BENEFITS OF ENERGY CONSERVATION AND MINNESOTA'S CONSERVATION IMPROVEMENT PROGRAM

JANUARY 2019

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This white paper offers an overview of the benefits associated with energy conservation, categorized by:

- benefits that accrue to the utility,
- benefits that accrue to the participants of energy conservation, and
- benefits that accrue to society.[1]

Minnesota's Conservation Improvement Program (CIP) is the state's primary energy conservation program and has long been a cornerstone of the state's energy policy. CIP helps Minnesota households and businesses conserve electricity and natural gas. Minnesota statute states that "cost-effective energy savings are preferred over all other energy resources," and "cost-effective energy savings should be procured systematically and aggressively." Minnesota's statutory emphasis on the importance of energy conservation is a testament to the robust and meaningful benefits that result from energy conservation.

Energy conservation results in a multitude of benefits that accrue on multiple levels — to the person or entity who makes the energy efficiency upgrade (the "participant"), the utility system, the utility business, other utility ratepayers, and society more broadly. The benefits are generally defined and quantified as the costs that the utility, participants, ratepayers, and society avoid by pursuing and achieving energy savings, generally referred to as *avoided costs*.

Minnesota's CIP cost-effectiveness framework captures and quantifies many energy conservation benefits within each of these categories. However, some benefits of energy conservation are not easily quantified, and are therefore not included in the state's cost-effectiveness model.

This white paper provides a description of the types of value and benefits included in each category of energy conservation benefits, as well as a brief description of whether and how those benefits are incorporated into the state's cost-effectiveness model.

The description of energy conservation benefits is not intended to imply that each benefit can or should be quantified and included in Minnesota's cost-effectiveness tests, but rather to provide an overview of the diverse benefits associated with energy conservation. Additionally, there may be additional benefits to energy conservation that are not included herein.

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[1] The categorization of energy efficiency benefits comes from the Regulatory Assistance Project, *Recognizing the Full Value of Energy Efficiency* (September, 2013).

1. Utility Benefits of Energy Conservation

A utility benefits from energy conservation investments in a number of ways.

The most obvious utility system benefit is the savings associated with the avoided cost of producing energy, building additional generation capacity, and transmitting and distributing that energy. However, utilities also benefit from energy conservation programs in less obvious and difficult to quantify ways, such as higher customer satisfaction, lower bad debt on the books due to customer non-payment, reduced customer disconnection costs, and reduced regulatory risk regarding future utility investments.

Cost-effectiveness tests used to evaluate Minnesota CIP include a detailed accounting of utility system benefits related to the reduced need to produce and distribute energy that results from energy conservation achievements, but do not include the less-easily quantified utility non-energy benefits that result from energy conservation. Energy-related utility system benefits are included in Minnesota's cost-effectiveness tests for the societal cost test, utility cost test, and the ratepayer impact test.

Quantifiable Utility System Benefits

Investments in energy conservation can allow utilities to forego or delay other, more expensive system investments; the monetary savings associated with those avoided or delayed investments are the *quantifiable utility system benefits* of energy conservation.

Energy conservation can allow utilities to avoid or defer supply-side investments in peak capacity, energy, transmission, distribution, and even ancillary services.[2] Because utility energy conservation programs tend to be significantly cheaper than the other supply-side investments, energy conservation investments result in significant monetary benefits to the utility, and therefore, its customers.

Similar benefits of energy conservation occur for natural gas utilities, where utility system benefits include avoided purchase of fuel, costs related to operations and maintenance, purchasing or building additional pipeline capacity, and distribution system upgrades. These utility system savings that result from energy conservation investments are quantified and included in cost-effectiveness testing in Minnesota's cost-effectiveness model.

The most straight-forward utility system benefit is the avoided cost of energy. For electricity, this refers to the avoided cost of fuel and operations and maintenance expense savings from not generating the marginal unit of energy. The avoided cost of energy is expressed as a cost per unit of energy. [3] In addition to the avoided cost of energy, electric utilities that invest in energy conservation reap the benefits of avoided generating capacity. The avoided cost of generating capacity refers to the avoided

[2] Page 1. July 1, 2016. Department of Commerce *Proposal In the Matter of Avoided Transmission and Distribution Cost Study for Electric 2017- 2019 Conservation Improvement Program Triennial Plans*. Docket No. E999/CIP-16-541

[3] Russell, Christopher, Brendon Baatz, Rachel Cluett, and Jennifer Amann. *Recognizing the Value of Energy Efficiency's Multiple Benefits*. American Council for an Energy-Efficient Economy. December 2015. Page 26.

cost of constructing a new generation facility or purchasing capacity in the wholesale market.[4] Currently in Minnesota, the avoided cost of adding generation capacity is typically based on the estimated cost of constructing a new natural gas peaking plant.

