PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

ENERGY DIVISION

AGENDA ID: 18638
RESOLUTION E-5082
August 27, 2020

R E S O L U T I O N

Resolution E-5082. Approval of the Database for Energy-Efficiency Resources updates for Program Year 2022 and revised version for Program Years 2021 and 2020.

PROPOSED OUTCOME:

- DEER2022 Update (effective January 1, 2022)
- Revise DEER2021 Update (effective January 1, 2021)
- Revise DEER2020 Update (effective 2020)

SAFETY CONSIDERATIONS:

- This Resolution has no impact on safety.

ESTIMATED COST:

- This Resolution is not expected to immediately result in additional cost, however, some of the changes may have cost implications that cannot be known at this time.

By Energy Division's own motion in Compliance with D.15-10-028.

SUMMARY

This Resolution approves updates to the Database for Energy-Efficient Resources (DEER) for program year (PY) 2022 and a revised version of DEER for PY2021 and PY2020, in Compliance with D.15-10-028 and Resolutions E-4818, E-4952, and E-5009. This update also addresses significant transitions for the DEER and workpaper system maintenance and operation.

All updated DEER assumptions, methods, values and supporting documentation are available on the DEEResources.com website.[1]

BACKGROUND

Past Decisions

The California Public Utilities Commission (Commission or CPUC) Decision D.15-10-028, Ordering Paragraph 17 states: "Commission staff shall propose changes to the Database of Energy Efficient Resources once annually via Resolution, with the associated comment/protest period provided by General Order 96-B. However, Commission staff may make changes at any time without a Resolution to fix errors or to change documentation." D.15-10-028, retains the direction from D.12-05-015 that DEER values be updated for consistency with existing and updated state and federal codes and standards while incorporating these changes into the annual DEER update.[2] D.15-10-028 also retains previous direction on CPUC staff latitude in updating DEER.[3] Other relevant past decisions include Resolution E-4952[4] (DEER2020), adopted on October 11, 2018 which clarified and specified some E-4818[5] (adopted on March 2, 2017) issues, as well as provided a large number of other significant changes, such as the peak demand period and building prototype and measure analysis software (MAS) control updates.

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[1] See Main Menu→DEER Versions→DEER2022 on http://DEEResources.com

[2] D.16-10-28, at 80, states "D.12-05-015 allowed additional mid-cycle changes if there are new state and federal codes and standards that affect DEER values. Specifically, the decision stated in Conclusion of Law 84: "We generally agree with parties' request that ex ante values should be adopted and held constant throughout the portfolio cycle. However, mid-cycle updates of ex ante values are warranted if newly adopted codes or standards take effect during the cycle."

[3] D.16-10-28, at 80, quotes from D.12-05-015: "Conclusion of Law 80 states: 'Our Staff should have significant latitude in performing DEER and other policy oversight functions and, absent specific directives to the contrary, should not be required to consult with or otherwise utilize any other groups to perform this work."

[4] Resolution E-4952

[5] Resolution E-4818

Timing and Applicability of DEER Updates

DEER updates flow into the portfolio development process by providing new savings estimates and other parameter updates for program design. New savings estimates, and underlying assumptions, methods, and values inform the direction of current energy efficiency programs. These allow program administrators (PAs) to shift program eligibility requirements and incentive support mechanisms to deliver cost-effective savings. DEER updates may also reflect new market conditions. PAs are required to factor in new assumptions and values by a) knowing there is an update, b) understanding the fundamental assumptions for the update, and c) identifying necessary shifts to their programs to capture cost effective savings. Updates to DEER methods apply in workpaper development and custom project savings estimates as well as program deployment decisions.

Final list of priority topic area updates for DEER2022 and revised DEER2021

The final list of updated topic areas is summarized in Table 1. The policy guidance for these updates is described in the Discussion section that follows. A more detailed technical description of the changes and additions is provided in Attachment A to this Resolution. Complete documentation and supporting material on the updated assumptions and methods and updated DEER elements such as database tables, calculators, and web pages are available at DEEResources.com.[6]

Seven stakeholders, including all four investor owned utilities (IOUs), submitted comments on the DEER Update Scoping Memo.[7] Below are the issues raised most frequently in the comments:

- Issues relating to EM&V study updates;
- The transition to the electronic Technical Reference Manual (eTRM);
- Issues related to fuel substitution;

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[6] Supporting material is available under the main menu/DEER Versions/DEER2021.
http://www.deeresources.com/index.php/deer-versions/deer2021

[7] The Scoping memo was posted on April 21, 2020 and is located in two locations:
http://deeresources.com/index.php/deer-versions/deer2022
https://pda.energydataweb.com, Search on DEER2022

- Issues related to the savings for smart thermostats;

We respond to comments on each of these topics and other issues in Section 8 of Attachment A to this Resolution.

Table 1. DEER2022 Update Measures

Priority	Effort	DEER Version	Update Topic Area	Sector		Measure/Tech Group					Forecasted Value				
				Res	Non-Res	Lighting	HVAC	DHW	Envelope	Plug/Process	UES	NTG	EUL	Measure Cost	Other
			Transition to eTRM												
!!!!	$$$$	2020	Implement eTRM Transition Plan	X	X	X	X	X	X	X	X	X	X		
!	$	Ongoing	Support current infrastructure	X	X	X	X	X	X	X	X	X	X		
			DEER methodology updates												
!!!!	$$	2022	Modifications to accommodate load shape updates	X	X	X	X	X	X	X					X
!!!	$	2022	Effective useful life (EUL) update process revision	X	X		X		X	X			X		
!!!	$	2022	Chiller measure tier definitions		X		X				X				
!!!	$	2021	Clarification of BRO measure application type	X	X	X	X	X	X	X			X		
!	$	2022	Reclassify Duct Sealing for pre-2006 buildings	X			X						X		
			DEER error corrections												
!!!	$$$	2021	Corrected/updated water heater calculator	X	X			X			X				
!!	$$	2020	Added missing values for ceiling and wall insulation	X					X		X				
!!	$	2020	Added missing values for Com building type chiller		X		X				X				
!!	$	2020	Expired DEER2020 lighting measures	X	X	X					X				
!!	$	2020	Corrected interactive effects table		X	X									X
			Review of EM&V studies												
!!!	$	2022	Overarching/general changes	X	X	X	X	X	X	X	X				
!!![H]	$$$	2022	Residential EM&V (including Home Upgrade; water fixtures; pool pumps)	X			X	X		X	X	X			

Priority	Effort	DEER Version	Update Topic Area	Sector		Measure/Tech Group					Forecasted Value				
				Res	Non-Res	Lighting	HVAC	DHW	Envelope	Plug/Process	UES	NTG	EUL	Measure Cost	Other
!!!	$$	2022	Lighting EM&V (upstream and downstream studies)	X	X	X					X	X		X[U][8]	
!![H]	$$$	2022	HVAC EM&V (including duct seal; unitary RTUs; chillers; and boilers)	X	X		X				X	X			
!!	$$	2022	Small Commercial EM&V (including refrigeration; irrigation; and DHW)		X			X		X	X	X			
			Review of codes & standards												
!!	N/A	2022	Codes and Standards changes, California and Federal												
			Review of market and research studies												
!!	$	2022	Review completed IOU studies								X	X	X		
			New measure additions												
!!!	$	2020	Fuel-substitution measure framework/adjustments	X	X		X	X			X	X	X		X
!!!	$	2020	New NTG IDs and values	X	X	X	X	X	X	X		X			
!!	$$	2021	New efficient water heater thresholds	X	X			X			X				
!!	$$	2022	Residential heat pumps for SEER ≥19	X			X								

DISCUSSION

Pursuant to D.15-10-28, the Energy Division published a DEER Update Scoping Memo on the proposed list of updates for DEER2022 and revised DEER2021 and DEER2020 items on April 21, 2020. The list of topic areas that this Resolution will incorporate are summarized below and described in detail in Attachment A, Database for Energy-Efficient Resources Updates for Program Year 2022 DEER2022 Update Statement, to this Resolution.

[8] upstream

A. Transition to eTRM

The DEER database has a 30-year history, starting in the 1990s under the California Energy Commission (CEC) where responsibility for developing energy efficiency measure parameters was delegated to a broad stakeholder coalition. With the 2006-08 energy-efficiency (EE) portfolio cycle, the CPUC Energy Division took control of the DEER and began hosting it on the "Deeresources" suite of websites. The CPUC's goal was to maintain a "frozen" set of values as a reference for measure development, program tracking claims and evaluations. The Commission also directed the IOUs to reserve a portion of energy efficiency funding for the purpose of maintaining and expanding data systems to support ex ante review and portfolio claims tracking. [9] Since the 2006-08 portfolio cycle, many technological advancements have occurred in the database space, and we seek to now modernize the architecture of the DEER and workpaper project archives (WPA) to create a truly relational database that can be searched, referenced and updated more efficiently and reliably.

The eTRM was developed in response to the IOUs' consolidation of territory-specific EE measures into a set of statewide workpapers, or EE measure offerings that share the same value tables across all IOU territories. The effort was conducted under the auspices of the California Technical Forum (Cal TF) and funded by Pacific Gas & Electric Co. (PG&E), Southern California Edison (SCE), Southern California Gas Co. (SoCalGas) and San Diego Gas & Electric Co. (SDG&E), referred to collectively as the "IOUs" or "IOU funders," and the State's two large publicly-owned utilities (POUs), Sacramento Municipal Utility District (SMUD) and Los Angeles Department of Water and Power (LADWP).

During this consolidation effort the Ex-Ante database (EAdb) tables and WPA file directory were standardized into the eTRM relational database format and made accessible through an online user interface. Similar to technical resource manuals used by other states, the California eTRM enforces a transparent deemed EE measure values data standard, enables global controls and allows users role-based access to different levels of EE measure data.

CPUC staff is currently developing a multi-year transition plan to progressively transition existing DEER and workpaper systems to a software platform jointly co-

[9] D.05-01-055, p.129.

funded by the IOUs called the Electronic Technical Resource Manual (eTRM) [10] with the objective of phasing out existing systems by December 31, 2021.

CPUC staff has been working with IOUs and consultants on development, transition, and adoption activities, and will approach the project in two phases. Phase 1 establishes that the eTRM reflects official ex ante data and displays current approved ex ante measure data for statewide measures and will be completed in the third quarter of 2020. Phase 2 addresses enhancements necessary for the eTRM to meet the Deemed Data Standard[11] for review, described in more detail in Appendix 2, and shall begin later in 2020 and be completed by June 2021 to provide Energy Division adequate time to test and accept before final transition of DEER.

The eTRM uses a modern relational database architecture that can be integrated with the CPUC's other EE data systems. The Energy Division will maintain authority over the values presented in the eTRM: in Phase 1 this will be accomplished with an application programming interface[12] (API) data call to the existing ex ante database, while enhancements developed in Phase 2 will enable staff oversight directly within the eTRM itself using a new "CPUC User" role with read/write privileges.

A.1 Designation of eTRM as a Data Source of Record

With this resolution, we confer the conditional designation "data source of record" to the eTRM, which has undergone a comprehensive readiness assessment by CPUC staff and consulting teams and meets and maintains the standard set forth by the CPUC staff for deemed EE measure data.[13]

The CPUC's present suite of deemed data resources—the current "data source of record"—is maintained by CPUC staff and resides across various websites, support tables, applications and file directories that can no longer be supported by CPUC IT staff or our consulting teams. Transitioning to the eTRM as data source of record will

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[10] https://www.caetrm.com

[11] "Deemed" energy efficiency measures are measures with validated and pre-determined energy savings values.

[12] An API is a set of functions and procedures which allow interactions between a program designed for the end user (application software) and another piece of software.

[13] Attachment A, Appendix 2 – Standard for Deemed Data Source of Record

replace these older systems and enable users transparent and efficient access to deemed EE measure data in an online environment; additional eTRM enhancements will make review and approval of EE measures more efficient, enable a more robust data architecture, and allow for integration with other EE data systems like the California Energy Data and Reporting System (CEDARS)[14] and the cost effectiveness tool (CET.)

Phase 1 of the Energy Division's transition plan involves designating the eTRM as a conditional data source of record to enable public users access to active Commission-approved deemed statewide measure values. The conditional designation will remain in place until the CPUC staff determines that the eTRM achieves the milestones described in this resolution. By July 1, 2021, the eTRM will be the definitive public access portal for active statewide measure data, and Staff will begin working with the IOUs to integrate relevant ex ante data into the eTRM so that at a suitable point in 2021 the DEER database and READI data viewer will be archived on the Commission's servers.

As a data source of record, the eTRM may be referenced in workpapers submitted for staff review and general portfolio planning activities beginning January 1, 2021. CPUC staff plans to begin preparations for Phase 2 in 2020, starting with eTRM functionality enhancements to facilitate workpaper submission, review, tracking, approval and updates directly within the eTRM platform itself. When this workflow enhancement is operational, the WPA will be retired as the workpaper review platform.

CPUC staff will also address the DEER structure and integrations with the CEDARS reporting system in Phase 2. When milestones in Phases 1 and 2 are achieved to the staff's satisfaction, the "conditional" label may be removed in a future DEER resolution. Future phased work and other administrative considerations may be considered after Phase 2 deliverables are completed.

Table 2 – Summary of eTRM Transition

Phase	Scope	Completion

[14] CEDARS was developed by the Energy Division in 2016 as a standardized database for EE program tracking claims, annual budget filings, and monthly reports. CEDARS enforces the reporting specification, performs validations and cost effectiveness processing on claims submitted by Program Administrators, and makes portfolio data accessible online at https://cedars.sound-data.com/.

Phase 1	Enable eTRM as public source of deemed estimated savings values	Q3 2020 Available for public use January 1, 2021
Phase 2	eTRM functionality enhancements to facilitate workpaper submission, review, tracking, approval and updates directly within the eTRM platform itself Sunset/Archive WPA DEER/Ex Ante Review data re-structured within eTRM platform Integration with CET and CEDARS reporting functions	Workpaper functionality – July 2021 DEER structure and CEDARs integration - TBD

For the list of necessary enhancements to the eTRM by Phase see Appendix 1 of Attachment A.

A.2 Deemed Data Standard User Acceptance

To ensure the eTRM platform meets the Energy Division data source of record (the Standard), CPUC staff conducted a critical assessment of the eTRM database and compared this against the required data in the Preliminary Ex-Ante Review database (PEAR) and EAdb. We are aware that the eTRM uses a more modern data structure than existing systems, so the assessment focused on identifying any gaps in the eTRM data or errors in its content and ensuring that all data necessary for staff review and oversight were represented in the eTRM.

CPUC staff provided the IOU funders with a data dictionary of all relevant deemed EE measure data fields necessary to meet staff requirements, related to the two phases of transition:

- Phase 1 enables the eTRM's nightly synchronization with the EAdb to ensure that current Energy Division updates are captured in the eTRM;

- Phase 2 enables a build-out of the special "CPUC User" role to enable CPUC review and direct oversight of ex ante values within the eTRM platform.

In addition, CPUC staff coordinated with the eTRM technical team on how to meet the standard for each phase and is setting up the proper views and APIs to allow for nightly syncing. CPUC staff identified some fields that need to be added to the eTRM database and required coding enhancements before the eTRM meets the data source of record standard. This work should begin no later than July 2020. Once enhancements for each phase are complete and accepted, CPUC staff will communicate to the energy efficiency proceeding service list that the eTRM meets and maintains the Standard. Staff will offer opportunities for online training and feedback when new developments are implemented.

To ensure the eTRM stays current with Energy Division measure value updates, the eTRM will deploy an API to retrieve views of each of the relevant data fields to be updated nightly, similar to the CEDARS API. Full documentation of the process is maintained on the eTRM website.[15] The API approach will be used until the support tables are integrated directly with the eTRM platform under Phase 2 work.

A.3 Funding and Contracting

Development of the eTRM was funded by the four IOUs as well as SMUD and LADWP under a competitive bidding process. This development was conducted as a proprietary platform and funded from the EE program budgets. We direct the IOUs to provide contracting support while completing Phases one and two of this transition to the eTRM. In general, activities in support of DEER and workpaper systems are funded from the IOU evaluation, measurement, and verification (EM&V) budgets. Therefore, similar to other routine estimated data support, this resolution establishes that the IOUs will fund their respective portions of the eTRM going forward from their annual EM&V budgets. Starting with 2021 budget authorization, the IOUs will include the necessary eTRM administration, maintenance, and next round of enhancement funding in their 2021 Annual Budget Advice Letter filings.

As some of the activities necessary to ensure the eTRM meets and maintains the Standard by January 1, 2021 will require completion in 2020, we authorize the IOUs to

[15] https://www.caetrm.com/login/?next=/

shift authorized 2020 funding where available to meet those preparatory needs starting in July 2020. The IOUs should file a Tier 1 Advice Letter no later than 30 days after adoption of this resolution to demonstrate 2020 activities' funding needs and sources.

