



**Policies for Energy Provider Delivery of Energy Efficiency North American Regional
Policy Dialogue
Washington, DC, April 2012**

**Practical Simplifying How We Count EE – How To Save
On M&V and Accommodate Scaled-up EE Programme
Delivery**

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Topics

- ❑ Energy Efficiency Program Evaluation Basics
- ❑ Evaluation Issues
- ❑ State of the Art



Energy Efficiency Actions in Public Policy Context



***There is a continuum of actions.
Our goal is to greatly accelerate and
“feed” (widen) this continuum of actions.
EM&V is a tool support these actions***

A large, light-orange arrow pointing from the bottom-left towards the top-right, representing a continuum of actions. Three colored circles (red, green, blue) are placed along the arrow's path, corresponding to the stages: RD&D, Deployment, and Transformed Markets.

RD&D

- Research
- Development
- Demonstration

Deployment

Voluntary implementation of projects and programs – outreach, education, subsidies, for example:

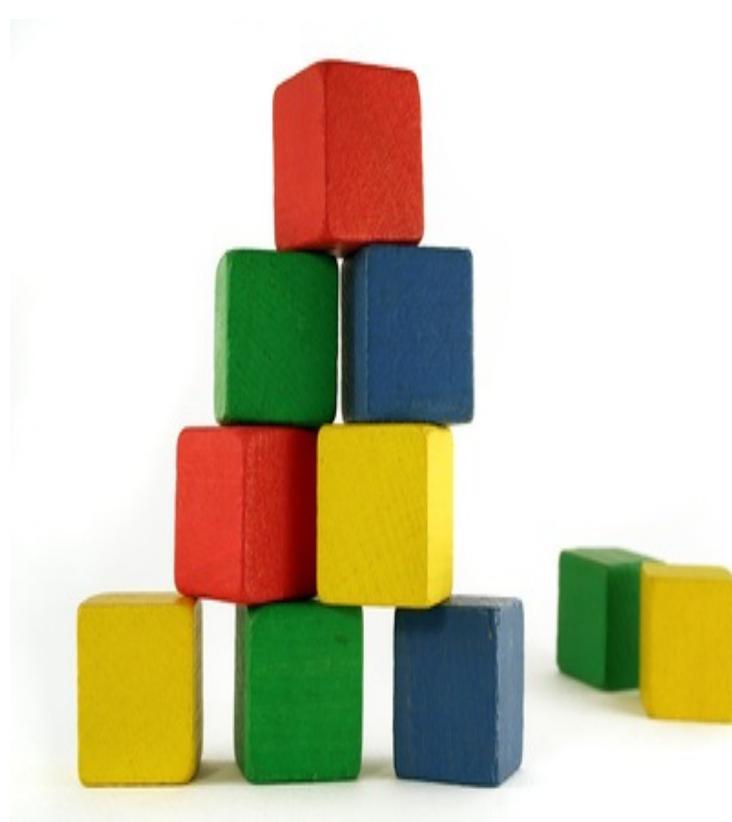
- Incenting early actors
- Incenting consumers, distributors, manufacturers
- Mass market and individual market strategies

Transformed Markets

Standard practice
or

Codes and standards

Energy Efficiency Program Evaluation Basics



Definitions – EM&V



- **Evaluation** - The performance of studies and activities aimed at determining the effects of a **program or portfolio**
- **Measurement and Verification** – Data collection, monitoring, and analysis associated with the calculation of gross energy and demand savings from **individual sites or projects**. M&V can be a subset of program evaluation.
- **EM&V** - The term “evaluation, measurement, and verification” is frequently seen in efficiency evaluation literature. EM&V is a catchall acronym for determining both program and project impacts.

Why Evaluate?



- **Quantify Results:** Document and measure the energy savings of projects and programs in order to determine how well they have met their goals; e.g., has there been a good use of the invested money and time? **Provide PROOF of the effectiveness of energy management.**
- **Understand why the effects occurred:** Identify ways to improve current and future projects and programs as well as select future projects. **“You can’t manage what you don’t measure” and “Things that are measured tend to improve”.**
- **Resource Planning:** To support energy resource planning by understanding the historical and future resource contributions of energy efficiency as compared to other energy resources. **Provide data to support efficiency as a reliable resource.**

