Building Long-Term Sustained Capacity and Influencing Decisions: The U.S. DOE SEP Capacity Model

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ABSTRACT

This paper presents a state-level systems model that incorporates traditional behavior change models into a more extensive framework for explaining energy efficiency and renewable energy impacts. The model was developed from a seminal national study of state energy programs covering a broad array of programmatic topic areas. The study examined a wide range of program offerings within 24 states, involving over 25 years of state efforts. While specific priorities and outcomes varied greatly across the states for each of the topic areas, consistent systems-level capacity-building patterns were revealed. This model demonstrates how the U.S. Department of Energy's (DOE's) State Energy Program (SEP) and non-SEP resources, when incorporated into a framework of essential capacity-building components, can lead to energy efficiency and renewable energy achievements. This paper then features two case study illustrations of the model.

Introduction

Traditional behavior change models typically include personal beliefs, attitudes, and knowledge that lead to intentions and actions. However, before an energy-efficiency portfolio can influence program participants in this way, it first has to develop the broader system capacity in which behavior change and other component impacts can exist. As a result of the evaluation team's efforts examining the implementation of over 25 years of programmatic efforts, we have developed a state-level systems model that incorporates traditional behavior change models into a more extensive framework for explaining energy efficiency (EE) and renewable energy (RE) impacts.

Our model was developed from a broader national study of state energy programs.[1] That seminal study utilized 68 interviews with former and current SEP officials and stakeholders across 24 states to evaluate how the State Energy Program (SEP), supported by DOE's Office of Weatherization and Intergovernmental Program (OWIP), has influenced the capacity of states to design, build, manage and offer EE and RE programs. SEP "provides financial and technical assistance to states through formula and competitive grants" (www1.eere.energy.gov/wip/sep.html). Formula grants allow states to develop goals and strategies tailored to their energy priorities, while competitive grants target the

[1] Hall, N., McCarthy, P., & Mapp, J. (2010). *The State Energy Program: Building Energy Efficiency and Renewable Energy Capacity in the States*. TecMarket Works technical report for Oak Ridge National Laboratory under contract to the USDOE/EERE/OWIP. The findings from this technical report were also described in a 2011 IEPEC paper of the same title authored by Hall, N., McCarthy, P., Mapp, J., and Lambert, F.

adoption of EE and RE products and technologies. The different initiatives carried out by SEP had varying degrees of success. The range of program areas included: (a) EE and RE policy, regulation, and legislative support; (b) EE and RE information to the public; (c) financial support services; (d) technical assistance services;(e) existing buildings (retrofits); (f) new construction (technical assistance); (g) building codes and appliance standards; (h) transportation (including alternative fuels); and (i) RE development and deployment.

An in-depth structured interview methodology was utilized because there is no existing database (or combination of databases) that describes the historical development of SEP impact across the spectrum of EE and RE program areas. While this approach does not provide precise capacity metrics based on testing or field measurements, it does utilize EE and RE experts identified by the states as being the most knowledgeable to document how capacity was acquired within the programmatic areas examined. The study plan was screened by a Peer Review Panel of EE and RE program evaluation experts, and approved by DOE's OWIP and Oak Ridge National Laboratory. The conclusions cited in this paper come from the relevant findings of those 68 interviews.

Initially we were unsure whether a consistent picture on which a developmental model could be based would emerge across that wide spectrum of states and program efforts. However, while specific priorities and outcomes varied greatly across the states for each of the topic areas, consistent systems-level patterns emerged concerning the way in which capacity was constructed in the states and the impacts that were subsequently achieved. As a result, we were able to develop a State Energy Programs Capacity-Building Model that summarizes the broader system in which behavior change and other component impacts exist (see Figure 1). This model demonstrates how SEP and non-SEP resources, when expertly combined into a system for supporting EE and RE activities, can lead to the behavior changes that result in the adoption of EE and RE technologies.