A.4 Administration

The IOU funders will grant the CPUC an irrevocable, royalty-free license to use, copy, and distribute the eTRM in perpetuity while they continue to contract for administration, maintenance, and enhancements of the eTRM. The IOUs will provide the Commission with a copy of the eTRM and all associated data, documentation, and administrative manuals—and any future releases—within 30 days of the release of any update. For continuity, the existing administrative arrangement shall continue until the end of 2021, when the transition will be completed. The IOUs shall continue to co-fund eTRM administration, maintenance and ongoing enhancements from EM&V budgets thereafter. The CPUC may consider the option of assuming the IOU ownership portion of the eTRM in a future resolution, after Phase 1 and 2 have been completed.

A.5 Other Transition Considerations

We acknowledge that any transition from one system to another has the potential to be confusing for users. Staff will announce changes in process, provide training, host workshops, and allow for enough time to enable smooth transition. Until the eTRM develops a new CPUC User role that will enable staff to manage workpaper review within the platform, IOUs will continue to upload their workpapers to the WPA using the existing process. Staff will notify IOUs and stakeholders on the R.1305011 Service List when the changeover to the new workpaper review platform will occur, at which time they may begin to submit their workpapers for review via the eTRM. Changes to the workpaper process will be addressed in the Phase 2 transition period in 2021.

Energy Division staff will continue to update values in the EAdb for the eTRM to pick up nightly with the API until the capability under the CPUC User role enables staff to perform these updates directly in the eTRM using "write" privileges.

A.6 Conditions of the Data Source of Record

System transitions require time for full deployment; therefore the "conditional" description will remain for the duration of the transition period as we consider a strategy to fully retire the old systems in a future DEER resolution. Once all activities under Phase 1 and 2 are satisfactorily completed, the CPUC will remove the "conditional" status and adopt the eTRM as the official database of record.

The IOUs will ensure that a copy of the eTRM database is provided to the CPUC and that this database is updated to always reflect the current version running on the eTRM. If the eTRM, for whatever reason, does not maintain the Standard in today's or a future Energy Division standard then the eTRM will be rendered out of compliance and the Commission shall exert ownership over the database.

The CPUC owns all deemed data submitted to the Energy Division for review and approval; the eTRM is required to make all required data accessible as a condition of compliance.

When contracting development or enhancement work for the eTRM, the CPUC's requirements with respect to the data source of record will take priority over other enhancements. The CPUC role to be created will enable CPUC staff to have the same functional oversight of deemed values as the existing systems.

B. DEER Methodology Updates

DEER methodology updates affect the methods and approaches used to generate measures savings and supporting energy savings parameters, such as net-to-gross (NTG), effective useful life (EUL), unit energy savings (UES), and incremental measure costs (IMC). An update to DEER methodology could alter the savings values, database structure, building prototype models, use of DEER database measures in workpapers, or the effort to move away from utility-specific to statewide measures. The changes for this cycle include the inclusion of load shapes in DEER, clarifications to the EUL update process and the BRO measure classification, redefining chiller measure tiers, reclassifying duct sealing as a building weatherization measure type, and eliminating the PEARdb.

B.1 Modifications to Accommodate Load Shape Updates

A new table (or tables) will be added to DEER to contain summary-level measure savings load shapes and/or load-shape characteristics once updated through CPUC Load Shape Update Study (Deliverable 17 of Contract A) or EM&V efforts and publicly vetted and reviewed by the CPUC staff. Resolution E-4867 ordered a working group to develop a proposal for how the DEER peak period methodology should be adjusted. The working group recommended an adjustment of the peak period times which was implemented in Resolution E-4952. They also recommended a longer-term adjustment called a "no-peak" methodology which would involve eliminating the peak kilowatt savings reporting and would move toward a dynamic peak. This 2022 DEER update lays some of the groundwork necessary to incorporate updated measure savings

load shapes, a first step toward this longer term dynamic peak goal. Some new load shapes will be available for use in 2021. Load shapes applicable to measures updated through 2019 EM&V efforts or via DEER 2022 will be available for use in 2022.

B.2 Chiller Measure Tier Definitions

This resolution modifies the DEER requirement for air cooled Path B[16] chillers. We allow a lower full-load efficiency improvement of seven percent for both tiers but require a higher part-load efficiency improvement of 12 percent for tier 1 and 20 percent for tier 2 chillers. This change does not apply to any currently existing DEER chiller measures because all of the air-cooled chiller measures in DEER are Path A, and it will not apply to custom projects. It will apply to non-DEER deemed measures supported by workpapers.

B.3 Clarification of BRO Measure Application Types

The EULs for BRO measures were established in Decision D.16-08-019 and can only be updated by a future decision. There has been some confusion around EULs associated with the Behavioral, Retro-commissioning, or Operational (BRO) measure application type (MAT) classification established in Resolution E-4818 in response to Decision D.16-08-019 and amended in E-4952. Because the EULs for these MATs were adopted by decision they cannot be changed in a Resolution, only through another Decision.

B.4 Reclassify Duct Sealing for pre-2006 Buildings

The duct sealing measures currently existing in DEER shall be reclassified as building weatherization (BW) measures and will only be eligible to be installed in buildings constructed pre-2006. Duct sealing may still be offered as a BRO measure in buildings constructed after 2005 based on exiting workpaper. BW measures require a new workpaper that includes new savings estimates. Resolution E-4952 (October 11, 2018) classified duct sealing as a BRO[17] measure with a three-year EUL, based on the RCx criteria of being "restorative of performance." This is true for residential and non-

[16] Path B refers to a compliance pathway for Title 24. Path B is often used for variable speed chillers and emphasizes part-load efficiencies.

[17] Defined as retrocommissioning (RCx)

residential buildings that were constructed after January 1, 2006 when the 2005 California Building Energy Efficiency Standards (2005 CA T-24) introduced a requirement for a duct leakage rate of six percent or less, in new buildings. Those constructed prior to 2006 were not required to have ducts sealed and research shows that ducts in these older homes had leakage rates on the order of 20 percent.

For pre-2006 buildings, duct sealing is not restorative in nature, but is an improvement—much like building-shell air sealing and upgrading attic insulation. Since Resolution E-4818 indicated that measures involving non-mechanical building components such as ductwork are eligible for building weatherization treatment, duct sealing at pre-2006 buildings shall be categorized as a BW measure. This establishes that there shall be two types of duct-sealing measures: those classified with MAT of retrocommissioning (BRO-RCx) that are installed in residential or non-residential buildings constructed January 1, 2006 or later and those with MAT of BW installed in residential or non-residential buildings built before January 1, 2006. Mobile homes do not have a requirement for duct sealing under the U.S. Department of Housing and Urban Development code, so duct sealing measures in all mobile homes shall be classified as BW types. The EUL for duct sealing classified as a BW measure shall revert to the previous value of 18 years, provided the materials and quality of the duct sealing installation is consistent with industry best practice.

C. DEER Error Corrections

Major changes were made to the DEER system under the DEER2020 Update; for example, the building prototypes and modeling approach were completely modified and the peak demand period was changed, but without a chance to thoroughly vet those updates. Although many errors and issues identified after the adoption of Resolution E-4952 DEER2020 Update were previously addressed, several more issues were uncovered or remain as described in the sub-sections that follow.

C.1 Corrected/Updated Water Heater Calculator

This Update corrects inconsistencies and missing information discovered in the water heater calculators. The PAs reported several issues and submitted a memo[18] to CPUC staff describing requested updates, improvements, and error corrections to the

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18 "Recommendations for Update to the DEER Water Heater Calculator for Program Year(s) 2019 and 2020," issued by SoCalGas, 2019-03-06.

2019 water heater calculator.[19] A revised water heater calculator[20] has been released. Subsequently, statewide workpapers for DEER2021 will need to be updated and resubmitted. The program administrators are required to work closely with staff and its team of contractors–DEER and Workpaper review to ensure PY2021 workpapers are filed at least six months prior to effective date.

C.2 Added Missing Values for Ceiling and Wall Insulation

Missing ceiling and wall insulation measure records for some climate-zone/building-type combinations were added.

C.3 Added Missing Values for Commercial building Type Chiller

Aggregated Commercial ("Com") building type records were added for DEER2020 air-cooled chiller measures where they were missing. The "Com" building type refers to an aggregated commercial building type composed of a weighted average of all the other commercial building types**.**

C.4 Expired DEER2020 Lighting Measures

A total of 474 DEER2020 lighting measures—having a start date of January 1, 2020—were expired on March 18, 2020.

C.5 Corrected Interactive Effects Table

Records in the commercial interactive-effects table that were found to contain errors that were corrected and updated. Numerous tables were updated as part of the PA-consolidation effort that was completed per Resolution E-5009. Some of the newly generated records were found to contain errors which were corrected.

D. Updates Based on Review of EM&V Studies

Commission staff reviewed recent EM&V findings and updated savings estimate parameters or approaches and NTG values where they indicate a substantial difference from current DEER values. EM&V sector evaluation results and/or special studies will continue to be some of the primary sources for DEER measure and workpaper updates.

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[19] DEER-WaterHeater-Calculatorv3.3.xlsm

[20] DEER-WaterHeater-Calculator-v4.0.xlsm.

Evaluation results with acceptable rigor and precision are used to update DEER and workpaper assumptions.

D.1 Overarching/General Changes Needed

In reviewing the 2018 EM&V reports and discussion with EM&V teams, there were several overarching issues that need to be addressed in the deemed savings system. Although 2022 is the target year for making these changes, we encourage the PAs and the Cal TF[21] to adopt these updates for the 2021 Program Year. The updates include:

Add program tracking data and evaluation requirements to the deemed workpaper template. A number of EM&V reports expressed issues with obtaining the data needed to effectively evaluate upstream and midstream programs, yet the PAs appear to be turning more often to this delivery method. To systematically capture the needed data, we direct the PAs to add a "Program Tracking Data and Evaluation Requirements" section to the deemed workpaper template, and CPUC staff will work with the Cal TF, PAs, and evaluation staff to develop the specification.

PAs should use a full or representative set of available DEER values whenever possible. Proper application of the full or at least a weighted representative set of DEER values can help reduce a significant divergence of EM&V Gross Realization Rates[22] (GRRs) from 100 percent. For example, if DEER has measure values for multifamily and manufactured homes but PAs only use the single-family value for claims, but still offer the program to multifamily and manufactured homes customers, then the GRR is going to be divergent from 100 percent (high or low depends on the relationship of the single family to multifamily and manufactured homes savings). We direct the PAs to wherever possible use DEER savings at the same level as the programs are offered, especially where DEER permutation savings vary significantly across primary characteristics. This action will produce more accurate savings estimates (GRRs less divergent from 100 percent) and will also allow program and EM&V data to be more directly used to improve deemed measure UES savings, approaches and assumptions.

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[21] Cal TF is a collaborative of stakeholders and experts who review technical issues related to California's integrated demand side management portfolio. It plays a technical oversight role in the development of the eTRM.

[22] The GRR is the ratio of the forecasted savings (DEER values) to the evaluated savings.

D.2 Residential Sector EM&V Updates

The only update to residential sector measures is for smart thermostats. There were four separate residential sector EM&V reports for PY2018 – hot water low-flow devices, smart thermostats, variable frequency drive (VFD) pool pumps, and Home Energy Reports. However, only three of those were reviewed for potential deemed measure updates, and only the smart controllable thermostats (SCT) will be updated. The SCT is a non-DEER measure, and an update for PY2021 based on 2018 EM&V results will be considered via a workpaper update.

D.3 Lighting Market EM&V Updates

There were no updates to the lighting sector DEER measures. The majority of the LED lighting measures have been retired due to a 100 percent LED baseline and an expansion of general service lamp (GSL) Standards to include reflectors, globes, and candelabras effective January 1, 2020.

D.4 HVAC Market EM&V Updates

A number of updates are recommended for the HVAC measure groups that were evaluated for PY2018. EM&V results from PY017 were also reviewed. The updates are:

Rooftop and split-system NTG updates and additional tracking data requirements. The EM&V studies revealed several significant issues with both UES and NTG values, producing low GRRs and NTG values. However, the UES issues involve a more extensive effort to identify the source of the errors. The evaluated NTG values for 2017 and 2018 significantly different but are lower than the forecasted NTG value. Therefore, we direct the use of the 2018 EM&V average electric NTG value of 0.50 and natural gas NTG value of 0.60 from the current values of 0.76-0.77. Another critical issue for this midstream program is that additional data should be collected from the distributors to better inform the UES values used for claims. To ensure that goal, we direct the PAs and Cal TF to add a section to the workpaper template to specify the tracking and evaluation data required for a deemed measure.

Fan motor replacements NTG update. 2018 EM&V results indicated a significant change in the UES with an evaluated average GRR for electric savings of 124 percent. A change to the DEER prototype modeling parameters will be investigated further but the primary reason for the difference is inaccuracy of claimed savings: Single-family UES values were used for multifamily and mobile homes. The average evaluated NTG was significantly higher than the current estimated value for all utilities and reflects the direct install program delivery approach and free services. We direct the NTG value be

updated to 0.85 from the current lower range of utility specific values (0.55-0.74) for direct install fan motor replacement programs.

Duct testing and sealing NTG update. Based on 2018 EM&V results, no electric or gas UES updates are recommended because results varied widely by utility and could not be applied at a statewide level. However, the average evaluated NTG was significantly higher than the current estimated value for all utilities and reflects the direct install program delivery approach and free services which the customer would not have otherwise found out about or considered doing on their own. Therefore, we direct the NTG value be updated to 0.95 from the current lower range of utility specific values (0.78-0.85) for duct testing and sealing offered under this direct install program.

Water-cooled chiller NTG update and additional tracking data requirements. Only SCE reported savings for water-cooled chillers in 2018 and they were delivered as a midstream program. 2018 EM&V results indicated that no change was needed for DEER UES values but a change to the NTG value was warranted. The evaluated GRR for electric savings was 221 percent. However, the primary issue was due to PAs using savings for a "commercial" building instead of savings for explicit building types. The operating hours vary significantly by building type (hospital, primary school, office) and the evaluation used the actual building type. Although tracking building type for an upstream or midstream program may be considered a burden on the distributor, the forecasted savings will always be incorrectly estimated by a sector average, and in this case, they were grossly underestimated. To address this issue, we direct the PAs and Cal TF to implement an overarching change to add a section to the workpaper template to specify the tracking and evaluation data required for a deemed measure.

The average evaluated NTG value of 0.81 for energy is significantly higher than the current estimated value of 0.60. Distributors reported that the program improved the sale of high efficiency chillers as the incentives helped them to offset some of the incremental cost for the end users. The evaluation also showed that the installed chillers were actually even higher efficiency than reported in the PA tracking data. Although the 2018 sample size and uptake for this measure was small, the distributor survey results indicate a strong influence on higher-efficiency chillers sales. We therefore direct the use of an updated NTG value for water-cooled chillers offered via a midstream program from the current value of 0.60 to 0.80, rounding off to the nearest 0.05.

Natural gas boilers NTG updates. SCG is the only PA that reported savings for boilers. The UES values had been previously evaluated in 2017 and the GRR was close to 100 percent (102 percent) so savings were not evaluated in 2018. However, the NTG was evaluated for the 2018 EM&V, which found an NTG of 0.19. This is significantly lower

than the current estimated value of 0.65. The measure is offered as a deemed measure and 70 percent of survey respondents said they learned about the program *after* making the decision to purchase a high efficiency boiler. This is also a strong indication that high-efficiency boilers are already standard practice for many customers. We therefore direct the use of an updated NTG value for gas boilers offered via a downstream program from the current value of 0.65 to 0.20, rounding off to the nearest 0.05.

D.5 Small/Medium Commercial Sector EM&V Updates

A number of updates are specified for the small/medium commercial measure groups that were evaluated for PY2018. EM&V results from PY2017 were also reviewed if they were available. The measures selected for evaluation represent the most significant percent of the savings encompassed by this market/sector evaluation group. Results are strongly dependent on the delivery method used (upstream, midstream, downstream, and direct install). The updates are:

No updates for refrigeration case LED lighting. No DEER updates are needed for this measure. The current NTG value was validated by 2018 EM&V results, and although the GRR was 0.77 this is not due to underlying UES assumptions.

No updates for tankless water heaters. No DEER updates are needed for this measure. The current NTG value was validated by 2018 EM&V results. Some issues were identified with open/closed system type and system temperature assumptions, and we will review these findings and integrate into the DEER water heating calculator if warranted.

Process pumping VFD NTG update. Process Pumping VFDs were only evaluated in 2018 not 2017. The evaluation found that most differences were due to incorrect utility calculations, so no UES changes are needed. However, the evaluated NTG value of 0.39 is significantly lower than the forecasted value of 0.60. Therefore, we direct the NTG value for process pumping VFD to be changed to 0.40 (40 percent), rounding to the nearest 0.05.

Agricultural irrigation. No updates to the UES values and approach can be recommended for this cycle even though updates are needed. Future EM&V efforts and PAs should focus on collecting the data needed to improve UES estimates. Commission staff direct the NTG value for agricultural irrigation to be changed from 0.60 to 0.30 (30 percent), rounding to the nearest 0.05

E. New Code Revisions or Code Revisions Not Covered in Previous DEER Updates

There were no updates to deemed measures based on code revisions. No updates were performed because relevant codes have not been updated. Some code updates, such as the CA 2019 Title 24 were already accounted for under Resolution E-4952. Scheduled updates of federal appliance and equipment standards have all missed their intended deadlines resulting in no relevant updates. Though not relevant to DEER, the new federal requirement for variable speed drive pool pumps effective July 19, 2021 is mentioned as a courtesy for workpaper updates.

