



Energy Technologies Area

Lawrence Berkeley National Laboratory

Using Deemed Savings and Technical Reference Manuals for Efficiency Programs and Projects

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Introduction

- ◆ LBNL is supported by the U.S. Department of Energy to conduct non-classified research, operated by the University of California
- ◆ Provides technical assistance to states—primarily state energy offices and utility regulatory commissions

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Technical Assistance

- ◆ LBNL's provides technical assistance to state utility regulatory commissions, state energy offices, tribes and regional entities in these areas:
 - ❑ Energy efficiency (e.g., EM&V, utility programs, behavior-based approaches, cost-effectiveness, program rules, planning, cost recovery, financing)
 - ❑ Renewable energy resources
 - ❑ Smart grid and grid modernization
 - ❑ Utility regulation and business models (e.g., financial impacts)
 - ❑ Transmission and reliability
 - ❑ Resource planning
 - ❑ Fossil fuel generation
- ◆ Assistance is independent and unbiased
- ◆ LBNL Tech Assistance website: <https://emp.lbl.gov/projects/technical-assistance-states>
- ◆ US DOE Tech Assistance gateway: <http://energy.gov/ta/state-local-and-tribal-technical-assistance-gateway>

Webinar Series

- ◆ Webinars designed to support EM&V activities for documenting energy savings and other impacts of energy efficiency programs
- ◆ Funded by U.S. DOE in coordination with EPA, NARUC and NASEO
- ◆ Audience:
 - Utility commissions, state energy offices, state environment departments, and non-profits involved in operating EE portfolios
 - Particular value for state officials starting or expanding their EM&V
 - Evaluation consultants, utilities, consumer organizations and other stakeholders also are welcome to participate
- ◆ For more information (upcoming and recorded webinars, EM&V resources) see:
 - <https://emp.lbl.gov/emv-webinar-series>
 - General Contact: EMVwebinars@lbl.gov

Series Contact:

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Today's Webinar

During this webinar, experts will introduce the use of deemed savings, information on setting up and updating TRMs, lessons learned, and resources for state officials. As examples, speakers will discuss the content and development processes used for the Northwest regional TRM and the Iowa state TRM.

◆ Deemed Savings and Technical Reference Manual (TRM) Basics

- Steven Schiller, Senior Advisor, Berkeley Lab

◆ Examples of TRMs, Planning Processes and Lessons Learned

- Iowa -
 - Jennifer Easler, Office of Consumer Advocate of Iowa, Iowa attorney General's Office
 - Chuck Rea, MidAmerican Energy Company
- Northwest Regional Technical Forum - Tina Jayaweera, Northwest Power and Conservation Council

◆ Q&A with panelists

Deemed Savings and Technical Reference Manual (TRM) Basics

Steven Schiller, Senior Advisor, LBNL



Why talk about Deemed Savings and TRMs?

◆ Upside:

- ❑ Save money for consumers, utilities, state agencies and thus the public
 - EM&V activities cost less
- ❑ Create certainty (and control) for all involved with reliable savings values
- ❑ Save time in the EM&V process

◆ Downside

- ❑ It takes some coordination and effort up front
- ❑ Values can be of poor quality and/or misused (although that is true for any approach)

Approaches: Determining Gross Energy Savings

- ◆ **Measurement and verification (M&V)** - using IPMVP options
 - Involve at least some measurements from site combined with analyses
 - Tend to be project-by-project assessment of savings
 - Typically applied to “calculated” or “custom” measures (e.g., commercial HVAC)
- ◆ **Conduct Statistical analyses of large volumes of metered energy usage data**
 - Uses utility bill data and often a control group
 - Typically applied to mass market, residential programs (e.g., weatherization)
- ◆ **Apply deemed (stipulated, default) savings values (or calculations)**
 - Based on historical and verified data to applicable projects and/or measures
 - Typically applied to well defined, “prescriptive” or “standard” measures
 - Some verification activities involved
 - Where TRMs are applied

Definitions for Deemed Savings and Calculations

- ◆ **Deemed Savings Value:** *(Stipulated Savings Value, Unit Energy Savings)*. Estimate of energy or demand savings for installed EE measure 'per unit':
 - Examples:
 - kWh saved per year per 12 Watt LED
 - therms saved per linear foot of weather stripping
 - Used for well understood and documented EE measures
 - For example: energy-efficient appliances such as washing machines, computer equipment and refrigerators, and lighting retrofit projects with well-understood operating hours
 - Developed from reliable data sources and analytical methods
 - Are applicable to the situation being evaluated

