § 216B.241, subd. 1c (b)	X	X					X
Energy conservation improvement, cost-effectiveness	Minn. Stat. § 216B.241, subd. 1c (f)	X	X					X
Energy conservation improvement, technical assistance	Minn. Stat. § 216B.241, subd. 1d (a)				X			
Energy conservation improvement, free choice of measures and installers	Minn. Stat. § 216B.241, subd. 2(a)						X	
Energy conservation improvement, less expensive than new supply	Minn. Stat. § 216B.241, subd. 2(b)	X						
Energy conservation improvement, Department decisions	Minn. Stat. § 216B.241, subd. 2(e)					X	X	
Energy conservation improvement, low-income programs	Minn. Stat. § 216B.241, subd. 7(a)					X		

Policy	Citation	Policy Impacts Reflected in Policies						
		Least-Cost	Fuel Diversity	Risk	Reliability	Low-Income	Customer Choice	Environmental
Reasonable rate	Minn. Stat. § 216B.03	X						
Renewable energy objectives, eligible energy objectives	Minn. Stat. § 216B.1691, Subd. 2		X					
Renewable energy objectives, local benefit	Minn. Stat. § 216B.1691, Subd. 9	X	X		X			
Resource planning, resource plan filing and approval	Minn. Stat. § 216B.2422, Subd. 2(c)	X	X					
Resource planning, long-range emission reduction planning	Minn. Stat. § 216B.2422, Subd. 2c							X
Resource planning, environmental costs	Minn. Stat. § 216B.2422, Subd. 3(a)		X					X
Resource planning, preference for renewable energy facility	Minn. Stat. § 216B.2422, Subd. 4		X		X			
Distributed energy resources, generation projects	Minn. Stat. § 216B.2411, Subd. 1 (b)	X					X	X
Minnesota's 2025 Energy Action Plan[69]	Report, page 7	X		X	X			X
Climate solutions and economic opportunities[70]	Report, page 3							X

Utility System Impacts

As noted in the NSPM, utility system impacts should provide the foundation for every cost-effectiveness test, and every cost-effectiveness test should include all material utility system costs and benefits.

[69] Rocky Mountain Institute, "Minnesota's 2025 Energy Action Plan: Stakeholder-Drive Strategies for Success."

[70] Minnesota Environmental Quality Board, "Climate Solutions and Economic Opportunities: A Foundation for Minnesota's State Climate Action Plan."

Regarding benefits, it is especially important to ensure that avoided cost estimates are comprehensive, up-to-date, informed by stakeholders, and ultimately reviewed and approved by regulators.

In Chapter 5, we describe the utility system impacts that are currently used in Minnesota and provide recommendations for how those impacts should be expanded to include some that are missing. We recommend that those additional utility system impacts be included in the primary cost-effectiveness test as well.

The next step in the RVF is to consider which non-utility system impacts to include in the primary test, consistent with state energy policy goals. We begin with participant impacts and then address societal impacts.

Participant Impacts

The National Standard Practice Manual

When considering whether to include participant impacts in the cost-effectiveness tests, it is important to recognize two overarching points: [71]

1. The decision of whether to include participant impacts in the primary cost-effectiveness test is a policy decision. Regulators may choose to include participant impacts in the primary cost-effectiveness test if that would achieve the jurisdiction's policy goals.

2. If regulators decide to include participant costs in any cost-effectiveness test, the test must also include participant benefits, and vice versa. This is necessary to ensure symmetrical treatment of participant impacts.

In general, deciding whether to include participant impacts in the primary cost-effectiveness test can be one of the most challenging decisions to make. States rarely have relevant policy directives that provide guidance on whether to include participant costs and benefits. Further, there are many important and complex factors to consider when making this decision. [72]

Accounting for Participant Impacts in Minnesota

We did not find applicable policies that indicate whether participant impacts should be included in the primary test in Minnesota. Further, historical practice offers slightly inconsistent guidance for how to account for participant impacts: the Total Resource Cost Test (which is often used to account for

[71] National Efficiency Screening Project, page 66.

[72] National Efficiency Screening Project, pages 66–71.

participant impacts) has not been used historically, but an SCT (which includes participant impacts) has been used historically as the primary cost-effectiveness test.

Through our interviews with Minnesota stakeholders, we heard little support for including participant non-energy benefits (except for low-income customer impacts that stakeholders felt should be included in the test). Arguments against the inclusion of participant non-energy benefits included:

- The benefits are not tangible and including them is "too far to digest." "The juice isn't worth the squeeze," implying it would be more trouble to calculate the benefits than the benefits are worth.
- They are too hard to quantify and too subjective. Utilities are uncomfortable carrying the burden of proof.
- Despite using the SCT to screen energy efficiency resources, Minnesota still considers energy efficiency programs as ratepayer-funded programs and not public benefit programs. Should ratepayers be paying for non-energy benefits?
- Concerns about the "opening of Pandora's box." Non-energy benefits could drive decisions to invest in efficiency, which would question the intent of the programs. Non-energy benefits could lead to over-incenting projects that customers would have done anyway, and free-ridership would be difficult to estimate. Energy savings should still be the primary reason to invest in efficiency resources.
- It could be politically harmful to include non-energy benefits, because efficiency resources need bipartisan support in Minnesota and including non-energy benefits could put that support at risk. Non-energy benefits are too "squishy" and would dilute the high integrity of the current Minnesota framework.
- The utilities are responsible for saving either electricity or natural gas, and to include other fuel savings would be too complicated considering the number of utilities in Minnesota.

The stakeholders interviewed suggested that if non-energy benefits were well quantified and supported, such as having the same level of regulatory scrutiny as applied to environmental benefits, then maybe they could support including them. However, interviewees seemed doubtful even of that approach.

These stakeholder positions are important and consistent with positions we have observed in other states. Determining the non-energy benefits of energy efficiency resources can be resource intensive, and the results are often uncertain. Further, accounting for participant non-energy benefits could lead to energy efficiency measures and programs that deviate from the core goal of reducing utility system costs. Nonetheless, one of the fundamental principles of the NSPM is that if participant costs are included in any one cost-effectiveness test, then participant benefits must be included as well.[73]

[73] National Efficiency Screening Project, page 66.

This means that Minnesota stakeholders face an important decision regarding participant non-energy benefits in the primary cost-effectiveness test. The Minnesota Test could choose either of the options below.

a) Continue to include participant costs because participant impacts are deemed to be important—in this case, the test should be expanded to account for participant non-energy benefits.

b) Stop including participant costs because there is insufficient interest or support to include participant non-energy benefits.

Either outcome would be consistent with the NSPM principles. Continuation of the current practice of including participant costs but excluding participant non-energy benefits would not be consistent with these principles and would result in a primary test that is skewed and misleading.

In Chapter 5, we describe how the Minnesota utilities can develop estimates for participant non-energy benefits to be used in the SCT. If stakeholders choose to include participant non-energy benefits in the Minnesota Test, then the same participant non-energy benefits used in the SCT should be used in the Minnesota Test.

Low-Income Participant Impacts

We found both policy[74] and stakeholder support for including low-income participant impacts in Minnesota's cost-effectiveness testing. Interviewee arguments supporting the inclusion of low-income non-energy benefits included:

- Non-energy benefits are more relevant for low-income customers. Minnesota statute requires a certain level of spending for low-income programs, and that funding needs to be spent regardless of cost-effectiveness.
- Low-income non-energy benefits are more tenable to stakeholders. Stakeholders recognize that there are health and safety benefits to low-income customers from energy efficiency improvements.
- Recent studies recognize health as a benefit of low-income energy efficiency investments.

Minnesota currently recognizes low-income customer impacts by allowing for implementation of low-income programs even if the low-income segment has a benefit-cost ratio less than 1.0. We recommend that Minnesota utilities continue this practice. This approach allows the Minnesota Test to account for this important policy goal and avoids the need to spend time and resources to develop estimates of the monetary value of low-income customer benefits. This approach is consistent with the NSPM, which notes that alternative thresholds are a reasonable approach to accounting for hard-to-quantify impacts.

[74] See Minn. Stat. § 216B.241, Subd. 2(e), Subd. 7.

Other Fuel Impacts

There are several instances where other fuel impacts can occur in energy efficiency programs. Some examples of such instances are presented in the NSPM and are repeated in Table 12.

Based on our research and interviews, Minnesota's cost-effectiveness tests currently do not account for any of the other fuel impact examples, and none of the Minnesota utilities offer the types of programs listed in Table 12.[75]

Table 12. Examples of other fuel impacts in efficiency programs[76]

Program Option	Description
Multi-fuel measures	When efficiency measures for one type of fuel result in savings of another type. For example, when insulation is installed in buildings that are cooled with electric air conditioning but heated with other types of fuels. Multi-fuel efficiency measures are frequently used in building retrofit programs and in new construction programs.
Fuel-optimization measures	When customers can choose from multiple fuel types to optimize the efficiency of an end-use. For example, customers may be given the option to switch from an inefficient oil heating system to a high-efficiency gas heating system.
Fuel-neutral programs	When regulators and efficiency planners choose to offer whole-building efficiency programs that address all fuel types with a single program provided by a single program administrator. This results in more efficient program delivery, fewer transaction costs, greater efficiency measure adoption, and better customer service in general.
Combined heat and power programs	When technologies are used to generate electricity efficiently, but require increased consumption in other fuels such as natural gas or biomass.
Strategic electrification options	When programs are designed to promote switching from non-electric to electric fuel for policy reasons. For example, an electric utility may wish to promote electric vehicles to achieve environmental and transportation policy goals.

Some efficiency programs might include more than one of the program options listed above. For example, fuel-neutral programs typically include multi-fuel measures and can include fuel-optimization measures.

Most interviewees were supportive of fuel-switching measures because of the many benefits cold-climate air source heat pumps can provide. However, interviewees indicated there are policy barriers for fuel switching. Both the benefits and barriers are summarized in Table 13. It was unclear to us whether

[75] Synapse did not review combined heat and power in depth, so it is possible such programs exist in Minnesota.

[76] National Efficiency Screening Project, Table 10, page 28.

the policies referenced by stakeholders are established in statute or Commerce orders, or rather were generally accepted historical practices.

Table 13. Benefits and policy barriers of fuel switching identified by interviewees

Benefits	Barriers
Fuel switching is a better use of resources because heat pumps provide space heating more efficiently than fossil fuel heating systems	Current policies do not allow the use of electric ratepayer funding for measures that increase electric consumption
Heat pumps could help Minnesota meet emissions reduction goals	Utilities must use a source BTU comparison that does not allow for BTU increases
Heat pumps are well aligned with the market dynamics of wind, which is an increasing portion of the region's generation profile	Current regulations do not allow utilities to market fuel switching to non-low-income customers
With dual fuel capabilities, customers could reduce the price they pay for propane and oil by purchasing fuel in off seasons	Heat pumps may not pass current cost-effectiveness tests because they would not yield any avoided utility costs related to generation, transmission and distribution, and marginal energy
Customers can diversify their heating sources in the case of limited propane or oil supply during periods of extreme cold	
Heat pumps are likely cost-effective from the participant's perspective	

Interviewees were also aware of the energy industry's changing dynamic, primarily pertaining to beneficial electrification. Interviewees indicated they struggle with how to incorporate efficiency and cost-effectiveness tests into this evolving energy landscape because currently there is limited policy direction. One interviewee expressed frustration that current policies are too "siloed" when they should be connected and complimentary to better reduce emissions. The interviewee felt Minnesota could do more to increase and integrate adoption of electric vehicles, renewables, load management resources, and fuel switching, and suggested that the utilities' role may need to shift to enablers of energy technology and infrastructure. Another interviewee noted electrification is a contentious topic in Minnesota, and the costs and benefits of electrification are not adequately captured in Minnesota's current cost-effectiveness tests.

We did not find any applicable policy directives that specifically require the inclusion of other fuel impacts in Minnesota's primary cost-effectiveness test. Nonetheless, there are many reasons why Minnesota utilities should include these impacts in the Minnesota Test.

Minnesota's primary energy policy supports aggressive and systematic procurement of cost-effective energy *savings*, and energy savings can be achieved from fuel switching.

As noted above, many interviewees were supportive of policies that promote other fuel initiatives. This may be a case where historical policies or practices are outdated relative to quickly evolving market trends. Heat pumps and electric vehicles are examples of new technologies that affect multiple fuels and thus require cost-effectiveness analyses that account for other fuel impacts.

In addition, best practice in program design suggests that incorporating other fuel savings into efficiency programs and energy policies can have significant benefits to electric and gas customers. Customers are more likely to participate in efficiency and other energy initiatives when offered "one-stop shopping" that allows for a whole house retrofit or otherwise holistic approach to energy management. New construction programs typically affect multiple fuels and therefore require accounting for other fuel impacts.

