

Addendum to Report Refrigerant Leakage Avoided Costs

Addendum Revision: 11.17.2021

Introduction

Per Resolution E-5152, starting in PY2022 the reporting of refrigerant leakage avoided costs (RLAC) is required for all energy efficiency measure claims as calculated from the CPUC's refrigerant avoided cost calculator (RACC)¹ for measure packages where the retrofit involves *adding* (not replacing) equipment that uses refrigerant – these include fuel substitution and electric resistance to heat pump measures - or where low global warming potential (GWP) refrigerant measure benefits will be claimed.

RACC Applicability and Adaptation for Deemed Measures

The CPUC's RACC performs a lifecycle refrigerant leakage avoided cost (RLAC) calculation *for only one device at a time*. Given that deemed measure packages have multiple measures and each measure has multiple device scenarios (pre-existing, standard, and measure efficiency levels), the RACC would need to be run multiple times, and several copies of the RACC provided for each measure configuration and permutation, which is not practical. In addition, to be able to use the CPUC RACC as a whole without major modification, scenarios such as partial-lifetime required for accelerated replacement measures (AR) were not possible. With these limitations, the approach used for deemed measures was simplified as follows:

- For a single-baseline, normal replacement (NR) measure application type (MAT) the RLAC calculation is straight-forward and is calculated as the difference between the full lifecycle RLAC values for the standard baseline device and the measure device.
- For the dual-baseline accelerated replacement (AR) MAT, to use the CPUC RACC without major modification or complication, the RLAC is simply calculated as the difference in the full lifecycle RLAC values for the pre-retrofit baseline device and the measure device. Any other approach to address the dual-baseline issue would require either a major modification or manipulation of the CPUC RACC tool along with an extensive explanation of those changes, which is currently not allowed for deemed reporting at this time.
- For both approaches, if the lifetime (EUL) of the two devices is different, then the lifetime of the measure will be used for both the baseline and measure RLAC calculations, consistent with the fuel substitution guidance approach² and the Energy Efficiency Policy Manual.³

¹ 2021 ACC Refrigerant Calculator v1b.xlsx – Source: <https://willdan.app.box.com/v/2021CPUCAvoidedCosts/folder/136593940728>. This is the official calculator referenced in the Decision. As of November 2021, the version posted on the CPUC's Cost Effectiveness web page (<https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/demand-side-management/energy-efficiency/idsm>) is not up to date.

² Fuel Substitution Technical Guidance for Energy Efficiency, Version 1.1, 10/31/2019, <https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/building-decarb/fuel-substitution-technical-guide-v11.docx>

³ Energy Efficiency Policy Manual, Version 6. Page 41. April 2020, <https://www.cpuc.ca.gov/-/media/cpuc-website/files/legacyfiles/e/6442465683-ee-policy-manual-revised-march-20-2020-b.pdf>

Deemed Measure RACC Workbook

The SCE team developed a Deemed Dashboard workbook to develop RLAC values for deemed measures that uses the CPUC's RACC as the core but provides a consolidated output that can be used for the eTRM, cost-effectiveness tool, and claims. This Deemed Dashboard presents the inputs that would be used for the CPUC RACC but calculates the avoided costs for several measures simultaneously in tabular form. For transparency and easy comparison to the CPUC RACC, the Deemed Measure RACC workbook also provides intermediate calculated values, not just the final refrigerant leakage avoided cost. For the same inputs, both dashboards will provide the same RLAC values.

The application issues that required the creation of a deemed measure calculator wrapped-around the basic CPUC RACC, and other key elements of the Deemed Measure RACC workbook include:

- **Equipment type names:** The RACC device type names – derived from a California Air Resources Board (ARB) study – are general equipment categories while the deemed measure package and equipment offerings are very specific. A mapping table was developed to map the deemed measure package names to the RACC ARB device type names.
- **Refrigerant charge amount and refrigerant type:** The CPUC RACC ARB-derived average leakage rates and average charge sizes are all specified per (typical) device but there is no contextual information for these values such as the associated average capacity or size, capacity range, or configuration specifics. However, almost all of the deemed measures use a capacity or size-based unit basis for savings - for example cooling is “per ton” - so the RLAC values used in the CET need to be on the same basis as the savings. The CPUC RACC also does not specify a default refrigerant type for each device type. For deemed measures, limited research was conducted to determine the typical refrigerant types and refrigerant charge estimates on a basis consistent with each measure (e.g. per ton, per kBtuh). The values were developed from other CPUC studies such as the DNV refrigerant study. Research was also conducted to identify default refrigerant types for each device. Values and sources are cited in the Deemed Measure RACC workbook.
- **“User-specified” instead of “ARB average” values:** This option is available in the CPUC RACC for device lifetime, refrigerant charge in pounds and weighted average cost of capital (WACC). The user-specified input option was used to specify the refrigerant charge and WACC values as explained in other bullets below.
- **Modification to CPUC RACC for use as look-up tables:** Some minor modifications were made to the two CPUC RACC tabs that are the basis of the refrigerant leakage and GWP assumptions to use them as look up tables for the deemed measure RACC workbook. No values were changed.
- **RACC Leakage rates and costs used as-is:** The existing ARB average leakage rates by device type were used as-is but as previously explained the ARB device types were mapped to deemed measure names.
- **Active device lifetime (EUL):** The deemed measure EULs will be used for this input value in the calculations, but deemed measures EULs were typically the same as the Average lifetime values

used in the RACC. As already stated, for consistency with fuel substitution, the EUL for the measure will be used if the baseline and measure EUL differ.

- **Statewide average WACC:** E-5152 directed the use of a “a load-share based average based on SW funding proportions”. A specific reference for these values was not provided in E-5152 but additional communication from the CPUC directed use of the values in D.19-12-021, pages 63-64, Table 1 Electric Funding Split percentages as shown below. Application of the load-share percent weights results in an statewide average WACC of 7.72%.

	IOU WACC (Nominal, after-tax)	SW Load- share Percent
PG&E	7.81%	44.5%
SCE	7.68%	40.0%
SDG&E	7.55%	15.5%

Future refrigerant avoided cost measure evaluations may be supported by an improved version of CPUC’s RACC and/or other versions of the calculator consolidated with methods and/or documentation from other related tools (e.g., DNV’s prototype lifetime GWP calculator including variables impacting equipment energy operation and refrigerant emissions). WACC value updates would happen under the Avoided Cost Calculator (ACC) updates.

RACC Supporting Documentation

Supporting documentation required for complying with referenced policy includes a copy of CPUC’s RACC documenting all inputs used to generate the reported RLAC values including normalized refrigerant charge leakage per unit, and avoided cost outputs for each measure in the measure package. The program administrator’s (PA’s) measure package updates resulting from this new requirement will be addressed through this addendum and the associated workbook by December 1, 2021. The 2021 submissions will be made via the WPA but future submissions for 2022 and beyond will likely be made via the eTRM. This addendum document and the Deemed Measure RACC workbook will be maintained on deeresources.com.

For description of the energy efficiency measures covered by this Addendum, please refer to the companion Measure Package submission including Deemed Measure RACC tool with specific description of evaluated measures and associated refrigerant leakage avoided cost outputs.

For the following Energy Efficiency Measure Package, this Addendum is submitted in compliance with Resolution E-5152 and latest CPUC guidance.

Measure Package Information: Update the table below with the measure package-specific information.

Measure Package ID and title	SWHC045-01 HEAT PUMP HVAC, RESIDENTIAL - FUEL SUBSTITUTION
Measure Package submission date	MM/DD/YYYY
PA Submitting Addendum	SCE
PA contact – Name, title, and email	Andres Fergadiotti, Engineer, Andres.Fergadiotti@SCE.com

Deemed Measure RACC (DM RACC) workbook and supporting documentation:

Deemed Measure RACC version	Deemed Measure RACC workbook v1.3 -Rev4
CPUC RACC version	2021 ACC Refrigerant Calculator v1 b.xlsx
Measure evaluation description and assumptions	Refer to DM RACC <i>Cover Sheet</i> tab, which explains specific adjustments to the CPUC RACC calculator for deemed measures without deviating from CPUC’s calculation methodology, and research supporting the user specified inputs in the calculator.
Measure Inputs	Refer to DM RACC’s “Deemed Dashboard” and “Refrig Type Research” tab
Measure Outputs	Refer to DM RACC’s “Deemed Dashboard” For “Refrigerant NPV Benefits” - Columns AX, AY, and AZ For “Refrigerant NPV Costs” - Columns BA, BB, and BC for, and For “Refrigerant NPV Net” - Columns BD and BE (for CET reporting) Results are also summarized on the <i>eTRM Outputs</i> tab
Remarks	The DM RACC will need to be updated whenever the CPUC RACC is updated and/or new devices or measures are added that are not covered by the tool.