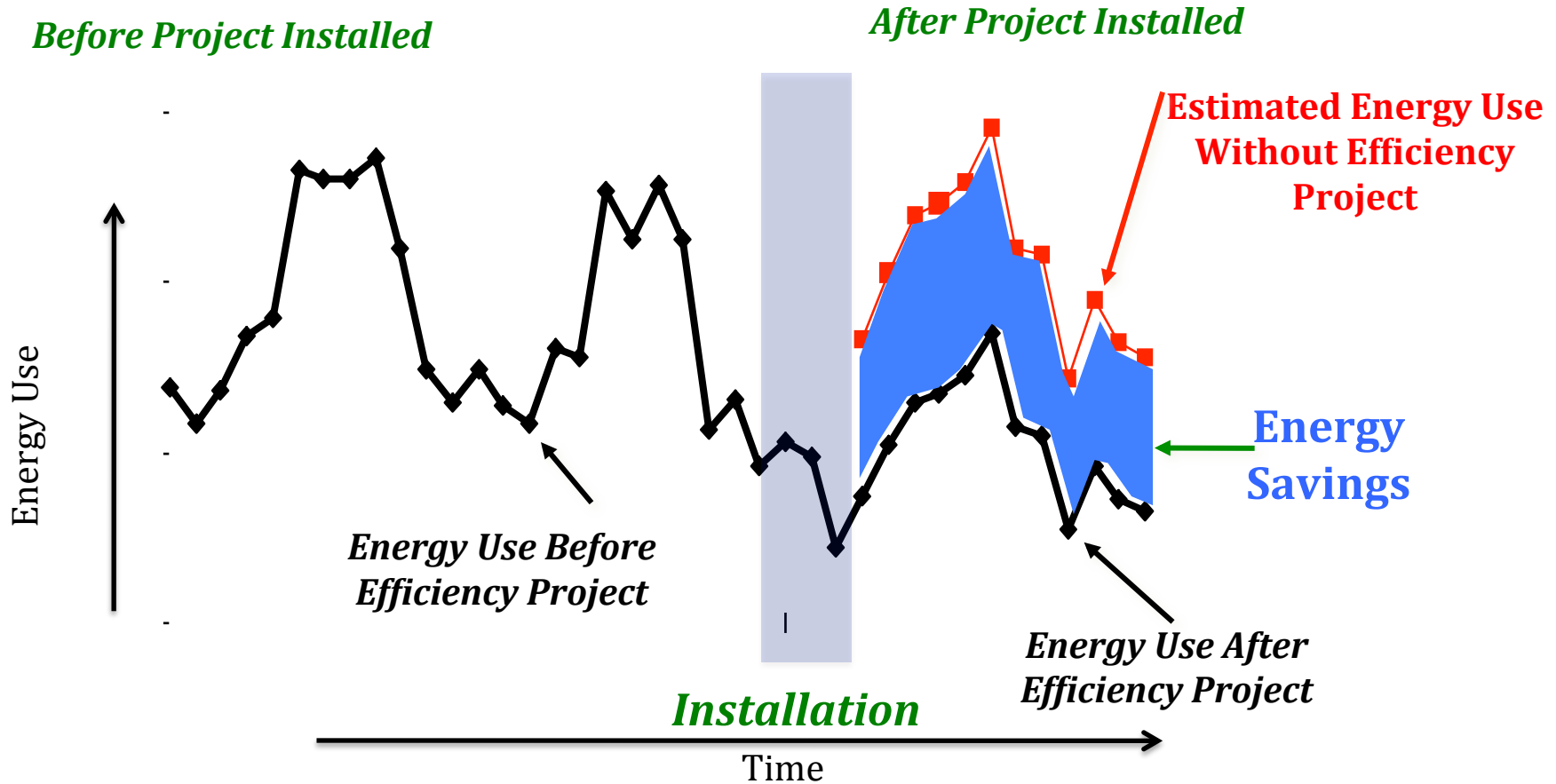
Formative and Outcome Evaluations



Evaluation Category	Phase at Which Implemented	Evaluation Type	Assessment Level
Formative	Pre-program Planning Phase	Market Assessment (includes characterization, baseline)	Market, Portfolio, Program
		Potential or feasibility	Portfolio, Program, Project
	Implementation Phase - ongoing	Process	Portfolio, Program
Outcomes	Implementation Phase - ongoing and/or ex-post	-- Impact --	Program, Project, Measure
		Market Effects Evaluation	Market, Portfolio
		Cost Effectiveness	Portfolio, Program, Project

