Criteria and Considerations for a Statewide Evaluation Framework for Energy Efficiency in Kentucky

Tasks 1 and 2

7/31/2015

A Report to the Kentucky Department of Energy Development and Independence July 2015

I. Introduction

The Commonwealth of Kentucky, as stated in Governor Beshear's Energy Plan, has a goal of offsetting at least 18% of the state's project energy demand in 2025. To begin progress towards that goal, the state adopted a voluntary goal of 1% annual utility electricity savings. These goals are supported by a suite of utility regulations allowing for energy efficiency cost and revenue recovery, additional utility incentives, and public financing and funding of energy efficiency improvements. While energy savings are occurring across the state due to utility-sponsored efficiency programs, as evidenced by utility filings, the state does not have a statewide, standardized approach for energy efficiency program evaluation, measurement, and verification (EM&V). Regulated utilities each report their savings according to their own practices and standards. The lack of a statewide EM&V framework means that state policy and program design is reliant on incomplete or obtuse datasets and those seeking to enter the market as an energy efficiency provider must navigate a complex regulatory landscape.

A statewide EM&V framework has the potential to address these challenges while bringing other benefits to the state. First, and foremost, it brings a level of rigor and scrutiny to the energy efficiency industry and creates a means of ensuring that the savings that utilities and implementers claim to be delivering are real and therefore the benefits to customers are real. An EM&V framework can remove risk from the energy efficiency program planning process, allowing for greater programmatic innovation and the potential to reach new customers. It also enables the state to more readily use energy efficiency as part of a least-cost approach for complying with the Clean Power Plan.

This paper will focus on the evaluation portion of the phrase "EM&V." Lawrence Berkeley National Laboratory (LBNL) has defined evaluation as "the performance of studies and activities aimed at determining the effects of an energy efficiency program or portfolio." *(Schiller 2011)* In the same report, LBNL defined measurement and verification as "data collection, monitoring, and analysis associated with the calculation of gross energy and demand savings from individual sites or projects." Important aspects of energy savings measurement that will not be addressed in this paper, but may be worth discussing during a stakeholder process, include the Commonwealth's approach to establishing baselines and a determination of persistence of savings. When properly done, EM&V provides policymakers and utilities with the necessary tools to ensure that energy savings are realized and achieved in a cost-effective manner. Across the country, states, regional entities, and the federal government have developed many different approaches to energy efficiency evaluation frameworks.

In order to arrive at a framework that the Commonwealth of Kentucky might adopt, policymakers will need to account for a number of topics ranging from what legal authority and oversight structure will be used to develop and enforce the evaluation approach to the role of public participation, budget, and how the evaluation reports will be used. These elements and many others are detailed in the State & Local Energy Efficiency Action Network's *Energy Efficiency Program Impact Evaluation Guide.* This first section of this report presents a number of those elements that can serve as a starting point for crafting a statewide evaluation framework, pulls examples of various ways that states have implemented each element, and the current approach employed by the Commonwealth of Kentucky as it pertains to each element. The states selected all have some kind of statewide EM&V framework. They represent a geographically diverse set of states with very different approaches to their evaluation of ratepayer-funded energy

efficiency programs. Beyond states' approaches to evaluation frameworks, there are a number of national, regional, and private sector efforts to improve efficiency program evaluation methodologies. These complementary efforts are viewed in the second section of this document. The third section of document provides a discussion of evaluation issues as they relate to the Clean Power Plan. At the time of writing this document the final rule had not been released by the U.S. Environmental Protection Agency (U.S. EPA). The U.S. EPA is anticipated to release EM&V guidelines in tandem with the final rule later this summer. Finally, an addendum on quantifying the emissions impacts of energy savings is included as understanding the carbon dioxide reductions associated with efficiency portfolios and programs will be important if states are to develop a least cost strategy for compliance with the Clean Power Plan.

Research for this paper consisted of a review of state statutes and regulatory orders governing utility energy efficiency program evaluation practices and interviews with EM&V experts within and outside of state government. Numerous resources developed by the U.S. Department of Energy, the U.S. Environmental Protection Agency, the American Council for an Energy Efficient Economy, and other public and private stakeholders were consulted. The resulting paper will serve as the basis for introducing stakeholders in Kentucky to EM&V and guiding the stakeholder process as the state explores the potential of a statewide evaluation framework.

II. Description of EM&V Criteria:

Introduction

States with various energy efficiency objectives can all benefit from formalized program or portfolio evaluation. Whether you have a goal of capturing all cost-effective energy efficiency, meeting targets set forth in mandatory or voluntary EERS, or EE spending goals, evaluation can assess progress towards, or achievement meeting, those goals. Beyond these top line metrics, program evaluations inform future program design and energy resource planning. Although the term 'evaluation' implies a process that takes place after a period of performance, it is important to recognize that evaluation planning should begin concurrently with program design and planning and that these processes are iterative and ongoing. This cyclical approach to energy efficiency program delivery is illustrated in Figure 1.

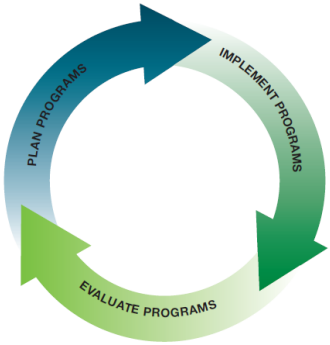

Figure 1 Evaluation as Part of a Cyclical Process Source: SEE Action 2012.

In addition to the questions of what to measure, an evaluation framework sets out the roles and responsibilities of government agencies, private-sector consultants, the utilities, and the public in the evaluation process. It establishes timelines and budgets that govern the process. Discussion of budget v. granularity and uncertainty and how each element below must be considered in respect to resources dedicated to EM&V. Each of these elements, and others, are presented below along with examples of how these criteria are addressed by other states and the way in which Kentucky currently approaches each aspect of the framework.

Authority and Structure

Legal Framework: Essential elements in the design of an evaluation framework for ratepayer-funded energy efficiency programs are defining the administrative and legal structures**.** Most states' evaluation practices and protocols are rooted in legislation or utility regulation. In 2012, ACEEE reported that 20 states have legislation governing efficiency program evaluation, 30 states have regulatory orders, and ten have evaluation practices governed by both legislation and regulation. For Illinois, Maryland, Massachusetts, and Pennsylvania the regulatory orders follow the legislation. (ACEEE 2012)

> **Arkansas:** Regulatory orders govern evaluation protocols (Rules for Conservation and Energy Efficiency Programs, Docket 06-004-R)
>
> **Maryland:** Evaluation in Maryland is very loosely based in legislation. A detailed framework is defined by regulatory order.
>
> **Texas:** Legislation authorizes the state to conduct evaluations and the process and reports are subject to regulatory rules.