For natural gas conservation programs, the avoided cost of energy is simply the cost of fuel since there is no expense related to generation for natural gas for distribution utilities. Costs related to the extraction and processing of natural gas are captured through the fuel commodity cost. Natural gas conservation also results in operations and maintenance savings on the distribution system, which is included in Minnesota's cost-effectiveness model.

Electric energy conservation can also allow a utility to avoid or delay investments in transmission and distribution upgrades by reducing strain on certain parts of the utility system. This value to the utility system is nuanced and highly dependent upon the location and type of energy conservation measures.

Not all capacity reductions due to demand reductions from CIP achievements impact the need for transmission and distribution resources in the same way. The impact is highly dependent on the location of the capacity reductions. For example, in an area that currently has generation export constraints, capacity reductions can actually increase the need for transmission investments.[5] Conversely, investment in energy conservation in targeted areas where there is high load growth or other stress on the transmission and distribution system can help the utility avoid costly system upgrades, while maintaining reliability.

Natural gas utilities that invest in energy conservation experience similar benefits to their distribution system. However, they must also be targeted with natural gas conservation to reap those benefits. By reducing the capacity needs for natural gas in targeted areas of the utility's distribution system, they may be able to defer or forego costly distribution system upgrades.

Another quantifiable utility benefit of energy conservation is the reduction in wholesale power and capacity prices caused by the decreased demand for energy, called *demand reduction induced price effects* (DRIPE). Energy efficiency reduces demand for energy and therefore prices decrease. This effect is quantified and included in energy conservation cost-effectiveness tests in several states, including Illinois, but is not currently included in Minnesota's cost-effectiveness model. [6] The role and magnitude of DRIPE in Minnesota may be worth additional research and investigation to determine if it should be quantified and included in Minnesota's cost-effectiveness model.

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[4] Russell, Christopher, Brendon Baatz, Rachel Cluett, and Jennifer Amann. *Recognizing the Value of Energy Efficiency's Multiple Benefits*. American Council for an Energy-Efficient Economy. December 2015. Page 26.

[5] Page 3. July 1, 2016. Department of Commerce *Proposal In the Matter of Avoided Transmission and Distribution Cost Study for Electric 2017- 2019 Conservation Improvement Program Triennial Plans*. Docket No. E999/CIP-16-541

[6] Russell, Christopher, Brendon Baatz, Rachel Cluett, and Jennifer Amann. *Recognizing the Value of Energy Efficiency's Multiple Benefits*. American Council for an Energy-Efficient Economy. December 2015. Page 26.

Utility Non-Energy Benefits

While direct utility system benefits are straight-forward and relatively easy to quantify, the utility realizes additional benefits from successful energy conservation programs.

Non-energy benefits to the utility include reductions in the cost of environmental compliance, risk, or bad-debt from customer non-payment; increased customer satisfaction; and improved company image. It is difficult to quantify these benefits accurately. Therefore, utility non-energy benefits of energy conservation are not currently quantified or reflected in Minnesota's CIP cost-effectiveness model.

The avoidance or deferral of supply-side investments can lead to non-energy utility benefits related to the reduced cost of compliance with environmental regulations and the reduced financial risk for utility system assets.[7] Both of these benefits support the financial health and stability of the utility business. By reducing the amount of energy produced through traditional, supply-side resources, the utility reduces the amount of carbon and pollutants it emits. These emissions reductions provide obvious benefits for the environment, which we will discuss later. However, emissions reductions also help to reduce financial risk and uncertainty to the utility, by allowing the utility to avoid or lessen existing or future financial penalties associated with environmental regulations.

