DEER2015 Update Comments

SCE Comments on Packaged and Split Air Conditioning Equipment

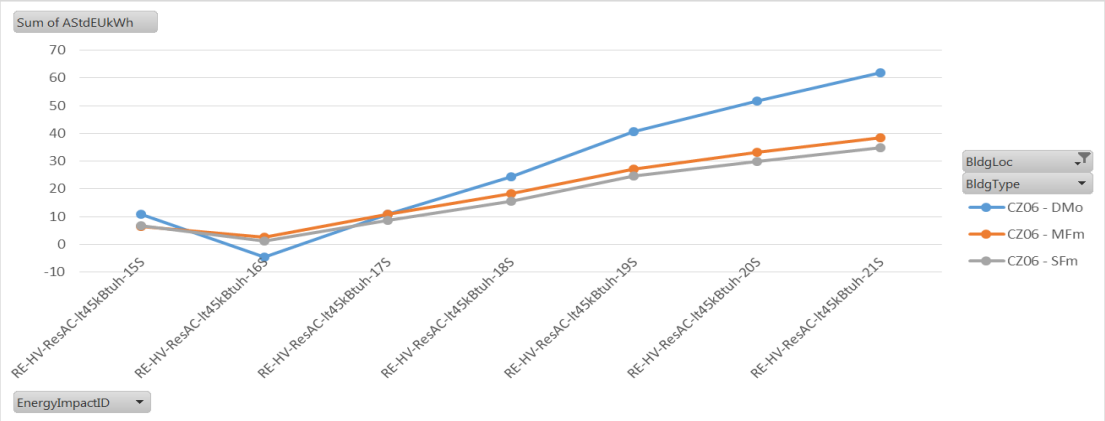
Process comments:

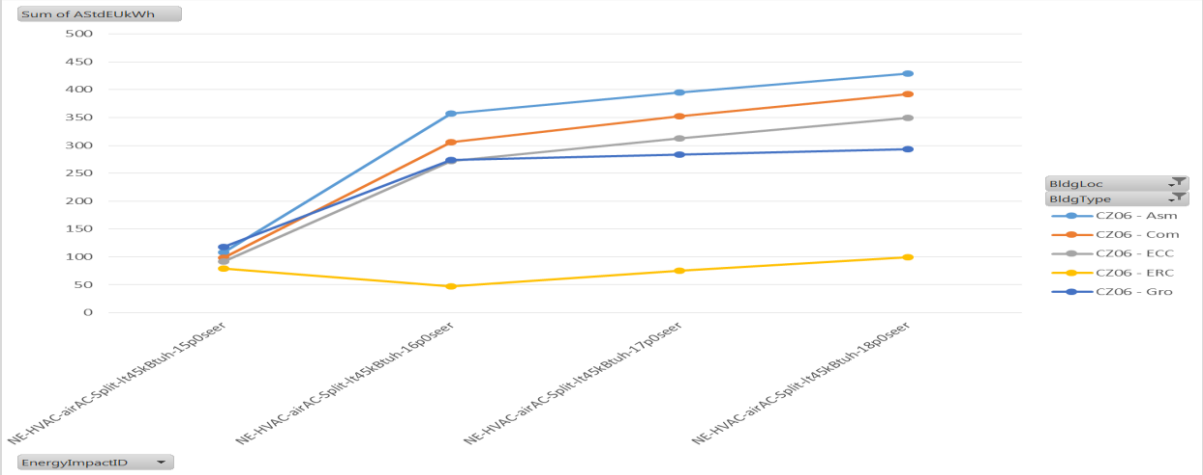
1. Coordinate effort and map work steam to decrease errors, improve statewide consistency, and save money and resources
2. CPUC staff consider providing notification of any updates made to DEER and create a central log of database updates providing related documentation; log would capture changes to workbooks and related items
3. CPUC staff to update supporting documentation through MASControl

Technical comments:

1. DEER 2015 measures for residential and non-residential air conditioners less than 45kBtuh. A parallel exercise in these two categories conducted for comparison's sake yielded different energy savings trends when a similar output was expected. In the graph directly below, the 16 SEER units have lower savings (negative savings for DMO) than the 15 SEER units for residential split AC system measures that are less than 45 kBtuh. The graph further below, for non-residential split AC system measures less than 45 kBtuh, shows 16 SEER units as having higher savings than 15 SEER units. Since both measures illustrated below are essentially the same SEER-rated air conditioner units, it is unclear why the energy saving trend from 15 SEER to 16 SEER units differs by sector. **SCE asks that CPUC Staff provide explanation for the difference in output.**

Residential SEER-rated Air Conditioners less than 45 kBtuh





SEER-rated Split AC less than 45.xlsx

Response:

The reason for this difference stems from the fact that supply air fans operate continuously for commercial buildings, and they cycle with cooling and heating for residential buildings. The annual performance of the 16 SEER systems depends heavily on the two speed fan operation; the full load efficiency for the 16 SEER systems is actually lower than for the 15 SEER systems. Since the fan operates significantly more hours per year for the non-residential buildings, there is much greater possibility for savings for those buildings.