F. Review of Market and Research Studies

There were no updates to measures based on market and research studies. No updates were performed because no relevant market or research studies have been performed.

G. New Measure Additions

CPUC staff will be implementing several new DEER database measures for 2022. As a result of the statewide workpaper consolidation effort and the increased participation of third-party implementers, we anticipate that new measures may be proposed via workpapers and in response to this Resolution.

G.1 Normalized Metered Energy Consumption (NMEC)

The introduction of NMEC measures to the demand-side management portfolios requires the addition of new records to existing support tables in the DEER database. No other effects on the DEER databases are anticipated.

G.2 Fuel-Substitution Measures

The introduction of fuel substitution energy efficiency measures to the deemed portfolio require the addition of new fields to the workpaper Ex Ante data (EAD) tables and the DEER database. These fields are important for future reporting of California greenhouse gas (GHG) reduction goals and include lifecycle CO2 emissions reduction, lifecycle source energy savings, and infrastructure cost. The changes included addition of a "Fuel Sub-Deemed" measure impact type, addition of two EULs, addition of a fuel-substitution NTG ratio of 1.0, and modifications to the Energy Impact tables in the DEER database.

G.3 Updated Water Heater Thresholds

Some threshold values for baseline and efficient water heaters were updated based upon recent manufacturer data, hence defining new efficient water heater measures and energy impacts. The new threshold values are available as part of the new water heater calculator. When new thresholds were not defined, the calculator provides new UES values for existing water heater measures.

G.4 Residential Heat Pumps for SEER ≥19 SEER

Because the efficiency of heat pump technology has improved, high-efficiency heat pump measures were added. New measures for high-efficiency heat pumps (SEER 19, 20, and 21) were created using DEER2020 building prototypes and MASControl3.

COMMENTS

Public Utilities Code section 311(g)(1) provides that this resolution must be served on all parties and subject to at least 30 days public review. Please note that comments are due 20 days from the mailing date of this resolution. Section 311(g)(2) provides that this 30-day review period and 20-day comment period may be reduced or waived upon the stipulation of all parties in the proceeding.

The 30-day review and 20-day comment period for the draft of this resolution was neither waived nor reduced. Accordingly, this draft resolution was mailed to parties for comments, and will be placed on our agenda no earlier than 30 days from today.

FINDINGS

1. Decision D.15-10-028 requires that CPUC staff propose changes to the Database of Energy Efficient Resources once annually via Resolution, with the associated comment/protest period provided by General Order 96-B.
2. Decision D.15-10-028 retains the direction from D.12-05-015 that DEER values be updated to be consistent with existing and updated state and federal codes and standards.
3. Decision D.15-10-028 also states that CPUC staff may make changes at any time without a Resolution to fix errors or to change documentation.
4. The proposed updates to the DEER values are a result of a) updates to underlying methodology or correction of errors, b) updates for corrections and clarifications, c)

updates based on evaluation study results, d) new code updates, e) review of market and research studies, f) addition of new measures, and g) transition to the eTRM.

5. Decision D.05-01-055 establishes the Energy Division staff authority to review and approve workpapers, including authority to designate a set of values as the deemed data source of record.
6. The CPUC owns all data submitted for deemed EE measure review and approval.
7. The Energy Division maintains a suite of data resources that make up the "data source of record" of approved deemed values. The data used for Energy Division ex ante review are available in a data dictionary known as the Deemed Data Standard.
8. The deemed data resources currently in use on Deeresources.com/.info/.net can no longer be supported by the Commission's IT department and require modernization.
9. The eTRM is a modern, proprietary data software platform funded and built under competitive contract by the IOUs, LADWP, and SMUD to facilitate deemed EE measure review.
10. The eTRM will be under development from July 2020 to ensure that it meets the Energy Division Deemed Data Standard by January 1, 2021.

THEREFORE, IT IS ORDERED THAT:

1. The DEER2022 and Revised DEER2021 and DEER2020 Updates, listed in Table 1, as described in Attachment A and supporting documentation available on the *deeresources.com* website, are approved with effective dates as listed.
2. Pacific Gas and Electric Company (PG&E), Southern California Electric Company (SCE), Southern California Gas Company (SoCalGas), and San Diego Gas & Electric (SDG&E), the San Francisco Bay Area Regional Energy Network (BayREN), Southern California Regional Energy Network (SoCalREN), Tri-County Regional Energy Network (3CREN), Local Government Sustainable Energy Coalition (LGSEC), Lancaster Choice Energy (LCE), and Marin Clean Energy (MCE) must use the updated assumptions, methods and values for 2020 and 2021 planning and savings claims, and 2022 planning, implementation and reporting.
3. The eTRM is adopted as the conditional Energy Division Deemed Data Source of Record effective January 1, 2021.
4. The Energy Division will transition from existing systems to the eTRM by December 31, 2021 and ensure that necessary archival needs are met.

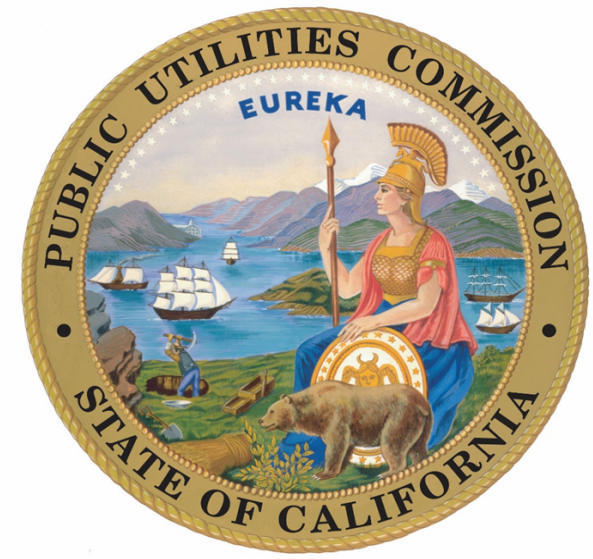
5. The DEER databases and eTRM shall continue to be administered and maintained by the IOU funders without changes to contract management until completion of both Phase 1 and Phase 2 activities, or December 31, 2021.
6. The IOUs shall fund eTRM enhancement activities identified in Appendix 1 from their approved 2020 budgets under their existing vendor contract. The enhancements will begin in July 2020 and shall be completed no later than June 30, 2021 to enable comprehensive user testing and acceptance of the enhancements before transitioning fully by 12/31/2021.
7. The IOUs shall file a Tier 1 Advice Letter no later than 30 days after the adoption of this Resolution outlining Phase 1 2020 activities funding needs and funding sources.
8. The IOUs shall fund Phase 2 eTRM enhancements, administration and maintenance from their 2021 EM&V budgets, to be submitted in their Annual Budget Advice Letter Filings.
9. The IOU funders will grant the CPUC an irrevocable, royalty-free license to use, copy and distribute the eTRM in perpetuity while they continue to contract for administration, maintenance and enhancements of the eTRM.
10. The IOUs will provide the Commission with a copy of the eTRM and all associated data, documentation and administrative manuals—and any future releases—within 30 days of the release.
11. The Commission reserves the right to exert ownership of the IOU funded portions of the eTRM with agreement from the IOU funders.

This Resolution is effective today.

I certify that the foregoing resolution was duly introduced, passed and adopted at a conference of the Public Utilities Commission of the State of California held on August 27, 2020; the following Commissioners voting favorably thereon:

ALICE STEBBINS
Executive Director

Attachment A



Database for Energy-Efficient Resources Updates for Program Year 2022

DEER2022 Update Statement

August 27, 2020

Energy Division

California Public Utilities Commission

DEER2022 UPDATE STATEMENT

Contents

1. Transition to eTRM

The California Public Utilities Commission (CPUC) staff is currently working on a multi-year transition plan to progressively transition the Database for Energy-Efficient Resources (DEER) and workpaper activities to a software platform jointly funded by California investor-owned utilities (IOUs) called the Electronic Technical Resource Manual (eTRM), with an ultimate objective of phasing out existing systems by December 31, 2021. CPUC staff has been working with stakeholders on development, transition, and adoption activities, and will approach the project in two phases. Phase 1 should begin in July 2020 and addresses enhancements necessary for the eTRM to meet the Deemed Data Standard provided in Appendix 2 –Standard for Deemed Data Source of Record. In this appendix, Table A-3 presents the list of table fields that the CPUC requires the eTRM to include for consideration as the deemed data source of record. Phase 2 addresses system integration issues and will begin later in 2020. It will be completed by July 2021 to provide the CPUC Energy Division adequate time to test and accept before final transition of DEER.

2. DEER Methodology Updates

DEER methodology updates affect the methods and approaches used to generate measure savings and support table values. Examples include changes that would alter the database structure, building prototype models, use of DEER database measures in workpapers, or the effort to move away from utility-specific to statewide measures.

2.1. Modification to Accommodate Load Shape Updates

Effective Program Year: 2022. Resolution E-4867 ordered a working group to develop a proposal for how DEER peak-period methodology should be adjusted. The working group recommended an adjustment of the peak period times, which was implemented in Resolution E-4952. They also recommended a longer-term adjustment called a “no-peak” methodology that would involve eliminating the peak kilowatt savings reporting and move toward a dynamic peak. This 2022 DEER update lays some of the groundwork necessary to incorporate updated measure-savings load shapes, a first step toward a long-term dynamic peak goal. The updated measure-savings load shapes listed in Table A-1 are available in DEER.

To accommodate the load shapes, new fields have been added to the DEER Electric Impact Profile table to contain summary-level, measure-savings load shapes and load-shape characteristics, once they are updated through Deliverable 17[23] or EM&V efforts and publicly vetted and reviewed by the CPUC staff. New load shape formats have been created and a memo describing the formats will accompany new data tables that will contain the full load-shape values. Some new load shapes, applicable to the measures shown in Table A-1 below that were updated in E-5009 and from the updated water heater calculator (see Section 3.1), will be available in 2021 for use in 2022 planning. Load shapes applicable to measures updated through 2018 and 2019 EM&V efforts (such as smart thermostats and home energy reports) or via DEER 2022 will be available for use in 2022. The new fields will also indicate the sources of the summary-level load shape, such as simulation-based tools or advanced metering infrastructure (AMI) analysis, which could originate from impact evaluations or from studies conducted to support workpapers.

Table A-1. Measures from DEER2020/DEER2021 with Updated Load Shapes

Measure_ID
NE-HVAC-RefChg-Dec-Typ-ntxv
NE-HVAC-RefChg-Dec-Typ-txv
NE-HVAC-RefChg-Inc-High-ntxv
NE-HVAC-RefChg-Inc-High-txv
NE-HVAC-RefChg-Inc-Low-ntxv
NE-HVAC-RefChg-Inc-Low-txv
NE-HVAC-RefChg-Inc-Typ-txv
RE-HV-RefChrg-Inc-NTXV-16pct
RE-HV-RefChrg-Inc-NTXV-4pct
RE-HV-RefChrg-Inc-TXV-16pct
RE-HV-RefChrg-Inc-TXV-4pct
RE-HV-RefChrg-Dec-TXV-typ

[23] Deliverable 17 of the Group A Contract involves updating some of the load shapes of deemed measures.

Measure_ID
RE-HV-RefChrg-Dec-NTXV-typ
RE-HV-RefChrg-Inc-TXV-typ
RE-HV-RefChrg-Inc-NTXV-typ
NE-HVAC-airAC-SpltPkg-65to134kBtuh-12p5eer-woutPreEcono
NE-HVAC-airAC-SpltPkg-65to134kBtuh-12p5eer-wPreEcono
NE-HVAC-airAC-SpltPkg-240to759kBtuh-10p8eer_MZ
NE-HVAC-airAC-SpltPkg-240to759kBtuh-10p8eer_SZ
RE-WtrHt-FuelSub-LrgStrg-HP-lte6kW-rep75G-HI-2p94UEF-80g
RE-WtrHt-FuelSub-LrgStrg-HP-lte6kW-rep75G-HI-3p09UEF-80g
NE-WtrHt-FuelSub-LrgStrg-HP-lte6kW-80G-HI-2p94UEF
NE-WtrHt-FuelSub-LrgStrg-HP-gt6kW-100G-4p20COP
NE-WtrHt-FuelSub-LrgStrg-HP-gt6kW-120G-4p20COP

2.2. Chiller-Measure Tier Definitions

Effective Program Year: 2022. Previous policy in Resolution E-4952[24] acknowledges the need for re-evaluating DEER tiers based on part-load performance using additional data. Low participation in air-cooled chiller energy-efficiency programs prompted Southern California Edison (SCE) to gather data to allow the examination of the tier levels that define chiller equipment that qualify for energy efficiency rebates. SCE performed a market study to ascertain the sales proportion of Path B[25] air-cooled chillers for varying full- and part-load efficiency levels and delivered

[24] Resolution E-4952, Section 7.13 Required efficiency over Title 24 baseline for Chiller Full and Partial Loadings, p. A-64.

[25] Two efficiency compliance paths are available for chillers. Path A is used for single-speed chillers designed primarily to run at full load and Path B is used for variable speed chillers designed to operate primarily at part load. For example, for a <150-ton air-cooled chiller, Path A efficiency minimums are 10.1 EER/12.7 IPLV and Path B efficiency minimums are 9.7 EER/15.8 IPLV.

study results in a memo. The Energy Division reviewed the market data provided by SCE and found the case for modifying Tiers 1 and 2 for Path B air-cooled chillers compelling. Through 2021, the DEER chiller tier requirements for DEER and non-DEER chiller measures will remain as stated in Resolution E-4952[26] as follows:

> *DEER includes HVAC measures for liquid chilling machines (chillers) defined with fixed incremental increases in efficiency over minimum Title 24 requirements. DEER currently includes two tiers of chiller measures: 10 and 15 percent better than Title 24 requirements. DEER also includes a requirement that 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.*

For 2022, this resolution modifies the DEER requirement for air-cooled Path B chillers by allowing a lower full-load efficiency improvement of seven percent above code for both tiers, but requires a higher part-load efficiency improvement of 12 percent for tier 1 and 20 percent for tier 2 chillers. This change will not affect the existing DEER2020 air-cooled chiller measures because their energy savings were determined assuming fixed-speed operation (Path A). Instead, this change will apply to non-DEER deemed measures supported by workpapers for chillers that comply via the Path B option.

2.3. Clarification of BRO Measure Application Type EUL

Effective Program Year: 2021. There has been some confusion around effective useful lives (EULs) associated with Behavioral, Retrocommissioning, or Operational (BRO) measure application types (MATs). Therefore, this section attempts to clarify by reiterating the relevant Decisions and Resolutions. Since it was established in a Decision, the EUL for BRO measures can only be updated by a future CPUC Decision. The EULs for BRO measures were set at one year by Decision 13-11-005

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[26] Resolution E-4952, Section 2.2 Expanded HVAC Savings Methods, pp. A-17-18.

and amended in Decision 16-08-019. The most recent BRO MAT classification established in Resolution E-4818 and amended in E-4952 was based on Decision 16-08-019 and established an EUL of one year to three years. On page 9, E-4818 states:

> *The savings from restored maintenance, configuration, and usage behave differently over time, and have a shorter effective useful life than the equipment they address. BRO programs have an effective useful life of one to three years; Decision 16-08-019 adopted a two-year life for behavioral programs in nonresidential settings and a three-year effective useful life for retrocommissioning and operational programs.*[27]

Furthermore, Ordering Paragraph 2 Resolution E-4818 states that the EUL for BRO measure application types is not to exceed three years:

> *We direct the Program Administrators to ensure that all program activities and installations resulting in performance that does not exceed the nominal efficiency (i.e., rated, intended, or original efficiency) of the pre-existing condition are offered through a behavioral, retrocommissioning or operational program framework, with an effective useful life not to exceed three years.*

However, Decision D.16-08-019 allows for the modification of BRO EULs as stated on pg. 46:

> *Because there is a wide variation in evidence to support various expected useful lives, we will still err on the conservative side and allow a two-year life for behavioral programs in non-residential settings, and a three-year life for retrocommissioning and operational programs. This may be revisited as we gain further experience with these types of programs. We invite the program*

[27] Only residential behavioral programs have an effective useful life of one year, per D.16-08-019.

administrators or implementers to provide us with further evidence in the future if they ask us to lengthen these estimates.

If Program Administrators (PAs) would like changes to BRO EULs, they may bring supporting documentation to the Commission for consideration in a future Decision.

2.4. Reclassify Duct Sealing for Pre-2006 Buildings

Effective Program Year: 2021. Resolution E-4952 updated the MAT of the duct sealing measure to a BRO measure and changed the EUL value to three years because Resolution E-4818 directed that "all measures which utilize a degraded performance baseline and/or are restorative of performance in nature be classified as retrocommissioning." This is true for residential and non-residential buildings that were constructed after January 1, 2006, when the 2005 California Building Energy Efficiency Standards (2005 CA T-24) introduced a maximum duct leakage rate of six percent or less in new buildings with some exceptions in certain climate zones. The exceptions were later removed. The 2005 CA T-24 standards also introduced a requirement for duct sealing in building alterations when a furnace or air conditioner was replaced or when more than 40 feet of ductwork was replaced.

