"DEER2017 and DEER2018"[1] Update - Solicitation for Comments on Scope

California Public Utilities Commission, Energy Efficiency Branch
June 1, 2016

Commission staff is soliciting comments on the draft scope of the 2017 and 2018 update to the Database of Energy Efficiency Resources (DEER) to be adopted by Resolution in 2016[2].

Comments on the scoping memo are due on 06/10/2016.
Commission staff will review and send an updated scope by 06/17 in case of any changes.

The timeline of this year's DEER update is:

06/01/2016	DEER 2017+18 Scope notice
06/10/2016	Party Comments (on Scope) Due
06/17/2016	Scope Update Release (if revised)
07/11/2016	DEER 2017+18 Draft Resolution Release
07/20/2016	DEER 2017+18 Draft Workshop
08/08/2016	Party Comments (on Updates) Due
08/18/2016	DEER 2017+18 Final Resolution Release

Commission staff has identified the following specific priorities when determining updates for DEER2017 and DEER2018.

1. New Code Update or Code Update Not Covered in Previous DEER Updates: Recent code updates are the highest priority as these are needed to ensure that code and Industry Standard Practice baselines are properly defined.
2. Updates to Underlying Methodology: The DEER Update will focus on updates and improvements to simulation and modeling methodologies to reflect latest research results.
3. Broad Updates with Applicability to DEER and non-DEER Measures: The DEER update will focus on revisions with broad application across all measures.
4. Updates that Affect Large Portfolio Contributions or Large Measure Counts: The DEER update will focus on updates that result in revisions to a majority of savings and other cost effectiveness values in terms of overall portfolio contribution as well as total measure counts.

[1] The DEER Update will include measures that are effective 1/1/2017 as well as measures effective 1/1/2018. Measures will be properly flagged in the database so it's easy to identify values for 2017 versus 2018 planning and/or claims.

[2] 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.

The DEER team is considering the updates described in Table 1 with added detail as found in Attachment A. Note that updates may not be comprehensive. Specifically, depending on the available information and resources, not all ex ante values may be updated for a particular measure group. For example, the DEER team may update only Unit Energy Savings (UES) values for a particular measure group.

Commission staff seeks input to the following questions:

1. Are there additional criteria that the Commission should consider for setting priorities?
2. For any of the update areas listed in Table 1 and described in more detail in Attachment A, what additional resources or methods should be considered?
3. Are there additional update areas that should be included in Table 1 and Attachment A that are needed to address the priorities listed above? What resources or methods should be utilized for any additional update areas?

In your comments please provide specific recommendations for a particular update area only if the recommended additional resources or methods include data and studies that have been publically vetted and reviewed. Due to the limited timeline for this years' update only *critical* additional measures will be considered.

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

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

Table 1 - Draft DEER2017 and DEER2018 Update Priorities

Area of Update	Justification for Update / Approach and Source	Reference							Sector					Tech Group					Ex Ante Value					
		Codes	Ex Post	Market	ISP	Custom	Workpaper	Calc Methds	Cross	Res	Com	Ind	Ag	Lighting	HVAC	DHW	Envelope	Plug/Proc	UES	Load Shape	EUL/RUL	NTG	Cost	GSIA
A. Updates based on Code Requirements																								
1. Residential Updates																								
Roof Insulation	2016 Title-24 , model parameters	X								X							X		X					
Framed Wall U-value		X								X							X		X					
Duct Insulation		X								X					X				X					
Whole House Fan	2013 Title-24 , model and methodology	X						X		X					X				X	X				
Attic Radiant Barrier	2003 Title-24 , model and methodology	X						X		X							X		X					
Window Model	Title-24 code compliance standards, model and methodology	X						X		X							X		X					
Residential Vintage Definitions	2016 Title-24 , methodology	X						X		X									X					
Residential HVAC Calibration	Methodology update required based on changes listed above							X		X					X									
Lighting HVAC Interactive Effects								X		X				X					X					
2. Non-Residential Updates																								
Package HVAC Integrated Energy Efficiency Ratio (IEER)	2016 Title 24 and federal standards, revised measure definitions based on code minimum EER and IEER requirements, update model parameters based on code compliant performance data	X						X		X	X				X				X					
Water Chiller full load efficiency (kW/ton) and Integrated Part Load Efficiency (IPLV)	2016 Title 24 standards, revised measure definitions based on code minimum full-load and IPLV requirements, update model parameters based on code compliant performance data	X				X	X				X				X				X					
Linear fluorescent lighting code baseline	Title 24 lighting power density restrictions, documentation published by the CEC; updated measure baselines	X									X			X					X		X			
B. Updates Based on Corrections to Error																								
Residential Lighting Use Profile	Alignment to previously published documentation , model parameters update		X					X		X				X						X				
Residential HVAC sizing								X		X					X				X					

