



# **What's in Your EM&V Genome? Improving Transparency and Understanding of EM&V Practices through Standardized Reporting**

**Julie Michals, NEEP**

Paper Co-Authored with Arlis Reynolds and Hossein Haeri (Cadmus Group), and David Jacobson (Jacobson Energy Research)

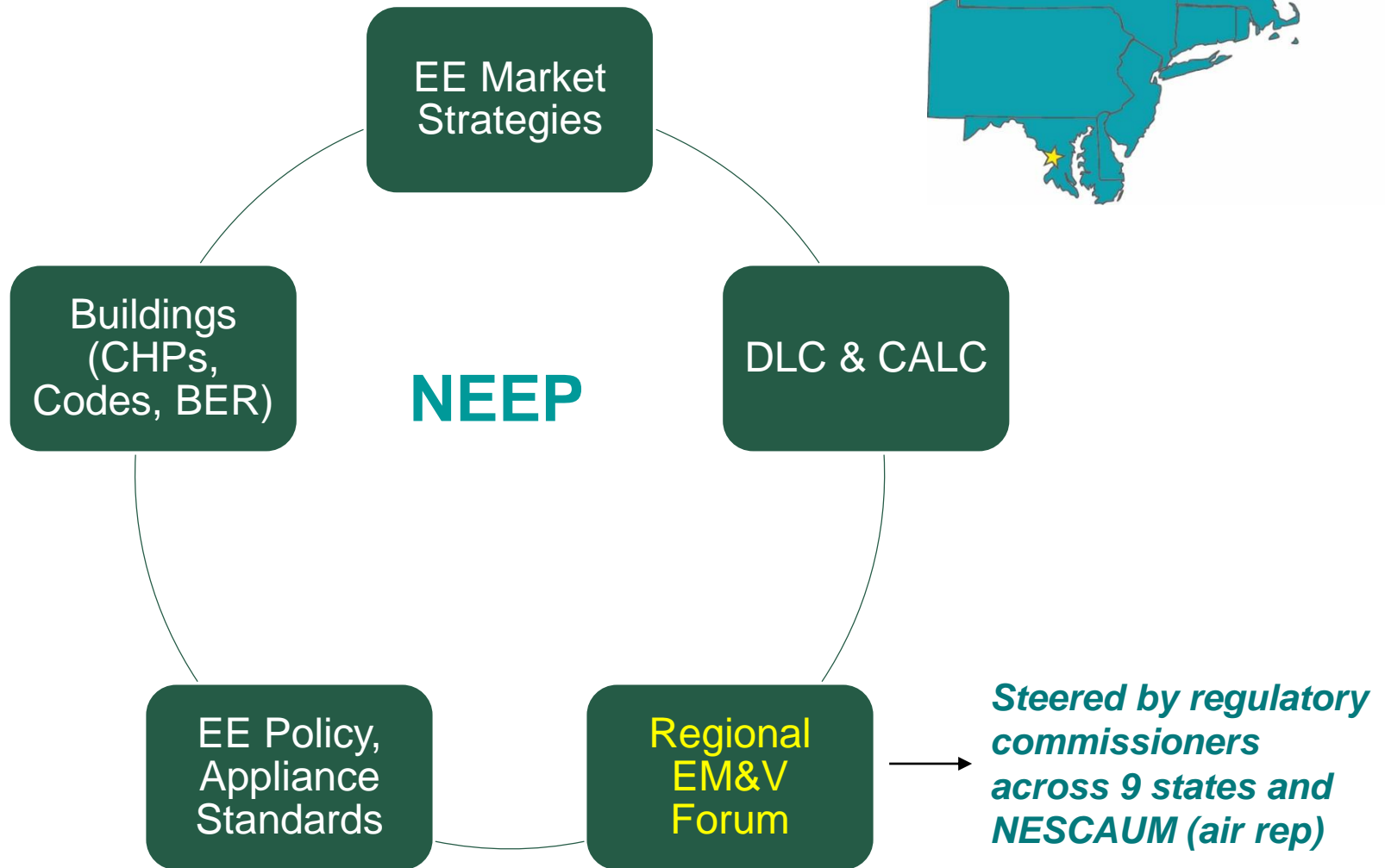
**2015 IEPEC Conference — Long Beach, California**