Commercial SEER-rated Split Air Conditioners less than 45 kBtuh

For additional detail, please refer to this attachment.

2. Application of DX equipment vintage updates in DEER 2015. Specifically, SCE is not clear if vintage specification updates on DX equipment have already been implemented. We currently cannot trace if these updates have already been implemented, and if they are consistent with the CPUC document "Residential and Commercial SEER Rating by Vintage**." SCE asks that CPUC Staff expand and clarify vintage specification updates as intended.**[i]

DX equipment Vintage specification update

Mobile homes prior to 1995 are upgraded to SEER 10 from SEER 6.5. There are no other vintage changes for residential buildings.

			Building Vintage						
Residential - SEER rating by vintage			Before 1978	1978 - 1992	1993 - 2001	2002 - 2005	2006 - 2009	2010 - 2013	2014 - 2015
	DEER2014	SFm, MFm	10	10	10	10	13	13	13
SEER-rated Air Conditioners	DEER2015	SFm, MFm	10	10	10	10	13	13	13
SEER-rated Heat Pumps			Before 1976	1976 - 1994	1995 - 2005	After 2005			
SEER-rated Evap-cooled AC	DEER2014	DMo	6.5	6.5	10	13			
	DEER2015	DMo	10	10	10	13			

For SEER-rated split and packaged measures in commercial buildings, the two oldest vintages are updated to SEER 10 and SEER 9.7, respectively.

		Building Vintage						
Commercial - SEER rating by vintage		Before 1978	1978 - 1992	1993 - 2001	2002 - 2005	2006 - 2009	2010 - 2013	2014 - 2015
SEER-rated Split Air Conditioners	DEER2014	8.5	9.5	10	10	13	13	13
	DEER2015	10	10	10	10	13	13	13
SEER-rated Packaged AC	DEER2014	8.3	9.3	9.7	9.7	13	13	13
	DEER2015	9.7	9.7	9.7	9.7	13	13	13

For commercial packaged, EER-rated measures, the pre-2002 vintages are updated to the 2002 vintage specification. In addition to the efficiency rating changes, for units greater than 110 kBTU/hr, the oldest vintage (before 1978) includes an economizer in DEER2015.

			Building Vintage						
Commercial Packaged Air Conditioners - EER rating by vintage			Before 1978	1978 - 1992	1993 - 2001	2002 - 2005	2006 - 2009	2010 - 2013	2014 - 2015
65 to 110 kBTU/hr	DEER2014		7.7	8.9	8.9	10.1	10.1	11	10.8
	DEER2015		10.1	10.1	10.1	10.1	10.1	11	11
110 to 135 kBTU/hr	DEER2014		7.7	8.9	8.9	10.1	10.1	11	10.8
	DEER2015		10.1	10.1	10.1	10.1	10.1	11	11
135 to 240 kBTU/hr	DEER2014		7.7	8.3	8.3	9.5	9.5	10.8	10.8
	DEER2015		9.5	9.5	9.5	9.5	9.5	10.8	10.8
240 t0 760 kBTU/hr	DEER2014	Single-zone	7.7	8.3	8.3	9.3	9.3	9.8	9.8
	DEER2015	Single-zone	9.3	9.3	9.3	9.3	9.3	9.8	9.8
	DEER2014	Multi-zone	7.7	8.5	8.5	9.5	9.5	10	10
	DEER2015	VAV	9.5	9.5	9.5	9.5	9.5	10	10
greater than 760 kBTU/hr	DEER2014	Single-zone	7.7	8.0	8.0	9.0	9.0	9.5	9.5
	DEER2015	Single-zone	9.0	9.0	9.0	9.0	9.0	9.5	9.5
	DEER2014	Multi-zone	7.7	8.2	8.2	9.2	9.2	9.7	9.7
	DEER2015	VAV	9.2	9.2	9.2	9.2	9.2	9.7	9.7

Response:

The vintage-specific HVAC simulations that represent the pre-existing technology case are specified for each measure as documented in the referenced table. The measure definitions in both the supplied workbook "2015DEER-PackagedAndSplitDXUpdate-30Oct2014.xlsx" and in READI include a description of the pre-existing efficiency level for each building vintage. The workbook also includes a tab called "Technologies" that specifies the HVAC parameters used for each HVAC measure group; the column labeled "Case" identifies the Measure, Code/Standard as well as vintage-specific technologies used in the measure definitions. The DEER team can provide additional assistance to PA engineers in tracking these specifications in the simulation models produced by the DEER2015 version of MASControl if needed.

3. IEER-rated measures updates specifically affecting larger rated DX system efficiency measures as described in "DEER2015 Commercial EER-rated packaged Air Conditioners Technologies" and related energy modeling capability within the DOE2 energy modeling prototype. Our questions and/or clarifications are as follows:
   - For large systems (e.g. > 240 kBtu/h), does performance documentation account for multi-compressors and refrigerant circuits? Can these parameters be identified within the corresponding energy simulation prototype and/or ".inp" file?
   - Is performance documentation mapped so that energy impacts can be evaluated on large systems (e.g., > 240 kBtu/h) with (and identifying) number of compressors and circuits? Is there documentation developed by the DEER team establishing number of compressor and/or circuits assumptions used to develop EER and/or IEER efficiency ratings?
   - Is there an IEE input parameter in the energy simulation prototype and/or ".inp" file that can be used for enabling parametric runs in terms of IEE?

