**CPUC Comments on WP ID: SWHC044-02 Ductless HVAC, Residential – Fuel Substitution**

Lead PA: SCE

Workpaper Submittal Date: 1/4/2021

CPUC Review Date: 1/20/2021

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| CPUC Comment | PA Response |
| Measure ExAnte and Implementation ExAnte Tab: MIT  Deem-WP-FS does not exist in Pear.  Deem-DEER-FuelSub or Deem-WP-FuelSub are correct | We will revise to Deem-WP-FuelSub in the EAD and MeasureDataSpec files. |
| Workpaper review team was unable to review the model files because the eQuest files were not included in the workpaper package. As such, we were unable to verify the model inputs. Please include the model files for review. | Applicable efficiency values will be adopted from the analogous (CPUC approved) electric workpaper SWHC050-01. In SWHC050-01, SCE developed new Ductless mini-split heat pump TechIDs in MASControl 3 by modifying the existing TechIDs for Split Heat Pumps. The following modifications (and corrections) were included:  \*The EIR values were calculated by zeroing the fan power in the MASControl 3 workbooks.  \*The SEER to EER and HSPF to COP conversion for SEER14 and SEER 15 was revised to be consistent with the SEER16+ TechIDs in MasControl 3’s TechData spreadsheet.  The modelling update plan on the next page details the updates to the methodology.  A sample of the updated models will be shared with the CPUC for review with this response document. We will make further updates, as needed based on your review. |
| From what we could review – we question the following input: The efficiency for the baseline AC (for heating & cooling measures) should be 14 SEER. While the measure case HP should have cooling efficiency ratings from 15 to 18 SEER. eQuest uses EIR or “Electric Input Ratio” for efficiency which SEER can be converted to, and a lower EIR means higher efficiency. The problem I found is that in the WP text (page 13) in the input tables, the baseline is listed with a EIR of 0.245, while the EIR for the measure cases range from 0.277 to 0.249. Why are the measure case EIR’s greater than the baseline? | Yes, the 0.245 within the workpaper document was a typo. The original baseline EIR was actually 0.290. The workpaper document will be updated to reflect the new (and corrected) EIR values from the modelling update plan described below. |
| There appears to be a potential discrepancy with the normalizing capacity with the system size capacity listed in the cost table sizing assumptions. For example, for DMo buildings the total building capacity (cooling + heating) in tons is listed as 3.5 Ton + 55 kBtu (or about 4.6 tons) for a total of about 8 tons. The capacity used for normalization was 7 Tons. All of the building types appear to have different normalizing capacities when compared to the system sizing capacities listed in the workpaper | The “HVAC Tonnage” tab in the saving calculations file show the tonnages used to normalize the savings.  Since only one system (heating or cooling) should be operating at a time, using the total system capacity of the AC and furnace was not used. Only cooling capacity is used to normalize the savings per ton. Since the cooling capacities can differ by building type and climate zone, the savings per model were normalized by the specific tonnage of the cooling system for the permutation of building type and climate zone. |
| Page 2, there is a repeated word in the last paragraph of the technology summary. “It is expressed as a percentage, meaning that that percentage of energy turns into heat.” | This will be reworded to “The AFUE is expressed as the percentage of the energy transformed into usable heat.” |
| Page 3, in the measure case technology characterization table, Tier 4 of the heating only offerings does not list the correct measure IDs, the SWHC044M should be SWHC044P. | The table will be revised to use the correct measure ID. |

Please note responses to comments in the table below, revise workpaper, and upload the entire package to the WPA. If needed, please reach out to Workpaper Review Team to set up a call to discuss.

# Ductless HVAC eQuest Batch Processing Update Plan

Consultant will update the eQuest models for the ductless HVAC measures using eQuest batch processing files. The models will adopt the EIR values from the newest ductless mini-split measures developed in MASControl 3 for workpaper SWHC050-01 “Ductless HVAC Heat Pump Res – Electric-to-Electric”.

The baseline wall AC models will adopt the efficiency values for the 11 EER ductless AC. The 11 EER efficiency has been selected as the most efficient value for room air conditions of all sizes and types from Title 20 Table B-2.

The baseline 67% AFUE wall furnace will use the value of 1.3333 for FURNAC-HIR based on the conversion equation from AFUE to HIR used in the “MscTechData” tab in the “TechData\_PkgHVAC.xlsm” workbook. This value is not applicable to the measure case runs but will be left as a placeholder in the batch tables to avoid BLD processing errors within eQuest.

The efficiency values for the ductless systems were calculated using the same methodology as the DEER measures from the “SEERDxTechData” tab in the “TechData\_PkgHVAC.xlsm” MASControl workbook. As this workpaper’s measure cases are analogous to the electric workpaper SWHC050-1, this workpaper will adopt the same efficiency values.

The applicable values are shown in the table below.

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| --- | --- | --- | --- | --- | --- |
| **Technology** | **Cooling Efficiency** | **Cooling EIR** | **Heating Efficiency** | **Heating EIR** | **kW per CFM** |
| Baseline Wall AC, 11 EER and Wall Furnace, 67% AFUE | 11 EER | 0.31025 | 67% AFUE | 1.33333 (HIR) | 0 |
| Measure Ductless Mini-Split HP, 15 SEER | 15 SEER | 0.29171 | 8.7 HSPF | 0.29596 | 0 |
| Measure Ductless Mini-Split HP, 16 SEER | 16 SEER | 0.27348 | 9.0 HSPF | 0.28571 | 0 |
| Measure Ductless Mini-Split HP, 17 SEER | 17 SEER | 0.25739 | 9.4 HSPF | 0.27355 | 0 |
| Measure Ductless Mini-Split HP, 18 SEER | 18 SEER | 0.24309 | 9.7 HSPF | 0.26509 | 0 |

*\*The HSPF values from MASControl are different from the values used in the workpaper originally. The workpaper values will be updated to match the MASControl values.*

All other fields updated in the batch file will remain unchanged in this update.

The batch processing will run eQuest models for all permutations, including:

* Baseline and all four measure tiers
* All vintages for SFm, MFm and DMo building types
* All five residential thermostat setpoints
* All 16 Climate zones

Modeling will be run using the new CZ2022 weather files so that these measures can be applicable for future program years.

These measures (TechIDs) were not available in MASControl when this workpaper was originally developed, so the workpaper modelling methodology was used. SCE considered simply using the newly available MASControl ductless mini-split HP measures for this update instead of the original analysis. However, after reviewing the TechData\_PkgHVAC files, we found that the HP capacities for the 16, 17, and 18 SEER models was 68% greater than the 14 and 15 SEER models. The larger models also included two stage controls and different part load curves. The intent of these models was to simply show the difference in energy using the improved EIR values. Thus, we recommend updating the original batch processing files only with the newest EIR values, instead of using the newer MASControl files.

**This update plan is pending any additional comments from the CPUC once they have fully reviewed the remaining eQuest models. SCE is requesting CPUC consultant’s comments by 2/15/2021.**