Developing State and National Evaluation Infrastructures- Guidance for the Challenges and Opportunities of EM&V

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ABSTRACT

Evaluating the impacts and effectiveness of energy efficiency programs is likely to become increasingly important for state policymakers and program administrators given legislative mandates and regulatory goals and increasing reliance on energy efficiency as a resource. In this paper, we summarize three activities that the authors have conducted that highlight the expanded role of evaluation, measurement and verification (EM&V): a study that identified and analyzed challenges in improving and scaling up EM&V activities; a scoping study that identified issues involved in developing a national efficiency EM&V standard; and lessons learned from providing technical assistance on EM&V issues to states that are ramping up energy efficiency programs. The lessons learned are summarized in 13 EM&V issues that policy makers should address in each jurisdiction and which are listed and briefly described. The paper also discusses how improving the effectiveness and reliability of EM&V will require additional capacity building, better access to existing EM&V resources, new methods to address emerging issues and technologies, and perhaps foundational documents and approaches to improving the credibility and cross jurisdictional comparability of efficiency investments. Two of the potential foundational documents discussed are a national EM&V standard or resource guide and regional deemed savings and algorithm databases.

Introduction

Energy efficiency policy in the U.S. has largely been driven by building codes, appliance and equipment efficiency standards and programs paid for by utility customers. Energy efficiency budgets for programs funded by U.S. utility customers have increased significantly in recent years (e.g., $5.3B in 2010 compared to $1.6B in 2005) [Consortium for Energy Efficiency 2010]. A recent Lawrence Berkeley National Laboratory study projected that ratepayer-funded energy efficiency programs could increase to $7.5-12B in 2020 based on an analysis of existing state policies and legislation (e.g., Energy Efficiency Resource Standards) and utility resource plans (Barbose et al 2009). The U.S. also has a robust private sector Energy Services Company (ESCO) industry; ESCOs estimated that energy efficiency projects and measures account for about $3B of their $4.1B in annual revenues in 2008 (Satchwell et al 2010). In addition, the American Recovery and Reinvestment Act (ARRA) provided a massive influx of funding for local and state energy efficiency programs (~$16 Billion) to be spent over ~3-4 years (Goldman et al 2010).

Funding for end-use energy efficiency actions is expected to increase significantly in the United States over the next decade with much of the expansion coming from states that have historically not participated in ratepayer-funded efficiency activities (Barbose et al 2009). Increased efficiency funding should result in more benefits as well as more scrutiny of reported results. Therefore, evaluating the effectiveness and impact of energy efficiency programs is likely to become increasingly important for policymakers and private and public funders of efficiency actions, particularly in those states that are ramping up energy efficiency programs.

In this paper we summarize three activities that the authors have conducted and which are associated with this expansion of efficiency evaluation, measurement and verification (EM&V) activities. The first activity was a research study that analyzed the opportunities and challenges associated with improving and scaling up EM&V practices in the United States. The second activity was a scoping study that identified issues involved in developing a national efficiency EM&V standard or guidance document; some state policy makers and regulators believe that a national standard would help those states with limited resources or experience develop "best-practice" EM&V.

The third activity involves lessons learned from providing technical and policy assistance on EM&V issues to public service commissions, utilities and stakeholders in states that are starting up or expanding their ratepayer-funded energy efficiency activities: Arkansas, Hawaii, Idaho, Kentucky, Maryland, New Mexico, Ohio, Pennsylvania, and Washington. The assistance typically involved helping these states set up infrastructures for implementing effective EM&V. The research and assistance described in this paper set the parameters and patterns for how state-based (or perhaps new federal mandated) EM&V activities will be conducted in states that are increasing their EM&V activities and thus also provides important guidance for the evaluation community.

