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Date: May 1, 2017

To: Energy Efficiency Proceeding Service List R13-11-005

From: Energy Division, Public Utilities Commission

CC: ALJ Julie Fitch; ALJ Valerie Kao; Pete Skala; Robert Strauss; Katie Wu

Subject: Solicitation for Comments on Scope – Database of Energy Efficiency Resources (DEER)

Commission staff is soliciting comments on the scope of update to the Database of Energy Efficiency Resources (DEER) to be adopted by Resolution in 2017[1]. Comments on the scoping memo are due 05/15/2016.

Commission staff will review comments and send an updated scope by 06/01 in case of substantial changes to the scope.

The timeline for this year's DEER update is:

05/01/2017	DEER Scope Notice
05/15/2017	Party Comments Due
06/01/2017	Scope Update Release (if revised)
07/10/2017	Draft Resolution
07/18/2017	Public Webinar
07/31/2017	Party Comments Due
08/10/2017	Final Resolution

Commission staff has identified the following specific priorities for the upcoming update:

[1] D.15-10-028, Ordering Paragraph 17: "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 change documentation.

1. Updates Based On The Recent Commission Resolution On Existing Baselines[2];
2. Addition of New Measures
3. Updates to Underlying Methodology or Correction of Errors;
4. New Code Update or Code Update Not Covered in Previous DEER Updates;
5. Updates Based on EMV Studies.

Commission staff seeks input to the following questions:

a) Are there additional criteria that the Commission should consider for setting priorities?
b) Are there additional update areas that should be included in **Error! Reference source not found.** and Attachment A that are needed to address the priorities listed above?
c) For any of the update areas listed in **Error! Reference source not found.** and described in more detail in Attachment A, what additional resources or methods should be considered?

In your comments please provide specific recommendations for a particular update area only where the recommended additional resources or methods include data and studies that have been publically vetted and reviewed.

Please post comments to http://www.energydataweb.com/cpuc/search.aspx and search for "DEER Scoping Memo (Revised DEER2017+DEER2018 and DEER2019)" in the Search Text box.

Contact Maryam Mozafari at Maryam.Mozafari@cpuc.ca.gov with any questions or clarifications.

[2] D.16-08-019:

@ 32: "We will adopt a default policy for an existing conditions baseline with exceptions, consistent with AB 802's direction."
@ 47-48: "Commission staff should organize a working group approach to identifying the measure-level treatment for baselines, and if these should vary within sectors or program savings determination categories … The recommendations should be brought back before us in the form of a staff resolution for Commission approval by the end of 2016."
O.P. 4: "Commission staff shall facilitate a working group process and/or utilize an existing working group such as the California Technical Forum to discuss measure-level baseline rules and documentation required to meet the "preponderance of the evidence" standard for accelerated replacement and repair eligible projects. Staff shall bring a resolution for the Commission's consideration by January 1, 2017 with recommendations for resolving these issues."
Resolution E-4818 OP.26 "Commission staff shall make any necessary updates to the DEER savings estimates to reflect the baseline policy summarized in this Resolution."

Table 1 - Draft DEER Update Priorities

DEER Version	Area of Update	Sector		Tech Group					Ex Ante Value		
		Res	Non-Res	Lighting	HVAC	DHW	Envelope	Plug/Proc	UES Baseline	UES Methods	Measure Definition
Updates Based on E-4818 Baseline Resolution											
2017	Clothes washer	X						X	X		
	Refrigerator/freezer	X						X	X		
	Domestic water heater	X				X			X		
	Gas furnace efficiency	X			X				X		
	HVAC cooling efficiency	X	X		X				X		
	Exterior wall insulation	X					X		X		
	Attic insulation	X					X		X		
	Interior lighting	X	X	X					X		X
	Domestic water heater	X	X			X			X	X	X
	Gas boiler efficiency		X		X				X	X	X
	Effective/Remaining Useful Life	X	X	X	X	X	X	X			
	Net-to-Gross	X	X	X	X	X	X	X			
New Measures											
2017	VRF efficiency measures		X		X				X		
Updates Based on Correction of Errors or Methodology											
2017	Water chillers		X		X				X	X	
Updates Based on Code Changes											
2018	Clothes Washer	X						X	X		
Updates Based on Available Evaluation Reports and Findings											
2019	Net-to-gross	X	X	X	X	X	X	X			
	Refrigerant Charge Adjustment		X		X				X		X

