Statewide Deemed Workpaper Rulebook

Version 2.0

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Change Log

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1.0	03/20/2019	Original Document
2.0	7/31/2019	Updated based on CPUC guidance documents received through July 2019.

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Chapter 1 Introduction

1.1 Overview

Energy efficiency savings are quantified via workpapers, which are technical engineering documents that prescribe pre-determined values for energy savings, measure costs, and other ex ante values. Workpapers are generally used for homogenous, high volume interventions and have historically been developed by the California Program Administrators (PAs)[1] with California Public Utilities Commission (CPUC) input and approval. The CPUC-maintained Database for Energy Efficiency Resources (DEER) provides ex ante values that can facilitate workpaper development.

Energy efficiency programs offer measures that employ either a deemed savings approach or a calculated savings approach for the purpose of estimating energy efficiency savings. A deemed measure is a prescriptive energy efficiency measure that uses a predefined and CPUC-approved savings calculation, cost, eligibility, and other measure attributes. A deemed measure uses either values from DEER or an approved workpaper of measure savings assumptions that will be applied consistently to the same measure.

This Statewide Deemed Workpaper Rulebook (Rulebook) presents a compendium of the current CPUC directives for estimating ex ante savings claims for energy efficiency measures using the deemed savings calculation method. It is intended to communicate current deemed savings rules and processes only. This Rulebook is not intended to restrict or impede program design and is not a program guidebook.

This Rulebook represents the investor-owned utilities' (IOUs) understanding of the CPUC's rules and requirements for claiming energy savings from installed energy efficiency measures. The elements covered by this document are relevant to all PAs and implementers.

1.2 Document Structure

This document contains two primary chapters. In Chapter 2: Overarching Requirements, we present our understanding of the overarching rules and regulations of energy efficiency in California. All resource program activities should follow the rules in this chapter, regardless of the savings calculation methodology. Chapter, 3: Deemed Requirements, discusses regulatory rules and procedures specific to the deemed savings calculation approach. To fully understand all the requirements for the deemed savings calculation approach, one must read both the Overarching Requirements chapter and the Deemed Requirements chapter.

Within each chapter, requirements are categorized according to their origin, and indicated in one of the following two ways:

- **CPUC Requirement**: These are the PA's interpretation of official CPUC rules and requirements. Implementers must comply with CPUC Requirements to fulfill the orders within various CPUC decisions, resolutions, rulings, and policies.

[1] The California Program Administrators are the four investor-owned utilities: Pacific Gas & Electric (PG&E), Southern California Edison (SCE), Southern California Gas Company (SCG), and San Diego Gas & Electric (SDG&E).

- **PA Requirement:** These are policies created by the PAs that enable compliance with CPUC reporting requirements and quality assurance expectations. Implementers must comply with PA Requirements to facilitate logistical scalability in administrating energy efficiency programs.

In addition, call-out boxes are provided for some requirements to add clarity or guidance. These call-outs detail the PA's understanding of CPUC guidance and expectations. Compliance with these details is encouraged, but not required; their interpretation and application are at the discretion of the Implementer.

The PAs have cited publicly available sources for rules and glossary terms wherever possible. In most cases, rule sources can be found directly on the CPUC website. The PAs can also provide these references upon request.

1.3 Audience

This Rulebook is intended to provide current and future Implementers of California energy efficiency programs a better understanding of the regulatory requirements to be followed when proposing, designing, implementing, and delivering successful programs. We also anticipate that other stakeholders of energy efficiency programs will benefit from the increased transparency and centralized guidance.

1.4 Terminology

This Rulebook uses a variety of terms defined in the glossary in Appendix B. For reference, a key to abbreviations used herein is included in Appendix C.

1.5 Versioning

The Rulebook is intended to be a living document that will be updated for clarity and accuracy over time. Any new rules developed by the CPUC or the PAs will be incorporated into future versions. The current version will be indicated by the date on the cover page.

Chapter 2 Overarching Requirements

2.1 Introduction

This chapter contains the rules and requirements that apply to energy efficiency programs. All program designs are subject to the ruleset in this chapter.

2.2 Measure Eligibility

2.2.1.1 Measure Delivery

PA Requirement: Deemed measures may use any of four delivery channels: upstream, midstream, downstream, or direct install. Workpapers may include up to all four delivery types, but programs must implement controls to avoid double-dipping in the event more than one intervention strategy is implemented for a particular measure.

CPUC Requirement: All upstream and midstream interventions must be delivered statewide.[2] The following table describes the statewide requirements around each delivery channel.

Table 1 - CPUC Requirements for Statewide Program Delivery

	Upstream	Midstream	Downstream	Direct Install
Entity with which Implementer Partners	Manufacturers	Distributors / Suppliers / Retailers (includes Instant Rebate / Point-of-Sale Programs)	End-use customer	Contractor
Must be offered Statewide	Yes	Yes	No, unless specifically ordered by the CPUC	No, unless specifically ordered by the CPUC

2.2.1.2 Double Dipping and Double Counting

CPUC Requirement: Projects receiving incentives or claiming savings through any energy efficiency program must not also receive incentives (i.e. double-dip) or claim savings (i.e. double-count) for the same interventions through any other PA EE program, regardless of channel (e.g. downstream, midstream, or upstream), provider (e.g. other utilities, the California Energy Commission, or the California Public Utilities Commission), or savings calculation method (e.g. deemed, custom, meter-based) .[3]

[2] *D.16-08-019*, p. 104.
[3] California Public Utilities Commission, May 16, 2002, *D 02-05-046: Interim Opinion Selecting 2002-03 Local Energy Efficiency Programs*.

To prevent double dipping and double counting, program implementers should take reasonable actions to avoid overlap with other PA EE programs involving the same measures. Additionally, Implementers should establish a quality control process with the PA to identify potential double dipping and double counting and rectify if needed.

2.2.1.3 Offerings May Change Without Notice

CPUC Requirement: The CPUC may provide direction or dispositions impacting ex ante parameters that may trigger a change to rebate/incentive levels, savings calculations, and/or eligibility for any measure.

Implementers should ensure that customer applications and associated terms reflect the potential for such changes. Implementer systems of record should be able to manage retroactive and prospective changes to values.

2.2.1.4 To-Code Measures

CPUC Requirement: For programs that target (or will claim) to-code savings, the implementation plan must describe what program design elements, data collection activities, and/or analyses will be conducted to lend insight into the following questions:

- Where does the to-code savings potential reside? What equipment types, building types, geographical locations, and/or customer segments promise cost-effective to-code savings?
- What kinds of barriers are preventing code-compliant equipment replacements?
- Why is natural turnover not occurring within certain markets or for certain technologies?
- What program interventions would effectively accelerate equipment turnover? [4,5]

2.2.1.5 Fuel Substitution[6]

CPUC Requirement: Fuel substitution measures are defined as changing from one IOU regulated fuel to another IOU regulated fuel (natural gas to electricity or electricity to natural gas, provided that they pass the three-prong test, as defined in the Energy Efficiency Policy Manual - Version 3, Adopted in Decision 05-04-051). Fuel substitution programs/measures/projects with a predominantly load building or load retention character are not eligible. The three-prong test is currently under review.[7] The three-prong test requires that each measure, project, and program:

1. Must not increase source BTU consumption,

[4] Implementation Plans are discussed in more detail in D.15-10-028.
[5] California Public Utilities Commission, November 9, 2017, *D.17-11-006: Decision Regarding To-Code Pilots*.
[6] The CPUC has updated their requirements for fuel substitution measures. Please see the recently released CPUC Fuel Substitution Decision 19-08-009 and Technical Guide using the following link: https://pda.energydataweb.com/#!/documents/2304/view. This section will be updated accordingly in the next Rulebook update.
[7] *Administrative Law Judge's Ruling Seeking Comments on Three-Prong Test* (Ruling) issued on June 25, 2018.

2. Must have a TRC and PAC greater than 1.0, and
3. Must not adversely affect the environment.[8]

The Implementer carries the burden of proof that the fuel substitution intervention focuses on energy efficiency and creates net resource value. Fuel-substitution programs/projects, whether applied to retrofit or new construction applications, must pass the three-prong test to be considered.

The following information is needed in order to perform the three-prong test:

- Baseline energy use (in kWh, kW, and therms);
- Proposed energy use (in kWh, kW, and therms);
- Measure end-use (Lighting, HVAC, Refrigeration, Process, Whole building, Other);
- Measure code;
- Site location;
- Measure cost; and
- Incentive amount.

The three-prong test is normally run at a project's inception for feasibility, at project's commitment to confirm qualification, and at project's completion when final costs and savings are known. Additionally, Implementers that expect to include fuel substitution measures in their programs should state so in their implementation plans.

The installation of natural gas fired self-generation, as well as self-generation units using other non-renewable fossil fuels, will be treated as fuel substitution. Common with other types of fuel-substitution, any costs of gas transmission and distribution, and environmental externalities, must be considered. In addition, cost-effectiveness analyses of self-generation must account for utility interconnection costs.[9]

2.2.1.6 Installations Must Adhere to Laws and Codes

CPUC Requirement: All measures(s) must be installed in accordance with all applicable federal, state, and local laws, building codes, manufacturers' specifications, and permitting requirements. If a contractor performs the installation or improvement, the contractor must hold the appropriate license for the work.

If a customer or contractor is the recipient of a rebate or incentive offered for an energy efficiency improvement or installation of energy efficient components, equipment, or appliances, a rebate or incentive can only be provided if the customer or contractor certifies that the improvement or installation has complied with any applicable permitting requirements, including any applicable specifications or requirements set forth in the California Building Standards Code (Title 24 of the California Code of Regulations). In addition, if a contractor performed the

[8] *Energy Efficiency Policy Manual*, pp. 24-25.
[9] California Public Utilities Commission, Energy Division, Final Ex Ante Review Disposition, Project ID PGE-16-C-C-0110; California Public Utilities Commission, December 14, 2016, *D.06-12-013: Order Approving Southern California Edison Company Petition for Modification of Decision 05-09-043, With Modifications*.

installation or improvement, the contractor must hold the appropriate license for the work performed.[10]

Also, if a customer or contractor is the recipient of a rebate or incentive offered by an energy efficiency program specifically for the purchase or installation of air-conditioning or heat pump units, and their related fans, the rebate or incentive will be paid only if the customer or contractor provides proof of permit closure.

> The Implementer and PA will only verify the reasonableness, not the authenticity, of the submitted proof of permit.

2.3 Ex Ante Values

Energy efficiency savings, especially those attributable to a specific program, cannot be directly measured. All energy savings estimates are relative to a counterfactual – a baseline assumption for the expected energy use if the program intervention does not take place.

The term “ex ante” refers to all activities and estimations that take place prior to the evaluation of a savings claim. Ex ante values are the basic components of a savings claim; they include not just annual energy and demand savings, but also measure cost, incentive, effective useful life, net-to-gross ratio, and others.

2.3.1 Measure Application Type and Baseline Determination

The Implementer must assign a measure application type (MAT) in order to determine the appropriate measure baseline, which dictates the calculation basis for benefits and costs in cost-effectiveness calculations. The cost-effectiveness of a savings claim is expressed as a ratio of benefits to costs.

2.3.1.1 Measure Application Types

CPUC Requirement: The CPUC recognizes the following standard categories of MATs[11]:

- New Construction (NC);
- Normal Replacement, including Replace and Burnout (NR);
- Accelerated Replacement (AR);
- Add-On Equipment (AOE)
- Building Weatherization, shell and related components (BW);
- Behavioral (BRO-Bhv);
- Retrocommissioning (BRO-RCx); and
- Operational (BRO-Op)

The MAT represents how an energy efficiency measure is applied to a project and provides the basis by which measure baseline, cost, and energy savings can be determined. Implementers must classify all proposed energy efficiency measures into one of the measure application types

[10] California Code, Public Utilities Code Section 399.4(b)(1).
[11] *Resolution* E-4952, p.A-46

in order to determine forecasted savings.[12] The following table describes the default baseline for each measure application type.[13]

Table 2 - Default Baseline by MAT[14]

Alteration Type	Delivery Channel	Savings Platform	Measure Application Type			
			New Construction	Normal Replacement	Accelerated Replacement	Add-On-Equipment, Weatherization, Behavioral, RCx, and Operations
No Existing Condition (New Construction, expansions, added load)	All	All	Code / Standard Practice	N/A	N/A	N/A
Existing Buildings (including major alterations)	Upstream & Midstream	All	N/A	Code / Standard Practice	N/A	Code / Standard Practice
	Downstream / Direct Install	Custom	N/A	Code / Standard Practice	Dual	Existing
		Deemed	N/A	Code / Standard Practice	Dual	Existing
		Meter-Based	N/A	Existing	Existing	Existing
Non-Building Projects (including Industrial & Agricultural)	SEM programs	Meter-Based	N/A	Existing	Existing	Existing
	Non-SEM programs	All	N/A	Code / Standard Practice	Dual	Existing

The MAT also dictates other ex ante values, as summarized below:

Table 3 - Ex Ante Values Dictated By MAT

MAT	Baseline	Measure Cost	EUL	RUL
New Construction	Code / Standard Practice	IMC	Measure EUL	0
Normal Replacement	Code / Standard Practice	IMC	Measure EUL	0
Accelerated Replacement	Dual	ERC	Lesser of measure EUL or RUL of existing	RUL of existing
Add-On Equipment	Existing	FMC	RUL of existing	0
Behavioral, Residential	Existing	FMC	1	0

[12] *Energy Efficiency Policy Manual*, pp. 31-32.
[13] *Resolution E-4818*, p. 4.
[14] This table is a modified version of the table officially adopted in D.16-08-019 and updated in *Resolution E-4818*, at p. 4.

Behavioral, Non-Residential	Existing	FMC	2	0
Retrocommissioning and Operational	Existing	FMC	3	0
Weatherization	Existing	FMC	Measure EUL	0

2.3.1.1.1 New Construction

CPUC Requirement: The New Construction (NC) MAT is used where equipment is installed in either a new area or an area that has been subject to a major renovation, to expand capacity of existing systems, or to serve a new load. The NC MAT is used where there is no reference operation for existing conditions, such as with new construction, expansions, added load, a change in the function of the space (e.g. office to laboratory), or a substantial change (e.g. ~30% or more) in design occupancy.[15] For NC measures, the baseline is the Standard Practice, or Code baseline in place at the time the project commenced.[16]

2.3.1.1.2 Normal Replacement

CPUC Requirement: The Normal Replacement (NR) MAT is used where existing equipment (including Add-On Equipment) has either failed, no longer meets current or anticipated needs, or is planned to be replaced for reasons unrelated to the program.[17] For NR measures, the baseline is the Standard Practice, or Code baseline in place at the time the project commenced.[18] The NR MAT may be applied to any measure or program, with certain exceptions, and without a burden of proof.[19]

> Existing equipment that is not operational or is not meeting the existing service requirements, including Add-On Equipment, is categorized as Normal Replacement.

2.3.1.1.3 Accelerated Replacement

CPUC Requirement: The Accelerated Replacement (AR) MAT is used for the replacement of existing equipment that could and would remain operational without program intervention. It is used in direct contrast to the NR MAT, which is used when existing equipment either could not or would not remain operational.

AR measures are required to demonstrate both (1) the continued viability of the existing equipment and (2) the program influence on the decision to retire the system early. Evidence that the equipment **could** have remained operational only addresses viability; evidence indicating that the equipment **would** have remained in operation addresses both criteria. Assessment of evidence for and against both viability and influence is referred to as a "preponderance of evidence (POE) based assessment". The POE may be assessed at the measure, project, or program level. The POE determination is based on the most convincing evidence and its probable truth or accuracy, not on the amount of evidence presented.

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[15] *Resolution E-4818*, p.66.
[16] California Public Utilities Commission, August 18, 2016. *Resolution E-4795: Approval of the Database for Energy-Efficient Resources (DEER) updates for 2017 and 2018, in Compliance with D.15-10-028*, p. 39.
[17] *Energy Efficiency Policy Manual*, p. 29.
[18] *Resolution E-4795*, p. 39.
[19] *Resolution E-4818*, p. 67.

Program-level POE-based assessments should use broad market data to inform what fraction of program participants are likely AR versus NR.[20]

The AR MAT has three use cases:

- Early Retirement (ER);
- Repair Eligible (RE); and
- Repair Indefinitely (RI).

The ER use case involves the replacement of viable, existing equipment prior to the end of its useful life, when it would normally be replaced. The RE and RI use cases involve the replacement of existing equipment that would normally be repaired. POE-based assessments weigh: (1) whether the existing equipment could be viably operated (or repaired), and (2) whether the existing equipment would continue to be operated (or repaired) in absence of program intervention. AR measures are recorded as a single claim with a dual baseline.[21] Resolution E-4939 adopts the use of consistent POE and reporting requirements for all three use cases of AR.