- ◆ **Deemed Savings Calculation:** An agreed-to (stipulated) **engineering algorithm(s)** used to calculate the energy and/or demand savings associated with an installed EE measure(s).
 - Example: kWh saved per year = [(annual operating hours) x (kW_{pre} – kW_{post})]

Deemed Savings and Algorithm Resource Database – AKA “TRM”

- ◆ Resource (document, database, website) that includes information used in program **planning, reporting** and **evaluating** of EE programs
- ◆ Common reference for utility program managers, implementers, evaluators, and regulators
- ◆ Information can include:
 - Energy efficiency measures metrics – **deemed savings values (demand, energy)**
 - Engineering algorithms to calculate savings – **deemed savings calculation**
 - Parameters needed for calculating savings (e.g., typical operating hours)
 - Factors related to savings (e.g., *net-to-gross ratios*, measure lifetimes, project costs)
- ◆ Typically include documentation of:
 - Assumptions (e.g., baselines) used to prepare values
 - Calculations
 - What are **appropriate applications** for applying values and algorithms

Deemed Savings and TRM Advantages

- ◆ Saves time and money while providing relative accuracy – calculate once, versus over and over again for each program/project every year
- ◆ Pre-vetted, pre-approved values – reduce regulatory risk and **provide certainty** for regulator, utility, implementer and customer in terms of incentive payments
- ◆ Maintains consistency
 - ❑ Planning and evaluation values will be calculated using the same methodology while allowing for utility specific inputs
 - ❑ Evaluation findings (e.g., billing analysis, metering, survey data) inform TRM updates allowing utilities to pool evaluation resources; the Uniform Methods Project can be a standard way to develop values:
<http://energy.gov/eere/about-us/ump-home>
- ◆ Probably the most common (perhaps by far) method used for utility EE programs

TRM and Deemed Savings Cautions

◆ Can they be misused? Yes!

- ❑ Only as good as the data, analysis, and QC that goes into them (garbage in.....)
- ❑ Accurate on average
 - Should be - can be better than case by case M&V
 - But, accurate for each project and customer (probably not.....)

◆ Watch out for:

- ❑ Applying values only where they are applicable!
- ❑ Systematic biases
- ❑ Interactive and stacking effects (multiple measures in same facility)

◆ Best with transparency and documentation including a guide on how to use the data and algorithms

The use of deemed values in a savings calculation is an agreement to accept a stipulated value, irrespective of what actually “happens”

When using deemed values, it is important to realize that technologies alone do not save energy - it is how they are used that saves energy

Applicability Conditions (concept)

Retail LED

- 10 hours per day
- Baseline = 60 Watts

Multi-Family Common Area LED

- 8 hours per day
- Baseline = 40 Watts

Point of Sale LED

- 2.5 hours per day
- Baseline = 40 Watts

Low Income Residential Direct Install

- 4 hours per day
- Baseline = 75 Watts

Residential New Construction

- 2.75 hours per day
- Baseline = 18 Watts

Bottom Line

◆ TRMs:

- ❑ Create greater savings certainty and consistency for savings values, and perhaps more accuracy
- ❑ Are widely assumed to reduce a state's EM&V costs
- ❑ Focus EM&V resources

◆ Statewide or regional TRMs are becoming essentially a standard practice

◆ However,

- ❑ As with any tool need to be used correctly and with caution
- ❑ Require (a) agreement among stakeholders, (b) some startup research and costs, and (c) time to get going

TRM Formats and Jurisdiction Options

Formats

- ◆ **Online database**
- ◆ **Downloadable database (most common):**
 - **Electronic Database** – often Excel worksheets but can be (should be....) more sophisticated database tools, provides lookup values for tracking system
 - **PDF** – text format with common sections for each measure protocol; most common format for recent TRMs
 - **Word** – text format, similar to PDFs

Jurisdictions (Coverage)

