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Gavin Newsom, Governor

Date: March 30, 2021

To: Energy Efficiency Proceeding Service List R.13-11-005

From: Energy Efficiency Branch, California Public Utilities Commission

CC: ALJ Julie Fitch; ALJ Valerie Kao; Pete Skala; Jennifer Kalafut; Paula Gruendling; Peter Biermayer

Subject: **Solicitation for Comments on Scope of Update for Database of Energy Efficiency Resources for program year 2023 (DEER2023) and error corrections for program years 2021 and 2022**

California Public Utilities Commission (CPUC) Staff invite comments on this proposed scope to update the Database of Energy Efficiency Resources for program year 2023 (DEER2023) to be scheduled for adoption by a Resolution in Q3 2021.[1] Our scoping effort started with informal feedback from and discussions with the CPUC energy efficiency (EE) Program Administrators (PAs). We also considered current market conditions, conventional DEER update sources such as evaluation results and research studies, and analysis of energy efficiency (EE) regulatory oversight operational needs. This effort targets updates needed for program year 2023, but due to evolving regulatory requirements, some error corrections and clarifications are also needed for the previous 2022 and 2021 DEER updates.

In addition to the business-as-usual annual DEER update, the scope considers the convergence of significant changes that offer a unique opportunity to take a fresh look at options for improving the overall "DEER-workpaper ecosystem." Significant developments include the shift from utility-specific to statewide workpapers, development of the electronic technical reference manual (eTRM), changes to the fuel substitution test, and upcoming needs for programs designed by non-utility, third-party implementers. The dynamic and evolving California energy environment also requires anticipating and preparing for future needs such as building decarbonization and potential integration of energy efficiency (EE) and the integrated resources planning (IRP) process.[2] To proactively address issues that will likely impact future DEER updates, we briefly discuss some of the most pressing issues in this memo. Commission staff will take further action on these items based on stakeholder comments and feedback.

1 See D15-10-028, OP 17, http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M155/K511/155511942.pdf.
2 *Staff Proposal for Incorporating Energy Efficiency into the SB 350 Integrated Resource Planning Process (EE-IRP),* https://pda.energydataweb.com/#!/documents/2083/view.

1 DEER Update Schedule, Topic Areas, and Submitting Comments

Comments on this scoping memo are due April 15, 2021. Table 1-1 presents the proposed timeline for this year's DEER update cycle.

Table 1-1. DEER update timeline

Schedule	Activities
03/31/2021	DEER scoping memo notice
04/15/2021	Scoping memo comments due
06/23/2020	Expected draft resolution & webinar notice release
TBD	Public webinar
07/06/2021	Party comments due (20 days after draft Resolution release)
08/19/2021	Expected commission voting meeting

CPUC Staff identified many topic areas in need of an update. A summary of the update topic areas and items within each topic area are provided in Table 1-2 with details presented in Attachment A. Table 1-2 also includes our assessment of the priority and level of effort needed to accomplish each item. The final list of updates to be implemented for the DEER2023 Update will be based on Commission priorities and resources, time available to meet the DEER update Bus Stop,[3] and stakeholder comments. What cannot be accomplished for the 2021 Bus Stop can be considered for the next DEER update cycle, or raised elsewhere via an appropriate procedural vehicle, such as a proceeding. The updates fall into nine topic areas and most are consistent with past updates. Finally, CPUC staff plans to continue activities for transitioning development and storage of deemed values into the eTRM environment in 2021. The topic areas addressed in this memo are categorized under:

1. DEER methodology updates
2. DEER error corrections
3. Review of energy efficiency evaluation, measurement, and verification (EM&V) studies
4. Review of codes and standards
5. Review of market and research studies
6. New measure additions
7. Support table updates
8. eTRM as ex ante database of record
9. Considerations for future DEER update cycles

[3] DEER Resolution is to be adopted by September 1 of each year.

CPUC Staff is seeking input for the following questions:

- Do you agree with the DEER2023 update priorities listed in Table 1-2?
- Are there additional topic areas and/or issues that should be prioritized for the current update cycle to meet 2023 program needs or correct previous errors?
- For the topic areas listed in Table 1-2 and Attachment A, what resources or methods should we consider? Please support recommendations with publicly vetted data and studies.

Please post comments to http://www.energydataweb.com/cpuc/search.aspx after searching for "DEER Scoping Memo for PY2023 (DEER2023)" in the "Search Text" field.

Contact Peter Biermayer at Peter.Biermayer@cpuc.ca.gov with any questions or clarifications.

Table 1-2. Draft DEER2023 update priorities

Priority	Effort	DEER Version	Update Topic Area	Sector		Measure/Use Group					Forecasted Value				
				Res	Non-Res	Lighting	HVAC	DHW	Envelope	Plug/Process	UES	NTG	EUL	Measure Cost	Other
DEER methodology updates															
!!!!	$$$$	2023	Deemed building energy modeling prototype updates	X	X	X	X	X	X	X					X
!!!!	$$$	2023	Peak demand period definition update	X	X	X	X	X	X	X	X				
!!!!	$$$	2023	Update simulation weather files to CZ2022	X	X	X	X	X	X		X				
!!!!	$$	2023	Modifications to allow new load shape sources	X	X	X	X	X	X	X					X
!!!	$	2023	Measure cost methodology and documentation guidance	X	X	X	X	X	X	X				X	
!!!	$	2022	New DEER measure fields for added load	X	X		X	X			X				
!!!	$	2022	Refrigerant avoided costs	X	X		X	X							X
!!	$	2023	Clarify the add-on equipment approach to EUL	X	X		X	X					X		
!!	$	2023	Clarify the approach to the DEER GSIA table updates	X	X		X	X					X		
!	$	2021	Custom must use deemed values for deemed measures		X	X	X	X	X	X	X			X	
DEER error corrections and clarifications															
!!!	$$	2021	DEER water heater calculator corrections for commercial building type		X			X			X				
!!!	$$	2021	Commercial water heater savings		X			X			X				
!!!	$	2023	Water-cooled chiller measure tier definitions		X		X				X				
!!!	$	2020	Residential duct sealing measure missing some energy impacts	X			X				X				
!!!	$	2021	Residential duct sealing measures normalizing unit modification	X			X				X				
!!!	$	2021	Residential duct sealing GSIA values expiration	X				X							X
!!!	$	2021	Refrigerator/freezer measures normalizing unit modification	X	X					X	X				
!!!	$	2020	Fuel substitution default NTG applicability clarification	X	X		X	X				X			
!!	$$	2023	Align residential clothes washer measures with ENERGY STAR® tiers	X						X	X				
!!	$$	2023	Align residential dishwasher measures with ENERGY STAR® tiers	X						X	X				
!!	$$	2023	Whole-house fan measure updates	X			X				X				
!!	$$	n/a	LED commercial lighting measure clarification		X	X									
Review of EM&V studies															
!!!!	$	2023	Summary	X	X	X	X	X	X	X	X	X	X	X	X
!!!	$$$	2022-23	Residential sector 2019 EM&V reports	X			X	X		X	X	X			
!!!	$$	2023	Nonresidential lighting 2019 EM&V reports		X	X					X	X		X	

Priority	Effort	DEER Version	Update Topic Area	Sector		Measure/Use Group					Forecasted Value				
				Res	Non-Res	Lighting	HVAC	DHW	Envelope	Plug/Process	UES	NTG	EUL	Measure Cost	Other
!!	$$$	2023	HVAC sector 2019 EM&V report	X	X		X				X	X			
!!	$$	2023	Small/medium commercial EM&V		X			X		X	X	X			
Review of codes & standards															
!!!!	$$	2023	Federal standards for commercial natural gas packaged boilers	X	X		X				X				
!!!	$$$	2023	CEC Title 24 building efficiency updates	X	X		X				X				
!!!	$	n/a	CEC Title 20 appliance efficiency updates	X	X										
!!	$	2022	New low-GWP refrigerant standards	X	X		X	X			X				
Review of market and research studies															
!!!	$$	2023	Upcoming studies	X	X		X		X		X	X			
!!!	$$	2023	Update EULs based on Group A EUL study	X	X								X		
!!!	$$	2023	Review Group E market studies	X	X		X			X	X				
!!!	$$	2023	Review IOU emerging tech studies	X	X										
New measure additions															
!!	$$	2023	Multifamily central water heating systems	X	X			X			X				
Support table updates															
!!	$	2022	New BldgType, EUL, MeasImpactType, and TechType values	X	X			X	X	X			X		X
eTRM as ex ante database of record															
!!!!	$$$$	2023	Further clarification of eTRM Transition Plan, Phases 2 and 3	X	X	X	X	X	X	X	X	X	X	X	X

!!!! indicates highest priority items and **!** indicates lowest priority

$$$$ indicates highest cost items and $ indicates lowest cost

2 Considerations for Future DEER Update Cycles

Table 2-1 provides a list of items staff has identified that could be considered in future DEER updates. If any of the items in Table 2-1 are determined to be a priority for stakeholders, then we will assess them for inclusion in a future update cycle, but they are currently not scoped or budgeted as DEER update activities. Further descriptions of these issues are provided in Section 9 of the Attachment. Commission staff will consider taking further action on these items based on stakeholder comments and feedback.

Table 2-1. Draft DEER future updates

Effort	Update Topic Area	Sector		Measure/Use Group					Forecasted Value				
		Res	Non-Res	Lighting	HVAC	DHW	Envelope	Plug/Process	UES	NTG	EUL	Measure Cost	Other
DEER methodology updates													
$$$$	EnergyPlus prototypes	X	X	X	X	X	X	X	X				X
$$$	Future peak demand period definition update	X	X	X	X	X	X	X	X				X
$$$	CEC CEUS baseline study update delayed		X	X	X	X	X	X	X	X	X	X	X
$	Claims reporting errors due to baseline-specific fieldnames	X	X	X	X	X	X	X	X				
$	Custom Projects Guidance: improve usability of DEER NTG table	X	X	X	X	X	X	X		X			
$	Upcoming studies	X	X		X		X		X				

$$$$ indicates highest cost items and $ indicates lowest cost

3 Glossary of Terms[4]

A glossary of the terms used in Attachment A is provided for reference.

Deemed measure	Also referred to as a prescriptive energy-efficiency measure and is generally used for mass-market technologies. Measure values are predefined and/or stipulated for a group (market, segment, customer, etc.) rather than using site-specific parameters. Values that are stipulated and/or pre-defined include baseline assumptions and eligibility, savings values and/or calculation approach used for savings, operating hours, measure costs, installation rates, delivery approach, and other key measure attributes like net-to-gross (NTG) and effective useful life (EUL).
Database for Energy Efficient Resources (DEER)	The DEER provides energy savings estimates for typical energy efficient technologies and measures claimed through energy efficiency programs regulated by the California Public Utilities Commission. The database contains information and data, such as unit energy savings, effective useful life values, and net to gross ratios for measures that are commonly installed. DEER is currently managed by the Energy Division, with funding provided by California ratepayers.
Workpaper	Technical engineering documents that prescribe pre-determined values for energy savings, measure costs, and other forecasted values.
Workpaper disposition	The final result of the workpaper review process that labels the workpaper as "approved" or "rejected."
EnergyPlus™	EnergyPlus™ (Energy+) is a building simulation program from the Department of Energy (DOE) that can be used to model building energy use. It is intended primarily to simulate weather-sensitive loads such as space heating, space cooling, ventilation, and associated auxiliary equipment (e.g., pumps, cooling towers) loads. It can also be used to simulate other end-uses.