Background: EM&V Common Practices and Resources

Energy efficiency programs funded under the American Recovery and Reinvestment Act (the "Stimulus Program"), programs funded by utility customers, and ESCO projects have varying level of EM&V activity and requirements. In the private sector, the focus is on project-by-project analyses, or measurement and verification (M&V). The International Performance Measurement and Verification Protocol (EVO 2010) and documents from the American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE 2002) and the Department of Energy's Federal Energy Management Program (DOE FEMP 2008) Measurement & Verification Guidelines define the state of the art for project-level M&V.

In terms of program or portfolio evaluation, or the combination of program evaluation and project measurement and verification (EM&V), the state of the art has been defined by activities associated with efficiency programs funded by utility customers (i.e., ratepayer-funded programs). A range of EM&V approaches and techniques are used to estimate electricity and fossil fuel savings for these programs. Regulators support evaluation activities because of their interest in documenting total savings, assessing the cost-effectiveness of efficiency compared to generation alternatives, and assessing the relative contribution of program administrators in achieving savings and impacts versus common practice, end-user self motivation, or codes and standards.

Over the last two decades, the professional efficiency evaluation community has undertaken a number of efforts to develop common practices and standard terms for efficiency project M&V and program evaluation of the impacts of energy efficiency programs; an example is the National Action Plan for Energy Efficiency Model Energy Efficiency Program Impact Evaluation Guide (NAPEE 2007). A number of states have also established EM&V requirements and/or guidance documents for efficiency programs utilizing funds from regulated utility ratepayers; the California Public Utility Commission's Energy Efficiency Evaluation Protocols are a prominent example (CPUC 2007). We identified fourteen states and two regional organizations (Northwest Regional Technical Forum and Regional Technical Forum in the Northeast) that have developed technical reference manuals that include ex ante savings estimates or deemed calculation methods for energy efficiency measures included in ratepayer-funded energy efficiency programs (SEE Action 2011). Numerous regional and national EM&V efforts are underway that facilitate sharing of EM&V resources and support increased consistency in industry practices. Examples include the Northwest Regional Technical Forum, the Regional Evaluation, Measurement and Verification Forum (in the Northeast and Mid-Atlantic states), Efficiency Valuation

Organization Certified M&V Professional program, State Energy Efficiency Action Network, the Consortium for Energy Efficiency, the North American Energy Standards Board, and several regional transmission organizations such as ISO New England and PJM Regional Transmission Organization.

Challenges and Opportunities Associated With Improving and Scaling Up EM&V Practices

Lawrence Berkeley National Laboratory (LBNL) conducted a study (Messenger et al. 2010) on the opportunities and challenges associated with improving and scaling up EM&V practices in the United States. This study was conducted to inform and help prioritize proposed activities of the EM&V Technical Work Group formed from the Leadership Group of the National Action Plan for Energy Efficiency (Action Plan)[1]. A key objective of Action Plan EM&V research was to catalog the range of evaluation practices and methods used in different jurisdictions and identify important emerging evaluation issues. There was also an interest in defining issues that are important to address and capacity building that needs to be provided in order to allow EM&V to be more effective and thus yield more accurate, credible, and timely results that accelerate deployment and improve management of energy efficiency.

For the above referenced LBNL study, interviews were conducted with over 50 energy efficiency policy experts and regulatory staff, program administrators, evaluation practitioners in 14 states and the Pacific Northwest region. At the time of the study, these states accounted for ~80% of current spending on ratepayer-funded energy efficiency.

Not surprisingly, the study indicates that policymaker, technical expert and stakeholder views on EM&V issues depend on the situations in their jurisdictions and their perspective on how the energy efficiency market and efforts to develop national savings goals will evolve: whether efficiency policies will continue to develop state by state, whether a national energy efficiency resource standard policy will be adopted, or whether some combination will develop with perhaps more regional initiatives. The study also indicates that EM&V needs and perspectives vary because of an evolving market and policy environment that will likely continue to include multiple administrators and/or sources of funding for energy efficiency programs. The EM&V objectives for energy efficiency programs may include documenting consumer savings, providing input to resource planning, validating value in ratepayer investments, or documenting economic development impacts (e.g., new jobs) and avoided greenhouse gas emissions.