Summary Description of the Model

A critical aspect of SEP funding is that it can be used by the states in those ways that best meet each individual state's policies and priorities. The SEP capacity-building model describes a process by which SEP and non-SEP resources are used to influence a state's energy efficiency and renewable energy priorities, which in turn lead to the establishment of state policy and legislation and the development of critical infrastructure. Those policies, legislation, and infrastructure influence states' choices regarding the types of EE and RE programs to sponsor, which then determine the kind of professional expertise that is developed. Once programs are designed and appropriate staff are in place, specific EE and RE initiatives can be implemented.

Programmatic implementation utilizes SEP-supported staff expertise, particularly for services directly provided by the energy office (e.g., technical assistance, loans/grants, education, codes & standard, etc.). SEP-developed infrastructure is also essential to implementation. It not only supports a state's internal structure for planning, organizing, and managing energy efficiency and renewable energy projects, it also provides a vehicle for establishing, integrating and coordinating external (non-SEP) partnerships essential for policy, program and project success.

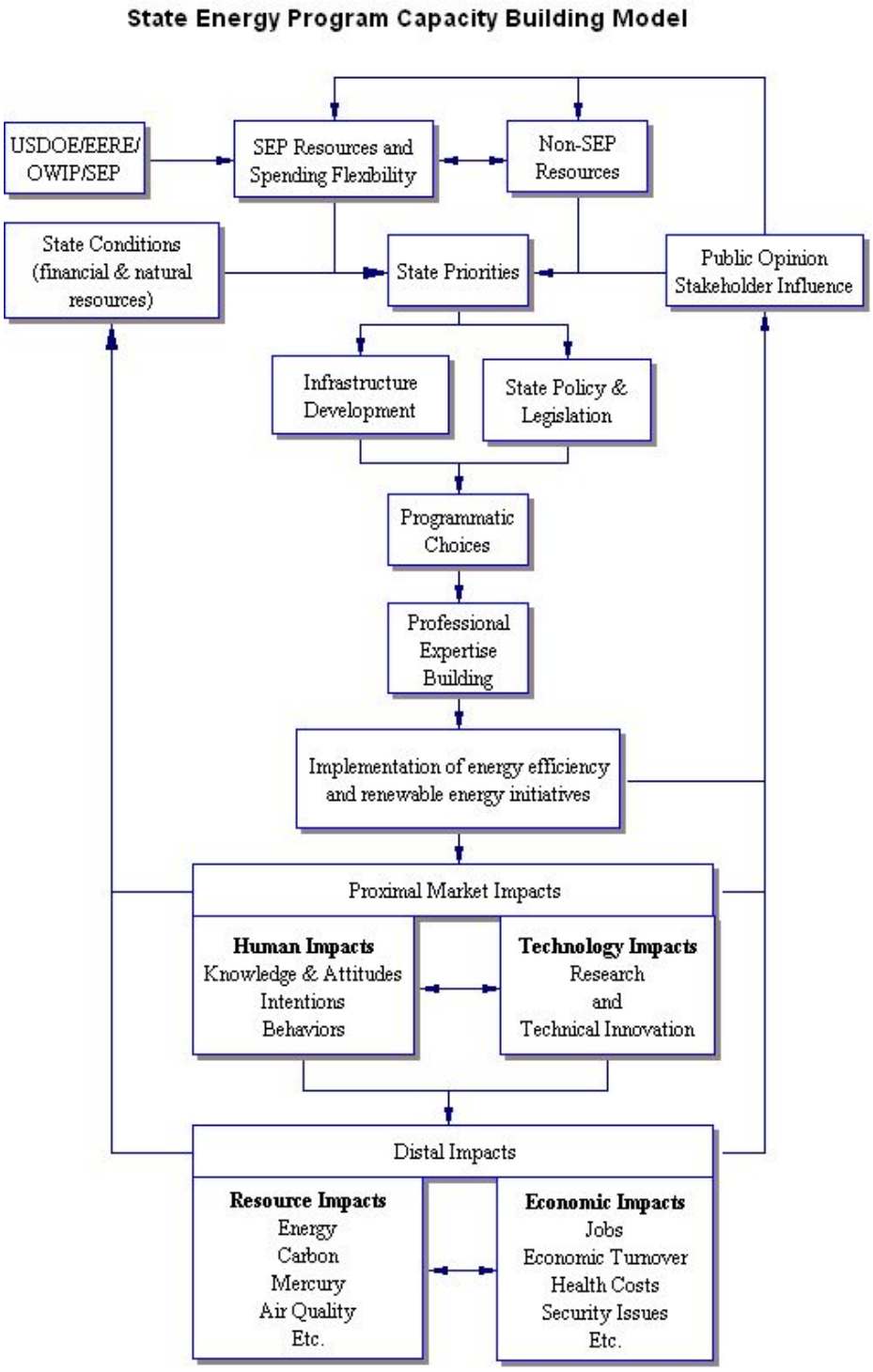

Figure 1. State Energy Program Capacity-Building Model

The states have been able to use their SEP-developed infrastructure and the expertise developed within the state energy offices to leverage additional non-SEP resources, particularly through partnership development. The states' existing capacity for guidance, oversight and support has facilitated the utilization of such non-SEP resources.

The market impacts of SEP's EE and RE initiatives are both proximal (near-term achievements that move events along toward some desired conclusion) and distal (the ultimate objectives of the program's efforts). The proximal impacts may take the form of both human and technology changes in EE and RE capacity. The human side includes changes in people's knowledge, attitudes, intentions, and ultimately their behaviors. One example is when an energy audit educates, informs and causes beliefs that they can make a difference by implementing the recommended actions. The technology side includes research progress that ultimately leads to technological innovations. An example of this includes when alternative fuels research supports the development of production, distribution and use of new technologies; or when efficiency standards move the market to develop and disseminate more efficient technologies.