Further, policies to encourage beneficial electrification, including fuel switching, electric vehicle adoption, and renewable generation, are essential for Minnesota to achieve its climate change and emission reduction goals.

For these reasons, we recommend that the Minnesota Test account for the value of other fuel impacts. The retail prices for the other fuels should be used as the avoided costs in the cost-effectiveness analysis.

Societal Impacts

Environmental Impacts

As indicated in Table 11, there are several policy directives in Minnesota indicating the importance of reducing greenhouse gases, and the role of energy efficiency in achieving those reductions. [77] Minnesota utilities already account for environmental benefits in the primary cost-effectiveness test. Specifically, the Commission approved avoided environmental costs for sulfur dioxide, particulate matter, carbon monoxide, nitrous oxides, lead, and carbon dioxide.[78] Accordingly, we recommend that environmental impacts be included in the Minnesota Test as well.

[77] Minn. Stat. § 216B.2401.

[78] Minnesota Public Utilities Commission, In the Matter of the Further Investigation into Environmental and Socioeconomic Costs Under Minnesota Statutes Section 216B.2422, Subdivision 3.

Commerce recently completed an extensive proceeding to update environmental externality factors. Interviewees were appreciative of the process and most felt it resulted in appropriate values.

Public Health Impacts

The NGEA opening language on energy planning states "the legislature finds that it is in the public interest to… provide for an optimum combination of energy sources consistent with environmental protection and the protection of citizens."[79] This suggests that public health impacts should be an important consideration when evaluating energy efficiency and other energy resources.

Therefore, we recommend that utilities include public health benefits in the Minnesota Test. There is a vast amount of literature on the public health impacts of the electricity and gas industries, which can be used to determine monetary values of these impacts.[80]

Energy efficiency programs can offer several types of public health benefits. First, some programs will result in significantly improved indoor air quality for program participants. Second, reducing emissions from fossil fuel consumption can improve the health and mortality of all people who might be subject to those emissions. Third, the health benefits from improved indoor and outdoor air quality can result in reduced health care and health insurance costs. In estimating the value of public health benefits, it is important to distinguish between these different types of benefits and not double-count across them.

Economic Development and Job Impacts

Minnesota statute states that "cost-effective energy savings should be procured systematically and aggressively in order to reduce utility costs for businesses and residents, improve the competitiveness and profitability of businesses, create more energy-related jobs, reduce the economic burden of fuel imports, and reduce pollution and emissions that cause climate change."[81] All of the identified reasons for pursuing energy savings directly and indirectly support economic prosperity and job creation.

For these reasons, we recommend the utilities include economic development and job impacts in the Minnesota Test.

There are three types of economic development impacts associated with energy efficiency resources: (a) jobs associated with managing, delivering, and installing energy efficiency measures and programs; (b) jobs associated with the supply chains of materials needed to support the energy efficiency program; and (c) jobs associated with the increased spending that occurs because of reduced energy bills in

[79] Next Generation Energy Act, subd. 1.

[80] See, e.g., Lazar and Colburn, "Recognizing the Full Value of Energy Efficiency (What's Under the Feel-Good Frosting of the World's Most Valuable Layer Cake of Benefits);" Skumatz, "Non-Energy Benefits/Non-Energy Impacts and Their Role & Values in Cost-Effectiveness Tests: State of Maryland;" and Northeast Energy Efficiency Partnerships, "Non-Energy Impacts Approaches and Values: An Examination of the Northeast, Mid-Atlantic, and Beyond."

[81] Minn. Stat. § 216B.2401.

homes and businesses. Further, it is important to account for the net job impacts of energy efficiency programs, which is the difference between the number of jobs created by energy efficiency and supply-side alternatives.

Minnesota previously studied economic impacts from CIP, and found that between 2008 and 2013, CIP activities and ongoing energy savings through 2032 led to positive net effects on statewide employment and income, as well as positive net effects on statewide value added and output.[82] Such a study provides an excellent starting point for including economic development and job impacts in the Minnesota Test.

There are some challenges associated with putting job estimates into monetary terms for a cost-effectiveness analysis. Net economic development and/or job gains are often expressed in terms of increased gross domestic product (GDP) or gross state product (GSP) and/or job-years. It is not clear how these metrics can be translated into monetary terms suitable for inclusion in efficiency benefit-cost analyses, particularly since the drivers of these benefits (efficiency program spending and reduced utility system costs) are already included in the cost-effectiveness analyses.

At a minimum, the utilities should estimate energy efficiency job impacts and present them alongside the monetary results of the cost-effectiveness analysis. This allows for a quantitative recognition of job impacts, even if they are not monetized and included in the cost-effectiveness results themselves.

Energy Security Impacts

Minnesota legislation states that energy savings should "reduce the economic burden of fuel imports."[83] In addition, in developing the NGEA the "legislature further [found] and declare[d] that the protection of life, safety, and financial security for citizens during an energy crisis is of paramount importance."[84]

Therefore, we recommend the utilities include energy security benefits in the Minnesota Test. There is not much literature available on the magnitude of energy security benefits of energy efficiency programs, and we are not aware of any state that currently includes this impact its cost-effectiveness analysis. Consequently, if energy security benefits are included in the Minnesota Test, stakeholders may want to develop a proxy multiplier to address this impact.

Summary of the Minnesota Test

Table 14 presents a summary of our recommendations for what to include in the Minnesota Test.

[82] Cadmus, "The Aggregate Economic Impact of the Conservation Improvement Program 2008-2013," page 10.

[83] Minn. Stat. § 216B.2401.

[84] Next Generation Energy Act, subd. 1.

Table 14. Impacts Included in the Minnesota Test

Impacts	Description	Rationale for Inclusion	Quantification
Utility System Impacts	All utility system costs and benefits	Included in any cost-effectiveness test	Jurisdiction-specific values
Other Fuel Impacts	Changes in fuels that are not provided by the utility energy offering efficiency	Supports Minnesota's emission reduction goals, consistent with best practices, and stakeholder support	Jurisdiction-specific values
Environmental Impacts	Net impacts on CO_2 and other emissions	Supports Minnesota's emission reduction goals	Jurisdiction-specific values
Water Savings	Net impacts on water consumption	Impacts to participants and society	Jurisdiction-specific values
Jobs and Economic Development	Net impacts on jobs or gross state product	Supports Minnesota's goals for economic prosperity and job creation	Studies from other jurisdictions, proxies, quantitative and qualitative information
Public Health	Reduced morbidity and mortality from fossil fuel generation	Supports Minnesota's goals related to the protection of life, safety, and financial security for citizens in an energy crisis	Studies from other jurisdictions, proxies, quantitative and qualitative information
Energy Security	Reduced fuel imports	Supports Minnesota's goals related to increased fuel diversity and reliability	Proxy

Figure 10 illustrates the different elements included in the Minnesota Test. We recommend that this test include all the utility system impacts and all non-utility system impacts except for participant impacts.

Figure 10. Impacts Included in the Minnesota Test

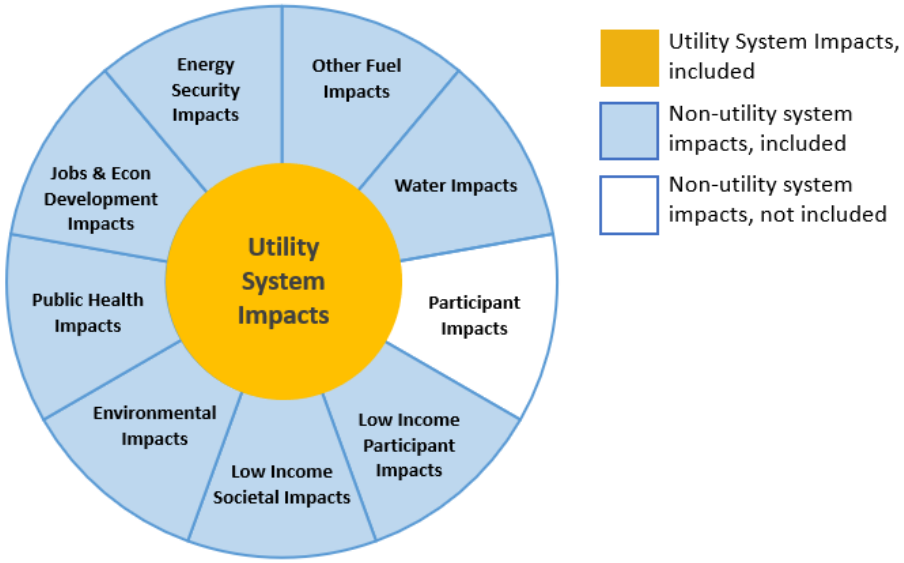


Table 15 presents our high-level assessment of how much priority to give to the different elements of the Minnesota Test. For each of the key impacts we indicate the potential magnitude, based on estimates of these impacts that we have seen in other states. We also indicate how challenging it might be to develop monetary estimates for each of the impacts, again based on our experience in other states. Based on these two considerations, we indicate how much priority Minnesota utilities and other stakeholders should give to each type of impact.

Table 15. Priority of Impacts in the Minnesota Test

Impacts	Potential Magnitude	Challenge in Developing	Priority
Utility system impacts			
Avoided environmental compliance costs	High	Moderate	High
Avoided costs of complying with RPS	Moderate	Low	High
Wholesale price suppression effects	Moderate	Moderate	Medium
Reduced risk	Moderate	Moderate	Medium
Increased reliability	Moderate	High	Medium
Avoided credit and collection costs	Moderate	Low	Medium
Market transformation	Moderate for some programs	High	Medium
Avoided ancillary services	Low	Moderate	Low
Non-utility system impacts			
Other Fuel Impacts	High for some programs	Low	High
Environmental Impacts	High	Moderate	High
Water Savings	Moderate for some programs	Low	Medium
Jobs Economic Development	Moderate to high	High	Medium
Public Health	Low to moderate	High	Low
Energy Security	Low	High	Low

7. Other Inputs and Assumptions

Discount Rates

Current Practice in Minnesota

Minnesota primarily applies two discount rates: a societal discount rate and a utility discount rate. The societal discount rate is based on the U.S. Treasury's 20-year constant maturity rate. Commerce staff have found that such a rate captures the market's expectations regarding inflation along with a small risk factor, which is a reasonable method for estimating a social discount rate.

The utility discount rate is a utility's after-tax weighted average cost of capital (WACC) approved in its most recent rate case. Commerce has stated that since the WACC "is the utility's cost for its capital, it is a reasonable measure of the value society places on a utility investment."[85]

Table 16 indicates the rates currently used in Minnesota for each cost-effectiveness test. As indicated, the utility WACC is used for most purposes, and the societal discount rate is used for residential customers under the SCT and the PCT.[86]

Table 16. Minnesota's current discount rates[87]

Cost-Effectiveness Test	MN Practice
Societal	Social discount rate for Residential Utility WACC for Commercial
Utility	Utility WACC
Participant	Social discount rate for Residential Utility WACC for Commercial
RIM	Utility WACC

The stakeholders we interviewed provided mixed support for adjusting the discount rates. Most agreed that this study should address the question of whether to update discount rates. Some of the key responses we received include:

- A low-risk discount rate may be most appropriate for energy efficiency resources. Utilities' efficiency investments are recovered almost instantaneously and are reconciled annually, resulting in little risk relative to power plant investments.

[85] Minnesota Department of Commerce, In the Matter of Inputs to BENCOST for Natural Gas 2017-2019 Conservation Improvement Program at inputs 11 through 13.

[86] Minnesota Department of Commerce, at inputs 11 through 13, and Minnesota Office of the Legislative Auditor, "Energy Conservation Improvement Program."

[87] Minnesota Department of Commerce, In the Matter of Inputs to BENCOST for Natural Gas 2017-2019 Conservation Improvement Program.

- The combination of discount rates and escalation rates applied to avoided costs impacts the real value of energy efficiency resources over time. It is important to ensure there are no discrepancies between real and nominal impacts.
- The current methodologies for the test are reasonable (i.e., applying the WACC to the UCT).

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The NSPM explains that a discount rate reflects a particular "time preference," which is the relative importance of short- 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.

