



# Common EM&V Methods and Savings Assumptions Project - Executive Summary

## May 2010

For the Regional Evaluation Measurement & Verification Forum  
(Facilitated and managed by Northeast Energy Efficiency Partnerships)



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## Executive Summary

In mid-2009, Northeast Energy Efficiency Partnerships, Inc. (NEEP) engaged KEMA to execute this Common EM&V Methods and Savings Assumptions Project (“the Project”) on behalf of the Regional Evaluation, Measurement and Verification Forum (“the Forum”). The Forum is a regional consortium that is facilitated and managed by NEEP and represents states in New England, New York, and the mid-Atlantic.

This project is comprised of three fundamental tasks or “Parts”:

- A. Review and document common evaluation, measurement and verification (EM&V) methods;
- B. Review and compare energy and demand savings assumptions; and
- C. Develop related advisory guidelines and recommendations.

In a broad sense, the project is intended to help improve and ensure the understanding, transparency, and credibility of both electric and gas energy efficiency resources implemented in the Northeast and mid-Atlantic region as well as the processes used to determine their savings. It is hoped that the advisory guidelines will promote greater consistency and collaboration by highlighting existing commonalities and areas with potential for more compatible savings approaches.

This Common EM&V Methods and Savings Assumptions Project is a study of current practice that culminates in advisory guidelines and EM&V methods for the Forum region. The recommended method is intended to be a basic level of EM&V rigor: the level at which one would achieve parity with prevailing, accepted practice. Alternative methods offer the means of achieving higher levels of rigor, acquiring information necessary for specific measure, program or regulatory environment. These alternative methods may be particularly well suited to more complex or uncertain applications. Program administrators may benefit from selecting a combination of the two approaches to meet a range of regulatory, wholesale market, and environmental objectives/requirements.

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## A Note on Terminology

The phrase “evaluation, measurement and verification (EM&V)” does not refer to a uniform, monolithic discipline. Properly speaking, as shown in the definitions from the Regional EM&V Forum Glossary below, M&V is a subset of evaluation.<sup>1</sup>

*Evaluation* - The conduct of any of a wide range of assessment studies and other activities aimed at determining the effects of a program, understanding or documenting program performance, program or program-related markets and market operations, program-induced changes in energy efficiency markets, levels of demand or energy savings, or program cost-effectiveness. Market assessment, monitoring and evaluation (M&E), and measurement and verification (M&V) are aspects of evaluation.

*Measurement and Verification (M&V)* - A subset of program impact evaluation that is associated with the documentation of energy savings at individual sites or projects using one or more methods that can involve measurements, engineering calculations, statistical analyses, and/or computer simulation modeling.

In common practice, “evaluation” and “measurement and verification” are frequently, but inaccurately, used interchangeably. Three additional definitions from the Forum’s Glossary are incorporated by reference in this report:

**CONFIDENCE** - An indication of how close, expressed as a probability, the true value of the quantity in question is within a specified distance to the estimate of the value. Confidence is the likelihood that the evaluation has captured the true value of a variable within a certain estimated range.

**PRECISION** - The indication of the closeness of agreement among repeated measurements of the same physical quantity. It is also used to represent the degree to which an estimated result in social science (e.g. energy savings) would be replicated with repeated studies.

**RIGOR** - The level of effort expended to minimize uncertainty due to factors such as sampling error and bias. The higher the level of rigor, the more confident one is that the results of the evaluation are both accurate and precise.

This report adheres to the definitions above unless otherwise noted.

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<sup>1</sup> Regional EM&V Forum, [Glossary of Terms](#), Version 1.0, March, 2009.

## Study Approach

The early stages of the Project included a scoping task to define a “priority set of electric and gas efficiency measures” on which to focus the research of this study. Table 1 below presents the final list of fourteen (14) program types/measures selected by the Project Committee.