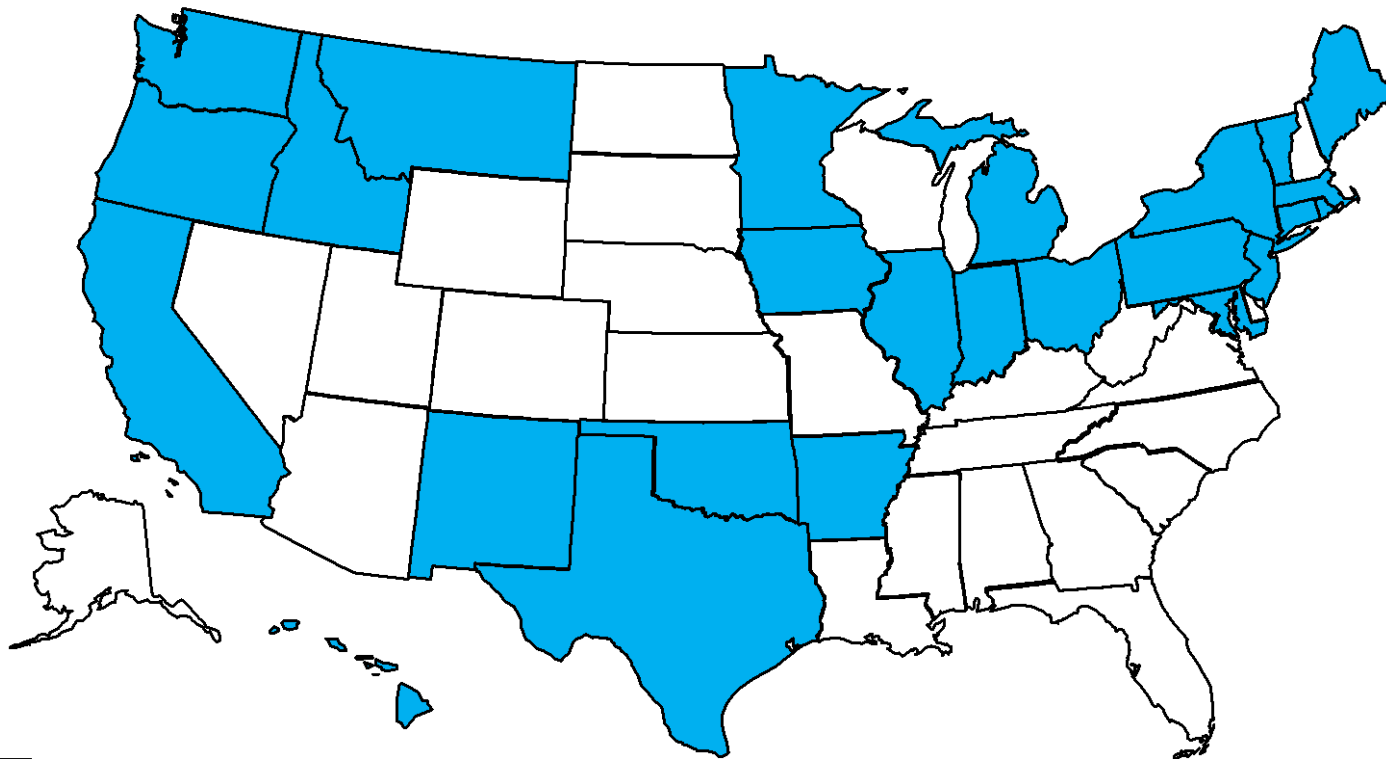
- ◆ **Regional/Statewide**
 - Used to specify the basis for determining savings values claimed by any program administrator
 - Administered by regional non-profit, state commission or agency, advisory committee, program administrators
- ◆ **Program Administrator (e.g., utility)**
 - Used to specify the savings values claimed by a single utility. Often developed by that utility
 - Administered by utility


Who Does Evaluation (and TRMs)

- ◆ Administration of the evaluation function (from a 2012 survey):
 - 37% utility administration
 - 36% administration by the utility regulatory commission or a combination of the commission and utilities
 - 27% administration by some other government agency or third-party entity
- ◆ Most states (79%) rely on independent consultants/contractors to conduct the actual evaluations with 21% using utility and/or government agency staff

“A National Survey Of State Policies and Practices For the Evaluation Of Ratepayer-Funded Energy Efficiency Programs” Martin Kushler, Seth Nowak, and Patti Witte February 2012 Report Number U122. www.aceee.org

Today's National Picture



 TRM – state, regional, existing or in progress

- More and more jurisdictions are adopting TRMs – about 20 state or regional TRMs
- Movement to create regional if not national standardization of resources
- U.S. DOE supporting efforts at standardization