The choice of discount rate is a policy 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 current and future customers, as well as applicable policy goals. Further, the choice of a discount rate should recognize the objective of the efficiency 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 offers the following steps to assist a state in determining the discount rate for the primary cost-effectiveness test:

a) **Articulate the state's applicable policy goals** - These should be the same goals used in developing the Resource Value Framework and should serve as the basis of the jurisdiction's regulatory perspective.

b) **Consider the relevance of a utility's WACC** - Is the utility investor time preference consistent with the jurisdiction's applicable policy goals?

c) **Consider the relevance of the average customer discount rate** - Should the discount rate be based on the average utility customer time preference? Does this time preference adequately address applicable policy goals and future utility customers?

d) **Consider the relevance of a societal discount rate** - Is a societal time preference and use of a societal discount rate consistent with the jurisdiction's policy goals and associated regulatory perspective?

e) **Consider an alternative discount rate** - Given that the regulatory perspective may be different from the utility, customer, and societal perspective, the discount rate does not need to be tied to any one of these three perspectives. For example, regulators/decision-makers could decide to use a discount rate that is lower than the utility WACC and the customer discount rate, but higher than the societal discount rate.

f) **Consider risk implications** - Consider using a low-risk discount rate for energy efficiency cost-effectiveness if the net risk benefits of energy efficiency resources are not somehow accounted for elsewhere in the cost-effectiveness analysis.

The NSPM notes that the discount rate that is used for the primary cost-effectiveness test should be consistent with, and ideally identical to, the rate used for the other energy efficiency tests.[88]

Recommendations

We recommend that Minnesota stakeholders follow the six steps outlined in the NSPM for evaluating their discount rate. In doing so, the stakeholders should especially consider the relevance of the utility WACC as the discount rate, given that this is the predominant rate used in the Minnesota cost-effectiveness analyses.

For the remainder of this section, we provide recommendations for how to address each of the NSPM steps, based upon our assessment of Minnesota policies and practices. Our goal is to help facilitate the discussion; the decision on this important issue should be made by Minnesota stakeholders, and ultimately Commerce.

Articulate state policy goals

Minnesota has a broad set of applicable energy policy goals, as described detail in Chapter 6. We do not see any specific policy goals that directly provide guidance on how to weigh short-term versus long-term benefits.

Nonetheless, the overall set of policy goals clearly affirms that energy efficiency is the state's most valuable energy resource and that utilities should aggressively pursue all cost-effective energy efficiency. The policy goals also place an emphasis on the societal benefits of energy efficiency, which is consistent with the state's decision to use the SCT as the primary test for energy efficiency cost-effectiveness. This emphasis on societal impacts suggests placing a higher priority on long-term impacts, relative to a perspective focused on utility impacts alone.

Consider the relevance of the utility WACC

This is one of the most important steps in deciding which discount rate to use for cost-effectiveness analyses. A discount rate equal to the utility WACC is frequently used for utility benefit-cost analysis, because it reflects the cost of capital to the utility and the time preference of utility investors.

However, the time preference for utility investors is not the same as the time preference of customers or the time preference of regulators. The time preference for a cost-effectiveness analysis should be consistent with the goal of the analysis. The goal of energy efficiency cost-effectiveness analysis is to identify those resources that are likely to result in safe, low-cost, reliable electricity service, consistent with state policy goals, over the long term. The goal of the cost-effectiveness analysis is not to maximize

[88] National Efficiency Screening Project, pages 83–84.

investor value. These different objectives dictate different time preferences, i.e., different discount rates.

It is sometimes argued that the utility WACC should be used as a discount rate for the UCT because this test represents the perspective of the utility, and that the WACC is the best indicator of the time preference for the utility. However, the UTC is not well named. It does not represent the perspective of the utility. It represents the perspective of the "utility system," which includes all the costs and benefits experienced by the utility and passed on to customers.

It is sometimes argued that the utility WACC should be used as a discount rate because utilities need to collect sufficient revenues to pay dividends and interest to their investors. However, the choice of the discount rate has no impact on the ability of the utility to recover its costs of capital. The recovery of any debt and equity costs associated with resource acquisition should be included in the calculation of each resource's costs and benefits in the cost-effectiveness analysis.

It is sometimes argued that the utility WACC should be used as a discount rate because this helps utilities to prioritize capital expenses versus operating expenses, based on the cost of those capital expenses. However, a utility's decision to invest in capital versus operating expenses should be driven by the goal of providing safe, reliable, low-cost service to customers while meeting policy goals, not the goal of optimizing capital expenditures for the benefit of utility investors.

For these reasons, we recommend that utility WACC not be used as the discount rate for any of the cost-effectiveness analyses in Minnesota.

Consider the relevance of customer discount rates

Given that the objective of the energy efficiency cost-effectiveness analysis is to identify those resources that provide safe, reliable, low-cost services to customers, it is sometimes argued that the customers' time preference should be used to determine the discount rate.

While it is true that the objective of the cost-effectiveness analysis is to best serve customers, it does not follow that customer time preferences should be used to determine the discount rate. A customer's own personal time preference might be very different than the time preference of a regulator who has an obligation to consider the long-term implications for future customers, as well as the short-term implications for current customers. A customer's time preference does not account for the objective of the energy efficiency cost-effectiveness analysis or the policy goals behind it.

For this reason, we recommend that a customer discount rate not be used for any of the energy efficiency cost-effectiveness analyses in Minnesota.[89]

[89] Note that a customer-based discount rate is sometimes appropriate for the PCT, in those instances where the test is used to market efficiency programs to customers.

Consider the relevance of a societal discount rate

Minnesota utilities already use a societal discount rate for the SCT, for residential customers. This is appropriate because the SCT is designed to account for the societal perspective, and the societal discount rate is consistent with that perspective.

Minnesota utilities also use a societal discount rate for the PCT, again for residential customers. This is appropriate because a societal discount rate is consistent with the regulatory perspective, and the purpose of the PCT in this instance is to inform regulators of the implications for participants.

We recommend that a societal discount rate be used for the Minnesota Test. A societal discount rate is consistent with the regulatory perspective in Minnesota, as articulated in the large array of regulatory policies in Minnesota, and the fact that Minnesota policies generally place relatively high priority on long-term impacts.

Furthermore, the societal discount rate should also be used for the secondary cost-effectiveness tests in Minnesota, again because this rate is consistent with the regulatory perspective and policy goals in Minnesota.

Consider alternative discount rates

The purpose of this step is to determine whether a state prefers an alternative discount rate (e.g., a discount rate that is lower than the utility WACC and higher than the societal rate). This step is especially important for a test that is developed through the Resource Value Framework and is neither the UCT nor the SCT. The Minnesota Test described above is an example of such a test.

Minnesota has multiple policy goals directing the consideration of societal impacts. Consequently, the Minnesota Test described above includes several important societal impacts. A societal discount rate would be completely consistent with those goals and would provide a time preference that is consistent with the regulatory perspective in Minnesota.

Therefore, we recommend that a societal discount rate be used when applying the Minnesota Test for all customer classes and types of programs.

Consider risk implications

The purpose of this final step is to determine whether the discount rate chosen based upon the above considerations properly accounts for risk. In particular, does it reflect the fact that energy efficiency resources tend to have lower net risk than supply-side resources?

A societal discount rate is considered to be a relatively low-risk discount rate. Further, the rate currently used in Minnesota is based on a U.S. Treasury rate, which is a benchmark for low-risk investments. Therefore, the societal discount rate appropriately reflects the net risk benefits of energy efficiency and does not need to be modified for risk implications.

Summary

In sum, we recommend that the societal discount rate currently used in Minnesota for some cost-effectiveness tests be used for all tests: the UCT, the SCT, the PCT, and the Minnesota Test. This one discount rate is appropriate for all tests because it is consistent with the policies in Minnesota that require consideration of societal impacts. Further, these policies generally place relatively high priority on long-term impacts.

This approach is consistent with the recommendations of the NSPM. It also offers the advantage of allowing for more direct comparison of results across the different tests. For example, it allows for a direct comparison between the Minnesota Test and the UCT, which would indicate the impacts of achieving Minnesota's broad energy policy goals relative to the impacts of simply reducing utility system costs according to the UCT.

Analysis Period and End Effects

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

Since most efficiency resource costs are incurred immediately while benefits are spread out over time, 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.

As mentioned above, Minnesota's IRP statutes require utilities to consider long-range emission reductions as part of their planning. Energy efficiency resources are one method utilities can use to reach the state's greenhouse gas emission reduction goals.[90]

Minnesota's analysis period is limited by the measures with the longest lives, and all measures are currently capped at 20 years.[91] While most measures will have measure lives of 20 years or less, many important energy efficiency measures provide savings well over 20 years, such as weatherization improvements, heating equipment, and water heaters.

A limited analysis period creates an end-effects problem and is inconsistent with Minnesota's long-range emissions reduction planning. Minnesota can remedy this issue by extending its analysis period to cover the full life of the efficiency resource whose installation is influenced by an efficiency program. Minnesota should extend the analysis period to at least 30 years but could consider as high as 40 years

[90] Minn. Stat. § 216B.2422, Subd. 2c.

[91] Minnesota Department of Commerce, In the Matter of Inputs to BENCOST for Natural Gas 2017-2019 Conservation Improvement Program at input 20.

to ensure an adequate length for all potential measures. Some interviewees supported an extended analysis period.

Assessment Level

Customer Segment Screening

Commerce staff evaluate the cost-effectiveness of the measures and programs proposed by each utility. Commerce approves cost-effectiveness at the utility segment level (i.e., residential, low-income, C&I, and other). Such an approach is consistent with the NSPM, and we recommend Commerce continue to review cost-effectiveness at all levels while screening at the high-level customer segment level. Such an approach should be taken regardless of which cost-effectiveness test is applied.

The primary advantage of screening at the segment level is that it indicates the costs and benefits of initiatives that provide a package of efficiency services to an entire sector. This may allow for non-cost-effective programs to be provided to a sector as part of a complete set of efficiency services to that sector—an objective often driven by concerns about equitable access to efficiency programs across a large range and number of customers.

The primary disadvantage of screening at the segment level is that it could result in the inclusion of efficiency measures or programs that are not individually cost-effective, thereby decreasing the economic value of the suite of programs for that sector.

One example frequently raised during interviews is that water heaters are often not cost-effective for natural gas utilities. Stakeholders agreed that it was important to continue offering this core measure to ensure a comprehensive portfolio of efficiency measures, to reduce negative impacts on trade allies, and to reduce customer dissatisfaction. Interviewees appreciated the regulatory flexibility to provide programs that benefit customers.

Through interviews, we learned that some but not all utilities exclude measures that are not cost-effective, even if rolled into a cost-effective customer segment. The utility supported this approach by claiming they have a responsibility to produce the highest number of benefits for customer's investment in energy efficiency resources.

Screening at the measure level is the most restrictive application of the cost-effectiveness tests and can have perverse implications. In some cases, it could reduce the overall net economic benefits of efficiency investments. Further, such an approach is inconsistent with Minnesota policy to screen at the customer segment level. Utilities should cease such practice, and Commerce staff and other stakeholders should ensure that utilities no longer engage in this practice.

Fixed Cost Allocation

Efficiency program costs should be included in cost-effectiveness analyses only at the level at which they become variable. As examples, fixed program costs should not be allocated to measures for assessing the cost-effectiveness of individual measures and fixed portfolio-level costs should not be allocated to programs for assessing the cost-effectiveness of individual programs. Such an approach is consistent with the principle that cost-effectiveness analyses should be forward-looking and focused only on marginal impacts.

After reviewing the utility plan filings, it seems that Minnesota does not allocate fixed costs to each measure or program. Instead, costs associated with evaluation, marketing, and regulatory review are included in the "other" segment. These costs support the success of the utilities' programs, although they may not result in direct benefits. As a result, the cost-effectiveness tests do not apply to these costs.[92]

We recommend that Minnesota continue its current practice of including costs only at the level at which they become variable. Minnesota should continue to monitor the portfolio-level cost-effectiveness results to ensure costs within the other segment do not exceed total portfolio benefits.

Transparency

Policy Articulation

Transparency is critical to supporting successful application of the Resource Value Framework, particularly in how a jurisdiction articulates its energy and other applicable policy goals. This exercise can provide a clear platform from which interested parties can confirm priorities, gaps, or missing needs, and identify appropriate costs and benefits.

Including statutes and a long history of regulatory decisions, Minnesota has an extensive number of policies relating to energy efficiency and energy resources. Synthesizing this volume of information is important for stakeholders, program implementers, and regulatory agencies to make fully informed decisions in their daily roles and responsibilities.

To our knowledge, Minnesota's policies have not been summarized in quite the same way as presented in Appendix D. We recommend using this table as a straw proposal for stakeholders to continue discussing the policy goals most important to Minnesota.

In addition to summarizing overarching policies as presented in Appendix D, it may be useful to gather and summarize Minnesota's many detailed goals, targets, and other policy requirements. This document

[92] See Minnesota Department of Commerce, In the Matter of CenterPoint Energy's 2017-2019 Natural Gas Conservation Improvement Program Triennial Plan.

should be updated every time a new decision comes into effect to maintain a comprehensive repository of all goals and requirements. Minnesota Rules Chapter 7690 seems the most intuitive place to maintain all such requirements, although a website could suffice if updating the rules is an onerous process.