[4] Some definitions are original but were derived from the *Energy Efficiency Policy Manual* and *PG&E Resource Savings Rulebook* whenever possible.

DEER data tables	Four tables in the DEER that contain the measure definition information, the energy impact and savings data, the measure cost data, and the implementation approach data (e.g., measure application type, delivery channel, etc.). Note: the implementation tables in DEER are currently inactive and not viewable and have not been updated in recent DEER versions.
Workpaper Ex Ante Data (EAD) tables	Similar in format to the DEER data tables, these are four worksheets in an Excel workbook that are used to provide the data used to claim a measure. The information is the same as for the four DEER data tables and includes the measure definition information, the energy impact and savings data, the measure cost data, and the implementation approach data (e.g., measure application type, delivery channel, etc.).
DEER support tables	Forty-two tables in DEER that provide the allowed values for supporting measure parameters such as climate zone, building vintage, building type, effective useful life, NTG ratio, delivery type, and measure application type. Twenty-two of these tables are shared with California Energy Data and Reporting System (CEDARS) for verification purposes.
Measure application type (MAT)	"A categorization of energy efficiency measures based on measure attributes–each measure application type has its own baseline treatment, cost basis, eligibility, and documentation requirements. There are six approved measure application types, which include: Accelerated Replacement, Add-On Equipment, Behavioral, Retrocommissioning and Operational, New Construction/New Capacity, Normal Replacement, and Building Weatherization. Each of these measure application types is further defined below." A major change to MAT types was made in Resolution E-4818 then restated and clarified in the E-4952 resolution for the DEER2020 Update.
Effective useful life (EUL)	An estimate of the median number of years that energy-efficiency measures installed under a program are still in place and operable.

electronic Technical Reference Manual (eTRM)	A technical reference manual (TRM) is a document containing a description, savings methodology and related characteristics for each deemed measure that can be claimed through energy efficiency program(s). The CPUC is in the process of adopting an electronic TRM in database format with a web interface that provides information and data, such as unit energy savings, effective useful life values, and net to gross ratios for measures that are commonly installed through IOU-funded energy efficiency programs in California.
Incremental measure cost (IMC)	The difference between the cost of existing or baseline equipment or service and the cost of alternative energy-efficient equipment or service.
Net-to-gross ratio (NTGR)	A ratio or percentage of net program impacts divided by gross or total impacts. NTGRs are used to estimate the net savings by excluding those savings attributable to the free ridership that may be occurring among energy efficiency program participants.
Unit energy savings (UES)	The energy *or demand* savings (kWh, kW, or therm) associated with a single unit of a given energy-efficiency measure.

Attachment A
DEER2023 Update Summary

Contents

List of Tables

1 Introduction and background

Decision D.15-10-028, Ordering Paragraph 17 established the general approach to be used for the annual Database for Energy Efficiency Resources (DEER) update: "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." The updates are grouped into these nine topic areas:

1. DEER methodology updates
2. DEER error corrections and clarifications
3. Review of energy efficiency evaluation, measurement, and verification (EM&V) studies
4. Review of codes and standards changes
5. Review of market and research studies
6. New measure additions
7. Support table updates
8. Transition to eTRM
9. Considerations for future DEER update cycles

2 DEER methodology updates

DEER methodology updates affect the methods and approaches used to generate measures savings and support table values. Examples include changes that would alter the database structure, building prototype models, or the use of DEER database measures in workpapers.

2.1 Deemed building energy modeling prototype updates

Effective Program Year: 2023 and 2024. There are three sets of deemed building energy modeling (BEM) prototypes to update: residential, commercial, and refrigeration sector models. In order to avoid a massive amount of workpaper updates at one time and to make the most effective use of the California Energy Commission's (CEC) two statewide appliance and end use baseline studies—RASS and CEUS[1]—we will stage the prototype updates over two program years, PY2023 and PY2024. With the completion of the RASS at the end of 2020, validation of and updates to the current residential prototypes and associated measures are underway, and we intend to complete those in time for PY2023 workpaper updates.

For commercial measures, we will delay the prototype updates so we can wait for the CEUS survey results expected mid-2022. In addition to CEUS updates we will update the prototypes to correct any prototype or measure modeling issues from EM&V or other studies and incorporate new measures. We will identify the highest-impact simulated measures for the portfolio and focus on updating the

[1] RASS is the Residential Appliance Saturation Study (https://www.energy.ca.gov/data-reports/surveys/2019-residental-appliance-saturation-study) and CEUS is the Commercial End-Use Survey (https://www.energy.ca.gov/data-reports/surveys/california-commercial-end-use-survey).

simulations for those measures for PY2023. Those simulated measures with a lower impact on portfolio savings will be updated next to be available for the PY2024 update. We will prioritize the measure runs for the two years using a complete list of workpapers that use prototype-simulated savings or the models themselves, and an assessment of the portfolio savings contribution for the measures represented by each workpaper.

Era and vintage updates

Effective Program Year: 2023. A major element of the prototype update effort is to reduce the number of vintages and eras currently used by the deemed prototype BEM system. The current vintages and eras (groups of vintages) defined in Resolution E-4952[2] are shown in Table A-2-1 and are intended to represent different Title 24 code versions. The primary set of 10 vintages is used for the commercial and the residential single family and multifamily prototype models. The six vintages in the right-hand table are used only for the residential manufactured home prototypes. Also note that the vintages are grouped into four era categories: New, Recent, Existing, and Old. These four categories are the only "vintage" values available for use in savings claims. While all of these vintages make sense for alignment with Title 24 code versions, it adds false precision and unneeded complexity to the analyses. The categories also do not likely capture the true customer population and program participant characteristics.

For those eras with multiple vintages, the differences between the savings results for each vintage can often be very minimal. In addition, the most common era used for deemed savings claims is Existing, followed by Recent, then Old, and finally New.

Table A-2-1. Current residential and commercial vintages and eras

All Buildings (other than mobile homes)	
Era	**Building Vintage (BldgVint)**
Old	1975 (<1978)
	1985 (1978-1992)
	1996 (1993-2001)
Existing (Median Age)	2003 (2002-2005)
	2007 (2006-2009)
	2011 (2010-2013)
	2015 (2014-2016)
Recent	2017 (2017-2019)
New	2020 (≥2020)

Mobile Homes	
Era	**Building Vintage (BldgVint)**
Old	MH72 (MH: <1976)
	MH85 (MH: 1976-1994)
Existing (Median Age)	MH00 (MH: 1995-2005)
	MH06 (MH: 2006-2014)
Recent	MH15 (MH: 2014-2019)
New	2020 (≥2020)

To simplify the current approach, we intend to reduce the list to only four eras and will use only one of the vintage prototypes within each current era to represent that era. We plan to use the following simplification of the eras and vintages, as shown in Table A-2-2.

[2] Resolution E-4952, October 11, 2018. http://www.deeresources.com/files/DEER2020/download/Resolution%20E-4952.PDF

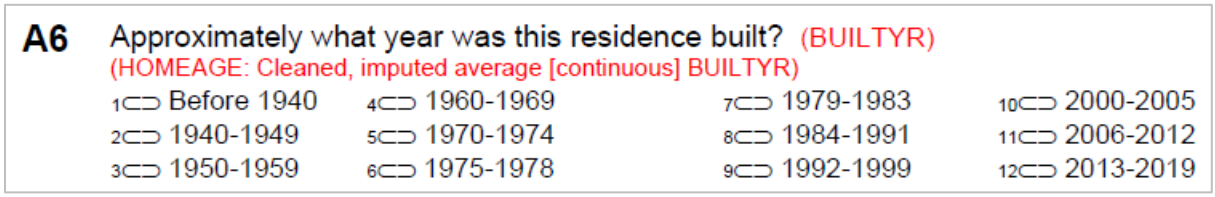
Table A-2-2. Planned residential and commercial vintages and eras

All Buildings (other than mobile homes)	
Era	**Building Vintage (BldgVint)**
Old	1985 (1978-1992)
Existing (Median Age)	2011 (2010-2013)
Recent	2017 (2017-2019)
New	2020 (≥2020)

Mobile Homes	
Era	**Building Vintage (BldgVint)**
Old	MH85 (MH: 1976-1994)
Existing (Median Age)	MH06 (MH: 2006-2014)
Recent	MH15 (MH: 2014-2019)
New	2020 (≥2020)

The RASS building age categories are provided in Figure A-2-1. We will use the RASS data to look at the age distribution of the three residential home types and use this information to either validate or revise the residential era-vintage assignments.

Figure A-2-1. 2019 RASS survey building age categories



RASS-informed residential prototype updates

Effective Program Year: 2023. The recently completed (but not yet approved by CEC) 2019 RASS study will be reviewed and used to validate and update the deemed residential prototypes. A top-down approach will be used first to compare RASS whole-building and HVAC end-use annual unit energy consumption (UEC) values to the equivalent prototype simulation results. Comparisons will be made at the building type, HVAC system type, vintage or era, and Title 24 climate-zone (CZ) level. Building characteristics such as floor area and number of floors will also need to be considered for this comparison. Because the RASS sample design was based on CEC forecast climate zones, RASS results from the reports cannot be used directly and instead additional analysis of the data will be required. Because RASS used the new CZ2022 weather files, the residential prototypes will need to also be rerun first with the new weather files. If the top-down comparison shows significant discrepancies, those will be documented, and the prototypes adjusted to better reflect the RASS UECs. Any adjustments and the reasons for making those adjustments will also be documented. An attempt will also be made to use the end-use survey information and end-use UECs for additional prototype or deemed measures adjustments. We will also look at the RASS HVAC system types to determine if additional HVAC system types should be added. Any updates to the models—including rerunning with new CZ2022 weather data—will be completed in time to be used for PY2023 workpaper updates.

Refrigeration model prototypes update

Effective Program Year: 2023. The Program Administrators (PAs) previously recommended an update of the two deemed (DEER) refrigeration prototypes: grocery (Gro) and refrigerated warehouse (WRf).

For these measures, the refrigeration system prototypes are modeled in the refrigeration-specific DOE-2.2R tool. The grocery prototype was updated by Southern California Edison (SCE) and is vetted and incorporated into approved workpapers. The PA updates include using compressor performance curves to reflect the use of newer refrigerants, and updates for stand-alone refrigerated cases and walk-ins. We approve of those updates to the grocery prototype and will use it to update the MasControl3 tools on the DEER website.

An overall refresh of the refrigerated warehouse model should wait for better market characterization information, such as might be available from the CEC CEUS study to be completed in 2022, and also more resolution of the need to modify deemed measures to account for low-GWP refrigerants.

2.2 Peak demand period definition update

Effective Program Year: 2023. We must update the peak demand period dates to align with the new building simulation weather files, so the peak kW consumption is accurately calculated. The current approach to develop peak demand periods is as follows: Electric peak demand impacts for energy efficiency measures are represented by the average kWh reduction over a 15-hour window. The 15-hour window is from 4 p.m. to 9 p.m. (5 hours) over a three-day "heat wave" that occurs on consecutive days in June through September. The first day of that heat wave is determined for each climate zone and marks the start date for the peak demand period.

The rules used to identify the three-day peak demand periods for the new weather data can be summarized more simply as follows:

- Consistent with Title 24 and also CZ2010, a 2009 calendar year is used to determine which days are weekends and holidays
- The heat wave occurs between June 1 and September 30
- The heat wave occurs on consecutive days and does not include weekdays or holiday,
- The heat wave has the highest index value computed by adding and giving equal weight to each of these values:
    - The peak temperature over the three-day period
    - Average temperature over the three-day period
    - The average temperature from 4 p.m. to 9 p.m. over the three-day period

This general approach is outlined in the previous 2014 weather update document[3] and the CPUC Energy Efficiency Policy Manual,[4] and an update to the peak demand period hours of 4 p.m. to 9 p.m. was specified in the DEER2020 Update.[5]

The peak demand period start-dates determined for the new CZ2022 weather file data are presented in Table A-2-3 along with the previous CZ2010 values.