How TRM Efforts Get Initiated

- ◆ With these TRMs operating in about half the states, commissions, stakeholders and utilities are asking:
 - ❑ Why are we recalculating or re-justifying the same savings values over and over again?
 - ❑ Why does one of our utilities use “x” and another “y” for the same measure?
 - ❑ How can we increase certainty of savings throughout the process – i.e. how manage risk for utility customers and utilities?
 - ❑ How can we save time and money?
- ◆ Most are "ordered" or just agreed to by a Commission or perhaps an advisory board if there is a third-party EE administrator
- ◆ The barriers are usually money and process:
 - ❑ Its almost certainly cheaper to do one for the state versus one per utility or implementer, but those costs are buried, versus a single larger line item
 - ❑ In some cases utilities and implementers do prefer that the Commission approves the TRM - to avoid second guessing, i.e. to provide certainty

Getting a TRM Process Started

Planning Steps

1. **Research** (review other states' and regions TRM efforts)
2. **Set Objectives** (Used for planning, reporting and/or in place of ex-post savings determination?)
3. **Decide what information is needed:**
 - a. For example, gross and/or net savings values, cost data, effective useful life
 - b. Deemed saving values only or also calculation tools? Include work papers for custom measures?
4. **Answer some questions – next column**
5. **Then set budgets and timeframes – and a framework and/or work plan**

Questions

- a. Who's database? Who develops, verifies, and maintains data? How is it reviewed? How is it approved?
- b. What metrics are included are values to be “expected values” or “conservative values” (remember EE savings are estimates)
- c. Start from scratch or start with another state's system and modify? A regional effort?
- d. Build large system (lots of EE measures) from beginning or start small (just high priority EE measures) and build up as data warrants?
- e. What format – on-line, spreadsheet, pdf, etc.?
- f. What are criteria for “good” data and how rigorously it is verified and applied appropriately?
- g. What is process for input and approval of TRM and updates. How to strive for transparency, wide input and limited legal/regulatory hoops required to make changes?

Updating

Process


- ◆ Typically done every one, two or three years
- ◆ Review and summarize other jurisdiction's TRM update processes for comparison and guidance
- ◆ Recommend an overarching strategy to update the TRM in a timely and appropriate manner, to best meet the needs of the organizations using it
- ◆ Interview stakeholders to identify needs and schedules relevant to the update process, commonalities that are mutually supportive of a single process and schedule, as well as any unique needs or situations that necessitate extra attention.
- ◆ Identify measures to be added or updated in the next round of TRM measure development

Lessons Learned

- ◆ Define update cycle that matches planning cycles (or planning and reporting if retroactive application)
 - Typically annual or every other year
 - Be realistic on time required to do updates
- ◆ Use savings verification and evaluation results to inform updates
- ◆ Develop process where old measures are systematically reviewed through annual update process
- ◆ Maintain a reference library to track:
 - Changes
 - Feedback
 - Error corrections
 - New information including new measure suggestions and references

Using TRM Data From Other States

- ◆ Many states use data from other states, but will document that is applicable to their own state (climate, market, baselines, operating hours, measure characteristics)
- ◆ Scoping study was conducted developing regional TRMs and included an assessment of savings values for 20 measures covering different fuels, sectors, end-uses in multiple TRMs, findings:
 - ❑ Savings estimates vary by order of magnitude across TRMs
 - ❑ Main drivers of variances are:
 - Differing baseline assumptions (e.g., hours of use, weather, prevailing codes)
 - Source of savings calculations (building simulation versus engineering algorithm)
 - Parameters included in algorithm (e.g., use of HVAC interaction factor for lighting)



Scoping Study to Evaluate Feasibility of National Databases for EM&V Documents and Measure Savings

Tina Jayaweera, Hossein Haeri, Allen Lee, Scott Bergen, Cynthia Kan, Aquila Velonis, Christy Gurin, Michael Visser, Andrew Grant, and Ashley Buckman

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Evaluation, Measurement and Verification Working Group

June 2011

EM&V and TRM Resources

- ◆ DOE/EPA SEE Action EM&V Resources website:
<http://www4.eere.energy.gov/seeaction/topic-category/evaluation-measurement-and-verification>
- ◆ U.S. DOE Uniform Methods Project website:
<http://energy.gov/eere/about-us/ump-home>
- ◆ TRM review and development scoping study:
http://www4.eere.energy.gov/seeaction/system/files/documents/emvscoping_databasefeasibility.pdf



Now - Our TRM Example Speakers

◆ Iowa TRM

- ❑ Jennifer Easler, Office of Consumer Advocate of Iowa, Iowa attorney General's Office
- ❑ Chuck Rea, MidAmerican Energy Company