**Table 1: Priority Set of Program Types/Measures**

Program Types/Measures	
<b>Residential</b>	
Central A/C	Gas Boilers/Furnaces
Comprehensive Multi-Measure (R)	Lighting (R)
<b>Commercial/Industrial</b>	
Comprehensive Multi-Measure (NC)	Lighting (R)
Custom Measures (R/NC)	Motors (NC/TR)
Gas Boilers/Furnaces	Prescriptive Chillers (NC/TR)
HVAC (NC/TR)	Unitary/Split HVAC (NC/TR)
Lighting (NC)	VSDs (R/NC)

For Part A: Common EM&V Methods, KEMA interviewed a sample of Forum program administrators (both from the evaluation staff and implementation staff) and national experts to identify and define the methods participants use for calculating preliminary (ex-ante) savings, determining the inputs to those calculations, verifying installation, calculating evaluated (ex-post) savings<sup>2</sup>, for dealing with the issues of uncertainty and precision and for documenting their efforts. KEMA also reviewed a sample of work products from recent evaluations undertaken within the Forum’s region and a selection of the most commonly referenced existing guidance documents. This research provides a snapshot of evaluation theory and practice among Forum members and an external reference point to inform the development of regional guidelines.

In Part B: Savings Assumptions, KEMA performed a technical review of existing documentation on gross energy and demand savings determination methods, assumptions, and algorithms across the region for the priority set of fourteen electric and gas efficiency measures. This effort culminated in comparative tables of commonalities and differences in savings assumptions and algorithms and specific methods recommendations for improving consistency.

<sup>2</sup> This project reviewed types of methods to determine net savings, but does not make recommendations for net savings methods. This issue is being addressed separately in another EM&V Forum project.



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Finally, Part C: Guidelines employed the results of Parts A and B activities to develop a recommended set of guidelines for fourteen priority measures, including recommendations for crosscutting EM&V parameters. These broad guidelines are intended to establish the basis for common EM&V methods and levels of rigor to be implemented consistently in the region.

## **EM&V Methods (Part A): Trends, Themes & Conclusions**

This section of the Executive Summary provides a high-level overview of evaluation, measurement, and verification procedures used within and outside the Forum region. This overview is derived from surveys conducted with Forum program administrators, a review of selected evaluation studies or work products, and a review of a select set of EM&V guidelines promulgated by external organizations.

The survey of program administrator and evaluator practices found some fundamental commonalities. Respondents uniformly reported a structured approach to estimating and tracking savings, verifying installations, measuring savings, and validating inputs to calculations. The data requirements for these activities were comparable across the respondent pool, even if individual data points may have had different names for different respondents. These structures and inputs for calculating savings are typically codified into a resource, generically called a technical reference manual (TRM).

They also noted that there are a variety of drivers for their selected EM&V methods or approaches, including regulatory requirements, customer and shareholder interests, external market participation, and to inform their own decision making. While there is no comprehensive reference documentation for EM&V analogous to TRMs for savings calculation, respondents generally reported that their methodologies are consistent in some respects with external requirements such as those issued by ISO-NE and PJM for their forward capacity markets. Within this bounded realm of agreement, there are a wide variety of terms, definitions, and methodological approaches.

The review of recent evaluation work products confirmed the survey findings, that there is general agreement in principle as to the need for and practice of evaluation, measurement and verification, but that the specifics vary by participant and situation. Forum participants use a variety of methods to evaluate, measure, and verify savings. In comparison, KEMA's review of existing guidelines from other regions and organizations revealed recommendations for consistent methodologies and levels of rigor within clearly defined categories.

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## **TRENDS**

**More Aggressive Goals and Budgets.** The role of energy efficiency has evolved greatly over the last five and especially in the last two years. The scope of programs and the scale of program budgets are increasing greatly. Very aggressive statewide goals have been developed or are under consideration. Survey respondents stated the below as some of the current drivers behind upcoming changes they have planned to EM&V practices:

- More formal evaluations in response to state policy
- Increasing evaluation budgets along with program budgets
- Greater focus on measured data and a changing industry for C&I

With greater budgets, respondents see 'attribution' becoming a more important issue going forward. With technology rapidly advancing, and increasing number of consumers purchasing energy efficient technologies without incentives, it is becoming more challenging to attribute savings to program activities.

**Participation in Forward Capacity Markets.** Energy efficiency resources are being accepted on par with supply options by the regional organizations responsible for system reliability, as noted in the discussion of the FCM above. These requirements are expanding the scope of evaluation efforts to include increased analysis of demand and peak day impacts.

**Federal Initiatives.** Federal funding for Smart Grid projects and American Recovery and Reinvestment Act projects is flowing into the region. These federal initiatives complement program administrator activities but come with their own evaluation requirements. By funding parallel, but not necessarily coordinated, activities in the market, they may create new challenges for evaluators, especially in regard to attribution of claimed or observed savings.