[3] "DEER2014—Codes and Standards Update for the 2013-14 Cycle," February 11, 2014, http://deeresources.com/files/DEER2013codeUpdate/download/DEER2014UpdateDocumentation_2-12-2014.pdf
[4] CPUC Energy Efficiency Policy Manual, version 6, April 2020, pg. 36.
[5] Resolution E-4952, October 11, 2018. http://www.deeresources.com/files/DEER2020/download/Resolution%20E-4952.PDF

Table A-2-3. Comparison of CZ2010 and CZ2022 peak demand period start-dates

Climate Zone	CZ2010 (Title 24 2013) Weather Files				CZ2022 (Title 24 2022) Weather Files			
	Start Date	Week-day	Temperature (°F)		Start Date	Week-day	Temperature (°F)	
			Maximum Peak	3-day Average			Maximum Peak	3-day Average
CZ01	Sep 16	Wed	81	59.8	Aug 26	Wed	86	60.2
CZ02	Jul 8	Wed	103	75.9	Aug 26	Wed	102	74.7
CZ03	Jul 8	Wed	91	69.2	Aug 26	Wed	87	71.3
CZ04	Sep 1	Tue	99	77.5	Aug 26	Wed	101	80.0
CZ05	Sep 8	Tue	87	64.8	Sep 16	Wed	93	68.3
CZ06	Sep 1	Tue	102	77.1	Sep 2	Wed	85	76.1
CZ07	Sep 1	Tue	90	73.9	Sep 2	Wed	83	74.4
CZ08	Sep 1	Tue	105	79.8	Sep 2	Wed	98	79.7
CZ09	Sep 1	Tue	107	86.6	Sep 1	Tue	100	82.9
CZ10	Sep 1	Tue	109	86.3	Jun 29	Mon	105	85.5
CZ11	Jul 8	Wed	113	88.3	Jun 29	Mon	110	90.2
CZ12	Jul 8	Wed	109	82.4	Jun 29	Mon	107	84.5
CZ13	Jul 8	Wed	108	86.7	Jun 29	Mon	109	90.6
CZ14	Aug 26	Wed	105	86.8	Jun 29	Mon	109	88.9
CZ15	Aug 25	Tue	112	97.5	Jun 29	Mon	120	100.8
CZ16	Jul 8	Wed	90	78.8	Aug 12	Wed	88	77.7

The first thing to notice about the new values is that for about half the climate zones the month of the peak has shifted, but not consistently in one direction. For some climate zones, the peak happens a month sooner but for others it happens a month later. In addition, for some climate zones the CZ2022 peak temperatures are lower than the CZ2010 values, but that may be because the hottest day of the year has shifted outside of the conventional June-September summer period, for example for CZ08 the hottest days of the year for CZ2022 weather data occur in October. For these reasons, we may explore revision to the peak demand period definition for the 2024 DEER update.

For reference, the weather stations used to represent the Title 24 climate zones are provided in Table A-2-4.

Table A-2-4. Weather stations representing Title 24 climate zones

Climate Zone	Weather Station locations	
	Location	Elevation (ft)
CZ01	Arcata	203
CZ02	Santa Rosa	125
CT03	Oakland	6
CZ04	San Jose-Reid	135

Climate Zone	Weather Station locations	
	Location	Elevation (ft)
CZ05	Santa Maria	253
CZ06	Torrance	88
CZ07	San Diego-Lindbergh	13
CZ08	Fullerton	395
CZ09	Burbank-Glendale	741
CZ10	Riverside	840
CZ11	Red Bluff	348
CZ12	Sacramento	16
CZ13	Fresno	335
CZ14	Palmdale	2,523
CZ15	Palm Springs-Intl	475
CZ16	Blue Canyon	5,279

2.3 Update simulation weather files to CZ2022

Effective Program Year: 2023. The last ten years have been observed to be among the hottest on record, and temperatures and the frequency-duration of heat waves are expected to increase. The typical meteorological year (TMY) weather files used for deemed measure building simulations to date, CZ2010, were based on 12 years of National Oceanic Atmospheric Administration (NOAA) data from 1988 through 2009. PG&E launched a project in collaboration with the other IOUs, CEC, CPUC and White Box Technologies to update the typical year weather files used in California and produced a report[6] and presentation[7] documenting the methodology. New weather files (CZ2022) were created using a 20-year period from 1998 through 2017. The California Energy Commission (CEC) will be adopting new time dependent valuation (TDV) costs and the CZ2022 weather data for the 2022 Title 24 update, effective January 1, 2023. To be in alignment with CEC, all simulated and other weather-dependent deemed measures will be updated with the CZ2022 weather data, with updated deemed savings values effective for program year 2023. All other weather-dependent deemed workpaper measures not provided directly by CPUC-maintained tools effective January 1, 2023 and later shall also be updated using the CZ2022 weather files. In addition, all custom projects, normalized metered energy consumption (NMEC) site-specific and program-level projects, will use CZ2022 data for weather normalization of claims effective January 1, 2023. Custom projects may not use CZ2022 files for weather normalization before that date. This change will align DEER with the avoided costs that already use the CZ2022 weather files.

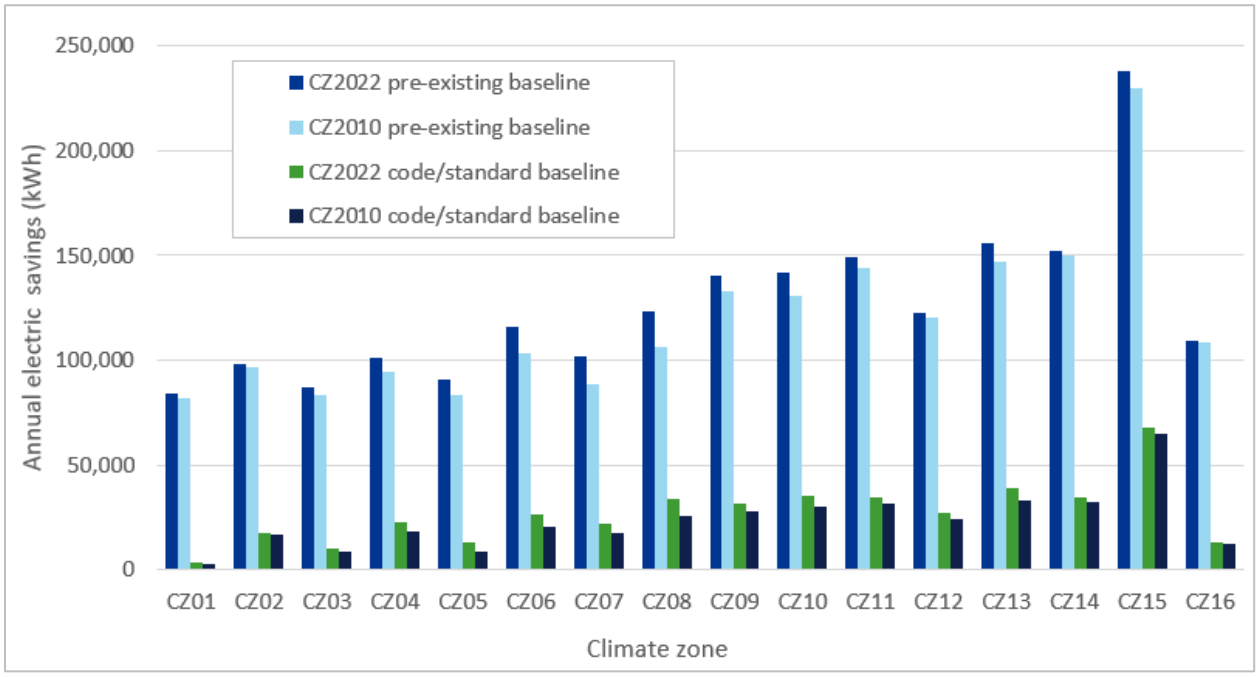
The new weather files are located on the DEER Resources website[8], and should be used by replacing the old (.BIN) weather files with the new (.BIN) weather files in the "DOE2/weather" folder on your computer before running the model. We are also making changes to the existing peak demand period with this weather update; see section 2.2 for updates to the start date for the 3-day "heat wave" used

[6] Update of California weather files for use in utility energy efficiency programs and building energy standard compliance calculations, 2020. https://tinyurl.com/5akf9s2t
[7] https://pda.energydataweb.com/api/view/2280/Weather%20webinar%20CALEE2018%207-12-2019.pptx
[8] http://deeresources.com/index.php/mascontrol3-resources

to calculated peak demand. New post processing scripts will be published on the DEER website that incorporate these new dates. See section 10.2 for possible future "no-peak" period revisions.

Examples of the effect on deemed measure savings estimated by building simulations using the new weather files are shown in Figure A-2-2 for a 12.5 EER[9], 65 kBtu/h non-residential split/package air conditioning unit by California CEC climate zone. Figure A-2-3, shows deemed measure savings for the same system by DEER non-residential building types. The building type descriptions and corresponding abbreviations are shown in Table A-2-5. The figures compare savings using each of the weather files for two measure cases: one using a pre-existing baseline (for accelerated replacements) and the other using the code/standard baseline (for normal replacements and new construction). The figures show that, while some climate zones and some building types show a greater weather impact than others, some of the effects are significant.

Figure A-2-2. Annual savings by climate zone for commercial split/package AC systems[10]



[9] EER is the energy efficiency ratio
[10] Equipment capacity: 65 kBtu/h-134 kBtu/h; efficiency: 12.5 EER

Figure A-2-3. Annual savings by climate zone for commercial split/package AC systems[10]