Thus, defining EM&V requirements has many challenges. Since much of the focus of this paper is on EM&V for states initiating or expanding their efforts, the following is the author's summary list of current challenges for EM&V activities overall but perhaps most acutely in the "new states":

- EM&V is sometimes seen as expensive, not credible, not timely, not transparent, and as a burden, not a benefit.
- Jurisdictions calculate and define savings differently, utilize different deemed savings values and baseline assumptions, tend to not report uncertainty in results, and apply different levels of independent review. This can make meaningful comparisons difficult

[1] In 2010, DOE and EPA established a successor organization to the Action Plan, the State Energy Efficiency Action Network (SEE Action). SEE Action also has established an EM&V Working Group; the authors continue to provide technical support to the EM&V Working Group as it refines and updates EM&V issues and capacity building needs.

across states and hurt the credibility of energy efficiency when savings values for the same measures, even when justifiable, vary from one state to another.

- The quality of program evaluation and review processes varies widely among states. This is driven by different EM&V objectives but can also be caused by the level of financial resources and technical expertise available.
- Jurisdictions have difficulty reliably determining savings directly attributable to their programs and also use different methods and apply different net savings factors (e.g., free riders, spillover, snap back) when estimating net savings. This makes it difficult to define and set standards for rigor and accuracy for net savings given different policy objectives, and assess broader "net" market effects of energy efficiency programs.
- Since most EM&V focuses on first year savings there is a lack of support for analyses of savings persistence. Similarly, comparative analysis of alternative program designs, estimates of market changes, and mechanisms for prompt and regular program feedback are not emphasized.
- Utilities, state agencies, regional planning and transmission organizations, and the federal government all prepare multi-year, energy-resource plans that look to properly balance the demand for electricity and natural gas with the supply of these resources. As efficiency becomes a bigger part of the resource "mix", and more investments are made in efficiency, the importance of properly accounting for efficiency resources has grown and EM&V conducted to date has not emphasized this need.
- EM&V practices have yet to evolve to take advantage of the Smart Grid infrastructure that allows for increased data collection.

Turning to the opportunities for EM&V, we believe that improving the effectiveness and reliability of EM&V will require additional capacity building, new methods to address emerging issues and technologies, and perhaps foundational documents and approaches to improving the credibility and cross jurisdictional comparability of efficiency investments. Some suggestions for these three areas that the SEE Action EM&V Working Group and/or the authors have identified are:

- Capacity Building examples: National database of evaluation reports and plans; regional databases of ex-ante deemed savings values and standardized energy saving algorithms; training to increase the number of EM&V practitioners and their level of expertise, including webinars and policy/technical support for states with emerging or expanding efficiency programs.
- Address emerging issues and technologies examples: Leverage 'smart grid' and Automated Meter Infrastructure (AMI) deployments by utilities to improve our understanding of the load shape impacts of energy efficiency measures and programs; develop new behavioral program evaluation approaches; and develop new top-down evaluation approaches to assess the aggregate impacts of energy efficiency strategies (e.g., codes, standards, programs).
- Foundational documents and approaches examples: Provide and maintain tools and resources that support items and efforts such as: common approaches to documenting energy and demand savings from typical efficiency measures (i.e. a national EM&V guide with measure-specific evaluation plans), consistent EM&V definitions, independent review by EM&V practitioners of efficiency programs, reporting of certainty of program impact estimates, and net savings determination.

In the next two sections, we discuss these suggestions in the context of development of a national efficiency EM&V standard and policy/technical support provided to states with emerging or expanding efficiency programs.