SCE asks that related documentation be updated by CPUC Staff to address the questions above.

Response:
The performance maps all assume a unit that is based on four equally-sized compressors controlled by an on-board digital controller that provides sequential compressor staging. This was found to be the most common configuration of systems in this size range based on published manufacturers' literature. The number of assumed circuits is embedded in the EIR_fPLR and Closs_fPLR part-load performance curves. Adequate manufacturer's data were not available to develop performance maps for units with higher numbers of circuits (typically units with nominal capacity greater than 65 tons). Some units at the low end of this capacity range (20 ton units) use 3 compressors, but most (25 tons or greater) were found to use 4 compressor circuits. These differences were found to be mostly capacity based rather than manufacturer based. In general, DEER analyses are based on general capacity classes, seeking to identify typical conditions within that class, and do not account for minor capacity related differences that may occur within a given capacity class. The number of circuits is dependent on the system design, which was accounted for in the development of performance maps. As such, the typical physical arrangement used in the development of performance maps would match those used to develop EER and IEER manufacturers' ratings. Note that simulations and performance maps are based on best available information of typical field installation conditions (rated air flow and external static pressure). These invariably differ from those used to establish AHRI ratings.

The performance maps do account for multi-compressor operation via a combination of the EIR_fPLR and Closs_fPLR curves. The analysis accounts for multi-stage compressors differently depending on whether the air handler is a packaged VAV system or a packaged single zone system. For the packaged VAV system, the compressors in the model operate down to about 17% of nominal capacity via sequential cycling. The sequential cycling of all compressors is approximated by the EIR-fPLR curve. Below that point the unit is assumed to run with one compressor operating under hot gas bypass control. This operation is simulated via the Closs-fPLR curve.

The packaged single zone system is based on an assumed two stage operation associated with the most common space thermostat for this type of system (stage-1 and stage-2 operation). The on-board controller cycles the compressors sequentially in response to the thermostat. When the load is above 50% of capacity (Stage 2), the EIR-fPLR curve approximates the staging of two equal sized compressors, each cycling sequentially to meet the load (i.e. the 3rd compressor cycles to meet the load between 50% and 75% load, while the 4th compressor cycles to meet the load between 75% and full load with the 3rd compressor operating at full load). The 1st and 2nd compressors operate continuously under these conditions. When the load is below 50% of capacity, the CLoss_fPLR curve is used to approximate the sequential cycling of the 1st and 2nd compressors. The EIR-fPLR and Closs_fPLR curves also account for the control of condenser fans common to these larger units based on stage 1 or stage 2 operation. The supply air fan cycles between full speed for stage 2 operation and cycles between low-speed for stage 1 operation. Low speed fan operation is assumed to be 66% of design flow - the maximum allowed by code. The fan runs continuously during occupied periods at the speed appropriate to the calculated cooling stage, with low speed fan operation occurring for those times when there is no active cooling required.

The IEER values are not used directly in the simulations. Since they reflect representative annualized efficiencies they are not meaningful in an hourly simulation. Each measure has an IEER level calculated for it, and IEER levels that are different from the IEERs in the measures can be interpolated between the measures.

4. A) After reviewing SFM prototype including Code Case (CB8) and Costumer Average (CAv) cooling (EIR) efficiency for all vintages using SFM-w09-v96-hAC-cCB8-mRE-HV-ResAC and SFM-w09-v96-hAC-CAv-mRE-HV-ResAC tech IDs, it was observe that the Code Case as generated by MASControl retains the same equipment (EIR) efficiency for all vintages (e.g., v75 through v14) – see table below. Can the MASControl application generate code cases on older vintages (e.g., prior 2001, 2001, and/or 2005)? Is the Code Case as generated by MASControl limited to 2008 and/or 2013? Please expand on bases and capability and limitations for generating Code Case by software application.

Response:
The "Code Case" referenced here is the efficiency level that would be installed in the absence of the PA program that installed the measure technology. For DEER2015, the code case is defined by the latest applicable code (State or Federal) and documented on the [Com Technology Summary] and [Res Technology Summary] tabs of the workbook "2015DEER-PackagedAndSplitDXUpdate-30Oct2014.xlsx" where the efficiency tier is specified as "Code". The version of MAScontrol used for this update must use the code case options specified with the "C13" code in order to simulate the code levels associated with the DEER2015 measures. Previous versions of the MASControl software used for DEER2011 and DEER2014 are available from DEEResources.com; these versions generate code case specifications appropriate for DEER2011 and DEER2014 respectively.

The referenced workbook is updated to make the case applicability of the vintage specific technologies more clear.

