

# What's in Your EM&V Genome?

## Improving Transparency and Understanding of EM&V Practices through Standardized Reporting

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### ABSTRACT

Energy-efficiency (EE) impact evaluation authenticates the savings achieved and attributable to a particular program and time period. In the past, the mere existence of impact studies provided confidence in reported program savings. As EE resources become key components of system planning and greenhouse gas reduction strategies, however, a growing audience is seeking better understanding of evaluation practices to ensure the credibility of the resource to meet key policies goals.

The Northeast Energy Efficiency Partnerships' (NEEP) Regional Evaluation, Measurement, and Verification Forum (EM&V Forum) conducted a project to improve transparency of EM&V activities through standardized reporting forms. Through its collaborative stakeholder committee comprised of representatives of nine states,<sup>1</sup> the Forum developed two standard forms that characterize methods and rigor associated with the evaluation results. One form characterizes methods in impact studies, and the other form aggregates EM&V data for a specific program and program year.

In this paper, the authors present key features of the forms—focusing on the characterization of EM&V methods and rigor—and discuss challenges for both the user and the reader. In particular, the authors discuss the approach to key challenges such as summarizing EM&V data for a non-evaluation expert, systematically assessing the rigor associated with EM&V results, and guarding against misinterpretation of the data.

The paper also discusses potential uses of the forms, including supporting Clean Air Act (CAA) state air quality compliance plans (State Implementation Plans, or SIPs for ozone attainment) as well as potentially EPA's CAA 111(d) energy efficiency and supporting EM&V reporting requirements.

### Background and Purpose

Energy efficiency program administrators typically conduct a range of evaluation activities to determine savings from their programs, including impact evaluations, market assessments, and process evaluations. Since its inception in 2009, the Regional EM&V Forum<sup>2</sup> has been working to develop greater transparency and consistency in EM&V practices to support the inclusion of the growing energy efficiency resource in meeting state and regional energy and environmental goals and markets. The Forum also focuses on informing, coordinating with, and referencing national EM&V protocols and EE reporting efforts to support the broader inclusion of EE in national policies and regulations, including the CAA air quality standards required for ozone attainment in State Implementation Plans (SIPs), and EPA's Clean Power Plan CAA 111(d) regulations.

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<sup>1</sup> NEEP region includes New England (Connecticut, Massachusetts, Maine, New Hampshire, Rhode Island, and Vermont), New York, Maryland, Delaware, and the District of Columbia.

<sup>2</sup> <http://www.neep.org/initiatives/emv-forum>

The Forum's initial focus in 2009-2010 was to develop EM&V guidelines with recommended impact evaluation and savings calculation methods for a priority set of EE measures, intended for use and referencing by program administrators and third-party, independent evaluators conducting evaluations to determine gross energy/demand savings, and for state regulators to reference in reviewing and comparing evaluations. These guidelines<sup>3</sup> were adopted by the Forum Steering Committee whereby 'states would encourage their use,' and were intended, over time, to lead to greater consistency in EM&V practices, comparability, and level of certainty in savings.

While several Forum member states did reference the Guidelines in relevant state EM&V documents or plans, their actual use was limited and difficult to track. Concern raised by one state in particular was that any regional or national EM&V guideline or protocol is likely to prescribe the "lowest common denominator" in EM&V practice, which may not be aligned with a state's actual practice.<sup>4</sup> This general concern led the Forum Steering Committee regulators to ask of the Program Administrators "so then what are the EM&V methods being used to evaluate your programs?" As such, the Forum redirected its efforts in 2013-14 toward a strategy less oriented to prescribing particular EM&V methods, to instead focusing on how program administrators (and their evaluation contractors) can consistently describe the EM&V methods used to evaluate energy efficiency programs.