# OVERVIEW

- About NEEP
- Background: Standardized EM&V Methods Reporting Forms
- The Forms: Study and Program Level Reporting
- State Pilots: MA Results to Date
- Next Steps

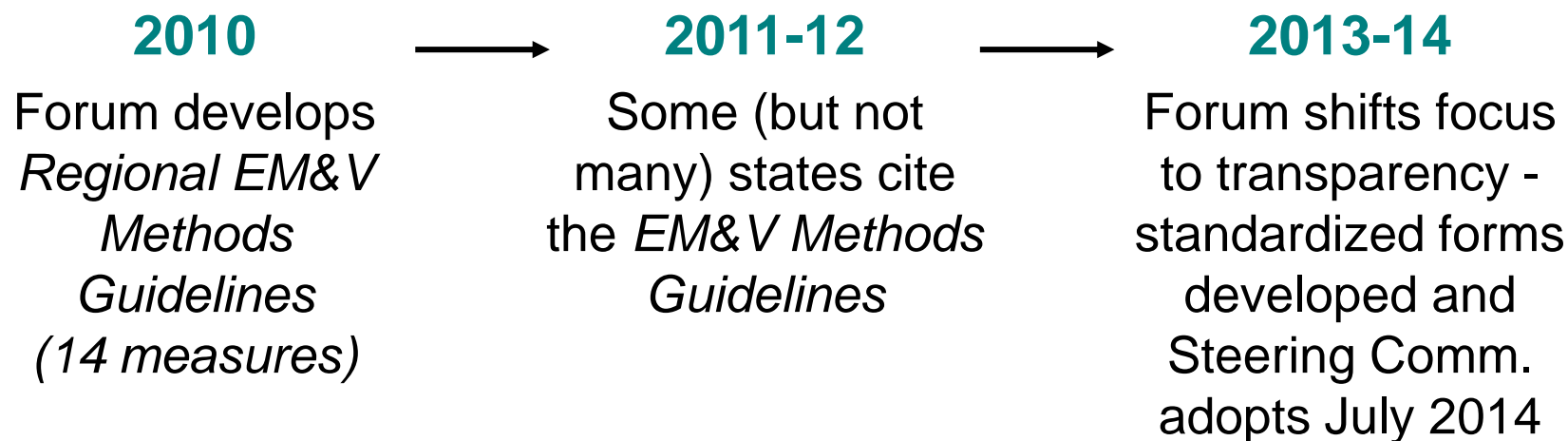
# ABOUT NEEP

## Regional EM&V Forum



# STANDARDIZED EM&V METHODS REPORTING

## A Project of the Regional EM&V Forum



*Overarching Goal: Build transparency and understanding of EM&V practices to support inclusion of EE resources in state, regional and national energy & environmental policies and markets*

# WHY STANDARDIZED EM&V METHODS REPORTING?

## The 'Food Label' for Various Audiences

PUCs, DEPs, EPA, SEOs, system planners, PAs, evaluation consultants want to know:

- What EM&V methods were used to estimate reported savings?
- How rigorous are the reported EE savings?
- How do EM&V methods compare across states?
- How do EM&V methods used align with existing state, regional or national EM&V protocols?
- Where should I focus my attention in review of specific studies and program EM&V?
- How can I streamline my evaluation review process and reduce administrative costs?