B) Further, it was observe that the Costumer Average (CAv) cooling (EIR) efficiency as generated by the MASControl is consistent with DEER2015 documentation (e.g., "Residential – SEER rating by vintage") on older vintages (v75 – v03) and newer vintages (v07 – v14) suggesting that DEER SEER-rated by vintage refers to the Costumer Average SEER – see table below. Please expand/clarify and confirm assumption.

Additionally, it was observed that CAv and CB8 are the same on later vintages (e.g., v07 – v14) – see table below. Please expand on reasoning for this assumption.

	Prototype	Vintage	Cooling EIR	Tech ID
Code Case CB8	SFM	v75	**0.2567**	
Cav	SFM	v75	0.3103	
Code Case CB8	SFM	v85	**0.2567**	
Cav	SFM	v85	0.3103	
Code Case CB8	SFM	v96	**0.2567**	SFM-w09-v96-hAC-cCB8-mRE-HV-ResAC
Cav	SFM	v96	0.3103	
Code Case CB8	SFM	v03	**0.2567**	
Cav	SFM	v03	0.3103	
Code Case CB8	SFM	v07	**0.2567**	
Cav	SFM	v07	0.2567	
Code Case CB8	SFM	v11	**0.2567**	
Cav	SFM	v11	0.2567	
Code Case CB8	SFM	v14	**0.2567**	
Cav	SFM	v14	0.2567	SFM-w09-v14-hAC-cCAv-mRE-HV-ResAC

			Building Vintage						
Residential - SEER rating by vintage			Before 1978	1978 - 1992	1993 - 2001	2002 - 2005	2006 - 2009	2010 - 2013	2014 - 2015
	DEER2014	SFm, MFm	10	10	10	10	13	13	13
SEER-rated Air Conditioners	DEER2015	SFm, MFm	10	10	10	10	13	13	13
SEER-rated Heat Pumps			Before 1976	1976 - 1994	1995 - 2005	After 2005			
SEER-rated Evap-cooled AC	DEER2014	DMo	6.5	6.5	10	13			
	DEER2015	DMo	10	10	10	13			
For SEER-rated split and packaged measures in commercial buildings, the two oldest vintages are updated to SEER 10 and SEER 9.7, respectively.									

SCE asks that CPUC Staff clarify and provide reasoning for Code Case (CB8) and Costumer Average (CAv) applicability, clarifying and expanding on material as appropriate in the Technology and Run Definitions sections.

Response:
In order to satisfy the requirements of the DEER database, MASControl needs to be able to simulate each vintage building with the current code level condition for the measure. Thus, while other aspects of the code case building will vary with vintage (e.g. windows & lighting power), the HVAC efficiency parameters will be at the current code level for the code case for any vintage run. The 2008 code was left in MASControl for debugging, but it is not relevant to DEER.

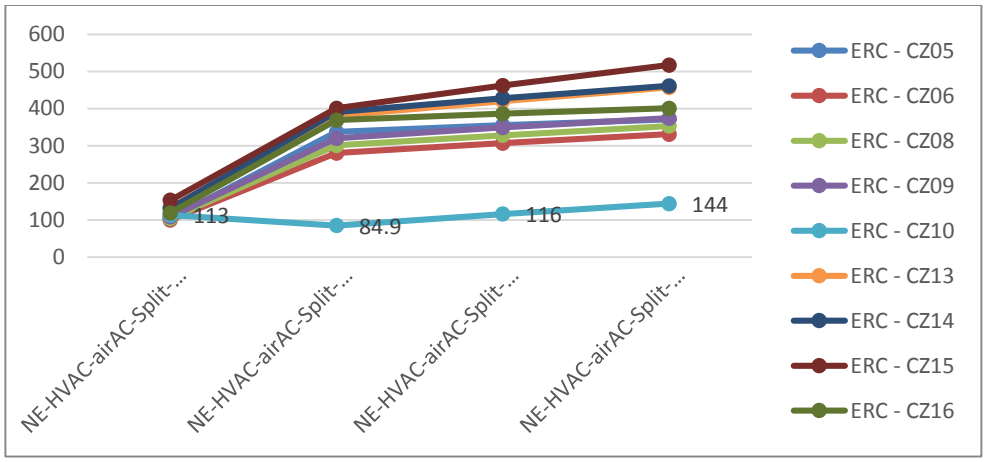
The "SEER rating by vintage" is the same as the Customer Average case in MASControl.

The customer average (often referred to as the "pre-existing") efficiency levels are generally equal to the efficiency that was required by code or was standard practice during a given vintage period. If the code did not change over a range of vintages, then the customer average efficiency will also be constant.

5. ERC CZ10 energy impact values are not updated with two-speed fan operation as defined in the measure definition. **SCE asks that CPUC Staff clarify or update ERC CZ10 energy impact values accordingly.** Reference tables and charts are provided below.