Buildings constructed prior to 2006 were not required to have ducts sealed and research shows that ducts in these older homes had leakage rates on the order of 20 percent. For pre-2006 buildings, duct sealing is not restorative in nature, but is an improvement—much like building-shell air sealing and upgrading attic insulation. Since Resolution E-4818 indicated that measures involving non-mechanical building components such as ductwork are eligible for building weatherization treatment, duct sealing at pre-2006 buildings shall be categorized as a building weatherization (BW) measure.[28] This classification should be retained for duct sealing measures

[28] Resolution E-4818, page 69, duct sealing is specifically mentioned as a building weatherization measure "…non-mechanical building efficiency improvements (e.g. windows, insulation, air sealing, duct sealing….)"

installed in residential and non-residential buildings constructed before January 1, 2006.

This establishes that there shall be two types of duct-sealing measures: those classified with MAT of retrocommissioning (BRO-RCx) that are installed in residential or non-residential buildings constructed January 1, 2006 or later and those with MAT of BW installed in residential or non-residential buildings built before January 1, 2006. Mobile homes do not have a requirement for duct sealing in U.S. Department of Housing and Urban Development code, so duct sealing measures in all mobile homes should be classified as BW types.

This change allows for different unit energy savings (UES) for the two types of duct sealing measures where the BRO-Rx measures would be expected to have lower baseline leakage rates than the BW duct sealing measures. The current DEER duct sealing savings are appropriate for duct sealing installed as a BW measure because the baseline leakage is 40 percent for the high-leakage measure and 25 percent/28 percent (residential/commercial) for the medium/low-leakage measure. Hence, the current measures shall be reclassified as BW measures, and will only be eligible in buildings constructed pre-2006. Some buildings in the BW classification will have had their ducts sealed due to permit compliance requirements at the time of furnace, air conditioner, or duct system replacement[29]—again, much like some older homes have had their attic insulation upgraded since initial construction. Program implementation will establish the criteria for when duct re-sealing in those buildings are eligible for program incentives.

The EUL for duct sealing, classified as a BW measure shall revert to the previous value of 18 years, provided the materials and quality of the duct sealing installation

[29] The 2014-16 HVAC Permit and Code Compliance Market Assessment (Work Order 6) showed low levels of compliance with duct sealing requirements (http://calmac.org/publications/HVAC_WO6_FINAL_REPORT_VolumeI_22Sept2017.pdf).

is consistent with industry best practice.[30] The duct connections must not be sealed with duct tape (cloth-backed rubber adhesive tapes). Mastic or aerosol sealant materials are preferred, and butyl tape can be used where mastic or aerosol are impractical. The previously established 18-year EUL for duct sealing was based on two IOU-conducted retention studies,[31,32] both finding a higher EUL than the recommended value of 18 years. These findings are substantiated by Lawrence Berkeley National Laboratory (LBNL) research that found only duct tapes showed significant duct leakage after accelerated aging tests were performed.[33]

3. DEER Error Corrections

DEER error corrections or clarifications are those that typically impact the actual DEER values or application of the values. Corrections to the DEER database are often needed due to the complexity of the DEER ecosystem and decisions and resolutions, the quick pace of the Rolling Portfolio timeline, and today's dynamic energy environment. Major changes were made to the DEER system under the DEER2020 Update. For example, the building prototypes and modeling approach were completely modified, and the peak demand period was changed, but without a chance to thoroughly vet those updates. Although many errors and issues identified

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[30] California building codes require mechanical connections on metal to metal duct must be secured with at least three mechanical fasteners and flex to metal connections must be secured with at least three mechanical fasteners and two nylon straps: one on the inner liner and one on the outer liner. The code requires the ducts to be sealed with mastic, polymer, or certain tapes but industry best practice disallows tapes as the primary sealant material.

[31] Pacific Gas & Electric Company. 2006. Retention Study of Pacific Gas & Electric Company's 1996 and 1997 Residential New Construction Energy Efficiency Programs. PG&E Study ID number: 386R2 CALMAC Study ID number: PGE0247.01.

[32] Itron, Inc. 2004. 1994 Residential New Construction Ninth-Year Retention Evaluation (Energy Advantage Home Program) Study Number 716A. Prepared for Southern California Gas Company

[33] Walker, I.S. and Sherman, M.H. 2003. "Sealant Longevity for Residential Ducts," Durability of Building and Construction Sealants and Adhesives, ASTM STP 1453, A. Wolf Ed., American Society for Testing and Materials, West Conshohocken, PA.

after the adoption of Resolution E-4952 DEER2020 Update were previously addressed, several more issues were uncovered or remain as described in the sub-sections that follow.

3.1. Updated Water Heater Calculator and Resulting Energy Impacts

Effective Program Year: 2021. The PAs have been actively working with CPUC staff to identify the corrections and improvements needed for DEER water heating measures that were discovered during the Phase 1 review of the 2019 residential and commercial small water heaters. The PAs reported several issues and submitted a memo[34] to CPUC staff describing requested updates, improvements, and error corrections to the 2019 water heater calculator.[35] The issues include, but are not limited to, completing the update of measures from energy factor (EF) to uniform energy factor (UEF) efficiency ratings for heat-pump water heaters, updating the UEF values using data from current data sources, determining savings for the commercial building type at all climate zones for all water heater categories, and providing statewide savings for each climate zone. Consideration for improving diversity in operation for residential versus commercial water heaters and combining multiple measures that represent varying draw patterns (low, medium, high) into a single measure was also requested, but could not be incorporated without having weights to generate weighted averages. Any corrected or previously missing measures will be updated in DEER and a corrected water heating calculator will be added to deeresources.com. Subsequently, statewide workpapers for DEER2021 will require updating and resubmittal.

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[34] "Recommendations for Update to the DEER Water Heater Calculator for Program Year(s) 2019 and 2020," issued by SoCalGas, 2019-03-06.

[35] DEER-WaterHeater-Calculatorv3.3.xlsm

3.2. Addition of Missing Energy Impacts for Ceiling and Wall Insulation

Effective Program Year: 2020. For DEER2020 ceiling and wall insulation measures with missing records for some climate zones, missing records have been added.

3.3. Addition of Missing Chiller Records for Commercial Building Type

Effective Program Year: 2020. For DEER2020 air-cooled chiller measures that are missing the "Com" building type, the aggregated "Com" records have been added.[36]

3.4. Expiration of all DEER2020 Lighting Measures

Effective Program Year: 2020. Since the industry standards for lighting measures were revised last year for 2020 measures, all DEER2020 lighting measures contained in the Preliminary Ex Ante Review database/Ex Ante database (PEARdb/EAdb) became invalid. This consequence, however, was not reflected in PEARdb/EAdb until March 2020. Hence, the 474 DEER2020 lighting measures that had a start date of January 1, 2020 were set to expire on March 18, 2020. All lighting measures for the 2020 program year were ExAnte2020 measures approved via workpapers that were not based upon DEER2020 lighting measures. Presently, there are no active DEER lighting measures.[37]

3.5. Corrections to DEER2020 Interactive Effects Table

Effective Program Year: 2020. Numerous tables were updated as part of the PA-consolidation effort (within each climate zone that contains services territories of more than one IOU) that was completed per Resolution E-5009 DEER2021 Update. Among those were the commercial and residential interactive effects tables (2020-Com-InLtg and 2020-Res-InLtg, respectively) that contain the interactive effects

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[36] Note, we are also reviewing the HVAC EM&V study related to building types for chiller measure claims.

[37] While all measures have workpapers which are reviewed and approved by the CPUC, some measures referred to as "DEER" measures have had EM&V studies and have additional more thorough vetted status.

factors for lighting measures installed within conditioned spaces. Some of the newly generated records in the commercial interactive-effects table were found to contain errors that were corrected and updated in February 2020.

4. Review of Energy Efficiency Evaluation, Measurement, and Verification (EM&V) studies

EM&V Sector evaluation results and/or special studies are one of the primary sources for DEER measure and workpaper updates. Evaluation results that have rigor and precision can be used to update both DEER and workpaper assumptions. Parameters in need of data to reduce uncertainty or increase accuracy are identified and fed back into the next EM&V cycle. The CPUC staff examined the findings of recently completed impact evaluations and other studies to identify those that indicate a substantial difference from current DEER values and are robust enough to be used to update key DEER parameters. Due to the change in peak demand definition for 2020, we observed demand gross realization rates (GRRs), but will not make any updates to peak demand UES values.

A complete list of the studies considered is provided in Appendix E of the 2018-2020 EM&V Plan.[38] Due to the DEER Update schedule, we only considered studies completed by Q1 2020. The available studies from Appendix E include CPUC impact evaluations from PY2017 and PY2018 for the high-impact Efficiency Savings and Performance Incentive (ESPI) measures and IOU studies shown in Table A-2. Applicability of these EM&V results to DEER or workpapers is shown in column three and updates to gross savings or net-to-gross (NTG) values are indicated in the last three columns.

Table A-2. Summary of Recent EM&V Study Results

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[38] "2018-2020 CPUC & Program Administrator Energy Efficiency Evaluation, Measurement and Verification Plan Version 9," California Public Utilities Commission, 12/19/2019, https://pda.energydataweb.com/api/view/2325/2018-20_EMV_Plan_Final.pdf.

Study	Measure	DEER or Workpaper	Gross Savings*	Old NTG	New NTG
Residential	Hot Water Fixtures	DEER	None	No updates	
Residential	Smart Thermostat - Rebate	Workpaper	UES, LS	0.55	055
Residential	Smart Thermostat – Direct Install	Workpaper	UES, LS	0.55	0.90
Residential	Pool Pump VFD	Workpaper	None	No updates	
Lighting	Upstream/Residential	Expired in 2020	LS	No updates	
Lighting	Non-residential Downstream	Workpapers	LS	No updates	
HVAC	Rooftop and Split System	DEER	None	0.76	0.55
HVAC	Fan Motor Replacment	DEER	None	0.55	0.85
HVAC	Duct Testing and Sealing	DEER	None	0.79	0.95
HVAC	Water-Cooled Chillers	DEER	None	0.6	0.8
HVAC	HVAC Boiler	DEER	None	0.65	0.2
Small Commercial	Refrigeration Case LED Lighting	DEER	None	No updates	
Small Commercial	Tankless Water Heaters	DEER	None	No updates	
Small Commercial	Process Pumping VFD	Workpaper	None	0.6	0.4
Small Commercial	Agricultural Irrigation	Workpaper	None	0.6	0.3

*UES=unit energy savings; LS=load shape

4.1. Overarching/General Changes Needed

Effective Program Year: 2022. In reviewing the 2018 EM&V reports and discussion with EM&V teams, there were several overarching issues that need to be addressed in the deemed savings system. Although 2022 is the target year for making these changes, we encourage the PAs and California Technical Forum to adopt these updates by 2021.

Add program tracking data and evaluation requirements to the deemed workpaper template. Several evaluation reports expressed issues with obtaining the data needed to effectively evaluate upstream and midstream programs, yet the PAs appear to be turning more often to this delivery method. This section would specify the recommended list of primary inputs and contextual data needed for proper application and evaluation of the savings (e.g., building type, climate zone, hard-to-reach, etc.). This approach will ensure the right level of data is collected and available not just for evaluation, but for correct attribution of the assumptions typically made for upstream/midstream programs. It would also cover the detailed information collected by a downstream or direct install program.

This issue is even more important for fuel substitution measures where savings are highly dependent on the baseline/in-situ equipment and/or other conditions. This new specification section can also be used to standardize the data collected, which may be less an issue for Statewide programs but become extremely important in a third-party-predominant environment. As such, CPUC staff direct the PAs to add a "Program Tracking Data and Evaluation Requirements" section to the deemed workpaper template, and we will work with the Cal TF, PAs, and evaluation staff to develop the specification.

PAs should use a full or representative set of available DEER values whenever possible. Proper application of the full or at least a weighted representative set of DEER values can help reduce a significant divergence of EM&V GRRs from 100 percent. For example, if DEER has measure values for multifamily and manufactured homes but PAs only use the single-family value for claims, and yet offer the program to customers in multifamily and manufactured homes, then the GRR is going to be divergent from 100 percent (high or low depends on the relationship of the single family to multifamily and manufactured homes savings). If the savings for different building types (or other characteristics) are significantly different but a single building type is assumed by PAs, the evaluation will consider and use the full set of DEER detailed data and will always produce GRRs that diverge significantly from 100 percent. We direct the PAs to wherever possible use DEER savings at the same

level as the programs are offered, especially where DEER permutation savings vary significantly across primary characteristics. This will reduce significant deviations of the GRR from 100 percent and will also allow program and EM&V data to be more directly used to improve deemed measure UES savings approaches and assumptions.

4.2. Residential Sector 2018 EM&V Updates

Effective Program Year: 2022. There were four residential sector reports for PY2018, however only three of those are discussed here. The PY2018 Home Energy Report[39] evaluation results may impact workpapers for PY2021 and 2022, but it is not a conventional deemed measure, and as a procedural workpaper does not require UES or NTG updates because both are provided by billing analysis.

4.2.1. Hot Water Low-Flow Add-on Devices

Commission Staff reviewed the 2018 impact evaluation of hot water fixtures.[40] The report contains enormous detail and analyzed the individual devices, building type-delivery channel combinations, and provided assessments of water use that could potentially be used to update DEER measure UES and NTG values. However, the results are presented at a PA-specific level, cannot be easily translated to expected Statewide measure changes, and cannot be mapped to specific DEER measures, so no updates will be made at this time to either UES, NTG, or Installation Rate values. If this measure is evaluated again, Commission staff recommend that the evaluation focus on providing more actionable results and include a direct comparison of estimated to evaluated values in the body of the report.

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[39] "Impact Evaluation of Home Energy Reports Residential Sector - Program Year 2018," DNV GL, April 1, 2020. https://pda.energydataweb.com/#!/documents/2366/view

[40] "Water-Saving Fixtures: A Residential and Multifamily Survey to Inform Program Year 2018 Impact Evaluation," APEX Analytics, March 25, 2020. https://pda.energydataweb.com/#!/documents/2368/view

4.2.2. Variable Frequency Drive (VFD) Pool Pump

Commission Staff reviewed the PY2018 pool pump impact evaluation.[41] No UES or NTG values will be updated because these measures are no longer being offered due to a Standards change. PG&E ended its program in 2018 and SCE ended its program in 2019. Since January 1, 2020, California's Title 20 Standards have required that pumps manufactured after this date operate at two or more speeds. In addition, federal standards that should be effective July 19, 2021 require that all pool pumps must meet a minimum efficiency value, but only variable frequency drive (VFD) pumps can meet this value. Therefore, no updates are needed for this measure. Any pool pump workpaper will expire when the federal standard takes effect.

4.2.3. Smart Controllable Thermostats

Commission staff reviewed the PY2018 Impact Evaluation of Smart Thermostats.[42] UES, NTG, and load shape are impacted by the evaluation report that examined data from thermostat installations through a single-family rebate program. The evaluated savings are applicable to thermostats delivered through that channel. This non-DEER measure workpaper is due to be updated this year based on evaluation results. This process may include using evaluation results to update the load shape for smart thermostats as described in section 2.1. Although, the EM&V study gave a NTG of 0.48 for the Deemed downstream rebate programs, the uncertainty in this value did not warrant a change in the existing NTG of 0.55.

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[41] "CPUC Group A Residential Sector PY 2018 Pool Pump Impact Evaluation," NMR Group, Inc., April 1, 2020. https://pda.energydataweb.com/#!/documents/2367/view

[42] "Impact Evaluation of Smart Thermostats Residential Sector - Program Year 2018," DNV GL, April 1, 2020. https://pda.energydataweb.com/#!/documents/2364/view

4.3. Upstream and Downstream Lighting 2018 EM&V Updates

Effective Program Year: 2022. The PY2017 and PY2018 upstream lighting evaluations revealed significantly lower installation rates and the PY2018 evaluation NTGR confirmed that all-LED baseline and expiration of DEER lighting measures was justified. The information and data (including logger data) from the last several lighting evaluations will be considered for deemed load shape update efforts and for a 2023 update of DEER prototypes that will be informed by the upcoming California Residential Appliance Saturation Survey (RASS) and Commercial End-Use Survey (CEUS) studies.

4.3.1. Upstream/Residential Lighting

Commission staff reviewed the PY2018 upstream and residential downstream impact evaluation report.[43] All of the LED lamp measures covered by this evaluation have been discontinued as a PA offering due to the Title 20 changes for General Service Lamps that went into effect January 1, 2020. DEER and workpaper updates (DEER measures and workpapers were expired December 31, 2019) have already been made for the PY2020 cycle. No other updates or changes are needed. However, the 2017 and 2018 evaluations support the need for the addition of tracking data requirements as directed in Section 4.1.