National Efficiency EM&V Standards

There are three primary reasons for developing a national efficiency EM&V standard. First, some state utility and air regulators and practitioners believe that a national standard would streamline EM&V implementation, reduce costs and complexity, and improve comparability of results across jurisdictions. That said, there are benefits associated with each jurisdiction setting its own EM&V requirements based on their specific portfolio and evaluation budgets and objectives, although many state regulators simply ask: "Cannot I just use what everybody else uses?" The second reason for a national standard is, if energy efficiency is determined by the US Environmental Protection Agency to be a Best Available Control Technology (BACT) for avoiding criteria pollutant and/or greenhouse gas emissions, then a national EM&V standard may be required for documenting the emission reductions resulting from efficiency actions. The third reason is that an EM&V standard might be required if future Federal legislation is enacted that includes a national energy resource standard (e.g., an energy efficiency resource standard, a renewable electricity standard or a clean energy standard) that allows end-use energy efficiency to qualify as an eligible resource for purposes of complying with the standard.

Developing a national EM&V standard is likely to be a lengthy and complex process (Schiller et al 2011). How lengthy and complex may depend in part on whether such a standard is a voluntary guideline or required to be used by utilities (or states) seeking to comply with a national energy resource standard. If it is a voluntary guideline, the requirements for agreement might not be as high as for a national EM&V standard that was included in order to comply with an energy resource standard in Federal legislation.[2] Schiller et al (2011) conducted a scoping study that identifies issues associated with developing a national EM&V standard for end-use, non-transportation, energy efficiency activities and defined EM&V requirements and issues that would need to be resolved.

Perhaps the most fundamental of these issues is "how good is good enough?". This has always been the fundamental issue of EM&V for energy efficiency and is a result of the counter-factual nature of efficiency. Counter-factual in that savings are not measured, but estimated to varying degrees of accuracy by comparing energy consumption after a project (program) is implemented with what is assumed to have been the consumption of energy in the absence of the project (program). Therefore, the issue of "how good is good enough" is a short version of asking how certain does one have to be of the energy savings estimate that results from EM&V activities and is that level of certainty properly balanced against the amount of effort (e.g., resources, time, money) that is utilized to obtain that level of certainty? The implication is that not only should energy efficiency investments be cost-effective, but EM&V investments should consider risk management principles and thus also balance the costs and value of information derived from EM&V (i.e., EM&V should also be cost-effective).

In a number of Federal energy bills proposed over the last several years, energy efficiency has been included as an eligible technology that could meet the requirements of a "clean", "diverse", or "renewable" energy standard.[3] Thus, in addressing the issue of "how good is good enough," one will probably also have to address the question of "as compared to what." Since all energy resources have

[2] There are numerous guides (such as the previously referenced NAPEE 2007 Guide) that address the different EM&V approaches than can be used, but only state or utility jurisdiction-specific documents currently set requirements, and many of those are actually pretty general as well.

[3] In his January 25, 2011 State of the Union address, President Obama called for a new goal of "by 2035, 80 percent of America's electricity will come from clean energy sources."

uncertainties associated with their development, performance and cost, policymakers may conclude that there is a need to establish a level of confidence and risk regarding the performance of energy efficiency resources not just in absolute terms but relative to other resources. For example, given that resources such as wind or nuclear power generation plants directly measure their output, will there be expectations that efficiency resources must also be directly measured? Or will energy efficiency, due to its inherent characteristics, which in almost all cases does not allow direct measurement of "savings", be treated differently as is current standard practice?

"As compared to what?" can also refer to the baseline against which efficiency actions are compared for determining energy savings and whether attribution (causes of the efficiency based savings) should be considered? For example, should gross savings be documented (i.e., the savings from efficiency actions irrespective of their cause) or should attempts be made to document net savings (i.e., those savings directly attributable to an efficiency program)? We identify four high-level issues that need to be considered and addressed as part of developing a new national EM&V standard for energy efficiency resources, whether as a national mandate or as a voluntary guide for state and regional efficiency activities:

- What level of detail will be provided in the EM&V standard and how much flexibility will be left to professional discretion?
- Will requirements be performance-based (i.e. a requirement for a level of certainty) or prescriptive (i.e. requiring certain EM&V approaches for any given efficiency activity)?
- Who is responsible for documenting EM&V savings from energy efficiency resources that have been met as part of a national clean energy resource standard - a state agency, administrators of ratepayer-funded energy efficiency programs (e.g., utilities), or independent, third-party EM&V professionals?
- What entities will be the users (audiences) for the results (information) that the EM&V standard generates beyond a Federal entity responsible for enforcing an energy resource standard (e.g., will regional electricity system operators use the results for system planning and/or will environmental regulators use the results for testing compliance with emission reduction requirements)?