◆ Northwest Regional Technical Forum

- ❑ Tina Jayaweera, Northwest Power and Conservation Council

Iowa Technical Reference Manual

Jennifer Easler
Iowa Office of Consumer Advocate
Jennifer.Easler@oca.iowa.gov

Chuck Rea
MidAmerican Energy Company
CBRea@midamerican.com

Iowa Regulatory History of the TRM

- Iowa Energy Efficiency Policy and Programs established in 1990. No formal, statewide TRM requirement. EE measure characteristics and savings assumptions are evaluated periodically through EE plan process:
 - Statewide Assessment of Potential (5-year cycle)
 - Utility-specific Plan development/savings goals (5-year cycle)
 - Utility-specific reports on spending and impacts (annual)
 - Utility-specific Evaluation, Measurement and Verification (approximately 5-year cycle)
- TRM offers detailed, consistent, transparent, sound basis for measure characteristics and saving assumptions

Iowa Policy Considerations

- EE goals are based on “achievable” cost-effective EE potential rather than EERS or spending mandate
- EE performance can be considered in setting utility ROE, but no explicit incentives for EE impacts
- Historically used 1.0 Net-to-Gross factor for all measures; evaluated free-ridership in plan development and EM&V
- Measure baselines evaluated/determined in Assessment of Potential and 5-year Plan Development
- External policies (RTOs and EPA) support a process that demonstrates/assures reliable EE savings estimates
- TRM is a pragmatic step rather than “policy driven”

Iowa TRM Players

- Vermont Energy Investment Corporation (VEIC) is the primary contractor for the Iowa TRM
- Iowa Utilities Association (IUA) serves as the lead for the energy efficiency providers
- Development process is split among three groups:
 - VEIC
 - Oversight Committee
 - Technical Committee

Oversight and Technical Committee

- Utilities
 - Black Hills Energy
 - Cedar Falls Utilities
 - Iowa Association of Municipal Utilities
 - Interstate Power and Light
 - MidAmerican Energy Company
- Advocates/Parties to EE Cases
 - Iowa Office of Consumer Advocate
 - Environmental Law and Policy Center
 - Iowa Environmental Council
 - Winneshiek Energy District

TRM Goals

- Provide transparent and consistent basis for calculating gross energy savings
 - Electric energy and peak demand savings
 - Gas throughput and peak day savings
- Support calculation of cost-effectiveness under the Iowa Societal Cost test
 - Useful life
 - Incremental cost
 - Load shape analysis and definition
 - O&M savings
 - Non-energy benefits
 - Interactive effects
 - Persistence
 - etc.

Other Uses

- Portfolio evaluation
- Planning and goal setting
- Environmental and other compliance requirements

Measure Characterization

- Eligible measures are split into two groups
 - High impact measures
 - Low impact measures
- Standard format for each measure characterization
 - Measure ID
 - Name and description
 - Effective dates
 - Base and efficient specifications
 - Algorithms
 - Other key parameters (life, cost, ...)
 - Other pertinent details
 - Examples
 - Citations

Process

- VEIC produces draft measure characterizations
- Multiple rounds of discussion with Technical Committee
- Presentation to Oversight Committee
- Oversight Committee discusses and debates policy considerations
- Testing

Lessons Learned: Challenges and Issues

- Very few issues or challenges on the technical side
 - Lighting
 - Peak savings methodologies
- More issues (relatively speaking) on the policy side
 - Approval process
 - Effective date
 - Iowa has a long planning cycle
 - Cherry picking
 - Gross vs. Net savings
 - Maintenance and updates

The Pacific Northwest's "Technical Reference Manual"

Tina Jayaweera

**Northwest Power and
Conservation Council**

But First...Some Orgs

- **Bonneville Power Administration (BPA)**
 - Federal agency that markets wholesale electrical power from hydroelectric dams in the Columbia River Basin
- **Northwest Power and Conservation Council (the Council)**
 - Formed by the Northwest Power Act (1980)
 - Interstate compact agency with a mission to “ensure, with public participation, an affordable and reliable energy system while enhancing fish & wildlife in Columbia River Basin”



And, the Regional Technical Forum

- **Regional Technical Forum (RTF)**
 - Chartered by the Council (at the request of Congress) to help ensure reliable energy savings estimates
 - Members appointed for their technical expertise and experience (not constituency-based)
 - No Regulatory Authority
- **Reports to:**
 - Technically, RTF reports to the Chair of the Council
 - Pragmatically, RTF reports to BPA, utilities, Energy Trust of Oregon, & regulators – those that run efficiency programs (We work for “the region”)

Seeks Value Through

Open

- Findings used widely
- Learn from others
- Transparency

Peer Review

- Many eyes
- Yields high quality

Economy of Scale

- Big savers held in common
- Avoid duplication
- Seek synergies

Who Uses It?