4.3.2. Nonresidential Downstream Lighting

Commission staff reviewed the PY2018 nonresidential lighting impact evaluation report.[44] The measure groups evaluated were LED Fixtures, LED lamps, and T-LEDs. LED lamp results were not considered for updates because they have been discontinued as a measure due to the Title 20 changes for General Service Lamps

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[43] "Upstream and Residential Downstream Lighting Impact Evaluation Report Lighting Sector – Program Year 2018," DNV GL, April 1, 2020.
https://pda.energydataweb.com/#!/documents/2365/view

[44] "2018 Nonresidential ESPI Deemed Lighting Impact Evaluation, Final Report," Itron, April 1, 2020.
https://pda.energydataweb.com/#!/documents/2363/view

that went into effect 1/1/2020. Other significant changes have been made to the three remaining deemed lighting measures that are now covered by Statewide workpapers, with the primary change due to incorporation of an LED baseline. In addition, the EM&V results are only presented at the PA-specific level, so the results cannot be interpreted for application to a Statewide measure offering. As such, no updates will be made to either UES values or NTG values for nonresidential downstream lighting. However, detailed lighting characteristics data and logger information gathered for the evaluation will be considered for the next major update of DEER prototypes, lighting hours-of-use estimates, and potentially load shapes for the lighting measures still being offered.

4.4. HVAC Sector Program Year 2018 EM&V Updates

Effective Program Year: 2022. Commission staff reviewed the 2018 HVAC EM&V report.[45] Results and findings are strongly dependent on the delivery method used (upstream, midstream, downstream, direct install). All measures were reviewed for potential UES and NTG updates. Results from the last several HVAC evaluations—along with RASS and CEUS—will be considered when updating prototypes in the 2023 DEER update.

4.4.1. Rooftop and Split-System

2018 EM&V results indicate that significant changes are warranted for both the UES and net savings as indicated by the GRR and the NTG values for this predominantly midstream program. However, for reasons explained below there are no definitive value changes that will be made to the UES for this DEER update cycle. Changes should be anticipated for the next cycle and/or the next update of the DEER prototypes.

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[45] "Program Year 2018 (PY 2018) HVAC Sector Impact Evaluation Final Report." https://pda.energydataweb.com/#!/documents/2362/view

The evaluated average GRRs for electric and gas UES values were 55 percent to 61 percent. Evaluated gross savings were estimated primarily by updating the EER and fan power index (kW/CFM) in the DEER prototype models, running all the permutations, and applying DEER weights. Review of the DEER prototype eQUEST models revealed that the UES values were significantly higher than expected for a high-efficiency rooftop or split system measure. Savings from the models was approximately 60 percent of the total cooling load versus the expected 10 percent to 15 percent savings for an efficiency improvement. One example presented in the report showed total cooling use was 576 kWh/ton, estimated savings was 350 kWh/ton and ex post savings were only 61 kWh/ton (11 percent). Unfortunately, there were other confounding issues including tracking data and claims issues so it not possible to apply these findings to specific DEER or workpaper measures. However, Commission staff will explore this issue further with the evaluation team and the PAs to determine if a DEER and/or workpaper prototype model update is warranted.

The evaluation also found that tracking data for this midstream (distributor-offered) program were inconsistent and incomplete. A recommendation to require distributors and contractors to submit basic information about the end users such as facility/business name, address, account number, and contact info (phone, email, and back-up contact). The report also recommended requiring additional proof of installation such as invoices, photos, and commissioning reports (10 percent of sampled projects had *zero savings* and 36 percent had field-verified equipment discrepancies). These requirements, especially those that can be obtained remotely and digitally may become easier and the primary evaluation method as a result of COVID-19. To address this issue, we direct the PAs and Cal TF to implement an overarching change to add a section to the workpaper template to specify the tracking and evaluation data required for a deemed measure, as described in Section 4.1.

The average evaluated NTG values for both fuels were 48 percent to 60 percent, which is significantly lower than the current estimated values of 76 percent to

77percent. The 2018 EM&V results were much higher than 2017 EM&V results (12 percent to 29 percent), but because both years NTG values were lower than the existing NTG value, a lower NTG value is warranted by this trend. Therefore, we direct the use of the 2018 EM&V average electric NTG value of 0.50 and natural gas NTG value of 0.60.

4.4.2. Fan Motor Replacement

The 2018 EM&V results indicated that a significant change is warranted for both the UES and net savings as indicated by the GRR and the NTG values. The evaluated average GRR for electric savings was 124 percent and for natural gas therm savings 148 percent. The average electric demand savings GRR was less than one at 46 percent, but values varied significantly from northern to southern California: 40 percent for PG&E, 67 percent for SCE, and 75 percent for SDG&E. Although a change to some of the DEER prototype modeling parameters are strongly indicated (specifically Fan Watt Draw (kW/CFM) and Supply Delta-T) there are other factors such as PAs using single-family UES values for all residential building types, that prevent us from specifying a clear UES update. However, the PAs should explore this issue further with the evaluation team and determine if a prototype update is warranted for a future update.

The average evaluated NTG value of 85 percent is significantly higher than the current estimated values which differ by utility (55 percent, 67 percent, 74 percent). The increased higher attribution is a result of the program delivery approach. The program offers free upgrades via a direct install approach which relies on direct customer recruitment and offers a free service which the customer would not have otherwise found out about or likely even otherwise considered doing on their own. Therefore, we direct the use of the DEER NTG value of 0.85 for direct install fan motor replacement programs.

4.4.3. Duct Testing and Sealing

For this measure group, a billing analysis was performed so there are no DEER or workpaper parameters to update, but the evaluation does provide an independent

assessment/comparison of existing deemed values. The electric GRR was 109 percent and generally indicates the existing UES values are acceptable. The overall natural gas GRR was 146 percent indicating a change is warranted, however the utility level results vary widely: Positive and statistically significant gas savings were found for SCG with a 310 percent GRR, while the gas estimates for PG&E and SDG&E are negative but not statistically significant, so their GRRs were zero. Therefore, no changes are recommended for either electric or gas UES estimates.

The average evaluated NTG value of 95 percent is significantly higher than the current estimated average value for all utilities of 79 percent (range 78 percent to 85 percent). The increased higher attribution is a result of the program delivery approach. The program offers free upgrades for a package of measures via a direct install approach which relies on direct customer recruitment and offers a service which the customer would not have otherwise found out about or considered doing on their own. Therefore, we direct the use of an NTG value of 0.95 for duct testing and sealing offered under this direct install program, with applicable Workpaper IDs provided in the evaluation Appendix C.

4.4.4. Water-Cooled Chillers

Only SCE reported savings for water-cooled chillers in 2018 and they were delivered as a midstream program. 2018 EM&V results indicated that no change was needed for DEER UES values but a change to the NTG value is warranted. The evaluated GRR for electric savings was 221 percent and demand was 179 percent. However, the primary issue was low savings claims due to PAs using average savings for a "commercial" building instead of savings available for explicit building types. The operating hours are significantly different for a hospital versus a primary school or office, and operating hours drive the savings. Although tracking building type for an upstream or midstream program may be considered a burden on the distributor, the estimated savings will always be incorrectly estimated by a sector average, and in this case, they were grossly underestimated. In most cases the building type can be easily determined from the end user's business name. In addition, although the

sample was only 10 points, the evaluation found one reported chiller that was never installed. Although there are no UES updates for this measure, these findings justify additional tracking and evaluation data requirements. To address this issue, we direct the PAs and Cal TF to implement an overarching change to add a section to the workpaper template to specify the tracking and evaluation data required for a deemed measure, as described in Section 4.1.

The average evaluated NTG value of 0.81/0.82 for energy/demand is significantly higher than the current estimated value of 0.60. Distributors reported that the program improved the sale of high efficiency chillers as the incentives helped them to offset some of the incremental cost for the end users. However, the distributors did this without providing any explicit knowledge of the program or incentive to the end user. An EM&V end user survey confirmed that they had no awareness of the program or high efficiency equipment decisions. The evaluation also showed that the installed chillers were even higher efficiency than reported in the PA tracking data. Although the 2018 sample size and uptake for this measure was small, the distributor survey results indicate a strong influence on higher-efficiency chillers sales. We therefore direct the use of an updated NTG value for water-cooled chillers offered via a midstream program from the current value of 0.60 to 0.80, rounding off to the nearest 0.05.

4.4.5. Natural Gas Boilers

SoCalGas is the only PA that reported savings for boilers. The UES values had been previously evaluated in 2017 and the GRR was close to 100 percent (102 percent) so savings were not evaluated in 2018. However, the NTG was evaluated for 2018 and an update is warranted. The evaluated NTG value of 19 percent for therms is significantly lower than the current estimated value of 65 percent. The measure is offered as a downstream measure and that might be one cause for high-free-ridership because 70 percent of survey respondents said they learned about the program after making the decision to purchase a high efficiency boiler. This is also an indication that high-efficiency boilers are already standard practice for many

customers, and that an industry standard-practice study is warranted. We therefore direct the use of an updated NTG value for gas boilers offered via a downstream program from 0.65 to 0.20, rounding off to the nearest 0.05.

4.5. Small and Medium Commercial 2018 EM&V Updates

Effective Program Year: 2022. Commission staff reviewed the ESPI EM&V report for the 2018 small/medium commercial sector.[46] The measures selected for evaluation represent the most significant percent of the savings encompassed by this market/sector evaluation group. Results and findings are strongly dependent on the delivery method used (upstream, midstream, downstream, direct install). All measures were reviewed for potential UES and NTG updates.

4.5.1. Refrigeration-Case LED Lighting

For refrigeration-case LED lighting, 2017 and 2018 evaluation results found similar causes for GRRs that were much less than 1. The evaluated average GRR for electric savings was 0.77. However, the largest impact was due to double counting of the measure at some stores, not a UES parameter issue. There was also a minor issue with one utility assuming T12s for the baseline and using a higher estimate of lamps per door (the unit basis for the measure) which also reduced savings. In addition, both evaluations recommend shorter EUL/remaining useful life (RUL) values. The 2017 evaluation recommended 5.3 years and the 2018 evaluation recommended a four-year lifetime, compared to the current 16-year EUL and 5.3 RUL. A revised EUL for this measure would reflect the finding that when the case is replaced, the LEDs rebated through the program will be removed from service. However, because this is an add-on equipment (AOE) measure no updates are needed for the EUL values, only in the actual application of the existing values by the PAs where the EUL of the AOE is limited by the RUL of the host equipment.

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[46] "PY2018 Small/Medium Commercial (SMB) Sector ESPI Impact Evaluation, Final Report," Itron, March 31. https://pda.energydataweb.com/#!/documents/2361/view

Regarding the NTG values, both the 2017 and 2018 evaluations confirmed the estimated NTG values, so no updates are needed. Most recently, the 2018 evaluation found a statewide weighted NTG value of 0.63 versus the 0.60 estimated value.

4.5.2. Tankless Water Heaters

No updates are recommended for tankless water heater UES parameters or NTG values. The evaluated NTGR of 0.55 was comparable to the estimated value of 0.58. Some minor issues were identified with system types (closed-loop systems versus open-loop systems assumed in the workpaper), system temperatures, and UES values assumed for workpapers versus those found in the field. The deemed review team will review these findings and integrate into the next version of the DEER water heating calculator if warranted.

4.5.3. Process Pumping VFD

Process pumping VFDs were only evaluated in 2018 not 2017. The evaluation found that most differences were due to incorrect utility calculations, so no UES changes are needed. However, the ex post NTG value of 0.39 is significantly lower than the estimated value of 0.60. Therefore, we direct the NTG value for process pumping VFD to be changed from 0.60 to 0.40, rounding to the nearest 0.05.

4.5.4. Agricultural Irrigation

Both 2017 and 2018 evaluations recommended one quantitative change and several qualitative estimation process changes. In both years, EM&V teams found an average pumping discharge pressure different than the previous workpaper guideline of 20 pounds per square inch (psi) – in 2017 the average evaluated value was 34 psi and in 2018 it was 22.1 psi. The current Statewide workpaper does not specify a value for pumping discharge pressure. In 2017, the evaluation recommended that a guideline for operating hours be established, as the measured operating hours contributed to a reduced GRR. In 2018, the evaluation recommended that the savings calculation include the pre-project crop, pre-project

irrigation method, and post-project crop. Finally, qualitative evidence showed that effective useful lifetimes (EULs) are shorter than the deemed value of 20 years but did not gather enough information to offer an alternative value. No updates to the UES values and approach can be recommended for this cycle even though updates are needed, so future EM&V efforts and PAs should focus on collecting the data needed to improve UES estimates.

NTG values also appear to need to need updating. The 2017 evaluation found estimated NTGs were about half of the estimated values (0.28 vs 0.60). The primary reason for the reduced value was that program factors were much less important than other factors in the customer's purchase decision. For the 2018 evaluation, the sample size was too small to estimate a robust NTG. However, given the definitive results of the 2017 evaluation, Commission staff direct the NTG value for agricultural irrigation to be changed from 0.60 to 0.30 (30 percent), rounding to the nearest 0.05.

5. New Code Revisions or Code Revisions Not Covered in Previous DEER Updates

For this update cycle, there are no changes to consider for codes or standards. The 2019 Title 24 code cycle standards were previously implemented under Resolution E-4952. Scheduled updates of federal appliance and equipment standards have all missed their intended deadlines, as shown on the Appliance Standards Awareness Project (ASAP) products summary web page.[47] Products that were supposed to receive efficiency updates effective in 2022 include clothes dryers, refrigerators/freezers, fluorescent lamp ballasts, and metal-halide lamp fixtures. These delays are added to the 2021 delay which included pool heaters, commercial water heaters, computer-room air conditioners (CRAC) and small electric motors. There are many updates scheduled for 2023 that will also miss their deadlines

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[47] https://appliance-standards.org/products-and-links

including residential water heaters, commercial central air conditioner/heat pump water or evaporative-cooled units, commercial refrigeration equipment, walk-in coolers/freezers, and high-intensity discharge (HID) lamps. Pool pumps are not a DEER measure, but they do have an update mentioned here as a courtesy: As of July 19, 2021, there is a federal requirement for variable speed pool pumps, hence the energy efficiency measure will be required by law.

6. Review of Market and Research Studies

Market and research studies, including industry standard-practice studies and baseline studies[48] are a rich source of update information but are only periodically conducted. These types of studies can be used for calibration of whole site and end use energy use, establishing industry standard and/or best practices, developing operating hours, and developing model prototype characteristics. A critical issue in the past with these studies is the time lag between study completion and integration of the results into DEER. Towards that goal, we are tracking current sector-scale baseline studies, considerations for future DEER update cycles, even if the results cannot be used for the current cycle. There are no updates to DEER this year resulting from these types of studies.

7. New Measure Additions

CPUC staff will be implementing several new DEER database measures for 2022. As a result of the statewide workpaper consolidation effort and the increased participation of third-party implementers, we anticipate that new measures may be proposed via workpapers and in response to this Resolution.

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[48] For example, the Commercial End-Use Study (CEUS), Residential Appliance Saturation Study (RASS), Commercial Saturation Study-Commercial Market Share Tracking (CSS-CMST) studies, and California Lighting and Appliance Saturation Study (CLASS).

7.1. Normalized Metered Energy Consumption (NMEC) measures

The introduction of NMEC measures to the demand-side management portfolios required the addition of new records to existing support tables in the DEER database as described in the PEAR change log.[49] No other effects on the DEER databases are anticipated.

7.2. Fuel-Substitution Measures

The introduction of fuel substitution energy efficiency measures to the deemed portfolio may require the addition of new fields to the workpaper ex ante data (EAD) tables and the DEER database—which largely share the same data specification. These fields are important for future reporting of California greenhouse gas (GHG) reduction goals and may include lifecycle CO2 emissions reduction, lifecycle source energy savings, and infrastructure cost. The Fuel Substitution Technical Guidance for Energy Efficiency[50] issued in 2019 required careful review to determine the ways that DEER and workpapers would be affected. These effects are described in the sub-sections that follow.

7.2.1. Fuel-Substitution Measure Impact Type

Effective Program Year: 2020. The Fuel Substitution Technical Guidance for Energy Efficiency specifies the measure impact type to select when submitting a workpaper regarding a fuel-substitution measure. According to the technical guidance, the workpaper documentation should indicate that the measure impact type is "Fuel Sub-Deemed." This option—as well as two others—were added as described in the PEAR change log.

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[49] Available at http://www.deeresources.com/files/deerchangelog/pearchangelog.html.

[50] California Public Utilities Commission, October 31, 2019, "The Fuel Substitution Technical Guidance for Energy Efficiency," Version 1.1. (See: https://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=6442463564.)

7.2.2. A-Fuel-Substitution Effective Useful Life

Effective Program Year: 2020. The Fuel Substitution Technical Guidance for Energy Efficiency indicates that the measure EUL should be used to calculate lifetime source-energy savings and avoided CO2 emissions in several places as follows:

- To calculate the life-cycle source energy savings, the fuel substitution calculator multiplies annual source energy factors from Table 2 and Table 3 (in Btu/kWh and Btu/therm for electricity and natural gas, respectively) by the site energy savings for each year of the measure's EUL.[51]
- Chapter 2, Section 2.3, p. 7: "Life-cycle CO2 emissions are defined as the total CO2 emissions over the EUL of the measure technology.[52]
- As with energy efficiency measures, the EUL and remaining useful life (RUL) values corresponds to the measure technology for the fuel substitution measures.[53, 54]

Furthermore, all equations provided in Chapter 3 of the Guidance employ a single EUL variable. As a result, two EULs were added as listed in the PEAR change log to support the submission of a fuel-substitution workpaper for residential cooking appliance upgrades that was submitted in 2020.