Area of Update	Justification for Update / Approach and Source	Reference							Sector					Tech Group					Ex Ante Value					
		Codes	Ex Post	Market	ISP	Custom	Workpaper	Calc Methds	Cross	Res	Com	Ind	Ag	Lighting	HVAC	DHW	Envelope	Plug/Proc	UES	Load Shape	EUL/RUL	NTG	Cost	GSIA
Building shell insulation measures								X		X							X		X					
C. Updates Based on Evaluation Results																								
Residential refrigerant charge adjustment	Update based on available evaluation data , model parameters update		X							X					X				X					
Duct sealing plus refrigerant charge adjustment			X							X					X				X					
Lighting Early retirement second baseline	Standard practice exceeds code, codes and standards research, manufacturer sales data, measure baselines update	X			X			X	X					X					X			X		

Attachment A

Description of Areas of Planned Updates for DEER2017 and DEER2018

Contents

Updates based on Code Requirements

There are a number of updates to the assumptions and methods based on adopted changes to the California Title 24 Building Standards (2016 Title 24) which were adopted in 2015 and become effective 1 January 2017. Additionally, some previously effective code changes that were not correctly or appropriately considered in past DEER versions are proposed to be included or corrected. All of these change impact the "code baseline" value results used in measure savings calculations. Some of these changes also impact the measure case value results (the model result for the building with the measure installed).

Residential Updates

Roof Insulation Requirement

A new section in the 2016 version of Title-24 requires roof insulation for residential attics that contain heating and cooling ductwork. Since the DEER single family and multifamily prototypes both have ducts in the attic, this requirement will be applied to both of those building types for DEER 2017. The requirement is applicable to climate zones 4 and 8 through 16, and the path that applies continuous R-8 insulation above the roof rafter will be implemented.

Framed Wall U-value

The 2016 Title-24 increases the insulation level required in exterior walls for all climate zones except CZ06 and CZ07.

Duct Insulation

The 2016 Title-24 increases the required level of duct insulation in most climate zones.

Whole House Fan

Whole house fans became a Title-24 code requirement in 2015 for single-family homes in climate zones CZ08 through CZ14. Whole house fans were modeled as a measure in DEER2005, but have not been added to the pre-existing or code case prototype DEER models. The investigation of whole house fan modeling necessary to meet the Title-24 requirement in the DEER single-family prototypes has led to the identification of a number of changes needed for the specification of whole house fan parameters including:

- revised flow rate to align with Title-24 requirements;
- revised fan power based on current standard practice;
- updated control sequence based on current standard practice;
- Increase in the amount of thermal mass in the residential models to better account for the transient effects of lower nighttime space temperatures possible with whole house fan controls.

To ensure accurate whole house fan results based upon the above considerations the simulation tool will be updated to improve modeling capabilities for whole house fan controls.

The whole house fan measure in the current release of DEER was developed for DEER2005 (MeasureID = D03-441). This measure will be updated to account for the code requirements noted above.

Attic Radiant Barrier Requirement

Radiant barriers in attics of single-family and multi-family houses have been a Title-24 code requirement for most climate zones since 2003. These requirements were not previously accurately included into DEER residential prototypes due to model limitations that did not allow separate specification of inside roof surface irradiative and convective properties. Updates to the simulation program and DEER prototypes will be made to include the modeling of radiant barriers in all cases as required by code. The importance of this update was heightened, and deemed necessary to the accuracy of the DEER values considering the changed and new roof insulation, duct insulation and whole house fan code requirements listed above.

Window Model

All previous DEER modeling methods have incorporated simplified overall heat loss and solar gain models for glazing (the use of shading coefficients and center-of-glass u-values). This method was in agreement with the method used by the CEC in their development of Title 24 standards as well as CEC approved methods for calculating window impacts when using the performance method for showing compliance with Title 24. The DEER team demonstrated in previous work that the simplified glazing calculation method, for multi-pane and coated window glazing's will overestimate solar gains at non-normal (90 degree) angles of incidence, which, in turn, may overestimate savings for measures that reduce cooling energy usage (such as high efficiency air conditioners) and underestimate savings from measures that reduce heating energy (such as high efficiency furnaces). The DEER2017 update will replace the simplified heat loss and gain methods for windows with a more accurate layer-by-layer method that considers specific fenestration performance characteristics such as opaque frame thermal performance, impacts of different coatings and tints and solar gain with respect to angle of incidence. This method is consistent with the NFRC window rating method upon which code requirements are based. This update is also consistent with trends throughout the energy modeling industry to adopt more robust fenestration calculation methods. For example, the CEC recently adopted a simulation tool for residential compliance (CBECC-Res) that also uses a layer-by-layer approach to window modeling.