Programs targeting small business customers (based on the definition of Small Business adopted in Resolution 4939 below) qualify for pre-approval for use of accelerated replacement measure type. Project-level preponderance of evidence must include evidence of customer eligibility for program participation and evidence of equipment viability for the remaining useful life claimed.[22]

2.3.1.1.4 Add-On Equipment

CPUC Requirement: The Add-On Equipment MAT is used for installations of new equipment onto pre-existing equipment, improving the nominal efficiency of the host system. The existing host system must be operational without the AOE equipment, continue to operate as the primary service equipment for the existing load, and be able to fully meet the existing load at all times without the add-on component. The add-on equipment must not be able to operate on its own. The actual energy reduction occurs at the host equipment, not at the add-on component, although any add-on component energy usage must be subtracted from the host savings.[23] AOE may use a Code, Standard Practice, or Existing Conditions baseline.

> The replacement of broken or poorly performing add-on equipment is considered through the NR MAT, not the AOE MAT.

2.3.1.1.5 Building Weatherization

CPUC Requirement: The Building Weatherization (BW) MAT is used for non-mechanical building efficiency improvements such as windows, insulation, air sealing, and duct sealing.[24]

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[20] *Resolution E-4818.*
[21] California Public Utilities Commission, Energy Division, April 18, 2015, Disposition for Workpaper PGECOHVC126 Revision 6 (*Unitary Air-Cooled Commercial A/C and H/P <65kBtu/h*).
[22] *Resolution* E-4939, p.49.
[23] *Resolution E-4795*, pp. 26-27.
[24] *Resolution E-4795*, p. 21.

BW measures use an existing condition baseline, however, the use of a Code or Standard Practice baseline is permitted.

2.3.1.1.6 Behavioral, Retrocommissioning, and Operational

CPUC Requirement: The Behavioral, Retrocommissioning, and Operational (BRO) MAT is used for measures that either restore or improve energy efficiency and that can be reasonably expected to produce multi-year savings. By definition, BRO measures result in performance that does not exceed the nominal (rated or original) efficiency of the pre-existing condition. BRO measures may use a Code, Standard Practice, or Existing Conditions baseline.

Savings from correcting deferred maintenance, performance restoration, and operational characteristics are considered within the BRO category. In cases where savings are a component of savings captured through equipment replacement, separate claims should be made for the equipment replacement savings and savings that arise from updating maintenance and operational factors.[25]

2.3.1.2 Baseline Selection

CPUC Requirement: All energy efficiency measures must have a baseline from which energy savings are assessed. The baseline establishes the energy consumption profile for a participant in the absence of program influence from the energy efficiency program. The MAT and alteration type are used to determine the baseline.[26] See Table 2 in section 2.3.1 for more details.

2.3.1.2.1 Code/Standard Practice Baseline

CPUC Requirement: The Standard Practice Baseline is an estimate of the activity or installation that would take place absent the energy efficiency program as required by code, regulation, or law, or as expected to occur as standard practice. The Standard Practice Baseline activity or installation must meet the anticipated functional, technical, and economic needs of the customer, building, or process and provide a comparable level of service as the energy efficiency measure.[27]

A Standard Practice baseline must comply with all codes, regulations, and standards when the project commences,[28] including but not limited to: minimum building energy efficiency requirements; emissions requirements; federal, state, and local government regulations; other regulatory agencies.[29] The standard practice need not comply with local reach codes.[30]

The standard practice must represent a typical or commonly implemented practice, although it need not be the predominant (i.e. greater than 50%) practice.[31] The selected standard practice must be reasonable to implement. Industry Standard Practice studies may provide suggestions or requirements for common practices.

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[25] *Resolution E-4795*, p. 28.
[26] *Energy Efficiency Policy Manual*, pp. 31-32.
[27] *Resolution E-4939*, p.8.
[28] *Resolution E-4795*, p. 39.
[29] California Public Utilities Commission, Energy Division, *Final Ex Ante Review Disposition*, Project ID x240. CPUC Industry Standard Practice Guide Version 1.2A, Section 2.7 ISP by Code or Regulation.
[30] *D.09-05-037*, OP 4.
[31] *Energy Efficiency Policy Manual*, pp. 31-32.

Standard practices are generally accepted as superior to other alternatives (e.g., a customer's standard way of complying with legal or ethical requirements, or a customer's preference for the best product with superior efficiency in customized design). Justification for selection of a Standard Practice Baseline (e.g. current purchasing trends, customer considerations) should be provided.

If only one activity or installation meets the customer's anticipated functional, technical, and economic needs, that option defines the standard practice by default. In cases where the existing conditions are more efficient than the standard practice, the existing conditions define the baseline. Use of the less efficient Code or Standard Practice as the baseline is referred to as a "regressive baseline" and is not allowed – the baseline selected for calculating energy savings may not use more energy than existing conditions.[32]

2.3.1.2.2 Dual Baseline

CPUC Requirement: The Dual Baseline incorporates elements of both the Existing Conditions Baseline and the Standard Practice Baseline. A Dual Baseline analysis is used exclusively for AR measures. The Dual Baseline reflects the difference between: 1) the savings that should be credited for the initial years of installation based upon the pre-existing or replaced equipment usage; and 2) the savings credit for later years based upon an eventual pre-existing equipment replacement (assumed to occur if the measure had not been installed as part of the program). At the later date, when the pre-existing equipment would have been replaced due to normal turnover (for reasons such as imminent failure or remodeling), an alternate equipment efficiency baseline is used. A Dual Baseline analysis requires two savings calculation periods:

- The Existing Conditions Baseline is applied to the remaining useful life period, defined as the first baseline period (see the Measure Life section for discussion of RUL determination). For this period, savings are calculated based on the difference between the measure and the Existing Conditions Baseline. The measure cost for this period is the Full Measure Cost.
- The Standard Practice Baseline is applied to the period between the remaining useful life (RUL) and effective useful life (EUL), defined as the second baseline calculation period. For this period, the savings are calculated based on the difference between the measure and the Standard Practice Baseline. The measure cost for this period is the full cost of equipment, including installation, for the second baseline equipment measure.[33] The second baseline should be based on known codes and standard practices that will be in effect at the end of the RUL.[34] For measures that do not exceed Code or Standard Practice, the second period of the dual baseline has zero savings.[35]

[32] *D.12-05-015*.
[33] *Energy Efficiency Policy Manual*, p. 32-33.
[34] California Public Utilities Commission, Energy Division, May 12, 2010, *Disposition for Workpaper 100512 (Non-DEER High Impact Measure (HIM) Review: Linear Fluorescent Measures)*.
[35] *Resolution E-4818*, p. 68.

While the measure cost for the second baseline period is the full cost of the second baseline equipment measure, for logistical reasons, the PAs calculate this value from the provided Full Measure Cost and Incremental Measure Cost.

2.3.2 Benefit Calculations

The following sections describe the ex ante values that are used to calculate the benefits side of the "benefit-cost" (cost-effectiveness) calculation.

2.3.2.1 Annual Savings Calculations

2.3.2.1.1 Direct and Indirect Energy/Demand Impacts

CPUC Requirement: All direct energy/demand impacts, either positive or negative (e.g. heat recovery heat exchanger saves gas but increases electricity use), must be included in savings claims. Indirect/interactive impacts must be included in savings claims, whether positive or negative (e.g. interactive effects from efficient lighting increasing HVAC gas use). HVAC and refrigeration interactive effects are incorporated into DEER and must be included in non-DEER workpapers. These interactive effects can only be applied to the portion of energy use that occurs within the conditioned space. Refer to DEER for internal gain fractions for residential appliances.

Programs should detail whether incentives are calculated based solely on direct savings, or both direct and indirect savings.

Exception: For projects that also save water, embedded (indirect) energy savings can be claimed.[36] The Water-Energy Calculator must be used to determine the embedded energy savings that can be claimed.

2.3.2.2 Net-to-Gross Ratio

CPUC Requirement: A net-to-gross (NTG) ratio must be determined for every claim. DEER currently has a variety of default NTG ratios, varying by parameters such as length of availability of incentives or sector (Residential vs. Non-Residential). Refer to DEER for the full list of default NTG ratios.

Accelerated Replacement measure application types use an adjustment factor of 0.75 applied to the below-code savings as shown in the equation below:[37]

$$NTG_{BC} = NTG_{AC} \, x \, NTG_{Adjustment\ Factor}$$

[36] California Public Utilities Commission, Energy Division, March 1, 2013, *Disposition for Workpaper PGECOAPP104 Revision 4 (Energy Efficient Televisions)*; California Public Utilities Commission, Energy Division, March 27, 2013, *Disposition for Workpaper PGECOAPP104 Revision 5 (Energy Efficient Televisions)*; California Public Utilities Commission, Energy Division, March 29, 2017, *Disposition for Workpaper PGECOAPP128 Revision 0 (Retail Products Platform)*.
[37] *Resolution E-4952*, p. A-44.

PA energy efficiency goals have changed from gross to net effective January 2018. Although the CPUC is solely responsible for determining net savings, programs are expected to encourage participants to perform actions that would not occur without the energy efficiency program intervention. Implementers should understand how net savings are calculated for planned interventions, and programs should describe in their implementation plans how they seek to attain net savings, including any eligibility and documentation requirements the program would impose to demonstrate program influence. For example, programs may impose and tailor eligibility criteria to exclude likely free riders and include only those customers who are unlikely to adopt energy efficiency absent program support.

2.3.2.3 Measure Life

2.3.2.3.1 Effective Useful Life

CPUC Requirement: The longest allowable effective useful life for a measure is 20 years.

Exception 1: Schools (K – 12 and Community Colleges) are allowed to use an EUL of up to 30 years for existing equipment only. The EE measure EUL is limited to a maximum of 20 years.

Exception 2: Water-Energy Nexus measures have an available EUL of 30 years for removed equipment.[38]

2.3.2.3.2 EUL of Add-On Measures

CPUC Requirement: For AOE measures, the EUL is the lesser of the RUL of the host equipment/system or the EUL of the measure.[39] For newly installed or replaced equipment that includes a new AOE component, the AOE savings may use the EUL rather than the RUL of the host equipment as a limit. In all cases the add-on equipment savings life is also limited by the AOE EUL value.[40]

2.3.2.3.3 Default Remaining Useful Life of Existing Equipment

CPUC Requirement: The default remaining useful life for existing equipment is one-third of the existing equipment's EUL. Deviations from this RUL value should be supported by evidence such as equipment installation date, maintenance records, or other external factors.[41]

[38] California Public Utilities Commission, September 17, 2015, *D.15-09-023: Decision Regarding Tools for Calculating the Embedded Energy in Water and an Avoided Capacity Cost Associated with Water Savings.*
[39] *Resolution E-4818*, p. 27.
[40] *Resolution E-4952*, p. 56.
[41] *D.12-05-015* at 347.

2.3.2.3.4 BRO EULs

CPUC Requirement: Behavioral programs in non-residential settings are permitted to use an EUL of up to two years, while retrocommissioning and operational programs are permitted to use an EUL of up to three years for ex ante savings claims.[42]

2.3.3 Cost Calculations

2.3.3.1.1 Measure Cost Basis Determination

CPUC Requirement: A measure cost must be submitted for each individual measure. The cost basis is determined by the baseline type, as indicated in the following table.[43]

Table 4 - Applicable Measure Cost Basis for Measure Application Types

Baseline Type	Applicable Measure Cost Basis
Standard Practice Baseline	Incremental Measure Cost (IMC)
Existing Conditions Baseline	Full Measure Cost (FMC)
Dual Baseline	Accelerated Replacement Cost (ARC)

2.3.3.1.2 Project and Measure Cost Determination

CPUC Requirement: Reported measure costs must include all customer out-of-pocket expenses incurred as a result of implementing the energy efficiency measure(s). Out-of-pocket expenses include the cost of any equipment or materials purchased, including sales tax and installation, any ongoing operation and maintenance costs, any removal costs (less salvage value), and the value of the customer's time in arranging for the installation of the measure (project management), if significant. At a minimum, for program installed measures, cost information should clearly itemize labor and material costs.[44] Only costs related to the project or measure should be included; the costs of product or feature choices not related to energy efficiency (e.g. standby equipment) should be removed.[45]

Methods for collecting cost data include, but are not limited to:

- Itemized invoices, which include the make, model, unit price, quantity of equipment, and the total cost;
- Technology costs from DEER (in READI Tool);
- Web-scraping (useful for measures that are sold online by retailers);
- EM&V impact evaluation studies and cost studies conducted by both the CPUC and PAs; and
- Cost data collected through previously completed projects.
- Contracted costs from manufacturers/distributors from upstream/midstream programs.

[42] *D.16-08-019*, p. 46.
[43] *Energy Efficiency Policy Manual,* p. 54.
[44] *California Standard Practice Manual*, p. 8.
[45] Measure Costs in EE Cost Effectiveness Tests. www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=3873.

2.3.3.1.3 Accelerated Replacement Measure Costs

CPUC Requirement: The Accelerated Replacement Cost (ARC) is the cost of the efficiency measure installed in an Accelerated Replacement situation. The ARC is the FMC of the efficiency measure, reduced by the net present value of the FMC that would have been incurred to install the Standard Practice second baseline equipment at the end of the RUL. The ARC is calculated using the following formula:

$$\boldsymbol{ARC = FMC - \frac{(FMC - IMC)}{(1 + D)^{RUL}}}$$

Where: FMC = full measure cost
IMC = incremental measure cost
D = CPUC-adopted PA discount rate
(7.66% for PG&E service territory, 7.65% for SCE service territory, 7.38% for SCG service territory, and 7.55% for SDG&E service territory)[46]
RUL = Remaining useful life (in years) of the early retired equipment

2.3.3.1.4 Baseline Technology Mix

CPUC Requirement: Where baseline savings are developed using a mix of technologies, baseline costs must be calculated based on the same baseline technology mix.[47]

[46] These are the CPUC-adopted PA discount rates as of the publish date of this Rulebook but are subject to change. Implementers should verify the currently adopted discount rate with their PA.
[47] California Public Utilities Commission (CPUC), Energy Division. May 13, 2019. *Disposition Approving Pacific Gas & Electric's LED High-Bay and Low-Bay Fixtures Workpaper PGECOLTG178 Rev 4*.

Chapter 3 Deemed Measure Requirements

3.1 Introduction

This chapter contains the rules and requirements that apply to deemed energy efficiency measures. All deemed program designs are subject to the ruleset in this chapter.

CPUC Requirement: Deemed values must be taken from a DEER version or workpaper effective at the earlier date of either permit issuance (if the installation requires a permit or approval from a regulatory agency) or installation completion[48].

3.2 Measure Level Requirements

PA Requirement: Measure specifications and eligibility requirements must be set for each deemed measure and should be well-defined to clearly align with the measure case description. Specifications and eligibility must be included in a CPUC-approved workpaper document and any other public-facing collateral such as a product catalog or program handbook. See Workpapers section for further requirements and details.

In order to qualify for a rebate, program participants must follow all applicable measure level requirements. This includes, but is not limited to: building type, climate zone, and delivery type. Unless otherwise specified in the Program Implementation Plan and applicable workpaper, all equipment must be new and, prior to application submission, properly installed and completely operational (following the operational requirements of the equipment). Measures must be more efficient than the pre-existing condition.[49]

3.3 Ex Ante Values

Please refer to the Overarching Requirements Chapter for more information on this topic.

3.3.1 Measure Development

3.3.1.1 CPUC Coordination on New Measure Development

CPUC Requirement: When proposing new deemed measures for the energy efficiency program portfolio, the PAs and any third party (Implementer or non-Implementer) must:

1. Use due diligence when developing the proposed ex ante values such that those new ex ante values represent the expected electricity and natural gas savings, costs, and lifetime of the measure;
2. Undertake research, in collaboration with Commission Staff, as required, to establish reasonable expected values, and
3. Assess promising new technologies and use the results of research undertaken during the assessment period to improve the ex ante values.[50]

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[48] Resolution E-4952, p. A-47

[49] California Public Utilities Commission, Energy Division, March 1, 2013, *Disposition for Workpaper (2013-2014 Lighting Retrofits)*.

[50] *D.12-05-015*, Ordering Paragraph 144, p. 431.

3.3.1.2 Current Workpaper Values

CPUC Requirement: The CPUC often approves savings and measure attributes for a specific effective time period.[51] The Date Approved (StartDate) is the first date for which a workpaper was approved for use and Expiry Date is the date after which the measure is no longer eligible.

3.3.2 Measure Application Type and Baseline Selection

Please refer to the Overarching Requirements Chapter for more information on this topic.

3.3.2.1 Baseline Selection

Please refer to the Overarching Requirements Chapter for more information on this topic.

3.3.2.1.1 Existing Conditions Baseline

CPUC Requirement: Workpapers for deemed measures that utilize an Existing Conditions Baseline must establish reliable aggregate data reflective of the existing condition and circumstance (buildings, customers, climate zones, etc.) where the measure is to be applied.[52] Workpapers that are submitted for ex ante review and approval by the CPUC may also request an Accelerated Replacement Baseline (or blend of Normal and Accelerated Replacement) for specified program deliveries, customer types, and/or measures applications. Such requests should specify the types of evidence collected from participants that will ensure compliant program delivery.[53] Program designs, program rules, and customer eligibility criteria are submitted to the Commission for approval, with a strong argument or data supported case that is highly indicative of inducing accelerated replacement. The program rules must specify the customer eligibility criteria and the evidence of customer and measure eligibility that will be collected for each program installation. The specified evidence must be collected for each installation as part of the program implementation, and this evidence must be made available to the Commission upon request and submitted as supporting documentation with related energy savings claims.[54]

3.3.3 Benefit Input Calculations

3.3.3.1 Best Available Data

CPUC Requirement: Use the latest evaluation, measurement and verification studies published in the development of ex ante values including energy impacts, cost data, effective useful life, remaining useful life, and net-to-gross ratios.[55]

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[51] Implementers must ensure that they use valid workpaper values in all savings and cost calculations. Current CPUC-approved workpapers can be found at http://deeresources.net/workpapers.
[52] E-4818, p. 18.
[53] E-4818, p. 43.
[54] E-4818, p. 46.
[55] *Energy Efficiency Policy Manual.*

If a given measure tier is proposed to be applicable to more than one technology, then several samples of each technology need to be evaluated to ensure that the proposed measure performance is typical of the range of performance available in the market for those same technologies.