**Emerging Carbon Markets.** At present there is no national cap and trade system in the United States<sup>3</sup>. The Regional Greenhouse Gas Initiative in the Northeast and Mid Atlantic is the first mandatory market-based CO<sub>2</sub> control effort in the US. This effort, and possible federal requirements for an energy efficiency and renewable energy portfolio standard, may have implications for the evaluation and verification of energy efficiency efforts going forward. Versions of S. 548 (Markey Waxman) included provisions for the Department of Energy to

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<sup>3</sup>A national market-based SO<sub>2</sub> cap and trade program has existed in the United States since its introduction through the 1990's Clean Air Act amendments.

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accept and review compliance reports and establish evaluation, measurement and verification (EM&V) protocols to support a potential energy efficiency standard.<sup>4</sup>

## **THEMES**

**Confusion.** Despite the recent promulgation of a glossary of EM&V terms, inclusion of definitions of terms in the survey that respondents had in advance, and regardless of the length of experience of the respondent, there appeared to be some confusion over terms. The review of existing evaluation guidelines show that program administrators in the region operate under multiple evaluation guidelines with varying degrees of overlap in terms of scope and authority. Definition and nomenclature in many cases are similar enough to be confusing without being clear enough to readily identify the operative reference document. We found that some terms that are not equivalent were used interchangeably, for example “M&V” and “billing analysis.” We also found that some terms, such as “Option A,” referring to a protocol for measurement and verification, had different meanings depending on the context. The “Option A” terminology derives from the International Performance Measurement Verification Protocol (IPMVP), has a similar but not identical definition in the ISO-NE & PJM M&V requirements, and may be used to mean the use of stipulated, as opposed to measured, values. A key challenge for this process is that there is no one regulatory authority with jurisdiction over all uses of evaluation products. This creates the situation where regional guidelines can only be implemented through a process of separate jurisdictions adopting, in their own time and through their own processes, functionally equivalent, if not identical guidelines.

**Consistency.** The survey and review of the evaluation results did not reveal any methodological approaches that were in and of themselves invalid. Rather this research found inconsistent application of tools across the spectrum of measures and measure inputs. For example, billing analysis can be an excellent tool for measuring energy impacts, however, may not be adequate as the sole method for measuring demand impacts despite reported use for this purpose

**Frequency & Focus.** KEMA’s review of evaluation activities in the Forum region and review of survey responses showed that the frequency and focus of evaluation varies across measures and individual measure parameters. In some cases, measures have been thoroughly reviewed multiple times by the same program administrator. In others the evaluation addressed specific

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<sup>4</sup> Statement of Patricia Hoffman, Acting Assistant Secretary for Electricity Delivery and Reliability, United States Department of Energy Before the Committee on Energy and National Resources, United States Senate, April 22, 2009.

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parameters on cycle, for example in the case of lighting where hours of use were studied in one year and coincidence was the focus in the next. Another approach was to rely on previous evaluation efforts where the stakeholders agree there has been no substantive change, in cases of this approach in the same service territory, or where stakeholders agree that the findings in one territory can reasonably applied to another.

In practice, except in case of new or significantly changed measures, evaluation studies often do not attempt a comprehensive review of all measure parameters in one evaluation project. As noted in the Cross Cutting Guidelines (see Sections 4.1.1 et. seq.) the recommend approach includes flexibility to adjust the methods, as in the case of verification, or the timing, as in the case of baselines, to accurately reflect the needs of the stakeholders and the phase of program development. Residential lighting evaluation efforts in the Northeast offer an example of this flexible approach. Evaluation efforts for these measures of late have been focused almost exclusively on determination of net-to-gross ratios. Due to the longevity of programs in this region, the number and quality of evaluation studies, and the relative stability of the market and technology, this focus has been accepted by the stakeholders.

## **CONCLUSIONS**

### **One Reference Standard**

We find that there would be value derived from a comprehensive and consistent set of guidelines for evaluation across the region. Based on the responses to the survey instrument, secondary research, and decades of experience in the field of EM&V across many jurisdictions, we anticipate Forum members would derive at least the following benefits from implementation of regional EM&V guidelines:

- Clear and consistent standards for program evaluations cross jurisdictional lines: Some program administrators operate similar programs in more than one state and may face different evaluation requirements.
- Reduced transaction costs for evaluation: In the absence of clear and consistent guidelines, each evaluation activity, even of the same feature of the same measure, starts from the beginning. Program administrators must draft an RFP to meet the current operative requirements, proposers must confirm a host of requirements, (e.g. confidence and precision) and determine the cost of meeting them, and the design of the research must be tailored to meet the regulatory drivers of the day.
- Increased opportunity for leveraging evaluation efforts: Data acquisition is an expensive activity. In the absence of consistent guidelines, the data collected for one utility or

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program may not be applicable for another. It also creates a situation where small samples in many areas may provide less rigor for the results than one large sample over the same area would.