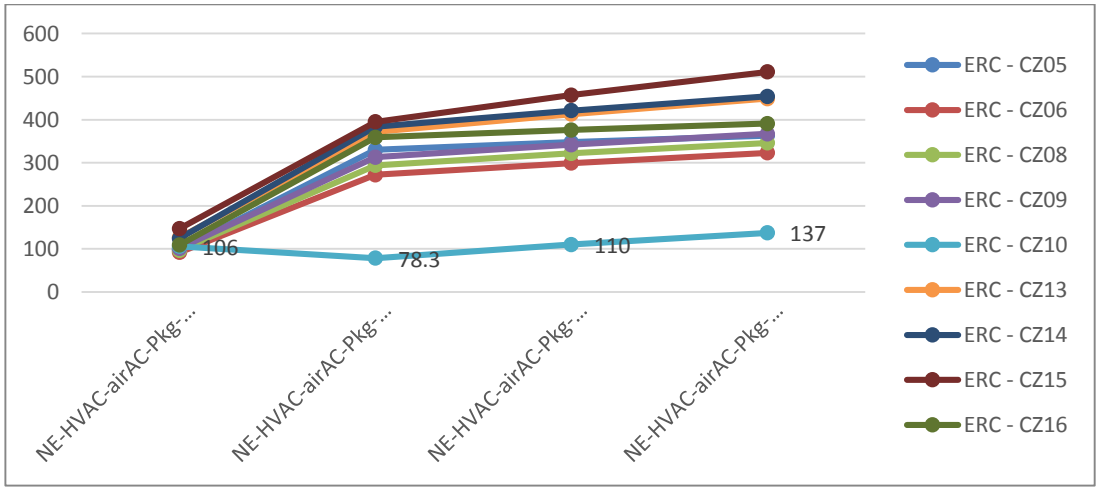
SEER-rated split AC 45 to 55

Sum of AStdEUkWh	Column Labels								
	ERC								
Row Labels	CZ05	CZ06	CZ08	CZ09	CZ10	CZ13	CZ14	CZ15	CZ16
NE-HVAC-airAC-Split-45to55kBtuh-15p0seer	104	100	104	108	113	134	131	153	119
NE-HVAC-airAC-Split-45to55kBtuh-16p0seer	337	280	301	320	84.9	380	391	401	369
NE-HVAC-airAC-Split-45to55kBtuh-17p0seer	355	307	328	349	116	420	428	462	386
NE-HVAC-airAC-Split-45to55kBtuh-18p0seer	371	331	353	374	144	457	461	517	401
Grand Total	**1167**	**1018**	**1086**	**1151**	**457.9**	**1391**	**1411**	**1533**	**1275**



SEER-rated packaged AC less than 55

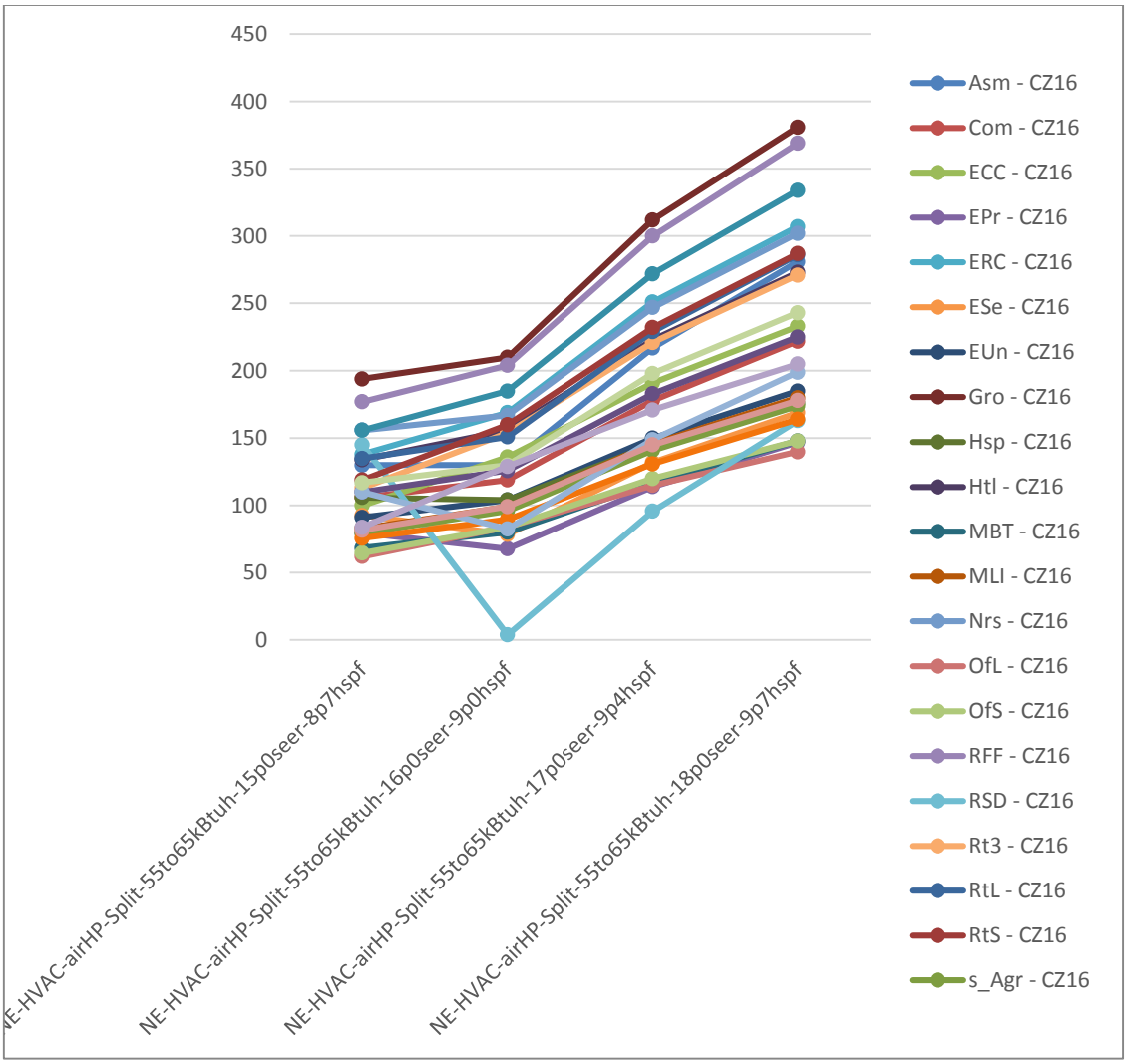
Sum of AStdEUkWh	Column Labels								
	ERC								
Row Labels	CZ05	CZ06	CZ08	CZ09	CZ10	CZ13	CZ14	CZ15	CZ16
NE-HVAC-airAC-Pkg-lt55kBtuh-15p0seer	98.1	91.9	96.7	101	106	126	124	147	109
NE-HVAC-airAC-Pkg-lt55kBtuh-16p0seer	330	272	294	313	78.3	372	384	395	359
NE-HVAC-airAC-Pkg-lt55kBtuh-17p0seer	348	299	322	342	110	413	421	457	376
NE-HVAC-airAC-Pkg-lt55kBtuh-18p0seer	363	323	346	367	137	449	454	511	391
Grand Total	**1139.1**	**985.9**	**1058.7**	**1123**	**431.3**	**1360**	**1383**	**1510**	**1235**