To address these four high-level issues, we identify and discuss nine issue topic categories that if addressed and resolved should generate answers for these high-level issues. We expect that the entity designated in any future Federal energy legislation to develop a national EM&V standard for energy efficiency will be tasked with addressing the various issue topic categories.[4] The nine topic categories are:

1. Legislative Structure for Efficiency Resource Standard
2. Scope and Metrics of a Standard, including net versus gross savings requirements
3. Baselines
4. EM&V Approaches
5. Certainty of Savings Determination
6. Who Conducts the Evaluation Activities
7. Reporting and Schedules
8. Dispute Resolution
9. Regulatory Audiences and Requirements for Standards/Protocols

[4] This could occur as part of an administrative rulemaking process to implement legislative provisions of an energy efficiency resource standard or a renewable electricity or clean energy standard.

It should be noted that these issues address only one primary objective of EM&V – documenting the effects (specifically energy and/or demand savings) resulting from efficiency activities to determine if savings goals have been met. The issues do not address documenting non-energy co-benefits of efficiency activities (e.g., emission reductions) or other objectives of EM&V activities: understanding why those effects occurred, identifying ways to improve current activities (i.e., process evaluations), and providing feedback on energy efficiency programmatic activities. The importance of these other objectives of EM&V cannot be overstated for meeting long-term energy efficiency goals and thus must be considered as regulators establish the infrastructures for both implementing and evaluating energy efficiency programs.

Establishing EM&V Infrastructures for Energy Efficiency Programs

Turning to each state where technical and policy assistance was provided, many of the issues and principles at the state level revolve around the question of, given that energy efficiency savings values will always be estimates, how accurate, precise, or certain must one be in order to meet the objectives of the EM&V activities given the value placed on efficiency as an energy resource, job generator, consumer saver, emissions avoider? How to address this question is addressed below.

Risk Management – One Size Does Not Fit All

Relative risk is an important concept for consideration when developing EM&V standards for energy efficiency whether at the state or federal level. Conceptual approaches that draw upon risk management techniques provide a useful framework for addressing EM&V requirements and the definition of an EM&V infrastructure. Unfortunately, for energy efficiency, risk management is hampered by the large number of difficult to quantify aspects of efficiency savings estimation; although the tools for addressing this are improving (with advances such as wireless transducers). Other resources have uncertainty and risks as well (e.g., performance risks, cost of construction, and risk and uncertainties associated with future fuel costs). However, perhaps the single most identifiable risk of efficiency is the inability to directly measure savings, which creates uncertainty.

Tolerance for uncertainty is driven by how much risk is associated with getting the wrong answer. For example, with energy efficiency, the risks include crediting too much or too little savings to the actions that have been taken to comply with an energy resource standard. This can lead to expending too many resources on ineffective actions or the opposite, or simply not obtaining the desired outcome – less energy consumption. There are other risks though which are counter-balancing. These include spending too much on EM&V beyond the importance of lowering uncertainty and, more importantly, inappropriately eliminating this measurement risk and taking on the risk of excluding viable efficiency resources that are then replaced with supply side resources that have different, and perhaps greater, risks associated with their performance and/or lifecycle costs. Thus, the primary risk to be managed with efficiency EM&V might simply be that over-specifying certainty of what cannot be measured causing efficiency activities to be stifled. Perhaps this is summed up best by the quote attributed to Albert Einstein: “Everything that can be counted does not necessarily count; everything that counts cannot necessarily be counted.”