Residential Vintage definitions

A residential building vintage for 2017 is being added as defined by the new code requirements described above. DEER2017 will develop new vintage energy impacts and unit energy savings (UES) values for all residential measures impacted by these changes (i.e. all measures except exterior lighting measures). The recent residential building vintage definitions will be updated based on how code updates impacted the building characteristics. The table below shows DEER2017 updated residential vintage definitions.

Vintage	Definition
1975	pre-1978
1985	1978 - 1992
1996	1993 - 2001
2003	2002 - 2005
2007	2006 - 2009
2012	2010 - 2014
2015	2015 - 2016
2017	2017

In addition to the new vintage impacts, energy impacts and UES values based on the modeling changes described above will be developed for all building vintages and rolled up into the "Existing" building vintage result for each measures. An assessment of the magnitude of changes to the existing vintage values will be made and the DEER team will make a recommendation to either update existing vintage results for DEER2017 or retain the older results.

Residential HVAC Calibration

Changes to the modeling described above will require that the base-case building prototypes, which vary by climate zone and building vintage, be re-calibrated to the heating and cooling energy use "targets" derived for RASS residential building population data. Calibration of the prototypes assures that the heating and cooling energy aligns with the energy target values that relate to actual billing data. The calibration process adjusts the heating and cooling thermostat setpoints and the building shading levels as well as the weights used to roll-up the results of the multiple-thermostat prototypes.

Lighting HVAC Interactive Effects

Once all updates are complete, the cumulative changes to residential lighting HVAC interactive effects factors (IEFs) will be investigated. If the IEF values change significantly a new workbook of residential lighting HVAC interactive effects will be published; otherwise the team will recommend retaining the older values.

Non-Residential Updates

HVAC Equipment Measures – Alignment with California Title 24 and Federal Minimum Efficiency Requirements

Title 24 requires air-cooled package HVAC air conditioners and heat pumps greater than 65 kBtuh and all water chillers (except absorption chillers) to meet both minimum full-load and minimum integrated part-load efficiency requirements. Additionally, program administrators offer incentives that allow the

customer to choose which efficiency metric, either the full- or part-load value, as the basis for the deemed savings and incentive. Previous versions of DEER did not include part-load efficiency values for heat pumps or chillers, and the part-load values for air conditioners were based on typical market averages rather than the characteristics of the simulated equipment. DEER2017 will include an update to all measure definitions to include reference full- and part-load efficiency requirements for both the baseline and measure technologies. These revisions will bring the DEER measure definitions in line with all minimum efficiency requirements that will be in place on January 1, 2017. Furthermore, DEER will be revised to include scale-able values and methods that facilitate the PAs' development of non-DEER measure definitions without having to develop new savings values within workpapers.

Air Conditioning System Measures

The 2016 Title-24 Energy Standard has new requirements for the annualized Integrated Energy Efficiency Ratio (IEER) for packaged air conditioning equipment. The full load efficiency values (EER) are unchanged from the previous standard. The IEER values reported for the air conditioning baselines and measures for the DEER 2016 version were based on a survey of actual equipment available in the market place. These market average values provided typical IEER values for each efficiency Tier. For previous DEER releases, the IEER requirements of the Title 24 standard at the time were relatively low. Based on the market average IEER values, it was clear that the DEER Standard level models would exceed these requirements. With the increased stringency of the energy code, it is no longer certain that the IEER values of the DEER standard models are in compliance. Therefore, an activity is underway to determine the appropriate rated IEER values for each of the DEER standard and measure cases. If any of the current DEER air conditioning system models fail to comply with the 2016 Title-24 standard, then new models will be developed to replace them.

Water Chiller Measures

Since 2013, Title 24 has required water chillers to meet minimum full-load efficiency (kW/ton) and minimum integrated part-load efficiency (IPLV) values. Additionally, Title 24 also included alternate efficiency paths for chiller types. Path A requires fairly high full-load efficiency values. Path B sets lower minimum full-load efficiency requirements than Path A, but requires much higher minimum integrated part-load efficiency values compared to Path A. Previous versions of DEER included measures based only on Path A efficiency requirements and did not include IPLV values in the measure definition.

Currently, PAs offer incentives in their deemed incentives in the following four categories:

1. Exceed Path A requirements for full-load efficiency
2. Exceed Path A requirements for integrated part-load efficiency
3. Exceed Path B requirements for full-load efficiency
4. Exceed Path B requirements for integrated part-load efficiency

The current version of DEER only supports measures defined using Path A full-load efficiencies. DEER2017 will include updated measure definitions that meet specific measure performance criteria.

For example, a measure definition could be a water cooled centrifugal chiller that exceeds Path B full-load efficiency requirements by 15%. Additionally, DEER will include scale-able savings values for each of the four classes of measures listed above so that PAs can develop alternative non-DEER efficiency levels for chillers without having to develop new savings values in workpapers.