3.3.3.2 DEER Values

CPUC Requirement: Workpapers must use DEER assumptions, methods, and data in the development of non-DEER values when available/appropriate and shall follow Commission Staff direction relating to the appropriate application of DEER to non-DEER values. Any proposed workpaper measure definitions that are different from DEER definitions should be calculated using DEER reference impacts.[56] DEER is updated on an annual basis. Workpapers must use the appropriate DEER version based on their program implementation year.

If DEER values and methods are not available, new values may be proposed for Commission Staff review and approval.[57] For non-DEER measures, DEER values should be used as the starting point. In cases where any of the installation parameters differ from the assumptions for the DEER measure, the Implementer should apply DEER methodologies for estimating the non-DEER parameter value.[58] Non-DEER values may not be used without Commission Staff approval.

Direct replacement of DEER measures is not allowed in workpapers.[59]

3.3.3.3 Effective Useful Life/Remaining Useful Life

Please refer to the Overarching Requirements Chapter for more information on this topic.

3.3.3.4 Installation-Rate / Gross Savings Installation Adjustment

CPUC Requirement: The installation rate (IR) or Gross Savings Installation Adjustment (GSIA) represents the percentage of units for which incentives were paid but not installed. If measures are removed after installation, the reduction should be captured in the EUL, not the GSIA.[60] Commission Staff maintains a table of installation rates for DEER and non-DEER measures in READI. For any measures not listed in this table, the installation rate shall be assumed to be 1.0.[61]

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[56] *Disposition for Workpaper PGECOAPP128 Revision 0 (Retail Products Platform).*
[57] *Energy Efficiency Policy Manual*, Rules VI 4-6 pp. 27-30.
[58] *Energy Efficiency Policy Manual*, pp. 27-30.
[59] *Disposition for Workpaper PGECOHVC174 (Multiple Speed Unitary Air-Cooled Commercial Air Conditioners and Heat Pumps ≥65 Bth/h)*
[60] *Energy Efficiency Policy Manual*.
[61] California Public Utilities Commission, Energy Division, *Disposition for Workpaper PGECOALL111 Revision 0 (Tier 2 Advanced Power Strips)*.

3.3.3.5 Net-to-Gross Ratio

CPUC Requirement: Net-to-Gross ratios must be chosen from available NTG IDs in the READI database tool that is the repository for DEER values.[62] Uniform statewide Net-to-Gross values should be used if the variation between utilities is not significant.[63]

Gas and electric projects must have separate Net-to-Gross values, unless the values are sufficiently similar that a single value is warranted.[64] The DEER default NTG value of 0.7 is available to be assigned to measures that have not been in the same program for at least two years.[65] The default residential NTG is 0.55 for measures that have been in programs greater than two years using any delivery mechanism.[66]

3.3.3.5.1 Emerging Technologies NTG Value

CPUC Requirement: Commission Staff shall have the authority to accept or reject a utility Emerging Technologies measure classification and to set any Emerging Technologies measure's Net-to-Gross at a higher or lower value than the default value (0.85), as it deems appropriate.[67]

3.3.3.5.2 Hard-to-Reach NTG Values

CPUC Requirement: For direct install measures that claim a hard-to-reach (HTR) NTG value (0.85), the workpaper should detail how HTR installations will be tracked. HTR values are only applicable for measures that meet the following criteria: [68]

[62] Workpaper Disposition for Lighting Occupancy Sensor Controls.
[63] *D.12-05-015*, p. 54.
[64] *D.12-05-015*, p. 399.
[65] DEER, 2015 Workpaper Guidance – Lighting Retrofits, 2011 DEER Update Report, p. 15-1 – 15-4.
[66] California Public Utilities Commission, Energy Division, February 28, 2013, *Disposition for Workpaper (On-Demand Pump Control for Central Domestic Hot Water Systems)*.
[67] *D.12-05-015*, p.62; DIS.02272013.CPUC, Workpaper Disposition for Lighting Occupancy Sensor Controls, February 27, 2013.
[68] WPSDGENRRN0009r1 Preliminary Workpaper Review, DEER, Resolution G-3510, p.58-59.

Table 5 - Hard-to-Reach Definitions by Segment

Segment	Required HTR Criteria	Criteria Definition
Residential	Geographic, and At least one of the following: - Language; - Income; or - Housing Type.	Geographic: homes or businesses in areas other than the US Office of Management and Budget Combined statistical areas of the SF Bay Area, the greater LA area, and the greater Sacramento area OR in a disadvantaged community, as defined by CalEPA. Language: primary language spoken is other than English. Income: those customers who qualify for the California Alternative Rates for Energy or the Family Electric Rate Assistance Program Housing Type: multifamily and mobile home tenants (rent and lease). Business Size: less than ten employees and/or classified as Very Small (customers whose annual electric demand is less than 20 kW, or whose annual gas consumption is less than 10,000 therm, or both). Leased or Rented Facility: investments in improvements to a facility rented or leased by a participating business customer.
Commercial	Geographic, and At least one of the following: - Language; - Business Size; or - Leased or Rented Facility	

If a customer does not have a geographic barrier, a customer that meets three of the other barriers listed above will qualify as hard-to-reach.[69]

The definition of hard-to-reach (HTR) is for a customer, not a building. If a measure is installed into a site owned by a business while occupied by either one or more businesses or residential customers, the ratepayer customer who pays for the energy use impacted by the measure installation is the customer to consider when applying the hard-to-reach definition. When classifying a customer as HTR, two criteria are considered sufficient if one of the criteria met is the geographical criteria.

3.3.3.5.3 NTG Values for Schools and Constrained Areas

CPUC Requirement: Projects undertaken by K-12 schools and community colleges, and programs that target specific transmission, distribution, or generation constrained areas (other than bottoming-cycle combined heat and power projects) may use a NTG value of 0.85 for above code measures.[70]

[69] G-3497
[70] 2015 Workpaper Guidance – Lighting Retrofits; D.14-10-046, pp.163-164.

3.3.3.6 Building Types

Workpapers must indicate which building types are eligible for the measure and include the associated savings for each eligible building type. Eligible DEER building types can be found in the READI database. New building types may be proposed to the CPUC for consideration.

> The workpaper developer may choose to submit ex ante values by specific building types or alternatively submit weighted average values using the applicable "Com" or "Res" building type. ("Com" and "Res" represent a weighting of all DEER commercial and residential building types respectively). If the energy savings and costs do not vary by building type, specify the building type as "Any."[71]

CPUC Requirement: When selecting building types for upstream measures, the preferred reporting method is to select a representative average building stock for the targeted sector ("Com" or "Res") rather than individually reporting each specific building type. If a workpaper author chooses to report specific building types, provide information on how the program will identify the specific building type for each claim.[72]

3.3.3.7 Building Vintage

CPUC Requirement: The median building vintage shall be used for claims of measures that are applied to buildings whose age is unknown or undocumented.[73]

3.3.3.8 Operating Hours

CPUC Requirement: Use the operating hours values and methods from the most recent version of DEER if the measure values are available.

3.3.3.9 Interactive Effects

CPUC Requirement: In DEER, the "whole building" energy impacts include interactive effects while the "direct end use" energy impacts exclude interactive effects.[74] Implementers must include HVAC interactive effects in non-DEER workpapers. In DEER, the "whole building" energy impacts include interactive effects while the "direct end use" energy impacts exclude interactive effects. Interactive effects must only be applied to the portion of energy use that occurs within the conditioned space. Refer to DEER for internal gain fractions of residential appliances.[75]

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[71] http://deeresources.com/files/guidance/download/ExAnte-DataStructure_MeasureCostSpecification_12-22-2015.pdf. Ex Ante Measure Cost Specification, p.4.
[72] *Disposition for Workpaper PGECOHVC126 Revision 6 (Unitary Air-Cooled Commercial A/C and H/P <65kBtu/h).*
[73] *Resolution E-4952, p. 40*
[74] *Energy Efficiency Policy Manual*, p. 34; *Disposition for Workpaper PGECOAPP104 Revision 4 and Revision 5 (Energy Efficient Televisions)*.
[75] *Disposition for Workpaper PGECOAPP128 Revision 0 (Retail Products Platform).*

3.3.4 Water-Energy Nexus Measures

CPUC Requirement: Implementers may propose water-energy measures to be incorporated into the existing Water Energy Nexus (WEN) workpaper, WPSDGEWEN0001.[76] The information listed in this section reflects the unique requirements for water-energy measures and should be combined with requirements provided in Section 5 for workpaper development.

3.3.4.1 Use of the Water-Energy Cost-Effectiveness Calculator

CPUC Requirement: The Water-Energy Cost Effectiveness Calculator can be found via the CPUC's Water Energy Nexus website at http://www.cpuc.ca.gov/nexus_calculator/ and must be used to calculate embedded energy savings. Implementers must provide justification for any departures from the default values contained in the Water-Energy Cost Effectiveness Calculator.[77]

3.3.4.2 Water-Energy Measure Parameters

CPUC Requirement: The following parameters shall be applied when calculating savings for water-energy measures:

- Net-to-Gross: WEN measures shall use the DEER NTG value when available. If the DEER value is not available, then the measure shall use the Metropolitan Water District (MWD) value. If neither the DEER nor MWD NTG is available, then the measure shall default to a NTG value of 0.85.[78]
- Effective Useful Life: WEN measures have a maximum expected useful life of 30 years for removed equipment.[79]
- Direct Energy Savings: For measures that have both direct and embedded energy savings, the measure attributes for the direct energy saving measure will be used for embedded energy savings even if they do not directly apply to the water efficiency portion of the measure (for example, load shape, climate zone, building type, etc.).[80]

3.3.4.3 Updating Workpapers with Water Savings

PA Requirement: When modifying or retiring a deemed measure, if there are water savings related to the measure, the WEN workpaper must be updated to reflect the change. The WEN workpaper must be updated when new deemed measures are offered that include water savings to include an associated water measure to claim savings for the embedded energy.

3.3.4.4 Water Savings for Water Energy Measures

CPUC Requirement: WEN measures shall use the water savings reported in the direct energy savings measure workpaper, where available. If water savings are not reported in the workpaper, or it is a water-only measure and therefore has no workpaper, must propose values using the Water-Energy Cost Effectiveness Calculator.[81] An Implementer must propose a revision to the WEN workpaper in order to have a new water-only measure available for use.

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[76] California Public Utilities Commission, Energy Division, *Disposition for Workpaper PGECOALL112 (Water Energy Nexus (WEN))*.
[77] *D.15-09-023*.
[78] *D.15-09-023*.
[79] *D.15-09-023*.
[80] *D.15-09-023*.
[81] *D.15-09-023*.

3.4 Quality Assurance and Quality Control

3.4.1 Rolling Portfolio Schedule

3.4.1.1 DEER Updates, Bus Stop Schedule

CPUC Requirement: Decision 15-10-028 details the mechanics for the Rolling Portfolio schedule as part of Phase II of Rulemaking 13-11-005. Key elements of the Rolling Portfolio schedule and requirements are listed below:

1. Final DEER values, updated annually by the CPUC, must be applied prospectively to Implementer programs as applicable. DEER values will be updated once per year with limited exceptions. DEER updates will be proposed by Commission Staff via resolution with opportunity for comment by stakeholder parties. Implementers will have an opportunity to review and comment on DEER updates.
2. The last business day in November will be the cut-off date for EM&V studies to be included in the following year's ex ante update. Draft ex ante values will be released for comment two months later, by January 31st. The PAs suggest that Implementers consider this schedule when anticipating the incorporation of applicable evaluation results into DEER ex ante updates.
3. Commission Staff must complete DEER updates by September 1st of each year.
4. Updates to workpapers to reflect changes in DEER must be completed by January 1st of the following year. Workpaper updates that include more changes than simply conforming with the latest DEER update may be submitted at any time on the first and third Monday.[82]

3.4.1.2 Ex Ante Values

CPUC Requirement: DEER values will generally change only once per year, and there will be a delay between when changes are announced and when changes are effective so that market participants have time to incorporate changes into their activities. [83]

3.4.2 Workpapers

CPUC Requirement: All deemed measures must be supported by CPUC-approved workpapers.[84] CPUC-approved workpapers provide deemed energy savings values, deemed calculations, deemed variables and factors, and the methodologies by which they were derived. Workpapers must include the applicability of the values and calculations, sources and references, assumptions, and analyses and evaluations to support the values.[85] Implementers

[82] *D.15-10-028*.
[83] *D.15-10-028*, p. 119.
[84] Based on California Public Utilities Commission, April 21, 2015, *D. 05-04-051: Interim Opinion – Updated Policy Rules for Post-2005 Energy Efficiency and Threshold Issues Related to Evaluation, Measurement and Verification of Energy Efficiency Programs*, p. 25.
[85] 2017 Workpaper Guidance November 14, 2016; California Public Utilities Commission, January 11, 2018, *D.18-01-004: Decision Addressing Third Party Solicitation Process for Energy Efficiency Programs* (A.17-01-013, et al.).

may propose new or updated workpapers to the PAs, but proposed workpapers must not provide preferential treatment to any provider of energy efficiency services.[86,87]

> The PAs currently accept, review, and submit to the CPUC Implementer-derived workpapers, leveraging the California Technical Forum (Cal TF) for review and vetting.

3.4.2.1 Workpaper Document (MS Word)

CPUC Requirement: Workpaper narratives shall align with ex ante data submitted. The narrative within a workpaper shall clearly tie to the values used in the Excel data submittal.[88]

PA Requirement: A proposed workpaper document must contain the following sections:

- "At-a-Glance Summary" – This summarizes the workpaper results which includes: Measure Code, Measure Description, Base Case Description, Units, Energy Savings (Base Case – Measure), Full Measure Cost ($/unit), Incremental Measure Cost ($/unit), Effective Useful Life (years), Measure Installation Type, Net-to-Gross Ratio, Important Comments.
- General Measure & Baseline Data: Measure Description & Background, Technical Description, Installation Types and Delivery Mechanisms, Measure Parameters, Codes and Standards Analysis, and Data Collection Requirements.
- Calculation Methodology.
- Load Shapes.
- Costs: Base Case Cost, Measure Case Cost, Full and Incremental Measure Cost.
- Revision History – This section records updates required by dispositions, program changes, code changes, savings changes, format changes, author and date of modification.
- Appendices – This includes the data submission template and any associated references noted within the workpaper.

Please see Appendix E for the current Statewide Workpaper Template used by PAs.

3.4.2.1.1 Measure Descriptions

CPUC Requirement: The measure description should be detailed enough to sufficiently describe the measure without referring to other sources.[89]

3.4.2.2 Data Reporting Workbook

CPUC Requirement: All measures associated with a proposed workpaper must be submitted by the PAs in the appropriate CPUC Ex Ante Specification template.[90] The CPUC Ex Ante

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[86] *Energy Efficiency Policy Manual*, p. 41.
[87] *D.18-01-004*.
[88] Final 2015 Efficiency Savings and Performance Incentive Ex Ante Review Performance Scores.
[89] California Public Utilities Commission, Energy Division, October 2, 2015, *Disposition for Workpaper PGECOHVC139 Revision 3 (Residential HVAC Quality Maintenance)*.
[90] Refer to http://deeresources.com/index.php/ex-ante-database/ex-ante-guidance for template and guidance on submitting ex ante data.

Specification contains four tables: EnergyImpact, Implementation, Measure, and MeasureCost.[91] These tables contain all of the workpaper parameters required to claim ex ante savings and calculate cost effectiveness. Acceptable inputs to the reporting template are included in support tables located in the Ex Ante Specification data template as well as the latest version of the READI Tool[92], which contains updated information.

PA Requirement: Implementers are required to complete the Statewide Data Specification[93] (not the CPUC Ex Ante Specification) for each new workpaper they develop. Each PA will use the information in the Implementer's completed Statewide Data Specification to complete the CPUC's Ex-Ante Specification template specific to its EE portfolio.

The requirements listed below reflect additional information provided by the CPUC.