Why do utility regulators typically not understand the nuts and bolts of EM&V? Anecdotally, and legitimately, as quoted by a Forum state regulator, "EM&V makes my eyes bleed..." EM&V is complicated, challenging to understanding and difficult to digest results, and its documentation is daunting. While executive summaries of evaluation studies provide key information on results and approaches, the type of information varies, as do definitions, descriptions of methods use, and presentation of information. Regulators often retain an evaluation consultant to review the evaluations conducted by a 3rd party contractor to the program administrators, given the complexity of the field.

With these challenges, and a strong interest in obtaining basic information about EM&V in a digestible and user-friendly format for regulators, among other audiences, the Forum created a set of model EM&V Methods Standardized Reporting Forms<sup>5</sup> (standardized forms). Developed by Cadmus, with guidance from a project subcommittee represented by a range of stakeholders,<sup>6</sup> the Standardized Forms are based on a straightforward, on-line, checklist format, and are designed to:

- Make state/program administrator EM&V practices more accessible and transparent to interested parties, and provide supporting information to increase basic understanding of approaches;
- Allow for comparability of EM&V practices through the use of a simple, model template/reporting format with supporting consistent definitions;
- Help to reduce administrative costs associated with presenting and reviewing EE program impacts by having a consistent format for reviewing results;
- Enable interested parties to compile data and analyze common practices and associated impacts
- Inform and coordinate with national EM&V needs and reporting efforts.

These key objectives address the needs of not only state energy regulators, but potentially other key audiences, that might include state air quality agencies, state energy offices; federal agencies such as the US Department of Energy, and US Environmental Protection Agency; ISO/RTO system planners;

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<sup>3</sup> *Regional EM&V Methods Guidelines*

<sup>4</sup> The guidelines largely reflect 'best practices' in EM&V approaches in the Northeast, and are aligned with acceptable methods set forth in ISO/RTO forward capacity market M&V manuals. Nonetheless, the perception by some leading EM&V practitioner voices in the region was that the regional protocols would lead to less rigorous EM&V for some states, and moreover would stifle flexibility and creativity in evaluation practices.

<sup>5</sup> <http://www.neep.org/model-emv-methods-standardized-reporting-forms>

<sup>6</sup> Subcommittee members included energy utility regulators, program administrators, air regulators, system operators, and evaluation consulting experts.

program evaluators and implementers; and researchers, among others.

The specific types of questions the forms are designed to address to support the above audiences interests may differ somewhat across the audiences, but also overlap in many areas. These key questions include:

1. **What EM&V method(s) were used?** How were the baseline, verification rates, measure life, and persistence of savings determined? How were gross and net energy and demand savings calculated (deemed savings, engineering desk review, M&V, large-scale billing analysis)?
2. **How reliable are the reported energy or peak demand savings?** How does the EM&V address uncertainty and rigor for a particular study or reported program savings? What was the validity of the results in terms of data quality, how the data were collected, statistical confidence and precision of the results, and appropriateness of the methods to address potential bias?
3. **How do EM&V methods compare across states for similar programs?** Is it the EM&V methodology, program design, or something else that drives differences in savings assumptions when study results and Technical Reference Manual (TRM) values are compared across states?
4. **How do the EM&V approaches used align with any existing state, regional or national EM&V protocols?** The standardized reporting forms do not prescribe a certain EM&V method or protocol, but allow a program administrator or third-party evaluator who conducts a study to reference existing protocol(s) serving as the source for the methods used.
5. **Where should the EM&V reviewer focus his or her attention?** The standardized forms provide sufficient information to address the above questions and can point a reviewer to where they may want to better understand the details of a study (or group of studies), without having to review every study. This helps to streamline the evaluation review process and reduce costs. The user guide to the forms provides general guidance on how to interpret information in the forms, and with state pilots underway, will be modified and improved to support user understanding and application of the reported information.

## Approach

To address the perspectives and needs of different audiences, we created two separate forms: the study form and the program form. As discussed later in this paper, both forms include information related to EM&V methods and rigor, but they present data at different levels of detail and are associated with different activities in the program cycle. Figure 1 compares the purpose of the forms.