Attachment
Revised DEER2017 + DEER2018 and DEER2019 Update Summary

1 Updates due to Baseline Resolution

Commission decision D.16-08-019 formally adopts a policy of existing conditions as the basis for estimating ex-ante savings of deemed energy efficiency measures. D.16-08-019 directs Commission staff to develop a resolution for measure-level treatment of energy savings baselines. Resolution E-4818 was approved by the Commission on March 2, 2017 and directed Commission staff to update DEER to reflect revised baseline policies[3]. Commission staff have reviewed all measures currently included in DEER and summarized areas where ex ante value updates are likely needed based on direction in E-4818.

1.1 Residential Clothes Washer Measures

The residential clothes washer measures were last updated for DEER2016 in response to federal appliance efficiency requirements that went into effect on March 7, 2015. Impacts in the Ex Ante database include values for both Pre-existing and Standard baselines. Measures were evaluated for front loading and top loading machines, and the savings estimates were developed using the MASControl[4] tool which incorporates a building simulation application. The clothes washer pre-existing baseline for DEER2016 was carried over from previous DEER versions.

Current Pre-Existing Baselines

For the front loading machines, the DEER2016 pre-existing baseline used a Modified Energy Factor (MEF) value of 0.78 for building vintages through 2003, and a value of 1.26 for later vintages. For top loading machines, the DEER2016 pre-existing baseline was identical to the code efficiency of 1.29 Integrated Modified Energy Factor (IMEF).

Planned Clothes Washer Measure Updates

A review of the California Lighting and Appliance Saturation Study (CLASS)[5] has shown that clothes washer efficiencies do not vary substantially with building vintage. The average efficiency for existing top loading washers from that study was found to be 1.53 MEF, and the average for front loading washers was 2.20 MEF. The DEER team will perform more detailed analysis of available datasets and consider baseline revisions to reflect typical existing conditions for these measures.

In addition to the pre-existing baseline changes, a review will be made of products that have entered the market since the DEER2016 release to determine whether the range of clothes washer measure tiers should be extended.

[3] E-4818 O.P. 26

[4] MASControl, version 1 of the DEER energy analysis software available from www.deeresources.com

[5] FINAL REPORT WO21: Residential On-site Study: California Lighting and Appliance Saturation Study (CLASS 2012), November 24, 2014, CALMAC Study ID: CPU00095.01.

1.2 Residential Refrigerator and Freezer Measures

The last simulation update to residential refrigerator and freezer measures was for DEER2014. Since then, values were updated in DEER2015 due to changes in the federal energy code and in DEER2017 based on a review of measures offered in the PAs programs as well as changes to typical efficiency tiers recommended by EPA for EnergyStar[6] and by the Consortium for Energy Efficiency[7]. The DEER2015 and DEER2017 updates were done using scaling methods with the DEER2014 basis simulations.

The Ex-Ante database currently does not include impacts relative to a pre-existing condition for residential refrigerators. The CLASS database includes sufficient data to establish pre-existing baselines for each type of refrigerator and freezer that is included in DEER. These values will be utilized with the DEER2014 refrigerator and freezer basis values to calculate impacts for pre-existing baselines. For some refrigerator types, the pre-existing values indicated by CLASS are significantly better than the Federal energy code. The DEER Standard baseline for these types will be set equal to the Pre-existing baseline.