3.4.2.2.1 Effective Useful Life and Remaining Useful Life ID

CPUC Requirement: For Add-On Equipment and Retrocommissioning measures, provide the Effective Useful Life of the add-on component and the Remaining Useful Life of the equipment that the measure is being applied to. The EUL is the minimum of the EUL of the former and the RUL of the latter.[94]

3.4.2.2.2 Measure SupportTable

CPUC Requirement: The Measure Support table is one component of the Statewide Data Specification. When a measure is not intended to be applicable to specific building types or climate zones, submit only one line in the Measure Support Table with Building Type = Any and Climate Zone = Any.[95] Implementers shall provide the specific building types and locations in their claims.[96]

3.4.2.2.3 Measure Implementation Reporting

CPUC Requirement: The Impl Support Table is another component of the data reporting template for workpapers. Implementers should report each delivery channel separately in the Impl Support Table.[97]

3.4.2.2.4 DEER Measure IDs

CPUC Requirement: If a measure is in DEER, the implementation table must reference the DEER measure via the DEER measure ID.[98]

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[91] The Ex Ante Specification data template can be downloaded as a Microsoft Access file from http://deeresources.com/index.php/ex-ante-database/ex-ante-guidance/16-ex-ante-specification.
[92] READI can be downloaded from http://deeresources.com/index.php/deer-versions/readi.
[93] The Statewide Data Specification is located on the Cal TF website here: http://www.caltf.org/s/Statewide-MeasureDataSpec-measure-name-template-r1.xlsm.
[94] California Public Utilities Commission, Energy Division, July 25, 2015, *Disposition for Workpaper PGE3PHVC153 Revision 3 (Programmable Thermostat – Nonres)*.
[95] WPSDGENRCC0016r1 Preliminary Workpaper Review.
[96] WPSDGENRCC0016r1 Preliminary Workpaper Review.
[97] Preliminary Workpaper Review PGE3PHVC159, PGECODHW125r1.
[98] California Public Utilities Commission, Energy Division, March 9, 2015, *Disposition for Workpaper PGE3PHVC159 Revision 2 (Duct Test & Seal: Residential)*.

3.4.2.3 Workpaper Submittal and Approval Process

The workpaper submittal and approval process has two different tracks, Phase 1 and Phase 2, depending on the type of submission. The following table summarizes the differences between the two types of submission.

Table 6 – Workpaper Submittals

	Phase 1 Submittals	Phase 2 Submittals
Types of Workpapers Allowed	• Updates related to DEER methods, assumptions, and values; • New workpapers with an effective date starting January 1st of the next program year; • Workpapers updated subsequent to the DEER resolution; • Workpapers with an update from any other source; • Workpaper updates that are outside the scope of DEER resolutions but are submitted before January 1st of the next program year.	• Non-DEER workpapers; • Updates to existing workpapers not included in the scope of DEER resolutions; • New workpapers with effective dates other than January 1st; • Updates to existing workpapers based on code changes; • Updates based on E-4818.
Deadline to Submit Workpaper	By January 1st of DEER update year.[99]	First and third Mondays of the month,[100] March through December. New workpapers with effective dates other than January 1st cannot be submitted during January or February (therefore no new submittals until March 1st).
CPUC Review Timeline	Workpapers not reviewed by March 1st will receive "interim" approval and are subject to prospective review.[101] Workpapers that are resubmitted in response to CPUC guidance: 25-days for subsequent review and disposition.[102]	• Workpapers chosen for review: 15-day preliminary review + 25-day detailed review. • Workpapers not selected: "interim" approval if after allotted review timeline but remain subject to prospective review.
Workpaper Effective Date	January 1st of DEER update year, may be updated based upon March 1st disposition.	• **For updates to existing workpapers:** Upon CPUC approval of workpaper submission or 25 days from workpaper submittal; if not reviewed, "pass-through" approval. • **For new workpapers with effective dates other than January 1st:** only reviewed March – December, then upon CPUC approval of workpaper submission or 25 days from workpaper submittal; if not reviewed, "pass-through" approval.

[99] *D.15-10-028*, p. 84.
[100] *D.15-10-028*, OP 21.
[101] *2017 Workpaper Guidance*, November 14, 2016.
[102] DNV GL. 2018. 2018-2019 Workplan Ex Ante Workpaper Workplan. December 24.

Workpapers with ex ante savings estimates are subject to Commission Staff review and approval. [103]

- Phase 2 workpapers chosen for review will undergo a 15-day preliminary review stage to determine whether a complete dataset is submitted in accordance with the Ex Ante Database specification, followed by a 25-day detailed review. Within 25-days of a Phase 2 workpaper submittal to the proper workpaper submission folder on the Workpaper Project Archive site, Commission Staff may (a) Request additional information needed in order for staff to complete a review of the workpaper, (b) require revisions to the workpaper, (c), approve the workpaper, or (d) reject the workpaper. In cases where Commission Staff request additional information or requires revisions, Commission Staff will review and either approve or reject the workpaper within 25 days of receiving the additional information or revised workpaper submitted to the appropriate folder on the Workpaper Project Archive site.[104]
- If Phase 2 submitted workpapers are not reviewed within the directed timeline, the ex ante values in the workpapers will receive interim approval but remain subject to prospective review and update under Phase 2 review requirements. If workpapers include errors (such as incorrect parameter values from the current Commission-approved DEER or existing, applicable codes and standards), then ex ante corrections of those errors are retroactive. [105]
- For Phase 2 submissions, the effective date is the date when Commission Staff approves the workpaper or once the 25-day detailed review opportunity period has passed. Claims cannot be made prior to the effective date.[106]

3.4.2.3.1 Existing Workpapers

PA Requirement: When available, Implementers must use an existing workpaper. A new workpaper may not be developed unless the measure substantially differs from the existing approach. Updates to existing workpapers are encouraged to reflect new/best available data.

3.4.2.3.2 Statewide Workpapers

CPUC Requirement: PAs will coordinate workpaper submittals so that duplicative workpapers (i.e. PAs submit separate workpapers for the same measure) are not submitted. Only one workpaper may be submitted for each set of programs/measures which are adopted by more than one program administrator; such workpapers have been termed “statewide workpapers”. Statewide workpapers must include measures, energy impacts, and technology costs valid for all relevant service territories.[107]

3.4.2.3.3 Workpaper Notifications

PA Requirement: Notifications on existing workpapers are posted on the Workpaper Project Archive site maintained by the CPUC. Program Administrators currently have access to these

[103] *2017 Workpaper Guidance*, November 14, 2016.
[104] *Energy Efficiency Policy Manual,* Appendix G.
[105] *2017 Workpaper Guidance*, November 14, 2016.
[106] *Disposition for Workpaper PGECOHVC139 Revision 3 (Residential HVAC Quality Maintenance)*; *2017 Workpaper Guidance*, November 14, 2016.
[107] *2017 Workpaper Guidance*, November 14, 2016.

notifications. Program Administrators will encourage the CPUC to make these notifications available to Implementers in a yet to-be-determined public forum.

3.4.2.3.4 Technologies with a Single Manufacturer/Vendor

CPUC Requirement: CPUC offers the following guidance with regard to workpaper development for technologies supported by one vendor only: "technologies and their energy efficiency features must be described generically and using basic engineering principles and should not identify a specific vendor or developer."[108] All other workpaper requirements apply.

3.4.2.4 CPUC Workpaper Dispositions

CPUC Requirement: Commission Staff may provide review recommendations or "dispositions" on reviewed workpapers. Those disposition types are listed below:

- Approved: workpaper may proceed with no changes to the submission.
- Conditional Approval: disposition includes specific revisions from the Energy Division. If agreed to by PA and Energy Division, workpaper is approved.
- Resubmission Required: disposition includes request for additional information or specific revisions or additions.
- Rejection: workpaper does not fall within the definition of an energy efficiency measure or does not meet Commission requirements for inclusion into a utility portfolio.[109]

Workpapers should include guidance from prior workpaper dispositions.[110]

CPUC Requirement: Dispositions for workpapers reviewed after the Phase 2 review period will apply on a prospective basis. Ex ante corrections to errors are retroactive.[111] A workpaper that does not get approved and receives a disposition must be updated to meet Commission requirements or it may not be included in the portfolio. Any deadlines or effective dates set forth in the disposition must be followed in order for measures to be eligible.

3.4.3 Dispute Resolution Process

CPUC Requirement: When Implementers disagree with CPUC Energy Division Staff positions on submitted workpapers, Implementers shall work with PA staff to set up meetings with Commission Staff to discuss the disagreement and work toward consensus. If the disagreement persists past meetings with Commission Staff and Staff's recommendations on the disputed values are included in a draft Resolution[112], Implementers shall work with IOU staff to develop comments on the draft Resolution.

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[108] California Public Utilities Commission (CPUC). 2019. "Informational Memo on Allowing a Sole Source measure in a Workpaper." Memorandum submitted to Cassie Cuaresma, SE; Henry Liu, PG&E, Ed Reynoso, SDG&E; Chan U Paek, SCG.

[109] *Energy Efficiency Policy Manual,* Appendix G, p.94.

[110] *Disposition for Workpaper PGE3PHVC153 Revision 3 (Programmable Thermostat – Nonres)*; Final 2015 Efficiency Savings and Performance Incentive Ex Ante Review Performance Scores.

[111] *2017 Workpaper Guidance*, November 14, 2016.

[112] Please note the two uses of the word "resolution" in this section. A "dispute resolution process" is the general process used to resolve disagreements and reach consensus with Commission Staff. The "draft Resolution" refers to the Commission's formally published documents upon which interested parties may comment.

The *Energy Efficiency Policy Manual* outlines a dispute resolution process based on D.12-05-015 for when an entity submitting a workpaper to Commission Staff finds the Staff requirements for that workpaper unacceptable. In this case, Commission Staff and the IOU will schedule one or more meetings to work toward agreement. If agreement is reached, Commission Staff will upload the workpaper to the Workpaper Project Area at which point the workpaper will become effective. Disputes that cannot be resolved through meetings with Staff will be addressed through the Resolution review process. In this case, Commission Staff will include recommendations on the disputed ex ante values in a draft Resolution. The IOUs will have an opportunity to submit comments on Staff's proposed adjustments to the disputed values in the draft Resolution, and the Resolution will be subject to Commission vote. Draft Resolutions will be issued every six months to address disputed ex ante values for workpapers submitted during the previous six months. [113]

[113] *Energy Efficiency Policy Manual*, pp. 97-98.

Appendix A – Bibliography

AB802, Energy Efficiency, October 8, 2015.
https://legiscan.com/CA/text/AB802/id/1145844

AB 1890, The Electric Utility Industry Restructuring Act. September 24, 1996.
http://www.cpuc.ca.gov/General.aspx?id=7881.

ASHRAE. *ASHRAE Guideline 14-2014 – Measurement of Energy, Demand, and Water Savings*. https://www.ashrae.org/home.

California Code, Public Utilities Code, PUC Section 339.8 (electric) and Sections 890-900 (gas).

California Code, Public Utilities Code, PUC Section 896; PG&E Tariff Gas Schedule G-PPPS.

California Code of Regulations, Title 24 (Building Standards Code).
http://www.energy.ca.gov/2015publications/CEC-400-2015-037/CEC-400-2015-037-CMF.pdf (2016 version)

California Code of Regulations, Title 20, Division 2, Chapter 4, Article 4 (Appliance Energy Efficiency Regulations).

California Direct Access Program, http://www.cpuc.ca.gov/General.aspx?id=7881.

California Energy Commission. *Glossary of Energy Terms*.
http://www.energy.ca.gov/glossary/glossary-i.html.

California Public Utilities Commission. March 23, 2018. *Administrative Law Judges' Ruling Seeking Comment on Certain Measurement and Verification Issues, Including for Third Party Programs* (A.17-01-013, et al.).

California Public Utilities Commission. January 11, 2018. *D. 18-01-004: Decision Addressing Third Party Solicitation Process for Energy Efficiency Programs* (A.17-01-013, et al.).

California Public Utilities Commission. November 9, 2017, *D.17-11-006: Decision Regarding To-Code Pilots*.

California Public Utilities Commission, Energy Division. August 24, 2017. *Resolution E-4867: Approval of the Database for Energy-Efficient Resources (DEER) updates for 2019 and, revised versions 2017 and 2018 in Compliance with D.15-10-028, D.16-08-019, and Resolution E-4818*.

California Public Utilities Commission, Energy Division. March 2, 2017. *Resolution E-4818. Measure level baseline assignment and preponderance of evidence guidance to establish eligibility for an accelerated replacement baseline treatment*.

California Public Utilities Commission. December 30, 2016. *Assigned Commissioner and Administrative Law Judge's Ruling Regarding High Opportunity Energy Efficiency Programs or Projects*.

California Public Utilities Commission. August 18, 2016, D.16-08-019: Decision Providing Guidance for Initial Energy Efficiency Rolling Portfolio Business Plan Filings

California Public Utilities Commission. August 18, 2016. *Resolution E-4795: Approval of the Database for Energy-Efficient Resources (DEER) updates for 2017 and 2018, in Compliance with D.15-10-028*.

California Public Utilities Commission. December 3, 2015. *Resolution G-3510: PG&E, SCE, SoCalGas, and SDG&E addressing approval of Energy Efficiency (EE) Incentive awards for program year (PY) 2013 and 2014.*

California Public Utilities Commission, October 22, 2015, *D.15-10-028: Decision Re Energy Efficiency Goals for 2016 and Beyond and Energy Efficiency Rolling Portfolio Mechanics*.

California Public Utilities Commission. September 17, 2015. *D.15-09-023: Decision Regarding Tools for Calculating the Embedded Energy in Water and an Avoided Capacity Cost Associated with Water Savings.*

California Public Utilities Commission. April 21, 2015. *D. 05-04-051: Interim Opinion – Updated Policy Rules for Post-2005 Energy Efficiency and Threshold Issues Related to Evaluation, Measurement and Verification of Energy Efficiency Programs*.

California Public Utilities Commission. November 3, 2014. *Commission Staff Memo: Required Corrections to Measure Level Input Parameters Identified by Commission Staff per D.14-10-046 Order Paragraph 16*.

California Public Utilities Commission. October 28, 2013. *Introduction to the California Net Energy Metering Ratepayer Impacts Evaluation.* www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=4292.

California Public Utilities Commission. September 19, 2013. *D.13-09-044: Decision Implementing 2013-2014 Energy Efficiency Financing Pilot Programs*.

California Public Utilities Commission. July 2013. *Energy Efficiency Policy Manual v5 (R.09-11-014)*. http://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/Utilities_and_Industries/Energy_-_Electricity_and_Natural_Gas/EEPolicyManualV5forPDF.pdf.

California Public Utilities Commission. May 10, 2012. *D. 12-05-015: Decision Providing Guidance on 2013-2014 Energy Efficiency Portfolios and 2012 Marketing, Education, and Outreach*.

California Public Utilities Commission. July 14, 2011. *D. 11-07-030*: *Third Decision Addressing Petition for Modification of Decision 09-09-047 (A. 08-07-021, et al)*.

California Public Utilities Commission. April 2006. *California Energy Efficiency Evaluation Protocols: Technical, Methodological, and Reporting Requirements for Evaluation Professionals*.

California Public Utilities Commission. January 27, 2005. *D. 05-01-055: Interim Opinion on the Administrative Structure for Energy Efficiency: Threshold Issues*.

California Public Utilities Commission. July 2002. *California Standard Practice Manual: Economic Analysis of Demand-Side Programs and Projects*.

California Public Utilities Commission. *READI Help Measure Catalog*. http://www.deeresources.com/index.php/22-readi-help/24-measure-catalog

Draft Guidance for Program Level M&V Plans: Normalized Meter-based Savings Estimation.

Efficiency Valuation Organization. *International Performance Measurement and Verification Protocol (IPMVP)*. https://evo-world.org/en/products-services-mainmenu-en/protocols/ipmvp https://www.pge.com/includes/docs/pdfs/mybusiness/energysavingsrebates/rebatesincentives/taxcredit/onbillfinancing/handbook_obf.pdf

https://www.pge.com/tariffs/assets/pdf/tariffbook/ELEC_RULES_11.pdf.

https://www.pge.com/tariffs/assets/pdf/tariffbook/GAS_RULES_11.pdf

Investor Confidence Project. February 2018. *Targeted Commercial Protocol, version 2.0*. http://www.eeperformance.org/targeted-commercial.html.

Pacific Gas and Electric Company. *January 17, 2017. A.17-01-015, Application of Pacific Gas & Electric Company (U39M) for Approval of 2018-2025 Rolling Portfolio Energy Efficiency Business Plan and Budget*.

State and Local Energy Efficiency Action Network (SEEAction). December 2012. *Energy Efficiency Program Impact Evaluation Guide*. https://www4.eere.energy.gov/seeaction/system/files/documents/emv_ee_program_impact_guide_0.pdf.

U.S. Department of Energy, Federal Energy Management Program. November 2015. *M&V Guidelines: Measurement and Verification for Performance - Based Contracts, Version 4.0*.