Response:

The DEER team has reviewed the energy impacts for these measures and has updated the values for ERC in climate zone CZ10.

6. Energy impacts for HP measures for Sit Down Restaurants (RSD). An anomaly was found for the HPsplit system (55 to 65) in RSD building type CZ 16. A screen shot is included for more detail. **SCE requests CPUC Staff provide an explanation or correction for the anomaly.**



Response:
The DEER team has updated the SEER-rated HP measures as they apply to the Sit-Down restaurant, eliminating the near-zero and negative impacts for some climate zones.

SCE Comments on Refrigerator and Freezer

Technical comments:

1. Measures for refrigerators with ice makers, in their current draft form of DEER 2015, contain overestimated savings values. Federal standards for refrigerators use an adder of 84 kWh per year for models with automatic icemakers, since icemaker test methods have not yet been developed (see PDF). Energy Star and CEE qualifying models use 10%, 15%, or 20% less than federal standards, before the 84 kWh per year adder. If DEER 2015 savings calculations do not first remove the adder of 84 kWh per year, savings are overestimated. **SCE suggests that the DEER 2015 team verify if this is occurring.**

CEE_ResApp_CallMemo_14Jul2014.pdf

CEE_ResApp_CallMemo_14Jul2014.pdf

Response:
All of the DEER refrigerator and freezer measures assume the same configuration of refrigerator or freezer is used in the code/standard case and in the measure case. If the measure technology includes an ice-maker or through-the-door ice service, the baseline technology is assumed to also include these features. Energy savings for these measures are scaled based on the difference in rated annual energy use between the measure technology and the baseline technology.

The Energy Star criteria for these technologies were changed on 9/15/2014 to be "10% less measured energy use than the minimum federal efficiency standards". The federal minimum efficiency standards are defined as dependent on size, configuration and functionality, including: "Ice Maker: No-ice maker, automatic ice maker, through the door icemaker ". The current standards include the consideration of both icemakers and through-the-door ice service. The CEE document referenced with this comment appears to be based on preliminary results not incorporated in the final 2015 standards.

If CEE qualified refrigerators are a PA program criteria, an additional or replacement tier level can be proposed and incorporated into the DEER2015 measure list.

2. Three clarifications on refrigerator measure volume. We assume that CLASS size ranges and DEER names are based on refrigerator total volume.
   - Please **verify if the size range 17-19 cubic feet means "≥ 17 and <20".**
     Response:
     Based on the RASS survey instrument, the definition for a size range "17 – 19 cu. ft." is as the commenter states.
   - It appears that the adjusted volumes used for DEER 2015 savings calculations were based on midpoints of total volume size ranges (e.g., 18 cubic feet adjusted volume selected for the

17-19 cubic feet total volume range). **Please confirm or clarify methodology used.**
Response:
The volumes used for the size ranges are intended to reflect the typical size within the given range. The values chosen for the mid-point of the size ranges are based on the RASS size ranges.