Inputs and Assumptions

Transparency is also critical for documenting the inputs, assumptions, and results of the cost-effectiveness analyses. The NSPM recommends using a reporting template to provide clear and consistent information for all interested parties.

Minnesota appears to have a robust planning and reporting structure through the Energy Savings Platform, a regularly updated TRM, the BENCOST inputs for natural gas utilities, and Commerce's detailed oversight. This system is especially impressive considering the number of IOUs, cooperatives, and municipal utilities in the state.

The NSPM recommends applying a template to provide clear and consistent information for all interested parties. In this white paper, we apply many of the templates suggested in the NSPM. Stakeholders should review and modify these tables to ensure they reflect the policies and inputs most import to Minnesota stakeholders. We suggest Minnesota utilities continue to apply and update these templates in their plans and reports. Such transparency should be afforded to all cost-effectiveness tests applied, whether the primary or secondary tests.

The Microsoft Excel models the utilities use to screen energy efficiency resources could be drastically improved. In their current state, the screening tools are not transparent and do not provide supporting measure or cost details. The interviewees agreed that the tools can be difficult to work with, especially when trying to screen multiple measures with different saving assumptions, or when working with multiple utilities on a single project. Such tools are the heart of cost-effectiveness screening and should be designed carefully to allow detailed transparency.

We recommend Minnesota develop a comprehensive, transparent screening tool common across natural gas and electric utilities that includes measure-level assumptions and inputs. The model should allow the user to easily trace formulas back to the model inputs and should allow utilities flexibility to screen more complicated projects.

In addition, the BENCOST input document for natural gas utilities is helpful for clearly defining key inputs and assumptions to cost-effectiveness tests. A similar structure would be equally helpful for electric utilities and could even be combined into a single inputs document for both natural gas and electric utilities.

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.

Under cost-effectiveness tests that do not include participant impacts, the early replacement 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 an early replacement measure is partially offset by the benefit of deferring the replacement cost that would otherwise have been incurred several years later (i.e., by pushing the date on which the next replacement piece of equipment will have to be purchased much farther out into the future).

The benefits of early replacement measures 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 early replacement measure, there is simply one stream of benefits for just the duration of the early replacement period. In other instances, the early replacement 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 the duration of the early replacement period and another for remaining useful life of the early replacement measure.

Minnesota and Early Replacement

Minnesota's current practices for early replacement were not clear to us in our research. If Minnesota includes participant impacts as part of it primary cost-effectiveness test, then it should adopt the NSMP's recommendations regarding early replacement. Specifically, the primary cost-effectiveness test should recognize that the initial cost of an early replacement measure is offset by the benefit of deferring the replacement cost that would otherwise have been incurred several years later.[93]

Free-Ridership and Spillover

The NSPM's recommendations regarding free-ridership and spillover apply to states that focus on net savings. Minnesota only requires gross savings be reported by the utilities, although realization rates are applied where studied.[94]

[93] National Efficiency Screening Project, chap. 12.

[94] Midwest Energy Efficiency Alliance, "Minnesota."

One of the interviewees explained that utilities frequently run evaluations and identify free-ridership impacts. The utilities do not adjust their costs or savings for free-ridership, but they adjust their program design to minimize free-riders. The interviewee appreciated this approach, noting that jurisdictions with net savings tend to battle over the values to use in screenings, and net savings can lead to reduced incentives and savings.

It is important for states to consider and minimize free-ridership and spillover as part of market transformation effects. Because Minnesota evaluates net impacts, we find its current approach is appropriate. Our only recommendation is that Minnesota clearly indicate its net savings approach, as we could not find documentation of that approach.

8. Cost-Effectiveness in Related Processes

Integrated Resource Planning

Some states use long-term IRP processes to help identify the portfolio of resources (supply-side and demand-side) that is least-cost and meets energy policy goals. Such IRP processes typically involve optimizing the costs, performance, and other attributes of all resource options in a dynamic fashion using optimization models, scenario analyses, and sensitivity analyses.[95]

Minnesota uses IRP, with energy efficiency resource featuring prominently in IRP-related policies. Some of the key policies include:

- "The legislature finds that energy savings are an energy resource, and that cost-effective energy savings are preferred over all other energy resources."[96]
- For each electric utility that submits an integrated resource plan to the Public Utilities Commission, the utility must include in their CIPs "an explanation of how its overall conservation improvement program enables the utility to meet the long-term demand-side management goals established in its most recent integrated resource plan."[97]
- "As a part of its resource plan filing, a utility shall include the least cost plan for meeting 50 and 75 percent of all energy needs from both new and refurbished generating facilities through a combination of conservation and renewable energy resources."[98]

Minnesota utilities typically use the revenue requirement test for cost-effectiveness assessments, which is essentially the UCT, and they include avoided costs for environmental externalities. Participant costs are not included in the analysis.

Many interviewees indicated that key decisions on energy efficiency investments are made in the IRP process rather than in the CIP planning process. Therefore, it is important that the criteria for selecting resources (i.e., the tests) in the IRP be consistent with those used for selecting energy efficiency programs.

We recommend that the IRP practices in Minnesota use the same primary cost-effectiveness tests used for energy efficiency resources. If Minnesota chooses to adopt the Minnesota Test for energy efficiency based on our analysis above, then it should also apply the same criteria for selecting resources in the

[95] National Efficiency Screening Project, page 3.

[96] Minn. Stat. § 216B.2401.

[97] Minnesota Department of Commerce, Chapter 7690, Energy Conservation Improvement at 7690.0500, subp. 2, D.

[98] Minn. Stat. § 216B.2422.

IRPs. Similarly, if Minnesota chooses to modify its existing primary test based on our above recommendations, then the modified primary test should be used in the IRPs.

Potential Studies

Demand-side management potential studies often represent the economic potential case using the Total Resource Cost Test. Potential studies typically include all costs to utilities and participants, but generally do not include participant benefits. This can lead to results that are not symmetrical and are skewed against energy efficiency.

The Center for Energy and the Environment (CEE), in collaboration with Optimal Energy, is currently conducting an in-depth demand-side management potential study for Minnesota. The results are expected in Fall 2018. Based on our interview with CEE, the potential study is consistent with Minnesota's use of the SCT in that it includes environmental externalities and considers the full incremental cost of demand-side management measures. CEE uses the SCT to screen demand-side management measures on a pass/fail basis, using the avoided costs provided by the utilities.

Minnesota should continue to develop potential studies using the same primary cost-effectiveness test used for energy efficiency resources. If Minnesota chooses to adopt the Minnesota Test for energy efficiency based on our analysis above, then it should also apply the Minnesota Test to potential study estimates. Similarly, if Minnesota chooses to modify its existing primary test based on our above recommendations, then the modified primary test should be used for potential studies.

9. Summary of Recommendations

Primary Test

We recommend that the Minnesota Test be used as the primary test for evaluating energy efficiency cost-effectiveness in Minnesota. This test was developed using the RVF and is intended to reflect Minnesota policy goals and be consistent with the fundamental principles of the NSPM. Table 17 presents a summary of our recommendations for what to include in the Minnesota Test.

Table 17. Impacts included in the Minnesota Test

Impacts	Description	Rationale for Inclusion	Quantification
Utility System Impacts	All utility system costs and benefits	Included in any cost-effectiveness test	Jurisdiction-specific values
Other Fuel Impacts	Changes in fuels that are not provided by the utility energy offering efficiency	Supports Minnesota's emission reduction goals, consistent with best practices, and stakeholder support	Jurisdiction-specific values
Environmental Impacts	Net impacts on CO_2 and other emissions	Supports Minnesota's emission reduction goals	Jurisdiction-specific values
Water Savings	Net impacts on water consumption	Impacts to participants and society	Jurisdiction-specific values
Jobs and Economic Development	Net impacts on jobs or gross state product	Supports Minnesota's goals for economic prosperity and job creation	Studies from other jurisdictions, proxies, quantitative and qualitative information
Public Health	Reduced morbidity and mortality from fossil fuel generation	Supports Minnesota's goals related to the protection of life, safety, and financial security for citizens in an energy crisis	Studies from other jurisdictions, proxies, quantitative and qualitative information
Energy Security	Reduced fuel imports	Supports Minnesota's goals related to increased fuel diversity and reliability	Proxy

Secondary Tests

We recommend that the four current tests used by utilities in Minnesota be used as secondary tests. These tests comply with the requirements of NGEA and provide useful cost-effectiveness information from different perspectives. We further recommend that the tests currently used in Minnesota be modified to be consistent with their theoretical definitions, as follows:

- The UCT should be expanded to include all utility system costs and benefits, including: wholesale price suppression effects, avoided costs of complying with the RPS, some avoided environmental compliance costs, avoided credit and collection costs, reduced risk, increased reliability, and market transformation benefits.
- The PCT should be expanded to include all participant costs and benefit, including participant NEBs.
- The SCT should be expanded to include additional societal benefits, including: public health benefits, economic development impacts, and energy security benefits.
- The RIM test, if it is used at all, should be modified to include the same additional utility system costs and benefits as the UCT

Additional Recommendations

In the sections below, we highlight some of our recommendations for key cost-effectiveness test inputs and assumptions. For the sake of brevity, we have not repeated all our recommendations—just those areas that could have a greater impact on cost-effectiveness results.

Discount Rates

We recommend that the utility WACC not be used as the discount rate for any of the cost-effectiveness tests in Minnesota. The utility WACC represents the time preference of utility investors. However, this is different from the time preference of customers and the time preference of regulators. The goal of the cost-effectiveness analysis is not to maximize investor value. The goal of the analysis is to maximize the net benefits to customers. The discount rate must be consistent with this goal in order to achieve it.

Further, we recommend that a societal discount rate be used for all the tests employed in Minnesota, especially the Minnesota Test. A societal discount rate is consistent with the Minnesota policies that require consideration of societal impacts. Further, Minnesota policies generally place relatively high priority on long-term impacts.

Analysis Period and End Effects

Minnesota's analysis period is limited by the measures with the longest lives, and all measures are currently capped at 20 years.[99] A limited analysis period creates an end-effects problem and is inconsistent with Minnesota's long-range emissions reduction planning. Minnesota can remedy this issue by extending its analysis period to cover the full life of the efficiency resource whose installation is influenced by an efficiency program. We recommend Minnesota extend the analysis period to at least 30 years, but could consider as high as 40 years to ensure an adequate length for all potential measures. Interviewees supported an extended analysis period.

Assessment Level

Some utilities exclude measures that are not cost-effective, even if rolled into a cost-effective customer segment. Screening at the measure level is the most restrictive application of the cost-effectiveness tests and can have perverse implications. Such an approach is inconsistent with Minnesota policy to screen at the customer segment level. We recommend the utilities cease such practice, and that Commerce staff and other stakeholders ensure the utilities no longer engage in this practice.

Transparency

The Microsoft Excel models the utilities use to screen energy efficiency resources could be drastically improved. The current screening tools are not transparent and do not provide supporting measure or cost details. We recommend Minnesota develop a comprehensive, transparent screening tool. It should be common across natural gas and electric utilities and include measure-level assumptions and inputs. The model should also allow the user to easily trace formulas back to the model inputs and should allow utilities flexibility to screen more complicated projects.

In addition, the BENCOST input document for natural gas utilities is helpful for clearly defining key inputs and assumptions to cost-effectiveness tests. A similar structure would be equally helpful for electric utilities and could even be combined into a single inputs document for both natural gas and electric utilities.

Next Steps

Should adjustments to cost-effectiveness testing be warranted, all interviewees were in favor of an open, collaborative process, consistent with past practices. Working groups were mentioned most frequently as the preferred approach. Alternatively, one interviewee would also be amenable to written responses if a record is required, while another interviewee preferred to keep the discussion within the

[99] Minnesota Department of Commerce, In the Matter of Inputs to BENCOST for Natural Gas 2017-2019 Conservation Improvement Program at input 20.

TRM group. An interviewee recommended developing and providing a straw proposal—including specific end goals and timelines—for a working group to refine. Finally, one interviewee noted that the magnitude of the proposed changes could determine whether a working group or a less extensive proceeding is most appropriate.

Recommendations for Further Research

There are several types of energy efficiency impacts that are not well understood and could have a significant impact on the cost-effectiveness analyses in Minnesota. Here we list a few topic areas that warrant further research, with the highest priority areas generally presented toward the top of the list. We place a relatively high priority on utility system impacts, because these are not only part of the Minnesota Test they are also part of the secondary Utility Cost and Societal Cost Tests.