Working Group Created by D. 16-08-019 to Develop Consensus Recommendations on Measure-Level Baseline Assignments. *T1 Working Group Report*. http://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=6442451953

Appendix B – Glossary

Term	Definition
Accelerated Replacement (AR)	See Measure Application Type.
Accelerated Replacement Cost (ARC)	The full measure cost incurred to install the new high-efficiency measure, reduced by the net present value of the full measure cost that would have been incurred to install the standard efficiency equipment at the end of the remaining useful life period. See Section 2.3.3.1.4 for more information.
Add-On Equipment (AOE)	See Measure Application Type.
Aggregation	Method of quantifying meter-based savings claims by comparing pre/post normalized meter data from a population of participants with pre/post normalized meter data from a population of non-participants. Claims are made at the program or population level.
Behavioral, Retrocommissioning, and Operational (BRO)	See Measure Application Type.
California Public Utilities Commission (CPUC)	Regulates investor-owned electric and natural gas utilities operating in California. Regulates privately owned electric, natural gas, telecommunications, water, railroad, rail transit, and passenger transportation companies, in addition to authorizing video franchises.[114]
Code	In California energy efficiency context, generally refers to Title 20 (appliance energy efficiency) and Title 24 (building energy efficiency) of the California Code of Regulations but can be any codes and regulations enacted by federal and local governments and regulatory agencies that mandate a particular technology to be utilized.[115]
Community Choice Aggregators (CCA)	Organizations created by local governments pursuant to Assembly Bill 117 for the purpose of procuring power and administering energy efficiency programs on behalf of local citizens.[116]
Comparison Group	A population of non-participating customers similar and representative of a population of customers participating in an energy efficiency program. In an aggregation meter-based savings approach, the difference in normalized usage between the comparison group and the participating population yields the program's savings.
Coverage Factor	The range in observed values of independent variables during the baseline period in a site-specific meter-based analysis.
Customer	An account holder who receives delivered energy from one of the Investor Owned Utilities (IOUs). The parent company of the account holder and any of its subsidiaries are considered one IOU customer.[117]
Database of Energy Efficiency Resources (DEER)	Database located at: http://www.deeresources.com that contains information on energy efficiency technologies and measures, including estimates of energy savings potential and measure costs for these technologies in residential and non-residential applications.

[114] http://www.cpuc.ca.gov/aboutus/.
[115] California Code of Regulations, Title 24 (Building Standards Code) and Title 20, Division 2, Chapter 4, Article 4 (Appliance Energy Efficiency Regulations).
[116] California Public Utilities Commission, July 2013, *Energy Efficiency Policy Manual v5 (R.09-11-014)*, p. 48.
[117] CPUC email from Peter Lai, Energy Division, April 19, 2017.

Term	Definition
Deemed Measure	A prescriptive energy efficiency measure. Energy efficiency measures with predefined savings calculations, cost, eligibility, and other measure attributes.[118]
DEER Peak Demand Savings (through 12/31/2019)	The average demand impact, for an installed measure, as would be "seen" at the electric grid level, averaged over the nine hours, between 2 p.m. and 5 p.m., during the three-consecutive weekday period which contains the highest average temperature during the 12 p.m. to 6 p.m. period for those three days.[119,120]
DEER Peak Demand Savings (after 1/1/2020)	The average demand impact as would be "seen" at the electric grid level, averaged across 15 hours from 4 p.m. to 9 p.m. during the three-consecutive weekday period containing the highest algebraic sum of: • The average temperature over the three-day period, • The average temperature from noon to 6 p.m. over the three-day period, and • The peak temperature within the three-day period. The Peak Period shall fall within the dates of June 1 through September 30, inclusive. The three Peak Period days shall not include a holiday. Holidays within this window of dates include July 4th, or the nearest weekday to July 4th, and Labor Day.
Delivery Channel	The target of an EE program activity is known as the delivery channel, usually described as upstream (directed at manufacturers of EE measures), midstream (directed at distributors of EE measures), downstream (directed at retailers of EE measures or at retail locations where EE measures are sold), or direct install (directed at and provided directly to the customer). Otherwise known as "channel".
Direct Energy Savings	The primary energy and demand impacts that result directly from a measure such as the savings that result from the equipment involved in a retrofit activity (e.g., savings resulting directly from the lower input wattage of newly installed efficient lighting fixtures). Associated with Resource Programs as opposed to Non-Resource Programs.[121]
Direct Install	Energy efficiency solutions provided directly to the customer at little or no cost through installation contractors provided and managed by an Implementer.
Disadvantaged Communities	Pursuant to Section 39711 of the Health and Safety Code, the California Environmental Protection Agency (CalEPA) developed a means for identifying disadvantaged communities, which may include, but are not limited to: (1) Areas disproportionately affected by environmental pollution and other hazards that can lead to negative public health effects, exposure, or environmental degradation. A.17-01-013 et al. (2) Areas with concentrations of people that are of low income, high unemployment, low levels of homeownership, high rent burden, sensitive populations, or low levels of educational attainment.[122]

[118] *Energy Efficiency Policy Manual*, p. 49.
[119] California Public Utilities Commission, May 10, 2012, *D.12-05-015: Decision Providing Guidance on 2013-2014 Energy Efficiency Portfolios and 2012 Marketing, Education, and Outreach*.
[120] D.12-05-015, Attachment A: Summary of Changes to Database for Energy Efficiency Resources 2011, p. 14.
[121] Generalization of *Energy Efficiency Policy Manual* definition of HVAC interactive effects.
[122] D.05-18-041, p. 39

Term	Definition
Downstream	Classification of program delivery in which program is delivered by agents or representatives (including installation contractors) that have direct interaction with end-use customers or through a program website.[123]
Dual Baseline	Means that an existing baseline is used for the calculation of energy savings for the remaining useful life of the removed equipment. At the end of the remaining useful life (RUL), the customer would have needed to replace the failed equipment with equipment that reflected current energy efficiency standards and/or standard practices. This second baseline is used to calculate the [reduced] savings for the remainder of the effective useful life of the measure.
Early Retirement (ER)	See Measure Application Types.
Effective Useful Life (EUL)	An estimate of the median number of years that the measures installed under the program are still in place and operable.[124]
Embedded Energy	The amount of energy (in kWh) needed to supply, move, and treat water (in million gallons or acre/ft), delivered to a user, and to treat the water post-use (if necessary).
Emerging Technologies (ET)	New energy efficiency technologies, systems, or practices that have significant energy savings potential but have not yet achieved sufficient market share (for a variety of reasons) to be considered self-sustaining or commercially viable. Emerging technologies include late stage prototypes or under-utilized but commercially available hardware, software, design tools or energy services that if implemented appropriately should result in energy savings.[125]
Energy Efficiency (EE)	Activities or programs that influence customers to reduce energy use by making investments in more efficient equipment or controls, which reduce energy use while maintaining a comparable level of service.[126]
Energy Efficiency Measure or Measure	Energy using equipment, control system, or practice whose installation and/or implementation results in a reduction of energy purchased from the distribution utility (while maintaining a comparable or higher level of a specific service or to accomplish a specific amount of work). For purposes of these Rules, solar-powered, non-generating technologies are eligible energy efficiency measures. To be included in a program, the CPUC must approve the measure assumptions to be used to report savings. Also referred to simply as “measure”.[127]
Energy Efficiency Savings	Energy efficiency measures may result in both energy savings (measured in kilowatthours or therms) and demand (measured in kilowatts). The term “energy savings” may be used to refer to both energy and demand reductions.
Energy Efficiency Project	Implementation of an EE measure or group of measures at essentially one time, through a single incentive application.
Evaluability	An assessment of the probability that sufficient evaluation information will be available when evaluations are actually undertaken.[128]

[123] California Public Utilities Commission, August 18, 2016, *D.16-08-019: Decision Providing Guidance for Initial Energy Efficiency Rolling Portfolio Business Plan Filings*, p. 104.
[124] *Energy Efficiency Policy Manual*, p. 49.
[125] *Energy Efficiency Policy Manual*, p. 50.
[126] *Energy Efficiency Policy Manual*, p. 52.
[127] *Energy Efficiency Policy Manual,* p. 52.
[128] State and Local Energy Efficiency Action Network (SEEAction), December 2012, *Energy Efficiency Program Impact Evaluation Guide*, p. 8-3.

Term	Definition
Evaluation, Measurement and Verification (EM&V)	Activities that evaluate, monitor, measure, and verify performance or other aspects of energy efficiency programs or their market environment. The CPUC's Energy Division has management and contracting responsibility estimating savings impacts for purposes of calculating savings claims. The IOUs are authorized to contract and manage studies to evaluate program design and to assess the market. *See* Measurement & Verification.[129]
Ex Ante Review (EAR)	Process that estimates the potential energy savings and the customer financial incentive for an energy efficiency measure before it is installed and/or implemented based on predictions of typical operating conditions and baseline usage. The review process that occurs before savings for a measure or project savings claim is "frozen" and undertaken to verify that the ex ante values used to calculate the reported savings are reasonable and based on best available information.[130]
Ex Ante Values	Estimated savings, cost, incentive, effective useful life, net-to-gross ratio, and other values that are the basis of the savings claim. The ex ante values are the values prior to the evaluation of the portfolio cycle. These values reflect the IOU-reported savings, which may be revised with an impact evaluation.[131]
Experimental Design	An approach to program design which quantifies savings by identifying two similar customer groups, installing and/or implementing a set of energy efficiency measures in one group, and observing the difference in normalized usage between the two groups.
Ex Post Values	Estimated savings, cost, effective useful life, net-to-gross ratio, and other values that are determined by the CPUC through the Evaluation, Measurement and Verification process for energy efficiency measures, programs, and portfolios. Ex post evaluations serve the fundamental purpose of developing estimates of reliable load impacts delivered through ratepayer-funded efficiency efforts.[132]
Free Rider	Program participants who would have installed and/or implemented the measure or equipment in the absence of the program.[133] To prevent free ridership, implementers should avoid claiming influence if their interventions, if any, in a specific project don't happen during customer's decision-making process or result in no additional efficiency improvement over what the customer is planning to do anyway to meet today's needs.
Fuel Substitution	Programs which are intended to substitute energy using equipment of one energy source with a competing energy source (e.g. switch from electric resistance heating to gas furnaces).[134]
Fuel Switching	See Fuel Substitution.

[129] *Energy Efficiency Policy Manual*, p. 52; California Public Utilities Commission, January 27, 2005, *D.05-01-055. Interim Opinion on the Administrative Structure for Energy Efficiency: Threshold Issues*, p. 115.
[130] *Energy Efficiency Policy Manual*, p. 53.
[131] *Energy Efficiency Policy Manual*, p. 53.
[132] California Public Utilities Commission, December 31, 2016,*2013-2017 Energy Division & Program Administrator Energy Efficiency Evaluation, Measurement and Verification Plan Version 7 (Final)*
[133] *D.05-01-055,* p. 53.
[134] *Energy Efficiency Policy Manual*, p. 53. This document uses the terms "fuel switching" and "fuel substitution" interchangeably. Others use fuel switching to refer to changes to a non-regulated fuel (e.g. not electricity or gas), whereas fuel substitution refers to regulated fuels (electricity or gas). See the CEC Staff Paper: Framework for Establishing the Senate Bill 350 Energy Efficiency Savings Doubling Targets (January 2017) at pp. 18-19.

Term	Definition
Full Measure Cost (FMC)	The total cost of the EE measure which may include: audits, design, engineering, construction, equipment, materials, removal, recycling, overhead, sales tax, shipping, and labor directly related to the energy efficiency attributes of the measure. Product or feature choices not directly related to EE should be removed. Labor cost can be contractor or in-house if proof of direct project hours and costs are provided. Invoices should include the make, model, unit price, and quantity of equipment, the vendor name and address, the customer's name and address, the invoice number, the date of sale, and the total cost. [135] Participant costs include: • Initial capital costs, including sales tax • Ongoing operation and maintenance costs include fuel cost • Removal costs, less salvage value • Value of the customer's time in arranging for installation, if significant.
Gross Realization Rate	Also known as Realization Rate. The ratio of achieved energy savings to predicted energy savings that takes into account the likelihood that not all Commission-approved projects undertaken by IOUs will come to fruition. [136]
Gross Savings	Gross savings count the energy savings from energy efficiency measures installed by program participants irrespective of whether or not those savings are from free riders. Gross savings are adjusted by a net-to-gross ratio to produce net savings (that is, to remove the savings associated with free riders).[137] It should be noted that Gross Savings do include adjustments for Realization and Installation Rates. (See also GSIA.)
Gross Savings and Installation Adjustment (GSIA)	The GSIA is a DEER adjustment factor that combines the Realization Rate and Installation Rate. It is dependent on both the measure technology and how the measure is delivered.[138]

[135] California Public Utilities Commission, July 2002, *California Standard Practice Manual: Economic Analysis of Demand-Side Programs and Projects*, p. 11.
[136] *Energy Efficiency Policy Manual,* p. 54.
[137] *Energy Efficiency Policy Manual,* pp. 53-54.
[138] http://www.deeresources.com/index.php/22-readi-help/24-measure-catalog.

Term	Definition
Hard-to-Reach (HTR) - Residential	Those customers who do not have easy access to program information and/or generally do not participate in energy efficiency programs due to a language, income, housing type, geographic, and/or home ownership (split incentives) barrier. These barriers are defined as: • Language – Primary language spoken is other than English, and/or • Income – Those customers who qualify for the California Alternative Rates for Energy or the Family Electric Rate Assistance Program, and/or • Housing Type – Multifamily and Mobile Home Tenants (rent or lease), and/or • Geographic – Located in areas other than the San Francisco Bay Area, San Diego area, Greater Los Angeles Area (Los Angeles, Orange, San Bernardino, Riverside and Ventura counties) or Sacramento, or in a Disadvantaged Community (as designated by CalEPA) and/or • Home Ownership – Renters.[139] When classifying a customer as hard-to-reach, it is considered sufficient if only two of the criteria listed above are met if one of the criteria is the geographic criteria. If the geographic criteria are not met, three of the other criteria must be met.
Hard-to-Reach – Non-Residential	Business customers who do not have easy access to program information or generally do not participate in energy efficiency programs due to language, business size, geographic location/Disadvantaged Community status, or lease (split incentive) barrier.[140]
Implementer	Commercial entity involved in designing and/or implementing an energy efficiency program. An Implementer may be a separate commercial entity or a department within the IOU or program administrator. A separate entity, contracted by a program administrator, to design and deliver an energy efficiency program is also referred to as a third-party implementer.[141, 142]
Incentive	Payments for pre-approved projects that retrofit or install new equipment to save energy and are typically much larger in scope than those that qualify for a rebate; typically, the term “incentives” (as opposed to “rebates”) applies to custom projects.
Incremental Measure Cost	The additional cost of installing a more efficient measure calculated from the price differential between energy efficient equipment and services and standard or baseline equipment or services. Note that any cost premium resulting from features or components that do not improve the efficiency of the equipment is excluded from the incremental measure cost calculation.[143]
Indirect Energy Savings or Interactive Effects	The secondary energy and demand impacts that result from a measure to a secondary system or equipment not directly involved in the retrofit activity (e.g., cooling or heating energy impacts resulting from the installation of efficient lighting fixtures). Associated with Resource Programs as opposed to Non-Resource Programs.[144]

[139] California Public Utilities Commission, December 3, 2015, *Resolution G-3510: PG&E, SCE, SoCalGas, and SDG&E addressing approval of Energy Efficiency (EE) Incentive awards for program year (PY) 2013 and 2014, p.* 58. Disadvantaged Communities criteria added per D. 18-05-041, p. 48 and CoL 27.
[140] *Resolution G-3510*, pp. 58-59. D. 18-05-041, p. 48 and CoL 27.
[141] *D.16-08-019*, p. 105.
[142] *D.12-05-015*, p. 223.
[143] *Energy Efficiency Policy Manual*, p. 54.
[144] Generalization of *EE Policy Manual* definition of HVAC interactive effects.

Term	Definition
Industry Standard Practice (ISP)	A measure or practice that represents the typical current equipment purchased, or a commonly used, currently trending practice in the applicable markets absent the program. ISP represents today's market trend, i.e., whether a technology would be commonly purchased by customers today (not in situ or saturation), with consideration of key factors or barriers driving the technology adoption. The practice is considered "ISP-by-code" when the selection and adoption of that specific measure or practice is required to meet government standards, codes or regulations (including non-energy regulations). The practice is considered "ISP-by-default" when the selected measure is the only viable option considered by customer. *See* Standard Practice. In addition, an ISP can be a method or technique that has been generally accepted as superior to any alternatives because it produces results that are superior to those achieved by other means or because it has become a customer's standard way of doing things (e.g., a standard way of complying with legal or ethical requirements, or a customer's preference for the best product with superior efficiency in customized design). This is generally applicable to custom measures and projects.
Influence	See Program Influence.
Installation Rate	The ratio of the number of verified installations of a measure divided by the number of claimed installations rebated by the utility during a claim period. Typically, Installation Rates used on an ex ante basis will be based upon previous ex post evaluations. [145]
International Performance Measurement and Verification Protocol (IPMVP)	The IPMVP provides an overview of current best practice techniques available for verifying results of energy efficiency, water efficiency, and renewable energy projects in commercial and industrial facilities. It may also be used by facility operators to assess and improve facility performance. The IPMVP is the leading international standard in M&V protocols. It has been translated into 10 languages and is used in more than 40 countries.[146]
Investor-Owned Utility (IOU)	A business organization providing a product or service regarded as a utility (such as water, natural gas or electricity) to a service area, and managed as a private enterprise rather than as a function of government or a utility cooperative.[147] (e.g., Pacific Gas and Electric Company)
Measurement and Verification (M&V)	As distinguished from Evaluation, Measurement & Verification, M&V refers specifically to the process of quantifying measure- or project-level energy and cost savings resulting from improvements in energy-consuming systems. The effort required and rigor achieved from M&V should be commensurate with the project capital investment and savings risk.[148]

[145] *Energy Efficiency Policy Manual*, p. 55.
[146] California Public Utilities Commission, April 2006, *California Energy Efficiency Evaluation Protocols: Technical, Methodological, and Reporting Requirements for Evaluation Professionals*, p. 229.
[147] http://www.energy.ca.gov/glossary/glossary-i.html.
[148] U.S. Department of Energy, Federal Energy Management Program, November 2015, *M&V Guidelines: Measurement and Verification for Performance - Based Contracts, Version 4.0*, p. 2-1.

