Quantifying the Outcomes of Clean Energy Policy Support Programs: the Experience of the State Energy Program National Evaluation

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ABSTRACT

While all program evaluations present their own unique challenges, the study of Clean Energy Policy Support (CEPS) programs can be especially difficult because of the often indirect ties between such efforts and the implementation of energy-saving measures by targeted groups. This paper discusses the methods used in a current study of state-level CEPS programs that is being carried out as part of a broader national evaluation of the State Energy Program (SEP). That evaluation is designed to develop independent estimates of four key program outcomes: energy and cost savings; job creation; carbon emissions reductions; and renewable energy production. The CEPS portion of the study examines nine programmatic activities (PAs) from eight different states that were randomly selected from the population of all SEP-funded efforts of this type from the 2008 program year. Within the broad area of policy support programs, the nine PAs under study represent three key subareas: Program design and pilot implementation of state policies to increase the efficiency of its municipal building stock or to advance the market for renewable technologies; Assessments of renewable technologies (e.g., hydrogen, biomass, etc.) for inclusion in state renewable portfolio standards; and, Legal and regulatory support to facilitate increased usage of energy efficiency and renewable energy resources and associated portfolio standards. Methods used in this study for data collection, data analysis, and attributing outcomes to the federal sponsor (the U.S. Department of Energy) are all discussed below.

Introduction

The State Energy Program (SEP) provides grants and technical support to the states and U.S. territories in support of a wide variety of cost-shared energy efficiency and renewable energy activities. The activities carried out by each state are designed to meet their unique energy needs while also addressing national goals such as energy security. Past studies identified close to 20 broad program area categories (e.g., audits, retrofits, workshops and training, codes and standards) to classify the range of the states' SEP activities. The current study focuses on a subset of that full range, representing the most heavily funded SEP activities during the study period. Clean Energy Policy Support (CEPS) is one of the subject areas being examined. It is important to note that we use the term "programmatic activity" (PA) in this paper to refer to a related set of activities performed in a single year under a common administrative framework (e.g., multiple retrofits or loans). In other studies, such a collection of activities might be referred to as a "program."

The SEP National Evaluation looks at SEP-supported activities undertaken by the states both in the 2008 program year and during the subsequent three-year period when program funding was greatly increased using funds from the American Reinvestment and Recovery Act (ARRA). All nine CEPS activities examined in this evaluation are from Program Year (PY) 2008, when that broad program area category (BPAC) accounted for a larger proportion of SEP funding than during the ARRA period. The activities selected for study all represent state efforts to develop or support policies that facilitate the adoption and use of energy efficiency and clean energy technologies. The three subareas into which the sample CEPS activities fall are: Program design and pilot implementation of state policies to increase the efficiency of its municipal building stock or to promote renewable technologies; Assessments of renewable technologies for inclusion in state

renewable portfolio standards; and, Legal and regulatory support to facilitate increased usage of energy efficiency and renewable energy resources and associated portfolio standards.

This paper discusses the methods used to quantify the effects of CEPS activities in the ongoing SEP National Evaluation. We will discuss how we selected a representative sample for study and how data were collected for the sampled PAs. In addition, the methods used to estimate the outcomes achieved by those activities and to determine what portion of those effects are attributable to SEP funding will also be discussed.

Background

Assessing the magnitude of energy savings achieved or the amount of renewable energy generated as a result of Clean Energy Policy Support efforts undertaken by the states can be very difficult for a number of reasons. State activities of this type support the development of policies designed to encourage future development of energy efficiency or renewable energy projects by other public or private sector actors. While laying the groundwork for subsequent energy efficiency and renewable energy projects, these policy efforts do not generally provide direct financial or technical resources to implement such projects. Accordingly, identifying specific projects developed as a result of CEPS activities presents methodological challenges.

Furthermore, linkages between any resulting projects and actual outcomes (e.g., energy and cost savings) must be identified if the effects of policy actions are to be fully measured. Add to that the fact that energy savings and renewable generation are often the product of multiple funding streams and influences, and the difficulty inherent in this type of study becomes apparent. Not surprisingly, the outcomes of interest sometimes lag policy actions by several years, which further complicate evaluation efforts.