7.2.3. Fuel-Substitution Measure NTG Values

Effective Program Year: 2020. The Fuel Substitution Technical Guidance for Energy Efficiency indicates that—consistent with Decision 19-08-009[55]—fuel-substitution

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[51] CPUC. "The Fuel Substitution Technical Guidance for Energy Efficiency," Version 1.1, 2019-10-31, Chapter 2, Section 2.2, p. 6.

[52] Ibid, Chapter 2, Section 2.3, p. 7.

[53] Ibid, Chapter 3, Section 2.2, p. 14.

[54] Ibid, Chapter 3, Section 2.2, p. 16.

[55] CPUC Decision 19-08-009, August 5, 2019, p. 3.

measures shall use a net-to-gross ratio of 1.00 until impact evaluation results become available. Details are provided in the PEAR change log.

7.2.4. Future Fuel-Substitution Measure Considerations

Background:

- Lifecycle CO2 and lifecycle source energy savings are outputs of the cost-effectiveness tool (CET) and are available from the California Energy Data and Reporting System CEDARS.
- Methodology for determining lifecycle CO2 emissions is currently being investigated for potential revisions, however these values will continue to be available from CEDARS.
- PAs are required to collect and report infrastructure cost data for downstream measures, but that data is not currently being used because there is no guidance yet on how these costs should be incorporated into the CET calculation or the avoided costs. (That said, it would still be useful to provide a field to collect infrastructure cost data.)

Effective Program Year: 2022. The introduction of fuel substitution energy efficiency measures to the deemed portfolio may require the addition of new fields to the workpaper Ex Ante Data (EAD) tables and the DEER database—which largely share the same data specification. These fields are important for future reporting of California avoided GHG goals and include lifecycle avoided CO2 emissions, lifecycle source energy savings, and infrastructure costs. Discussion of this topic was initiated in 2019 with the CPUC Reporting and Data Management Project Coordination Group (Reporting PCG).

Fields that might be considered to track infrastructure costs in the MeasureCost table of DEER for fuel substitution measures include: FSInfraLaborCost, FSInfraMatlCost, and FSInfraInstallHrs.

7.3. Updated Energy-Efficient/Baseline Thresholds for Water Heaters

Effective Program Year: 2021. As part of the effort to update the water heater calculator (described in 3.1), recent manufacturer data were downloaded from the Air-conditioning, Heating, and Refrigeration Institute (AHRI) website to verify that the baseline and energy-efficient cases are appropriate given the availability of various product categories that are code compliant in California. These updates resulted in revised energy impacts for many of the pre-existing measures. Five fuel substitution measures were also added for both residential and commercial applications. A revised version of the water heater binning tool Excel workbook has been made available at the same time as the water heater calculator was released for stakeholder review (May 1, 2020).

7.4. Residential Heat Pumps for SEER ≥19 SEER

Effective Program Year: 2022. New measures for high-efficiency heat pumps (SEER 19, 20, and 21) will be created using DEER2020 building prototypes and MASControl3. Since high SEER systems have variable capacity compressors, they will have different performance curves than lower SEER systems, hence the performance curve will be updated in MASControl3 for these high SEER systems.

8. Comments on DEER2022 Update and CPUC Staff Responses

On April 21, 2020 CPUC staff published to the Energy Efficiency Proceeding R.13-11-005 service list a memo outlining the intended scope of the planned update to the DEER and a solicitation of comments on that proposed scope. Comments were filed by QC Manufacturing, Google Nest, Pacific Gas & Electric Company, Southern California Edison, San Diego Gas and Electric, Southern California Gas, and Southern California Regional Energy Network. Those comments were grouped by topic and the most significant issues are summarized below along with a response from the CPUC staff.

8.1. BRO EULs

Southern California Regional Energy Network (SoCalRen):

SoCalREN supports the consideration of EULs for Behavior, Retrocomissioning, and Operational (BRO) measure classifications in a future decision and suggests this be addressed prior to the DEER2022 resolution.

Southern California Edison (SCE):

Section 2.5: Clarification of BRO measure application type, provides a regulatory history of the technical policy for BRO effective useful life. However, the scope of the BRO EUL update is unclear. The section states, "The EULs for BRO measures can only be updated by a future decision." SCE seeks clarity on the scope of DEER updates planned for BRO measure EULs.

CPUC Staff Response:

EULs for the BRO measure application type were established by Decision 16-08-019; hence, they can only be changed by a future Decision. Since several parties have asked CPUC staff for clarification of BRO measure EULs in the past year, we thought clarification was appropriate. No changes will be made to the EUL for BRO measures until such time as it is addressed in a future Decision.

8.2. Reclassifying Duct Sealing

Southern California Gas Co. (SoCalGas):

SoCalGas intends to follow CPUC's direction to use two measure application types for duct sealing based on the building vintage and suggests creating two new EUL IDs in DEER for duct sealing measures as BRO and building weatherization.

CPUC Staff Response:

We will create a new EUL ID in DEER for duct sealing measures of the building weatherization measure application type.

Pacific Gas & Electric Co. (PG&E):

PG&E requests that the Duct Sealing reclassification be considered an error correction and make the changes effective in 2021. Resolution E-4952 (October 11, 2018) directed a measure classification for Duct Sealing that conflicts with direction in Resolution E-4818 (March 3, 2017). This resulted in a reduction of EUL for Duct Sealing from 18 years to three years, drastically reducing its cost-effectiveness. Resolution E-5009 states that there is consensus that three years is too low of an EUL for this measure and makes plans to work towards a correction, effective 2021. This erroneous 3-year EUL for Duct Sealing is creating disruption in the market and produces an artificially low total resource cost (TRC) for residential programs. Correcting this EUL is a simple fix that has real impacts on residential programs and should be made as soon as possible.

Southern California Edison (SCE):

SCE recommends implementation in 2020, as the prior EUL classification would be a correction for certain applications.

San Diego Gas & Electric Co. (SDG&E):

Reclassifying duct sealing from EUL = t years due to BRO-RCx, to EUL = 18 years due to BW for buildings constructed before January 1, 2006 has an effective date of 2022. This change should be applicable to 2020 since the conditions for the change exist today. It does not make sense to wait until 2022 when programs can implement the measure now, subject to updated workpapers.

CPUC Staff Response:

Although the reclassification of a set of duct sealing measures is not an error correction, we will change the effective date to 2021 for the reclassification of duct sealing as a MAT of BW with an EUL of 18 years in pre-2006 buildings.

8.3. Ecosystem

Pacific Gas & Electric (PG&E):

"Topics that may require IT upgrades: There are two sections which indicate revisions to the structure of the DEER tables,

- Load shape update process revision, pg A-3, which states “a new table or tables will be added to DEER…”
- Future fuel-substitution measure considerations, pg A-13, which states “The introduction of fuel substitution energy efficiency measures to the deemed portfolio may require the addition of new fields to the workpaper Ex Ante Data (EAD) tables and the DEER database…”

PG&E would like to highlight that structural IT changes to the DEER database and/or reporting also requires IOU database structure changes. PG&E requests that CPUC incorporate ample notice and time for utilities to comply."

CPUC Staff Response:

We recognize that the indicated updates are characterized as structural changes and will give ample notice of such changes through the Reporting PCG.

Southern California Regional Energy Network (SoCalRen):

One area that requires clarification in the Scope Update to DEER 2022 is the intersection of DEER and CEDARS Sources of Truth (SoT). The Sources of Truth are not currently aligned with DEER and specific coordination on this would be helpful for compliance filings.

Additionally, the CPUC has rightfully continued to make the connection between DEER and the P&G study. SoCalREN recommends that particular attention is given to align DEER values, such as NTG and GRRs, with the measure level values used in the Potential and Goals (P&G) study for all levels of analysis on Technical, Economic and Market Potential. This should be aligned with the DEER Bus Stop approach and integrated into the P&G study.

With respect to the integration of DEER values and the Integrated Resource Plan (IRP), SoCalREN commends the Commissioned staff in their Staff Proposal for Incorporating Energy Efficiency into the SB 350 Integrated Resource Planning Process. SoCalREN recommends that the Commission continue their diligence in sequencing and incorporating DEER updates with IRP activities as appropriate.

SoCalREN understands that two landmark updates will be made to the RASS and the CEUS studies. Given that the technical value and potential impacts to DEER values may be significant, SoCalREN requests the opportunity for public comment on all study drafts related to RASS and CEUS. Not only will they impact DEER but may shape future business plan filings and implementation plans.

Southern California Edison (SCE):

SCE recommends that technical assumptions for goal development and portfolio assessment be aligned as reasonably as possible. The proposal[56] recently filed by the National Resources Defense Council (NRDC) discusses alignment considerations.

CPUC Staff Response:

Work is underway to more closely align CEDARS and DEER variable names. DEER values are inputs used in the Potential & Goals. Discussion of P&G study technical inputs are in the scope of said study and dealt with in that venue. Any changes to DEER based on the RASS or CEUS studies will be implemented according to the DEER update process and, as such, will be available for review during the Scoping Memo comment period and during the Resolution Draft comment period.

[56] NRDC Motion Seeking Commission Ruling and Comment Period on the CAECCC proposal for improvements to the Energy Efficiency Portfolio and Budget Approval Process Working Group Report

8.4. EM&V

Pacific Gas & Electric Co. (PG&E):

Regarding Table A-4-1: Summary of recent EM&V study results, A-10: The scoping memo identifies many NTG values to be considered for update based on California EM&V studies only (pg A-9). PG&E recommends that DEER also consider the ACEEE national average NTG values as well. California EM&V studies rely on unverified self-report surveys with a circuitous scoring methodology that has undergone multiple revisions, and the NTG surveys often take place one or more years after project completions. Additionally, a recent PY2018 impact evaluation reported that it was clear customers were interpreting questions differently from the survey's intent. For many years ACEEE's State Energy Efficiency Scorecard annual report (https://www.aceee.org/state-policy/scorecard) has dropped CA NTG values since they are extreme outliers on the national stage. The most recent (2019) ACEEE Scorecard report shows national average electricity NTG of 0.84, and gas NTG of 0.90, while the most recent CA portfolio NTG values are electricity NTG of 0.64 and gas NTG of 0.67 (Energy Efficiency Portfolio Report, CPUC, May 2018).

CPUC Staff Response:

The NTG values determined through California EM&V studies are more appropriate to use in DEER updates than national average NTG values. California EM&V studies target specific program and utility offerings and develop NTG values for that specific program, which will yield more relevant NTG values. An average at the fuel type level is not even a good metric given the diversity of EE programs and offerings. Regarding the NTG survey questions, there is always room for improvement and issues like the one mentioned should be considered in the scope of respective impact evaluations.

Southern California Regional Energy Network (SoCalRen):

SoCalREN generally supports reviewing current impact evaluation reports to update energy savings. It is recommended to supplement these studies with additional publicly available reports and studies from ESource, Electric Power Research

Institute (EPRI), and other such organizations. Additionally, the updates to RASS will be beneficial to include in updates to key DEER parameters.

SoCalREN recommends that the changes to the refrigerated case lighting and water heating measures be considered in parallel with any statewide water heating program activities, as well as any related control measures that increase the cost effectiveness of such measures.

CPUC Staff Response:

We will make updates based on RASS next year when the study is completed and will bring in results from other studies where appropriate and if California sources do not exist. We agree that controls are a useful future consideration for future workpapers.

San Diego Gas & Electric Co. (SDG&E):

The list of EM&V studies does not include smart thermostats under "Residential EM&V" even though the other measures were studied for PY2018. We recommend adding to the priorities.

Under "Review of EM&V Studies" the smart thermostat measure is listed. Why is it the only measure excluded from Residential measures evaluation? Add to Table 1-2 as it is a priority as it has current impacts to what would be appropriate to forecast in 2021 Annual Budget Advice Letter (ABAL) and future solicitations. In addition, smart thermostats are part of the EE+DR measure opportunities for control but if the WP is only reflecting the EE component it is difficult to justify including it in the portfolio from a cost effectiveness perspective.

The memo describes the timeline of when the impact evaluations would be included in DEER updates when giving an example about "[l]oad shapes applicable to measures updated through 2019 EM&V efforts or via DEER 2022 will be available for use in 2022." The 2019 EM&V efforts, also know as PY2018 impact evaluations, the available for "use year" or "Effective Program Year" is 2021 and not year 2022. It should be included in DEER2022 as noted.

"The Home Energy Reports, Smart Thermostat, and Pool Pump evaluations may impact workpapers for PY2021 and PY2022, but these measures are not being considered for addition to DEER in 2022". While SDG&E can agree with the Pool Pump not needing to be considered for workpaper updates as the measure will become code in 2021, there is a huge drop in savings for Smart Thermostats found in the impact evaluation that would necessitate a workpaper update. Provide clarity on the required timing to update the smart thermostat workpapers.

The list of EM&V studies omitted residential "Fan Motors" from "HVAC EM&V" technologies listed in parentheses. Residential "Fan Motor" technology was included in the 2018 HVAC Impact Evaluation Report by DNV GL. Add "Fan Motor Replacement" to the DEER 2022 priorities. (section 5.2.2 in HVAC eval report).

CPUC Staff Response:

Smart thermostats are not a DEER measure, so guidance is being provided through the workpaper process. However, the smart thermostat NTG values are held in the DEER database support tables, and those will be updated with the new NTG values from the 2018 smart thermostat evaluation. Fan motors were inadvertently excluded from the scoping memo, but evaluation results are being reviewed for possible inclusion in the 2022 DEER update. EM&V results are available for use in workpapers as soon as they are released. The results relevant to DEER measures are updated on the normal DEER update cycle, i.e. they are included in the current year, 2022 DEER update. The results will be in the database and available for use in September 2020 when the Resolution is voted out.

8.5. Transition to eTRM

Southern California Regional Energy Network (SoCalRen):

SoCalREN supports the transition to the electronic reference manual (eTRM) and the general direction of the DEER-workpaper ecosystem. The potential of the eTRM to further streamline the workpaper process, as well as upstream and downstream efforts that use DEER values is strongly supported. If the eTRM were to serve as a

single database of record as mentioned in Section 2.4 of Attachment 2 - DEER2022 Update Summary, many stakeholders would greatly benefit from this consolidation. Furthermore, SoCalREN looks forward to the role of the eTRM in streamlining the new workpaper process as well as serving as an easily searchable workpaper database. Additionally, the promise for the eTRM to also contain load shapes is of great importance. The ability to access the load shapes as well as the underlying assumptions would greatly benefit the Program Administrators, Implementers and third parties. In the future cycle updates of the eTRM, SoCalREN looks forward to understanding how Section 5.2 of Resolution E-5009 is more fully addressed in the future of building simulation prototypes and modeling. Accessing load shapes and a robust dataset through interoperable software such as EnergyPlus would allow for significant workflow improvements across stakeholders. Lastly, SoCalREN is interested in joint efforts related to standardizing prototypes and compliance rulesets.

As mentioned throughout these comments, SoCalREN supports the transition to the eTRM and look forward to the expected benefits of its progressive launch and continued development.

Southern California Edison (SCE):

Transition to eTRM: Table 1.2 includes the following Update Topic Area description: “Implement eTRM Transition Plan (Includes User testing/acceptance Plan, Ex ante data Compliance Plan, Governance plan, IOU co-funding plan, IT Administration plan, systems integration plan); establish CPUC position on CalTF governing board.” SCE recommends a correction from “CalTF governing board” to “eTRM governing board”.

Transition to eTRM – Section 9: describes a multi-year transition plan to the Electronic Technical Reference Manual (eTRM). SCE recommends that the transition consider a distinct cutover to the eTRM environment, rather than a transition plan that includes hosting and funding two systems in parallel. SCE recommends setting a goal of having DEER sunset at the end of 2021 and eTRM

become the system of record thereafter. Furthermore, SCE recommends that funding for the transition to eTRM be discussed and decided upon during the DEER 2022 update.

San Diego Gas & Electric Co. (SDG&E):

Under "Support DEEResources…" The following should be added to the end of the sentence, "…eTRM platform complete, on or before 12/31/21."

CPUC Staff Response:

We agree that load shapes should be accessible and transparent and will work toward that goal as part of the final state of the ecosystem. We have removed language regarding a governing board from the resolution at this point in time and acknowledge the comment for future consideration. We agree that an expeditious transition to avoid duplicative platforms is important, and CPUC staff have identified modifications to the eTRM necessary to accommodate workpaper submission, review, tracking and approval that shall begin in July 2020. A parallel transition is necessary to fully sunset the existing DEER, Ex Ante, and PEAR databases by the end of 2021. The decision to sunset the existing systems will depend on the replacement solutions' ability to meet all policy- and technology-related requirements. The CPUC will sunset the existing systems once it is satisfied that these needs are met by the replacement solution.

8.6. EUL

Southern California Regional Energy Network (SoCalRen):

SoCalREN recommends the Commission consider this update (2.2 EUL updates) prior to the DEER2022 Resolution or at least early enough to inform the next iteration of the Potential and Goals Study.

(10.2) SoCalREN supports the Commission exploring the EUL updates for add-on equipment which will more accurately reflect the savings potential and claims expected to exist in the market.