Utilities, ETO, BPA

- Reduce evaluation costs

Regulators

- Wide review
- Establish standards for reliability & methods

Planners

- Provides estimates for conservation potential assessments

Evaluators

- Conveys expectations
- Describe methods

Who Comprises the RTF?

- **Membership**
 - 30 voting members + corresponding members
 - Serve pro bono (with some exceptions)
 - Come from: utilities, Northwest Energy Efficiency Alliance, implementers, BPA, EM&V consultants, national labs, Energy Trust of Oregon, NRDC, and others
 - Meet monthly + in subcommittees
- **Funding from voluntary contributions from BPA, the region's largest utilities, & Energy Trust of Oregon**

The RTF Has Guidelines for Its Decision-Making Process

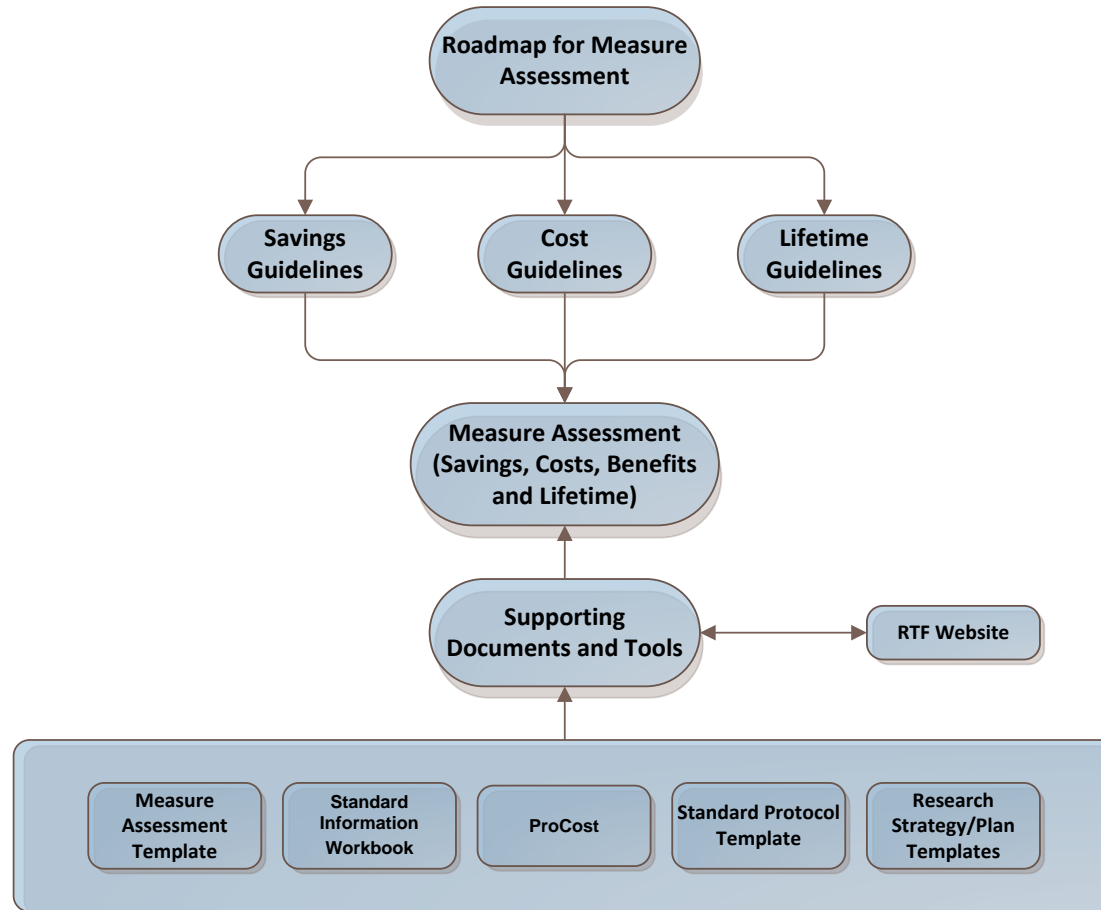


**Regional
Technical
Forum**

**ROADMAP FOR THE ASSESSMENT OF ENERGY
EFFICIENCY MEASURES**

<http://rtf.nwcouncil.org/subcommittees/Guidelines/Default.asp>

Guidelines Structure



Roadmap, Figure 1: Structure and Relationship of RTF Documents and Tools (updated 2016-01-14)