In Kentucky, evaluations are required through regulatory order 807 KAR 5:058, and evaluations for demand-side programs are required to be performed individually for each investor-owned utility. (http://www.lrc.ky.gov/kar/807/005/058.htm)

EM&V Administrator: An evaluation administrator is an entity that is selected to oversee the evaluation process within a specific geographic region and/or market. This authority is most often granted to a utility (36% of the time) and/or public utility commission (18%), but can also be a third-party entity, or a separate state government agency. (*SEE Action 2012 and ACEEE 2012)*) State government agencies responsible for administering an evaluation in some instances can include a state energy office, department of environment or natural resources, or a similar state agency, depending on the structure of a state's energy efficiency program administrators. (*ACEEE 2012 Table B-2, page 54-55, February 2012*)

> **Arkansas:** Arkansas Public Service Commission oversees energy efficiency plans and reporting. The Commission hires an Independent Evaluation Monitor (paid for jointly by the utilities) to do the technical oversight of EM&V. (ACEEE)
>
> **Georgia:** The Georgia Public Service Commission oversees the EM&V process.
>
> **Maryland:** Maryland's EM&V framework calls for both a single contractor to oversee utilities' evaluations and contractor to coordinate the utilities and their EM&V contractor. Appendix A of the Consensus Report includes a detailed breakdown of which entity is responsible for which parts of the EM&V process.
>
> **Texas:** All EM&V in Texas is overseen by the Public Utilities Commission of Texas.
>
> *"Essentially, this approach delineates roles and responsibilities between two separate Contractors – one as the prime EM&V Contractor for the utilities and the other in an*

independent Evaluator capacity for the Commission overseeing and coordinating with the utilities and the selected EM&V Contractor." (Consensus Report, 3)

Texas: All EM&V in Texas is overseen by the Public Utilities Commission of Texas.

Who Conducts Evaluation: Evaluations should be conducted by independent party. In the vast majority of states (79%), independent consultants are hired to perform the actual evaluations. Of the remaining states, utility staff or utility staff in consultation with contractors may perform the evaluation (16%) or government agency staff assume on that role (5%). (ACEEE 2012)

Arkansas: Utilities hire independent EM&V contractors.

Georgia: Utilities and utility consultants perform the evaluations.

Maryland: In Maryland's model, individual utilities work with the Statewide Contractor to run their own individual evaluations. The work of the Contractor is evaluated and verified by the Commission's Statewide Evaluator.

Texas: The PUC hires an EM&V contractor, who conducts the EM&V study. **Fill in with Katie Rich's information.**

"The commission shall select an entity to act as the commission's EM&V contractor and conduct evaluation activities. The EM&V contractor shall operate under the commission's supervision and oversight, and the EM&V contractor shall offer independent analysis to the commission in order to assist in making decisions in the public interest." PUC Subst R 25.181 (q)(3)

Statewide or by individual utility: ACEEE reports that 47% of evaluations are administered on a utility-by-utility basis while 30% are strictly statewide or combined evaluations. Another 23% of states perform statewide and individual utility evaluations.

Arkansas: Evaluations are conducted for individual utilities.

Georgia: Evaluations are conducted for individual utilities.

Maryland: Evaluations are conducted for individual utilities.

Texas: Texas EM&V is statewide. Individual utilities may conduct evaluations for the purpose of verifying provider work before issuing incentives/refunds/payments but overall program and portfolio EM&V is statewide.

Utilities in Kentucky are currently responsible for administering the evaluation of their energy efficiency programs.

Type of Evaluation: There are three primary categories of evaluation: impact, process, and market. Impact evaluation is used to determine the change that has occurred – reduced energy usage, for example – due to energy efficiency programs. While quantified energy savings (gross and/or net) are the primary performance metrics included in an impact evaluation, other

performance metrics such as participation, demand savings, monetary savings, and emissions reductions may be included if goals for these metrics were included in the original program design and evaluation planning process. For most of these metrics, reporting annual data is sufficient, but the state should determine whether more granular (seasonal variations, for example) might be important. For energy savings data, the boundaries of what is to be evaluated must be defined – options range from measure specific (light bulb savings) data to end-use system-wide (a whole lighting system), a whole facility approach, or a grid-wide approach that accounts for transmission and distribution losses. Impact evaluations can be performed in real-time or be retrospective. Process evaluations examine program operations and delivery with the goal of identifying improvements that will increase the program's efficacy or efficiency. Lastly, market evaluations assess the structure and functioning of a market, market participants' behavior, and/or changes in the market that result from program implementation. (SEE Action 2012)

Arkansas: Impact evaluations are required annually on May 1. The reports will include evaluation results for each program as well as the overall portfolio. Metrics to be reported out include energy savings of each program and the amounts spent on energy conservation and efficiency program as well as the total amount spent on all programs.

Georgia: The rules call for evaluation plans, and presumably then the reports themselves, to address impact and process evaluations. (Georgia Rules)

Maryland: Process and impact evaluations are both performed.

Texas: Annual impact evaluations are reported.

Roles of the Implementers and Evaluators: When determining the savings resulting from ratepayer energy efficiency programs, there are two types that are reported within an impact evaluation: claimed savings and evaluated savings. The administrator or implementer of the energy efficiency programs are responsible for determining claimed savings, which are then reported to the government agency overseeing the energy efficiency programs. Claimed savings are necessary in order to validate program expenditures and to pay contractors whose compensation is dependent on implementation or achieved savings. Evaluated savings are conducted in order to determine the savings independently or verify the accuracy of the reported claimed savings. The evaluated savings are completed by an independent third-party evaluator, which in general practice means an entity that has no financial stake in the results of the evaluation and that has no bias in favor of any stakeholders involved with the energy efficiency programs. The responsibility for conducting the evaluation studies is most often is given to a consultant or contractor, however utilities or government agency staff can also conduct the evaluations. The selection process for an independent third-party evaluator is carried out through a request for proposal or qualification (RFP or RFQ) that include a detailed selection criteria and budget expectation. (*SEE Action2012*) ACEEE reports that 79% of states surveyed use an independent evaluator. (ACEEE 2012) However, it is for the state to determine if the utilities hire the independent consultant or if that role should be retained by the state.

Maryland: See Appendix A of the Consensus Report.