Finding appropriate sources of data for studies of policy-related activities is also a challenge. These data are needed to develop a narrative to assess the contribution of the SEP-supported policy effort to subsequent energy efficiency and renewable energy projects and then to tie those projects to energy savings and other important outcomes. Due to the substantial variation among the different CEPS activities supported by SEP, appropriate data sources tend to vary from case to case. The evaluation of some programmatic activities relies heavily on secondary data while others depend more heavily on primary data collected from program records or through survey research.

Study Population and Sample

Fifty PAs in program year 2008 were initially classified as being CEPS efforts. Seventeen of them were subsequently excluded from the sampling frame because they did not meet a pre-established minimum funding threshold or, upon further examination, they turned out to be administrative programs rather than policy support efforts. The remaining 33 PAs represent a broad range of policy support activities designed to facilitate the use of energy efficiency and renewable energy technologies by individuals, businesses, and communities.

Based largely on the relative amount of funding allocated by the states and territories to CEPS activities in the 2008 program year, it was determined that eight of the 82 PAs selected for the SEP National Evaluation should come from this broad program area. Probability Proportional to Size (PPS) sampling was used to ensure that the largest PAs in this category had the greatest likelihood of being selected for study. In fact, the very largest PAs in this (and all other) broad categories were selected "with certainty," meaning that they were automatically chosen if their budget was above a certain level.

While the original allocation to the CEPS area was eight PAs, this was later increased to nine when it was determined that one of the selected activities, which had originally been chosen to represent another broad program area, was actually a policy-related effort. Accordingly, that PA, for which data collection had already commenced, was kept in the sample but reclassified as a CEPS

activity. As noted earlier, the nine CEPS efforts included in the study can be split into three key subareas:

- Program design and pilot implementation of state policies to increase the efficiency of its municipal building stock or to advance the market for renewable technologies;
- Assessments of renewable technologies for inclusion in states' renewable portfolio standards; and
- Legal and regulatory support to facilitate increased usage of energy efficiency and renewable energy resources and associated portfolio standards.

Data Collection Methods

The policy support PAs vary widely in their design, scope and activities; consequently, data collection methods vary widely between each PA and may include both secondary research and primary data collection. In all cases, individual PA evaluations start with a careful review of the policy itself, with all pertinent information obtained from the state energy office and secondary sources. Further data collection required for each PA, regardless of the variety, include the following three components:

- Specific downstream measure or technology installed through the policy or regulatory change.
- Baseline data on what conditions existed (and would likely have continued) prior to the policy or regulatory change.
- The degree of influence the SEP funding had on upstream decisions of PA design and implementation, and their associated downstream impacts.

For each of the data collection components above, the specific needs for each program types are presented below.

Specific Downstream Measure or Technology Installed through the Policy or Regulatory Change

The impacts of each PA can ultimately be associated with the outcomes the policies are designed to affect (e.g., energy and cost savings, job creation, carbon emissions reductions, and renewable energy production). Accordingly, the methods for estimating the overall impacts of each PA must include a determination of the downstream changes caused by the policies supported. The strategies used to collect information on the specific downstream impacts varied by subarea and consequently, the type of data collected for each PA varied as well. The data collected to determine downstream impacts for each subarea are described below.

Program design and pilot implementation of state policies to increase the efficiency of its municipal building stock or to advance the market for renewable technologies. As stated earlier, we first determined what the intended objectives of the program design efforts or pilot programs were through interviews with the State Energy Offices (SEO). This information provided guidance on what types of downstream activities were ultimately supported by the PAs and gave direction for the remaining data collection. For example, one of the evaluated PAs was intended to support the development of a large variety of renewable energy programs throughout the state. Through various interviews with relevant staff at the SEO, we were able to narrow our focus to a handful of specific programs they supported as part of this PA during the program year.