Steve Schiller, for LBNL Electricity Markets and Policy Group, PEPDEE April 2012

Savings Cannot Be Measured, *They Are Estimated*

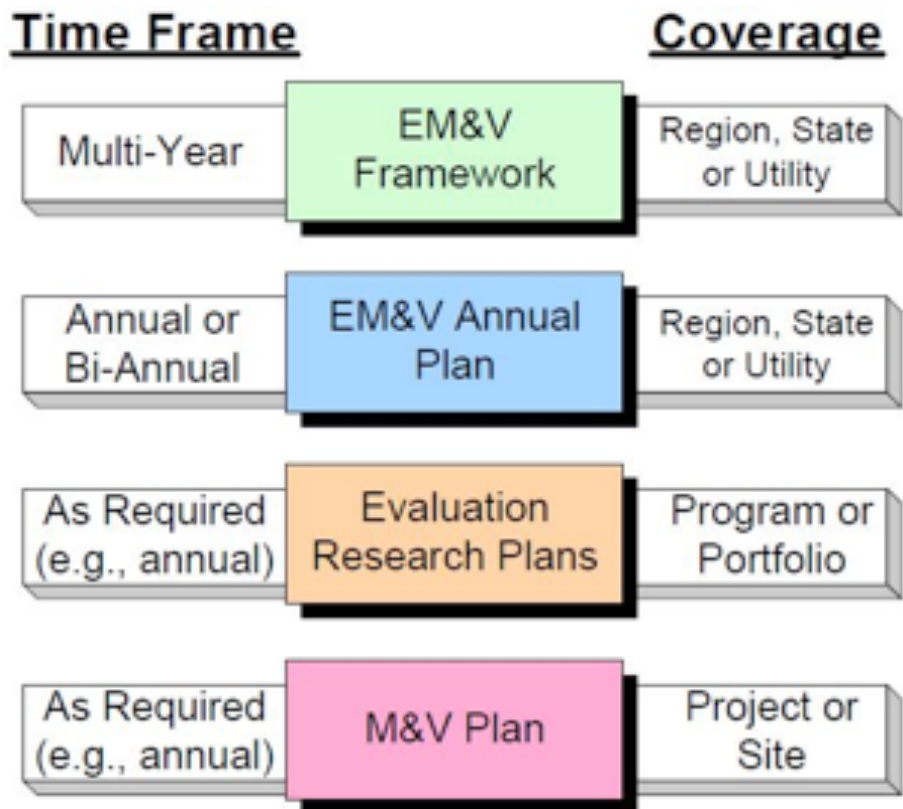


Graph of Energy Consumption Before, During And After Project Is Installed

Documents for Defining Evaluation Activities



- **EM&V Framework** –Primary document that lays out top level structure. *This is perhaps the principle document that all stakeholders can focus on and provide high level input.*
- **Annual Plan** – Indicates major evaluation activities that will be conducted during the evaluation cycle
- **Evaluation Research Plans** – Created for the major EM&V activities
- **Site Specific M&V Plans** – For custom project sites that are analyzed and inspected



Evaluation Issues



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The Big Issues of EM&V



How good is good enough?

- Fundamental issue of EM&V
- **How certain** does one have to be of savings estimates and is that certainty **balanced** against the **amount of effort** utilized to obtain that level of certainty?
- EM&V investments should consider risk management principles - balance the costs and value of information derived from EM&V (i.e., **EM&V should be cost-effective**).

As compared to what?

- First - Defining a **baseline** against which efficiency actions are compared for determining energy savings and whether attribution should be considered – **the counter-factual**
- Second – Establishing level of performance confidence and risk for efficiency **relative to other options for reducing savings and risk of not getting the savings**

EM&V is About Risk Management

Energy Savings versus Energy Avoidance



- Regulators/utilities/resource planners focus on **how much energy would have been consumed if the consumers had not taken the energy efficiency action.** They want to know how much energy is avoided. To do so they make adjustments.
- Energy consumers often use the word ‘savings’ to describe ‘cost reductions.’ They might make ‘technical’ adjustments but certainly not ‘resource’ adjustments.
- Result – savings for consumers might be different than savings determined from a resource/regulatory perspective