Texas: insert information from interview with Katie Rich

Budget: Establishing the budget for impact evaluations is an important part of the process as it will affect the type of measurement calculations used, the confidence levels of the reported savings, **(insert more from VT presentation).** The state must balance the cost of information with the value of information.

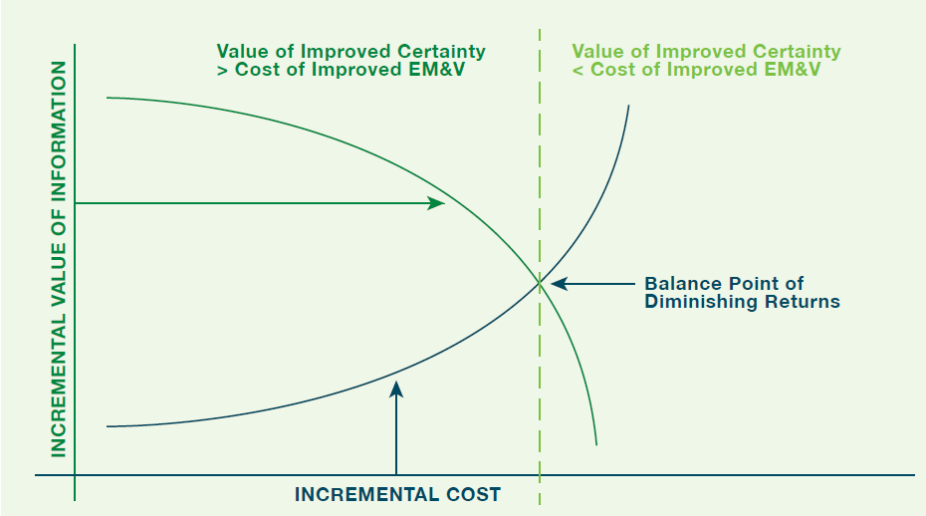

Figure 2 Incremental Value of Information versus Incremental Cost of Evaluation Source: SEE Action 2012.

Questions that policymakers must ask to determine the appropriate budget include:

1. How large are the efficiency program budgets and savings goals? Larger programs require more dollars allocated to evaluation, but not budgets that are necessarily larger percentages of the total program budget.
2. Are new programs going to be evaluated or are all of the programs well-understood, established programs the only ones being evaluated? New programs may require more resources.
3. Is demanding field testing and data collection necessary?

Many other questions are outlined in *Chapter 7 of the SEE Action Energy Efficiency Program Impact Evaluation Guide.* (SEE Action 2012)

Nationally, in 2011, EM&V budgets were 3.6% of total energy efficiency budgets. Evaluation budgets typically range between 3% and 6% of annual portfolio budgets. (SEE Action 2012) The size of the portfolios being evaluated will impact cost as will the programs' longevity. For larger portfolios with larger budgets, 3% is likely sufficient. However, 3% of a smaller portfolio's budget may be insufficient to cover evaluation costs. (Cadmus 2009) Also, in the early years of energy efficiency programs and efficiency investments ramp-up, restricting the evaluation budget to a percentage of the portfolio budget may prove problematic.

Where possible, smaller utilities may consider alternative cost-saving measures such as pooling of measurement and verification resources and jointly conducting evaluations of similar programs through local associations. This tactic has proven effective for small utilities in California, Michigan, and the Pacific Northwest. Alternatively, small utilities may consider either coordinating their measurement and verification activities with regional utilities or adopting the results of evaluations of similar programs implemented by investor-owned utilities. (energy.gov/eere/about-us/about-ump)

For the 2013-2014 program year, evaluation budgets for investor-owned utilities in California were set at 4% of the portfolio budget. Resources were allocated for an impact evaluation (42%), market transformation evaluation (30%), and a process evaluation (21%). The remaining resources were dedicated to a financial audit, policy research, and other support needs. (Best 2013). In 2008, evaluation budgets in Iowa, Oregon, and Pennsylvania were apportioned 50/30/20 (percent) to impact, process, and market evaluations, respectively. (SEE Action 2012)

Arkansas: No budget restrictions are specified, although the TRM does reference the NAPEEE guidelines of 3 – 6%.

Maryland: One of the reasons for the Consensus Report and the development of the framework was that "best practices" outlined in hearing testimony were putting EM&V at 5-7% of total program budgets, whereas Maryland found that the average allocation for EmPower Maryland EM&V was only 2.6%. Because of sensitivity to credibility and transparency, the Commission decided it needed to play a larger role in the EM&V process. The Contractor and Evaluator are both paid for out of the utilities' portfolio budgets, allocated on the basis of total Maryland electricity use.

Comment [JF1]: Need to define what this is

Texas: The EM&V contractor budget is divvied up among utilities on the basis of their annual program costs and recovered via cost-recovery rider. The budget is reviewed biennially. EM&V costs do not figure against any cost caps or administrative cost caps. (PUC Substantive Rules Chapter 25. Subchapter H. Division 2)

Calculating Savings – M&V, Deemed Savings, and Large-scale Consumption Data Analysis: There are three methodologies for conducting an impact evaluation that can be applied individually or in combination. An M&V approach looks at individual project's energy or demand savings and applying these savings to the total universe of projects within a particular program. The International Performance Measurement and Verification Protocol (IPMVP) outlines four approaches to M&V that can be applied at the end-use, system level or the whole building level. Gross savings may be reported out with adjustments to gross savings subsequently applied to the results. Large-scale consumption data analysis uses metered data to compare energy usage data of a group of efficiency program participants to a control group. (SEE Action 2012)

Deemed savings values, or stipulated savings values, are estimates of energy or demand savings for a single unit of an installed energy efficiency measure that has been developed from acceptable and reliable data sources and analytical methods, and that is applicable to the situation being evaluated. (*SEE Action 2012)* Deemed savings values can be calculated to determine the amount of savings and/or the lifetime of savings to claim for a particular measure, along with

free-ridership and net-to-gross values for computing net savings. In order to calculate the savings values for particular measures, a series of stakeholders agree upon engineering algorithms, and the resulting calculations and values are incorporated into a technical reference manual (TRM) resource. A TRM provides greater consistency and transparency for savings values, and can reduce EM&V costs. (SEE Action Deemed Savings Webinar 2012) Technical reference manuals can take the form of a document or database, and once created, typically have a regular process for updating to account for new calculations and incorporating new measures. The use of TRMs is widespread, with 19 different states having created a TRM resource to date. *(ACEEE EM&V Database)* A majority of states (70%) surveyed by ACEEE in 2012 also acknowledged using deemed savings values or databases from other states as well. (*ACEEE 2012)*