| <b>Nutrition Facts</b>  |                       |         |         |
|---|-----------------------|---------|---------|
| Serving Size 1 Banana (130g)  |                       |         |         |
| Servings per Container 1  |                       |         |         |
| Amount Per Serving  |                       |         |         |
| Calories 300  | Calories from Fat 130 |         |         |
| % Daily Value*  |                       |         |         |
| Total Fat 16g   | 24%                   |         |         |
| Saturated Fat 8g  | 39%                   |         |         |
| Trans Fat 0g  |                       |         |         |
| Cholesterol 0g  | 0%                    |         |         |
| Sodium 15mg   | 1%                    |         |         |
| Potassium 320mg   | 9%                    |         |         |
| Total Carbohydrate 44g  | 15%                   |         |         |
| Dietary Fiber 4g  | 16%                   |         |         |
| Sugars 32g  |                       |         |         |
| Protein 2g  |                       |         |         |
| Vitamin A   | 2%                    |         |         |
| Vitamin C   | 15%                   |         |         |
| Calcium   | 2%                    |         |         |
| Iron  | 6%                    |         |         |
| Riboflavin (Vitamin B2)   | 4%                    |         |         |
| Vitamin B6  | 15%                   |         |         |
| Folate  | 4%                    |         |         |
| Magnesium   | 6%                    |         |         |
| Copper  | 4%                    |         |         |
| Manganese   | 10%                   |         |         |
| * Percent Daily Values are based on a 2000 calorie diet. Your daily values may be higher or lower, depending on your calorie needs: |                       |         |         |
|   | Calories              | 2,000   | 2,500   |
| Total Fat   | Less than             | 65g     | 80g     |
| Sat Fat   | Less than             | 20g     | 25g     |
| Cholesterol   | Less than             | 300mg   | 300mg   |
| Sodium  | Less than             | 2,400mg | 2,400mg |
| Total Carbohydrate  |                       | 300g    | 375g    |
| Dietary Fiber   |                       | 25g     | 30g     |

# PROJECT TEAM AND STAKEHOLDERS

## Extensive Input in Developing the Forms...

- **NEEP** – Julie Michals, Project Manager
- **Cadmus Group** – Developed on-line forms, conducting state pilots & training, modifications to forms, develop database – **Arlis Reynolds, Project Manager**
- **Technical Advisors** – Steve Schiller (for LBNL); David Jacobson (Jacobson Energy Research)
- **Forum Project Advisory Committee**
  - Forum state representatives (PUC, DEP, SEO reps) and respective evaluation consultants
  - Program Administrators
  - DOE, EPA, NESCAUM
  - Regional system planning reps (ISO New England)

# THE FORMS – DIGITAL PLATFORM

NEEP REGIONAL EVALUATION, MEASUREMENT & VERIFICATION FORUM

Developed by The Cadmus Group

CADMUS

**Welcome to the EM&V Methods Standardized Reporting Forms**  
**A Project of the Regional EM&V Forum**  
*Facilitated and managed by Northeast Energy Efficiency Partnerships, Inc.*

*Click the button below to create a new Program EM&V Summary Form.*

**PROGRAM EM&V METHODS SUMMARY FORM**

*Click the button below to create a new Study EM&V Methods Summary Form.*

**IMPACT EVALUATION STUDY EM&V METHODS SUMMARY FORM**

[Click here to access the full User Guide...](#)

[E-mail questions or comments about the forms...](#)

*This Project is supported by funding from the [Regional EM&V Forum States](#), the US Department of Energy, and the Lawrence Berkeley National Lab.*

U.S. DEPARTMENT OF ENERGY

BERKELEY LAB

# THE FORMS

## Two Levels

### Study Form

- Accompanies evaluation study
- Summarizes objectives, **methods**, results, and application of results
- Responds to need for quick digestion and comparison of EM&V methods used
- Primary audiences: state energy and air regulators, PAs, evaluation consultants, regional system planners

### Program Form

- Accompanies annual reports
- Summarizes **general** methods and **precision** for EE portfolios
- Responds to need for basic information about EM&V practices and high-level summary of EM&V rigor for reported savings
- Primary audiences: state energy and air regulators, SEOs, EPA, DOE, regional system planners, PAs