Distal impacts are those things that are typically seen as the long-term objectives of EE and RE programs, such as energy and cost savings, emissions reductions, job creation, and other economic benefits. These impacts typically follow from proximal market impacts, such as technical innovation and changes in knowledge and behavior, which allow longer-term resource and economic effects to occur.

The achievement of both proximal and distal impacts often leads to significant feedback loops affecting public opinion regarding the pursuit of such initiatives and support for leveraging additional non-SEP resources. Of course, the success (or lack thereof) of these initiatives loop back up to influence state conditions (e.g., the distal impacts on environmental resources and economic gains directly affect the state's financial and natural resource conditions).

Example Applications of the Model

The original national study that led to the development of this model yielded over 60 detailed case studies, with many covering multiple initiatives. This paper features two of those cases and uses the particulars of each one to illustrate the elements of the model and how they work. The first example, the Texas LoanSTAR Program, shows how SEP efforts had a direct impact on creating a major initiative and leveraged non-SEP impacts as well. The second example, Minnesota's Utility Implemented Energy-Efficiency Programs, illustrates the significant potential for SEP efforts to build successful initiatives by involving other key actors and leveraging outside resources.

Example 1: The Texas LoanSTAR Program

The Texas LoanSTAR (loans to Save Taxes And Resources) Program uses a revolving loan mechanism that can continue indefinitely, and has grown to become "the largest state-run building conservation program in the United States….The loans are utilized for public buildings, including state agencies, school districts, higher education, local governments, and hospitals" (www.seco.cpa.state.tx.us/ls).

U.S. DOE/EERE/OWIP/SEP

DOE distributed formula grant funds and Petroleum Violation Escrow funds to Texas to support state-developed program initiatives, which the state used to create the Texas LoanSTAR Program in 1988.

SEP Resources and Spending Flexibility

In this case and all others, EERE lets each state independently identify and establish energy program initiatives that best fit their individual circumstances and needs, provided that they are focused on one or more of U.S. DOE/EERE's approved energy efficiency or renewable energy initiatives. EERE allows wide discretion to the states to decide what is most useful and appropriate for their particular situation.