Even though deemed savings values can provide greater certainty, evaluated estimates of savings are still considered a more accurate representation of actual savings than those projected in a TRM. When program administrators or implementers rely on deemed savings values to report claimed savings, differences in savings estimates can arise after an evaluation is completed for the given program year. In the event that evaluation results end up modifying deemed values used for claimed savings, a majority of states apply the changes prospectively to future program cycles, rather than retrospectively to the program already delivered. (*ACEEE 2012)*

> **Arkansas:** "All EM&V activities undertaken as part of a utility-sponsored program, including, but not limited to, estimation of energy efficiency savings and process evaluations, shall be conducted consistent with the Arkansas Technical Reference Manual (TRM) and with national best program evaluation practices as established by the National Action Plan for Energy Efficiency ("NAPEE"), the State & Local Energy Efficiency Action ("SEE Action") Network, the International Performance Measurement and Verification Protocol ("IPMVP"), or other similar nationally or internationally accepted EM&V standards." (APSC)
>
> **Georgia:** A number of methodologies are acceptable including a "comparison of demand patterns of similar participant and nonparticipant groups, and/or use of customer bill analysis, engineering estimates, end-use meter data, or other methods to identify the gross and net impacts of program participation on customers' usage and demand patterns." (Georgia Rules)
>
> **Maryland:** The utilities' statewide Contractor (currently Navigant) presumably provides the deemed savings database used in its evaluations and as there is a single Contractor performing all utilities' evaluations, one may say that this is functionally a TRM. However, there is no official statewide TRM.
>
> **Texas:** The state uses a TRM developed by a consulting firm. The EM&V contractor relies on the TRM for evaluation. The TRM is reviewed and updated annually (including requests that come with documentation), with updates subject to Commission approval. Changes are applied prospectively. ((PUC Substantive Rules Chapter 25. Subchapter H. Division 2)
>
> The PUCT has found that ensuring that the utilities are involved in TRM updates, and the proposed changes are palatable to them, is incredibly important. Some updates are

handled by the evaluator directly, while others are handled by Frontier & Associates who then works with the utilities to handle filings for new or updated deemed savings approvals. In Texas, the utilities must submit these filings, which can complicate the process. Procedurally, they have found that it is important to align the timelines for updating the TRM with other state and utility filing deadlines so that the evaluation results can be incorporated into new programs. (Katie Rich)

Kentucky does not have a technical reference manual, but does use deemed savings values from other states and applies the modified savings values prospectively.

Net v. Gross Savings: In order to ensure that ratepayer funds are achieving their desired goals and that the energy savings are being properly attributed to ratepayer energy efficiency programs, policymakers need to decide whether to require utilities to report gross savings or net savings. Gross savings are the change in demand that is attributed to the energy efficiency programs for actions taken by customers regardless of why they participated in the program. As will be discussed further in Section 3 of this report, gross savings are also seen as beneficial for reporting energy efficiency savings that contribute to avoided carbon dioxide emissions. Net savings are the subset of the gross savings directly attributable to the energy efficiency program. In other words, without the energy efficiency program the customer would not have taken the action. Ideally, calculating net savings accounts for both freeriders, which results in a reduction in savings, and for spillover, which results in an increase in savings. *(MEEA 2014)*

A freerider is a program participant who would have implemented the energy saving measure(s) or practice(s) even without the program. Conversely, spillover refers to those reductions in energy consumption and/or demand caused by the presence of an energy efficiency program, beyond the program-related gross savings of the participants and without financial or technical assistance from the program. There can be participant and/or non-participant spillover. *(ACEEE, Examining Net Savings Issues: A National Survey of State Policies and Practices in the Evaluation of Ratepayer-Funded Energy Efficiency Programs, January 2014)* More information regarding how to determine net and gross savings can be found in the Appendix __. (*SEE Action, EE Program Impact Evaluation Guide, Tables 8.3 and 8.4, December 0212*)

The 2012 ACEEE survey of states' energy efficiency evaluations found that 50% of states use net savings while 29% use report out gross savings and 21% report out both. Interestingly, of the states that calculate net savings, over two-thirds adjust for freeriders while less than half adjust for spillover. (ACEEE 2012)

"Kentucky utilities are not required to report net savings or account for free-ridership or spillover effects. They report gross savings for their approved energy efficiency programs. On a utility-by-utility basis, however, utilities do report both gross and net savings, and may also use net savings calculations for their program planning." (MEEA KY)

Arkansas: Utilities' annual reports present net savings.

Georgia: Both net and gross impacts should be reported. (Georgia Rules)

Texas: Utilities report gross savings for cost recovery, but the Evaluator does present net-to-gross calculations. (Katie Rich)

Stakeholder Participation:

> **Maryland:** Stakeholders that were included in the development of the Consensus Report included utilities, cooperatives, the Maryland Energy Administration, and the Office of Peoples' Counsel.

Evaluation Results: Evaluation results can be used in a number of ways. Very broadly, they allow program administrators, policymakers, and other stakeholders to see if a program or portfolio meets its goals, understand why the program had a certain impact, improve existing or future program design and delivery, and provide a better understanding of energy efficiency as a grid resource. The SEE Action *Energy Efficiency Program Impact Evaluation Guide* stresses that evaluation is part of a cycle of portfolio planning, implementation, and evaluation. Evaluation planning should begin in tandem with the program planning process. This allows implementers to plan for proper data to collection and establish necessary baselines for evaluation. It ensures that the evaluation process is designed to sufficiently assess the program goals and metrics. Evaluation results from previous program years should be used to inform future program design and resource allocation decisions. Beyond those involved in program design, energy resource planners can use evaluation results to inform their forecasting and resource procurement decisions. For customers and those in political office, evaluation results may be used to justify investment in energy efficiency as a resource and inform future policy positions.

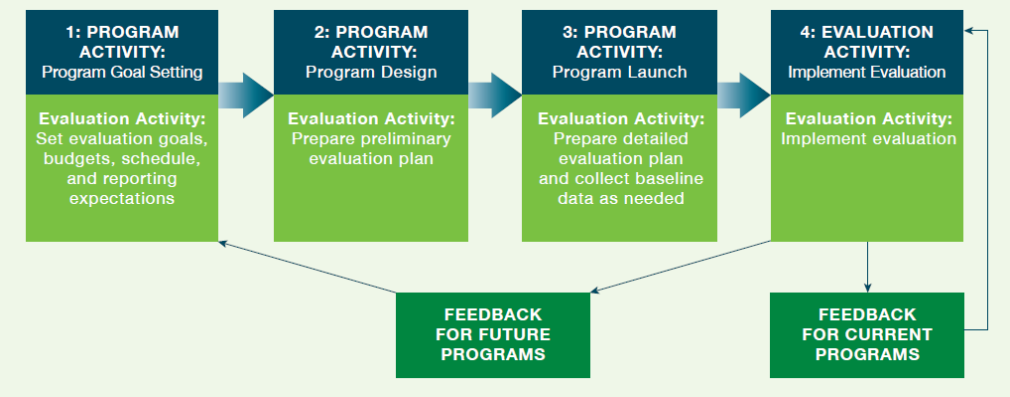

Figure 3 Program Implementation Cycle with High-level Evaluation Activities Source: SEE Action 2012.