Tailoring EM&V Activities to the needs and objectives of State regulatory commissions and energy efficiency program administrators

Over the last several years the authors have worked with a number of state regulatory commissions (and energy efficiency program administrators and stakeholder groups) that requested

policy and technical support on developing appropriate EM&V infrastructures, policies, regulations, and options to oversee and manage EM&V activities.[5] Technical assistance activities include workshops on EM&V issues, roles and responsibilities that are targeted to stakeholders and regulatory staff as well as direct support to state regulatory staff on EM&V issues. These issues include review and input on EM&V requirements in regulatory decisions that establish energy efficiency policy guidelines, suggestions on an EM&V regulatory oversight framework, samples of EM&V framework documents, and development of scopes of work for PUCs and EE program administrators that want to retain independent, third-party evaluators. Examples of products include EM&V webinar series sponsored by EPA (www.emvwebinar.org), an Order issued by the Maryland Public Service Commission on EM&V structure (Maryland 2009), Avista Utilities EM&V Framework (Avista 2010), and a report to the New Mexico Public Regulatory Commission on future EM&V infrastructure (NARUC 2011).

In conducting technical assistance activities on EM&V issues, it is essential to become familiar with and understand the specific programmatic and regulatory context: the objectives and scale of the efficiency activities being evaluated and how EM&V results will be used (e.g. to determine performance incentives for administrators, to assess whether a program administrator has met a savings target). For example, one state may have very limited goals for energy efficiency, may not have performance incentives for their efficiency portfolio administrator that are linked to program impacts, and may have minimal existing energy codes. Another state might have established aggressive, long-term energy savings targets in legislation and developed a performance-based incentives scheme for program administrators. Given these differences, the first state might have very little need for rigorous EM&V and fairly 'permissive' baselines; while the second state might require very rigorous (and expensive) EM&V with 'conservative' baselines.

These differences in 'needs' for less or more rigorous EM&V also translate into significantly varying levels of investment in EM&V. Anecdotally, it appears that many public utility and local and state government efficiency programs as well as private sector projects, have very little, if any, investment in ex-post EM&V activities and rely heavily on ex-ante savings estimates with some level of inspections to verify installations. In contrast, a number of states with large efficiency budgets (e.g., California, Massachusetts, New York, and Wisconsin) have made significant investments in ex-post EM&V actions. For some state policymakers, these decisions often revolve around trade-offs between devoting more resources for EM&V activities versus increasing energy efficiency program budgets.

In summary, it has not been necessary for regulatory commissions and administrators of ratepayer-funded energy efficiency programs in states to define a saved unit of energy in exactly the same way; each state can and many do develop EM&V requirements that are appropriate for their own situations. Therefore, the authors' input to various organizations has been predicated on the need for defining EM&V requirements for each jurisdiction that are linked to the needs of that jurisdiction.

EM&V Principles for States

Although EM&V requirements may vary among states, we recommend that each state establish a set of principles that will inform their EM&V activities and suggest the following concepts for consideration as a starting place:

- There are three key primary objectives of evaluations:

[5] Technical assistance by the LBNL team has been funded primarily by the U.S. Department of Energy Office of Electricity Delivery and Energy Reliability. In addition to providing support as part of the LBNL team, Steven Schiller has been funded by U.S. Environmental Protection Agency, NARUC, the Energy Foundation and utility clients to support efficiency portfolio and EM&V infrastructure development.

1. To document and measure the effects of a program or portfolio and determine whether it met its goals with respect to being a reliable energy resource in terms of meeting identified objectives of energy and demand savings (and other objectives such as avoided emissions).
2. To document actual and potential efficiency resource metrics to be used in state and regional, long-term energy resource planning efforts.
3. To help understand why those effects occurred and identify ways to improve or discontinue current programs (portfolios), and select future programs (portfolios).