Non-SEP Resources

Texas provides matching dollars from the state for implementation of the Texas LoanSTAR program. In addition, following the success of this SEP-initiated program, the state contributed additional dollars to expand the number of loans. More recently, Texas has made a substantial additional contribution from the state's share of the ARRA funds provided for SEP.

State Conditions

The Texas State Energy Office, the Governor, and the Legislature were supportive of finding ways to save state and local governmental and institutional organizations money via EE improvements to their buildings. However, the state had rejected the idea of using general revenue or other state funds for loan purposes. The SEP office had built the capacity to assess the impact of energy-saving technologies but needed to find a way to help fund governmental and institutional energy-efficient construction and retrofits that exceeded code or standard practice. SEP managers found that, if funding could be acquired that would not impact the state budget, support could be built for spending those funds to help save energy in the government and institutional sectors.

Public Opinion & Stakeholder Influence

SEP experts indicated that the general public in Texas was supportive of energy-efficiency improvements for public and institutional organizations and considered this a special resource-constrained market that needed help to improve the energy efficiency of its buildings. The public was also supportive of initiatives that lessened pollution and reduced the need for increasing utility rates to pay for new power plant construction. However, many stakeholders in Texas were not supportive of financing these improvements with state tax dollars or other funding sources that drained state revenues.

State Priorities

SEP managers supported the idea of using SEP funds to build and test a program that provided energy-efficiency loans for capital improvements or energy-efficient new construction within state and local governments and institutional organizations. The State Energy Office SEP staff worked with other stakeholder groups, including the Governor's office and the state legislature and local governmental units, to establish general support

for designing and testing an energy-efficient loan program. Support was contingent on the State Energy Office finding non-state funds to test the program and leading that effort in a way that assured loan and payment performance. The State Energy Office obtained approval from EERE to use SEP funds to design, manage and staff the program and used the state's Petroleum Violation Escrow funds (PVE) to fund the actual loans. This arrangement satisfied state priorities and concerns, but a new loan management infrastructure had to be established for program implementation within the state energy office.

Infrastructure Development

The State Energy Office had already built the expertise needed to estimate energy savings from changes achievable by various buildings and building technologies but had not acquired the capacity to design and operate a loan program. To rectify this gap in expertise, the State Energy office used SEP funds to acquire the additional expertise needed to design and implement a successful loan program. The office acquired capacity-building help from other state agencies that worked with financial mechanisms and also received assistance from the financial sector for understanding how to effectively run a loan program. This effort was more complex than first anticipated, not only requiring the allocation of office space, staffing, and support services, but also the professional development of key staff regarding the full set of energy and financial skills needed to perform at an expert level to make and sustain a substantial number of loan contracts. Savings had to be real and achievable and payment amounts needed to be based on monthly savings for each month over a period of time shorter than the life of the technology. Infrastructure for making and processing loans had to be developed so that energy savings and loan performance were matched and guaranteed.

State Policy & Legislation

The design and implementation of an energy-efficiency loan program was a new endeavor and state policy had to be developed to support such an initiative. The SEP managers worked with the Governor's office and key members of the legislature to build support for a policy to implement the program and serve the targeted market. The SEP managers needed to demonstrate that such a loan program would work, that the risks were low, that recipients would repay their loans, and that the program would be a success. SEP managers had to design the program to be cost-effective at every stage of the loan so that at no time would savings to the participant be less than the loan payment. In other words, each loan had to be cash-positive every month, from the first month, to the last. The demonstration of a successful design allowed support for the program to grow and set the foundation for a policy to support and implement the test program.

Programmatic Choices

The State Energy Office was already offering a limited set of energy-efficiency programs that served residential, commercial and industrial markets. They also offered energy assistance that allowed the public and institutional sectors to understand what actions could be taken to capture energy savings. However, financing was a key barrier to successful project implementation. The support for the policy, coupled with the SEP dollars to implement and manage the program and the PVE dollars that could be allocated for capital project loans, allowed the State Energy Office to move forward with building the

capacity to offer a test program. The program was designed to address key market barriers for the targeted sectors and provide significant savings with every loan. Because loans were based on requests from the targeted sectors, the program also had to develop loan offer selection criteria and priorities.