1.3 Domestic Water Heater Measures

Residential

Residential small storage and instantaneous water heater measures were last updated in DEER2015 in response to new Federal code requirements. The impacts were determined using a workbook calculation tool, with impacts calculated for both Pre-existing and Standard baselines. Pre-existing baseline values were carried forward from previous DEER values.

The CLASS database shows only minor differences in water heater efficiencies relative to building vintage, whereas the DEER2015 pre-existing baselines were significantly worse for older vintages than for newer vintages. Thus, the DEER pre-existing baseline for each residential water heater type will be updated using CLASS data averaged across the building vintages.

Nonresidential

[6] "ENERGY STAR Program Requirements Product Specification for Clothes Washers," Version 7.1, United States Environmental Protection Agency, May 20, 2015.
https://www.energystar.gov/sites/default/files/ENERGY%20STAR%20Version%207.1%20Clothes%20Washers%20Program%20Requirements.pdf

[7] "CEE Super Efficient Home Appliance Initiative High efficiency specifications for residential clothes washers," Consortium for Energy Efficiency, March 7, 2015.
https://library.cee1.org/system/files/library/12282/CEE_ResidentialClothesWasherSpec_07Mar2015.pdf

Domestic water heater measures for commercial buildings were last updated in DEER2015 using a workbook analysis approach. This update included only small storage and instantaneous water heaters. Large storage water heaters were last updated in DEER2014 by simulation with the MASControl program. Ex Ante values for commercial water heaters include results for both Pre-existing and Standard baselines.

There are no sources for new pre-existing conditions for commercial water heaters that are known to CPUC staff, so this measure is not slated for update in the current effort.

1.4 Residential Gas Furnace Efficiency Measures

Residential gas furnace measures were updated in DEER2017 in order to include the 2015 and 2017 vintages in the measure impacts. Simulations for DEER2017 were developed using the MASControl2[8] tool which incorporates building simulations, and impacts are provided in the Ex Ante database for both Pre-existing and Standard baselines.

The pre-existing baseline efficiencies for DEER2017 were 78% for vintages through 2014, and 80% thereafter. Furnace efficiencies in the CLASS database averaged 81%, and were fairly constant through the vintages. For this DEER update, the DEER team will perform further review and analysis of CLASS and other available data sources and consider revisions to both the Pre-existing and the Standard baselines.

1.5 HVAC Cooling Efficiency Measures

Residential

Cooling efficiency measures were updated in DEER2017, with simulations run using the MASControl2 program. Results in the Ex Ante database for DEER2017 include impacts relative to both Pre-existing and Standard baselines. Pre-existing efficiency values for DEER2017 were SEER 10 through 2005, SEER 13 from 2006 through 2014, and SEER 14 for 2015 and later.

Cooling efficiencies in the CLASS database vary somewhat with vintage, with the recent vintages being most efficient. Due to significant equipment replacements the average efficiencies in older vintages are very similar to recent vintages. Mid-range vintages tend to be slightly less efficient. Since the survey is five years old, it is likely that these trends have shifted such that the vintage differences have diminished. Given this uncertainty, the DEER team will perform more complete analysis of CLASS data and determine if pre-existing efficiencies need to be updated to higher SEER values.

[8] MASControl2, update to MASControl version 1 of the DEER energy analysis software available from www.deeresources.com

Nonresidential

The last significant update for commercial unitary air conditioners and heat pumps was DEER2015. This update included all AC and HP units below 65 kBtu/hr, and all AC units 65 kBtu/hr and greater, and simulations were performed with the MASControl software. Values in the Ex Ante database include impacts relative to both Pre-existing and Standard baselines. The Pre-existing baselines in DEER2015 were based on historic code requirements. For buildings built before 2002, it was assumed that the air conditioners had been updated to the efficiency level of the 2002 to 2005 vintage.

A review of the California Commercial Saturation Survey (CSS)[9] shows efficiency levels significantly above the DEER2015 Pre-existing baselines. The DEER will perform further analysis of CSS and other available data sources and consider baseline update that reflect typical existing conditions for these measures.