All PAs in this subarea required additional primary data collection with program participants and/or sub-grantees. We used information collected from the state energy office and online sources

to create lists of participants and sub-grantees that were affected by the PA. These lists were then used to create samples of participants who we contacted for additional interviews. The sample design used for this data collection varied by the needs of each PA and the size of the contact list generated.

During our interviews, we asked program participants about the activities they undertook with support of the SEO during the program year. For example, for the evaluations of PAs which supported municipal energy efficiency pilot programs, we asked participants what measures they installed as part of the pilot program. In another PA, we asked program participants about the support they received from the SEO regarding renewable technology installation and what they ultimately installed in response to this support. These responses were considered the downstream impacts of the PAs and were converted to energy savings, renewable generation, and the other impacts of interest during the analysis phase of this evaluation.

Assessments of renewable technologies for inclusion in states' renewable portfolio standards. For this subarea, data collection was required to determine the impact of any policy changes that may affect a renewable technology's inclusion in the state's renewable portfolio standard (RPS) and therefore the market for these technologies. We evaluated the market for the technology in question prior to the SEP supported policy change and determined any facilities that were planning to come online during the time period later affected by the policy change. To do this, we used secondary data sources to create a list of generation facilities that existed at the time of the policy change, their lifetime, and their generation capacity. This list was then verified through interviews with generation unit owners and other stakeholders within this market. We also reviewed secondary data on facilities that were planning to come online before the policy change and verified which of the planned or existing facilities were built or shut down in response to the policy with stakeholders as well.

Legal and regulatory support to facilitate increased usage of energy efficiency and renewable energy resources and associated portfolio standards. This subarea contained a variety of activities conducted by state energy offices to support energy efficiency policy development or implementation within their state. Because each PA varied in its scope and efforts, we first had to determine what the overall policy objectives were and what was supported through this PA. This was done primarily through interviews with the state energy offices and secondary research to follow up on information provided in those interviews. For example, one of the PAs in this subarea supported a SEO staff member's participation in statewide meetings to discuss and develop efforts to support climate change mitigation. We reviewed the public minutes of these meetings to further determine what the PA supported during this program year.

After determining what the objectives of the PA were, we then reviewed what programs were established in response to the legal and regulatory support and the impacts generated from those programs. In this instance, the programs supported by the PAs were large in scope so we were most often interested in the annual results of those programs rather than information on specific project results. The data was obtained from secondary sources, primarily through public filings of program results.

Baseline Data on What Conditions Existed (and Would Likely Have Continued) Prior to the Policy or Regulatory Change.

Another critical step in determining the impact associated with the efforts supported by each PA is understanding the market prior to the policy or regulatory change and what it may have been like in the absence of the PA. To do this required an understanding of the market conditions prior to the impact associated with the PA, other policies or legislation that affected the market concurrent to the policy affected by the PA, and assumptions for what the market would have been without a

change in policy. This evaluation also varied based on the type of PA-supported activities. A description of the methods uses are described below.

Program design and pilot implementation of state policies to increase the efficiency of its municipal building stock or to advance the market for renewable technologies. We evaluated market conditions prior to the PA by reviewing secondary data sources on the activities and programs supported by the state energy office at this time. For example, where the PA supported pilot municipal energy efficiency programs, we researched the history of the policy that supported these pilot programs as well as what the affected communities were doing prior to their participation in the pilot program. During interviews with program participants we also asked about their motivations for participating in the programs and what they planned to do in the absence of the program.

Assessments of renewable technologies (e.g., hydrogen, biomass, etc.) for inclusion in states' renewable portfolio standards. For this subarea we researched the market conditions for the relevant renewable technologies and their treatment in the state's RPS prior to the PA. We used secondary sources to gather information about the market conditions as well as interviews with stakeholders to determine why the PA occurred and why the ultimate policy changes were enacted. We also reviewed other local or federal policies that would have impacted the market for the renewable technology. However, for these PAs, there were no additional policies or legislation that affected the relevant markets.