Study Form	Program Form
<ul style="list-style-type: none"> <li>• Accompanies impact evaluation study at time of completion</li> <li>• Summarizes objectives, methods, results, and rigor</li> <li>• Responds to need for quick digestion and comparison of EM&amp;V methods used</li> <li>• Primary audiences: program administrators, evaluators, regulators; regional system planners</li> </ul>	<ul style="list-style-type: none"> <li>• Accompanies annual reports of program savings</li> <li>• Summarizes program EM&amp;V strategy, methods, rigor, and supporting documentation</li> <li>• Responds to need for basic information about EM&amp;V practices and rigor supporting reported savings</li> <li>• Primary audiences: energy program and air quality regulators, regional system planners, EPA/DOE</li> </ul>

**Figure 1. Study and Program Standardized Forms in Context**

## Study Form

The study form summarizes key information – including methods, rigor, and results – associated with a specific impact evaluation study. It contains much of the same information that would typically be described in a study executive summary, but condenses the key information into check-box options or yes/no responses. As such, the study form can be described as a standardized executive summary. The study form is designed to be completed and associated with a specific impact evaluation final report.

In developing the study form, the project team noted that Massachusetts and New York were already using templates to summarize findings from evaluation reports of any type. In both states, the Program Administrators were required to complete these study summaries to describe the key objectives, methods, results, and recommendations for each completed EM&V study. Program administrators typically requested the evaluation contractor who performed the study to complete the study summary. In New York, Program Administrators submitted the summaries to the regulatory review team, and in Massachusetts the Program Administrators submitted the summaries with their annual reports. In both states the study summaries are published and available for the public to review alongside the full evaluation report.

To minimize redundancy and reporting burden, the project team developed the EM&V methods study form to build on the existing MA and NY study summaries, so that these states could use the standardized forms in place of their existing forms. We designed the study form first to meet the project objectives of transparently summarizing key EM&V study information, and then compared the forms to the existing study summary templates. To ensure that the study form could be used to replace, rather than add to, the current study summary processes in MA and NY, we expanded the study form to include all information requested in the existing study summaries even if that information is not required to meet the Forum EM&V project objectives.

## Program Form

While each study form summarizes a unique impact evaluation study, the program form summarizes the evaluation strategy and methods for a specific energy-efficiency program in a specific program year. The program form looks similar to the study form in content, format, and length, but typically contains data aggregated over multiple evaluation studies completed over multiple years. In each program form, these aggregated data represent the EM&V strategies and methods that support the savings values reported for the specific program in a specific program year. As such, the form is designed to be completed at the same frequency as the program reporting cycle (typically, annual) and submitted with the Program Administrator's report of program savings.

The project team found no evidence of existing reporting practices comparable to the program form. At most, some Program Administrators described overall EM&V strategies, listed the recently completed evaluations that affect program results, or discussed how recent evaluation results influenced differences between planned and actual savings estimates. When reported, this information was in a narrative format with little structure or consistency to facilitate comparisons across programs or program years.

The program form consolidates the key information necessary to understand and assess the EM&V strategies and activities used to support the program savings values reported for that program cycle. This information includes:

- Reported program savings as a percentage of the overall portfolio, to assess the relative importance of the program in terms of total reported impacts;
- Whether there are newly completed, ongoing, or planned evaluation studies that impact reported

savings;

- The overall EM&V strategy for the program;
- The methods used to determine each of the savings building blocks Figure 2, further below; and
- The assessment of rigor associated with the EM&V methods.

Providing these data at the program level does not require any new research or calculations. (This was an important point to clarify for Program Administrators concerned about the burden of additional reporting requirements). However, unlike the study form for which most data existed in the study executive summary and report, much of these data only exist in disparate informal documentation or in the heads of evaluation managers. The program form attempts to assemble, document, and present these data to help readers understand the big picture of program importance, EM&V strategy, EM&V methods, and validity of the program reported results.

## Key EM&V Information

### How can we briefly summarize key EM&V data for a non-evaluation experts?

The first step to develop the templates for both was to identify the key EM&V information required to meet the project objectives. This involved assessing the information required to respond to the project objectives, any important additional contextual information to help the reader interpret the EM&V information, or currently reported information that could be consolidated in this process.