Of the states surveyed by ACEEE in 2012, 98% said that they used evaluations for general oversight of the programs. Less than half of the states surveyed (41%) said that evaluations were used determined eligibility for shareholder incentives, 23% said that evaluation results were used to determine lost revenue recovery, and only 7% use evaluations to determine the amount of energy efficiency program cost recovery. (ACEEE 2012)

The other aspect of reporting evaluation results is considering what actually gets reported and in what format. It is within the purview of the agency establishing an evaluation framework to

specify what data and units of measurement are to be used, the format for reporting to ensure compatibility with tracking systems, who gets access to what data, and define data confidentiality protocols. To generate consistency across datasets, among other suggestions, the *Energy Efficiency Program Impact Evaluation* recommends standardizing the following aspects of data collection:

- Measure naming convention (all programs use the same terminology for the same energy measures, end-uses and applications)
- Categorization of measures (such that all indoor lighting measures, for example, are grouped consistently across programs)
- Classification of sectors and building types across programs
- Categorization of program delivery methods (direct install, point of sale, or prescriptive rebates)

The issue of standardized data and reporting is further addressed in the next section.

> **Arkansas:** Annual Reports are organized on http://www.apscservices.info/eeAnnualReports.aspx. The results are used for cost recovery and program update and improvement purposes, among other reasons.
>
> **Georgia:** The rules governing evaluation plans in Georgia exemplify how evaluation planning should be conducted alongside program planning.
>
> > "Each utility shall file a summary of the process and load impact evaluation plan, concurrently with the development of the programs themselves, to assess the implementation and quantify the impact on energy and capacity use of the demand-side resources. The evaluation plan shall identify the type and timing of the measurement activity used to evaluate each demand side resource. The evaluation plan shall provide a process by which the results will be used to modify impact estimates for future planning and design of demand-side programs…"
> >
> > "…Demand-Side Resource Implementation Monitoring. The utility shall file monthly data on a quarterly basis, except as indicated otherwise, the following information regarding demand-side programs to enable the monitoring and evaluation of the program. If, upon review of the information submitted in a quarterly implementation monitoring report, the Commission determines that a change in program design, schedule, cost, or evaluation methodology is substantial enough to warrant the utility filing for a demand-side certificate amendment and the utility has not done so, the amendment process described in Rule 515-3-4-.10 shall be initiated." (Georgia Rules)
>
> **Maryland:** Results are used for cost recovery and program revisions.

EM&V Efforts to Further Capture Energy Efficiency as a Resource

Establishing an evaluation framework will better position Kentucky to fully capture the benefits of energy efficiency. In addition to considering a statewide evaluation framework, a number of international, federal, regional, and private-sector efforts exist to further improve a state's ability to ensure that energy efficiency savings are real and the results and metrics are presented to policymakers and stakeholders in meaningful ways.

International Performance Measurement and Verification Protocol (IPMVP): Published by the Efficiency Valuation Organization, the IPMVP provides a framework and definitions for measuring and verifying project-specific energy efficiency savings. Efficiency measures included in the protocol include fuel saving, water efficiency, load shifting, and retrofit measures along-side practices that improve operating procedures. IPMVP is commonly used by evaluators during the M&V portions of rate-payer funded efficiency program evaluations. Just as important, however, is the fact that energy savings companies (third party project development and implementation companies) utilize the IPMVP when evaluating projects completed using energy savings performance contracting in public facilities as well as projects delivered to the industrial sector.

Benefits:

- It is an internationally accepted approach to M&V and is integrated into many other EM&V frameworks such as that used by PJM Interconnection.
- Efficiency providers are familiar with it.
- Workforce trainings and certifications are offered for those seeking to become proficient in using IPMVP.

Limitations:

- It is project-specific and may be better suited for custom programs or measures.
- It is an M&V protocol not an evaluation framework.
- The process for updating it is in the hands of the Efficiency Valuation Organization and therefore it may not be the most suitable means of measuring and verifying savings associated with new technologies or program delivery methods.

Superior Energy Performance and ISO 50001: ISO 50001 is an international standard for energy management. It can be used by companies and organizations in all sectors and of any size. The standard supports continuous energy improvement through the development of an energy management system (EnMS). An EnMS is a means for developing policies and procedures to methodically track, analyze, and act on findings to improve energy efficiency. Companies and organizations have the opportunity to become ISO 50001 certified, although it is possible to employ the standard without being certified. (ISO 50001) Superior Energy Performance is a tiered (silver, gold, or platinum) energy management certification developed by the U.S. Department of Energy for the industrial sector. Facilities that develop an EnMS that meets ISO 50001 requirements and achieve energy savings can achieve Superior Energy Performance certification. Superior Energy Performance audits are conducted by verification bodies accredited by the American National Standards Institute- ASQ National Accreditation Board. On average, certified facilities achieve a 10% reduction in energy costs after 18 months of Superior Energy Performance implementation resulting in an annual savings of $87,000 to nearly $1 million using no- or low-cost operational measures. (Superior Energy Performance)

Benefits:

- Provides for a means of tracking energy efficiency within the industrial sector that is approved by the federal government.
- The Superior Energy Performance Measurement and Verification Protocol for Industry is recognized by the U.S. EPA in its Clean Power Plan Technical Support Document on State Plan Considerations.
- Requires significant documentation and independent verification by accredited professionals.
- Based upon an internationally accepted standard for continuous energy improvement. (IIP)

Limitations:

- Companies may be implementing ISO 50001 and Superior Energy Performance practices, but if they are not achieving certification it may be difficult to track.
- Superior Energy Performance is limited to the industrial sector.
- Both are relatively new standards and certifications.