Updates Based on Corrections to Errors

Lighting: Linear Fluorescent Code Baseline

The CEC's analysis to support revisions to 2013 Title 24 lighting power restrictions examined commonly available T8 lamps and ballasts. The maximum lighting power density (LPD) values included in Title 24 were based on the lighting power values resulting from the use of higher output lamps and lower output ballasts (thus reducing the LPD values) than previous versions of Title 24. The DEER team overlooked this CEC analysis that should have been considered for updating code baselines for linear fluorescent measures in the 2016 DEER update. For DEER2017 the DEER team will examine the CEC analysis and underlying data and propose appropriate updates to code baseline values for linear fluorescent technologies used in both interior and exterior applications.

Lighting Use Profile

Analysis supporting DEER2011 resulted in revised lighting usage profiles, annual operating hours (HOU) and coincident demand factors (CDF). DEER2011 included updates to HOU and CDF values, which changed the overall savings values. However, the DEER2011 and subsequent updates by mistake neglected to include the lighting profiles advertised in the DEER2011 update documentation into the DEER prototypes. DEER2017 will include revisions to the interior lighting use hourly and monthly profiles based on data used to update the lighting HOU and CDF values in DEER2011.

Residential HVAC sizing

DEER2016 incorrectly included commercial HVAC sizing factors in the residential HVAC analysis, inadvertently increasing the supply air flow rate and cooling capacity. The sizing parameters will be corrected so that the flow rate and capacities align with the documented values. This correction impacts all central air-conditioner and heat pump equipment measures.

Building shell insulation measures

During the investigation of the above listed Title 24 standards, errors were discovered in the specification of some existing ceiling and wall insulation measures. The error associated with measures that add insulation to existing ceiling insulation levels caused energy savings values to be underestimated in most vintages and climate zones. Savings for the wall insulation measure were underestimated in all cases. A total of four measures will be updated. The updated methodology will also be used to add higher level ceiling insulation measures as requested by program administrators.

Updated Measures:

MeasureID	Description
RB-BS-BlowInIns-R0-R13	Wall Blow-In R-0 to R-13 Insulation
RB-BS-CeilIns-VintR-AddR11	Ceiling - Add R-11 batts on top of vintage-specific existing insulation
RB-BS-CeilIns-VintR-AddR19	Ceiling - Add R-19 batts on top of vintage-specific existing insulation
RB-BS-CeilIns-VintR-AddR30	Ceiling - Add R-30 batts on top of vintage-specific existing insulation

Additional Measures:

MeasureID	Description
RB-BS-CeilIns-VintR-AddR38	Ceiling - Add R-38 batts on top of vintage-specific existing insulation
RB-BS-CeilIns-VintR-AddR44	Ceiling - Add R-44 batts on top of vintage-specific existing insulation
RB-BS-CeilIns-VintR-AddR50	Ceiling - Add R-50 batts on top of vintage-specific existing insulation

Updates Based on Newly Available Evaluation Results

These changes will be included in DEER2018 for use commencing on 1/1/2018.

Refrigerant Charge Adjustment

DEER2014 includes four refrigerant charge measures based on scenarios derived from monitored data along with a weighted measure that combines the results of the four scenarios into a single measure. The measure parameters will be updated based on more recent EM&V data and a new weighted refrigerant charge measure will be created from these updated measure results.

Updated Measures:

MeasureID	Description
RE-HV-RefChrg-Dec-high	Decrease Refrigerant Charge - High (>= 20% rated charge)
RE-HV-RefChrg-Dec-typ	Decrease Refrigerant Charge - Typical (< 20% rated charge)
RE-HV-RefChrg-Inc-high	Increase Refrigerant Charge - High (>= 20% rated charge)
RE-HV-RefChrg-Inc-typ	Increase Refrigerant Charge - Typical (< 20% rated charge)

Res-RefrigCharge-wtd	Adjusted Refrigerant charge

Duct Sealing and Refrigerant Charge Adjustment

The update to the refrigerant charge adjustment measure will be incorporated into the combined duct sealing plus refrigerant charge adjustment measure that is currently in DEER.

Lighting Early Retirement Second Baseline

Early retirement measures require savings to be calculated above the pre-existing equipment energy use for the Remaining Useful Life (RUL),Then, additional savings are calculated above a code or standard practice baseline for the rest of the Effective Useful Life (EUL). With rapid improvements in technology and equally rapid reductions in cost, standard practice is exceeding code minimum requirements in some specific cases. The DEER team will examine all available evaluation results and data along with added market activity information from secondary sources (such as Codes and Standards research and proposals, NEMA sales data, etc.) and propose revised second period baselines for early retirement measures. These revisions will likely take the form of “mixtures” of different technologies as is currently done for some screw and pin based lamps.