We categorized these key information into seven sections on the study form and four sections on the program form, and organized the sections to answer four key questions about the methods. Table 1 presents the sections of the study and program forms.

**Table 1. Sections of the Study and Program Forms**

OBJECTIVE	FORM OUTLINE	
	Study Form	Program Form
What results does the EM&V information apply to?	1 – General Information	1 – Program Year Summary
	2 – Study Summary and Results	
What EM&V methods were used to support the results?	3 – EM&V Methods for Gross Savings	2 – EM&V Methods Summary
	4 – EM&V Methods for Net Savings	
What level of rigor is associated with the EM&V methods?	5 – EM&V Rigor Summary	3 – EM&V Rigor Summary
Are the EM&V methods consistent with existing protocols?	6 – Evaluation Protocols	4 – EM&V Protocols
Auxiliary Information	7 – Recommendations	N/A

We organized the sections in both forms to follow a sequence of four questions related to understanding the EM&V methods.

### To what results does the EM&V information apply?

Both forms begin with summary information about the relevant results on which the form is based. This helps the reader quickly understand the background and relevance of the EM&V information in that form.

For the study form, this summary information describes the study's purpose (e.g., to estimate cooling full load hours for ductless heat pumps in single-family residential buildings) and results (e.g., 300 hours per year). The form also provides a series of check boxes to characterize the results by customer sector, state (or region), program design type, energy savings type, and end-use.

For the program form, this summary information defines the program and program year on which the data are based and presents the reported savings data for that program and program year. In addition to the gross or net reported savings, the form presents the program's savings as a percentage of the overall portfolio savings. This contextual information guides the reader about the relative importance of the program (and program EM&V methods) to the overall portfolio. The summary information also asks a few background questions about EM&V.

### **What EM&V methods were used to support the results?**

The second, and largest, group of data in the forms is the characterization of EM&V methods. The study form separates this discussion into two sections – one each on methods for estimating gross and net savings – while the program form consolidates the information into a single section. We discuss the characterization of EM&V methods at both the study and program level later in this paper.

### **What level of rigor is associated with the EM&V methods?**

After the presentation of EM&V methods is a section that focuses on the characterization of rigor<sup>7</sup> associated with the EM&V methods. This is a challenging subject that we discuss later in this paper, but was an important question to address for energy program decision makers. While the previous sections on EM&V methods are designed to provide significant detail on the specific methods used to verify or estimate key parameters, readers still must be knowledgeable about EM&V practices to interpret whether those methods are appropriate for the program and technology, aligned with EM&V best practices, or appropriately rigorous based on the relative importance of the result to the overall savings portfolio. The characterization of EM&V rigor attempts to bridge that gap and help the reader quickly understand the accuracy and reliability of the methods and results.

### **Do the EM&V methods follow existing evaluation protocols?**

Continuing the discussion on the assessment of the EM&V methods, both forms include a section to indicate whether the EM&V methods follow existing EM&V-related protocols. This information supports the assessment of EM&V methods and may give the reader confidence that the methods are appropriate. For example, if an impact evaluation of commercial lighting systems indicates that it is consistent with the US DOE Uniform Methods Savings Protocols for estimating energy savings from commercial lighting systems, then the reader may have confidence that the methods and rigor are appropriate without needing to understand the methods in greater detail.

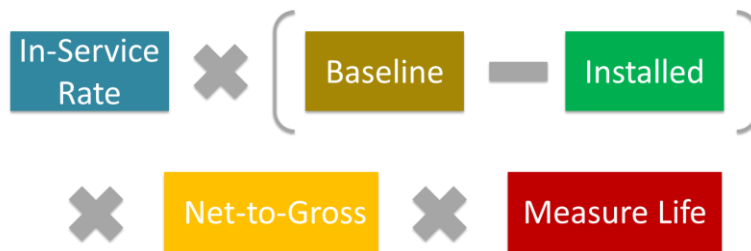
## **Defining EM&V Methods**

A central objective of this project was defining the EM&V methods used to verify savings in a clear, concise, and consistent format. Our first step was to identify the different components of typical energy-efficiency savings calculations. We then used various sources to develop a list of methods for estimating each of those savings components.