# FORM CATEGORIES

## Program Form

1 – Program Year Summary

2 – Program **EM&V Methods** Summary

3 – Program **EM&V Rigor** Summary

4 – Relevant EM&V Documents/Protocols

## Study Form

1 – General Information

2 – Study Summary and Results

3 – **EM&V Methods** for Gross Savings

4 – EM&V Methods for Net Savings

5 – Study **EM&V Rigor** Summary

6 – Relevant EM&V Docs/Protocols

7 – Recommendations

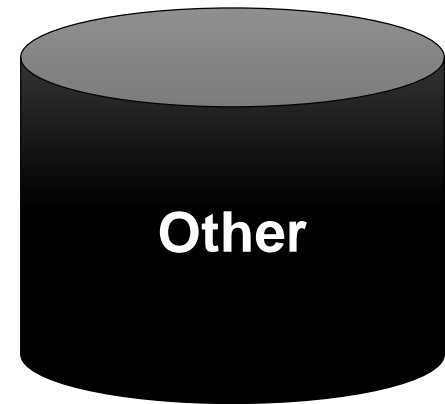
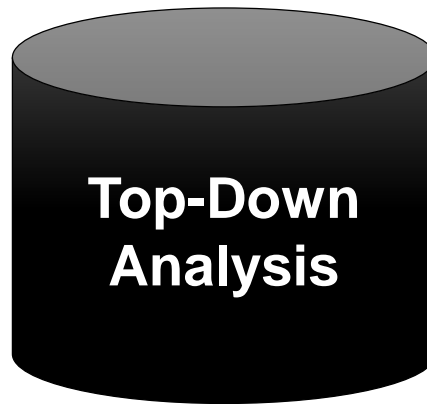
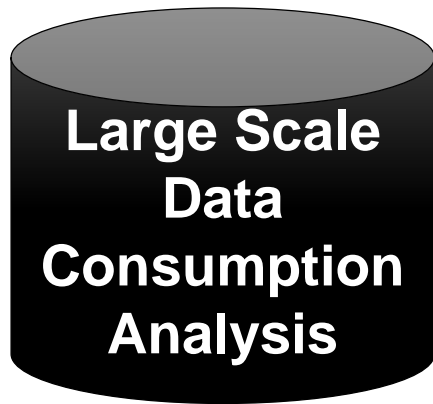
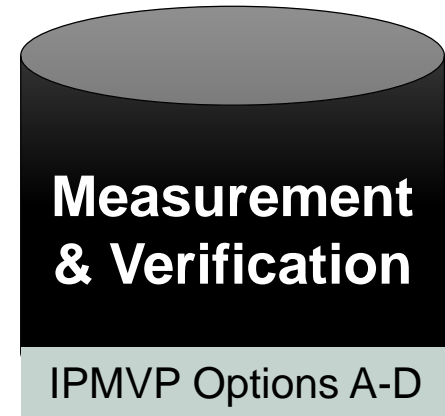
# EM&V METHODS

## Key Building Blocks of EE Savings Calculation



# EM&V METHODS FOR GROSS SAVINGS

Based on SEE Action EE Program Impact Evaluation Guide



Randomized Control Trials

Quasi-Experimental Methods

# EM&V METHODS

## PROGRAM FORM

EM&V Methods

Methods for Estimating Baseline

Methods for Verifying Installation

Methods - Energy and Demand Savings

Net Savings Estimation

Measure Life

Persistence Estimation

## STUDY FORM

EM&V Methods for Gross Savings

Methods for estimating baseline

Method for installation verification

Methods for gross impact analysis

Sampling for gross impact analysis

Data collection methods for gross impacts

EM&V Methods for Net Savings \*

Methods for net impact analysis

Sampling for net impact analysis

\* Based on US DOE UMP

# EM&V RIGOR

## Key Elements

### Characterizing EM&V Rigor

EM&V Strategy

Data Quality

Sampling Methods

Confidence and Precision

Measurement Methods

# EM&V DOCUMENTS

## Referencing Protocols Used

Relevant EM&V Documents

National Protocols

Regional/State Protocols

Relevant EM&V Studies

# FORM FORMAT

## Mix of standardized and 'open-ended'

**Methods for Estimating Gross Impacts**  
Describe and characterize the methods for estimating gross and adjusted gross impacts.

**1. Select method(s) for gross impact analysis:**

Deemed savings  
 Engineering desk review  
 Measurement & verification  
 Large scale consumption data analysis  
 Top-down analysis (macro consumption)  
 Other (describe below)  Not applicable

**2. Select sampling method(s) for gross impact analysis:**

Census                      Sampling Unit   
 Sample                      Participant Sample Size   
 Other                      Non-Participant Sample Size   
 Not Applicable

Provide additional description:



structured response



flexible response

# FORM GUIDANCE

## User Guide and 'Info' Functions

The image displays two overlapping screenshots from a web application. The top-left screenshot shows the main interface with the following elements:

- Logo: ne ep REGIONAL EVALUATION, MEASUREMENT & VERIFICATION FORUM
- Header: Welcome to the EM&V Methods Standardized Reporting Forms, A Project of the Regional EM&V Forum, Facilitated and managed by Northeast Energy Partnerships, Inc.
- Buttons: "Click the button below to create a new Program EM&V Summary Form." (circled in red), "IMPACT EVALUATION EM&V METHODS SUMMARY FORM", "Click here to access the full User Guide..."
- Logos: U.S. DEPARTMENT OF ENERGY, BERKELEY L.A.M.
- Text: "This Project is supported by funding from the Regional EM&V Forum States, the US Dept..."