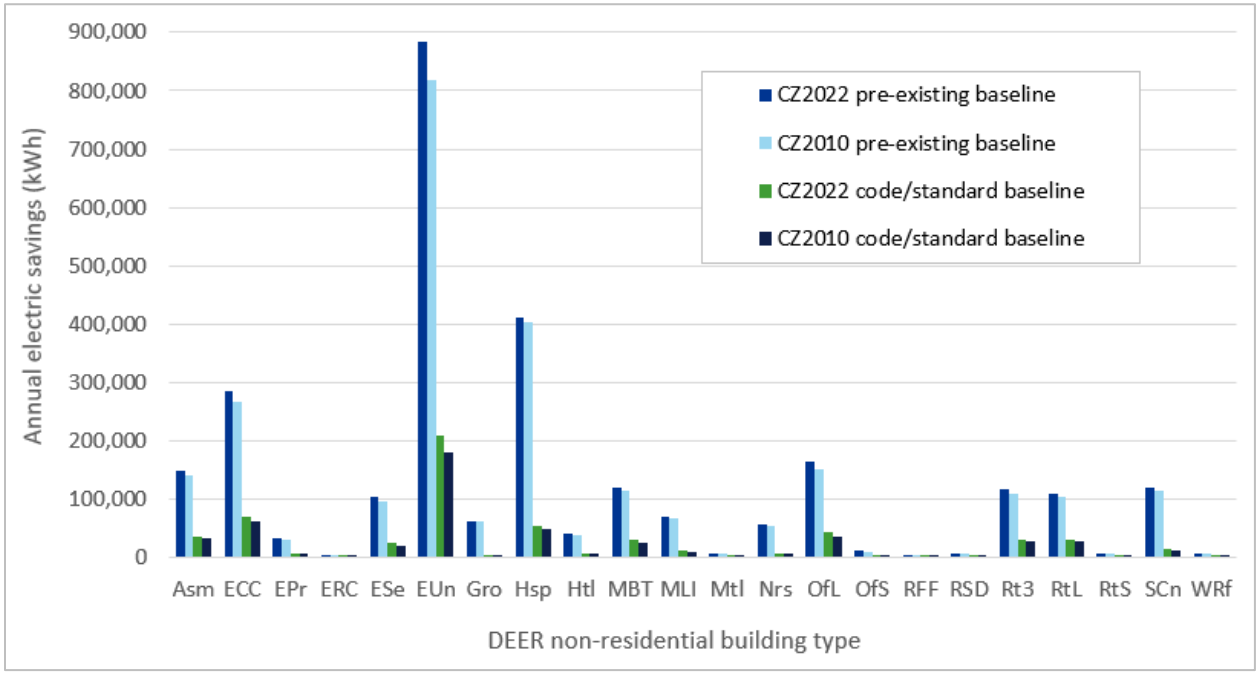


Table A-2-5. DEER Building type descriptions and codes

Description	Code	Description	Code
Assembly	Asm	Nursing Home	Nrs
Community College	ECC	Large Office	OfL
Primary School	EPr	Small Office	OfS
Secondary School	ESe	Fast-Food Restaurant	RFF
University	EUn	Sit-Down Restaurant	RSD
Grocery	Gro	Department Store	Rt3
Hospital	Hsp	Big Box Retail	RtL
Hotel	Htl	Small Retail	RtS
Bio/Tech Manufacturing	MBT	Conditioned Storage	SCn
Light Industrial Manuf.	MLI	Refrigerated Warehouse	WRf
Motel	Mtl		

2.4 Modifications to allow new load shape sources

Effective Program Year: 2023. New sources of generalized load shape parameters (e.g., simulation-based tools or advanced metering infrastructure analysis) could originate from impact evaluations or from studies conducted to support workpapers will be noted. For 2023, PAs may also produce new load shapes using simulation outputs or advanced metering infrastructure (AMI) analysis and the load shape processing workbooks available on the DEEResources website.[11] These load shapes will be reviewed through the workpaper review process and included as possible shapes for processing into

[11] http://www.deeresources.com/index.php/deer-load-shape

avoided cost combos for 2023 claims. The details of the 2023 processes may not be the same as current processes.[12] The expectation is that all measures with updates will use the load shapes available in 2022. Measures that have an urgent need for additional load shapes with workpapers submitted after the DEER2023 Resolution and before the next avoided cost update may request that a new load shape be created or use any revised process available next year.

2.5 Measure cost methodology and documentation guidance

Effective Program Year: 2023. The DEER database contains tables with outdated gross incremental measure costs because the costs for all measures are updated in workpapers and are approved by the workpaper team. When upstream lighting comprised the majority of savings values, the cost information was quite detailed based on extensive workpaper review and EM&V. As the portfolio becomes more diversified and as cost effectiveness continues to be refined, the measure costs must also remain as up to date as the savings estimates and avoided costs. The DEER2023 update expires out-of-date values and revises the measure cost tables to align with the eTRM transition. The DEER2023 update also clarifies definitions to ensure the gross incremental measure costs are aligned. Examples include:

- For normal replacement measures, the costs for standard/code baselines should align (e.g., if two measures use the same baseline efficiency assumption in a model, they should both use the same baseline costs).
- For accelerated replacement measures, the costs need to address remaining useful life (RUL) and expected useful life (EUL) periods properly.
- For fuel-substitution measures, the labor costs do not cancel out as they do for replacement measures.
- For packages of measures and some specific measures, the costs should only include the energy saving measures/features and not include costs for non-energy impacts or aesthetic features. For instance, if the most popular high efficiency model charges more for a popular color or finish, then unit cost with the alternate color with the same energy performance is appropriate.

2.6 New DEER measure fields for added load

Effective Program Year: 2022. Beginning in PY2022, unit impact fields (UnitkWh1stBaseline, etc.) should include only energy savings, thus the values should always be greater than or equal to zero. Staff are modifying the CET to allow accurate accounting of both benefits and costs for fuel substitution measures when calculating program administrator cost (PAC) and total resource cost (TRC) ratios.

Fuel substitution workpapers where the measure has electric savings and added electric load will need to reflect the new changes and be revised for PY2022. Existing workpapers for those measures may remain effective until they are naturally revised and would reflect this change at that time. For measures with interactive effects, workpapers will reflect separation of savings from added load as they are naturally revised in future years.

[12] At this time, limited avoided cost "combo" processing ability requires that load shapes are prioritized based on percent of overall claims in recent years.

2.7 Refrigerant avoided costs

Effective Program Year: 2022. The Refrigerant Avoided Cost Calculator available on CPUC's Cost Effectiveness information page is a new tool that will be used to calculate refrigerant carbon equivalent emission impacts to be included in cost effectiveness calculations in 2022.[13] Using the Intergovernmental Panel on Climate Changes (IPCC) methodology and leveraging emissions estimates from the California Air Resources Board (CARB), the tool predicts the refrigerant leakage impact in a dollar equivalent avoided cost value. This calculator should be used to calculate the avoided costs of refrigerant leakage for any device containing a refrigerant (i.e. refrigerator, air conditioner, heat pump water heater, etc.) that is installed through a CPUC-regulated energy efficiency program. Note that the output field is labeled "net present value (NPV) avoided costs" regardless of whether that value represents a benefit or a cost, so users must be careful to input this data correctly into their cost-effectiveness tools. Positive avoided costs are a benefit while negative avoided costs are a cost in the California cost effectiveness tests.

The Refrigerant Avoided Cost Calculator tool calculates the refrigerant leakage for one piece of equipment at a time. To accurately account for the effect of a measure installed through an energy efficiency program, the NPV avoided cost of refrigerant leakage should be calculated for the baseline equipment and for the installed equipment, the difference of which is the NPV avoided cost attributable to the installed measure. For a heat pump replacing a gas furnace and air conditioner, the net cost of refrigerant leakage from heat pump fuel substitution measures could be significantly over-estimated if the replacement of an existing or planned air conditioner is not reflected.

The reporting of refrigerant leakage avoided costs is enabled for PY2022 claims and is applicable to all measures that contain refrigerant. Documentation of these avoided costs is required in workpapers as they are naturally revised in future years. New refrigerant avoided cost fields have been added to DEER support tables and are discussed in section 8.4.

2.8 Clarify the add-on equipment approach to EUL

Effective Program Year: 2023. Resolution E-4818 adopted the definition for Add-On Equipment (AOE) as presented in Section 2.2.5 of the Preponderance of Evidence guidance document.[14] The AOE definition states that the EUL of add-on equipment measures is capped at the RUL of the host equipment being retrofitted, and for deemed measure a default RUL is set at one-third the EUL. As stated in the guidance document, the default may be amended in a workpaper when evidence to do so is provided. Additionally, the host equipment is defined as the equipment that uses less energy as a result of the add-on measure.[15] 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 greater than zero. We have allowed changes to the host

[13] https://www.cpuc.ca.gov/general.aspx?id=5267
[14] "Early Retirement Using Preponderance of Evidence" (also Resolution E 4818, p. 24) http://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=5325.
[15] Resolution E-4818 Section 1.3.6.2 Add-On Equipment, pp.26-27.

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.

2.9 Clarify the approach to the DEER GSIA table updates

Effective Program Year: 2023. Decision D.11-07-030 (p. 22) initiated the tracking of installation rate values in DEER and populated them with EM&V results from the 2006-08 evaluation reports. The decision states that installation rates must be stored separately and not embedded in the gross savings for a measure. However, the DEER table name retains the Gross Savings and Installation Rate Adjustment factor (GSIA).[16] Rather than storing the values as a product, it would be clearer if the tables were separated into an installation rate table for deemed measures and a realization rate table for custom measures. The Decision does not provide a mechanism for updating the GSIA values and many have not been updated since inception. The 2023 DEER Update will update the installation rate values stored in the table.

2.10 Custom must use deemed values for deemed measures

Effective Program Year: 2021. Deemed measures can be processed through the custom programs as long as the deemed savings values are used and deemed rebates amounts are not exceeded.[17] This is not a change from previous policy, it is a restatement of existing policy that has not been consistently followed.

3 DEER error corrections and clarifications

DEER error corrections or clarifications are those that typically impact the actual DEER values or application of the values.

3.1 DEER water heater calculator corrections for commercial building type

Effective Program Year: 2021. The commercial sector-wide energy savings (BldgType=Com) were incorrectly calculated in the *DEER_WaterHeater_Calculator_v4.1.xlsm*. The savings calculations were corrected, the calculator was re-issued (*DEER_WaterHeater_Calculator_v4.2.xlsm*), and both the Preliminary Ex Ante Review (PEAR) and Ex Ante energy impact records were updated to provide the corrected sector-wide energy savings.

3.2 Commercial water heater savings

Effective Program Year: 2021. After discussions with Southern California Gas (SCG), it was agreed that the DEER water heater calculator methodology does not accurately estimate the energy savings provided by efficient large non-residential tankless water heaters (≥200 kBtu/h input capacity) used to deliver service hot water. As a result, the following DEER measures—previously unavailable beyond December 31, 2020—have been extended for use through December 31, 2022 as shown in Table A-

[16] The GSIA is a DEER adjustment factor that combines the Realization Rate and Installation Rate (CPUC Energy Efficiency Policy Manual). Note that for CEDARS claims, the reported deemed measure realization rate (RR) is always 1, and for custom projects the reported installation rate (IR) is always 1.

[17] PG&E Customized Energy Efficiency Policy & Programs Rulebook version 1.0 (2016), p. 16.

3-1. Note that new eQUEST building simulations will be performed for DEER2023 due to changes to the Federal standards as described in Section 5.1.

Table A-3-1. Large tankless commercial water heater measures

DEER Measure ID	Version	Start Date	Expiry Date	
			Revised	Previous
NG-WtrHt-LrgInst-Gas-gt200kBtuh-0p80Et	DEER2014	2013-01-01	2022-12-31	2020-12-31
NG-WtrHt-LrgInst-Gas-gt200kBtuh-0p85Et				
NG-WtrHt-LrgInst-Gas-gt200kBtuh-0p90Et				
NG-WtrHt-LrgInst-Gas-gte200kBtuh-lt2G-0p80Et	DEER2021	2021-01-01	2021-01-01	none
NG-WtrHt-LrgInst-Gas-gte200kBtuh-lt2G-0p90Et				
NG-WtrHt-LrgInst-Gas-gte200kBtuh-lt2G-0p96Et				

3.3 Water-cooled chiller measure tier definitions

Effective Program Year: 2023. For all liquid chilling machines (chillers), Resolution E-4952 defined two tiers of chiller measures. Tier 1 must exceed Title 24 by 10% for both full and part load efficiencies. Tier 2 must exceed Title 24 minimum requirements by 15% for both full and part load efficiencies. Resolution E-5082 changed the efficiency criteria for Path B[18] *air-cooled* chiller tiers, relaxing the full load efficiency requirement and increasing the part load efficiency requirement such that they exceed Title 24 minimum efficiency requirements as follows:

Tier 1 at 7% full-load efficiency improvement and 12% part-load efficiency improvement
Tier 2 at 7% full-load efficiency improvement and 20% part-load efficiency improvement

The 2023 DEER update will revise the efficiency tiers for Path B *water-cooled* chiller tiers such that they exceed Title 24 minimum efficiency requirements as follows:

Tier 1 at 7% full-load efficiency improvement and 12% part-load efficiency improvement
Tier 2 at 7% full-load efficiency improvement and 17% part-load efficiency improvement

3.4 Residential duct sealing measure missing some energy impacts

Effective Program Year: 2020. There 92 missing Energy Impact records for both residential duct-sealing measures at climate zones CZ14, CZ15, and CZ16 for the multifamily (MFm) and mobile home (DMo) building types. Along with providing the missing Energy Impact records, it was necessary to correct the sector-wide Energy Impact records for CZ14, CZ15, and CZ16 for the Res building type.