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<sup>7</sup> In this paper, we discuss rigor as a measure of the accuracy and reliability of the evaluated result.

Figure 2 shows the five components identified as key building blocks of energy efficiency savings calculations. The figure describes how each component contributes to the calculation of net lifetime savings, a common reporting metric for energy-efficiency programs.



**Figure 2. Key Components of Savings Calculations**

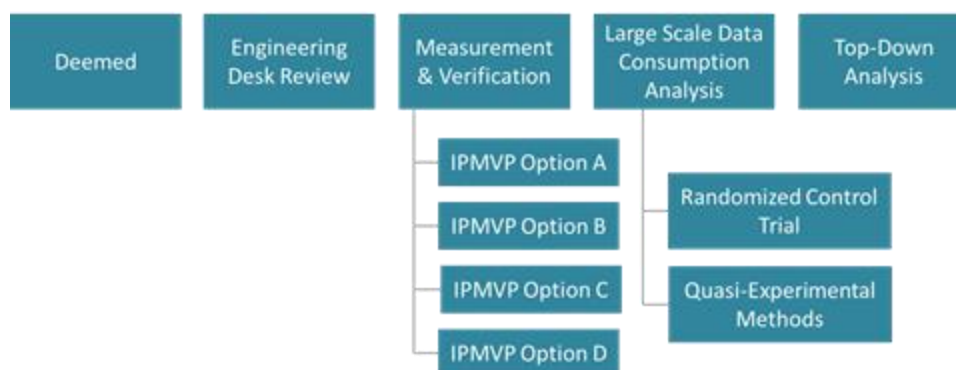
1. **In-Service Rate** represents the verification aspect of EM&V studies, in which the evaluation determined whether the reported measure is installed. Depending on the evaluation design, the in-service or verification may not be a distinct parameter of a calculation.
2. **Baseline** represents the estimate of baseline consumption, or the consumption that did or would have occurred without the energy-efficiency program, projects, or measure. It includes indicators for code, market practice, existing condition, and dual baseline approaches.
3. **Installed** represents the methods for estimating measure performance, or the consumption that occurs as a result of the energy-efficiency measure (e.g., unit energy consumption, or UEC). Since most EM&V studies are performed after measure installation, any measurement or other data collection is typically measurement of the installed condition.
4. **Net-to-Gross (NTG)** represents attribution analysis, or the quantification of savings directly attributable to the energy-efficiency program activities. Most EM&V studies examine NTG factors as a distinct EM&V parameter.
5. **Measure Life** represents the method for estimating the longevity of savings, including considerations for measure persistence, savings degradation, and rebound effects.

These five components represent the building blocks for estimating savings from energy-efficiency programs. Technical Reference Manuals typically present the values of each of these components (or the values of parameters that make up each component) as well as how to combine the components to calculate peak, annual, and lifetime impacts. On the other hand, the Forum EM&V standardized forms describe how those component values described in the TRM were derived.

To systematically characterize EM&V methods, the project developer developed a fixed list of approaches for addressing each of the building blocks. To complete the form, the user must select one of the items in this list that best described the approach to estimating that value.

In this paper, we present the options for component #3: Installed Consumption. In the forms, we describe this section as “Methods for Determining Gross Energy and Demand Savings”.

We referenced the SEE Action Guide to Estimating Savings from Energy Efficiency Programs to develop the list of methods uses for energy-efficiency program evaluation. Figure 3 shows our interpretation of EM&V options described in the SEE Action manual, with five primary categories of EM&V methods, with sub-categories for the Measurement & Verification and the Large Scale Data Consumption Analysis methods (the most common methods for EE programs).