Reducing the need to invest in additional supply-side resources also allows utilities to avoid financial risk associated with cost-recovery and earning a return for those investments. Due to regulatory lag, Minnesota utilities typically face some uncertainty around cost-recovery and earnings for their supply-side investments. Additionally, administrative costs of pursuing cost-recovery through the regulatory system — typically in the form of a rate case — for those investments can be significant. In Minnesota, cost-recovery for energy conservation investments travels through a less arduous, less lagged regulatory path than traditional supply-side investments. Therefore, successful investments in energy conservation can reduce a utility's financial risk around supply-side investments.

Finally, successful energy conservation programs benefit utilities financially by reducing the energy burden on utility customers. When customers receive energy conservation improvements, their utility bills decrease and they are better able to pay their bills. Successful conservation programs can reduce arrears, reduce costs related to customer disconnections for non-payment, and costs related to re-connections.[8] Successful energy conservation programs also help to improve utility customer satisfaction and improve company image by providing an opportunity for a positive utility-to-customer interaction and positive publicity around utility conservation program achievements.

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[7] Russell, Christopher, Brendon Baatz, Rachel Cluett, and Jennifer Amann. *Recognizing the Value of Energy Efficiency's Multiple Benefits*. American Council for an Energy-Efficient Economy. December 2015.

[8] Russell, Christopher, Brendon Baatz, Rachel Cluett, and Jennifer Amann. *Recognizing the Value of Energy Efficiency's Multiple Benefits*. American Council for an Energy-Efficient Economy. December 2015. Page 28.

2. Participant Benefits of Energy Conservation

Participants in energy conservation programs — whether residential, commercial, or industrial customers — benefit from implementing energy conservation measures in a number of ways. Participant benefits include utility bill savings as well as increased property values, improved comfort, improved health and safety, lower maintenance costs, and savings on other resources.[9]

In Minnesota, cost-effectiveness tests only include utility bill savings in the calculation of participant benefits; participant benefits are included in Minnesota's cost-effectiveness test in the participant cost test. Participant benefits beyond utility bill savings are difficult to quantify accurately and differ depending on the energy conservation measure installed, and so are generally not included in cost-effectiveness tests.

Benefits to Residential Participants

Residential participants in energy conservation programs benefit most directly by the decrease in their monthly utility bill. This benefit is applicable to participants in single-family homes as well as tenants in multifamily buildings. Bill savings vary by the specific measure or measures that participants implement, but can be substantial.

In addition to utility bill savings, there are significant non-energy benefits from energy efficiency upgrades that address other building issues.

According to a 2013 report by the Regulatory Assistance Project, when energy conservation improvements are implemented in residences, whether single family homes or multifamily buildings, "improvements to indoor air quality, moisture control, and other environmental health elements often occur,"[10] which result in improvements to occupant health, safety, and comfort. Further, many residential energy conservation programs specifically include additional testing related to health and safety: "Well-designed residential retrofit programs require combustion safety testing, air quality measurement, improved ventilation, humidity and moisture control, and removal of old heating equipment with cracked heat exchangers."[11]

The inherent improvements to indoor air quality and moisture associated with many energy efficiency upgrades, along with the additional health and safety testing included in many energy conservation programs, can reduce occupant health and safety problems which decreases the costs to medically manage and treat those problems and increases occupant productivity and well-being.

Energy conservation improvements to residences also often result in the reduced use of other resources. For example, residences that install low-flow showerheads and faucet aerators will see a reduction in their water consumption in addition to the energy used to heat that water. Similarly, energy

[9] Regulatory Assistance Project. *Recognizing the Full Value of Energy Efficiency*. September, 2013. Pages 45-49.
[10] Regulatory Assistance Project. *Recognizing the Full Value of Energy Efficiency*. September, 2013. Page 47.
[11] Regulatory Assistance Project. *Recognizing the Full Value of Energy Efficiency*. September, 2013. Page 48.

efficiency upgrades to a building envelope can reduce a participant's use of supplemental heating by wood-burning.

Finally, residential customers who implement energy efficiency improvements in their homes often improve their home's property value while reducing maintenance expenses. For instance, a new, high-efficiency furnace will add value to a home and requires less frequent maintenance to keep it running.

Benefits to Commercial and Industrial Participants

Commercial and industrial participants in energy conservation programs experience many of the same benefits as residential customers, including reduced utility bills, improved occupant comfort, improved health and safety conditions for occupants, reduced use of other resources, and increased property values. However, these benefits take on heightened importance for this group.