- Based on conversion factors in Table 5.4.3 of a DOE Technical Support Document, SCE believes that converting total volume to adjusted volume should result in a higher value. For example, top mount refrigerator-freezers in the 17-19 cubic feet total volume range will correspond approximately to an adjusted volume range of 20.3-22.7 cubic feet. The midpoint of this adjusted volume range would be 21.5 cubic feet (see attached spreadsheet) as opposed to the 18 cubic feet used in DEER calculations. **SCE requests that the DEER 2015 team review its refrigerator and freezer class size ranges for energy savings, making adjustments as required** for consistency with the DOE Technical Support Document.
  Response:
  The DEER team agrees with the reviewer and will update the adjusted volume associated with the measure definitions.


Total to Adjusted Volume.xlsx

3. DEER 2015 **include additional measures for refrigerators**. The following configurations are offered in SCE's programs, but their savings are calculated using non-DEER methodology:
   - Compact refrigerators in several configurations (Product Classes 11, 11A, 13, 15)
   - All-refrigerators (Class 3A)
   - Small sized (<17 cubic feet) bottom-mount and top-mount refrigerators, without icemakers (Create a new size range for Classes 3 and 5)
   - Extra-large refrigerators (>26 cubic feet). A review of Energy Star qualified products shows that bottom-mount models can be as large as 34.3 cubic feet total volume (45.9 cubic feet adjusted volume). The largest DEER 2015 size range uses a representative adjusted volume of 26 cubic feet. SCE proposes that an additional size tier be created to accommodate "Extra Large" refrigerators, perhaps using a total volume size range of "> 26 cubic feet" and a representative adjusted volume of 35 cubic feet. This would involve converting DEER's "Very Large" size range from "> 23 cu ft" to "23-26 cu ft."

Response:
Size ranges for the all refrigerator categories are expanded to include "mini" (total volume less than 13 ft^3) and "small" (total volume of 13 – 16 ft^3). Also, four categories of compact refrigerators are added to the measure list. As an example of defining additional categories of refrigerators, two extra-large bottom-mount refrigerator measures are added.

4. Additional information on refrigerator and freezer measure savings calculations used for DEER 2015. Specifically, **what interactive effects, in-situ factors, and/or other adjustments are applied** to the "basis" values in "2015DEER-RefrigeratorFreezerUpdate-1Oct2014.xlsx" in order to develop climate zone and building type-specific savings?

   SCE wishes to understand this process so that SCE can create non-DEER refrigerator measures if necessary, e.g. non-DEER size ranges used by Energy Star Most Efficient (≤ 18.0, 18.1-22.5, and > 22.5 cubic feet) and non-DEER efficiency requirements used by CEE (15% and 20% better than federal standard). SCE currently uses the "Normalized Energy Impacts" spreadsheet (see attachment) based on "DEER2010-2012ResidentialImpacts v1_5.xls" as the source for adjustments to "basis" values; **are these still applicable**, or are there updated values?

   
   Normalized Energy Impacts.xlsx

   Response:
   The energy impacts of the DEER2015 refrigerator and freezer measures are scaled based on the code/standard and measure technology rated-kWh defined in the measure definitions. The normalized energy impacts referenced in the measure definitions are the same values used for the DEER2014 update and can be extracted from the ex ante database using the measure IDs "RE-Appl-RefgCond-basis" and "RE-Appl-FrzrCond-basis" for refrigerators and freezers, respectively. Note: "Basis" measure types need to be enabled in READI to view these measures ("View => Options => Measures & Implementations").

   Additionally, new scaled refrigerator measure definitions can be created using READI to evaluate energy impacts for alternative measures. The DEER team can work with PA engineering staff to clarify any issues regarding the creation of new scaled measures via READI.

SCE Comments on Water Heaters

Technical comments:

1. CPUC staff has previously requested savings listings preferences from stakeholders. **For program implementation and calculation purposes, SCE requests that the savings are listed on a "Per Unit" basis rather than "Per kW/kBtuh."** [ii]

   Response:
   All of the 2015 DEER water heater measures have a normalizing unit of "Each", indicating that the energy impacts are per unit of specified technology (i.e. per water heater).

SCG Comments on Water Heaters

Technical comments:

1. An inconsistency in measure descriptions, an increase in baseline storage water heater size, lack of available data for cost analysis, and an inconsistency with the RASS 2009 study.

   Small instantaneous water heaters contain an inconsistency of measure descriptions in DEER 2015. The measure description, for the measure IDs detailed below, display "Efficient water heater: **Instant_EF** Gas (EF=0.82) replaces Gas Water Heater" while the measure technology description displays "**Small storage Gas water heater**: 75 gallon, EF = 0.82…". The measure IDs with inconsistence measure names and descriptions are below:

   - NG-WtrHt-SmlInst-Gas-150kBtuh-lt2G-0p82EF,
   - NG-WtrHt-SmlInst-Gas-150kBtuh-lt2G-0p92EF,
   - RG-WtrHt-SmlInst-Gas-150kBtuh-lt2G-0p82EF,
   - RG-WtrHt-SmlInst-Gas-150kBtuh-lt2G-0p92EF.

Response:
The measure technology descriptions for the referenced measures are updated.