Measure Classification

- Changes in system configuration, equipment specifications or operating practices
- Reduces electric power consumption as a result of increases in the efficiency of energy use, production, or distribution

| Savings Estimation Method |
|---|
| <ul style="list-style-type: none">• Unit Energy Savings (UES)• Standard Protocol• Custom Protocol• Program Impact Evaluation |

| Measure Category |
|---|
| <ul style="list-style-type: none">• Proven• Provisional• Planning• Small Saver |

| Measure Status |
|---|
| <ul style="list-style-type: none">• Active• Under Review• Deactivated |

Roadmap 1.3.1

RTF Role and Goal

- RTF role depends on a measure's savings estimation method
- Goal: Produce savings estimates of “comparable reliability”

RTF
approves
these

- Unit Energy Savings
- Standard Protocol

RTF
provides
guidance
on these

- Custom Protocol
- Program Impact Evaluation

Roadmap 2

Measure Categories for UES and Standard Protocol Measures

Proven

- RTF approves the estimation method / savings values based on reliable data and analysis. UES measures only require a **count of delivered units**. Standard Protocol measures require **faithful application**.

Provisional

- RTF approves sound engineering or statistical methods / savings values with the condition that additional data is collected via a **funded research plan**.

Planning

- If a measure has sufficient usefulness and applicability in the region, RTF approves sound engineering or statistical methods / savings values. Requires a **research strategy**.

Small Saver

- If measure is regionally applicable but **regional technical potential savings are too small**, the RTF approves sound engineering or statistical methods / savings values, **without further research**.

Measure Status



Active

- Measure meets all requirements set forth in the Guidelines



Under Review

- Errors need to be corrected
- Savings need to be revised based on new data.
- Placed under review prior to sunset date.



Deactivated

- Inadequate data exist to bring into compliance with *Guidelines*
- Insufficient value to the region to warrant further work

Unit Energy Savings (UES)

- Formerly known as “deemed”
- Stable, unitized savings that can be *reliably forecast through the period defined by the measure’s sunset date*
- Reduce program delivery costs by simplifying the data that must be collected
 - Verified count of delivered units is all that is required
 - Statistical or meta-statistical analysis used to reliably estimate savings



Getting to Unitized Savings (UES)

- **Statistical or meta-statistical data**
 - Quality judged by relative error of mean savings estimate
 - Avoid when savings significantly interact with other measures due to large sample needs
- **Calibrated engineering models**
 - Adjusted to individual cases or to the average characteristics and consumption of groups
 - Ex. Building simulation model heating loads calibrated to billing data from representative sample of SF homes
 - Savings expected to be regionally applicable
 - Significant interactions need to be dealt with
- **Planning/Provisional provides a path**

The "TRM"