Southern California Edison (SCE):

Timing of EUL updates and process – Section 2.2: Effective useful life (EUL) updates and process, describes a new process CPUC is planning for the 2022 program year, to allow for proposed changes or additions to EUL values in DEER. SCE recommends implementing the process in 2020, instead of implementation in 2022. SCE has leveraged this existing process for EUL values in 2019 and 2020 workpaper submissions and would like to see this process continue through 2020 and forward to allow best available data to be considered by CPUC for approved DEER values.

CPUC Staff Response*:*

The revisions to the EUL update process—while not officially effective until 2022—may be utilized earlier.

EULs will be updated and available for use as soon as the EUL research is published and reviewed. Upcoming work under the current EUL study contract includes determining the EUL for residential insulation. Other measures are being reviewed and prioritized for 2020 (to continue the research without site-based research due to COVID-19-related risk) and 2021 of that study.

We may explore updates to the add-on equipment/host EUL policy for the DEER2023 update. The host equipment is defined as the equipment that saves energy as a result of the add-on measure.[57] However, in some cases the add-on measure is not installed directly on the host equipment allowing the measure to remain in place even if the host equipment is replaced. Current policy zeros out savings when the host equipment is replaced, but we recognize that savings for the remote AOE will in fact be different, not zero. We have allowed changes to the host equipment to increase the EUL of the add-on measure in some of these cases where the add-on measure is not installed directly on the host equipment.

[57] Resolution E-4818 Section 1.3.6.2 Add-On Equipment, pp.26-27

Additionally, the suggestion has been made that the AOE EUL as the smaller of the EUL of the equipment or the RUL of the host equipment may be too low since AOE is not installed on old host equipment. The DEER2020 update[58] does consider add-on equipment that is installed onto new equipment, and already allows the host equipment RUL to be replaced by the host equipment EUL when the host equipment is installed at the same time as the add-on equipment. Additionally, the DEER2019 resolution allowed the EUL of host equipment to be increased to 30 years in some cases (windows) to allow a RUL of 10 years for add-on equipment (window film).[59] The policy regarding AOE installed on non-new host equipment will not change until a study has been conducted that supports such a change.

8.7. Fuel Substitution

Southern California Regional Energy Network (SoCalRen):

SoCalREN supports the methodology outlined in the appendix and recommends that the Commission begin to collect information on changes to participant behavior resulting from fuel substitution. In some cases, default DEER values may not capture how a participant may operate equipment of a new fuel type due to economic or thermal comfort considerations.

CPUC Response:

Collecting data on participant behavior is outside of the DEER update scope, but maybe considered by PAs or EM&V teams.

Southern California Edison (SCE):

Fuel Substitution Measures – Section 7.2.4: Future fuel-substitution measure considerations states, “CPUC staff proposes to write a script to calculate the annual source energy and avoided CO2 emissions using the existing annual electric energy

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[58] Resolution E-4952, p. A-37

[59] Resolution E-4867, p. 15

and natural gas savings values. The script will employ the equations provided in the Fuel Substitution Technical Guidance for Energy Efficiency. A similar change will be recommended for the workpaper EAD EnergyImpact worksheet. This change will help automate and consolidate calculations that now need to be performed externally." SCE recommends that CPUC staff consider that annual source energy and avoided CO2 emissions will change every year, as the percentage of renewable energy generation in the state increases. Also, the Fuel Substitution Technical Guidance will be subject to revisions in the future, to address stakeholder comments and concerns. Providing a script in the EAD EnergyImpact worksheet, would require constant maintenance, to stay current with changes in the Guidance. SCE proposes that the Fuel Substitution Calculator remain a separate, agile tool that would allow for low cost adjustments to annual source energy and avoided CO2 emissions changes.

Fuel Substitution Measures – Section 7.2.4: SCE supports the addition of fields to the Ex Ante Tables, to record unique information. These fields include FSInfraLaborCost, FSInfraMatlCost, FSInfraInstallHrs, Life-cycle Source Energy Savings, and Life-cycle CO2 emissions reduction. SCE recommends that the timing of these additions take into account the entire ecosystem of energy efficiency measures reporting, including internal IOU systems. The Scoping Memo cites discussions begun in 2019 with the Reporting and Data Management Project Coordination Group (Reporting PCG) regarding this topic. Because workpapers effective in 2022 need to be submitted by 12/31/2020, SCE recommends holding statewide workshops to plan implementation of these changes with IOUs and stakeholders to mitigate issues with reporting claims and calculating TRC for future program designs and ABAL filings. SCE also recommends including statewide custom project stakeholders, as these added fields will require additional project data tracking and reporting.

San Diego Gas & Electric Co. (SDG&E):

Support table updates omits updating and or editing information. For example, the READI tool DEER Support Table "NTG Ratio (2020)" for "FuelSubst-Default" has not been updated to include the recently added measure impact types associated with fuel substitution. Revise and edit existing support table tables data fields such as "NTG_ID" = FuelSubst-Default, so the Savings determination method (measure type):

Southern California Gas Co. (SoCalGas):

The memo states that the DEER database may be modified to accommodates the fuel substitution measures. The cost-effectiveness tool (CET) was recently updated to address the unique nature of this type of measure, and SoCalGas believes further improvement can be made to the tool. We suggest that the consideration of new data fields for the DEER database to be carried out with further CET calculation update to properly handle the source energy savings (full energy savings in Decision 19-08-009)1 and the emissions reduction.

CPUC Response:

At this time, the fuel substitution test will remain outside of the CET and maintained by CPUC staff and consultants. Previously proposed changes to the EnergyImpact table has been reconsidered and removed. The READI tool DEER Support Table "NTG Ratio (2020)" for "FuelSubst-Default" has been updated to include the recently added measure impact types associated with fuel substitution as indicated on the PEAR change log.

8.8. Load Shapes

Southern California Regional Energy Network (SoCalRen):

See comments on Table 1-2. "For load shape updates, we recommend the Commission ensure that the "no-peak" methodology be taken into account as the load shapes are developed. Since this will be a dynamic peak and geographically

specific, the load shapes require new methods and file formats when shared with stakeholders."

Southern California Edison (SCE):

Timing of Load Shape updates – Section 2.1: SCE does not recommend updating load shapes in the DEER 2022 Resolution for implementation in the 2021 program year. Section 2.1 describes the effective program year for load shape updates is 2021 and 2022. PAs and Third Parties are currently planning their 2021 portfolios and programs using workpaper values already approved by CPUC for 2021. A load shape update, released in the DEER 2022 Final Resolution in Fall 2020, will likely require updated workpaper values for the 2021 program year. This delayed update to 2021 workpaper values may disrupt the market and not allow sufficient time for PAs and Third Parties to react and plan accordingly. SCE recommends that any new load shape releases be prioritized for 2022 implementation to allow the market to adapt to new measure assumptions.

CPUC Staff Response:

The load shape update is a multi-year process. New formats have been created and a memo describing the format will accompany the new data tables. New load shapes will not be required for the 2021 ABAL planning process. A limited number of added load shapes will be available for review and use as part of DEER2022 for the 2022 ABAL planning process. Additional load shapes from EM&V studies and new measures will be added going forward. These load shapes are being updated in the CET and will be available for use in 2021.

8.9. Updates to Existing or Addition of New Measures

QuietCool Manufacturing, Inc.:

The following comments are submitted in order bring to your attention a topic that should be prioritized for the current update cycle to meet 2022 program needs, pertaining to previous DEER study data regarding whole house fans and nighttime ventilation cooling measures.

Upon reviewing the data from previous 2020 and 2021 programs, it has come to our attention that the DEER study data pertaining to whole house fans is very outdated, using data from Davis energy reports going as far back as 2004, making them nearly 16 years old. The incentive rebate programs offered by utility companies such as SCE use this data for measure cost analysis and computational evaluation of measure kWh savings, and are deeming whole house fans and nighttime ventilation cooling measures to be non-cost effective based on outdated data.

In the last 15 years much has changed in both the manufacturing and efficacy of these types of products, and they warrant a re-evaluation for utility rebate incentives to properly evaluate their benefits when implemented by homeowners, allowing them to be incentivized for doing so. Considering the huge impact to peak grid usage, carbon footprint reduction, and improved indoor air quality, whole house fans cannot be disregarded in homeowner incentive programs, which rely on DEER for their TRC cost-to-measure analysis. Title 24 CBECC analysis of additions/alterations retrofitted with whole house fans show huge kwh benefits which are not reflected in the DEER study, and therefore are not incentivized currently.

We feel that the following recent studies should be used to produce the 2022 DEER study data pertaining to whole house fans:

- 2013 Code CASE R SEMPRA Study for Nighttime Ventilation Cooling dated Sept. 2011: This report shows the HVAC reduction capable with whole house fans.
- UCLA Study on eliminating HVAC usage: Documents effectively removing HVAC in a majority of CA climate zones, documenting the viability reducing HVAC costs by nearly 100 percent with whole house fans.
- LBNL Study dated 2006-07-11 Ventilation Behavior report for the ARB: Report shows that 50 percent to 80 percent of homeowners are more than somewhat likely to open windows for energy saving purposes, refuting the old report claims that only 33 percent of people will open windows and run a whole

house fan. Currently Title24, part 6 energy software assumes only one-third of homeowners will use a whole house fan and applies an automatic derating of 66 percent to this measure during computational analysis, which is mathematically unjustified.

In addition, we feel that the efficiency of the average whole house fan systems has changed drastically with the inception of ECM motors, capable of being able to cool a home both passively and actively, with as little as 50 watts, as opposed to an HVAC system which consumes 800 to 1500 watts. Prices used in previous DEER studies are also higher than current values, causing further errors.

We would be happy to provide public copies of these reports for the CPUC and DEER study team to review, in hopes that we can facilitate the public utilities commission to properly encourage utility companies to incentive homeowners who choose to upgrade their homes with whole house fans, and reduce up to 60 percent 90 percent of their kwh consumption during the summer months.

CPUC Staff Response:

CPUC staff will assess whether the energy impacts for the whole house fan measure should be updated for the next resolution. Four DEER measures for whole house fans were updated for DEER2020 that assume that ECM motors drive the fans: WholeHouseFan-0.7CFM-ECM, WholeHouseFan-1.5CFM-ECM, WholeHouseFan-2.0CFM-ECM, and WholeHouseFan-3.0CFM-ECM.The measure cost data in the DEER databases, however, are known to be out of date and are not currently in use. Each statewide workpaper was submitted with updated measure cost data for the 2020 program year. In addition, SCE has recently submitted a new whole house fan workpaper for 2021 approval.

Southern California Edison (SCE):

13. New Measure Addition – Section 7: SCE recommends inclusion of measures for Residential HVAC Mini-Split systems, in addition to heat pumps (HP). Given statewide Energy Efficiency and decarbonization goals, these offerings (both HP and

Mini-Split HP) are critical for many programs including Residential, Upstream, and New Construction.

San Diego Gas & Electric Co. (SDG&E):

Please include these industrial applications measures in the Update:

- Oil pipe insulation
- Oil tank insulation
- Oil heater (both electric and therms)
- Material blower VSD (currently we use motor VSD) any process using air to move product
- Material Dryer VSD (currently we use motor VSD) Example drying sand or rock
- Gas compressor (other than air)

CPUC Staff Response:

CPUC staff will also assess whether residential heat pump and mini-split heat pump systems will be modeled using MASControl3 or a comparable tool in time for the next resolution. Staff do not, however, agree that the recommended industrial measures should be added to the deemed measure list in the DEER databases. Instead, these measures should be introduced and vetted through the work paper process.

8.10. Water Heaters

Southern California Gas Co. (SoCalGas):

As stated in this section, the revised water heater tool was made available on May 1, 2020. SoCalGas will update relevant water heater workpapers to incorporate the new DEER values and work with the CPUC staff if we find any comment after further review.

Southern California Regional Energy Network (SoCalRen):

SoCalREN supports the update from EF to UEF for heat pump water heaters. This will better align with current manufacturer efficiency ratings, as well as improving diversity between residential and commercial water heaters. As part of this update, SoCalREN recommends considering the value of grid interactive capabilities for HPWHs either as it relates to the water heater calculator or fuel substitution. The use of HPWHs for demand response and/or for their energy storage capability supports California's long-term goals towards GHG reduction.

CPUC Staff Response:

The water heater calculator does not currently have the functionality to account for demand response measures. While we agree that this functionality would be of value, adding it will be considered for a subsequent update.

9. Appendix 1 – eTRM Enhancement Planning

Table A-3 contains the necessary enhancements to the eTRM, at a minimum, needed to satisfy the Energy Division's two-phased transition approach. Phase 1 enhancements are expected to begin in July/August 2020 and are required to be completed satisfactorily as a condition of the Data Source of Record designation by January 1, 2021. Phase 2 requirements may being in 2020, and will be completed in June, 2021.

Table A-3. Required eTRM Enhancements

Row	eTRM Enhancement Requirements	Phase 1 2020	Phase 2 2020	Phase 2 2021	Both 2020/ 2021
2	Add additional data fields at staff direction to meet the Deemed Data Standard.	X			
3	Create a process (API with specific views designed by the ex ante team for the eTRM) that would sync with the Ex Ante tables and update the eTRM shared tables on a daily basis.	X			

4	Set versioning of shared parameters and value tables at the object (table/parameter) level rather than at the shared data library level.	X			
5	Add ability for editors to choose what columns appear (and their order) in the characterization when a value table is embedded (both shared and measure-specific).	X			
6	Creation of a CPUC-specific shared data library for DEER measures. This shared data library would support versioned parameters and value tables managed by CPUC and available for eTRM measures to import.	X			
7	Creation of a CPUC-specific shared data library for DEER measures. This shared data library would support versioned parameters and value tables managed by CPUC and available for eTRM measures to import.		X		
8	Add the ability to maximize production system uptime during deployment of enhancements and fixes. Deployments that require system downtime should be deployed outside typical business hours.				X
9	Add the ability to utilize the staging environment as a User Acceptance Testing platform for all enhancements				X
10	Add the ability to retain independent user profiles between staging and production environments during deployment of enhancements and fixes				X
11	Add the ability to deploy enhancements to production environment without compromising existing measures, measure data and user tracking data				X
12	Add the ability to roll-back changes in the event of failed deployment, without loss of data				X

13	Add ability to associate load shapes--either 8,760-hour or compressed format--to measure permutations based on permutation attributes. eTRM should store library of load shapes, which may be associated at the permutation level. -- Energy Division will need to finalize appropriate measure-level load shapes that can be used for each measure or technology type, but we would like to add IDs now if we can.			X	
14	Add the ability to select any available public field in any order, downloadable as Excel or PDF file. Ability for user to save report format associated with their specific log-in credentials so they can use repeatedly.		X		
15	Incorporate interactive report rendering system (e.g., Tableau Public Version) with eTRM. Build presentment into dedicated eTRM page (via iframe) and add Report link to global navigation.		X		
16	Add an extension of notifications available on measure and permutation reports. Any change to the data in the report, where the source is from a commit (NOT a saved draft) would trigger a notification to subscribers. Notifications would be aggregated so that a user only receives one notification per report per day, in the case that someone is committing updates to a measure multiple times in one day.		X		
17	Develop and add ability to download master report (flat file) of measure permutations that is not limited to a single measure.		X		
18	Develop master report (flat file) of measure permutations that is not limited to a single measure.		X		

19	Implement a software hard-coded roles and permissions matrix. Roles will still be categorized into system roles or measure roles. Included in the roles created shall be "CPUC User."		X		
20	Define and implement workflows to eTRM for Energy Division ex ante workpaper review, tracking, approval and value updating functionality.		X		
21	Creation of CPUC-specific workspace to allow for storage and viewing of DEER Measure and Energy data that could be imported into the eTRM Measure Template for further development and approval. Users who wish to develop a new measure based upon a valid DEER Measure (a DEER Measure that has not expired) shall be able to import DEER Energy data into the eTRM Measure Template for further development of a statewide measure.			X	
22	Add Functions that support email notifications as a measure changes status and assignee, including: Ability for a user to assign a measure to another user – During a measure status change – Independently of a measure status change (admin only) – Email notifications when a measure is assigned to you – Email reminders after a period of time that a measure has been assigned to you		X		
23	When Shared Table updates occur, the system will determine which measures are affected and permit the administrator to notify the appropriate parties who have registered for notification when specific measures or measure technology types change. Update notification would be at discretion of administrator.		X		

24	Add ability for the eTRM to generate a flat-file export that is compatible with the CET measure import specification: --The user shall be able to select measures from an available list --The user should be able to filter the measures based on parameters that define permutations (e.g., Delivery type, MAT) eTRM shall be able to import permutation-level cost-effectiveness values from a flat file that is compatible with CET measure results file specifications: --Values will be loaded and stored at the measure permutation level.		X		
25	Develop filters for dashboards that are specific to individual users. The dashboards and filters shall only be viewable by a specific user, as determined by the user's log-in credentials. as specified. Filters include end use, sector, and delivery type.			X	
26	Update the measure data model to include a new field for delivery type, so that it can be filtered on. Delivery type shall be added to the table of measures on the user's dashboard.				
27	Allow an editor to sort Value Tables based upon any column (parameter or value) and save that sort to embed that sort into a characterization field.		X		
28	Implement the ability for an editor to transpose value tables. This applies to both static (RTE) tables and dynamic (embedded) tables. In the case of an embedded value table, this display configuration only applies to the table in the characterization, and does not affect the underlying value table (located in the Supporting Data page of the measure)		X		