- Increased influence outside the region: In the event a national requirement for energy efficiency is enacted, members of the Forum will be in a better position to help define national EM&V standards. They will be able to take a leadership position on the national stage, with experience in the development and implementation of evaluation guidelines that transcend state boundaries. The alternative is to be a group of small individual voices advocating each for their own methods. Combined, the states in the Forum represent twice the load of California. Individually, their voices may not be heard.

These are only a few of the benefits we anticipate. We also expect that a regional approach would increase the quality of evaluation results, would make the Forum's evaluation requirements more attractive to vendors, and would reduce the overall cost of evaluation, freeing up more funding for program implementation.

## **The Challenges of Consistency**

**Challenges.** While the overarching goals and objectives of these guidelines are supported by Forum participants, there are a number of important challenges that need to be considered in applying the guidelines on a state by state basis. First, while there are some common policy concerns across the states that drive energy efficiency investments, states tend to prioritize their policy concerns differently, and as such there are significant differences in the magnitude and comprehensiveness of state efficiency programs (i.e., the number of programs, size of programs and program budgets), and associated EM&V resources that states can expend. Additionally, for each state, the EM&V life cycle varies by program (e.g., frequency of conducting evaluations), so the need for resources in any given year varies. For these reasons, there are inherent differences in the rigor of evaluation efforts across the region. For example, some states participating in wholesale forward capacity markets are likely to be more concerned with rigorous demand savings than those that do not, or some may simply place less emphasis on focusing EM&V efforts around FCM requirements, while others focus more on meeting economic and climate change goals (i.e. energy savings), or meeting policies to procure all cost-effective energy efficiency.

In addition to differing policy frameworks and timetables, each state has its own set of regulatory processes and collaborative arrangements. These differences make it challenging to move states towards greater consistent use of EM&V practices in a timely and consistent manner. In short, the process is complicated and nuanced. These challenges do not make it impossible or

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undesirable to make progress toward more consistent EM&V methods, but they are real issues that need to be addressed and considered by states in adopting these guidelines, with the recognition that moving towards greater consistency will take some time.

**Key Caveats.** While the Guidelines are developed for specific measures, several caveats are important to consider in their application:

1) The guidelines recommend approaches to evaluate the savings from specified individual measures and program types that are based on new or replacement measures. The particular measures and programs types presented were intended to provide bounds that address common program offerings and may not apply to all programs. Other program designs may necessitate use of methods that do not fit into the methodological approaches presented in the guidelines. Further, a common strategy is to do in-depth studies of individual savings parameters for a particular class of measures, an approach that can enhance the reliability of savings estimates in the long run, but, because it ignores other parameters, this approach may be inconsistent with the basic level of rigor in the guidelines. As such, it should be noted that these guidelines are targeted at studies that are intended to comprehensively estimate the multiple impact parameters that drive savings, and are not consistently applicable to focused studies that are intended to zero-in on individual parameters or subsets of parameters.

2) In application, the methods used on a program/measure specific basis may vary depending on the proportion or weight of a program's expected savings as a percent of total portfolio of savings. Regardless of what the mix of policy concerns is, in deciding what level of rigor to pursue in each individual study, it is important to focus on the sources of uncertainty bearing on the overall program portfolio (not necessarily the individual components), and to strategically allocate EM&V resources accordingly.

3) The guidelines do not make any recommendations with regard to evaluation timing or the transferability of evaluated results in different applications. These are complex issues that have significant implications with regard to the resources required to perform 'primary' EM&V across all programs/measures. KEMA found that current practice included application of evaluation results from one service territory to another service territory within the same state, and that some studies are designed for use across the Forum region. However, this study did not discover evidence that validity implications of data transferability have been explicitly, consistently, and transparently addressed, nor that standards exist to define the appropriate cycle of review for various measure inputs. KEMA recommends that the Forum undertake research to inform guidelines on transferability and review cycles to help ensure that the results are valid, appropriate, and reasonable.