- The cost of complying with Minnesota climate change requirements.
- Wholesale electricity and gas price suppression effects.
- Reduced risk.
- Reliability benefits.
- Avoided credit and collection costs.

If Commerce decides to include participant impacts in the Minnesota Test, then there are several issues related to participant NEBs that warrant further research, including:

- Which participant NEBs are likely to be most significant?
- Which programs are likely to be most affected by participant NEBs?
- Jurisdiction-specific studies to monetize the most significant and relevant participant NEBs.
- Additional studies to develop proxies for those participant NEBs that are not monetized.

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Appendix A: Conservation Improvement Program

Implementation and Regulatory Review

In its current structure, CIP is administered by the state's two electric investor-owned utilities (IOU), four natural gas IOUs, one combined electric/gas IOU, 125 municipal electric companies, and 18 municipal natural gas companies.[100] Table 18 and Table 19 summarize the electric and natural gas utilities, including their 2016 sales and savings.

Table 18. Electric utilities, 2016 sales[101]

Utility	Structure	Sales (MWh)	Sales (% of total)
Xcel Energy	IOU	30,296,689	46%
44 Cooperatives and 125 Municipals	Co-op / Muni	24,231,928	37%
Minnesota Power	Owned by Allete	8,181,382	13%
Otter Tail Power	IOU	2,563,598	4%
Statewide Total		**65,273,597**	**100%**

Table 19. Natural gas utilities, 2016 sales[102]

Utility	Structure	Sales (Dth)	Sales (% of total)
CenterPoint	IOU	171,780,802	49%
Xcel Energy	IOU	89,977,109	25%
Minnesota Energy Resource Corporation (MERC)	IOU	83,240,692	24%
Great Plains Natural Gas	IOU	7,590,996	2%

[100] See, Minnesota Public Utilities Commission, "Find a Utility Company."

[101] U.S. Energy Information Administration, "Electric Power Sales, Revenue, and Energy Efficiency Form EIA-861 Detailed Data Files"; Energy Savings Platform, "Minnesota."

[102] U.S. Energy Information Administration, "Electric Power Sales, Revenue, and Energy Efficiency Form EIA-861 Detailed Data Files."

Utility	Structure	Sales (Dth)	Sales (% of total)
Greater Minnesota Gas	IOU	1,274,379	0%
Statewide Total		**353,863,978**	**100%**

Minnesota's electric and natural gas utilities submit CIP plans at least once every three years to outline how their planned CIP activities comply with the requirements outlined in Minnesota statutes. The utilities also submit annual CIP performance reports to assess utilities' actual CIP performance compared to the goals approved in their CIP plans.[103]

All Minnesota utilities report their annual budget and actual program data in Reporting$_{ESP}$™, a cloud-based energy efficiency data management system developed by Energy Platforms, LLC.[104] IOUs are required to file three-year (triennial) plans and annual status reports through eDockets, Minnesota's online docket filing system.[105] Consumer-owned utilities (municipal utilities or electric cooperatives) file annual plans on Commerce's Energy Savings Platform.

Commerce is responsible for reviewing and approving utility CIP plans and annual status reports, ensuring the utilities comply with state regulations, and providing technical assistance to all utilities. Commerce staff evaluate each utility's CIP plan and performance reporting to ensure that statutory requirements are met, programs are cost-effective, energy savings are measurable and verifiable, and that they reach customers across all market segments.

After review of the utility plans and reports, Commerce staff issue Proposed Decisions with their analysis and recommendations, which are then reviewed and commented on by stakeholders. After Commerce staff complete their review, the Commissioner of Commerce or his/her delegated authority (currently the Deputy Commissioner of the Division of Energy Resources) approves each utility's plan as filed or with modifications.

The Public Utilities Commission (Commission) is primarily responsible for addressing and approving energy efficiency cost recovery, performance incentives, and any appeal proceedings.[106]

Utility Cost Recovery and Incentives

Utilities in Minnesota are allowed full cost recovery for energy efficiency investments. In addition, they can implement a rate decoupling mechanism and receive a financial incentive based on a percentage of their net benefits achieved.

[103] See Minnesota Department of Commerce, "Conservation Improvement Program Planning & Performance Reporting."
[104] For more information, see Energy Savings Platform, "Minnesota."
[105] For more information, see Minnesota Department of Commerce, "eFiling/eService Home/Login."
[106] Minn. Stat. § 216B.241.

Through Minnesota statute, utilities can recover costs for CIP through a Conservation Cost Recovery Charge embedded in utility rates. Utilities can file rate schedules with the Commission to reconcile balances on an annual basis.[107] Most IOUs include as part of their larger consolidated filings proposed adjustments to CIP cost-recovery riders based on the previous year's expenditures and performance incentive earned. Commerce staff review the proposed cost-recovery adjustments and file recommendations concerning the proposed adjustments to the Commission. After considering Commerce's recommendations and any public comments, the Commission then approves the proposed adjustments as-is or with modifications. Local utility commissions, boards, or city councils determine cost recovery mechanisms for cooperative and municipal utilities.

The Commission can authorize revenue decoupling to disassociate energy sales from fixed cost recovery.[108] The purpose of decoupling is to reduce a utility's disincentive to promote energy efficiency. To date, four utilities have implemented decoupling mechanisms in Minnesota: CenterPoint Energy, Xcel Electric, Great Plains Natural Gas, and Minnesota Energy Resource Corporation.[109]

Minnesota utilities receive a financial incentive—known as a shared savings incentive—for reaching or exceeding the state's efficiency goals.[110] In terms of the utility's performance, the shared savings incentive mechanism is bookended by a threshold level of performance and a capped level of performance. Table 20 provides the savings thresholds and caps for electric and natural gas utilities, as well as the statutory savings target as a benchmark.

For the performance threshold, utilities must reach a minimum energy savings level to receive a financial incentive. For electric utilities, the threshold is 1 percent of retail sales. For natural gas utilities, the threshold is 0.7 percent of retail sales.

For the performance cap, utilities earn a financial incentive until energy savings reach an upper limit, which is 1.7 percent of sales of retail sales for electric utilities and 1.2 percent of sales for natural gas utilities. The cap adds 0.2 percent to the energy savings goals of 1.5 percent for electric utilities and 1 percent for natural gas utilities.

[107] Minn. Stat. § 216B.16, subd. 6b(c).

[108] Minn. Stat. § 216B.2412..

[109] See CenterPoint Energy, Docket No. G008/GR-08-1075 and Docket No. G008/GR-13-316. MERC, Docket No. G007,011/GR-10-977. Xcel Electric, Docket No. E002/GR-13-868. Great Plains Natural Gas, Docket No. G004/GR-15-879.

[110] Minnesota Public Utilities Commission, In the Matter of the Commission Review of Utility Performance Incentives for Energy Conservation Pursuant to Minn. Stat. 216B.241, Subd. 2c.

Table 20. 2017 Triennial plan, shared savings incentive levels, percent of utility's retail sales[111]

Performance Level	Electric	Natural Gas
Threshold	1.0	0.7
Benchmark	1.5	1.0
Cap	1.7	1.2

In terms of the financial incentives available, the amount a utility can earn at any level of performance is based on achieved net benefits, based on the Utility Cost Test's net benefits. The share of net benefits that a utility can earn for achieving the performance cap is capped, and in 2017 the cap was 13.5 percent of achieved net benefits. The net benefit cap decreases annually as shown in Table 21, thereby reducing the share of net benefits that utilities can earn through the shared savings incentive mechanism. Below the performance cap, the financial incentives rate is 0.75 percent of net benefits for each 0.1 percent of retail sales avoided. Based on this formula for achieving the threshold savings level of 1.0 percent for electric utilities and 0.7 percent for natural gas utilities, in 2017 an electric utility would have earned 8.25 percent of net benefits and a natural gas utility would have earned 9.75 percent of net benefits.

In addition to the net benefit cap, the total amount a utility can earn through the financial incentive mechanism is capped by the utility's total energy efficiency expenditures. In 2017, the expenditure cap was 40 percent of expenditures. The expenditure cap also decreases over time, consistent with the net benefit cap, as summarized in Table 21. To summarize through an example, if in 2017 an electric utility achieved the savings cap of 1.7 percent of retail sales, then it would earn 13.5 percent of net benefits or 40 percent of its CIP expenditures, whichever is less.

Table 21. 2017 Triennial plan, net benefits and expenditure caps[112]

Year	Net Benefits at Performance Threshold (%)		Net Benefits Cap (%)	Expenditure Cap (%)
	Electric	Gas	Electric and Gas	Electric and Gas
2017	8.25	9.75	13.5	40
2018	6.75	8.25	12.0	35
2019	4.75	6.25	10.0	30

Commerce is unaware of any cooperative or municipal utilities that award themselves a performance incentive for CIP achievements.

[111] Minnesota Public Utilities Commission.

[112] Minnesota Public Utilities Commission.

Programs by Customer Segment

To achieve statewide savings goals, utilities implement programs designed for each customer segment: residential, low-income, and commercial and industrial (C&I). Similar initiatives are offered across Minnesota's many utilities.

Residential programs aim to increase efficiency in existing homes and new construction projects. These programs usually include energy audits, incentives for high-efficiency products and appliances, and weatherization measures. Customers are encouraged to begin with energy audits to find sources of energy waste and learn how to upgrade their homes and reduce their energy bills. Typical programs offer rebates for insulation and air sealing, or to replace inefficient lighting, HVAC, and water appliances with high-efficiency equipment. Select utilities allow residential customers to participate in demand response initiatives through utility-controlled air conditioner cycling programs.[113]

Low-income programs have similar offerings to residential programs with a few major differences. Unlike with residential and C&I programs, utilities have a spending requirement for low-income programs. As noted in Table 6, utilities are required to spend a minimum portion of their annual gross operating revenue from residential customers on programs that directly benefit low-income customers. Electric utilities must spend 0.2 percent of their revenue on low-income customers while natural gas utilities must spend 0.4 percent of their revenue.[114] Low-income rebates are also typically higher than they are for residential customers, and select services such as home energy audits are free.[115] Finally, low-incomes programs have historically been held to different cost-effectiveness requirements than non-low-income programs, such as not needing to have a benefit-cost ratio greater than one for the Societal Cost Test.[116]

Through the C&I programs, utilities offer rebates for efficient equipment for new and existing buildings. These rebates typically target larger appliances such as boilers, chillers, motors and drives, and lighting installations. C&I programs also include customer education, recommissioning studies to find sources of energy waste, and industrial process evaluations to tackle systematic inefficiencies within a large facility.[117]

Finally, utilities are required by statute to offer programs in their CIP plans that promote sustainable building design. Specifically, utilities must provide programs that facilitate professional engineering verification to qualify a building for green building certification, such as Energy Star labeling, Leadership

[113] Minnesota Department of Commerce, "Conservation Improvement Program."

[114] Minn. Stat. § 216B.241, subd. 7.

[115] CenterPoint Energy, "2017-2019 Conservation Improvement Program Triennial Plan," page 59.

[116] Minnesota Department of Commerce, In the Matter of the Implementation of Northern States Power Company, a Minnesota Corporation's 2013/2014/2015 Triennial Natural Gas and Electric Conservation Improvement Program (Petition) at 11.

[117] Minnesota Department of Commerce, "Conservation Improvement Program."

in Energy and Environmental Design (LEED), or Green Globes certification.[118] Utilities must also implement programs that are designed to achieve energy efficiency goals consistent with the B3 Sustainable Building 2030 performance standards (SB 2030).[119] SB 2030 is a progressive energy conservation program designed to significantly reduce the energy and carbon in Minnesota commercial, institutional, and industrial buildings.[120]

Evaluation, Measurement, and Verification

Commerce tracks the most cost-effective measures, technologies, and methodologies and promotes them across all utilities.[121] Commerce staff maintain a Technical Reference Manual (TRM), which consists of a set of pre-approved methodologies and inputs for calculating the energy savings impacts from installing energy efficiency measures. The TRM is updated annually by the TRM Advisory Committee (TRMAC), which recommends and votes on new measures and reviews evaluations.[122] Measure evaluations are sourced from third-party contractors or referenced from existing studies.[123]

Utilities are encouraged to reference the TRM for implementation and reporting purposes. However, they are not restricted to those measures listed in the TRM. Minnesota utilities may propose additional measures as standard offerings in their CIP plans, or implement custom measures without pre-approval from Commerce.[124]

Minnesota's Current Cost-Effectiveness Tests

The NGEA dictates that Minnesota utilities and stakeholders examine the costs and benefits to society, the utility, the participant, and ratepayers.[125] In practice, this direction has resulted in the use of four of the five standard benefit-cost tests included in the 2002 California Standard Practice Manual for Economic Analysis of Demand-Side Programs and Projects.[126] These four tests are the Societal Cost Test (SCT), the Utility Cost Test (UCT), the Participant Cost Test (PCT), and the Ratepayer Impact Measure Test (RIM).