29	Design new table styles (to be added to existing "Zebra" and "Plain" table style options). One example new style is a table with smaller font and narrower column widths. Enable measure editors to set a table style to both static (RTE) and dynamic (embedded) tables.		X		
30	Implement functions that assign a reference to a value table row.		X		
31	Add ability for users to hide columns and rearrange columns based on individual session needs.			X	
32	Allow users to save their permutation table preferences for next time (including sorting, filtering, hiding columns, etc.)			X	
33	Add capability to show calculated values in value tables		X		
34	Support the Boolean type, with TRUE and FALSE displayed/imported/exported instead of 0 and 1.		X		
35	Implement enhancement to the equation editing interface to allow editors to type directly into the editing bar (including autocomplete suggestions) without having to click (+) to see the list of terms to choose from.			X	
36	When viewing calculations, implement a way to provide insight as to the source of a calculation's variable – which could be a value table, parameter or another calculation – and a link to travel to the object detail page.			X	
37	Add capability to have global or imported calculations. Global calculations are calculations that are used in more than one measure.			X	

38	In the configure permutation fields panel, fields that are not mapped will be color-coded so that they are easier to see and correct.			X	
39	Pre-map values from shared parameters/shared value tables to data spec field.			X	
40	Add capability for users to filter and sort permutation table. When filtered, system would automatically hide the rows that are no longer unique due to missing columns			X	
41	Include ability to hide columns of the permutation table that user may consider unnecessary. Column-hiding functionality should also hide duplicate rows if columns being hidden were distinguishing columns to unique permutations			X	
42	In the exclusion table, implement a visual design for exclusion table rows that are NOT excluded (e.g. unchecked), so that they are easier for editors to scan in the table.			X	
43	Implement feature that allows range-checking on value tables. An editor would be able to specify a maximum value, minimum value, allowable data type (such as text or number only) and/or "cannot be empty" validation on a value table column. Value table cells that do not meet the validation criteria would be flagged to the measure developer or measure reviewer. --Prior to implementing this feature, ensure that error-checking features to be developed for eTRM are consistent with and at least as robust as the error-checking features for CET and CEDARs. --Note: This does not apply to static (RTE) tables.			X	

44	Implement text comparison and redlining feature for all measure text fields so textual differences between different versions of a measure are readily apparent. This feature shall allow an editor to compare two versions of a measure, selected by the editor, marked up with differences.		X		
45	Once necessary license with the WebSpellChecker CKeditor plugin is obtained, ensure it is used as the spell checking source for all rich text fields in the eTRM.		X		
46	Redesign the reference file download green rectangle element to reduce its footprint for an individual reference and when seen in a long list of references.		X		
47	Explore adding a drag-to-resize image capability to measure characterization rich text fields. If that solution is not recommended or stable, add up to two new image styles. One desired new style is a small stamp-size image style.		X		
48	Add the ability for a reference to be associated with a measure, value table, parameter or calculation by a specific page or table number. This eliminates the need to duplicate references in the reference library.		X		
49	Add a field to the reference data model for Publication Date. Add a filter to the manage references list that allows filtering by publication date.		X		
50	Add "Year" field to search matrix for reference search		X		
51	References that have file attachments will display an attachment icon in the manage references list. Implement the ability to filter the manage references list by "has attachment".		X		

52	Implement a list of common reference sponsor organizations. When adding or editing a reference, a user can select a sponsor organization from the list or add their own.			X	
53	Add an API endpoint that provides a master list of value tables across latest published versions of all measures and including the shared data library.		X		
54	Add an API endpoint that provides a master list of permutations across latest published versions of all measures.		X		
55	Add an API endpoint that provides a master list of all references. The list can be filtered by reference type.		X		
56	Include "at a glance" capability for viewing tables without clicking into them (using mouse-over or hover-enabled popup).			X	
57	Design and implement a pagination selector to all paginated eTRM lists (except panel lists), offering pagination by 25, 50, 100 objects.			X	
58	Design and implement a new reference detail page. --This reference detail would be viewable through site search, including the ability to include/exclude reference results from the search results list. All references shall be accessible through site search.		X		
59	Design and implement a new calculation detail page. Implement the addition of shared value tables, shared parameters and shared calculations being accessible through site search.			X	

60	Modify home page to allow view access without login. Such anonymous access would deny user features such as subscriptions, saved preferences, etc., that rely on a registrant's email address.			X	
61	Add new fields to the "Configure permutation fields" panel, "Data spec" tab.		X		
62	Add an affordance to download the measure characterization PDF separately from the full measure download packet. Only the PDF would be contained in the download.		X		
63	Allow ability to perform 8,760-hour array calculations (for example, developing annual carbon impact using hourly values that can be summed over full year), as well as over measure lifetime.			X	
64	Add measure name and version number to the characterization PDF file name.		X		
65	Revisit enhancements to the measure characterization PDF, ensuring: --Logical page breaks, where possible (not splitting up object/table names from its host object/table, etc.) -- Maintain proportionality and consistency in text style levels (headings) and sizes (esp. static vs. dynamic table headings) --Floated elements retain their size, instead of erroneously expanding to full width in the PDF --All symbols in the measure characterization text and calculations will render correctly in the PDF		X		
66	Update parameter .csv files to identify which values from shared parameters are selected for measure.			X	

67	Add ≥ and ≤ to the list of available symbols in the rich text editor toolbar.		X		
68	Applies to site search, measure list, manage measure list. Ensure the statewide measure ID is always displayed next to the measure name when viewing a list of measures.		X		
69	Allow ability to calculate Greenhouse Gas impacts using 8,760-hour GHG lookup data and 8,760-hour measure energy savings.			X	
70	Reconsider all places where an API name is presented to the user and consider the use of a friendly name instead. If we pursue a friendly name, effort includes: --Ability for users to manage the friendly name --Effort to migrate existing measures to use their friendly name, eliminating the need for CalTF to update all measures		X		
71	Provide necessary enhancements to fulfil the CPUC's updated eTRM Workpaper workflow process once it is complete (develop workpaper management backend and front end infrastructure, CPUC user roles, workpaper and parameter-level version control management, integrated communication tools, user interface design, and other requirements as needed).				X
72	Develop infrastructure as needed to ensure CEDARS can eventually use a live eTRM data connected for claims and reporting purposes.				X

73	Provide the framework that would allow the eventual sunsetting of the PEAR/Ex-Ante database, at which point the CPUC user roles may absorb all administrative permissions				X
74	Develop unanticipated enhancements that the CPUC determines essential within Phase 2 but did not foresee during the publication of this appendix				X
75	Creation of workpaper space for PAs to submit "Workpaper in Development" with ability for CPUC to provide early feedback on workpapers prior to submittal.				X
76	Add ability for the eTRM to generate a workpaper revision history by parameter				X
77	Create a dedicated schema on the server where views for all of the shared tables that will be read by CEDARS can be created, stored and modified. Provide assistance on how to make the 21 existing views work with the JSON tables, which includes the two new tables for 'source_status' and 'Measure'.		X		
78	Creation of a CPUC-specific shared data library for DEER measures. This shared data library would support versioned parameters and value tables managed by CPUC and available for eTRM measures to import.	X			
79	Ability for PAs to assign their measure/solution codes to eTRM measures and permutations		X		

10. Appendix 2 –Standard for Deemed Data Source of Record

Table A-4 lists the fields that the CPUC requires in order for the eTRM to meet the Phase 1 data source of record standard. This table identifies each ex ante database field name and the corresponding eTRM field name. As the CPUC will provide daily database views of all approved and up-to-date data, Table A-4 also indicates which fields the eTRM must synchronize using these views on a daily basis to remain in compliance as the official data source of record.

Table A-4. eTRM data fields required to meet Phase 1 standard

Field Description	PEAR/Ex Ante Fieldname(s)	eTRM Fieldname, if available	Status	Requires Daily Synchronization
Measure description	Description	OfferingDesc	Meets Standard	
DEER/Workpaper version	Version	Version	Meets Standard	TRUE
First-baseline case description	PreDesc	Existing Description	Meets Standard	
Second-baseline case description	StdDesc	Standard Description	Meets Standard	
Measure case description	MeasDesc	MeasureCase	Meets Standard	
Sector	Sector	Sector	Meets Standard	TRUE
Technology Group	TechGroup	TechGroup	Meets Standard	TRUE
Technology Type	TechType	TechType	Meets Standard	TRUE

Field Description	PEAR/Ex Ante Fieldname(s)	eTRM Fieldname, if available	Status	Requires Daily Synchronization
End-use category	UseCategory	UseCategory	Meets Standard	TRUE
End-use sub-category	UseSubCategory	UseSubCategory	Meets Standard	TRUE
Effective useful life ID	EUL_ID	EUL_ID	Meets Standard	TRUE
Effective useful life, years	EUL_Yrs	EUL (YR)	Meets Standard	
Remaining useful life ID	RUL_ID	RUL_ID	Meets Standard	
Gross savings & installation adjustment factor	GSIA_ID	GSIA_ID	Meets Standard	TRUE
Net-to-gross ID	NTG_ID	NTG_ID	Meets Standard	TRUE
Measure Impact Type (MIT)	MeasImpactType	MeasImpactType	Meets Standard	TRUE
Start date of measure, etc.	StartDate	Spec_Measure.EffStartDate	Meets Standard	
Expiration date of measure, etc.	ExpiryDate	Spec_Measure.Sunset Date	Meets Standard	

Field Description	PEAR/Ex Ante Fieldname(s)	eTRM Fieldname, if available	Status	Requires Daily Synchronization
Energy impact ID	EnergyImpactID	EnergyImpactID	Meets Standard	
Flag for interactive effects	ApplyIE	IE_Applicable	Meets Standard	
Interactive effects table	IETableName	IETableName	Meets Standard	
Energy Impact Calculation Type	EnImpCalcType	MeasImpactCalcType	Meets Standard	TRUE
First baseline kW savings	APreWBkW APreEUkW	UnitkW1stBaseline	Meets Standard	
First baseline kWh savings	APreWBkWh APreEUkWh	UnitkWh1stBaseline	Meets Standard	
First baseline therm savings	APreWBtherm APreEUtherm	Unittherm1stBaseline	Meets Standard	
Second baseline kW savings	AStdWBkW AStdEUkW	UnitkW2ndbaseline	Meets Standard	
Second baseline kWh savings	AStdWBkWh AStdEUkWh	UnitkWh2ndbaseline	Meets Standard	
Second baseline therm savings	AStdWBtherm AStdEUtherm	Unittherm2ndbaseline	Meets Standard	
HVAC system type	BldgHVAC	BldgHVAC	Meets Standard	TRUE

Field Description	PEAR/Ex Ante Fieldname(s)	eTRM Fieldname, if available	Status	Requires Daily Synchronization
Climate zone	BldgLoc	BldgLoc	Meets Standard	TRUE
Measure Impact Calculation Type for DEER measures	MeasImpactCalc Type	MeasureImpact CalculationType	Meets Standard	TRUE
Building type	BldgType	BldgType	Meets Standard	TRUE
Building vintage bin	BldgVint	BldgVint	Meets Standard	TRUE
Delivery method of measure	DeliveryType	Delivtype	Meets Standard	TRUE
Electric impact profile ID	ElecImpactProfileID	ElecImpactProfileID	Meets Standard	
Gas impact profile ID	GasImpactProfile ID	GasImpactProfileID	Meets Standard	
Description	Description	MeasureCase	Meets Standard	
Measure application type (MAT)	MeasAppType	MeasAppType	Meets Standard	TRUE
Measure Impact Type (MIT)	MeasImpactType	MeasImpactType	Meets Standard	TRUE

Field Description	PEAR/Ex Ante Fieldname(s)	eTRM Fieldname, if available	Status	Requires Daily Synchronization
Normalizing unit	NormUnit	NormUnit	Meets Standard	
Program administrator	PA	PA Type	Meets Standard	

Table A-5 provides the fields that the CPUC requires for the eTRM to meet the Phase 2 data source of record standard. Because Phase 1 is designed to meet public user requirements and Phase 2 is designed to meet CPUC user requirements, the fields indicated in this table will support the ex ante workpaper review team and impact evaluation teams.

Table A-5. eTRM data fields required to meet Phase 2 standard

Field Description	PEAR/ExAnte Fieldname(s)	Requires Daily Synchronization
DEER Measure ID	MeasureID	TRUE
HVAC system type description	BldgHVACDesc	
Climate zone description	BldgLocDesc	
Building type description	BldgTypeDesc	
Building vintage bin description	BldgVintDesc	
Coincident demand factor	CDF	
Flag for values available for claims reporting	ClaimSpec	TRUE
Date record created	Created	

Field Description	PEAR/ExAnte Fieldname(s)	Requires Daily Synchronization
Record creator	CreatedBy	
Record documentation source	CreatedCitation	
Default equivalent full-load hours	defEFLH	
EUL category	defEULCode	
Delivery type description	DeliveryTypeDesc	
NTG ID description	Desc	
Energy Impact Profile	EnergyImpactProfile	
Interactive effects factor for kW savings	IE_kW	
Interactive effects factor for kWh savings	IE_kWh	
Interactive effects factor for therm savings	IE_therm	
Flag for values available for percent filing	FilingSpec	TRUE
Notice of planned studies	FutureComment	
Gas impact profile	GasImpactProfile	
Gross savings & installation adjustment type	GSIAType	
Gross savings & installation adjustment type description	GSIATypeDesc	
Gross savings & installation adjustment factor	GSIAValue	
Hours of use	HOU	
Hours of use categories	HOU_cat	
Flag indicating DEER building type	IsDEERBldg	
Proposed content flag (not yet approved)	IsProposed	

Field Description	PEAR/ExAnte Fieldname(s)	Requires Daily Synchronization
Date of last modification to record	LastMod	
Party last modified record	LastModBy	
Supporting documentation for last modification to record	LastModCitation	
Comment regarding last modification to record	LastModComment	
Lighting category	LightingType	
Measure Application type (MAT) description	MeasAppTypeDesc	
Measure impact calculation Type description for DEER measures	MeasImpactCalcDesc	TRUE
Measure technology ID	MeasTechID	
Normalizing unit description	NormUnitDesc	
NTG ratio for electric savings	NTG_Elec	TRUE
NTG ratio for gas savings	NTG_Gas	TRUE
Flag for building type parent	ParentType	
First-baseline technology ID	PreTechID	
Workpaper revision number	revision	
Remaining useful life value, years	RUL_Yrs	TRUE
Sector description	SectorDesc	
Second-baseline technology ID	StdTechID	
End-use sub-category	SubUseCategory	TRUE
Technology group description	TechGroupDesc	

Field Description	PEAR/ExAnte Fieldname(s)	Requires Daily Synchronization
Technology type description	TechTypeDesc	
Technology type ID	TechTypeID	TRUE
Technology type name	TechTypeName	
End-use category description	UseCategoryDesc	
End-use sub-category description	UseSubCategoryDesc	

Table A-6 lists fields that the CPUC is still considering for Phase 2. These fields are legacy fields within the current PEAR/ExAnte database framework and the CPUC will work with stakeholders to determine whether they are relevant and required within Phase 2.

Table A-6. eTRM data fields under consideration for Phase 2 standard

Field Description	PEAR/ExAnte Fieldname(s)
Activity area flag	IsActivityArea
Assumed floor area of whole-building savings	MeasArea
Basis for scale	ScaleBasis
E3 climate zone	E3ClimateZone
E3 electric impact profile	E3ElecImpactProfile
E3 gas impact profile	E3GasImpactProfile
E3 target sector	E3TargetSector
Equivalent full-load hours	EFLH
EUL Basis Type	BasisType
EUL Basis Value	BasisValue
EUL Degradation Factor	BasisDegFactor

Field Description	PEAR/ExAnte Fieldname(s)
First-baseline multi-technology	PreMultiTech
First-baseline scale value	PreScaleVal
Flag for required parameter	Required
Flag for technology-based measure	TechBased
Impacts scale basis type	ImpScaleBasis
Impacts weighting type	ImpWeighting
Index for table records	Index
Maximum EUL for lighting	EUL_Max_Yrs
Maximum parameter value	ValMax
Measure option	MeasOption
Measure qualifier category	MeasQualifier
Measure qualifier category description	MeasQualifierDesc
Measure qualifier group	MeasQualifierGroup
Measure type	MeasType
Minimum parameter value	ValMin
Number of units assumed for whole-building savings	NumUnit
PA description	PADesc
PA name	Name
Parameter definition	List
Parameter definition label	Tag
Parameter ID for Technology ID	ParamID
Parameter order for Technology ID	ParamOrd
Parameter rule value	RuleValue
Parameter value for Technology ID	ParamVal

Field Description	PEAR/ExAnte Fieldname(s)
Second-baseline multi-technology	StdMultiTech
Second-baseline scale value	StdScaleVal
Technology type ID	TypeID
Type of parameter value	ValueType
Version code	Code
Version source	VersionSource
Version source description	VersionSourceDesc
Weight group ID	WeightGroupID
Workpaper ID and revision number	SourceDesc
Workpaper ID	workpaper_id
Workpaper title	title