**Figure 3. EM&V Methods for Gross Savings**

When completing the form, the user indicates the appropriate EM&V approach by selecting one or more of the categories that describes the study or program EM&V approach, and provides additional contextual detail in an open-ended text box.

The form also collects numerical data and other details to provide additional information on the EM&V methods. For example, the form requires an indication of the sampling approach (census, sample, or other) and the sample counts. The form also indicates whether and what type of energy data were collected (utility billing data, whole-building interval data, metered power data, or EMS “proxy” data, etc.)

## Characterizing EM&V Rigor

### How can we consistently and fairly assess rigor across program, measure, and evaluation types?

Developing an approach to characterize the rigor associated with the reported EM&V methods was the project’s biggest challenge. Although not among the original project objectives, regulatory stakeholders urged the project team to take one step beyond methods characterization. After reviewing the third iteration of the draft forms, the regulatory stakeholders asked, “Is there a way to translate this condensed EM&V methods information into an assessment of the accuracy, reliability, and appropriateness of the methods used?”

The project team acknowledged the importance of being able to answer this question, especially with increasing levels of scrutiny around energy-efficiency program impacts, but presented these challenges to creating a quantitative or systematic approach to characterizing rigor:

- The level of rigor associated with impact evaluation results depends on factors beyond the selected EM&V method. Other critical parameters include sampling approach, measurement accuracy and bias, the planned and achieved levels of statistical confidence and precision, data quality and evaluator qualifications.
- There are no definitive rules about what constitutes a rigorous evaluation. Differences in measures, program designs, program maturity, participant populations, changing markets, and other factors warrant different evaluation strategies, making it difficult to develop a global set of criteria for rigor, beyond methods.
- Impact evaluations may quantify confidence and precision estimates around evaluated results, but program administrators often do not calculate confidence and precision at the program or portfolio level.<sup>8</sup> Further, performing these calculations may not be meaningful since each

<sup>8</sup> One exception to this is PAs who participate in capacity markets. These PAs quantify precision estimates around their demand reduction values, but only for evaluations that meet the rigorous capacity market M&V requirements.



evaluation result is based on a different EM&V method and may be calculated with different levels of rigor.

The project team determined that it could not develop a comprehensive approach to grading EM&V methods in these first generation forms. Instead, we developed several guidelines to equip stakeholders with information relevant to characterizing rigor. These include:

- Provide the data in a format a user could use to make his or her own assessment of rigor.
- Indicate whether the methods align with best-practices or existing protocols.
- Educate users who are not evaluation experts on how to assess rigor given the form data.

We defined rigor in terms of the validity of the results, based on the quality of the data, appropriateness of the way the data was collected, statistical confidence and precision of the results, and appropriateness of the measurement methods. Therefore, we designed the EM&V Rigor Summary around these four parameters (Table 2).

**Table 2. Methods for Characterizing EM&V Rigor**

Parameter	Definition	Characterization
EM&V Strategy	The overall EM&V strategy describes the approach to validating the reported savings while balancing constraints such as budget and schedule.	Provide a qualitative discussion of the level of EM&V rigor for the program savings by describing the overall EM&V strategy, sources of uncertainty, and the specific factors listed below.
Data Quality	Data quality is judged primarily in terms of vintage and relevance to the program or evaluation. In the standardized form, data quality is assessed in terms data vintage and whether data on various components of the evaluation came from primary or secondary sources.	Indicate whether the EM&V results are based on recent research (w/in 5 years) resulting from primary or secondary research. If the data has not been collected from results within the last 5 years indicate “EM&V results are not based on recent research.” Describe your selection in detail in the space provided as needed.
Sampling Method	Sampling method is an important criterion for rigor. In the context of this form, it is assumed that random sampling is the only acceptable method for data collection. Levels of rigor are simply defined in terms of the fraction of evaluation components where random sampling was applied.	Describe whether all, most, or none of the program components were collected using census or random sampling methods. Describe your selection in detail in the space provided as needed.
Confidence and precision	Confidence and precision (C/P) are defined in terms of the statistical probability (confidence) and standard error of the data used in various components of the evaluation. Due to variations in guidelines for C/P, the form does not set specific precision criteria. Rather, rigor is defined in terms of whether the evaluation components met the planned C/P criteria.	Indicate whether all or some of the program components achieved the planned level of confidence and precision. If the program precision was not quantified select “No quantification of program EM&V precision.” Describe your selection in detail in the space provided as needed.
Measurement Methods	Measurement method related to the internal validity of the results and is a measure of whether the methods used in measurement of data such as surveys, on-site data collection, metering, etc. were applied in a manner to avoid bias in the data collection process.	Describe whether all or some of the program components achieved the planned level of confidence and precision. If the program precision was not quantified select “No quantification of program EM&V precision.” Describe your selection in detail in the space provided as needed.