[18] 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. The DEER tier 1 Path B air-cooled chiller minimum efficiency is (9.7)(1.07)=10.38 EER and (15.8)(1.12)=17.7 IPLV.

3.5 Residential duct sealing measures normalizing unit modification

Effective Program Year: 2021. Historically, the normalizing unit for residential duct-sealing measures for all HVAC types was tons of cooling capacity. For furnace-only HVAC systems, however, it makes more sense to use kBtu/h as the normalizing unit. A conversion methodology was developed for revising the normalizing unit and presented in *Res_Duct-Sealing_NormUnit=kBtuh_rNCGF_2020-11-19.xlsx*, available at deeresources.com. The Energy Impact records using kBtu/h as the normalizing unit for BldgHVAC=NCGF were uploaded to PEAR.

3.6 Residential duct sealing GSIA values expiration

Effective Program Year: 2021. The gross savings and installation adjustment (GSIA)[19] values for duct sealing GSIA_IDs are out of date, based on EM&V from 2006-08, and will be expired as shown in Table A-3-2. Duct sealing measures will use the GSIA default value of 1.0 given that 2018 EM&V realization rate is 95% based on billing analysis that captures both realization rate and installation rate. The older 2006-08 EM&V report found a high incidence of duct sealing measures that had not been installed due to one contractor who was quickly removed from the program.

Table A-3-2. GSIA IDs to be expired effective 2020-12-31

GSIA_ID	GSIA Value
Res-DuctSeal-PGE-2000	0.490
Res-DuctSeal-PGE-2078	0.410
Res-DuctSeal-SCE-2502	0.410
Res-DuctSeal-SCE-2507	0.510
Res-DuctSeal-All	0.463
Res-DuctSeal-SDG	0.410
Res-DuctSeal-PGE	0.584
Res-DuctSeal-SCE	0.468

3.7 Refrigerator/freezer measures normalizing unit modification

Effective Program Year: 2021. Historically, the normalizing unit for residential refrigerators/freezers was "Household." It makes more sense, however, to use "Unit" as the normalizing unit—particularly for an upstream delivery type. A household can have more than one refrigerator or freezer. The Energy Impact records were revised to reflect the change to NormUnit, but no changes were made to the energy savings.

[19] The gross savings and installation adjustment (GSIA) is a DEER adjustment factor that combines the realization rate and installation rate according to the Energy Efficiency Policy Manual Version 6, pg. 39.

3.8 Fuel substitution default NTG applicability clarification

Effective Program Year: 2020. The delivery type options for the "FuelSubst-Default" NTG ID were corrected so that this NTG ID is now available for use with fuel substitution measures offered through any delivery type.

3.9 Align residential clothes washer measures with ENERGY STAR® tiers

Effective Program Year: 2023. The current ENERGY STAR Version 8.0 clothes washer program requirements became effective February 5, 2018. Only front- and top-loading clothes washers with capacities greater than 1.6 ft^3 and less than 8.0 ft^3—and are not defined as combination all-in-one washer-dryers, residential clothes washers with heated drying functionality, or top-loading commercial clothes washers—are eligible for ENERGY STAR certification. There are currently no new versions in development.

The Consortium for Energy Efficiency (CEE) specification does not differentiate between top- and front-loading models, while ENERGY STAR does. The CEE specification defines standard sized clothes washers as greater than 2.5 ft^3. As of February 5, 2018, top-loading clothes washers meeting ENERGY STAR minimum efficiency requirements would not qualify for any CEE tier.

The equipment efficiencies will be updated as shown in Table A-3-3.

Table A-3-3. Residential clothes washer measure criteria, capacity between 1.6 to 8.0 ft^3

Category	Efficiency Tier	Minimum IMEF[20]		Maximum IWF[21]	
		DEER2023	DEER2020	DEER2023	DEER2020
Front-loading clothes washer	ENERGY STAR/CEE Tier 1	≥ 2.76	≥ 2.38	≤ 3.2	≤ 3.7
	ENERGY STAR Most Efficient/ CEE Tier 2	≥ 2.92	≥ 2.74	≤ 3.2	≤ 3.2
	CEE Tier 3	≥ 3.10	≥ 2.92	≤ 3.0	≤ 3.2
	Code/Standard baseline	> 1.84	> 1.84	< 4.7	< 4.7
	Pre-existing baseline	> 1.84	> 1.79	< 4.7	< 4.8
Top-loading clothes washer	ENERGY STAR	≥ 2.06	≥ 2.06	≤ 4.3	≤ 4.3
	CEE Tier 1	≥ 2.76	≥ 2.06	≤ 3.2	≤ 4.3
	CEE Tier 2	≥ 2.92	≥ 2.32	≤ 3.2	≤ 4.0
	CEE Tier 3	≥ 3.10	≥ 2.76	≤ 3.0	≤ 3.2
	Code/Standard baseline	> 1.57	> 1.29	< 6.5	≤ 8.4
	Pre-existing baseline	> 1.29	> 1.08	< 8.4	≤ 9.4

[20] Integrated modified energy factor (IMEF) is the energy performance metric for ENERGY STAR-certified residential clothes washers as of March 7, 2015.
[21] Integrated water factor (IWF) is the water performance metric for ENERGY STAR-certified residential clothes washers as of March 7, 2015.

To align existing DEER measures with the applicable standards, the measures shown in Table A-3-4 will need to be updated.

Table A-3-4. Relevant DEER measures for residential clothes washers

Category	DEER Measure ID	Version
Front-loading clothes washer	RB-Appl-EffCW-med-Tier1-Front	DEER2020
	RB-Appl-EffCW-med-Tier2-Front	
	RB-Appl-EffCW-med-Tier3-Front	
Top-loading clothes washer	RB-Appl-EffCW-med-Tier1-Top	
	RB-Appl-EffCW-med-Tier2-Top	
	RB-Appl-EffCW-med-Tier3-Top	

3.10 Align residential dishwasher measures with ENERGY STAR® tiers

Effective Program Year: 2023. The current ENERGY STAR Version 6.0 dishwasher program requirements became effective January 29, 2016. The CEE revised dishwasher specification from 2015 did not include a Tier 2 due to concerns around cleaning performance. The ENERGY STAR market share is currently 90%.[22]

The Version 7.0 specification is currently under revision, with the first draft published March 10, 2020. For Version 7.0, the EPA has increased the minimum efficiency requirements for residential dishwashers, decreasing the annual energy consumption allowance for standard sized models to 240 kWh/year. According to the EPA, the expected effective date is the first quarter of 2021.

The equipment efficiencies will be updated as shown in Table A-3-5.

Table A-3-5. Residential Dishwasher, Standard Capacity Measure Criteria

MeasureID	Efficiency	Maximum Annual Energy Consumption, kWh	
		DEER2023	DEER2020
Appl-Dishwash-StdSize-Tier1	ENERGY STAR/CEE Tier 1	≤ 240	≤ 260
Appl-Dishwash-StdSize-Tier2	CEE Tier 2	N/A	≤ 220
Appl-Dishwash-StdSize-Tier3	CEE Tier 3	N/A	≤ 180
Appl-Dishwash-StdSize-Tier1/2/3	Code/Standard	≤ 307	≤ 307

To align existing DEER measures with the applicable standards, the measures shown in Table A-3-6 will need to be updated.

[22] ENERGY STAR Program Requirements Product Specification for Residential Dishwashers, Eligibility Criteria, Draft 1 Version 7.0. https://www.energystar.gov/sites/default/files/ENERGY%20STAR%20Residential%20Dishwasher%20Version%207.0%20Draft%201%20Sepcification.pdf

Table A-3-6. Relevant DEER measures for residential dishwashers

Category	DEER Measure ID	Version
Standard size dishwasher	Appl-Dishwash-StdSize-Tier1	DEER2020
	Appl-Dishwash-StdSize-Tier2	
	Appl-Dishwash-StdSize-Tier3	
	Appl-Dishwash-StdSize-Tier1/2/3	

3.11 Whole-house fan measure updates

Effective Program Year: 2023. Whole house fans became a Title-24 code requirement in 2015 for single-family homes in climate zones CZ08 through CZ14. Resolution E-4795 was the most recent update of the whole house measure resulting in new whole house fan UES values for DEER2017 and the inclusion of whole house fans in new construction baseline models in climate zones where they are required by code. The whole house fan is utilized in single-family homes and the eQUEST model for this measure assumes that the whole house fan is on when outdoor cooling is available, the cooling load can be met by the whole house fan, and the outdoor temperature is at least five degrees below the cooling thermostat setpoint. The whole house fan will cool the space down to 70°F, if possible, regardless of the actual cooling thermostat setpoint.

At the time of the DEER2017 update, a number of changes were needed for the specification of whole house fan parameters including flow rates, fan power, control sequences and improvements to the definition and distribution of thermal mass in the residential prototypes. The new whole house fan measures considered a range of capacities and fan efficiencies. There has been some concern about the accuracy of whole-house fan unit energy savings developed using DOE2-based modeling, particularly because the results are approximately one-third of the CEC-developed savings results[23] used in the publicly-owned utilities' (POU) 2017 Technical Reference Manual.[24] The CEC-developed savings are modeled using the 2013 version of the California Simulation Engine (CSE) that is the basis for CBECC-Res software. The CEC whole house fan input assumptions are as follows. The whole house fan will:

- initiate if outdoor temperature is at least five degrees cooler than the indoor temperature
- cool the house to a fixed 68°F lower limit setpoint, consistent with natural ventilation assumptions when the thermostat is in cooling mode.
- terminate if the lower setpoint limit is reached, the 5°F minimum indoor-outdoor temperature no longer exists, or if the time is between the hours of 11 PM to 6 AM (windows assumed closed for security reasons).

The CEC-modeled home used their 2700 ft^2 residential prototype with whole house fan flow of 2000 cfm, so the modeled ventilation rate was 0.74 cfm/ ft^2. The study noted a 25% derating of whole house fan nominal airflow with no explanation for that number. The study discussed fan electricity

[23] Night Ventilation Cooling Compliance Option, Codes and Standards Enhancement Initiative, September 2011.
[24] 2017 Savings Estimation POU Technical Reference Manual published by the California Municipal Utilities Association.

consumption for a ducted economizer-type nighttime ventilation system but did not mention whole house fan assumptions of electricity consumption.

The DEER assumptions used to model whole house fans are very similar to those used by the CEC, though the lower limit setpoint is 70°F (causing slightly lower cooling savings, but also lower heating penalty). The DEER cooling availability schedule varies by climate zone and follows the 2017 T-24 Residential ACM manual, allowing ventilation cooling only during shoulder months. DEER assumptions do not include a derating of nominal airflow, however it does assume that the windows will only be open half the time when there is an opportunity to use the whole house fan.[25] This is the only factor used to account for windows open for cooling or airflow and windows closed at night for security reasons. A 2006 survey of ventilation behavior[26] found that 82% of respondents thought it was important to open the windows to cool the house and 70% thought it was important to open windows to save energy. The study also reported 92% of respondents thought it important to close windows for safety/security. The 50% probability assumption seems reasonable; nevertheless, we will perform parametric analysis to investigate the influence this assumption has on the whole house fan savings result. For transparency, the whole-house fan measure input assumptions are documented in Table A-3-7 and

Table A-3-8.