- Energy efficiency evaluations should develop retrospective estimates of energy savings attributable to a program in a manner that is defensible in proceedings that are conducted to ensure that energy efficiency funds are properly and effectively spent. Evaluation activities should go beyond documenting savings to actually improving programs and providing a basis for future savings estimates.
- The evaluation process should be integral to what is typically a cyclic planning-implementation-evaluation process. Therefore, evaluation planning should be part of the program planning process so that the evaluation effort can support program implementation, including the alignment of implementation and evaluation budgets and schedules, and can provide evaluation results in a timely manner to support existing and future programs.
- Evaluation budgets and resources should be adequate to support the evaluation goals and the level of quality (certainty) expected in the evaluation results over the entire time frame that program impacts need to be assessed.
- Energy and demand savings calculations should follow one or more of the approaches defined in the current version of:
  1. National Action Plan for Energy Efficiency (NAPEE 2007)
  2. The International Performance Measurement and Verification Protocol (EVO 2010)
- Evaluations should be transparent, relevant, consistent, and balanced in risk management between certainty of results and costs to achieve the results. Evaluators should also follow the guiding principles defined by the American Evaluation Association.

Drawing from established EM&V principles, program administrators, evaluation contractors and agencies with responsibility for overseeing EM&V activities (e.g., state utility commissions, energy office, or other entity) can define their own policy-specific program evaluation requirements. These requirements are determined by the program objectives, regulatory mandates (if any), expectations for quality of the evaluation results, intended uses of the evaluation results, and other factors that can vary across jurisdictions and programs. To define policy-specific program evaluation requirements, the authors work with regulatory staff and stakeholders in each jurisdiction to address the following issues:

- What are the evaluation objectives, metrics?
- What cost effectiveness tests will be used?
- What are the evaluation principles that drive the effort?
- What are the baselines against which savings are determined?
- Performance determined on basis of net or gross savings? What is included in net savings?
- What is the reporting “boundary” - are T&D considerations included, how ‘granular’ will the results be?

- How are savings estimates applied – looking back/going forward?
- What impact evaluation approaches will be used and how will they be selected?
- What are the schedules for implementing EM&V and reporting?
- What are the data management strategies?
- What are expectations for savings determination certainty (confidence and precision)?
- How much money will be spent on evaluation? What is balance between or level of impact, market and process evaluations?
- Who will conduct the evaluations, how is independent evaluation defined, what are the roles between implementers, evaluators, and regulatory staff?

These issues can be addressed though a variety of mechanisms, such as collaborative efforts (as is the case in Washington), with advisory groups (as is the case in New Mexico), or with regulatory proceedings (as is the case in many states).

EM&V Documents That Should Be Prepared For Each State

We generally recommend that states establish and document their EM&V requirements in a hierarchy of documents. These are listed below.

- EM&V Framework – A framework is a primary document that lays out EM&V principles, metrics, allowable approaches, net versus gross savings issues, reporting requirements, schedules, and the roles and responsibilities of various entities. An EM&V framework document tends to be "fixed" but can be updated periodically and often sets the expectations for the content and scope of other EM&V documents (e.g., annual portfolio and statewide evaluation reports produced by state agencies, utilities and/or independent evaluators charged with producing EM&V results). *This is perhaps the principle document that all stakeholders can focus on and provide high level input – the 'forest versus the trees" of EM&V.*
- Annual Portfolio (or State) EM&V Plan - An annual plan that indicates the major evaluation activities that will be conducted during the evaluation cycle (typically one, two or three years), including budget and allocation between programs/measures/market sectors, as applicable.
- Evaluation Activity-Specific Detailed Research Plans - Research plans are created for the major EM&V activities or studies planned in a given cycle prior to the time each effort is launched.
- Site Specific M&V Plans - Site-specific plans may be required for custom project sites that are analyzed and inspected.

Figure 1 outlines the hierarchy of these documents and indicates their typical time frame (or horizon) and applicability level (e.g. state or utility program administrator, program or portfolio of programs, or individual projects). Those documents with increasing level of detail can provide an appropriate place for each participant or stakeholder to provide input; for example all stakeholders may be interested in an EM&V framework but on the other end of the spectrum, only program implementers and evaluators will generally be concerned with the details of a research plan or M&V plan.