Professional Expertise Building

In addition to being experts on energy analysis, the Texas SEP staff found that they had to become loan professionals and acquire a wide range of new skills and use already-acquired technical skills in new ways. They had to become experts at estimating technology needs, projecting costs, performing savings stream assessment, doing cost-effectiveness analysis, and calculating both annual and life-time return on investment. In addition, the LoanSTAR program required staff to acquire skills in loan development and processing, monetary tracking and management, payment processing, risk analysis and reduction, and loan priority structuring, among other things, many of which were not anticipated in the early program design stage.

Implementation of Energy- Efficiency Initiatives

As a result of the program support and skill development efforts described above, the necessary infrastructure was formed and the loan program was launched. Staff, management and infrastructure costs were covered by SEP grants and matching state funds. Loan applications were constructed by SEP staff and SEP funds were used to market the program within the target sectors. Applications were received and approved by SEP staff, and loans were made. SEP managed the program, processed loans, and received payments, which were later reprocessed into new loans.

As of this writing, the program has operated for over 20 years, establishing new loans as old ones are repaid. Each dollar of PVE funds has been loaned several times over and energy savings continue to grow. The loan portion of the program has become self-supporting and has processed over $286 million in loans without a default. An additional $100 million of ARRA funds has been added to the loan fund to grow the program and stimulate the economy.

Proximal Market Impacts

Human Impacts. SEP managers indicated that state and local governmental units and other institutions have relied on the program to help them make energy-efficient decisions and focus on acquiring equipment that reduces energy costs. Key managers within these sectors have acquired knowledge about how energy-savings investments can be less expensive to purchase, install and use, even when the initial cost of the equipment is more expensive than standard equipment. Several state and local governmental and institutional organizations have taken out repetitive loans, indicating that the program has changed how these market actors acquire equipment and make retrofit changes.

Technology Impacts. The program has opened the door for governmental and institutional decision makers to acquire the energy-efficient equipment that was previously beyond their financial reach. The program has allowed new technologies (higher efficient HVAC systems, new efficient pumps and motors and a host of other equipment) to be integrated into the loan program as they have become proven in the market and cost vs. saving estimates have become more reliable.

Distal Impacts

Resource Impacts. The loans made through this program have resulted in millions of dollars worth of savings for the targeted sectors. Those savings have reduced energy use, which in turn has lessened carbon emissions and improved air quality. These summary conclusions from the interviewees are reinforced by the information provided on the LoanSTAR website (www.seco.cpa.state.tx.us/ls).

Economic Impacts. Interviewees noted that the program has expanded the penetration of energy-efficient equipment and construction approaches into the public and institutional markets and has increased the need for additional production and sales of energy-efficient equipment, strengthening demand for these technologies. It has allowed the participating organizations to improve their financial condition by reducing their energy expenditures, freeing up financial resources for other essential services. The resulting savings have lowered pressure on these organizations to increase taxes or fees to cover the increasing costs of energy.

Example 2: Minnesota's Utility-Implemented Energy-Efficiency Programs

U.S. DOE/EERE/OWIP/SEP

DOE distributed formula grant funds to Minnesota to support state-developed policy initiatives.

SEP Resources and Spending Flexibility

EERE provides each state the ability to independently identify and establish their own state-specific energy policy initiatives as long as they are focused on one or more U.S. DOE/EERE approved energy efficiency or renewable energy initiatives. As previously noted, EERE allows wide discretion to the states to address their own specific energy-related needs.

Non-SEP Resources

The state of Minnesota provided funding to the SEP initiatives in the form of matching dollars. In addition, additional leveraging in the form of indirect resources (staff time) were provided by all of the following entities: the Public Utilities Commission, the lead agency in charge of utilities and utility programs; the Governor's office, which needed to understand the pros and cons of having utility energy-efficiency programs in Minnesota; the Legislature, whose members needed to introduce, sponsor, support and defend legislative initiatives; and other key stakeholders and organizations that would be impacted by utility programs.