RTF Unit Energy Savings (UES) Measures

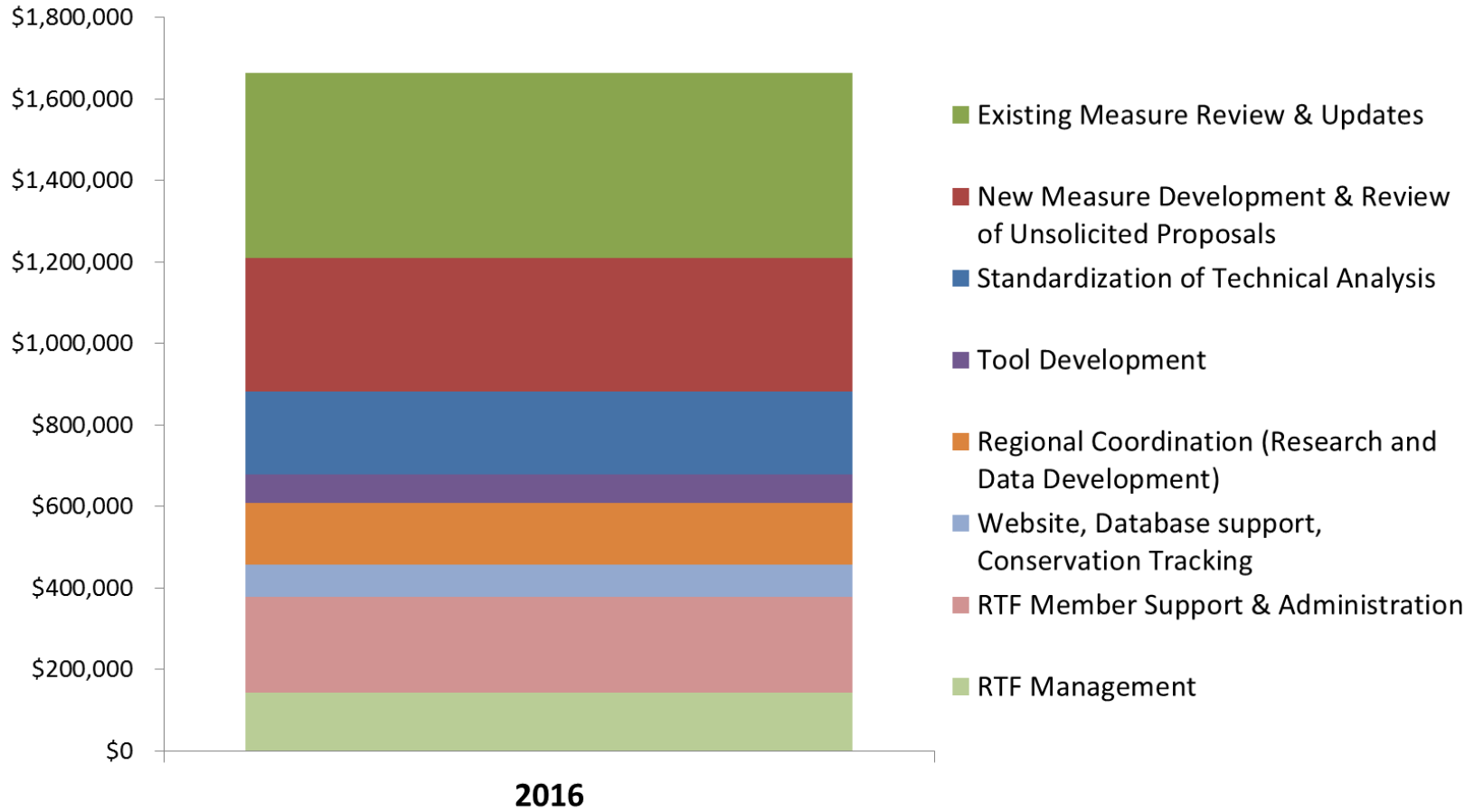
- Click any Measure title to see more details and history
- Email [Jennifer Light](#) with any requests or questions
- also see: [meetings](#) | [decisions](#) | [protocols](#)

Filter-as-you-type

| Sector | Measure ▲ | Category (?) | Status (?) | Latest RTF Decision | Sunset Date |
|------------------------|---|------------------------------|----------------------------|-------------------------------------|-----------------------------|
| Residential | Advanced Power Strips - IR-Sensing | Provisional | Under Review | 3/15/2016 | 8/31/2016 |
| Residential | Advanced Power Strips - Master Peripheral/Motion Sensing/PC-Interacting | Planning | Active | 9/22/2015 | 8/31/2018 |
| Residential | Appliances - Clothes Dryers - SF, MH, and MF in-unit | Planning | Active | 5/12/2015 | 4/30/2018 |
| Commercial | Appliances - Clothes Washers | Proven | Active | 9/22/2015 | 12/31/2017 |
| Residential | Appliances - Clothes Washers | Proven | Active | 5/12/2015 | 12/31/2017 |
| Residential | Appliances - Clothes Washers in MF | (none) | (none) | | |
| Commercial | Appliances - Dishwashers | (none) | Deactivated | 11/19/2013 | |

2016 RTF Budget

(not including Council In-kind Contribution)



RTF Highlights

- Has a manager
- Has an annual budget and long-term funding commitments
- Follows guidelines
- Continuously updates assumptions
 - Not a single document
- Uses dedicated contract analyst staff
- Releases everything publicly
- Measure savings have:
 - Quality standards
 - Status
 - Sunset dates

Questions?

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Discussion/Questions

For more EM&V information see:

- Webinars: <https://emp.lbl.gov/emv-webinar-series>
- For technical assistance to state regulatory commissions, state energy offices, tribes and regional entities, and other public entities see: <https://emp.lbl.gov/projects/technical-assistance-states>
- Energy efficiency publications and presentations – financing, performance contracting, documenting performance, etc. see: <https://emp.lbl.gov/research-areas/energy-efficiency>
- New Technical Brief - *Coordinating Demand-Side Efficiency Evaluation, Measurement and Verification Among Western States: Options for Documenting Energy and Non- Energy Impacts for the Power Sector*
<https://emp.lbl.gov/publications/coordinating-demand-side-efficiency>

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”