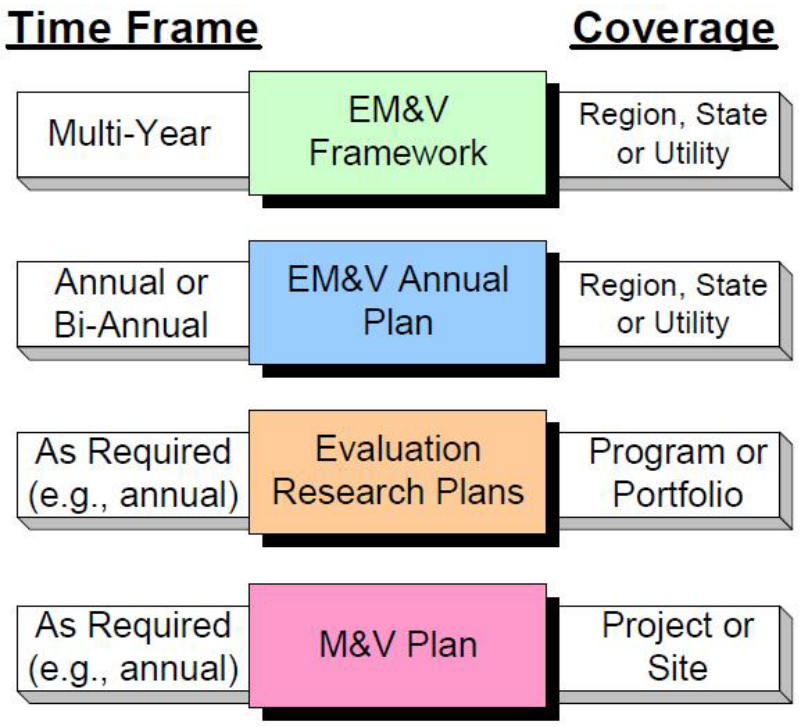

Figure 1: Hierarchy of EM&V Planning Documents

We also suggest that states develop Technical Resource Manuals (TRM), which are typically a database of standardized, state or region-specific ex ante algorithms (deemed calculations) and associated savings estimates (deemed savings values) for conventional electric and natural gas energy-efficiency measures. The TRMs are used by energy efficiency program administrators and implementation contractors to reduce EM&V costs and uncertainty in how measure savings will be credited with value. However, ex ante savings values for individual measures are not always formally vetted in a regulatory process and in some cases different values, for the same measures, are used by different utilities in the same state. Thus, we suggest that states establish procedures for building and maintaining TRMs with deemed calculations and savings values that can be accepted for ex ante savings without post-retrofit revisions in a given program cycle. We also encourage state regulators and program administrators to consider pooling their resources to support development of regional TRMs (as in the Pacific Northwest or Northeast).

Conclusion

Interest in efficiency is growing in the United States as well as interest, and concern, with how well we are documenting the value of our efficiency investments and learning from those investments. Improving the credibility, accuracy and timeliness of EM&V results is an important component in accelerating deployment and management of energy efficiency, and is particularly critical in those states that have adopted legislative or regulatory mandates or goals (e.g., Energy Efficiency Resource Standards). Improving the effectiveness and reliability of EM&V will require additional capacity building, new methods to address emerging EM&V issues, leveraging information that can be obtained from widespread deployment of AMI, and foundational documents and approaches to improving the credibility and perhaps cross jurisdictional comparability of efficiency investments.

A continuing challenge to improving the credibility and cost-effectiveness of EM&V will be

answering the question of "How good is good enough?". Risk management approaches can help answer this question and we urge states to consider their EE policy objectives plus risk management considerations as they define their EM&V planning process, roles and responsibility, and scope of activities (i.e., EM&V infrastructure).

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