Finding Balance



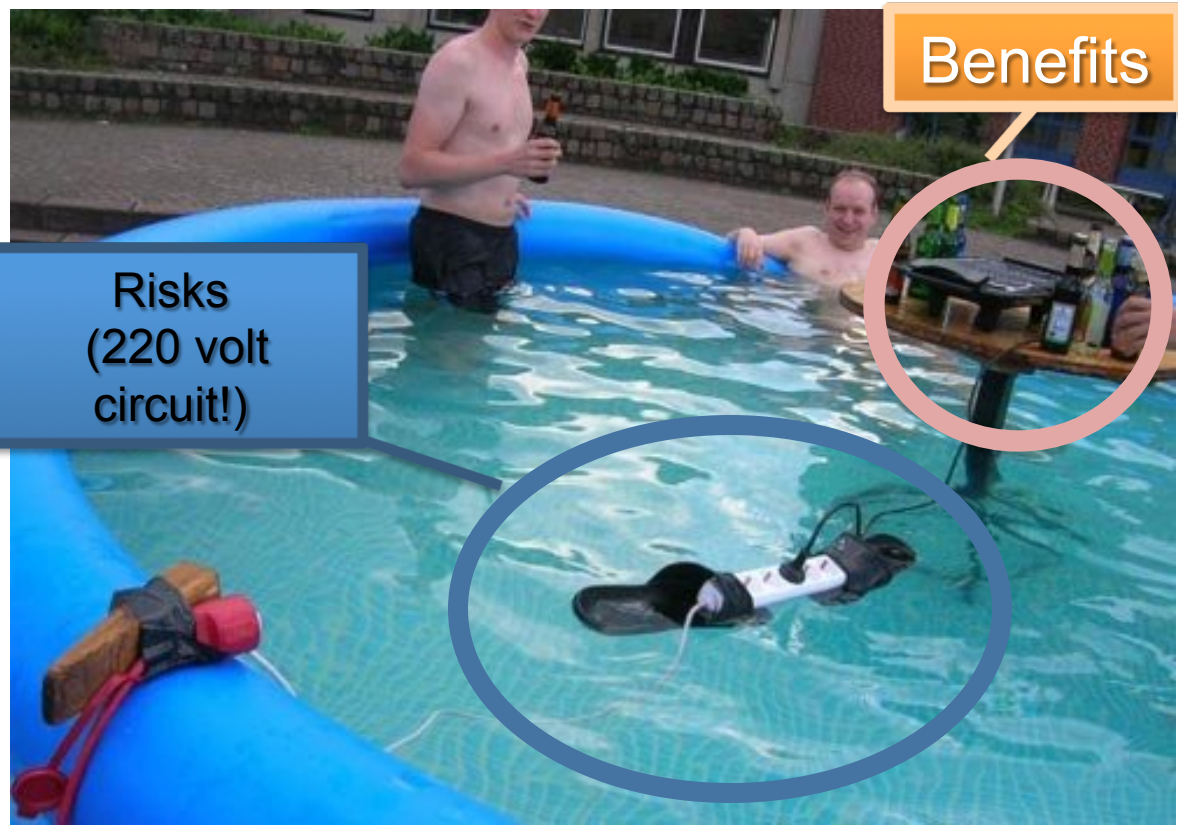
From Albert Einstein:

“Everything should be as simple as it is, but not simpler”

“Everything that can be counted does not necessarily count; everything that counts cannot necessarily be counted”

State of the Art – 30 Years of Development

balancing risks and benefits



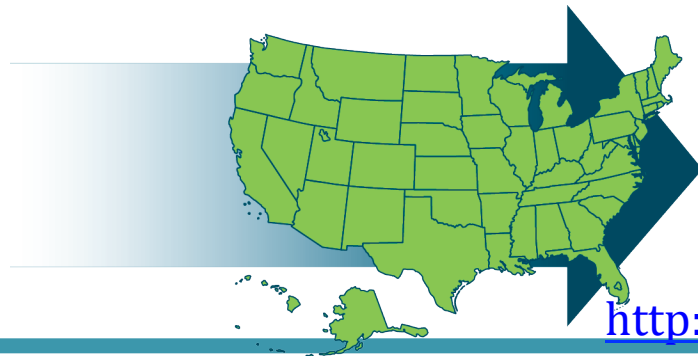
- Guidelines and Capacity Building
- Top Down Evaluation
- Stipulated Savings
- Evaluating Non-Energy Benefits
- Evaluating Demand Response
- Evaluating Behavior Programs
- Evaluating Codes and Standards
- Evaluating Net Savings

Guidelines and Capacity Building



State and Local Energy Efficiency Action Network (SEE Action), facilitated by the U.S. Department of Energy/U.S. Environmental Protection Agency, as well as DOE and EPA on their own have and are continuing to sponsor a number of EM&V projects, for example:

- Uniform Methods Project
- Data Warehouse Project
- Model Impact Evaluation Guide
- Guidance for Evaluating Behavior Programs
- EM&V webinar series - www.emvwebinar.org