The bottom-right screenshot shows a detailed view of the "Characterization of EM&V Rigor" form:

**Characterization of EM&V Rigor**  
The following four questions aim to provide information on the overall rigor of the evaluation. In the context of this form, we based on (1) the quality of the data, (2) appropriateness of the way the data was collected, (3) statistical confidence in measurement methods.

- 1. Data Quality**
  - All study components are recent and based on primary research.
  - Most study components are based on recent and secondary research.
  - Study EM&V components savings are not based on recent research.

more info...
- 2. Sampling Method**
  - All study components use census or random (incl. stratified) sampling methods.
  - Most study components use census or random (incl. stratified) sampling methods.
  - Study components use non-random sampling methods.

more info...
- 3. Confidence and Precision**
  - All study components achieve the planned level of confidence and precision.
  - Some study components did not achieve the planned confidence and precision.
  - Study components did not quantify confidence and precision levels.

more info...
- 4. Measurement Methods**
  - Measurement methods address all major sources of bias.
  - Measurement methods address some major sources of bias.
  - Measurement methods do not address potential sources of bias.

more info...

Describe your selection:

Four empty text boxes are provided for user input.



# STATE PILOTS

## Purpose

- Pilots serve to test, modify, and ultimately lead to state regulatory adoption of the standardized forms as the EM&V reporting format submitted by PAs as part of annual EE reports
- Forms will be modified to reflect improvements identified during the pilots
  - Capture study or program scenarios that were not adequately captured in the current forms;
  - Improve user friendliness for completing the forms;
  - Improve user guide descriptions and instructions;
  - Improve clarity on use and interpretation of form data; and
  - Help inform potential development of a database where forms can be saved and queried.

# MASSACHUSETTS PILOT

Summer 2015 – in process

Pilot Scope - 2014 Program Year:

- Residential Behavioral Program
  - 10% of statewide MWh savings (1 study)
- Residential Lighting Program
  - 19% of statewide MWh savings (5 studies)
- Large C&I Retrofit Program
  - 26% of statewide MWh savings (21 studies)

**Study** and **Program** Level Forms being piloted, but results are in only for Study forms ...

# MA PILOT

## Feedback to Date – Study Level Forms

- Study forms are quick to complete (< 1 hour)
- Information is available - challenge is characterizing studies consistently
- Description of studies needs fine-tuning (e.g., is ‘upstream’ a program type or delivery method?, etc.)
- Improve reporting for input parameter studies that don’t report gross or net savings
- Study Results
  - Need to clarify reporting results for larger studies with multiple sponsors (all state PAs or reporting PA only?)
  - Not clear which results PAs ultimately use – need to link or cross check with TRMs
- Updating User Guide in parallel with Pilot feedback

# EM&V METHODS STANDARDIZED FORMS

## Next Steps

1. Complete MA Pilot (August) – fully test Program Form; regulatory review and interpretation; summary report
2. Additional state pilot (Fall 2015) – TBD
3. Training/demos for Forum states, EPA, DOE (Fall 2015)
4. Coordinate with national efforts: EPA SIPs, CPP, TCR EE Registry (on-going); and with other REEOs
5. Modifications to forms (Fall 2015 – Winter 2016)
6. Develop database for completed forms (2016)

Seeking to leverage state funding with US DOE, private foundations, other funding sources...

# FOR MORE INFO...

Regional EM&V Forum:

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

Steering Committee adopted:

[Standardized EM&V Methods Reporting Forms](#) (in Word)  
and on-line filemaker forms: [Digital EM&V Methods Forms](#)

Regional EE Database (REED) – Forum States common  
EE savings etc. reporting platform at: [REED](#)



# QUESTIONS?

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