Table A-3-7. DEER input parameters for the whole-house fan measure

Parameter	Parameter name[27]	Pre-existing baseline case value	Measure case value
Ventilation method	VentMethod	AIR-CHANGE	AIR-CHANGE+FAN
Fan ventilation, cfm/sq.ft.	FanVentCFMpSF	0	0.7, 1.5, 2, 3
Ventilation control, °F	VentMaxT	70	70
Ventilation fan power, W/cfm	VentFanWperCFM	0	0.15, 0.125

Table A-3-8. DEER schedule for the whole-house fan measure

	enabled period		enabled period		enabled period		enabled period		enabled period	
Climate Zone	start date	end date	start date	end date	start date	end date	start date	end date	start date	end date
CZ01	never enabled									
CZ02	20-May	30-Sep	7-Oct	21-Oct						
CZ03	22-May	18-Jun	1-Jul	8-Oct	18-Oct	24-Oct				
CZ04	30-Apr	3-May	15-May	31-Oct						
CZ05[a]	28-May	28-May	31-May	2-Jun	12-Jun	13-Jun	10-Jul	15-Aug	29-Aug	29-Aug
CZ06	30-Apr	2-May	7-May	6-Nov	16-Nov	19-Nov				
CZ07	17-Feb	20-Feb	25-Apr	2-May	13-May	23-Nov	18-Dec	18-Dec	20-Dec	25-Dec

[25] The probability fraction is set to 100% on peak kW days for accuracy of peak savings calculations.
[26] Price, Phillip and Max Sherman. Ventilation Behavior and Household Characteristics in New California Houses, LBNL #59620 (2006).
[27] DOE2 Key words are documented in Volume 2 Dictionary file; specifically, VENT-METHOD is described on pg. 442. https://doe2.com/Download/DOE-23/DOE23Vol2-Dictionary_50d.pdf

Climate Zone	enabled period start date	enabled period end date	enabled period start date	enabled period end date	enabled period start date	enabled period end date	enabled period start date	enabled period end date	enabled period start date	enabled period end date
CZ08	18-Mar	27-Mar	20-Apr	21-Apr	24-Apr	10-Nov	15-Nov	21-Nov	18-Dec	23-Dec
CZ09	17-Mar	26-Mar	24-Apr	7-May	12-May	6-Nov	17-Nov	22-Nov	17-Dec	22-Dec
CZ10	18-Mar	25-Mar	25-Apr	7-May	13-May	6-Nov	17-Dec	22-Dec		
CZ11	28-Apr	4-May	15-May	29-Oct						
CZ12	28-Apr	4-May	15-May	29-Oct						
CZ13	2-Apr	2-Apr	26-Apr	8-May	12-May	1-Nov				
CZ14	27-Apr	6-May	15-May	30-Oct						
CZ15[b]	14-Jan	24-Jan	3-Feb	9-Feb	19-Feb	28-Feb	14-Mar	10-Apr	14-Apr	24-Nov
CZ16	24-May	1-Oct								

a Climate zone 5 has three additional enabled periods: 3-Sep to 17-Sep, 30-Sep to 2-Oct and 5-Oct to 12-Oct.
b Climate zone 15 has one additional enabled period: 16-Dec to 25-Dec.

3.12 LED commercial lighting measure clarification

Effective Program Year: N/A Almost all LED lighting measures were expired in 2020 due to LED becoming the baseline. Three measures were retained by using a higher-performance LED, as measured in lumens per Watt (lm/W). DEER Resolution E-4952 (published in 2018) set the base and measure cases using the Lighting Facts database, a compendium of the majority of LED lighting products available in the marketplace. The bottom tier products set the baseline (concluding a 100 lm/W TLED base efficacy was appropriate) while the top quartile products set the measure case efficacy. The Lighting Facts database was not updated after 2018 and could no longer be used to set efficacy standards.

After 2018, updates to LED efficacy (for both base and efficient cases) were based on multiple sources, including the Southern California Edison Industry Standard Practice (ISP) Study (October 2019), DesignLights Consortium updates (DLC, the DLC is a compendium of qualifying products that must meet standards of efficacy and quality), and the Department of Energy (DOE) Lighting R&D Opportunities Study (January 2020). Aggregate analysis of these resources and their subsequent revisions resulted in updates to LED efficacies which are exemplified by the TLED base case efficacy trend of 100, 111, and 128 lm/W in 2019, 2020 and 2021 workpapers, respectively.

After the base updates were made, the measure case efficiencies were similarly adjusted. The updated measure case efficacies were compared to the DLC database and it was observed that about 45% of high bay products qualified. The DLC qualified products are intended to represent the best products in the market and would correspond to the top tier of all products on the market, possibly the top quartile, although that could not be confirmed since the Lighting Facts database no longer exists.

The 2021 workpapers expiration dates were extended to 12/31/2022 (November 3, 2020 disposition) due to the impact of COVID on markets and a conclusion that it would be unlikely that clear market trends would emerge in time to update workpapers for 2022. Program administrators are instructed to submit revised workpapers reflecting revised efficacy assumptions by June 1, 2022.

4 Review of energy efficiency EM&V studies

EM&V market sector evaluation results and/or special studies will continue to be some of the primary sources for DEER measure and workpaper updates. Evaluation results with rigor and precision acceptable to support DEER measures will be used to update DEER and workpaper assumptions. Parameters in need of data to reduce uncertainty or increase accuracy will also be identified and fed back into the next EM&V cycle. The current evaluation is focused on program year 2019 (PY2019) claims. Year 2019 is an important milestone for deemed measures and the application of EM&V results because it was the last year for PA-specific workpapers. For PY2020, almost all of the measures will be based on Statewide workpapers which will make evaluation and the application of the EM&V results much easier and more robust.

4.1 Summary

The DEER team has examined the 2019 EM&V draft impact evaluation reports and other studies to identify findings that may result in updates to deemed measure parameters and/or savings estimation approaches. Additional updates may be made looking across studies for recent years such as looking across measures at the default NTG by delivery type (e.g. direct install, rebate, upstream).

A complete list of the studies to consider is provided in Appendix E of the CPUC's 2019-2021 EM&V Plan.[28] Due to the DEER Update and EM&V report schedule, EM&V results are only an initial assessment of updates based on pre-draft reports since the Bus Stop for the final EM&V report is March 1 Draft and April 1 Final. As for other studies, we have only considered studies that will be completed by Q1 2021. From Appendix E, the available studies of CPUC PY2019 impact evaluations and other related IOU or CPUC studies are provided in Table A-4-1.

Table A-4-1. Assessment of expected 2019 EM&V study results

Market Sector	Measure	Gross Savings*	NTG*
Residential	Water Heaters and Controls	TBD	YES
Residential	Smart Thermostat	UES, LS**	YES
Lighting	Nonresidential Indoor LED Tube	HOU, EUL	YES
Lighting	Nonresidential Indoor LED Fixture	HOU, EUL	YES
HVAC	Rooftop and Split System	TBD	NO
HVAC	Residential HVAC package	TBD	TBD
HVAC	PTAC Controls	TBD	TBD
Small Commercial	Process (Agricultural) Pump VFD	TBD	NO
Small Commercial	Process Ozone Laundry	TBD	YES
Small Commercial	Tankless Water Heaters	TBD	YES

[28] "Energy Division & Program Administrator Energy Efficiency Evaluation, Measurement and Verification Plan FINAL, 2019-2021, Version 10," California Public Utilities Commission, 12/30/2020, https://pda.energydataweb.com/api/downloads/2462/2019-21_EMV_Plan_final.pdf.

*Per E-4952, values are only changed if EM&V studies show a trend and if change is greater than 5%.
**UES=unit energy savings; LS=load shape; HOU=hours of use; EUL=effective useful life; and VFD=variable frequency drive

4.2 Residential sector 2019 EM&V reports

Effective Program Year: 2022, 2023. The two residential sector reports for PY2019 that are being reviewed for potential deemed measure updates are water heating equipment and smart thermostats. The PY2019 evaluation of residential domestic water heating equipment includes efficient storage, tankless, and heat pump water heater (HPWH) equipment, as well as central multifamily water heating measures including controls. This is primarily a NTG and market-measure characterization study due to the complexity of water heating measures baselines and the market. However, the study also collected residential hot water use information that can potentially be used for a future update to the deemed savings methodology and the DEER water heater calculator.

4.3 Nonresidential lighting 2019 EM&V reports

Effective Program Year: 2023. Since residential general-service lamp measures are no longer being offered, only deemed measure updates for nonresidential LED lighting measures are being considered. The PY2019 evaluation focuses on only two of the six measure categories which account for 90% of the nonresidential lighting savings: Indoor LED Fixtures and Indoor LED Tubes. The measures are offered for two delivery types: downstream and midstream. The report will be reviewed for deemed measure updates to the evaluated LED measures, as well as the newest nonresidential Type B and Type C LED tube measures,[29] once reports are finalized.

4.4 HVAC sector 2019 EM&V report

Effective Program Year: 2023. The PY2019 HVAC evaluation targeted two Commercial HVAC and one Residential HVAC measure groups. Commercial HVAC Rooftop and Split Systems was evaluated last year, and a new commercial HVAC measure this year is package terminal air conditioner controls (PTAC Controls) for lodging guest room HVAC units. The Residential HVAC evaluation covers a package of measures as described below.

Commercial HVAC, Rooftop and split system. These measures were previously evaluated in PY2018 and the NTG values were updated.

Commercial HVAC, PTAC controls. This measure installs occupancy controls on package terminal air conditioner (PTAC) and package terminal heat pump (PTHP) units found mainly in hotel and motel guest rooms. It appears that these measures are no longer being offered as statewide measures.

Residential HVAC measures. The evaluation is targeting a package of measures which includes coil cleaning, refrigerant charge and airflow adjustments, duct sealing, fan motor replacement, fan controls, and high-efficiency furnaces. A combination of billing analysis and building energy modeling is being used for the savings evaluation. A NTG study is also being conducted.

[29] Workpaper ID SWLG018, "Type B and Type C LED, Tube", https://www.caetrm.com/measure/SWLG018/01/

4.5 Small\medium commercial 2019 EM&V report

Effective Program Year: 2023. Small\Medium Commercial measure evaluation results and the resulting deemed measure updates (if any) are as follows:

Agricultural drip irrigation. This measure was previously evaluated in PY2018 and the NTG value was updated last year. However, the measure was only offered by one utility and has been discontinued, so no deemed workpaper updates are needed, and any deemed database values associated with the measure can be expired.

Process (agricultural) pump variable-frequency drive (VFD). This measure was previously evaluated in PY2018 and found that most differences were due to incorrect utility calculations, so no UES changes were needed. However, actual hours of operation are again being evaluated..

Process ozone laundry. This is a new measure for evaluation where both measure savings and NTG values are being studied. A PA custom tool that uses general engineering principles plus industry data on a typical laundry cycle is used to develop energy savings for this measure. The evaluation team is using an enhanced version of the tool and site-specific data to develop ex post savings.

Commercial tankless water heaters. This measure is offered primarily via midstream delivery and was evaluated last year. Review of Codes and Standards

Codes and Standards (C&S) changes often comprise the highest priority updates because they can significantly impact baselines. C&S updates consider both federal and State requirements (Title 24, Title 20).