SEE Action

STATE & LOCAL ENERGY EFFICIENCY ACTION NETWORK

<http://www1.eere.energy.gov/seeaction/evaluation.html>

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Top Down Evaluation



- Top down evaluation produces:
 - Statewide or regional energy indicators such as total energy consumption or per-capita energy consumption
 - Indications as to whether changes in consumption or indicators are due to particular efficiency policies or portfolios
- Different focus:
 - Change is aggregate consumption, rather than verification of measure and program savings
 - System planning and resource requirements
 - Aligns with environmental objectives and GHG reduction
- Different method - Using macro-economic models, using energy use or intensity as the unit of analysis
- Potential limitations – attribution
- Can be relatively inexpensive to implement

TRMs: Resources for Deemed Savings and Standard Calculations



Scope	Resource Name	Format	Information Included	Administrator
National	ENERGY STAR®	Online Calculators	<i>Ex ante</i> savings based on algorithms	Agency
Regional – Northwest	Regional Technical Forum (RTF) Deemed Measures	Online Database	<i>Ex ante</i> savings based on algorithms	Advisory Committee
Regional - Midatlantic	Mid-Atlantic TRM	PDF	Algorithms and <i>Ex ante</i> savings	Non-Profit Organization
Arkansas	Arkansas Deemed Savings Quick Start Programs	PDF	Algorithms	Public Utility
California	Database for Energy Efficient Resources (DEER)	Software Program	<i>Ex ante</i> savings	State Commission
Connecticut	Connecticut Light & Power and United Illuminating Company Program Savings Documentation	PDF	Algorithms and <i>Ex ante</i> savings	Public Utility
Hawaii	Hawaii Energy Efficiency Program TRM	PDF	Algorithms and <i>Ex ante</i> savings	State Commission
Maine	Efficiency Maine TRM	PDF	Algorithms and <i>Ex ante</i> savings	Trust
Massachusetts	Massachusetts Statewide TRM for Estimating Savings from Energy Efficiency Measures	PDF	Algorithms and <i>Ex ante</i> savings	Agency
Michigan	Michigan Energy Measures Database	Excel Database	<i>Ex ante</i> savings	State Commission
New Jersey	New Jersey Clean Energy Program Protocols to Measure Resource Savings	PDF	Algorithms and <i>Ex ante</i> savings	Agency
New York	New York Standard Approach for Estimating Energy Savings from Energy Efficiency Programs	PDF	Algorithms and <i>Ex ante</i> savings	Agency
Ohio	Ohio TRM	Online Database	Algorithms and <i>Ex ante</i> savings	State Commission
Pennsylvania	Pennsylvania TRM	DOC	Algorithms and <i>Ex ante</i> savings	State Commission
Texas	Deemed Savings, Installation, and Efficiency Standards	PDF	Algorithms and <i>Ex ante</i> savings	State Commission
Vermont	Efficiency Vermont Technical Reference User Manual	PDF	Algorithms and <i>Ex ante</i> savings	Non-Profit Organization
Wisconsin	Focus on Energy Evaluation Business Programs: Deemed Savings Manual V1.0	PDF	Algorithms and <i>Ex ante</i> savings	State Commission

Documenting Non-Energy Benefits (NEBs)



- What are the NEBs – can be big, greater than energy benefits:
 - Utility (~10%)
 - Societal (~40-60%)
 - Participant (~30-50%)
- Three main approaches, depending on category
 - Computation and measurement – direct or secondary
 - Modeling
 - Survey-based

(Source: Skumatz/SERA)

Evaluating Demand Response



Demand Response (DR) - Reduction in electric usage by end use customer(s) from normal consumption patterns in response to change in prices or explicit instructions to reduce load.

Example from PJM System:

Monday	Tuesday	Weds	Thursday	Friday	Sat	Sun
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

- ◆ **For each of the 5 Days in Weekday CBL Basis Window calculate:**
 - **Average daily event period usage** = simple average of the participants usage over the event hours in the day
- ◆ **For all 5 Days in Weekday CBL Basis Window calculate:**
 - **Average event period usage level** = simple average of 5 average daily event period usage values
- ◆ **Exclude any day which the day's average daily event period usage is less than 25% of the average event period usage level (25% rule) and replace**
- ◆ **Rank all remaining 5 days, and eliminate 1 day with lowest average daily event period usage**
- ◆ **Weekday CBL Basis must contain 4 days**