## Format

### How do we optimize the consistency and quality of data entered in the forms?

A persistent struggle in developing the forms was finding balance between standardization and flexibility. The team recognized that standardization was critical to meeting the project objectives to make information accessible to non-experts and to facilitate the comparison of data across multiple study or program forms. Considering the longer term goal to create an EM&V methods database of

searchable studies, programs, and methods, developing standardized data formats and a common language was critical. However, through stakeholder discussions and testing early versions of the forms with real studies and programs, the team found that it was difficult to fairly characterize EM&V methods without allowing unstructured contextual information.

## Parallel Structure

The final forms present a delicate balance between standardization and flexibility, both critical to providing transparent information. To achieve this balance, the team shaped the forms into a parallel structure that requires a standard response to each question but also offers the user the opportunity to expand on that response in an open-ended format. Figure 4 an excerpt from the “EM&V Methods for Gross Savings” section of the study form, demonstrates this structure.

The screenshot shows a form section with the following elements:

- Title:** Methods for Estimating Gross Impacts
- Instruction:** Describe and characterize the methods for estimating gross and adjusted gross impacts.
- Section Header:** 1. Select method(s) for gross impact analysis:
- Options:** A list of six methods, each with a checkbox:
  - Deemed savings
  - Engineering desk review
  - Measurement & verification
  - Large scale consumption data analysis
  - Top-down analysis (macro consumption)
  - Other (describe below)  Not applicable
- Buttons:** A "more info..." button is located to the right of the options.
- Text Box:** A large empty text box is on the right, labeled "Provide additional description:".

**Figure 4. Methods for Estimating Gross Impacts - Study Form**

In the above standardized section of the study form, the user is asked to “describe and characterize the methods for estimating gross impacts” for the associated evaluation result. The answer to this question is always available in the study report, and typically available in the study executive summary. However, the information is presented in a narrative that may be multiple pages long and may use language and formatting that differs even from other studies that examined the same subject. The Forum standardized form uses the parallel structure to mold these narratives into a structured summary that improves transparency and facilitates comparison without losing important contextual detail.

On the left side of the form, the user must select one or more options from a fixed list of methods that best represents the methods used in the study. The user may also select “Other” which requires an additional description. These options constitute the standardized characterization. On the right side of the form is a text box that allows the user to explain or qualify the menu selection. This text box gives the user flexibility to explain the selection in his or her own words or to provide key contextual information that may be unique to that study, program, or program administrator. Together, the standardized list and the text box summarize EM&V methods in a consistent and easy-to-read format with key information unique to that study or critical to understanding the method (or method selection).

## Web Forms

The team created web forms<sup>9</sup> to ensure consistent and comprehensive data collection, to facilitate future revisions, and to begin examining the feasibility of an EM&V methods database. The web form software supports rules and controls on data fields such as controlling the number and type of characters allowed in a specific data field to relational rules between data fields. The project team used these rules to make certain data fields required (e.g., selecting options from the standardized lists) and others optional (e.g., text boxes for additional narrative). We also created rules to make some questions conditional on the response to previous questions (e.g., the program form only asks the user to specify new evaluation studies only if the user indicates that there are new evaluation studies that impact the reported savings estimates for the current program year).