4.6 Federal standards for commercial natural gas packaged boilers

Effective Program Year: 2023. Changes to the federal standard, effective January 10, 2023,[30] increase the minimum efficiency ratings for all but the very large commercial packaged boilers as shown in Table A-5-1.

Table A-5-2. Federal standards update for commercial natural gas packaged boilers

Equipment	Size Category (input)	Minimum Efficiency[31]	
		New	Previous
Small Gas-Fired Hot Water Commercial Packaged Boilers	≥300 kBtu/h and ≤2,500 kBtu/h	84.0% E_T	80.0% E_T
Large Gas-Fired Hot Water Commercial Packaged Boilers	>2,500 kBtu/h and ≤10,000 kBtu/h	85.0% E_C	82.0% E_C
Very Large Gas-Fired Hot Water Commercial Packaged Boilers	>10,000 kBtu/h	82.0% E_C (no change)	

[30] Table I.1, CFR §431.87 at https://www.govinfo.gov/content/pkg/FR-2020-01-10/pdf/2019-26356.pdf
[31] E_T means "thermal efficiency;" E_C means "combustion efficiency."

Equipment	Size Category (input)	Minimum Efficiency[31]	
		New	Previous
Small Gas-Fired Steam Commercial Packaged Boilers	≥300 kBtu/h and ≤2,500 kBtu/h	81.0% E_T	Natural draft: 77.0% E_T All others: 79.0% E_T
Large Gas-Fired Steam Commercial Packaged Boilers	>2,500 kBtu/h and ≤10,000 kBtu/h	82.0% E_T	
Very Large Gas-Fired Steam Commercial Packaged Boilers[32]	>10,000 kBtu/h	79.0% E_T	

As a result, the energy savings for high-efficiency space-heating boilers and instantaneous tankless water heaters are expected to change. Affected DEER Measure IDs are provided in Table A-5-2.

Table A-5-3. DEER measures affected by update to federal standards

Use Category	DEER MeasureID	Version
SHW	NG-WtrHt-LrgInst-Gas-gt200kBtuh-0p80Et	DEER2014
	NG-WtrHt-LrgInst-Gas-gt200kBtuh-0p85Et	
	NG-WtrHt-LrgInst-Gas-gt200kBtuh-0p90Et	
HVAC	NG-HVAC-Blr-Stm-300to2500kBtuh-81p0Et-Drft	DEER2020
	NG-HVAC-Blr-Stm-300to2500kBtuh-82p0Et-Drft	
	NG-HVAC-Blr-Stm-gt2500kBtuh-80p0Et-Drft	
	NG-HVAC-Blr-Stm-gt2500kBtuh-81p0Et-Drft	
	NG-HVAC-Blr-Stm-gt2500kBtuh-82p0Et-Drft	

4.7 CEC Title 24 building efficiency updates

Effective Program Year: 2023. The 2022 Building Energy Efficiency Standards update draft is anticipated in March 2021. We will review the new standards when they are released and perform appropriate prototype revisions and announce measure revisions in the 2022 DEER Resolution.

4.8 CEC Title 20 appliance efficiency updates

No updates are currently anticipated because most Federal appliance and equipment efficiency standard updates were suspended, as noted on the Appliance Standards Awareness Project website.[33] However, if these updates are restarted and fast-tracked, it could require a major effort to update deemed measures since there are a significant number (22) of suspended commercial and residential equipment and appliance updates.

[32] Prior to March 2, 2022, for natural draft very large gas-fired steam commercial packaged boilers, a minimum thermal efficiency level of 77% is permitted and meets Federal commercial packaged boiler energy conservation standards.
[33] https://appliance-standards.org/products-and-links

4.9 New low-GWP refrigerant standards

Effective Program Year: 2022. In California, greenhouse gas (GHG) emissions from refrigerants in HVAC equipment is the fastest growing global warming pollutant. To address this climate threat, California State Senate Bill (SB) 1383, 2016, calls for the emissions of hydrofluorocarbons (HFCs) to be reduced so that by 2030, California's HFC emissions will be 40% of what they were in 2013 based on GWP impact. California SB 1013, 2018, was passed shortly after SB 1383 to help define the rules and timeline California needs to follow to reach the 2030 HFC emissions reduction goal.[34] While the act's original timeline has already changed, the latest pending amendment to SB 1013 calls for new stationary AC equipment installed after January 1, 2025 to contain a refrigerant with a 100-year GWP value below 750. Furthermore, under SB 1013, the CPUC and other state regulatory agencies are called upon to assess the operational performance of refrigerants with low-GWPs and to develop a strategy to encourage the adoption of those low-GWP refrigerants in equipment funded by energy efficiency programs overseen by the CPUC.

When SB 1383 was written, it appeared the United States was also planning to phase down the use of HFCs. After the passage of SB 1383, a 2017 US District Court ruling limited the US Environmental Protection Agency's (EPA) ability to regulate refrigerants based on GWP. The ruling effectively stalled national efforts to transition away from high-GWP refrigerants. Despite this, California is following the goals set by the Montreal Protocol and moving forward with a state-lead phasedown of HFCs.

CARB's latest proposed amendment to regulations on HFCs will delay the transition timing from 2023 to 2025. Many indications point to updates in the next cycle of California building and fire codes that will include revised policies and guidelines to allow for the use of mildly flammable HFC refrigerants in most major HVAC equipment. Once the building and fire codes are finalized, potentially starting in June or July of 2021, the policy and timing of California's transition, will be more certain. When the new regulations are in place, the baselines for affected deemed measures containing refrigerant will need to be updated. The 2021 Proposer Defined Study on HVAC Refrigerants provides a roadmap for accelerating the adoption of low-GWP HVAC refrigerants through a literature review and interviews with HVAC refrigerant related experts.[35]

5 Review of market and research studies

Market and research studies, including baseline studies,[36] 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.

5.1 Update EULs based on Group A EUL study

Effective Program Year: 2023. Although the EUL study reports are not yet finalized, updates to the building shell insulation and whole building EULs are anticipated for the DEER2023 update. Those that might be affected are listed in Table A-6-1.

[34] https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180SB1013
[35] The study is still being reviewed by CPUC and will be posted on calmac.org when it is final.
[36] For example, CEC's Commercial End-Use Survey (CEUS) and Residential Appliance Saturation Study (RASS), and CPUC's Commercial Saturation Study-Commercial Market Share Tracking (CSS-CMST) studies and California Lighting and Appliance Saturation Study (CLASS).

Table A-6-1. Effective/remaining useful life values that may be updated

Use Category	Sector	BldgType	EUL_ID	Current EUL_Yrs	Current RUL_Yrs
WhlBldg	Res	SFm	WB-#####-w## (45 IDs)	~18	~5.89
			WhlBldg-WBInsFen-NEW-MfrHse	20	6.67
			WhlBldg-WBInsFen-NEW-SF	18	6.00
			WhlBldg-WBInsFen-RET-SF	14	4.67

5.2 Review Group B & E market studies

Effective Program Year: 2023. A number of market characterization studies are being conducted this year that could help inform needed updates to deemed measures. The studies with the most potential for informing deemed measure updates include:

(Group B) "Heat Pump Market Baseline and Characterization for the State of California." The objective of this study is to characterize and develop baselines for the California heat pump market including air source heat pumps, ground source heat pumps, heat pump water heaters, heat pump pool heaters, and heat pump clothes dryers. The study will also look at heat pump programs in other jurisdictions. This study should be a key source of information for validating and/or updating deemed heat pump measure baselines. Unfortunately, the draft study is not available for review until the end of March.

(Group E) "Industrial/Agriculture Market Saturation Study." This study is also being conducted to inform the Potential and Goals Study. The study looked at six prioritized industrial and agricultural subsectors, and the three technologies/systems within each subsector with the best potential for energy savings. The only measures investigated that could impact DEER measures were in the "Water Pumping for Agriculture" subsector. The only finding that could potentially impact deemed measures is that 60% of agricultural pumping sites also have onsite solar PV, which could potentially impact savings to the grid if pumps are typically run during PV production times.

5.3 Review emerging technology studies

Effective Program Year: 2023. The IOUs in California invest in emerging technology studies, the results of which should inform new deemed measures. The program administrators should review the studies from the Emerging Technologies Coordinating Council website and create workpapers for those most suited for deemed measures.

6 New measure additions

This section describes the addition of the multifamily central water heating system measure that will be added to the DEER database for 2023.

6.1 Multifamily central water heating systems

Effective Program Year: 2023. There is a need for deemed energy savings for efficient centralized service hot water systems that are typical at some multifamily buildings. These will be generated by

first replicating the DEER MFm eQUEST building prototype family in EnergyPlus™ (E+) and then modeling a centralized hot water system.

7 Support Table updates

Throughout the year, additions and modifications must be made to the PEAR database. Once the changes to the PEAR database have been adopted via resolution, these additions and modifications are migrated to the Ex Ante database during the month following the resolution adoption. Events that typically trigger additions and modifications to the PEAR database include new IOU workpapers, new CPUC guidance documents, and new CPUC policies. As changes are made to the PEAR database, they are announced via the PEAR Change Log.[37] The changes in the subsections that follow were made since the adoption of Resolution E-5082 for DEER2023 Update.

7.1 New EUL values

Effective Program Year: 2020. EUL and RUL values were added to PEAR as shown in Table A-8-1.

Table A-8-1. Effective/remaining useful life values

EUL_IDs	Description	EUL	RUL	Start Date
NonRes-WhlBldg-SEM	Strategic Energy Management (SEM)	5.0	1.67	2020-01-01
ComLau-EffCW-Leased	Leased High-efficiency Clothes Washer (CEE Tiers 1,2,3), 5-year min. term	5.0	1.67	2020-09-24

The first new EUL ID, *NonRes-WhlBldg-SEM*, is consistent with CPUC D.17-09-025 Decision Adopting Energy Efficiency Goals for 2018-2030 and supported by Table 3-26 of the *Energy Efficiency Potential and Goals Study for 2018 and Beyond*.[38] It is being applied retroactively.

The second new EUL ID, *ComLau-EffCW-Leased*, is limited to the 5-year lease term required per the program design; the median lifecycle of a commercial clothes washer is significantly longer than five years.

7.2 EUL values to be expired

Effective Program Year: 2022. Many of the legacy EUL and RUL values for lighting measures will be expired in PEAR. Only those that are currently in use in approved workpapers will remain.

7.3 New technology type

Effective Program Year: 2021. A new DEER database technology type (TechType) was added for commercial heat pump water heaters that are rated using Coefficient of Performance (COP)—*HP_COP*. This TechType belongs to the pre-existing "WaterHtg-eq" technology group for all water heating equipment.

[37] Available at http://www.deeresources.com/files/deerchangelog/pearchangelog.html.
[38] Navigant. *Energy Efficiency Potential and Goals Study for 2018 and Beyond*, 2017, p. 73.

7.4 New support table fields for refrigerants

Effective Program Year: 2022. Six new fields were added for avoided costs of refrigerant leakage calculated using the Refrigerant Avoided Cost Calculator. Going forward these fields will be included in Ex Ante Data (EAD) tables or permutations files submitted for measure approval when the measure contains refrigerant.