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## **Savings Uncertainty and Validity**

Savings certainty is based on a range of parameters including: confidence/precision requirements for statistical sampling, and other sources of error such as measurement error, equipment accuracy, and parameter bias. Most M&V manuals (ISO New England, PJM, Federal Energy Management Program (FEMP), American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE)) include guidelines for controlling measurement error, equipment accuracy and parameter bias. In an effort to expand the uncertainty dialogue beyond statistical precision, this report includes a section on Other Sources of Uncertainty and Threats to Validity. The evaluation community is only beginning to grasp the importance and implications of this issue. The Forum is calling for a more balanced treatment of the true sources of uncertainty bearing on evaluation results, and KEMA hopes that Section 4.1.5 will draw attention to the vast number of threats to validity beyond statistical precision.

Understanding – let alone achieving – the statistical precision requirements across the region today are a real challenge. This issue is discussed at greater length in Section 2.6. For many years, the standard precision target for evaluated annual energy savings was based upon requirements in the 1978 Public Utility Regulatory Policies Act (PURPA). Now standards defined in regional capacity markets are emerging as key precision objectives. There is a host of complicating factors including: differences between the ISO-NE and PJM requirements; appropriately defining the domain for the analysis; balancing the importance and cost of increased confidence and precision with the impact or requirements; and compensating for a variety of sources of error.

Statistical methods provide the opportunity to characterize the whole from observations of a part. As energy efficiency's role in system operations, and the amount of money involved, increases so does the importance of accurately and appropriately characterizing its impacts. The discussion and recommendations in Section 2.6 (with the recommendations reiterated in Section 4.1.4) are offered as a starting point for what is likely to be an iterative decision making process.

## **Regional Readiness**

Some of the prerequisite conditions necessary for developing a geographically broad-based approach exist in the study region. These include the presence of external drivers (the forward capacity markets), a substantial investment in the activity in question (evaluation), duplicative or closely similar activities being undertaken by multiple parties, overlapping spheres of influence, confusion in the marketplace, and uncertainty about future requirements. Precedent exists in



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developing common EM&V protocols and savings assumptions in the energy efficiency industry, that being in the northwest region, where the Northwest Regional Technical Forum (RTF) developed and maintains EM&V protocols<sup>5</sup> and an on-line savings assumptions database for four states in the NW region. In California, the Public Utilities Commission approved a comprehensive set of consistent Savings Protocols by which the state's large utilities must comply. This report references the important and relevant experience of other regional/state protocols in developing the Guidelines herein, and are examples of relative success in improving consistency and creating a common currency for energy efficiency savings.

While there are indeed challenges to adopting common EM&V approaches across the Forum, largely driven by individual state focus on meeting state specific goals and needs, we believe that the barriers to adoption of a regional EM&V protocol are surmountable, and that the effort is worthwhile. The NW and California processes were driven by regional entities in the case of the NW and the regulator in the case of California. The process for accomplishing more coordination in the Northeast may need additional support to be successful.

## **Savings Assumptions (Part B): Prevailing Themes**

Section 3 of this report presents the Part B effort and includes measure-specific sections which provide a measure overview, summary of research sources, the prevailing savings algorithm(s) with commentary, a comparative table of savings assumptions used by Forum states or program administrators (with commentary), and recommendations to improve consistency in savings assumptions. While Sections 3.3.1 through 3.3.14 contain measure-specific recommendations, some common themes, which are technical in nature, resound throughout, such as:

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<sup>5</sup> From the Charter of the Regional Technical Forum of the Pacific Northwest Electric Power and Conservation Planning Council: Background: In 1995, the Bonneville Power Administration (Bonneville) began to shift responsibility for financing and acquiring conservation savings over to its utility customers. This shift in responsibility was intended to reduce Bonneville's costs and permit utilities to better tailor their programs to local situations. Congress recognized that one implication of this shift would likely be a more diversified approach to conservation acquisition across the region. Consequently, in 1996 it directed Bonneville and the Northwest Power Planning Council (Council) to convene a Regional Technical Forum (RTF) to develop standardized protocols for verifying and evaluating conservation savings. This is necessary because the historical program costs and savings may not be applicable to radically redesigned conservation programs. Congress further recommended that the RTF's membership include individuals with technical expertise in conservation program planning, implementation, and evaluation and that its services be made available to all utilities in the Northwest.