Evaluating Behavior Programs



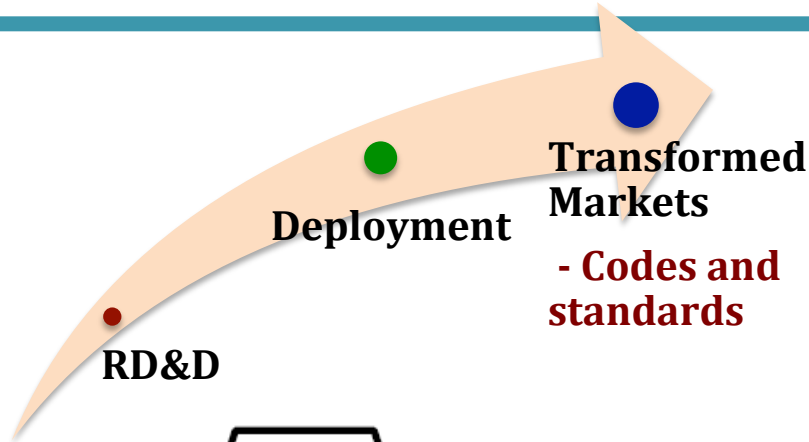
- **Behavior Programs:** Energy efficiency programs that utilize strategies intended to affect consumer energy use behaviors in order to achieve energy and/or energy demand savings
- Methods developed using **Randomized Controlled Trial (RCT)** to evaluate behavior-based programs
 - RCT method is robust, and offers a high degree of confidence in the validity of program impact estimates
 - If RCT not feasible, quasi-experiment methods can be acceptable

Determining Net Savings

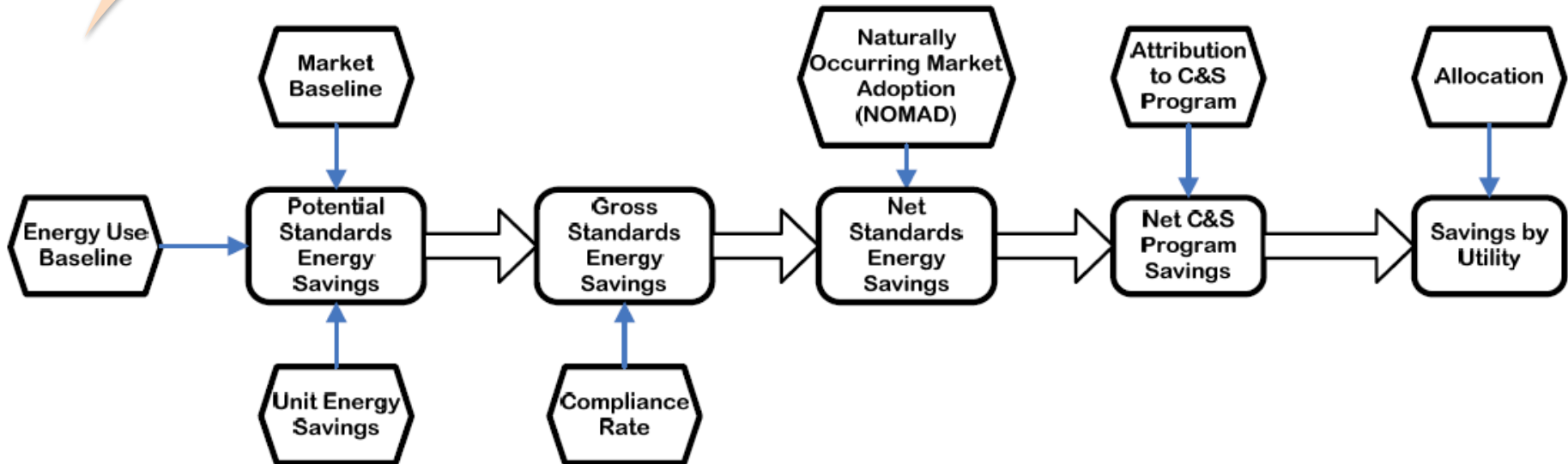


- **Net Savings:** The total change in load that is attributable to an energy efficiency program
- Attribution is obviously challenging
- Approaches Used:
 - Self-reporting surveys
 - Enhanced self-reporting surveys
 - Statistical models that compare participants' and non-participants' energy and demand patterns
 - Stipulated net-to-gross ratios

Evaluating Codes and Standards



Increasing importance in portfolio
e.g., California ~1% of budget, ~20% of savings



Been doing a lot in North America



- And more to come...



Discussion/Questions



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<http://eetd.lbl.gov/ea/ems/>