1.6 Residential Exterior Wall and Attic Insulation Measures

Residential exterior wall and attic insulation measures were updated in DEER2017 in response to changes in Title 24-2016 requirements. The update was performed using simulations with the MASControl2 software, and the Ex Ante database includes savings compared to both Pre-Existing and Standard baselines. The pre-existing baselines for DEER2017 are based on historical code requirements at the time of each vintage.

Values from the CLASS database show that pre-existing insulation levels are generally significantly lower than the values used in DEER2017. The DEER team will consider updates to insulation levels that reflect typical existing conditions by vintage.

1.7 Lighting Measures

Commission staff issued a Phase 1 disposition covering all screw-in LED and CFL lamps. The disposition includes direction for updates to energy savings and net-to-gross values[10]. To develop the disposition, Commission staff examined available market sales data, claims history from the PAs along with the applicable data and analysis included in the Commission's evaluation reports. Commission staff will consider incorporating direction from this disposition that is appropriate to be included in DEER for the purposes of updating deemed ex ante values, including savings, net-to-gross and effective useful life, based on existing conditions.

[9] "Commercial Saturation Survey" prepared for the California Public Utilities Commission, Itron, Inc., July 15, 2014.
[10] "Comprehensive Workpaper Disposition for: Screw-In Lamps," California Public Utilities Commission, Energy Division, March 1, 2017

1.8 Commercial Gas Boiler Efficiency Measures

Commercial gas boiler efficiency measures were last updated in DEER2016 by simulations performed using the MASControl program. A significant part of the DEER2016 update was to change the Pre-existing baselines to be forced draft instead of atmospheric draft.

There are no sources for new Pre-existing conditions for commercial gas boilers that are known to CPUC staff, so this measure is not slated for update in the current effort.

1.9 Effective and Remaining Useful Life

Currently, Commission policy recommends a remaining useful life (RUL) equal to one-third of the effective useful life (EUL)[11]. E-4818 includes direction that will likely result in many more measures being classified as early retirement, with savings calculated using the dual baseline approach[12]. Commission staff is concerned that the current default approach of setting the RUL equal to one-third of the EUL may not be reasonable for some measures. A more reasonable RUL may be higher or lower. Commission staff will review available market research, evaluation findings and data as well as previous stakeholder input and consider revisions to RUL values and methods.

1.10 Net-to-Gross

Updates to Address Direction in E-4818

Commission resolution E-4818 establishes a measure level framework for estimating deemed savings above an existing baseline. In some cases, savings are counted above the existing baseline for the entire measure life. In other cases, savings are estimated using the dual baseline approach (such as for accelerated replacement) where savings are estimated above the existing baseline for the remaining useful life (RUL) and above the standard practice or code baseline for the period equal to the effective useful life (EUL) minus the RUL. Historically, measures have been assigned a single net-to-gross value that was not dependent on measure application type (such as early retirement or normal replacement) or baseline (i.e. existing conditions, standard practice or code). However, as the number of measures with savings estimated above existing baselines increases, the likelihood increases that the net-to-gross for the "to-code", or first period savings, is different than the second, or above code savings. Therefore, Commission staff will review all available evaluation

[11] D.12-05-015 @ 347: "we note that DEER contains values for the effective useful life for many technologies and recommend using one-third of the effective useful life as the remaining useful life until further study results are available to establish more accurate values."

[12] For early retirement measures, a "dual baseline" applies which means that an existing baseline is used for the calculation of energy savings for the remaining useful life (RUL) of the removed equipment. At the end of the RUL, the customer would have needed to replace the failed equipment with equipment that reflected current energy efficiency standards and/or industry standard practices. This second baseline is used to calculate the [reduced] savings for the remainder of the effective useful life (EUL) of the measure.

findings and underlying data and consider developing different net-to-gross values for the two different savings values (above code or standard practice versus to code or to standard practice).