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**Combine Coincidence Factors.** Some measure/entities disaggregate the demand factors that are used to derive seasonal coincident peak demand impact from a non-coincident or connected demand impact. Such factors include discrete load, diversity, and coincidence factors. A single, combined factor that reflects local loading, diversity, and coincidence effects would simplify computations and permit “apples to apples” comparison of coincidence factors across states/regions.

**Develop Localized Assumptions.** While nearly all measures examined herein have potential for regional standardization of savings methods, there are few measures for which savings assumptions or stipulated values are truly portable, i.e. appropriate for use across all markets, geographies, technologies, etc. Just as weather-dependent measures require savings assumptions that reflect typical meteorological conditions, other measures require similar consideration. Regional consistency does not mean adopting identical assumptions; it will be appropriate to develop localized assumptions for hours-of-use and peak coincidence for most measures in order to reflect local characteristics of climate, demographics, and behavior.

**Standardize or Expand Dimensions.** Depending upon the nature of the measure or savings algorithm, researchers see benefit in some selective standardization or expansion of the breadth of savings assumptions. For instance, residential programs that currently use a single, whole-home estimate of lighting hours-of-use might benefit from expanding to room-level (e.g. bedroom, kitchen, garage) hours-of-use resolution. Conversely, commercial motor measures with discrete savings assumptions for dozens of facility types might benefit from standardizing on a more manageable set of buildings.

**Eliminate or Utilize Loading Factors.** For several of the priority measures, one of the recommendations is to eliminate a discrete “loading factor” from the savings algorithm. Also evident in “Combine Coincidence Factors”, this recommendation strives to eliminate unnecessary complexity from prescriptive savings algorithms. In principle, all measures employing “Equivalent Full Load Hours” as the time term in the equation should recognize that the EFLH already handles part-loading effects. One of the technical manuals reviewed would need to *add* a loading factor to the efficient motors algorithm in the interest of accuracy and consistency with this recommendation.

**Stipulate or Calculate.** Amongst the more basic priority measures such as lighting, some entities use stipulated savings values. In general, stipulated estimates are in the minority, but the method offers consistent, reasonable, and quick savings estimation for highly standard measures. While a regional consistency effort might necessitate a decision between stipulated or calculated estimates, a compromise seems appropriate for lighting measures. Demand

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reductions by lighting technology are logical stipulations as inputs, and a consistent algorithm would allow for localized tuning of hours and coincidence for savings impacts. Ultimately, stipulated savings values for lighting should be based upon calculations that include clear assumptions for fixture wattage, hours, in-service rate, coincidence, etc.

**Recognize Delivery Mechanism.** It is important to recognize that savings methods and assumptions can differ substantially by program delivery system. For instance, residential “retail” lighting programs require broader assumptions regarding hours of use due to uncertainty of lamp placement, whereas direct install programs can refine operating hours by room type. Similarly, the same C&I technology can possess different savings characteristics under a Prescriptive and Custom delivery mechanism. While the fourteen measure categories in this section did not include much program delineation, any standardization of savings methods/assumptions ought to capture the influence of program delivery.

## Recommended Guidelines (Part C)

The guidelines themselves were designed to be concise characterizations of the recommended savings methods and assumptions for each of the fourteen measures, supplemented by guidelines for specific cross-cutting issues. The guidelines were based on the part A and part B research as well as on KEMA’s professional judgment. For each measure, these summary guidelines include:

- The prevailing algorithm for energy and demand savings;
- Commentary on the algorithm and a description of inputs;
- Opportunities for improved consistency or where differences are warranted;
- Recommended methods for:
  - Estimating preliminary “tracking” savings;
  - Verification of installations\*;
  - Determining baseline conditions\*;
  - Determining measure life and persistence\*;
  - Calculating gross Energy and Demand “evaluated” savings
    - Basic evaluation M&V approach
    - Alternative M&V approaches to enhance the accuracy or rigor of savings;
- Savings Uncertainty and Validity - considerations on savings rigor, including statistical sampling and validity of savings estimates\*.

*\*Cross cutting recommendations*



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The final guideline publication will be a Forum product titled *Regional EM&V Methods and Savings Assumptions Guidelines*, which includes a preface prepared by NEEP (in consultation with Forum participants), followed by the guidelines presented in Section 4 of this report that cover pertinent cross-cutting EM&V issues and the fourteen measure-specific guideline summaries. Detailed research results such as interview responses (Part A results) and savings assumption values used by Forum states (Part B results e.g. hours of use equals 350 full-load equivalent hours) are not captured in the Forum Guidelines but are available in the full KEMA report.