PJM's EM&V protocol: PJM Interconnection, a regional transmission organization serving the Mid-Atlantic and portions of the Midwest, defines its EM&V protocols in the PJM Manual for Energy Efficiency Measure & Verification. It draws on the practices of ISO New England (ISO New England 2007), the M&V guidelines of federal government efficiency programs (US DOE FEMP 2008), and the IPMVP. Efficiency bid into the PJM market is a capacity resource and therefore it must be installed before the scheduled delivery year. In order to be bid into the market, an M&V plan for the proposed resource, post-installation M&V plan, and permission for a possible audit by PJM or an independent third party must be submitted prior to the RPM auction in the first delivery year. To bid into subsequent delivery years, the post-installation M&V plans and nominated values must be updated. The process also details the documentation that must be provided by an energy efficiency resource provider to claim the demand reductions associated with an efficiency resource.

Benefits:

- Continuous monitoring of EE resource performance as a single resource may provide capacity benefits in multiple delivery years.
- Penalties for failure to deliver the capacity resource.
- Market oversight as PJM reserves the right to audit the results reported in the initial and updated post-installation reports.
- Prescribed modeling and tracking systems as efficiency resources must be modeled in the eRPM system in order to participate in the PJM Capacity Market.
- Flexible approaches to M&V including site surveys, demand and energy measurements, and data analyses among others.

Limitations:

- Much of Kentucky and many of the surrounding states are not in PJM territory.
- PJM will allow a resource to bid in for up to four years. This is neither reflective of common practice to count only first year savings or lifetime savings.
- Many resources such as behavior change programs, CHP, and appliance recycling (unless tied to replacements) can be bid into PJM's markets.

EM&V 2.0: EM&V 2.0 includes a host of new approaches that are being employed to enhance the measurement of energy efficiency. Advances in software, cloud computing, and large scale data processing are enabling big data approaches that provide for the continuous measurement of energy savings. Rather than rely on deemed savings, EM&V 2.0 measures what occurs at the meter. Another differentiation between this new approach and traditional EM&V is that it supports a census style of measurement instead of a sampling approach and the ability to measure net savings with a large comparison groups analysis.

Benefits:

- It enables faster results, near real-time feedback on energy efficiency projects.
- It provides granular data that allows program managers to drive better performance from energy efficiency programs.

Limitations:

- The industry is still developing protocols and standards to guide EM&V 2.0 approaches and working to codify, accept and trust the results from EM&V 2.0 tools.
- Shifting from measuring deemed savings instead of metered savings may require additional regulatory adjustments in order to achieve goals, meet cost effectiveness tests and ensure a smooth transition towards counting metered savings.

Uniform Methods Project: The U.S. Department of Energy's Uniform Methods Project has and continues to develop M&V protocols to calculate energy savings for frequently implemented utility-sponsored efficiency program measures. The project aims to standardize methods for calculating energy savings. Current M&V practices vary from state to state or even utility to utility, making it difficult to compare findings across state borders and utility footprints. The protocols are based on a particular IPMVP option and calculate gross savings for residential and commercial measures and programs. A full list of available on the UMP website (http://energy.gov/eere/about-us/ump-protocols). While UMP protocols do not constitute an EM&V framework, it can be incorporated into a state's evaluation framework. It may serve as an alternative or be incorporated into a TRM or deemed savings database.

Benefits:

- Increased consistency, transparency, and credibility of energy savings resulting from utility efficiency programs.
- Keeps costs down for those states looking to establish EM&V practices.
- Improved ability to benchmark programs and compare savings across multiple jurisdictions.

Limitations:

- The set of protocols developed to date is limited.
- The protocols do not apply to custom programs.
- The benefits are maximized only if other states adopt the protocols.

Standardized Forms: There are a number of efforts under way to standardize reporting on utility energy efficiency programs to allow for improved transparency, accountability, and ability to compare programs across utilities or states. Currently, the information collected by utility regulators varies as does the format in which the data is reported. Greater data consistency will

also support efforts to develop national energy efficiency registries and multistate compliance plans. A number of efforts – existing and in development – to standardize the data collection and reporting process including the North East Energy Efficiency Partnership's Regional EM&V Forum (http://www.neep.org/initiatives/emv-forum) and Lawrence Berkeley National Laboratory's new effort in development to create an Excel-based standardized reporting tool for states with less mature evaluation and reporting protocols.

Benefits:

- Allows for a more "apples-to-apples" comparison of utility programs within and across states.
- Creates greater transparency and accountability of savings and spending.
- Full evaluations may not be completed for months after the end of a program year. Reporting claimed savings in a standardized format will allow policymakers to incorporate these savings into program design in a timelier manner.

Limitations:

- Multiple utilities or states need to adopt a standardized reporting framework for it to have value.
- It does not eliminate the need for EM&V.
- No states surrounding Kentucky utilize standardized reporting practices.

III. EM&V Considerations for Clean Power Plan and National Uniformity

The US EPA's Clean Power Plan, a regulation that sets state-specific targets for carbon dioxide reduction from existing power plants, is currently in draft form, with the final rule anticipated to be released in August 2015. The issues and considerations reviewed are in relation to the draft rule, with full recognition that there may be changes and additional considerations for EM&V depending on the content of the final rule. In addition, the EPA is expected to release additional guidance for acceptable EM&V methods for energy efficiency programs. The following section is a review a key considerations for the treatment of EM&V and energy efficiency programs as a compliance option under the proposed Clean Power Plan.

Issues of Evaluation within the Draft Clean Power Plan

Rate- or Mass-based Targets: Depending on whether a state complies using a rate or mass-based approach, EM&V has the potential to be treated differently when accounting for energy efficiency savings. If states adopt mass-based targets, EM&V protocols for the sake of compliance may not need to be applied because compliance is measured directly through statewide carbon dioxide emissions levels. In states that choose a rate-based approach, however, EM&V is necessary for reporting the amount of energy efficiency savings in relation to the plant's emissions, or lbs/MWh. *(MEEA, SEEA, SPEER Comments)*

Net v. Gross Savings: The use of gross or net savings should also be considered when using energy efficiency as a compliance option with a rate or mass-based approach. EPA has yet to provide direction as to whether either net or gross savings are required, however calculating gross savings is a better indicator for total emission reductions using a mass-based approach,

given that it accounts for total energy efficiency savings, regardless of whether they are attributable to a specific efficiency program. *(MEEA, SEEA, SPEER Comments)*