The web form also helps to aggregate data that the project team could use to guide future development of both the forms and a database. In several sections of the form, the project team determined that further refinements to the forms would be best guided by how users entered data in the in the current version. For example, in the program form's discussion of overall EM&V strategy, some stakeholders preferred the strategy description have more structure while others thought any built-in structure would limit thoughtful insights about unique program strategies. The team decided to leave the open-ended text box and review the real descriptions entered by users before deciding whether to build in additional structure.

The web-based forms use a backend database that makes it easy to compile, sort, and compare all input data. As users complete forms (e.g., for the pilots discussed below), the project team can automatically review data to examine where the forms would benefit from more or less detail or structure.

## Putting the Forms to Use – State Pilots

The EM&V Forum's Steering Committee, made up of energy commissioners from each of the nine participating states adopted the forms in summer 2014, whereby use of the forms in the Forum states is encouraged. The forms are being piloted during summer 2015 to test their application to selected programs and studies for 2014 program year reported results. The pilots test, modify, and ultimately lead to state regulatory adoption of the standardized forms as the EM&V reporting format submitted by program administrators as part of their annual energy efficiency reports. Importantly, for each pilot state, the forms may replace existing reporting requirements (to avoid duplication) and/or supplement such requirements.<sup>10</sup>

The forms will be modified to reflect improvements identified during the pilots, where specific modifications/improvements may be needed to: a) capture study or program scenarios that were not adequately captured in the current forms; b) improve user friendliness for completing the forms; c) improve user guide descriptions and instructions; d) provide improved clarity on use and interpretation of form data; and e) help inform potential development of a database where forms can be saved and queried. The pilots will also help to inform how the standardized forms can support national interest in standardized documenting of state EM&V practices to support inclusion of energy efficiency as a strategy in CAA state SIPs and 111(d) plans.

The pilots will involve various state agencies, including public utility regulators, state energy

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<sup>9</sup> The project team created the forms using FileMaker Pro.

<sup>10</sup> For example, the standardized forms are currently designed to report on impact evaluations, and not process evaluations or market assessments. While the forms may be expanded in the future to include such study types, states in the meantime would likely continue to use any existing state reporting summary formats for non-impact evaluation related studies.

offices, and air quality agencies, along with the program administrators, evaluation consultants to the regulatory agencies, and evaluation contractors. The pilots will focus on a sample of programs to allow for testing simple programs that are supported by only a few studies, and more complex programs where savings are informed by many studies. For each sample program, the supporting study level forms will be completed for each study. A key element of the pilots is to provide hands on training on completing the forms (for contractors and program administrators), and interpreting the forms (for regulators).

The outcomes and deliverables from the pilots will include completed forms, recommendations for improvements, guidelines to support interpretation of reported information, and FAQ sheets. Results from the pilots will be available in September 2015, with preliminary results presented on the panel for this paper in August.

**References:**

Northeast Energy Efficiency Partnerships, Regional Evaluation, Measurement, and Verification Forum.

“Regional EM&V Methods and Savings Assumptions Guidelines.” May 2010. Web link:

<http://www.neep.org/regional-emv-methods-and-savings-assumptions-guidelines-2010-0>

Northeast Energy Efficiency Partnerships, Regional Evaluation, Measurement, and Verification Forum.

“Model EM&V Methods Standardized Reporting Forms for Energy Efficiency, Version 1.0.”

July 2014. Web link: <http://www.neep.org/initiatives/emv-forum/model-emv-methods-standardized-reporting-forms>

State & Local Energy Efficiency Action Network, Evaluation, Measurement and Verification Working Group. “Energy Efficiency Program Impact Evaluation Guide.” December 2012. Web link:

[https://www4.eere.energy.gov/seeaction/system/files/documents/emv\\_ee\\_program\\_impact\\_guide\\_0.pdf](https://www4.eere.energy.gov/seeaction/system/files/documents/emv_ee_program_impact_guide_0.pdf)