Legislatively speaking, all four tests carry equal weight. While the utilities calculate results for all four tests in their plans and reporting, the SCT is the primary determinant of cost-effectiveness, "as it

[118] Minn. Stat. § 216B.241, subd. 1f(c)..

[119] Minn. Stat. § 216B.241, subd. 9(e)..

[120] See, Minnesota SB 2030 Energy Standard, "B3 Sustainable Building 2030 Energy Standards."

[121] Minn. Stat. § 216B.2412, subd. 1d.

[122] Burdette, Fryer, and Zoet, "2017 Conservation Improvement Update."

[123] Minnesota Department of Commerce, "State of Minnesota Technical Reference Manual For Energy Conservation Improvement Programs."

[124] Minnesota Department of Commerce.

[125] Next Generation Energy Act, Subd. 1c (f).

[126] See Minnesota Department of Commerce, Chapter 7690, Energy Conservation Improvement. See also: California Public Utilities Commission, "California Standard Practice Manual: Economic Analysis of Demand-Side Programs and Projects."

provides a relatively balanced comparison of CIP program benefits and costs."[127] How Minnesota currently applies each test is summarized below.

- **Societal Cost Test** - This test is the primary test used for decision-making.
- **Utility Cost Test** - This test is usually provided for informational purposes. The test is used to determine a utility's net benefits achieved and the resulting performance incentive it receives.
- **Participant Cost Test** - This test is useful in program design, to inform appropriate participant incentives.
- **Rate Impact Measure Test** - This test is provided for informational purposes, although results are not given much weight because most energy efficiency programs are not cost-effective using this test.

As part of the CIP plan review process, Commerce staff evaluate the cost-effectiveness of the programs proposed by each utility, and approve cost-effectiveness at the utility segment level. Historically, low-incomes programs have not been held to the same cost-effectiveness requirements as non-low-income programs, such as not needing to have a benefit-cost ratio greater than one for the Societal Cost Test.[128]

[127] Minnesota Department of Commerce, In the Matter of CenterPoint Energy's 2017-2019 Natural Gas Conservation Improvement Program Triennial Plan at 9.

[128] Minnesota Department of Commerce, In the Matter of the Implementation of Northern States Power Company, a Minnesota Corporation's 2013/2014/2015 Triennial Natural Gas and Electric Conservation Improvement Program (Petition) at 11.

Appendix B: Interview Questions

The types of questions Synapse asked of Minnesota's stakeholders to better inform our understanding of Minnesota's current screening practices, whether through conversation or written feedback, are provided below.

Current Minnesota Screening

Table 22 summarizes in general the costs and benefits that are used in the cost-effectiveness tests that Minnesota applies. These costs and benefits are not necessarily reflective of Minnesota's current practices. We would like to better understand how these tests are used in Minnesota. Some of the questions we may ask regarding this table and Minnesota's current screening practices include:

- Does this table include an accurate list of cost and benefits that Minnesota currently uses?
- Why are these costs and benefits included from Minnesota's perspective?
- Have there been recent discussions about updating any of the costs and benefits?
- Are any costs or benefits currently contentious?

Table 22. General costs and benefits in cost-effectiveness tests

Test	Purpose	Costs	Benefits	Use in MN
Societal cost	Most comprehensive test, enabling an assessment of cost-effectiveness based on the universe of costs and benefits of efficiency resource investment	– Program administration – Program financial incentive – Customer contribution	– Primary fuel(s) avoided supply costs – Secondary fuel(s) avoided supply costs – Other resource savings (e.g., water) – Environmental benefits – Non-energy benefits	The primary test used for decision-making
Utility cost	Indicates the extent to which ratepayer-funded efficiency will reduce costs to that same group of ratepayers; provides a foundation for all efficiency assessment tests	– Program administration – Program financial incentive	– Primary fuel(s) avoided supply costs	Frequently used for decision-making

Test	Purpose	Costs	Benefits	Use in MN
Participant cost	Useful in program design, to inform appropriate participant incentives	– Customer contribution	– Primary fuel(s) bill savings (retail prices) – Secondary fuel(s) bill savings (retail prices) – Other resource savings (e.g., water)	
Rate impact cost	Indicates whether long-term rates will increase or decrease on average	– Program administration – Program financial incentive – Utility lost revenue	– Primary fuel(s) avoided supply costs	Emphasized the least

Potential Improvements to Minnesota Screening

We expect most of the interview will be spent discussing the impacts that should be included or could be improved in Minnesota. Some of the questions we may ask include:

- What do you think are Minnesota's most important energy policy goals? Do you think these goals are being met through the current cost-effectiveness structure? If not, why not / what needs to be improved?
- In general, what do you see as the most important component(s) of cost-effectiveness testing?
- Are there limitations in Minnesota's current energy efficiency cost-effectiveness practices? What could be improved in Minnesota's cost-effectiveness testing?
- What is working well in Minnesota's cost-effectiveness testing?
- Have certain programs struggled to achieve cost-effectiveness in the past?
- We see the following issues as needing additional consideration (i.e., a deeper dive through our report). Would you agree? Are there other pieces we should investigate? Are these not the most important issues to investigate?
    - Participant non-energy benefits
    - Environmental externalities
    - Discount rates
    - Avoided electric capacity (demand), marginal energy, and transmission and distribution costs

- How do the cost-effectiveness tests apply to utility IRPs?
- How do the cost-effectiveness tests apply to the CIP performance incentive?

Appendix C: Interview Summary

This section summarizes themes from Synapse's interviews with stakeholders.

Cost-Effectiveness Tests

One interviewee summarized how cost-effectiveness tests used for energy efficiency in Minnesota have changed over the 35-year history of CIP. A Minnesota-specific test was used in the beginning of the program. About 20 years ago, the state switched to the California practice manual and has followed it since. Minnesota statute gives equal weight to each of the four required cost-effectiveness tests, and uses the word "perspective" rather than "test." Another interviewee stated that all four statutory tests must be calculated to be consistent with legislative intent, but that the tests could be modified or a new test could be added.

Interviewees agreed that the SCT is the primary test used for cost-effectiveness screening in Minnesota. One interviewee expressed concern that the SCT may be more difficult to pass than the UCT because it adds participant costs.

For the UCT, an interviewee noted the results are often marginally cost-effective, while another interviewee explained the test is primarily used for the shared savings incentive.

For the PCT, an interviewee noted that the test is often ignored, which is appropriate because investing in efficiency is a participant's decision. One interviewee felt there should be an upper limit on the PCT's benefit-cost ratio to inform incentive levels.

For the RIM test, interviewees noted the results are often not cost-effective, that cost-effectiveness is not required for the test, and that the test generally gets the least amount of attention. Some parties stated that rather than using the RIM test, they would like another way to examine the impact on customer's rates and bills from energy efficiency and other resources.

Some interviewees felt there is no need to adjust the current tests and that the SCT currently provides a fair assessment for efficiency investments. Conversely, one interviewee noted that numerous parties recognize the need to update which costs and benefits are included in CIP cost-effectiveness tests to reflect advancements in efficiency technologies, ability to incorporate savings into a larger utility resource framework, and the growing maturity of existing programs.

Interviewees also discussed the specific costs and benefits included in each test, which have been incorporated into Synapse's assessment of current practices.

Policies

Interviewees identified the following policies as among the most important energy policy goals in Minnesota:

- 1.5 percent energy savings goal
- 25 percent renewable energy production standard
- Greenhouse gas emission and fossil fuel reductions goals
- 216b.2041
- Solar energy standard (1.5 percent electric generation by 2020)
- Rates cannot exceed national standard by 5 percent
- Reliability
- Cost recovery
- Performance incentives
- Managing retail rates

Some interviewees indicated that the current tests reflect the policy goals well enough. Others felt the policies could be better connected and complementary to each other, rather than siloed as they are now. This was frequently alluded to by interviewees regarding electrification. They indicated that more emissions could be reduced if there were more support and guidance for beneficial electrification. Some interviewees felt modifications to non-energy benefits, discount rates, and other components of the cost-effectiveness tests could better reflect current policies. One interviewee also highlighted that cooperatives have different incentives for energy efficiency investments than IOUs, which should be better reflected in policy, or at least recognized more directly by regulators.

Avoided Costs

Many interviewees stated that avoided costs are the most important aspect of cost-effectiveness testing. Some also stressed the importance of accurately estimating avoided costs, while one interviewee further highlighted the importance of energy data that is current and transparent.

Most interviewees indicated a desire for avoided energy and capacity costs that better reflect temporal and locational accuracy. One interviewee noted that the locational and temporal deployment of conservation, as well as wind, solar, storage, and electric vehicles is changing the value of a kWh. Conservation may not be as cost-effective as it used to be during a given hour of the day, and cost-effectiveness tests should reflect such changes. One interviewee supported avoided costs that reflect wholesale market conditions at the time energy is saved. One interviewee explained that efficiency and load management programs can support renewable integration by better matching a utility's load to renewable generation profiles. However, current cost-effectiveness tests do not capture the time-varying value of energy efficiency that could achieve system efficiency and decarbonization goals through greater renewable integration.

Stakeholders agreed that more detailed avoided costs would require more and better data. Utilities do not have the data for such avoided costs, while the utilities argue that AMI meters would provide that data. BENCOST does not provide flexibility for locational benefits.

Electric utilities in Minnesota use different avoided energy costs. The methodology should be the same, although the output varies by utility. Some interviewees indicated that utilities may be using different

methodologies, and that utility-specific avoided costs can make if challenging from some utilities to pass cost-effectiveness tests.

With an excess of capacity in the region, interviewees questioned the value of avoided capacity through energy efficiency resources, as well as when utilities can claim a value for avoided capacity. Efficiency can also reduce capacity costs for natural gas, which should be reflected in cost-effectiveness tests. Further, some utilities have made investments to modernize their grids. This makes it increasingly difficult to identify separately (a) the investments avoided from energy efficiency resources from (b) the investments that needed to be completed for other purposes.

Commerce staff recently completed a process to update T&D avoided cost values. The updated avoided costs were lower than before, and the likely next step is to better understand where the higher T&D costs are and do more geo-targeting for savings. The new T&D values are system averages that all utilities use in their tests, and the study did not address temporal or locational values.

One interviewee supported making avoided cost calculations simpler, and suggested MISO values for avoided transmission could be used for all utilities.

Environmental Externalities

Most interviewees mentioned the Commission's recent investigation into environmental externalities and felt that was a thorough, robust process. Some interviewees felt it would be redundant for Synapse to further investigate externalities given the recent proceeding, while others felt further investigation could be warranted.

Two interviewees appreciated that the process for environmental externalities was clear with an extensive record on the rationale and calculations supporting the factors. One interviewee highlighted that it was a hugely expensive and thorough project that came up with the values.

One interviewee noted that the new environmental damage factors were higher than previous values, while another interviewee found the current avoided cost values too low and recommended they be updated to reflect the recognized regulatory cost of carbon values.

Support for Including Non-Energy Benefits

Interviewees agreed that if any non-energy benefits were to be included they should be for low-income customers. Stakeholders recognized that efficiency provides health and safety benefits to low-income customers, and that non-energy benefits are more relevant to the customer segment. Including non-energy benefits for low-income customers could better reflect low-income policies and result in greater services for the customer sector.

Two interviewees were interested in considering economic benefits as part of the SCT, potentially similar to Wisconsin's approach to economic benefits.

Some environmental, consumer, and low-income advocates were interested in including non-energy benefits and felt more should be done to include them in cost-effectiveness tests. Cost-effectiveness tests have typically focused on the costs and benefits related to energy savings provided to utilities, customers, and society, but generally within the confines of a "utility system" perspective. For example, non-energy benefits like health, safety, and comfort are recognized broadly as benefits from achieved energy savings but have not been codified in cost-effectiveness tests due to views that they are outside the purview of the purpose of utilities to provide safe, reliable, and affordable service.

Non-energy benefits may significantly outweigh the system value of energy efficiency resources. Health benefits could be particularly significant. If that is the case, then health insurance companies should pay for efficiency resources, not utilities. Symmetry in cost-effectiveness testing is important, and a valid reason to include non-energy benefits. Including non-energy benefits because natural gas prices are low would not be a valid reason.

Interviewees suggested proceeding with caution if non-energy benefits are included in cost-effectiveness tests. There could be more confidence in the information if the same process used for environmental externalities were used to value non-energy benefits. However, that may not be feasible.