Measure Application Type (MAT)	A categorization of energy efficiency measures based on measure attributes – each measure application type has its own baseline treatment, cost basis, eligibility, and documentation requirements. There are six approved measure application types, which include: Accelerated Replacement, Add-On Equipment, Behavioral, Retro-commissioning and Operational, New Construction, Normal Replacement, and Weatherization. Each of these measure application types is further defined below.[149] *Accelerated Replacement (AR):* A measure application type which includes three subtypes: Early Retirement (ER), Repair Eligible (RE), and Repair Indefinitely (RI).[150] *Add-On Equipment (AOE):* An Add-on Equipment (AOE) measure installs new equipment onto an existing host improving the nominal efficiency of the host system. The existing host system must be operational without the AOE, continue to operate as the primary service equipment for the existing load, and is able to fully meet the existing load at all times without the add-on component. The AOE must not be able to operate on its own. The actual energy reduction occurs at the host equipment, not at the add-on component, although any add-on component energy usage must be subtracted from the host savings. *Behavioral, Retro-commissioning, and Operational (BRO):* The BRO category includes measures that either restore or improve energy efficiency, and can be reasonably expected to produce multi-year savings. BRO measures include information or educational programs that influence energy-related practices (behavioral), activities and installations that restore equipment performance to its nominal efficiency (i.e. rated, intended, or original efficiency (retro-commissioning)) but do not enhance the measure's nominal efficiency, and measures that improve the efficient operation of installed equipment (operational). BRO subelements are abbreviated as follows: • *BRO-Bhv: BRO Behavioral* • *BRO-Op: BRO Operational* • *BRO-RCx: BRO Retrocommissiong* *Early Retirement (ER):* Subset of Accelerated Replacement. The ER category is a sub-type of the larger Accelerated Replacement category, which includes replacements of existing equipment with nominally higher efficiency equipment and where there is more evidence than not that a) the existing equipment would have remained in operation for at least the remaining life of the existing equipment, performing its current service requirement and b) the energy efficiency program activity induced or accelerated the equipment replacement. The existing equipment must have at least one year of remaining useful life to qualify as Early Retirement. *New Construction (NC):* NC includes eligible projects where equipment is installed in a new area or one that has been subject to a major renovation, or to expand capacity of existing systems, or to serve a new load. *Normal Replacement (NR):* NR includes measure installations where the existing equipment has failed or no longer meets current or anticipated needs or is being replaced due to remodeling, upgrading, or replacement activities that are undertaken in the normal course of business. Measure installations where the existing equipment is still functional but does not qualify for

Term	Definition
	Accelerated Replacement fall into this category. This category now includes measures that previously fit into the now-retired Replace on Burnout category. *Repair Eligible (RE):* A measure application type representing the replacement of equipment that needs a major repair to return the equipment to fully serving the load and that repair cost is less than 50% of the full measure cost.[151] *Repair Indefinitely (RI):* A measure application type representing the replacement of equipment that exceeds its EUL and has a history of repair and maintenance and could continue to be maintained to serve the load for the RUL of the existing equipment.[152] *Weatherization (BW):* The BW category includes improvements to non-mechanical building structures, improving the nominal efficiency of pre-existing equipment that is otherwise expected to perform essential building functions throughout the course of a building's life cycle, without regular replacement. Such measures improve the efficiency of equipment that does not burn out or when it does burn out the building can function without them; thus, the equipment is typically not replaced unless there is a major building renovation.
Midstream	Type of program delivery in which incentive goes to the distributor or retailer to encourage promotion of energy efficiency products in the market. Incentive may or may not be passed to the end-use customer. Incentive may or may not be passed to the customer. Does not include programs partnering with contractors or installers.[153]
Net Savings	The savings attributable to a program realized when free ridership is accounted for. The savings is calculated by multiplying the gross savings by the net to gross ratio.[154]
Net-to-Gross (NTG) Ratio	A ratio or percentage of net program impacts divided by gross or total impacts. Net-to-gross ratios are used to estimate and describe the free-ridership that may be occurring among energy efficiency program participant s.[155]
New Construction (NC)	See Measure Application Type.
Non-Resource Program	Energy efficiency programs that do not directly procure energy resources that can be counted, such as marketing, outreach and education, workforce education and training, and emerging technologies.[156]
Normal Replacement (NR)	See Measure Application Type.
Payback Period	The period of time required to recoup the funds expended in an investment, whereby future income is not adjusted to account for the time value of money.

[149] California Public Utilities Commission, March 2, 2017, *Resolution E-4818. Measure level baseline assignment and preponderance of evidence guidance to establish eligibility for an accelerated replacement baseline treatment.*
[150] Accelerated Replacement currently includes ER, RE and RI, although rules regarding RE and RI are not yet defined per: California Public Utilities Commission, Energy Division, March 2, 2017, *Resolution E-4818: Measure level baseline assignment and preponderance of evidence guidance to establish eligibility for an accelerated replacement baseline treatment.*
[151] Working Group Created by D.16-08-019 to Develop Consensus Recommendations on Measure-Level Baseline Assignments, T1 Working Group Report, p. 13.
[152] T1 Working Group Report, p. 13.
[153] *D.16-08-019*, p. 104.
[154] *Energy Efficiency Policy Manual*, p. 57.
[155] *Energy Efficiency Policy Manual*, p. 57.
[156] *Energy Efficiency Policy Manual*, p. 57.

Term	Definition
Persistence	Measure life is a function of equipment life and measure persistence. Equipment life is the number of years that a measure is installed and will operate until failure. Measure persistence takes into account business turnover, early retirement of installed equipment, and other reasons measures might be removed or discontinued.[157]
Point-of-Sale (POS) Rebate	Rebate for purchase of energy efficient product at the time of sale as a line item on the invoice/receipt.
Portfolio	A composition of energy efficiency programs, such as all IOU and non-IOU energy efficiency programs funded by ratepayers, that are implemented during a program year or cycle. May also refer to a group of programs sponsored, managed, and contracted for by a particular IOU.
Preliminary Ex-Ante Review Database (PEARdb)	The Preliminary Ex Ante Review database (PRdb) is a supplement to the Official Ex Ante database (EAdb). While the EAdb contains the official ex ante data that is available for claims processing, the PRdb provides access to data that the ex ante team has recently developed, is currently reviewing or has newly approved.
Preponderance of Evidence (POE)	Preponderance of evidence is a term borrowed from civil law. The preponderance of evidence standard requires that evidence for two opposing conditions be considered – in this case Accelerated Replacement and Normal Replacement baselines – and the condition more likely to be true (greater than 50% probability) be chosen.[158]
Program	A collection of defined activities and measures that: • are carried out by the administrator and/or their subcontractors and implementers, • target a specific market segment, customer class, a defined end use, or a defined set of market actors (e.g. designers, architects, homeowners), • are designed to achieve specific efficiency related changes in behavior, investment practices or maintenance practice in the energy market, and are guided by a specific budget and implementation plan.[159]
Program Administrator (PA)	A person, company, partnership, corporation, association or other entity selected by the CPUC and any subcontractor that is retained by an aforesaid entity to contract for and administer energy efficiency programs funded in whole or in part from electric or gas Public Goods Charge funds. For purposes of implementing PU Code Section 381.1, an “administrator” is any party that receives funding for and implements energy efficiency programs pursuant to PU Code Section 381. PAs currently include investor-owned utilities, community choice aggregators, and regional energy networks.[160]
Program Administrator Cost Test (PAC)	Measures the net resource benefits from the perspective of the program administrator. Like the TRC, the benefits are the avoided costs of the supply-side resources avoided or deferred. The costs are defined to include the net present value of all costs incurred by the program administrator while, unlike the TRC, the PAC excludes the costs incurred by the participating customers. As in the TRC test, the net present values for the PAC are calculated using a discount rate that reflects each utility’s after-tax weighted cost of capital, based on the most recent cost of capital decision.[161]

[157] Evaluation, Measurement, and Verification Working Group, December 2012: *Energy Efficiency Program Impact Evaluation Guide*, p. 3-3.
[158] *Resolution E-4818*, p. 37.
[159] *Energy Efficiency Policy Manual*, p. 59.
[160] *California Energy Efficiency Evaluation Protocols*, p. 217.
[161] *Energy Efficiency Policy Manual*, p. 18.

Term	Definition
Program Influence	The program services, such as technical or financial assistance, provided during a customer's decision–making process that motivate a customer to implement the more efficient, more costly energy efficiency measure than they otherwise would have.
Public Purpose Program (PPP)	State-mandated gas and electric assistance programs for low income customers, energy efficiency programs, and public-interest research and development that are funded by surcharges on utility bills.
Qualified Products List (QPL)	List of equipment that meets specifications and qualification requirements set forth in the applicable measure specification.
Randomized Control Trial (RCT)	A type of experimental design in which members of an eligible population are randomly assigned to either a treatment group or a control group. A program intervention (for example, implementation of a set of energy efficiency measures, or information about an energy efficiency program) is then provided to only the treatment group. Net savings is estimated as the difference in usage between the two groups.
Ratepayer	Those customers who pay for gas or electric service under regulated rates and conditions of service.[162]
Rebate	A financial incentive paid to the customer in exchange for a specific action, typically the installation of energy efficiency equipment.[163]
Regressive Baseline	Use of a Code or standard practice baseline when existing equipment efficiency exceeds code or standard practice efficiency.[164]
Remaining Useful Life (RUL)	An estimate of the median number of years that a measure being replaced under the program would remain in place and operable had the program intervention not caused the replacement.[165]
Remote Ex Ante Database Interface (READI)	READI is a program that allows users to examine the CPUC's databases of ex ante measure information. With the READI program you can: • Browse and examine the ex ante data tables. • Find existing DEER and non-DEER measure definitions. • Find and examine the Technologies that are used in the measure definitions. • Examine the deemed energy impacts associated with measures in tables and graphs. • Download data tables to your computer as workbook or CSV files. • Create and Save new measures based on existing Scaled measure definitions.[166]
Repair Eligible (RE)	See Measure Application Type.
Repair Indefinitely (RI)	See Measure Application Type.
Resource Program	Energy efficiency programs that generate energy savings that are quantified and tracked by program administrators.[167]
Sector	Customer groups sharing common characteristics and barriers that are building blocks to PG&E's portfolio, including Residential, Commercial, Public, Industrial, Agricultural, and Cross-Cutting.
Site Specific	Method of quantifying meter-based savings claims by analyzing pre/post normalized meter data for a particular site. Claims are made at the site or project level.

[162] *Energy Efficiency Policy Manual*, p. 60.
[163] *Energy Efficiency Policy Manual*, p. 61.
[164] *D.12-05-015*.
[165] *Energy Efficiency Policy Manual*, p. 61.
[166] http://deeresources.com/index.php/deer-versions/readi.
[167] *Energy Efficiency Policy Manual*, p. 61.

Term	Definition
Small Business	Resolution E-4939 adopted the small business definition currently approved by the CPUC for use in IOU tariffs: "A small business customer is defined as a non-residential customer with an annual electric usage of 40,000 kilowatt hours (kWh) or less, or an energy demand of 20 kilowatt (kW) or less, or annual consumption of 10,000 therms of gas or less. Alternatively, a small business customer is a customer who meets the definition of "micro-business" in California Government Code Section 14837 (Section 14837). Section 14837 defines a micro-business as a business, together with affiliates, that has average annual gross receipts of $3,500,000 or less over the previous three years, or is a manufacturer, as defined in Section 14837 subdivision (c), with 25 or fewer employees. The California Department of General Services is authorized to amend the gross receipt amount. In January 2010 DGS increased the gross receipt amount from $2,750,000 to the current amount of $3,500,000. (see, California Office of Administrative Law, Regulatory Action Number 2000-1110-01S.) This definition does not include fixed usage or unmetered rate schedule customers."
Source BTU Consumption	Conversion of retail energy forms (kWh, therms) into the BTU required to generate and deliver the energy to the site. This conversion is used to compare the relative impacts of switching between fuel sources at the source or BTU level for the three-prong test required for fuel-substitution programs.[168]
Standard Practice Baseline	A measure or practice used as the baseline for a specific measure that represents what the customer would implement in the absence of program influence or intervention. A standard practice can be established from an ISP study, from similar and recent typical activity, or from an analysis of the current viable options applicable to the customer and the customer's typical decision-making process. Where a standard practice is identified that exceeds the minimum efficiency established by a code or regulation, the standard practice is the appropriate baseline.
Third-Party Implementer	See Implementer.
Title 24	Title 24 of the California Code of Regulations is known as the California Building Standards Code. Part 6 is the California Energy Code.
To Code	Refers to the installation of measures (or the resulting savings) with an efficiency level that complies with (but does not exceed) the current California Title 24 Building Efficiency Standards, Title 20 Appliance Efficiency Regulations, or industry standard practice.[169]
Total Resource Cost Test (TRC)	The TRC is used by the CPUC as the primary indicator of energy efficiency program cost effectiveness and is the ratio between costs and benefits. The costs are those incurred by both participants (e.g., measures/equipment installed) and the program administrator. The benefits are the avoided costs of the supply-side resources avoided or deferred.[170]
Trade Professionals	Any third party such as contractors, installers, retailers, distributors, manufacturers, engineers, and energy service companies, etc.

[168] *Energy Efficiency Policy Manual*, p. 62.
[169] California Public Utilities Commission, November 9, 2017, D.17-11-006: *Decision Regarding To-Code Pilots*, p. 3.
[170] *Energy Efficiency Policy Manual*, p. 62.

Term	Definition
Upstream	Type of program delivery in which an incentive goes to the manufacturer to encourage production and promotion of energy efficiency products in the market. Incentive may or may not be passed to the end-use customer.[171]
Water-Energy Savings	The savings of Embedded Energy that results from water-savings projects. Considered part of the Water-Energy Nexus.
Water-Energy Nexus (WEN)	Term applied to the energy used to treat, heat, and convey water in California and programmatic opportunities to reduce energy use and conserve water.[172]
Weatherization (WEA)	See Measure Application Types.
Workpaper	Documentation prepared by the program administrators or program implementers that documents the data, methodologies, and rationale used to develop ex-ante estimates that are not in already fully contained in the Database for Energy Efficiency Resources (DEER) (D.10-04-029, footnote page 20).[173]

[171] *D.16-08-019*, p. 104.
[172] California Public Utilities Commission, "Water/Energy Nexus," http://www.cpuc.ca.gov/nexus_calculator/
[173] *Energy Efficiency Policy Manual*, p. 63.

Appendix C - Abbreviations

The following abbreviations are used throughout the document:

Abbreviation	Term
AOE	Add-On Equipment
AR	Accelerated Replacement
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
BRO	Behavioral, Retrocommissioning, and Operational
BRO-Bhv	BRO-Behavioral
BRO-RCx	BRO-Retrocommissioning
BRO-Op	BRO-Operational
BTU	British Thermal Unit
CAL TF	California Technical Forum
CCA	Community Choice Aggregators
CEC	California Energy Commission
CFL	Compact Fluorescent Lightbulb
CIP	Central Inspection Team
CIT	Custom Implementation Team
CMPA	Custom Measure and Project Archive
COM	Commercial Building Type
CPUC	California Public Utilities Commission
CV(RMSE)	Coefficient of Variation of the Root Mean Squared Error
DA	Direct Access
DEER	Database for Energy Efficient Resources
EAR	Ex Ante Review
EE	Energy Efficiency
EI	Energy Insight
EISA	Energy Independence and Security Act
EM&V	Evaluation, Measurement, & Verification
ER	Early Retirement
ERC	Early Retirement Cost
ESP	Electric Service Provider
ET	Emerging Technologies
EUL	Effective Useful Life
EM&V	Evaluation, Measurement and Verification
FMC	Full Measure Cost
GSIA	Gross Savings and Installation Adjustment
HTR	Hard-to-Reach
HVAC	Heating, Ventilation, and Air Conditioning
ICP	Investor Confidence Project
IMC	Incremental Measure Cost
IOU	Investor-Owned Utility
IPMVP	International Performance Measurement and Verification Protocol
ISP	Industry Standard Practice
LED	Light Emitting Diode
MAT	Measure Application Type

Abbreviation	Term
M&V	Measurement and Verification
MWD	Metropolitan Water District
NEW	New Construction
NMBE	Normalized Mean Bias Error
NMEC	Normalized Metered Energy Consumption
NR	Normal Replacement
NTG or NTGR	Net-to-Gross Ratio
OBF	On-Bill Financing
OTR	“Other” Building Type
O&M	Operations and Maintenance
PA	Program Administrator
PAC	Program Administrator Cost Test
PC	Project Cost
POE	Preponderance of Evidence
POS	Point-of-Sale
PPP	Public Purpose Program
QA/QC	Quality Assurance/Quality Control
QPL	Qualified Product List
RCA	Refrigerant Charge Adjustment
RCT	Randomized Control Trial
RCx	Retrocommissioning
RE	Repair Eligible
READI	Remote Ex Ante Database Interface
REA	Retrofit Add-on
RI	Repair Indefinitely
ROB	Replace on Burnout
RUL	Remaining Useful Life
SBD	Savings by Design
TRC	Total Resource Cost
UES	Unit Energy Savings
VRF	Variable Refrigerant Flow
WEA	Weatherization
WEN	Water-Energy Nexus
WPA	Workpaper Project Archive
WRR	Wattage Reduction Ratio

Appendix D – Technology-Specific Guidance

The requirements provided in this appendix provide technology-specific requirements for workpaper development. This is not an exhaustive list of historical requirements, but rather a select subset of requirements currently in effect or with an effective date in the near future. This section will continue to be updated in future Rulebook revisions.