2. Review of the small instantaneous water heater measures noticed the baseline code/standard measure has increased from a 40 gallon storage water heater in DEER 2013/2014 to a 75 gallon storage water heater in DEER 2015. SoCalGas would like to understand the justification of the increased baseline in water heater size. SoCalGas could not find any language requiring this change.

Response:
The code requirement for the gas instantaneous water heaters is an instantaneous unit with an EF of 0.82. Unlike the storage water heater measures, the instantaneous water heater measures assume the measure technology is replacing a different technology type (a small storage gas water heater). In this case, code dictates the minimum EF of the unit being replaced, based on the assumed size and fuel of the unit. Code does not cover the size of the unit being replaced, but is instead part of the measure definition.

The water heater calculator developed for DEER2015 determines the number water heaters required to meet a building hot water load by comparing the building peak hot water requirement and the equivalent capacity of the hot water heater being modeled. The instantaneous water heaters modeled in the 2015 DEER update have equivalent capacities of approximately 123 kBTU/hr whereas the 40 and 75 gallon storage water heaters have equivalent capacities of approximately 47 kBTU/hr and 92 kBTU/hr, respectively. The 75 gallon size category was chosen for the code case of the instantaneous water heaters to allow for closer comparison with regard to the number of units required for a given application.

Alternative size categories for the code case can be created by defining measures with a different pre-existing volume (see column F of the "Measure" tab in the water heater calculator). No additional technologies need to be defined for these alternative measures; the calculator will automatically select the unit with the minimum code requirement for the given size and fuel. New

measures can also be created that utilize instantaneous water heaters with smaller capacities and which may be more appropriate for a one-to-one replacement of a 40 gallon water heater. The DEER team can work with PA engineers to help define additional measure definitions as needed.

3. The code update for storage water heater regulates that storage size above 55 gallons must meet an energy factor not seen in today's market as shown in the California Energy Commission's appliance database. With no available market for small storage water heaters above 55 gallons to derive cost data, SoCalGas requests Commission Staff to provide the available data necessary to develop gross measure costs for these storage water heaters.

Response:
The new minimum EF requirements for small storage water heaters over 55 gallons are expected to have a large impact on the market for water heaters in the size range of 60 – 75 gallons. Reliable costs for minimum and higher efficiency units will likely not be available until the units become readily available in the second half of 2015. Commission staff does not currently have additional cost data for these units.

4. Commission Staff released the Water Heater Calculation Tool "DEER-WaterHeater-Calculator-v1.0.xlsm" as part of the documentation for the DEER 2015 update. The "Pre-Existing" therm usage for water heating does not align with the therm usage published in the 2009 RASS study report for residential buildings. SoCalGas would like to know the reasons behind the discrepancy and what data source, if other than the 2009 RASS study, was used.

Response:
The pre-existing energy targets for hot water have not changed since DEER2011. Calibration issues have not been addressed in either the DEER2014 or DEER2015 code updates, but will be considered in the DEER2016 update. The pre-existing energy use of water heaters in DEER2015, using the new simulation methods described in the workbook referenced in this question, are comparable to the DEER2014 pre-existing energy consumption values as evidenced in the table below. This table compares the energy savings of a water heater measure common to both DEER versions, a 40 gallon gas water heater with an EF of 0.70 compared to the pre-existing (vintage specific) water heater.

					Savings therm/yr		
MeasureID	PA	BldgType	BldgVint	BldgLoc	DEER2014	DEER2015	change
RG-WtrHt-SmlStrg-Gas-lte75kBtuh-40G-0p70EF	PGE	Res	Ex	IOU	45.00	43.7	-2.9%
RG-WtrHt-SmlStrg-Gas-lte75kBtuh-40G-0p70EF	SCE	Res	Ex	IOU	43.00	42.7	-0.7%
RG-WtrHt-SmlStrg-Gas-lte75kBtuh-40G-0p70EF	SDG	Res	Ex	IOU	42.5	42.3	-0.5%
RG-WtrHt-SmlStrg-Gas-lte75kBtuh-40G-0p70EF	SCG	Res	Ex	IOU	42.5	42.4	-0.2%

[i] This comment is based on observations from system efficiency as generated by MASControl using SFM vintages (please refer to PSACE 4).

[ii] SCE understands that code changes impact both electric storage and heat pump water heater work papers and program offerings. Small electric storage water heaters (30 to 55 gal) will no longer meet Tier 1 Standards. The table below lists the proposed minimum code requirements and above code requirements for each Tier. Only heat

pump water heaters will meet the new efficiency standards and SCE will have to modify the workpapers and program offering to reflect the changes.

Water Heater Type		Efficiency Tiers			
Fuel	Size (gallons)	Min. Code	Tier 1	Tier 2	Tier 3
Electric	30	0.951 EF	2.00 EF	2.20 EF	2.40 EF
Electric	40	0.948 EF	2.00 EF	2.20 EF	2.40 EF
Electric	50	0.945 EF	2.00 EF	2.20 EF	2.40 EF
Electric	60	1.98 EF	2.20 EF	2.40 EF	
Electric	75	1.96 EF	2.20 EF	2.40 EF	