State Conditions

The Minnesota SEP office did not have enough funds on their own to offer a wide range of energy-efficiency programs to all of the state's citizens. Consequently, the SEP office sought to have a wider impact by working with others to increase available resources and achieve more than would be possible acting on their own. The utilities in the state were not offering a full set of energy-efficiency programs targeting all customer segments. Energy-efficiency services were sporadic and varied from area to area, and the acquisition

of least-cost energy supplies that required energy efficiency as a primary approach had not yet been established.

Public Opinion & Stakeholder Influence

Minnesota's SEP experts stated that although public opinion was supportive of energy efficiency and environmental initiatives, there was no requirement for utilities to offer energy-efficiency programs. Support for a state requirement was not strong across the state's utilities. However utilities were sensitive to the fact that it was a service that could be uniformly applied in their state as long as costs were covered and profits or incentives for energy-efficiency gains were viable options. Legislators were not convinced that requiring the utilities to implement efficiency programs was a good idea and were apprehensive about its benefits and costs. Similarly, large businesses and representative organizations were not totally supported of the idea of programs funded via increases in utility payments. In contrast, environmental stakeholders were supportive of both energy efficiency and cost recovery.

State Priorities

SEP funding allowed energy-efficiency services to address only a small fraction of the state's needs. Minnesota's SEP program established an objective with the support of the Commission to expand energy-efficiency offerings in their state by having the utilities offer energy-efficiency programs to all of their citizens. SEP officials realized that the utility companies in their state had strong relationships with their customers, and could offer energy programs if the laws and energy policy of the state were changed to require utility programs funded via a public benefits charge on the customer's utility bill. The SEP set an objective to use their substantial knowledge, skills, and capacity to work with the Commission staff and other stakeholders to develop policies that required the offering of energy-saving programs by the state's utility companies in a way that fully utilized the state's SEP-acquired capabilities.

Infrastructure Development

SEP staff strategically built the internal and external infrastructure needed to accomplish the above-described objective and developed a tactical plan for moving toward that end. SEP identified and worked with each of the key stakeholders that were needed to support new legislation requiring utilities to offer energy-efficiency programs. Working groups were established to convey the least-cost supply-side benefits, costs and impacts as well as the savings from avoiding new power plant construction.

Over the preceding years, SEP had established the internal skills, knowledge and expertise to conduct program and implementation scenario analysis and assess cost-effectiveness of utility program offerings. The SEP office had established itself as the place to go for reliable information on energy efficiency. Information on the benefits and costs of utility programs was developed and shared with the public, working groups, interest groups, and other stakeholders, allowing these individuals to see that energy costs would go down for participants and non-participants alike when utility programs were offered. Likewise SEP staff demonstrated that emissions would be reduced and that fewer new power plants would be needed.

SEP staff established working groups with the State Public Utility Commission to help plan programs and review and approve utility program plans. SEP established and provided oversight support to advise the Commission on energy-efficiency issues and worked directly with the Commission to establish the portfolio's implementation framework. SEP staff still continues to help guide and oversee the implementation of the utility programs and provide valuable advice and recommendations. The SEP office became the state's technical expert in energy-efficiency program offerings and performed the necessary analysis to ensure that the programs were designed to be cost effective.

State Policy & Legislation

SEP staff worked with the Governor's office, with the public, and with key legislators and interest groups to address issues, objections and concerns. They conducted feasibility analysis to address policy and legislative concerns and issues. SEP reduced resistance and grew legislative, executive, industry and stakeholder support. SEP staff produced documents that could be easily incorporated into draft bills that legislators could modify and introduce with support from other law-makers and the Commission. SEP staff worked directly with key legislators, the Commission and the Governor's office to establish the supportive environment needed for the introduction of new legislation and helped those offices deal with questions and address concerns which allowed the legislation to be supported by a majority of the legislature, the Commission and the Governor's office. With SEP support and assistance, the law was introduced and passed and policies regarding funding and energy objectives were established.