Outreach to facility owners also allowed us to gather information on how they would have operated in the absence of the policy changes. This information further helped us establish a baseline of what the market would have been without the PA influence.

Legal and regulatory support to facilitate increased usage of energy efficiency and renewable energy resources and associated portfolio standards. Similar to the other subareas, we used secondary data to determine what the market was like prior to the policy that the PA supported. This information allowed us to create a baseline of what would have happened in the absence of the policy changes enacted as a result of the legal and regulatory support provided by the SEO. For example, for a PA that provided legal support to the development of aggressive energy efficiency programs and savings goals, we evaluated the historical annual energy savings from efficiency programs in that state and developed a forecast of what we would have expected the annual savings to be in the absence of the program supported by the PA. This became our baseline used for further analysis.

The Degree of Influence the SEP Funding Had on Upstream Decisions of PA Design and Implementation, and Their Associated Downstream Impacts.

SEP is designed to be a leveraged program—meaning an allocation of federal funding not only requires some additional funding from the states themselves, but also, states are not limited in the amount of funding they can provide. Indeed, the availability of SEP funding may influence other agencies within the state government and outside organizations to plan and fund their related programs accordingly. In a nutshell, annual SEP funding to the states not only can drive the level of funding the states provide for their own programs; but also, annual SEP funding can drive the decision to do the program or not. The kinds of data collected for each of the program types on the degree of influence SEP had on the program design and funding amounts are described below.

Program design and pilot implementation of state policies to increase the efficiency of its municipal building stock or to advance the market for renewable technologies. For this

group of programs, SEP funding was often used as seed money to design and implement pilots which were consistent with new policy initiatives. For example, the state government would offer tools (e.g., branding, savings calculators, etc.) and public recognition as an incentive for local and municipal governments to participate in pilots to increase efficiency of their municipal building stock and potentially jump-start a broader program initiative. Data collection activities focused on ascertaining the value of the recognition and the tools the state provided as an incentive to participating local governments and municipalities. Indeed, one state linked participation in the pilot to the application process for local Energy Efficiency and Conservation Block Grant (EECBG) funding by incorporating it in the grant solicitation scoring protocol, which was an important data point. Another state used the funding to coordinate many stakeholder groups for advancing renewable energy projects, and data collection focused on determining the relationship between the outputs of the SEP-sponsored stakeholder process and increased renewable technology installations.

Assessments of renewable technologies for inclusion in states' renewable portfolio standards. For these programs, the state supported studies using SEP dollars to assess the feasibility of technologies, or to assess the market for inclusion in its RPS. Of particular interest to the evaluation was an assessment of the degree of influence those studies had on the final RPS. One state sponsored a baseline study of market activity for hydrogen technologies, and the outcome of the study supported a determination by the state not to include hydrogen technologies in its RPS. Another state sponsored studies to examine potential revisions to its biomass regulations for inclusion in its RPS and ultimately did incorporate changes.

Legal and regulatory support to facilitate increased usage of energy efficiency and renewable energy resources and associated portfolio standards. For these programs, showing the degree of influence SEP funding had was more difficult. This kind of policy support activity is inherent in state energy agency functions and hard to assess in terms of SEP's influence on those activities. Data collection here focused on levels of staffing assigned to these tasks, the timing of implementation, and assessments of historical spending levels for similar staff duties.

Gross Impacts Analysis Methods

While the intent of this evaluation was to determine the impact attributable to the SEP funding, we first needed to determine the gross impact of each policy before applying attribution factors developed for each PA. The general gross impact analysis methods used for this study compared the downstream impacts of the policy to the baseline we developed. The difference between these two scenarios was the gross policy impact.

The analytical methods used to create these two scenarios again varied by program type. The specific techniques used are described below.

Program design and pilot implementation of state policies to increase the efficiency of its municipal building stock or to advance the market for renewable technologies

For PAs that developed a pilot program, we collected information on all measures installed in the pilot communities and estimated savings and generation using engineering methods to calculate gross impacts. For one of the PAs in this subarea, we were able to interview all pilot communities, and thus our results required no weighting. In the other PA in this subarea, we could only interview a sample of all communities affected by the PA and thus needed to expand the results to the population. As the sample was stratified by population, the results of the analysis were weighted accordingly.