Utility bill savings for commercial and industrial participants can be substantial, especially for energy-intensive businesses, and may allow a business to increase profits or even expand operations. Improved comfort and health and safety conditions can also affect a business's bottom line as it can increase employee productivity and decrease business expenses related to employee illness and injury.[12] Increases to property values may provide businesses with additional equity in their business assets that can be leveraged for capital.

In short, energy efficiency improvements to commercial and industrial buildings and processes can provide significant benefits to the financial health of a business.

[12] Regulatory Assistance Project. *Recognizing the Full Value of Energy Efficiency*. September, 2013. Pages 47-48.

3. Societal Benefits of Energy Conservation

Societal benefits of energy conservation include the environmental and public health benefits of reducing energy production and consumption as well as the economic benefits that energy conservation has on the state's economy.

Environmental benefits related to reduced emissions of carbon and criteria pollutants are incorporated into Minnesota's cost-effectiveness model. The economic benefits of Minnesota's CIP are not currently included in cost-effectiveness tests for the program.

Environmental Benefits of Energy Conservation

Many of the costs associated with the generation, transmission, distribution, and use of energy are borne by society at large and are related to environmental impacts. These costs are often referred to as environmental externalities and include public health and welfare impacts of pollutant emissions, impacts on water quantity and quality, and the impact of greenhouse gas emissions on climate change.[13]

Energy conservation allows utilities to reduce electric energy production and customers participating in natural gas CIP programs to reduce natural gas combustion, which in turn reduces emissions of carbon and other pollutants. Additionally, energy efficiency enables electric utilities to integrate higher levels of intermittent renewable energy into their system, thereby further reducing greenhouse gas emissions of the overall electric generation mix. Lowering carbon emissions has a long-term benefit of lessening the impacts of climate change. Reducing other (non-greenhouse gas) pollutants has a number of more short-term benefits related to public health and water and soil quality.

Economic Benefits of Energy Conservation

Energy conservation provides benefits to state and local economies. Per the Regulatory Assistance Project, "Energy efficiency is typically much less expensive than the energy supply it displaces, so consumers are left with additional disposable income. In addition, it is labor intensive, meaning that the funds invested are spent locally."[14]

According to the 2015 Minnesota Department of Commerce study "The Aggregate Economic Impact of the Conservation Improvement Program 2008-2013," CIP has resulted in and will continue to provide significant economic benefits for Minnesota's employment rates, employee earnings, household income, business revenue, industry production, capital investment, and Minnesota domestic product.[15]

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[13] Regulatory Assistance Project. *Recognizing the Full Value of Energy Efficiency*. September, 2013. Page 50.

[14] Regulatory Assistance Project. *Recognizing the Full Value of Energy Efficiency*. September, 2013. Page 53.

[15] Minnesota Department of Commerce. *The Aggregate Economic Impact of the Conservation Improvement Program 2008-2013.* October 2015. Page 11. http://mn.gov/commerce-stat/pdfs/card-report-aggregate-eco-impact-cip-2008-2013.pdf

In addition to these broad economic benefits, achieving Minnesota's energy efficiency potential would generate employment across the state and in a variety of occupations. According to the 2018 Clean Jobs Midwest report, energy efficiency is Minnesota's largest clean energy sector, employing nearly 45,000 Minnesotans, representing more than 75 percent of total clean energy employment in the state. Clean energy jobs in general, and energy efficiency jobs in particular, have grown at twice the rate of all other jobs in the state.[16] In Minnesota, energy efficiency jobs make up 22 percent of all construction jobs.[17]

Conclusion

In recognition of the many benefits that energy conservation provides to the state, Minnesota's energy policy declares energy efficiency as the state's preferred energy resource, with CIP as the primary means to acquire that energy efficiency resource. Minnesota's Conservation Improvement Program provides — and will continue to provide — a diverse range of benefits to the state's residents, businesses, utilities, utility ratepayers, environment, and overall economy.

[16] Clean Jobs Midwest 2018. https://www.cleanjobsmidwest.com/wp-content/uploads/2018/08/CJM-Executive-Summary-MN_2018.08.08.pdf

[17] E4TheFuture and E2. 2018. Energy Efficiency Jobs in America.
https://e4thefuture.org/wp-content/uploads/2018/09/EE-Jobs-in-America-2018.pdf