Table A-8-2. New DEER and EAD fields for refrigerant NPV avoided costs

New field	Field description
RefrigerantNPVBenefitsPre	NPV avoided costs calculated using the Refrigerant Avoided Cost Calculator for pre-existing baseline equipment
RefrigerantNPVBenefitsStd	NPV avoided costs calculated using the Refrigerant Avoided Cost Calculator for standard baseline equipment
RefrigerantNPVBenefitsMsr	NPV avoided costs calculated using the Refrigerant Avoided Cost Calculator for installed measure equipment
RefrigerantNPVCostsPre	Negative NPV avoided costs calculated using the Refrigerant Avoided Cost Calculator for pre-existing baseline equipment (should be entered as a positive value)
RefrigerantNPVCostsStd	Negative NPV avoided costs calculated using the Refrigerant Avoided Cost Calculator for standard baseline equipment (should be entered as a positive value)
RefrigerantNPVCostsMsr	Negative NPV avoided costs calculated using the Refrigerant Avoided Cost Calculator for installed measure equipment (should be entered as a positive value)

7.5 Additions to DEER2022 load shape tables

Effective Program Year: 2022. The DEER2008 and DEER2011 electric load shape parameters have been uploaded to PEAR. The following three natural gas load shapes have been generalized and uploaded to PEAR: Annual, WinterOnly, and SummerOnly.

8 Transition to eTRM

The eTRM (electronic Technical Reference Manual) launched Version 2.1 in January 2021 in accordance with direction given in the DEER2022 update Resolution E-5082. This year, CPUC staff continues to work on transitioning ex ante data and workpaper review activities to the eTRM environment.

9 Considerations for future DEER update cycles

In this section, we discuss some of the issues that will need to be considered for future DEER update cycles. Most of these changes will require significant assessment and planning efforts before they can be implemented. We will also need to coordinate with the Commission's IT staff, CEDARS staff, CET staff, and the PAs. We will also follow the Commission's internal Data Change Management Protocol which covers procedures to be followed when data system structural changes are needed. If any of these items are determined to be a priority for stakeholders, then we will assess them for inclusion in a future update cycle, but they are currently not scoped or budgeted as DEER update activities.

Commission staff will take further action on these items based on stakeholder comments and feedback.

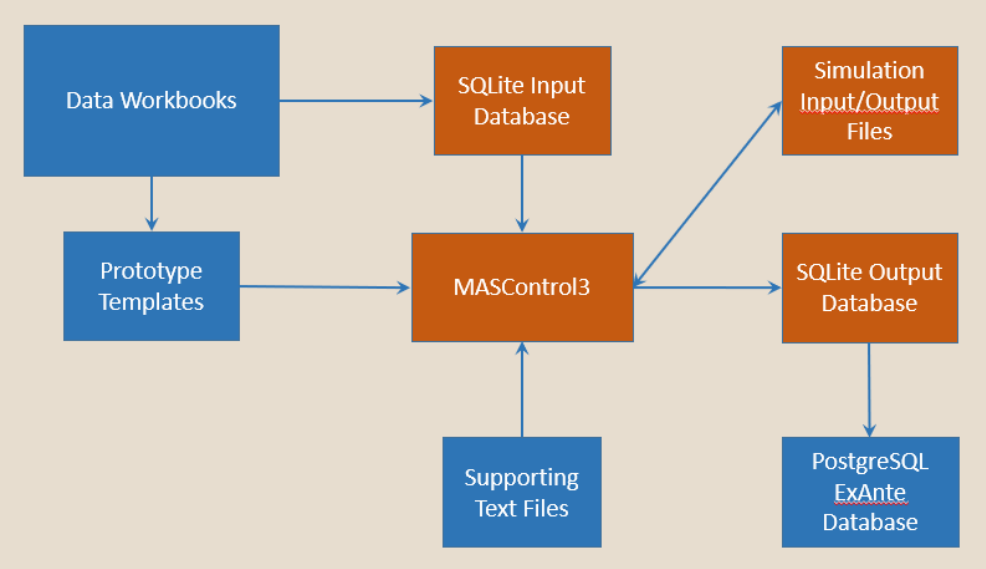
Issues that may be discussed and considered for future DEER updates are provided in the sub-sections that follow.

9.1 EnergyPlus prototypes

Before we can move from eQUEST™ to using EnergyPlus™ to model the energy savings for deemed measures, multiple steps are necessary:

Documentation: Current DOE-2/eQUEST-based building prototypes must be fully documented in a transparent, easily readable, and transportable manner. Currently, the prototype definitions and key parameters are embedded in a multilayered, intertwined, multistage environment shown in Figure A-10-1. The system includes elemental workbooks, library files, and parameterized prototype templates that make it challenging to tease out the key model characteristics for each prototype.
Assessment: Synchronization with CEC prototypes and modeling may be appropriate, as suggested in the recent SCE-Noresco whitepaper.[39]

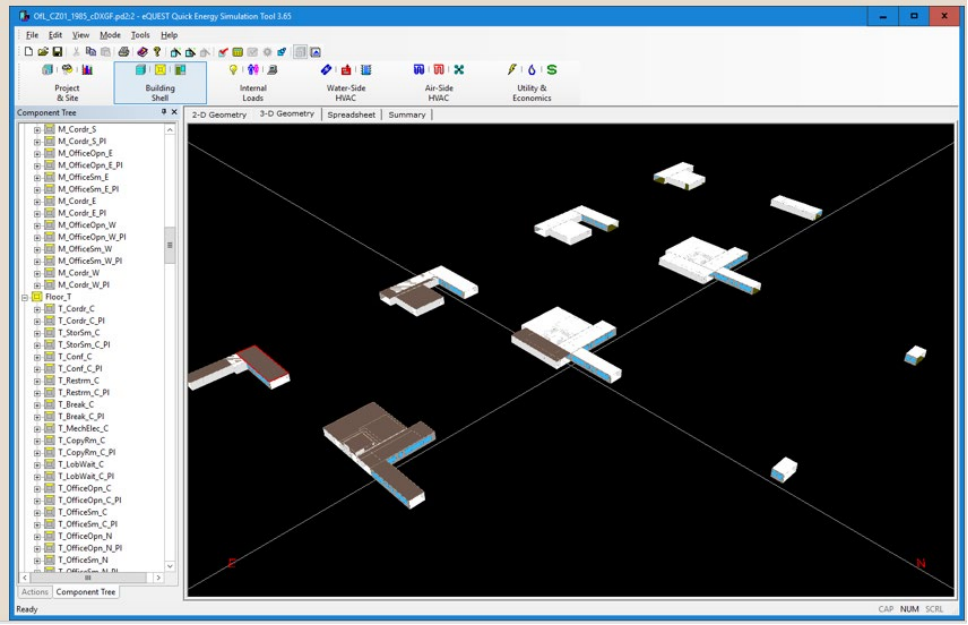
Figure A-10-1. MASControl building energy model development environment



In addition, the last DEER2020 update to the models adopted an "abstract object" approach (e.g., geometry, equipment performance values, operating hours) as illustrated in Figure A-10-2 that shows the model floors are not geometrically stacked which eliminated a whole-building view in eQUEST. This creates an additional complexity to adapting eQUEST prototypes to EnergyPlus and eliminates one pathway for quality control, using the geometrical integrity to visualize correct connection of the spaces, equipment, etc.

[39] "Draft Memo: Needs Assessment for a Universal Set of Prototype Building Models for California Building Stock," NORESCO prepared for SCE, July 23, 2020. Submitted by SCE in response to CPUC request for Scoping Document ideas.

Figure A-10-2. Abstracted geometry view in eQUEST for large office (OfL) prototype



9.2 Future peak demand period definition updates

Effective Program Year: 2023. We will consider adopting one of the 3 options below or exploring other options before the next DEER update cycle (PY2024 in 2022).

- Revisit the time window (4 to 9 pm), weekday and month range used for heat wave definitions. Heat waves are increasing in frequency and duration, and sometimes occur outside of the traditional summer months.
- Drop the peak demand concept and adopt an "avoided cost peak" approach which uses the avoided cost calculator peak costs which occur closer to net peak demand than coincident peak. Peak carbon values may also be a value of interest.
- Develop a more robust and data-driven normalization process that mixes regression of grid data with actual weather. This approach would be closer to what PJM does for their forward-capacity market assessment approach: A regression is run on ISO loads and actual weather data and peak is taken as 90% point of the regression. A similar approach called the "peak probability analysis" is used for deemed measures in Texas, as documented in the Texas TRM.

9.3 CEC CEUS baseline study update delayed

Historically, the Residential Appliance Saturation Study (RASS) and Commercial End-Use Survey (CEUS) studies have been used to revise the building prototype models and reconcile annual energy use, as well as check measures savings and other energy use values within the DEER system. The 2019 RASS was completed, and we are leveraging the data to update the residential prototypes, but the report is still awaiting final CEC approval. The CEUS study requires onsite visits, however, that have been highly impacted by COVID and the study will not be completed until mid-2022, so it may be available for use no sooner than the DEER2024 update.

9.4 Claims reporting errors due to baseline-specific fieldnames

Throughout the CEDARS, CET, and eTRM data platforms, the terms "1st baseline" and "2nd baseline" describe energy savings during either the RUL or EUL periods, depending upon the measure application type (MAT) of a given measure. In reviewing the claims reporting data for 2019, several thousand records were found to contain non-zero 2nd-baseline energy savings for measure application types other than "Accelerated Replacement" (AR). We request feedback on the proposal that fewer mistakes would occur if the fieldnames were changed to resemble more closely those long employed by DEER: standard/code baseline and pre-existing baseline. The proposed shifts are presented in Table A-10-1.

Table A-10-1. Proposed fieldname revisions for CEDARS and eTRM

CEDARS Fieldnames		Comment
Current	Proposed	
UnitkW1stBaseline	UnitkWPreBaseline	Non-zero values for all MATs, depending upon fuel type
UnitkWh1stBaseline	UnitkWhPreBaseline	
UnitTherm1stBaseline	UnitthermPreBaseline	
UnitkW2ndBaseline	UnitkWStdBaseline	Only non-zero for AR MAT[40]
UnitkWh2ndBaseline	UnitkWhStdBaseline	
UnitTherm2ndBaseline	UnitthermStdBaseline	

9.5 Custom projects guidance: improve usability of DEER NTG table

The NTG_2020 table in DEER would benefit from structural changes, particularly in the fields that designate the applicability of the NTG records. If a set of categorical parameters was developed for each table that—when taken together—form a unique identifier for each row and required for all claims submitted to CEDARS, then the ID columns of the tables could be removed. In addition, a hard-to-reach (HTR) flag should be included as one of these categorical parameters in the NTG table.

9.6 Upcoming studies

The following upcoming studies from Appendix E of the CPUC's 2019-2021 EM&V Plan will be reviewed for future DEER updates.[41]

Timing	Sector	Study Title	Study Manager	Study Type	Completion Date

[40] There are a few deemed measure workpapers for which above-standard/code savings are disallowed in some instances (e.g., SCE17LG097.2, SWLG009-01, and SWCR004-01).
[41] "Energy Division & Program Administrator Energy Efficiency Evaluation, Measurement and Verification Plan FINAL, 2019-2021, Version 10," California Public Utilities Commission, 12/30/2020, https://pda.energydataweb.com/api/downloads/2462/2019-21_EMV_Plan_final.pdf. [use hyperlinks] I.e., tiny URLs

2020	Residential	Market Study to Inform Future Whole House Retrofit Programs	PG&E	Market Study	12/31/2021
2020	Residential	California Multifamily Boiler Market Assessment Study - Phase II	SoCalGas	Market Study	6/30/2021
2020	Commercial	Unitary HVAC Market Research	SCE	Market Study	3/31/2021
2021	Residential	Whole Building and Measure Level Savings Estimation: Simple Structural Equation Approach	SCE	Other	10/1/2021