Other PAs in this subarea that supported program design within the state required more specialized analyses for each sub activity that took place as part of the program. For example, in

one state that supported the development of a market for solar generation, we reviewed the limitations put on the solar market by the RPS, incremental solar generation since the RPS' inception, and incremental solar generation since the PA support. That information was used to develop forecasts about what we could expect the solar market to be like as a result of the PA support. We determined the gross impact to be the difference between the PA supported forecast and the historical incremental generation prior to the PA.

In another instance, we evaluated a photovoltaic electric vehicle charging station that was supported by the PA. We determined that this installation would not have occurred without the PA influence, and therefore all generation and savings from this PHEV station were gross impacts because other funding was not available to this project.

Assessments of renewable technologies for inclusion in state renewable portfolio standards

As described in the data collection section above, for the PAs in this subarea, we collected data on what facilities existed or were expected to come online prior to and after the policy change. This data was then used to create two streams of renewable energy generation: one from facilities that existed or were on track to be developed prior to the policy change and one from the facilities that were initiated after the policy change. The difference between these two streams of generation was the overall gross impact caused by the policy change. We assumed the lifetime impact of the policy changes was equal to the lifetime of the generation units affected by the policy.

Legal and regulatory support to facilitate increased usage of energy efficiency and renewable energy resources and associated portfolio standards

For PAs that fell under this subarea, we calculated the gross impact as the difference between the program savings attributable to the policy changes (the downstream impact) and the forecasts we made based on historical program results for the previous policy that was in effect for each individual PA. The policies that we evaluated in this subarea did not include sunset clauses, so we assumed that the savings associated with the PA were those that have already occurred or are planned to occur. For example, in one state where the policy supported triennial savings plans, we are only evaluating the savings associated with the triennial plan that has occurred and the one that is currently in place.

Outcome Attribution Methods

Most programmatic activities supported by SEP funds also receive funding from other sources, such as state governments or utilities. Accordingly, it is important to determine what proportion of the measured outcomes is attributable to SEP support. The basic question addressed by all attribution analyses is this: what would the market actors targeted by the programmatic activity have done in regard to adopting relevant technologies or services in the absence of that activity? Accordingly, another key question to be addressed in an attribution analysis is: to what extent has the sponsor of interest (in this case the State Energy Program) influenced the allocation and deployment of resources by other contributors to the PA under study?

CEPS in general attempt to facilitate the use of energy efficiency and renewable energy technologies on a multi-project scale by removing barriers, creating favorable conditions, or requiring whole classes of customers to adopt a targeted technology through regulatory and policy initiatives. The attribution analyses for these types of programmatic activities will rely heavily on the collection, compilation, and interpretation of perceptions and opinions from a number of different types of actors.

As stated earlier, individual SEP PAs typically involved funding from sources in addition to the DOE contribution, such as State Energy Offices[1] or utilities. However, the proportion of impacts attributable to DOE's support is not necessarily limited to the proportion of total funds provided by DOE directly because the introduction of those funds can influence a PA's total funding level by stimulating contributions from other sources. The goal of our attribution analysis is to determine the full amount of measured impacts for each sampled PA and the BPACs that they represent that are attributable to the direct DOE contribution plus the funding from other sources that would not have occurred in the absence of the DOE investment.

Participant surveys were used to estimate the overall effect achieved by each PA under investigation. Data were gathered on the efficiency level, quantity, and timing of actions taken, and that information was used to estimate the effect of the PA overall. Interviewees were asked what actions would have been taken in the absence of the PA and what was due to the PA itself, considering all funding sources. This approach is well documented, relying on participant surveys to obtain information regarding program-induced changes to overall investment decisions at the participant level as well as changes to the quantity, efficiency, and timing of outcomes (KEMA Inc. 2012; Goldberg, Barry and Kuiken 2011; KEMA Inc. 2009).