Filing and Reporting: Additional key considerations included allowing for flexibility and recognizing aspects of EM&V that states are already pursuing for efficiency programs and taking into account transparency and the need for a level of standardization across states' EM&V practices that would allow for some level of consistency and comparability across program administrators and states. Commenters also suggested that the EPA give clear guidance on the schedule and requirements for filing EM&V plans and recognize existing protocols, including: International Performance Measurement and Verification Protocol (IPMVP), DOE Uniform Method Project, Northwest Regional Technical Forum, ISO New England, and PJM-approved methods. *(NEEP, et al Comments)* In terms of the baselines used to calculate energy savings, commenters suggested that EPA should provide guidance on a recommended and proven approach, such as Table 7.1 of the SEE Action Energy Efficiency Program Impact Evaluation Guide *(include citation)*, as various states and implementers use different baselines, which creates further inconsistencies. *(ACEEE Comments)*

Interstate Issues: Within the draft rule, there are also issues that arise with accounting for interstate trading or crediting of energy efficiency savings toward compliance. EPA outlined an approach to discount efficiency savings due to electricity imports and exports, in order to safeguard against double counting of saving. Specifically, they proposed an adjustment of electricity savings downwards in net electricity importing states because some of the emissions reductions are likely to occur out of state. However, there was not a comparable upwards adjustment in savings in net exporting states. *(MEEA, SEEA, SPEER Comments 2014).* Many commenters recommended that discounting not be applied, and that special considerations be given according to whether each state utilizes a rate or mass-based approach. *(ACEEE Comments)*

Energy Efficiency Registries: Many efficiency stakeholders have opined that a national registry to track energy savings is an important tool to facilitate states using energy efficiency as a compliance strategy. A registry would provide a "centralized, transparent vehicle for projecting, estimating, reporting, and auditing savings from energy efficiency measures." (ACEEE Comments). Beyond tracking individual states' energy efficiency achievements, a registry may serve as the backbone of a national or multistate energy efficiency crediting and trading platform. The National Association of State Energy Officials views a registry as way of creating a market for energy efficiency and avoided carbon emissions. (NASEO Comments) NASEO along with the National Association of Regulatory Utility Commissioners and the National Association of Air Quality Administrators also included a voluntary registry as one of a number of EM&V protocols and approaches that EPA should consider recognizing for compliance purposes. (3N Principles)

A number of companies and organizations are developing or considering the development of a national energy efficiency registry including The Climate Registry (www.theclimateregistry.org), a non-profit organization that currently operates a voluntary greenhouse gas registry for North American corporations, universities, and state and local government agencies, has received initial funding the build a national energy efficiency registry. (TCR 2014) The Midwest Renewable Energy Tracking System (www.mrets.org), which currently tracks renewable energy generation in many Midwestern and Southeastern states –

including Kentucky – is also considering expanding its services to track energy efficiency to help states comply with the Clean Power Plan. (M-RETS FAQ) Many of the platforms developed by APX Inc., the software provider supporting numerous renewable energy tracking systems used by multiple RTOs and states across the country, have the capability to track energy efficiency savings. APX announced in May 2015 that it has begun exploring and implementing ways to use its tracking systems to aid states' compliance with the Clean Power Plan (NARECS 2014).

Next Steps

At the time of researching and writing this report, the Clean Power Plan was in draft form. It was expected that significant changes would be made to the draft rule in the final rule. Regardless of the way in which energy efficiency is treated in the final rule, energy efficiency remains a least-cost emissions reduction strategy for all states. Establishing a framework to evaluate energy savings and associated emissions reductions is critical to understanding the impact that energy efficiency has on compliance. Even if Kentucky pursues a mass-based approach, and EM&V is not required in the state plan, state policymakers and regulators will still need to understand efficiency program evaluation results as they weigh options for emissions reductions. Utility regulators will still need evaluation results to ensure efficiency programs are achieving their aims in a responsible manner. Utilities, their program implementers, policymakers, and advocates can all use evaluation results to expand program offerings and consider the impacts of pursuing higher levels of energy efficiency in Kentucky.

While this report is not a living document, the authors will incorporate the final rule into the stakeholder discussions as the Commonwealth, as this project proceeds. To reiterate, however, an evaluation framework has benefits far beyond compliance with the Clean Power Plan and is worth pursuing regardless of Kentucky's approach to comply with the new federal carbon regulations.

IV. Addendum – Quantifying the Emissions Reductions from Energy Efficiency

One of the metrics that can be measured as part of a state's EM&V framework is emissions reductions, including carbon emissions reductions. Understanding the emissions reduction impacts of energy efficiency programs are important not only for Clean Power Plan compliance, but for compliance with other federal clean air regulations such as the National Ambient Air Quality Standard. Also, quantified air quality improvements from energy efficiency programs can be integrated into the benefit-cost test used by efficiency program administrators and regulators as a non-energy benefit.

As with evaluation frameworks, the staff resources and budget allocated to emissions reductions quantification will determine the type of approach used by the state. Relationships among state air and energy agencies, availability of data, and any multi-jurisdictional collaboration will also impact the methodology chosen and quality of the analysis. (EPA 2012) Below are a few methodologies requiring varied resource investment and levels of accuracy that Kentucky may consider going forward. All require establishing baselines to understand the impact of clean energy policies. Multiple approaches can be used at different point during the compliance planning process. Examples from Texas and Wisconsin are included to illustrate the ways in

which states have employed two of these approaches within and outside of an evaluation of efficiency programs.

Methodologies and Tools

Comment [JF2]: See if there's anything else from 4.2.1 and 4.2.2 http://epa.gov/statelocalclimate/documents/pdf/epa_assessing_benefits_ch4.pdf#page=32

Average Emissions: this approach uses an emission factor to estimate avoided emissions by reducing energy consumption. The emission factor is determined by defining a geographic area, summing the annual emissions of all the generators within that area, and dividing the total emissions for the area by the total annual net generation within the area. This calculation results in a system average emission rate. Put simply, it assumes "that when customers reduce their electricity use, say by 1 percent, the system operator will reduce the output of all generators by 1 percent." (RAP 2013) Alternately, you could assume that energy efficiency reduces the output of only non-baseload generating units, and perform an average emissions calculation using non-baseload generation instead of all generation. (RAP 2013) The U.S. EPA's Emissions & Generation Resource Integrated Database (eGRID) uses this methodology.

Benefits:

- Very simple and high level.
- Appropriate for determining whether a more rigorous analysis of the emission reduction impacts of energy efficiency should be conducted.
- RECS Tracking Systems, such as ISO-New England's Generation Information System (GIS) and PJM Interconnection's Generation Attribute Tracking System (GATS), use eGRID data.

Cautions:

- Not very accurate for the electric sector.
- Geographic areas (at least those used in eGRID) do not follow state boundaries, as illustrated in Figure 4.
- Not well suited to examining the local impact of energy efficiency policies from surrounding states.
- Not well suited to examining the impact of local energy efficiency policies on avoided emissions in other states.