C.1 Lighting

C.1.1 Exterior Lighting

C.1.1.1 Baseline and EUL

CPUC Requirement: LEDs are considered standard practice for exterior lighting applications, therefore savings would only be assigned for the highest performing LED products. Implementers using Accelerated Replacement (AR) measures shall demonstrate the following:

1. Procedures for establishing preponderance of evidence of Accelerated Replacement (AR).
2. Development of updated NTG values above the existing conditions baseline to the standard practice baseline.
3. Standard practice baseline that represents the typical types of LED fixtures that would be installed absent the programs.
4. Measure definitions that represent the higher performing LED fixtures that exceed the performance of the standard practice baseline established per above description.[174]

CPUC Requirement: As a result of the change in Standard Practice baseline to LED technologies, all currently approved outdoor lighting measures will no longer qualify for the Accelerated Replacement (AR) baseline after December 31, 2017.[175] DEER2019 defines the standard practice for exterior lighting measures to be LED technologies for Accelerated Replacement (AR), effective January 1, 2018.[176] Normal Replacement (NR) measures are to have savings above a Standard Practice baseline. A Standard Practice baseline for NR measures shall be based on a mixture of LED and high intensity discharge (both high pressure sodium and pulse start metal halide technologies.[177] The baseline technology mix for Normal Replacement and New Construction (ROB/NR/NC) and the second baseline for Accelerated Replacement measures shall be as follows:[178]

a. Streetlights: 100% LED;
b. Roadway/Area: 100% LED;

[174] California Public Utilities Commission, Energy Division, March 1, 2017, *Disposition for Workpapers (Covering Exterior LED Lighting Fixtures)*.
[175] Resolution E-4795, p. 37.
[176] Resolution E-4795, p. 37.
[177] California Public Utilities Commission, Energy Division, March 1, 2017 and April 12, 2017, *Disposition for Workpapers (Covering Exterior LED Lighting Fixtures)*.
[178] California Public Utilities Commission, Energy Division, May 7, 2018, 2018 Outdoor Lighting Disposition for Workpaper PGECOLTG R8

c. Parking Garage: 20% metal halide, 20% linear fluorescent, and 60% LED;[179]
d. Wall-mounted: 100% LED, and
e. Canopy: 100% LED.

Note: The only currently approved exception to the 100% LED baseline is PGECOLTG151 R9. Per CPUC's 5/13/2019 memo, the LED outdoor parking garage measure utilizes the baseline mix noted in item c above and is approved and effective 8/13/2019 to 12/31/2019.

C.1.1.2 *Lighting Net-to-Gross (NTG)*

CPUC Requirement: The Net-to-Gross Ratio for all LED Outdoor Lighting categories of streetlighting, road & area, wall mounted, canopy, and parking garages utilizing a normal replacement or new construction measure application type, is 0.91.[180]

C.1.1.3 Operating Hours

CPUC Requirement: Operating hours must be taken from the most applicable and updated DEER data.[181] Outdoor lighting measures have a maximum ex ante approved value of 4,100 hours per year.[182] Use consistent hours of use reductions amongst lighting workpapers for fixtures that have motion sensors.[183]

Note: Parking garages are assumed to be **2767.5** hours of use. This Equivalent Full-Load Hours (EFLH) is the average of the full power and lower-power usage at 35% power (the mid-point in the 20% to 50% range allowed) per CPUC's disposition "2017ExteriorLEDFixturesDisposition-1Mar2017-FINAL".

C.1.2 Interior Lighting

C.1.2.1 Measure Wattages

C.1.2.1.1 Equivalent Lumens

CPUC Requirement: Previously, lighting measures were defined or binned for a range of wattages (e.g. 5 to 8 watts, 9 to 12 watts). Now measures are binned according to equivalent lumens provided rather than on rated wattage (i.e. 4' linear between 4500 and 5400 lumens). The change to lumen bins is based on the premise that customers buy lighting replacements to meet service requirements (e.g. lumens) rather than the rated lamp watts. This change also allows measures to remain stable as efficacy continues to improve because the lumen requirement for a given application is likely to remain the same, but the wattage needed to achieve this lumen requirement will drop as efficacy increases. Lastly, as part of the re-binning,

[179] Disposition for workpaper PGECOLTG151 R9 dated May 13,2019 approves the workpaper till 12/31/2019. After that date, the baseline would need to be adjusted in accordance with Resolution E-4952 Section 4.2, A-26.
[180] California Public Utilities Commission, Energy Division, PEAR Database (PR db)
[181] California Public Utilities Commission, Energy Division, May 13, 2019. *Disposition Approving Pacific Gas & Electric's Commercial LED Outdoor Parking Garage Workpaper, PGECOLTG151 Rev 9*.
[182] California Public Utilities Commission, Energy Division, June 2, 2017, *Revised Disposition for Workpapers (Covering Exterior LED Lighting Fixtures)*.
[183] *Disposition for Workpapers Covering Exterior LED Lighting Fixtures*.

the sizes of the bins were reduced, improving the overall accuracy of calculations associated with each binned measure, while increasing the calculated savings[184].

C.1.2.1.2 Addition of TLEDs in the Baseline

CPUC Requirement: Tubular TLEDs are generally less expensive and efficient than either an LED retrofit kit (which includes light source, driver, and an optically designed insert for a troffer) or an LED fixture completely designed and optimized for LED technology. Since consumers select between TLEDs, retrofit kits, or a full LED fixture replacement when considering LED technology, TLEDs are included in the baselines of fixture and retrofit kit measures. Linear measures will assume the mixed baseline noted in Attachment A, section 1.1.1 of Resolution E-5009[185].

C.1.2.2 Product Tiers and Incentives

CPUC Requirement: Define product tiers in a way that assigns greater savings for higher performance measures and place an efficacy floor on eligible measures.[186] For residential upstream lighting programs, the electric IOUs shall only offer incentives for LED bulbs to products that are in the top half of quality on the market and that meet the Voluntary California Quality LED Specification (CEC Spec).[187]

C.1.2.3 Operating Hours

Use DEER operating hours for lighting projects within DEER building types except for projects utilizing an IPMVP Option C or Option D analysis, provided that analysis accounts for interactive effects.[188]

C.1.2.4 Baseline Selection

The baseline LED efficacy shall be representative of the typical performance of non-qualifying fixtures that provide the same level of service as the measure fixture.[189] The second baseline for the AR MAT for interior lighting shall be LEDs.[190]

C.1.2.5 LED Ambient Fixtures

C.1.2.5.1 EUL For LED Ambient Fixtures

CPUC Requirement: Use an EUL of 50,000 basis hours with a 16-year maximum life for both residential and nonresidential building types for LED ambient fixtures and retrofit kits.[191]

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[184] DEER Resolution E-5009, p. A-2.
[185] DEER Resolution E-5009, p. A-3.
[186] California Public Utilities Commission, Energy Division, September 29, 2017, *Disposition for Workpaper PGECOLTG178 Revision 3 (Covering High And Low Bay LED Fixtures)*.
[187] *D.12-11-015*, OP30.
[188] *D.12-05-015*; California Public Utilities Commission, Energy Division, *Final Ex Ante Review Disposition*, Project ID PGE-16-T-I-157.
[189] D.12-11-015, OP30.
[190] Resolution E-4952, p. 44
[191] California Public Utilities Commission, Energy Division, August 23, 2015, *Disposition for Workpaper PGECOLTG179 (LED Ambient Commercial Fixtures and Retrofit Kits)*.

Note: Additional information on rated hours/maximum life (years) for various lighting technology types can be found in 2013-2014 Lighting Retrofit Disposition spreadsheet.[192] Additional information on normalized hours of use for various applications can be found in the 2015 Lighting Retrofit Guidance memo.[193] Note however that subsequent guidance has directed that dusk-to-lawn lighting operating hours are capped at 4100 hours[194].

CPUC Requirement: DEER lighting code baselines should reflect the most recent Title 24 lighting power density requirements as well as changes in standard practice at the earliest opportunity.[195]

C.1.2.5.2 Baseline for LED Ambient Fixtures

CPUC Requirement: The baseline technology mix shall be 100% LED.[196]

C.1.2.6 Hard-Wired Interior Lighting Fixtures Baseline Selection

CPUC Requirement: The standard practice baseline for all interior hard-wired LED ceiling fixture, grid/troffer fixtures, and retrofit kits shall be 100% LED and a minimum efficacy of 111 lumens per watt for Type A TLEDs[197]. This also applies to the NR baseline and second baseline for AR for linear LED replacement lamps. [198]

C.1.2.7 High and Low Bay LED Baseline Selection

CPUC Requirement: The standard practice baseline for interior high-bay and interior low-bay lighting applications must be based on a significant fraction of LED technology. Approved baseline percentage mixes are available in DEER. The linear fluorescent proportion varies from 0% to 20%, TLEDs from 0%-20%, with the balance provided by LED fixtures.[199] Effective January 1, 2020, the standard practice baseline must be 100% LED.[200]

C.1.2.8 LED Specialty Lamps, Small Diameter Directional Lamps, and Reflectors

CPUC Requirement: On July 1, 2018, the approved wattage reduction ratio (WRR) values will change for savings calculations for LED Specialty Lamps and Reflectors using a baseline of incandescent lamps. The current and future WRRs are listed in the table below.

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[192] 2013-2014 LightingRetrofit Disposition-14December2013.xls
[193] 2015 Lighting Retrofit Guidance Memo, 2015 Workpaper Guidance- Lighting Retrofits, January 27, 2015
[194] SCE/PG&E to track down specific reference (update in DEER?)
[195] *Disposition for Workpaper PGECOLTG179 (LED Ambient Commercial Fixtures and Retrofit Kits)*.
[196] Resolution E-4952, p. A-26
[197] DEER Resolution E-5009, p. A-4
[198] Resolution E-4952, p.44
[199] California Public Utilities Commission (CPUC), Energy Division. May 13, 2019. *Disposition Approving Pacific Gas & Electric's LED High-Bay and Low-Bay Fixtures Workpaper PGECOLTG178 Rev 4.*
[200] Resolution E-4952

Table 7 –Wattage Reduction Ratio Values for LED Specialty Lamps and Reflectors

Lamp Type	Watts	WRR[201] (beginning July 1, 2018)
MR16	All	Not Eligible
PAR20	All	3.21
PAR30	All	2.34
PAR38	All	2.60
R/BR	< 11w	4.17
	>= 11w, < 14w	3.28
	>= 14w	2.97
Candelabra	All	4.61
Globe	< 3w	4.68
	>= 3w	3.10
Can Retrofit	All	2.34

After July 1, 2018, MR16 and other screw-in small diameter directional lamps with diameters of 2.25 inches or less are not eligible for program offerings.[202]

The approved baseline for globe and candelabra lamp shapes will be 5% CFL, 35% LED, and 60% incandescent. The approved based for reflectors (except small diameter directional lamps) will be revised to 10% CFL, 40% LED, and 50% incandescent.

Effective January 1, 2019, programs shall adopt minimum efficacy requirements as specified in the table below:[203]

[201] California Public Utilities Commission, Energy Division, March 1, 2018, *Disposition for Workpaper (2018 Screw-in LED Savings Methods)*.
[202] *Disposition for Workpaper (2018 Screw-in LED Savings Methods).*
[203] *Disposition for Workpaper (2018 Screw-in LED Savings Methods).*

Table 8 –Minimum Screw-In Bulb Efficacy (Lumens Per Watt)

CRI	Efficacy (LPW) (beginning January 1, 2019)
82	124.4
83	122.1
84	119.8
85	117.5
86	115.2
87	112.9
88	110.6
89	108.3
90	106.0
91	103.7
92	101.4
93	99.1
94	96.8
95-100	95.0

In addition, eligible measures must have a compliance score of 297 (= 2.3 x color rendering index + Efficacy).[204]

C.1.2.9 LED Operating Hours and EULs

CPUC Requirement: For residential building types, the maximum allowed EUL is 16 years and for commercial building types, the maximum allowed EUL is 12 years. Although the minimum lamp life required for Energy Star products is 25,000 hours and most products claim a lamp life of 25000-35000 hours, the Energy Division recommends using a maximum lamp life of 20,000 hours. Since the effective useful life (EUL) is dependent on the hours of operation, the EUL varies by building type.

The EUL is calculated using the following equation:

EUL= (Rated Life of Lamp (max 20,000 hours)) / (Average Operating Hours for Building Type)

C.1.2.10 LED A-Lamp Baseline

LED A-lamps are considered industry standard practice (ISP) and have been removed from IOU portfolios statewide

C.1.2.11 Efficacy Requirements

CPUC Requirement: In accordance with the Energy Independence and Security Act (EISA), the following minimum efficacy requirements must be followed for 2019: [205]

[204] *Revisions to Disposition for Comprehensive Workpaper (Screw-In Lamps)*.
[205] *Revisions to Disposition for Comprehensive Workpaper (Screw-In Lamps)*; *Disposition for Workpaper (2018 Screw-in LED Savings Methods)*.

Table 9 –Minimum Efficacy Requirements by EISA Wattage

EISA Wattage	Minimum Efficacy 2019
40W	95
60W	100
75W and 100W	110

As of January 1, 2018, Title 20 requires all general service lamps manufactured for sale in California to have a minimum efficacy of 45 lumens/watt. This will eventually eliminate the availability of filament based, incandescent general service lamps as inventories of these lamps manufactured prior to this date are gradually sold out of existing inventories. The change in Title 20 necessitates revision to the standard practice baseline for energy efficient lamps measures so that the baseline considers the likely choices for lamp purchases. Commission Staff directs Program Administrators to consider this in updates to LED A-lamp workpapers.[206]

C.1.2.12 Non-DEER Operating Hours

CPUC Requirement: For lighting projects in non-DEER buildings, Implementers must employ data-loggers to track fixture operating hours in all space types within that building following the methods described in CPUC guidance or the schedules for the lighting circuits controlled automatically through an existing building energy management system may be used.[207]

C.2 HVAC

C.2.1 General

CPUC Requirement: For proposed HVAC measures utilizing performance maps, the full range of "enhanced" equipment offerings in the market must be cataloged, performance maps developed, and energy savings estimated for each in order to select a typical expected performance for a given set of equipment characteristics. If using performance maps different from those in DEER, either use DEER assumptions or show intermediate calculations in which cycling loss is incorporated into curves.[208]

C.2.2 Net-to-Gross Values

CPUC Requirement: The NTG values for HVAC measures below are:

[206] *Disposition for Workpaper (2018 Screw-in LED Savings Methods)*.
[207] California Public Utilities Commission, Energy Division, *Final Ex Ante Review Disposition*, Project ID X219.
[208] *Disposition for Workpaper PGECOHVC174 (Multiple Speed Unitary Air-Cooled Commercial Air Conditioners and Heat Pumps ≥65 Bth/h)*

Table 10. NTG Values for HVAC Measures

	2019	2020
Commercial Upstream Packaged Units	0.75	0.65
Commercial Quality Maintenance	0.73 / 0.60	0.45
Residential Quality Maintenance	0.78 / 0.55	0.55

C.2.3 Heat Pump and Heat Recovery Variable Refrigerant Flow Systems

CPUC Requirement: For the following list of building types, Tier 1 and 2 Heat Pump and Heat Recovery VRF systems must use the comparable Title 24 VRF system as a baseline.

- Assembly
- Education – Community College
- Education – Secondary School
- Education – University
- Health/Medical – Nursing Home
- Hotel
- Large Office
- Lodging – Motel
- Manufacturing Light Industrial
- Primary Schools
- Small Office

Tier 1 efficiency must be at least 15% higher than Code energy efficiency rating and the replacement system must have a rated efficiency at least as high as the Tier 1 energy efficiency rating to qualify as a VRF measure.[209]

VRF fuel-switching measures are not currently allowed. They may be allowed in the future when it can be shown that the choice to adopt VRF systems is primarily influenced by Programs. VRF fuel-switching measures must also satisfy the CPUC "three-prong" test requirements.[210]

C.2.4 Variable Refrigerant Flow Measures in Custom Retrofit Projects

CPUC Requirement: Variable refrigerant flow (VRF) measures for existing building projects are on hold pending approved calculation methodology for customized retrofit projects. VRF systems in SBD may be included only for the purposes of setting the incentive rate in the compliance run but must be modeled as neutral for the whole building savings claim.