Interviews with non-SEP program staff were used to determine the effect that SEP activities had on the overall level of funding available for each PA. The provision of SEP funding may have enabled or encouraged other funding sources to leverage their own resources to increase the overall amount of funding available for the PAs under study. We found a number of studies of SEP activities indicating that sponsors of ratepayer-funded programs collaborated with SEP-funded State Energy Offices to leverage additional resources into SEP PAs (TecMarket Works 2010; Goldman et al. 2011). Managers of non-SEP programs that may have contributed to the SEP-funded programmatic activities were identified through interviews with SEO officials. Using information obtained from those individuals, we can estimate changes to the availability of supplemental funds from non-SEP sources resulting from the provision of the SEP funds. In other words, we determined whether other sources changed their own funding decisions because SEP funds were available. The share of impacts resulting from non-SEP sources that are due to SEP funding is the non-SEP outcome attributable to DOE.

SEP Program Manager Interviews were used to isolate the impact of DOE SEP funding for a given PA to determine the magnitude of outcomes that would not have occurred absent the DOE contribution. In some cases, SEP funding was used to supplement or expand programs or activities that were already in operation and would have continued to some extent in the absence of that funding. In other cases, the programmatic activity began with the SEP contribution and was supplemented by funding from other sources. In all such instances, we interviewed SEP Program Managers to assess the extent to which program outcomes identified through interviews with participants and other means would not have occurred in the absence of the SEP funding. The share of impacts related to SEP funding is the direct DOE SEP attributable outcome. By combining direct DOE-attributable outcomes with those resulting from non-SEP contributions that would not have occurred without DOE support, the total impact attributable to DOE/SEP support can be calculated. This is generally a subset of the full participant-level impacts achieved by the PA from all funding sources.

Conclusions

The methods used in evaluating these nine Clean Energy Policy Support PAs are replicable as a general framework; however, the individual evaluations generally required customized individual approaches. While gross estimation methods varied by individual program, standard attribution

[1] SEOs are referred to as the primary grantees. However, this study recognizes that other state government entities may also be grantees of DOE funding, so the term "SEOs" is used generically here to refer to such agencies as well.

methods applied but needed to be augmented to include the potential influence on fund leveraging beyond the federal level. As such, one of the general challenges to evaluating CEPS programs is to establish a solid basis for upstream policy drivers of downstream impacts. For example, articulating the program theory and logic can be challenging for evaluators if the intention of the funding with respect to the program logic was never well-defined at the beginning. As a general framework, the following proved to be useful.

- Reliable secondary data sources are critical to defining the range of primary data to be collected, and grounding key assumptions in the analyses.
- Grounding the influence of SEP in dollar terms by examining funding decisions proved to be a useful way of aligning upstream and downstream drivers of impacts.
- Understanding the program theory and defining a relationship between the program's outputs and the downstream impacts is critical to developing the researchable issues and gross estimation methodologies—relationships which are not always clearly defined by the SEOs themselves.

On the other hand, the variability across policies and program designs which drove the need for customization included the following factors:

- Researchable data on downstream impacts reside with a variety of populations, from the state itself to the vendors or developers who perform the work, the stakeholder groups, and/or the participants themselves.
- Baseline specification can lag program activity considerably
- The time horizon for the programs' impacts are also highly uncertain and can range from a few years to several decades, increasing the uncertainty of the ultimate impacts.

To the states, CEPS programs are clearly a central part of their SEP funding portfolio. Many states depend on this funding support to play a critical role in advancing their energy efficiency and renewable policy initiatives. Their impacts can be evaluated and the value of SEP funding in support of these programs can be demonstrated through the methods discussed in this paper. To demonstrate the value of these policy support activities, it would be difficult for the states to collect and track downstream data related to the policy changes. However, clearly articulated program design and logic as it relates to the funding assignment can assist in sustaining CEPS funding in states' portfolios and facilitate future program evaluation.

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