Programmatic Choices

SEP worked with the Commission and with the state's utilities to identify programs and technologies that would provide cost-effective returns to the people and businesses of Minnesota. SEP staff shared information with the utilities and the Commission regarding the different types of programs that could be implemented in each of the key market sectors and reviewed utility program plans and estimates of cost effectiveness and helped tailor the programs to be more effective. The Commission led these efforts, with direct support by SEP staff. The Commission relied on the SEP staff and their analysis and recommendations to move forward with a utility-based portfolio of programs.

Professional Expertise Building

Working as a team with the utilities and the Commission, SEP knowledge, skills and expertise were shared, allowing programs to be designed for Commission approval. SEP's capacity, built from over 20 years of experiences in building, assessing, managing and implementing energy-efficiency programs, were freely shared. Together, the utilities, the Commission, and the SEP team were able to plan for a set of programs and service offerings that were right for Minnesota's cost-effectiveness needs and the State's energy-efficiency goals.

Implementation of Energy-Efficiency Initiatives

The utilities, working with outside experts, stakeholders, SEP managers and Commission staff agreed on a set of programmatic efforts. Those efforts resulted in the construction and fielding of energy-efficiency programs now offered by the state's utilities.

Proximal Market Impacts

Human Impacts. Utility customers received information on the impacts of different technological choices and were provided with incentives to help influence their decisions. Accordingly, customers participated in the programs, implemented program recommendations and installed energy-efficient technologies.

Technology Impacts. SEP resources were used to examine approaches and equipment that could cost-effectively save energy. Technology offerings continue to evolve as the programs provide new or improved energy-saving products and services. Customers made more cost-effective energy choices that led to increased energy efficiency. SEP continues to examine new technologies and improvements to existing technologies and recommend to the Commission changes to the program service mix that are appropriate for Minnesota.

Distal Impacts

Resource Impacts. Energy is saved by the measures installed via the utility programs. Minnesota's SEP experts indicated that emissions from power plants are reduced, lowering carbon (CO2) and mercury (Hq) emissions and improving the air and water quality in the state as well as within the emissions shed areas across states and provinces exposed to those emissions.

Economic Impacts. The energy costs for the people of Minnesota are lowered, increasing discretionary income available to Minnesota's citizens and businesses, according to SEP experts. The economic health of Minnesota's citizens and businesses is improved, allowing businesses to be more competitive by reducing their costs. More resources are available to expand businesses and hire new employees. Savings are spent locally, increasing jobs and expanding the economy as a result of the higher levels of discretionary income. SEP experts further note that fish become less polluted with mercury, which could improve the fisheries and travel industries by making outdoor fishing and recreation a healthier activity in the state. The image of the state as a clean, environmentally friendly state could also be enhanced, leading to an expansion of Minnesota's travel industry.

Conclusion

This model provides an analytical framework for understanding where, why, and how state capacity-building efforts can be successful, and offers a strategic road map for the future. This model identifies the key components involved in the development of state capacity and the achievement of EE and RE impacts and can be used to identify the routes needed to reach programmatic objectives. The model is not limited to SEP applications because it also integrates non-SEP resource applications. Moreover, it recognizes the value of state-level spending flexibility to accommodate what works best for each state (e.g., solar in Arizona, hydro in Vermont, wind in Montana, biomass in Kansas). The primary value of the model is to expressly illustrate that capacity has to be strategically built within a framework that focuses on the specific conditions, priorities, and resources in each state. As indicated in the SEP Capacity Study, successful programs have spent considerable time and resources building the underlying capacity on which programs are based. Programs that have not built and maintained such capacity tend to be less successful and struggle in

the market without reaching their full potential. The key question that should be considered in building EE and RE programs and portfolios is not which programs to offer, but rather what capacity is needed to serve as the foundation on which specific types of programs can be successfully provided.