Note: VRF measures are available through mid/up-stream offerings for some building types.

C.2.5 High Emissivity Coatings on Furnace Refractory Measures

[209] *Resolution E-4867: Approval of the Database for Energy-Efficient Resources (DEER) updates for 2019 and, revised versions 2017 and 2018 in Compliance with D.15-10-028, D.16-08-019, and Resolution E-4818*.
[210] California Public Utilities Commission, Energy Division, March 1, 2017, *Disposition for Workpaper: (Variable Refrigerant Flow (VRF) Systems)*.

CPUC Requirement: "CPUC Staff requires a hold be placed on any applications with this measure until further review can be performed. The IOU must not execute any incentive agreements for projects with this measure until instructed by CPUC staff."[211]

C.2.6 Residential Duct Sealing

CPUC Requirement: A duct sealing measure is not eligible if it is part of an HVAC unit installation or replacement. Duct sealing implemented as part a new system installation is only eligible if it is part of the installation of an above code HVAC system installation.[212]

C.2.7 Non-Residential HVAC Rooftop Quality Maintenance

CPUC Requirement: Condenser coil cleaning, evaporator cleaning, and air flow adjustment are related to refrigerant charge adjustment (RCA) savings and the unit energy savings (UES) are to be calculated as prescribed below: [213]

- Condenser Coil Cleaning UES Values = DEER RCA UES values * 0.125;
- Evaporator Coil Cleaning UES Values = DEER RCA UES values * 0.0625; and
- Air Flow Adjustment UES Values = DEER RCA UES values * 0.0625.

Economizer decommissioning is not an accepted measure.[214]

C.2.8 HVAC Cooling Efficiency Measures

CPUC Requirement: For all HVAC (or other) measures' equipment sizes, in order to use the (customer average) pre-existing savings values in DEER (which indicates an accelerated replacement measure type is being assigned to a claim), program claims will be required to provide rated efficiency values for the systems that are replaced. Evidence of the pre-existing equipment rated capacity must be retained in the project files (such as a picture of the equipment and its nameplate showing the model number and rating information). This information is required to support the claim, support evaluation verification of the claim and to provide data for future refinement of pre-existing baseline values.[215]

C.2.9 Boilers and Water Heaters

Compliance with the methodology outlined in the 2018 Residential Water Heater Disposition is required for water heater measures (deemed and custom) that are covered by a UEF (uniform energy factor) rating and the following measure technologies:

- Gas and conventional electric storage water heaters with 30-, 40-, and 50-gallon capacities; and

[211] California Public Utilities Commission, Energy Division, *Final Ex Ante Review Disposition*, Project ID X329.
[212] California Public Utilities Commission, Energy Division, March 9, 2015, *Disposition for Workpaper PGE3PHVC159 Revision 2 (Duct Test & Seal: Residential)*.
[213] California Public Utilities Commission, Energy Division, May 2, 2013, *Disposition for Workpaper (Non-Residential HVAC Rooftop Quality Maintenance)*.
[214] *Disposition for Workpaper (Non-Residential HVAC Rooftop Quality Maintenance)*.
[215] *Resolution E-4867,* p. 23.

- Small gas instantaneous water heaters.[216]

C.2.10 On Demand Pump Controller for Domestic Hot Water Systems

CPUC Requirement: Savings values should be categorized based on the size of building served, “per dwelling unit” served by the domestic hot water system: “Low-Rise” (up to three stories) or “High-Rise” (from three stories and up).[217]

C.2.11 Chillers

CPUC Requirement: All chiller measures, including custom projects and non-DEER deemed measures supported by workpapers, must have efficiency levels of at least ten percent better than Title 24 minimum efficiency requirements.[218]

C.2.11.1 Chiller Efficiency Degradation

CPUC Requirement: In the savings analysis, account for the degradation in chiller efficiency at higher condensing temperatures in order to make the peak kW calculation accurate. This requirement is not applicable to Savings By Design or other new load projects.

C.2.11.2 Lead Chillers

CPUC Requirement: Lead chiller measures may only be utilized in custom programs and shall not be used in deemed downstream, upstream incentive or direct install programs. Custom programs for lead chiller measures shall include pre- and post-installation measurement and verifications that support the measure chiller is installed and operating as the lead chiller.[219]

C.2.12 Smart Thermostats

C.2.12.1 EUL

CPUC Requirement: An EUL of 9.1 years is appropriate for smart thermostats.[220]

C.2.12.2 NTG for Parallel Smart Thermostat EE and DR Programs

CPUC Requirement: A net-to-gross value of 0.55 is appropriate for smart thermostats.[221]

C.2.12.3 Rebate by Fuel Type

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[216] California Public Utilities Commission, Energy Division, March 1, 2018, *Disposition for 2018 Residential Water Heaters*.
[217] California Public Utilities Commission, Energy Division, February 28, 2013, *Disposition for Workpaper D2013 – Hot Water Pump (On-Demand Pump Control for Central Domestic Hot Water Systems).*
[218] *Resolution E-4952, p. 36*
[219] *Resolution E-4952, p. 37*
[220] California Public Utilities Commission, Energy Division, April 5, 2019, *Disposition for the Smart Communicating Thermostat SCE17HCo54 Rev 1 Workpaper.*
[221] California Public Utilities Commission, Energy Division, April 5, 2019, *Disposition for the Smart Communicating Thermostat SCE17HCo54 Rev 1 Workpaper.*

CPUC Requirement: Fuel source for HVAC equipment controlled by thermostat must match the specified fuel type in the savings calculation.[222]

C.2.12.4 Measure Application Type

CPUC Requirement: Normal Replacement (NR) is the appropriate measure application type for a smart thermostat.[223]

C.3 Plug Loads

C.3.1 Television EUL and Load Shape

CPUC Requirement: When estimating EUL for televisions, take into account that: annual television usage may decrease with television age, and older televisions may eventually get displaced to locations where they see little usage.[224]

CPUC Requirement: In the absence of a more similar DEER load shape, television measures should use the interior CFLs load shape in cost effectiveness calculations.[225]

C.3.2 Power Strips

CPUC Requirement: The effective useful life of a power strip measure must be reduced by the fraction of customers who are expected to de-install the measure before its end of life.[226]

CPUC Requirement: The Tier 2 Connected APS workpaper is not approved for use for "control outlet" devices unless supported by a field study.[227]

C.4 Other

C.4.1 Pump Overhauls

CPUC Requirement: Pump overhauls fall into the Behavioral, Retrocommissioning, and Operational (BRO) measure type. The Implementer must assess the customer's standard practice in identifying and overhauling pumps, and only offer ratepayer incentives to accelerate the normal practice. The baseline for each project must be the customer's normal practice for refurbishment. Second baseline savings impacts are zero unless the Implementer can demonstrate that the refurbished pump efficiency exceeds the OEM pump efficiency. The incremental cost used in the ARC cost calculation must be set to zero unless the Implementer

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[222] California Public Utilities Commission, Energy Division, November 8, 2016, *Final Ex Ante Review Disposition, D2017 Residential Smart Thermostat*.
[223] California Public Utilities Commission, Energy Division, April 5, 2019, *Disposition for the Smart Communicating Thermostat SCE17HCo54 Rev 1 Workpaper.*
[224] *Disposition for Workpaper PGECOAPP104 Revision 4 (Energy Efficient Televisions)*.
[225] *Disposition for Workpaper PGECOAPP104 Revision 4 and Revision 5 (Energy Efficient Televisions)*.
[226] *Disposition for Workpaper PGECOAPP111 Revision 0 (Tier 2 Advanced Power Strips)*; California Public Utilities Commission, Energy Division, August 25, 2015, *Disposition for Workpaper WPSDGEREHE0004 Revision 0.3 (Tier 2 Advanced Power Strips)*.
[227] *Disposition for Workpaper SCE17CS014 Revision 1 (Tier 2 Advanced Power Strips)*

can demonstrate that the program causes additional refurbishment measures which increase efficiency to be installed that would not be installed as standard practice.[228]

C.4.2 Plastic Recycling Machines

CPUC Requirement: "For future projects: Determine both the New Construction and retrofit market industry standard practice for plastics recycling machines, since it appears that available equipment choices are limited. Any remaining projects in the pipeline, (either NC or retrofit), shall be placed on hold until the IOUs complete an ISP study to assess and determine proper NC baseline."[229]

[228] California Public Utilities Commission, Energy Division, Ex Ante Review Disposition, *PGE-16-T-I-0046_2K1600059214+ Multiple_Pump Repair Second EAR 2017-08-18*

[229] California Public Utilities Commission, Energy Division, *Final Ex Ante Review Disposition*, Project ID X435.

Workpaper SW13XX###

Revision #

Program Administrator

Workpaper Title

Instructions

This **Measure Characterization Template** is intended to aid the development of the measure characterization text for a statewide deemed measure. The Measure Development and Peer Review QA QC Guidelines provide instructions and guidelines for developing the contents for each field included in this template.

To start a new measure, save this template as a new Word file.

Title Page: Insert End Use and Measure Name.

Field Names: Field names are denoted by the heading style shown below. These field names are fixed and should not be changed.

FIELD NAME HEADING STYLE

Boilerplate Text: To facilitate standardization across measures, "boilerplate" text that is commonly used across measures is provided in this template. Boilerplate text is preceded with *[Boilerplate text]* → and *should be modified accordingly* so the text accurately pertains to the specific measure.

*[Shaded text] denotes an instruction or s*uggestion or cue to the measure developer.

Sample tables are included throughout this template. Any tables can be modified or deleted to meet needs for the specific measure.

When Complete: Remove all *boilerplate text* and *shaded text* cues. Delete the Measure Characterization cover page and this Instruction page. Update table of contents.

Measure development tools and resources are available on the California Technical Forum website (www.caltf.org).

At-a-Glance Summary

Measure Codes	*List all solution/measure codes.*
Measure Description	*Describe the measure.*
Base Case Description	*Describe the base case technology that will be replaced with the energy efficient technology. State whether this is the customer's existing equipment or code/standard equipment.*
Units	*E.g. per lamp, per ton*
Energy Savings	*Provide average values, or leave the following text intact:* Refer to Excel Calculation Attachment
Full Measure Cost ($/unit)	*Provide average values, or leave the following text intact:* Refer to Excel Calculation Attachment
Incremental Measure Cost ($/unit)	*Provide average values, or leave the following text intact:* Refer to Excel Calculation Attachment
Effective Useful Life	*List all EULs and sources.* *E.g. 15 years (DEER EUL ID: HVAC-airAC)*
Measure Installation Type	*New Construction (NEW/NC), Replace on Burnout (ROB), Retrofit or Early Retirement (RET/ER), Retrofit First Baseline Only (REF), Retrofit Add-on (REA)*
Net-to-Gross Ratio	*List all NTG ratios and sources.* *E.g. 0.6 (DEER NTGR ID: Com-Default>2yrs)*
Important Comments	This work paper has a complementary Ex Ante Database data set that will be provided in a separate submission to the California Public Utilities Commission (CPUC).

STATEWIDE MEASURE ID

MEASURE VERSION

MEASURE STATUS

EFFECTIVE DATE

SUNSET DATE

TECHNOLOGY SUMMARY

MEASURE CASE DESCRIPTION

Measure Case Specification

BASE CASE DESCRIPTION

Base Case Specification

CODE REQUIREMENTS

Applicable State and Federal Codes and Standards

Code	Applicable Code Reference	Effective Date
CA Appliance Efficiency Regulations – Title 20 (yyyy)		
CA Building Energy Efficiency Standards – Title 24 (yyyy)		
Federal Standards		

NORMALIZING UNIT

PROGRAM REQUIREMENTS

Measure Implementation Eligibility

Boilerplate text → All measure application type, delivery type, and sector combinations established for this measure are specified below. Measure application type is a categorization based on the circumstances and timing of the measure installation; each measure application type is distinguished by its baseline determination, cost basis, eligibility, and documentation requirements. Delivery type is the broad categorization of the delivery channel through which the market intervention strategy (financial incentives or other services) is targeted. This table also designates the broad market sector(s) that are applicable for this measure.

Implementation Eligibility

[add rows to table as needed to display all unit combinations of application type, delivery type, and sector]

Measure Application Type	Delivery Type	Sector

Eligible Products

Eligible Building Types and Vintages

Eligible Climate Zones

[Boilerplate text, modify accordingly.] → This measure is applicable in any California climate zones.

PROGRAM EXCLUSIONS

DATA COLLECTION REQUIREMENTS

USE CATEGORY

ELECTRIC SAVINGS (KWH)

PEAK ELECTRIC DEMAND REDUCTION (KW)

GAS SAVINGS (THERMS)

LIFE CYCLE

Boilerplate text → Effective useful life (EUL) is an estimate of the median number of years that a measure installed through a program is still in place and operable. Remaining useful life (RUL)

is an estimate of the median number of years that a technology or piece of equipment replaced or altered by an energy efficiency program would have remained in service and operational had the program intervention not caused the replacement or alteration.
Boilerplate text except for AOE and AR measures → Note that RUL is only applicable for add-on equipment and accelerated replacement measures and not applicable for this measure.
Boilerplate text if AOE and AR measures → The methodology to calculate the RUL conforms with Version 5 of the Energy Efficiency Policy Manual, which recommends "one-third of the effective useful life in DEER as the remaining useful life until further study results are available to establish more accurate values."[230] This approach provides a reasonable RUL estimate without the requiring any a priori knowledge about the age of the equipment being replaced.[231] Further, as per Resolution E-4807, the California Public Utilities Commission (CPUC) revised add-on equipment measures so that the EUL of the measure is equal to the lower of the RUL of the modified system or equipment or the EUL of the add-on component." [232]
[Explain derivation of any proposed EUL/RUL value if and EUL ID for the measure does not exist or if adopting an EUL ID of a different measure.]
[After this table is completed the measure developer should confirm 1st baseline and 2nd baseline years]

Effective Useful Life and Remaining Useful Life
[Modify table as needed: add rows for additional measure offerings and/or add columns if EUL ID differs by fuel type or sector. If EUL varies by building type (i.e., lighting measures), indicate as such.]

Measure Offering	EUL ID	EUL Value (yrs)	Source
[Measure Offering]			
[Measure host equipment – AOE only]			

BASE CASE MATERIAL COST ($/UNIT)

MEASURE CASE MATERIAL COST ($/UNIT)

BASE CASE LABOR COST ($/UNIT)

MEASURE CASE LABOR COST ($/UNIT)

[230] California Public Utilities Commission (CPUC), Energy Division. 2013. Energy Efficiency Policy Manual Version 5. Page 32.
[231] KEMA, Inc. 2008. "Summary of EUL-RUL Analysis for the April 2008 Update to DEER." Memorandum submitted to Itron, Inc.
[232] California Public Utilities Commission (CPUC). 2016. Resolution E-4807. December 16. Page 13.

NET-TO-GROSS

The net-to-gross (NTG) ratio represents the portion of gross impacts that are determined to be directly attributed to a specific program intervention. ***[****Explain source and rationale for NTG value(s)****]***

Boilerplate text for default NTGs (modify accordingly if specifying residential default values) → These NTG values are based upon the average of all NTG ratios for all evaluated 2006 – 2008 commercial, industrial, and agriculture sector programs, as documented in the *2011 DEER Update Study* conducted by Itron, Inc. These sector average NTGs ("default NTGs") are applicable to all energy efficiency measures that have been offered through commercial, industrial, and agriculture sector programs for more than two years and for which impact evaluation results are not available.

Net-to-Gross Ratios [Add rows to table if needed]

NTG ID	Value	Source

GROSS SAVINGS INSTALLATION ADJUSTMENT

The gross savings installation adjustment (GSIA) rate represents the ratio of the number of verified installations of the measure to the number of claimed installations reported by the utility. This factor varies by end use, sector, technology, application, and delivery method. ***[****Explain source and rationale for GSIA value(s)****]***

[Boilerplate text for default GSIA] → This GSIA rate is the current "default" rate specified for measures for which an alternative GSIA has not been estimated and approved.

Gross Savings Installation Rate Adjustments [Add rows to table if needed]

GSIA ID	Value	Source

NON-ENERGY IMPACTS

[Boilerplate text] → Non-energy benefits for this measure have not been quantified.

DEER DIFFERENCES ANALYSIS

[Boilerplate text] → This section provides a summary of DEER-based inputs and methods, and the rationale for inputs and methods that are not DEER-based.

DEER Difference Summary

DEER Item	Comment / Used for Workpaper
Modified DEER methodology	
Scaled DEER measure	
DEER Base Case	
DEER Measure Case	
DEER Building Types	
DEER Operating Hours	
DEER eQUEST Prototypes	
DEER Version	
Reason for Deviation from DEER	
DEER Measure IDs Used	

REVISION HISTORY

Measure Characterization Revision History

Revision Number	Date	Primary Author, Title, Organization	Revision Summary and Rationale for Revision Effective Date and Approved By
01	mm/dd/yyyy	Name, Title Organization	Revision Summary & Rationale: Text Approved By: Name, Title, Organization Effective Date: mm/dd/yyyy
02			