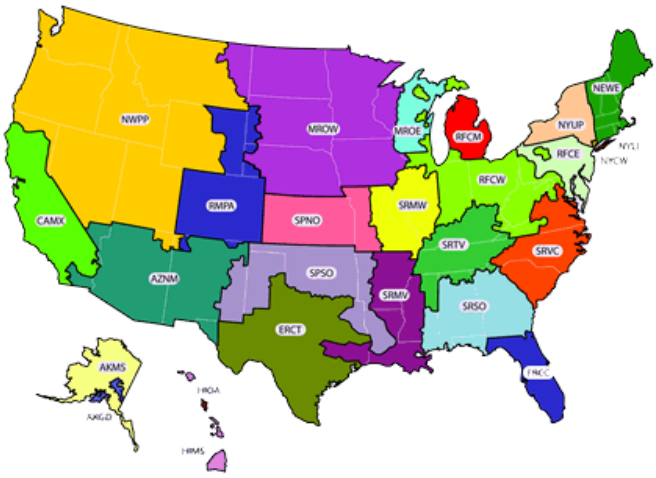

Figure 4 Figure 1: eGRID Subregion Representational Map. Source: EPA eGRID.

Marginal Emissions: this method attempts to capture emissions reductions at specific generating units by determining which units are likely to generate less electricity due to energy efficiency. When customers reduce their energy use, system operators reduce the output of the most expensive generators, the ones operating on the margins. There are two approaches to marginal emissions calculations. The capacity factor marginal emissions approach considers the historical capacity factors of all generators on the system. Those units with capacity factors close to 1 are operating nearly at full capacity all year. Those with low capacity factors are expensive to run and were only running during peak periods of the year – these are the marginal units and the ones likely to be displaced by energy efficiency. The second approach, the statistical/hourly marginal emissions method, uses the historical hourly behavior of individual generating units and hourly demand to determine the likelihood that a generator will be operating on the margin instead of capacity factors. Hourly emissions data for each marginal unit are considered to determine emissions avoided due to energy efficiency. (RAP 2103)

Benefits:

- More accurate than an average emissions approach and can pinpoint where emissions reductions will occur.
- EPA tools like AVERT (for the statistical/hourly marginal emissions method) and the Power Plant Emissions Calculator (for the capacity factor approach) exist and are available to use free of charge.
- The statistical/hourly approach accounts for hourly and seasonal variations in dispatch.

Cautions:

- Assumes future energy reduction patterns based on historical patterns and cannot account for changes in fuel prices and other factors that impact demand and dispatch.
- The capacity factor approach does not account for hourly/seasonal variations in dispatch.

Dispatch Modeling: This approach forecasts which generators will be dispatched based on a range of inputs and assumptions developed or selected by the modeler. Computer programs simulate how the grid (generation and transmission systems) will operate under various energy reduction scenarios. Inputs include future fuel prices, generation unit operating costs, demand projections, etc. Since each generator's emission rates are known, users can model scenarios with and without energy efficiency to develop values for avoided emissions. The North American Electric Reliability Council is one example of an entity that used dispatch modeling to assess the impacts of the draft rule, in their case for the purposes of evaluating the effects of the plan on grid reliability. (NERC 2015)

Benefits:

- This is the most complex, accurate, and sophisticated of the emissions reduction methodologies.
- Utilities, consultants, and certain state agencies may have access to and be familiar with dispatch modeling and available to partner with state air agencies for compliance purposes.

Cautions:

- Dispatch models are expensive and proprietary.
- Users need extensive knowledge of the models and grid system in addition to training in use of the model.

Mobile Source Analogy: This approach recognizes that attempting to identify exactly which generating units will be displaced by energy efficiency and evaluate the associated emissions reductions can be onerous. It makes the argument that an air regulator does not need to know where and how each individual energy efficiency measure is used, but rather what the aggregate impact of efficiency programs has on demand and emissions. The Regulatory Assistance Project puts forth the idea that the EPA should allow emissions reductions from energy efficiency to be calculated in the same fashion as mobile source emissions reductions are captured in states' implementation plans for National Ambient Air Quality Standards compliance – using statistical assessments. These assessments would rely on EPA-approved algorithms, performance assessment data, and understood levels of uncertainty. RAP suggests that the EPA develop a number of methodologies for translating energy savings to emissions reductions including a deemed savings database (an emissions equivalent to a deemed savings database) and an emissions factor approach that works much like an average emissions factor. (RAP 2015)

Benefits:

- This approach was called for after states went through more cumbersome processes for including energy efficiency into their state implementation plans for NAAQS compliance. (NESCAUM)
- Air regulators are more familiar with the methodology.

Cautions:

- No state has attempted this approach before.
- It relies up on guidance and resources yet to be developed by the EPA.

State Examples of Using Energy Efficiency for Emissions Reductions

While compliance with the Clean Power Plan is a new frontier, states do have experience using energy efficiency for emissions reductions and informing state policy and program design. It is important to remember that state plans to comply with the Clean Power Plan have different requirements than state implementation plans for NAAQS compliance, many unknown at this time, but it may be helpful to see how methodologies for translating energy savings into emissions reductions have been used in the past as illustrated by Texas. Wisconsin provides an example of an analysis of carbon dioxide reductions resulting utility-funded energy efficiency programs.

Texas: Texas is a good case study of a state that has employed energy efficiency as a means of achieving pollution reduction. In 2001, the Texas legislature passed Senate Bill 5, establishing the Texas Emissions Reduction Plan (TERP). TERP required the Texas Commission on Environmental Quality (TCEQ) to promote energy efficiency as a means of meeting ambient air quality standards. TCEPQ did this through a number of mandatory and voluntary incentive programs. Energy savings from the various programs were converted into emissions reductions using eGRID average emissions factors. (EPA 2011)

Wisconsin: Wisconsin is a state that used the hourly marginal emissions factor approach. Seasonal and off-peak emissions factors were developed using EPA continuous emission monitoring data on historical plan operations and emissions to determine which generating units were operating on the margins at various times of the day and year. Energy savings from various programs were assumed to be winter peak, winter off-peak, summer peak, and summer off-peak. This allowed the analyst to apply the appropriate emissions factor to the energy savings. A number of the state's Focus on Energy programs were used in this analysis including Wisconsin Energy Star Products, Wisconsin Energy Star Homes, and Home Performance with Energy Star. An independent contractor was hired by the state to perform the analysis, which included an analysis of the pounds of avoided CO2. (EPA 2011)

Conclusion

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