Updates to Improve Structure and Clarity

The current NTG table, originally developed for the DEER2008 update, includes applicability fields intended to limit usage of NTG for specific technologies or measure application types. PAs and other parties involved with efficiency program implementation have commented for some time that the structure and nomenclature of the table is often difficult to interpret, especially for new measures supported by new workpapers. Commission staff will undertake a comprehensive review of the current NTG table structure and nomenclature and make revisions to improve the clarity and remove confusion. Except for value revisions specifically discussed in this scoping memo, Commission staff does not intend to update any values in the NTG table. The intent of this effort is to improve the structure and clarity of the table.

2 Updates to Add New Measures

2.1 Variable Refrigerant Flow (VRF) Efficiency Measures

Commission staff issued a Phase 1 disposition covering VRF measures[13]. The disposition includes direction for updates to energy savings values for a limited number of DEER building types and is supported by several documents and updated tools including:

- Assessment of VRF performance in typical commercial buildings
- Research examining the energy impacts of baseline-to-VRF technology differences
- Limited investigation and results of analysis of "three-pronged" tests for fuel switching measures
- Updates to modeling tools to include capabilities for modeling multi-zone VRF systems (with and without heat recovery) and dedicated outside air systems (which are commonly incorporated with VRF systems.)

Commission staff will investigate expanding measure applicability to all DEER building types along with adding all VRF measure definitions and impacts into the DEER database.

[13] "Disposition for: Variable Refrigerant Flow (VRF) Systems," California Public Utilities Commission, Energy Division March 1, 2017

3 Updates Based on Methodology or Correction of Errors

3.1 HVAC Water Chillers

Since the release of the DEER2017 update, PAs have submitted concerns to Commission staff that the updated measure definitions for some classes of HVAC water chillers included part-load efficiency requirements that far exceeded the most efficient chillers currently available in the market. PAs have provided some preliminary market information for chillers that were incented during the most recent program activities. Commission staff will examine the DEER2017 measure definitions, available market information on chillers and the current DEER calculation methods and consider revising the measure definitions to include lower part-load efficiency levels.

4 Updates Based on Energy Code

The commercial measures updated for DEER2017 are based on energy code changes, as described in the following sections.

4.1 Residential Clothes Washer

In addition to the baseline change, there is a forthcoming change to the federal standard for top loading clothes washers that will go into effect on 1/1/2018.

5 Updates Based on EM&V Studies

5.1 Net-to-gross Review

The primary focus for updates based on EM&V will be the examination of NTG updates needed to address Commission direction to update many savings calculations to be based on existing conditions (see Section 1.10, above). In addition to the update to address direction included in E-4818, Commission staff will perform a complete review of all recent EM&V findings and underlying data and update any remaining NTG values where EM&V findings indicate a substantial difference from current DEER values. Below table list the EM&V studies available for review.

Impact Evaluation of 2015 Upstream HVAC Programs (HVAC 1)
Impact Evaluation of 2015 Commercial Quality Maintenance Programs (HVAC3)
Year 2 Study of HVAC4 Deemed Measures Uncertainty
Laboratory HVAC Testing Research for 2013-14 (HVAC5)
Impact Evaluation of 2015 Upstream and Residential Downstream Lighting Programs
2015 Nonresidential Downstream ESPI Deemed Pipe Insulation Impact Evaluation
2015 Nonresidential Downstream ESPI Deemed Sprinkler Impact Evaluation
2015 Nonresidential Downstream ESPI Deemed Pool Cover Impact Evaluation
2015 Nonresidential ESPI Deemed Lighting Impact Evaluation

5.2 Non-Residential Refrigerant Charge Adjustment

HVAC-5 included laboratory investigations of refrigerant charge adjustments and how those adjustments affect capacity and efficiency of package HVAC equipment. The nonresidential refrigerant charge adjustment measures were last revised for DEER2011. The DEER team will review the findings from HVAC-5 and revise DEER measure definitions and savings estimates as needed.