Arguments Against Including Non-Energy Benefits

Most interviewees were not immediately supportive of non-energy benefits in cost-effectiveness tests. Arguments against the inclusion of non-low-income participant non-energy benefits included:

- The benefits are not tangible and including them is "too far to digest." "The juice isn't worth the squeeze," implying it would be more trouble to calculate the benefits than the benefits are worth.
- They're too hard to quantify and too subjective. Utilities are uncomfortable carrying the burden of proof.
- Despite using the SCT to screen energy efficiency resources, Minnesota still considers energy efficiency programs as ratepayer-funded programs and not public benefit programs. Should ratepayers be paying for non-energy benefits?
- Concerns about the "opening of Pandora's box." Non-energy benefits could drive decisions to invest in efficiency, which would question the intent of the programs. Non-energy benefits could lead to over-incenting projects that customers would have done anyway, and free-ridership would be difficult to estimate. Energy savings should still be the primary reason to invest in efficiency resources.
- It could be politically harmful to include non-energy benefits, because efficiency resources need bipartisan support in Minnesota and including non-energy benefits could put that support at risk. Non-energy benefits are too "squishy" and would dilute the high integrity of the current Minnesota framework.
- The utilities are responsible for saving either electricity or natural gas, and to include other fuel savings would be too complicated considering the number of utilities in Minnesota.

Discount Rates

Interviewees had mixed opinions on whether discount rates should be investigated in more detail as part of this white paper. Some interviewees felt it would be useful for Synapse to review discount rates in more detail. Other interviewees felt the current discount rates are generally appropriate, although modifications or broader considerations may be warranted. Still other interviewees were uncertain if the discount rate should be adjusted or felt a deeper dive is not needed.

One interviewee mused whether a social discount rate would be more appropriate than the WACC, because it would better reflect the ratepayer perspective and because efficiency funding is fully reconciled annually and therefore less risky than other supply-side investments. The interviewee recognized that changing the discount rate could significantly impact cost-effectiveness results.

One interviewee contended that the WACC is appropriate because it reflects the utility investments that are being avoided. They noted that the participant O&M discount rates could be improved to be consistent between gas and electric utilities.

One interviewee highlighted that the discount rate should be considered simultaneously with the escalation rates applied to avoided costs. They also cautioned that real and nominal dollars should be calculated accurately, and that assuming a linear future may not be realistic.

Assessment Level

All interviewees confirmed that cost-effectiveness screening is performed at the customer segment level. Cost-effectiveness test results are provided at the program level, and most utilities review measure-level results as well. One interviewee particularly appreciated the regulatory flexibility that this approach provides, because it allows them to offer programs that benefit all customers.

One utility explained that internally they screen out measures if they are not cost-effective, although there are some exceptions. The utility supported this approach by claiming they have a responsibility to produce the highest number of benefits for customers' investment in energy efficiency resources. The utility was uncertain if they are the only utility that takes this approach.

Interviewees also consistently recalled a period around 2012 when low natural gas prices resulted in non-cost-effective customer segments. The Commission approved portfolio-level cost-effectiveness at the time. Hot water heaters, which especially struggled to maintain cost-effectiveness, were fundamental to the efficiency programs, and stakeholders agreed not to disassemble the program because of low cost-effectiveness. Utilities needed to offer a comprehensive and complete portfolio of energy efficiency resources including water heaters, and they were wary of negative impacts on vendors, trade allies, and customer satisfaction.

HVAC measures are challenged to meet cost-effectiveness, primarily because of limited cooling hours in Minnesota. When blended with other more cost-effective measures, HVAC measures are cost-effective

at the customer-segment level. An interviewee appreciated programs that provide variety and are not "one trick ponies."

An interviewee highlighted the spending requirement for low-income programs, and that sometimes the low-income customer segment is not cost-effective.

End Effects (Measure Life)

One interviewee explained that the maximum lifetime for gas measures is currently 20 years because that is the maximum time the screening model can handle. While 20 years is fine for most measures, some measures such as insulation could last longer than 20 years, and the interviewee argued it would be justified to extend the measure life to at least 25 years for better accuracy.

A different interviewee questioned whether measure lives are too much of an estimation, while another interviewee contended that a more conservative approach to measure lives is warranted.

Integrated Resource Planning

Interviewees provided conflicting comments on IRP practices. One interviewee said cost-effectiveness tests used for efficiency are the same tests used for IRP, while another interviewee indicated that different tests are used. The interviewees did not agree on whether participant costs are included in IRP cost-effectiveness tests, although interviewees agreed that environmental externalities are included in both processes. Many interviewees indicated that key decisions on energy efficiency investments are made in the IRP process rather than in the CIP planning process.

Fuel Switching

Multiple interviewees agreed that policies for fuel switching can and should be improved.

One interviewee explained that current policies do not allow the use of electric ratepayer funding for measures that increase electric consumption. Further, utilities must use a source BTU comparison that does not allow for BTU increases, which prohibits fuel switching. The interviewee would like to offer fuel switching and storage technology to customers, but such measures increase electric consumption, even though it's cost-effective overall and is a better use of resources.

Another interviewee in favor of fuel switching explained that heat pump technology could help Minnesota reach emission reduction goals. Heat pumps are well aligned with the market dynamics of wind, which is an increasing portion of the region's generation profile. Wind resources generate more electricity in shoulder and winter months when heat pumps would be in use. Heat pumps also have a high SEER value, providing additional benefits over fossil fuel heating. The interviewee admitted that they will install heat pumps if asked by customers, but that current regulations do not allow them to market fuel switching to non-low-income customers.

The same interviewee further described that fuel switching may not require removal of the existing heating technology, but rather implementing dual-fuel capabilities. Customers could fill their propane or oil heating tanks in the summer when prices are low and not refill them until the following summer. For example, during the polar vortex from a few years ago, Minnesota experienced limited propane availability, and customers could have used heat pumps as a stop gap.

Another interviewee summarized a recent Otter Tail case where the company proposed to offer rebates to convert customers from delivered fuels to heat pumps.[129] The interviewee expressed frustration that the current cost-effectiveness tests do not adequately capture the benefits of electrification from efficiency, customer savings, or carbon-reduction standpoints. The interviewee explained that even though heat pumps might be cost-effective for the participant (lower heating bills), result in reductions in carbon-emissions (particularly from propane to Otter Tail Power's generation mix), and be more efficient from an MMBtu perspective, heat pumps may not pass current cost-effectiveness tests because they would not yield any avoided utility revenue related to generation, transmission and distribution, and marginal energy.

Electrification

Many interviewees indicated they struggle with how to incorporate efficiency and cost-effectiveness tests into an evolving energy landscape because there is limited policy direction.

One interviewee indicated that discussions on beneficial electrification have been more frequent. Some stakeholders have suggested applying the energy efficiency framework to electrification or electric vehicles, but the interviewee was uncertain whether that is reasonable or whether a new framework is more appropriate. Historically, there have been instances where the Utility Cost Test has been used for distributed generation resources for expediency. The interviewee would like CIP to be addressed creatively in response to a changing world and to ensure Minnesota moves with the energy market.

Another interviewee argued that policies for efficiency, electric vehicles, fuel switching, renewables, and other energy resources should be better connected and complementary to each other, rather than siloed as they are now. The interviewee would like to promote various electric technologies to customers but faces regulatory barriers. The interviewee sees a future where load management technologies such as demand response and batteries better match variable generation resources such as wind and solar. Currently, demand response does not provide much market value because of excess capacity in the region, although risk mitigation is still a valuable outcome. Further, off-peak resources could be better utilized through time-of-use rates. Finally, the interviewee contended that the utilities' role may become less direct via an incentive payment as they look more broadly and become enablers of other technologies and infrastructure, such as for electric vehicles.

[129] See Docket No. E017/CIP-16-116.

Another interviewee agreed that conversations about strategic electrification and fuel switching are somewhat contentious. Whether and how to address electrification through CIP is also contentious, and the costs and benefits of electrification are not adequately captured in Minnesota's current cost-effectiveness tests. Measures for demand response, dynamic load management, and effectively integrating renewables are not adequately captured in Minnesota's current cost-effectiveness tests.

Shared Savings Incentive (Performance Incentive)

Multiple interviewees confirmed that the UCT is used for the shared savings incentive. Previously, the incentive levels had been higher than performance incentives in other states, but the structure was recently adjusted to reduce the amount utilities can earn. One interviewee pondered whether the previous incentive levels were richer than they needed to be.

Interviewees appreciated the robust financial incentives for shareholders, highlighting that utilities can earn more saving energy than selling energy if they aggressively pursue efficiency resources. One utility admitted that they make decisions based on performance incentives. The company tries to maximize the UCT net benefits to earn a higher incentive while providing a meaningful measure incentive to customers.

One interviewee stressed that cooperatives have a different business model than IOUs, and that regulators could do more to acknowledge that cooperatives do not have an incentive to install efficiency resources. Cooperatives have the same disincentives as IOUs, but cooperatives focus more closely on keeping rates low for members, with energy efficiency a means to mitigate rate impacts.

Working Well

Interviewees highlighted several different aspects that are working well in Minnesota, as summarized below.

- DSM cases are non-litigated as they are in other states, which allows parties to work collaboratively and effectively with decision-makers.
- Minnesota's net-to-gross practice of evaluating free-ridership impacts for program design purposes without impacting claimed savings reduces litigation and administrative burdens.
- The spirit in which people approach energy efficiency is encouraging. Stakeholders have a transparent and reasonable process of communicating and calculating input values.
- The success of LED lighting is potentially attributable to utility program efforts.
- Generally, cost-effectiveness testing has worked well in vetting traditional energy efficiency programs and building enough trust that the programs have significantly increased utility spending and savings over the past 10 years. The tests work to track costs and benefits from different perspectives to help utilities, regulators, and other parties prioritize where to spend efficiency dollars.

- The cost-effectiveness tests in Minnesota are widely accepted, easy to measure and understand, and used consistently among utilities.

Savings Target

One interviewee commented on annual savings targets, cautioning that the current policy target ignores long-term benefits. The interviewee would also like for cost-effectiveness tests to be used more directly in goal setting, such as identifying which technologies to invest in.

Process for Next Steps

Should adjustments to cost-effectiveness testing be warranted, all interviewees were in favor of an open, collaborative process, consistent with past practices. Working groups were mentioned most frequently as the preferred approach. Alternatively, one interviewee would also be amenable to written responses if a record is required, while another interviewee preferred to keep the discussion within the TRM group. An interviewee recommended a straw proposal—including specific end goals and timelines—be developed and provided for a working group to refine. Finally, one interviewee noted that the magnitude of the proposed changes could determine whether a working group or a less extensive proceeding is most appropriate.

Appendix D: Minnesota Policy Goals

Policy	Full Text	Citation	Policy Impacts Reflected in Policies						
			Least-Cost	Fuel Diversity	Risk	Reliability	Low-Income	Customer Choice	Environment
Energy savings policy goal	The legislature finds that energy savings are an energy resource, and that cost-effective energy savings are preferred over all other energy resources. The legislature further finds that cost-effective energy savings should be procured systematically and aggressively in order to reduce utility costs for businesses and residents, improve the competitiveness and profitability of businesses, create more energy-related jobs, reduce the economic burden of fuel imports, and reduce pollution and emissions that cause climate change. Therefore, it is the energy policy of the state of Minnesota to achieve annual energy savings equal to at least 1.5 percent of annual retail energy sales of electricity and natural gas through cost-effective energy conservation improvement programs and rate design, energy efficiency achieved by energy consumers without direct utility involvement, energy codes and appliance standards, programs designed to transform the market or change consumer behavior, energy savings resulting from efficiency improvements to the utility infrastructure and system, and other efforts to promote energy efficiency and energy conservation.	Minn. Stat. § 216B.2401	X	X					X

Policy	Full Text	Citation	Policy Impacts Reflected in Policies						
			Least-Cost	Fuel Diversity	Risk	Reliability	Low-Income	Customer Choice	Environment
Legislative findings	It is hereby declared to be in the public interest that public utilities be regulated as hereinafter provided in order to provide the retail consumers of natural gas and electric service in this state with adequate and reliable services at reasonable rates, consistent with the financial and economic requirements of public utilities and their need to construct facilities to provide such services or to otherwise obtain energy supplies, to avoid unnecessary duplication of facilities which increase the cost of service to the consumer and to minimize disputes between public utilities which may result in inconvenience or diminish efficiency in service to the consumers. Because municipal utilities are presently effectively regulated by the residents of the municipalities which own and operate them, and cooperative electric associations are presently effectively regulated and controlled by the membership under the provisions of chapter 308A, it is deemed unnecessary to subject such utilities to regulation under this chapter except as specifically provided herein.	Minn. Stat. § 216B.01	X			X			

Policy	Full Text	Citation	Policy Impacts Reflected in Policies						
			Least-Cost	Fuel Diversity	Risk	Reliability	Low-Income	Customer Choice	Environment
Next Generation Energy Act of 2007, general provisions	The legislature finds and declares that continued growth in demand for energy will cause severe social and economic dislocations, and that the state has a vital interest in providing for: increased efficiency in energy consumption, the development and use of renewable energy resources wherever possible, and the creation of an effective energy forecasting, planning, and education program. The legislature further finds and declares that the protection of life, safety, and financial security for citizens during an energy crisis is of paramount importance. Therefore, the legislature finds that it is in the public interest to review, analyze, and encourage those energy programs that will minimize the need for annual increases in fossil fuel consumption by 1990 and the need for additional electrical generating plants, and provide for an optimum combination of energy sources consistent with environmental protection and the protection of citizens. The legislature intends to monitor, through energy policy planning and implementation, the transition from historic growth in energy demand to a period when demand for traditional fuels becomes stable and the supply of renewable energy resources is readily available and adequately utilized.	NGEA § 2, subd. 1		X	X	X			X

Policy	Full Text	Citation	Policy Impacts Reflected in Policies						
			Least-Cost	Fuel Diversity	Risk	Reliability	Low-Income	Customer Choice	Environment
Next Generation Energy Act of 2007, Per capita fossil fuel use	It is the energy policy of the state of Minnesota that: (1) the per capita use of fossil fuel as an energy input be reduced by 15 percent by the year 2015, through increased reliance on energy efficiency and renewable energy alternatives; and (2) 25 percent of the total energy used in the state be derived from renewable energy resources by the year 2025.	NGEA § 2, subd. 2		X					X
Greenhouse gas emissions control, greenhouse gas emissions-reduction goal	It is the goal of the state to reduce statewide greenhouse gas emissions across all sectors producing those emissions to a level at least 15 percent below 2005 levels by 2015, to a level at least 30 percent below 2005 levels by 2025, and to a level at least 80 percent below 2005 levels by 2050. The levels shall be reviewed based on the climate change action plan study.	Minn. Stat. § 216H.02, Subd. 1							X
Energy conservation improvement, peak demand deficit	The commissioner may require investments or spending greater than the amounts required under this subdivision for a public utility whose most recent advance forecast required under section 216B.2422 or 216C.17 projects a peak demand deficit of 100 megawatts or greater within five years under midrange forecast assumptions.	Minn. Stat. § 216B.241, subd. 1a (d)			X	X			

Policy	Full Text	Citation	Policy Impacts Reflected in Policies						
			Least-Cost	Fuel Diversity	Risk	Reliability	Low-Income	Customer Choice	Environment
Energy conservation improvement, energy-savings goals	Each individual utility and association shall have an annual energy-savings goal equivalent to 1.5 percent of gross annual retail energy sales unless modified by the commissioner under paragraph (d). The savings goals must be calculated based on the most recent three-year weather-normalized average. A utility or association may elect to carry forward energy savings in excess of 1.5 percent for a year to the succeeding three calendar years, except that savings from electric utility infrastructure projects allowed under paragraph (d) may be carried forward for five years. A particular energy savings can be used only for one year's goal.	Minn. Stat. § 216B.241, subd. 1c (b)	X	X					X
Energy conservation improvement, cost-effectiveness	An association or utility is not required to make energy conservation investments to attain the energy savings goals of this subdivision that are not cost-effective even if the investment is necessary to attain the energy savings goals. For the purpose of this paragraph, in determining cost-effectiveness, the commissioner shall consider the costs and benefits to ratepayers, the utility, participants, and society. In addition, the commissioner shall consider the rate at which an association or municipal utility is increasing its energy savings and its expenditures on energy conservation.	Minn. Stat. § 216B.241, subd. 1c (f)	X	X					X

Policy	Full Text	Citation	Policy Impacts Reflected in Policies						
			Least-Cost	Fuel Diversity	Risk	Reliability	Low-Income	Customer Choice	Environment
Energy conservation improvement, technical assistance	The commissioner shall evaluate energy conservation improvement programs on the basis of cost-effectiveness and the reliability of the technologies employed. The commissioner shall, by order, establish, maintain, and update energy savings assumptions that must be used when filing energy conservation improvement programs. The commissioner shall establish an inventory of the most effective energy conservation programs, techniques, and technologies, and encourage all Minnesota utilities to implement them, where appropriate, in their service territories. The commissioner shall describe these programs in sufficient detail to provide a utility reasonable guidance concerning implementation. The commissioner shall prioritize the opportunities in order of potential energy savings and in order of cost-effectiveness.	Minn. Stat. § 216B.241, subd. 1d (a)				X			
Energy conservation improvement, free choice of measures and installers	The commissioner's order must provide to the extent practicable for a free choice, by consumers participating in the program, of the device, method, material, or project constituting the energy conservation improvement and for a free choice of the seller, installer, or contractor of the energy conservation improvement, provided that the device, method, material, or project seller, installer, or contractor is duly licensed, certified, approved, or qualified, including under the residential conservation services program, where applicable.	Minn. Stat. § 216B.241, subd. 2(a)						X	
Energy conservation improvement, less expensive than new supply	The commissioner may require a utility to make an energy conservation improvement investment or expenditure whenever the commissioner finds that the improvement will result in energy savings at a total cost to the utility less than the cost to the utility to produce or purchase an equivalent amount of new supply of energy.	Minn. Stat. § 216B.241, subd. 2(b)	X						

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Energy conservation improvement, Department decisions	A utility, a political subdivision, or a nonprofit or community organization that has suggested a program, the attorney general acting on behalf of consumers and small business interests, or a utility customer that has suggested a program and is not represented by the attorney general under section 8.33 may petition the commission to modify or revoke a department decision under this section, and the commission may do so if it determines that the program is not cost-effective, does not adequately address the residential conservation improvement needs of low-income persons, has a long-range negative effect on one or more classes of customers, or is otherwise not in the public interest. The commission shall reject a petition that, on its face, fails to make a reasonable argument that a program is not in the public interest.	Minn. Stat. § 216B.241, subd. 2(e)					X	X	
Energy conservation improvement, low-income programs	The commissioner shall ensure that each utility and association provides low-income programs. When approving spending and energy savings goals for low-income programs, the commissioner shall consider historic spending and participation levels, energy savings for low-income programs, and the number of low-income persons residing in the utility's service territory.	Minn. Stat. § 216B.241, subd. 7(a)					X		
Reasonable rate	Every rate made, demanded, or received by any public utility, or by any two or more public utilities jointly, shall be just and reasonable. Rates shall not be unreasonably preferential, unreasonably prejudicial, or discriminatory, but shall be sufficient, equitable, and consistent in application to a class of consumers. To the maximum reasonable extent, the commission shall set rates to encourage energy conservation and renewable energy use and to further the goals of sections 216B.164, 216B.241, and 216C.05. Any doubt as to reasonableness should be resolved in favor of the consumer.	Minn. Stat. § 216B.03	X						

Policy	Full Text	Citation	Policy Impacts Reflected in Policies						
			Least-Cost	Fuel Diversity	Risk	Reliability	Low-Income	Customer Choice	Environment
Renewable energy objectives, eligible energy objectives	Each electric utility shall make a good faith effort to generate or procure sufficient electricity generated by an eligible [renewable] energy technology to provide its retail consumers, or the retail customers of a distribution utility to which the electric utility provides wholesale electric service, so that commencing in 2005, at least one percent of the electric utility's total retail electric sales to retail customers in Minnesota is generated by eligible energy technologies and seven percent of the electric utility's total retail electric sales to retail customers in Minnesota by 2010 is generated by eligible energy technologies.	Minn. Stat. § 216B.1691, Subd. 2		X					
Renewable energy objectives, local benefit	The commission shall take all reasonable actions within its statutory authority to ensure this section is implemented to maximize benefits to Minnesota citizens, balancing factors such as local ownership of or participation in energy production, development and ownership of eligible energy technology facilities by independent power producers, Minnesota utility ownership of eligible energy technology facilities, the costs of energy generation to satisfy the renewable standard, and the reliability of electric service to Minnesotans.	Minn. Stat. § 216B.1691, Subd. 9	X	X		X			
Resource planning, resource plan filing and approval	As a part of its resource plan filing, a utility shall include the least cost plan for meeting 50 and 75 percent of all energy needs from both new and refurbished generating facilities through a combination of conservation and renewable energy resources.	Minn. Stat. § 216B.2422, Subd. 2(c)	X	X					

Policy	Full Text	Citation	Policy Impacts Reflected in Policies						
			Least-Cost	Fuel Diversity	Risk	Reliability	Low-Income	Customer Choice	Environment
Resource planning, long-range emission reduction planning	Each utility required to file a resource plan under subdivision 2 shall include in the filing a narrative identifying and describing the costs, opportunities, and technical barriers to the utility continuing to make progress on its system toward achieving the state greenhouse gas emission reduction goals established in section 216H.02, subdivision 1, and the technologies, alternatives, and steps the utility is considering to address those opportunities and barriers.	Minn. Stat. § 216B.2422, Subd. 2c							X
Resource Planning, Environmental costs	The commission shall, to the extent practicable, quantify and establish a range of environmental costs associated with each method of electricity generation. A utility shall use the values established by the commission in conjunction with other external factors, including socioeconomic costs, when evaluating and selecting resource options in all proceedings before the commission, including resource plan and certificate of need proceedings.	Minn. Stat. 216B.2422, Subd. 3(a)		X					X

Policy	Full Text	Citation	Policy Impacts Reflected in Policies						
			Least-Cost	Fuel Diversity	Risk	Reliability	Low-Income	Customer Choice	Environment
Resource Planning, Preference for renewable energy facility	The commission shall not approve a new or refurbished nonrenewable energy facility in an integrated resource plan or a certificate of need, pursuant to section 216B.243, nor shall the commission allow rate recovery pursuant to section 216B.16 for such a nonrenewable energy facility, unless the utility has demonstrated that a renewable energy facility is not in the public interest. When making the public interest determination, the commission must consider: (1) whether the resource plan helps the utility achieve the greenhouse gas reduction goals under section 216H.02, the renewable energy standard under section 216B.1691, or the solar energy standard under section 216B.1691, subdivision 2f; (2) impacts on local and regional grid reliability; (3) utility and ratepayer impacts resulting from the intermittent nature of renewable energy facilities, including but not limited to the costs of purchasing wholesale electricity in the market and the costs of providing ancillary services; and (4) utility and ratepayer impacts resulting from reduced exposure to fuel price volatility, changes in transmission costs, portfolio diversification, and environmental compliance costs.	Minn. Stat. § 216B.2422, Subd. 4		X		X			

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Distributed Energy Resources, Generation projects	A municipality, rural electric association, or public utility that offers a program to customers to promote installing qualifying solar energy projects may request authority from the commissioner to exceed the five percent limit in paragraph (a), but not to exceed ten percent, to meet customer demand for installation of qualifying solar energy projects. In considering this request, the commissioner shall consider customer interest in qualifying solar energy and the impact on other customers. A municipality, rural electric association, or public utility may not participate in a qualifying solar energy project on a property unless it is provided evidence that all reasonable cost-effective conservation investments have previously been made to the property.	Minn. Stat. § 216B.2411, Subd. 1 (b)	X					X	X
Minnesota's 2025 Energy Action Plan[130]	The 2025 Energy Action Plan lays out a path forward for Minnesota to help advance a clean, reliable, resilient, and affordable energy system for Minnesota. Funded through a U.S. Department of Energy grant, the 2025 Energy Action Plan focuses on near-term, cross-sector strategies that add value to Minnesota's dynamic energy landscape. While the scope of these strategies is wide, the Action Plan is not intended to be a comprehensive energy plan for the state; it centers on consensus-driven strategies with traction to move forward.	Report, page 7	X		X	X			X

[130] Rocky Mountain Institute, "Minnesota's 2025 Energy Action Plan: Stakeholder-Drive Strategies for Success."

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Climate Solutions and Economic Opportunities[131]	Minnesota needs bold action to meet [greenhouse gas emission] goals and secure the environmental, health, and economic benefits of tackling climate change… Minnesota needs clean energy policies that have an immediate impact on reducing emissions from our homes, buildings, and industries. We also need long-term strategies to transform our communities and their transportation systems to reduce our use of gasoline.	Report, page 3							X

[131] Minnesota Environmental Quality Board, "Climate Solutions and Economic Opportunities: A Foundation for Minnesota's State Climate Action Plan."