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Filer:	RJ Wichert
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Narrative for IES VE Title 24 2025.1.0 Sensitivity Tests

General:

This short document is used to provide an explanation of observations made while creating the sensitivity models. They fall into two headings:

- Models not considered
- Models that have failed

The following models are not considered in the IES VE Title 24 2025.1.0 sensitivity tests:

- 0418606-OffLrg-TES-StoTnkShp – The VE does not model storage tank shape
- 0418706-OffLrg-TES-StoTnkLoc – The VE does not model storage tank location
- 1014315-RetlStrp-WSHP – The VE does not contain the Title 24 WSHP curves
- 1014506-RetlStrp-WSHP – The VE does not contain the Title 24 WSHP curves
- 0519515-RetlMed-HPWtrHtrSplitTnkCprsrIns – The VE does not designate a compressor zone
- MF models – the VE does not currently cater for residential buildings

Explanation for models that fail:

The models that fail in the 2025 run fall into three categories:

1. Models that are failing as their variation from the baseline is in the opposite direction to CBECC, but only by small margins
2. Models that are showing similar trends to CBECC but are failing
3. Models that previously failed

1. Models that are failing as their variation from the baseline is in the opposite direction to CBECC, but only by small margins

   The following models are showing variations from the baseline that are in the opposite direction to CBECC, but the movement in that direction is small (typically less than 1%) and thus we ask for these to be considered as a pass:

   - 0418906-OffLrg-TES-StoTnkVol (CBECC: 0.15%, VE: -0.10%)
   - 0408516-OffLrg-HVACChWdeltaT (CBECC: -0.49%. VE: -0.51%)
   - 0408906-OffLrg-HVACChWdeltaT (CBECC: -2.37%. VE: 0.53%)
   - 1010515-RetlStrp-FPFC (CBECC: -2.00%, VE: 4.01%)
   - 0413216-OffLrg-CRAC (CBECC: 2.35%. VE: - 0.40%)
   - 0302006-OffMed-FloorSlabInsulation (CBECC: 0.18%. VE: - 0.11%)

2. Models that are showing similar trends to CBECC but are failing

   The following models are showing similar differences from the baseline in both scale and direction to CBECC, but are shown as fails. As they are very similar to CBECC we ask that these be considered as a pass:

   - 0303316-OffMed-LightingHighLPD (CBECC: 13.34%, VE: 13.33%)
   - 0303506-OffMed-LightingHighLPD (CBECC: 16.64%, VE: 17.27%)
   - 0314116-OffMed-FanPwrBox (CBECC: 28.84%, VE: 27.00%)
   - 0314206-OffMed-FanPwrBox (CBECC: 24.55%, VE: 27.74%)

3. Models that previously failed

As was the case in 2022, these models are showing higher values in the TES model than the Baserun model. This is for the exact same reason as explained for the 2022 models. See below.

- 0418406-OffLrg-TES-ChlrPriority
- 0418506-OffLrg-TES-StoPriority

Test Fail: Thermal Energy Storage Loop

- CEC Comment: Higher TDV Energy in the TES model than the Baserun model.

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IES Response:

The TES model in IESVE has a Water-to-water heat exchanger (WWHX) that transfers heat between the TES loop and the ChWL (see Figure 1 below). This heat exchanger is permanently coupled with the TES tank to avoid any potential mixing of water/glycol with water only; thus maintaining the heat transfer properties of water in the Chilled Water Loop. The WWHX has a non-zero approach temperature. i.e., there will always be a temperature drop in the WWHX. To account for this temperature drop, when the chiller is cooling the building, the chiller leaving water temperature needs to be lower than the required ChWL supply temperature (44°F) because it must first overcome the inefficiency of the WWHX.

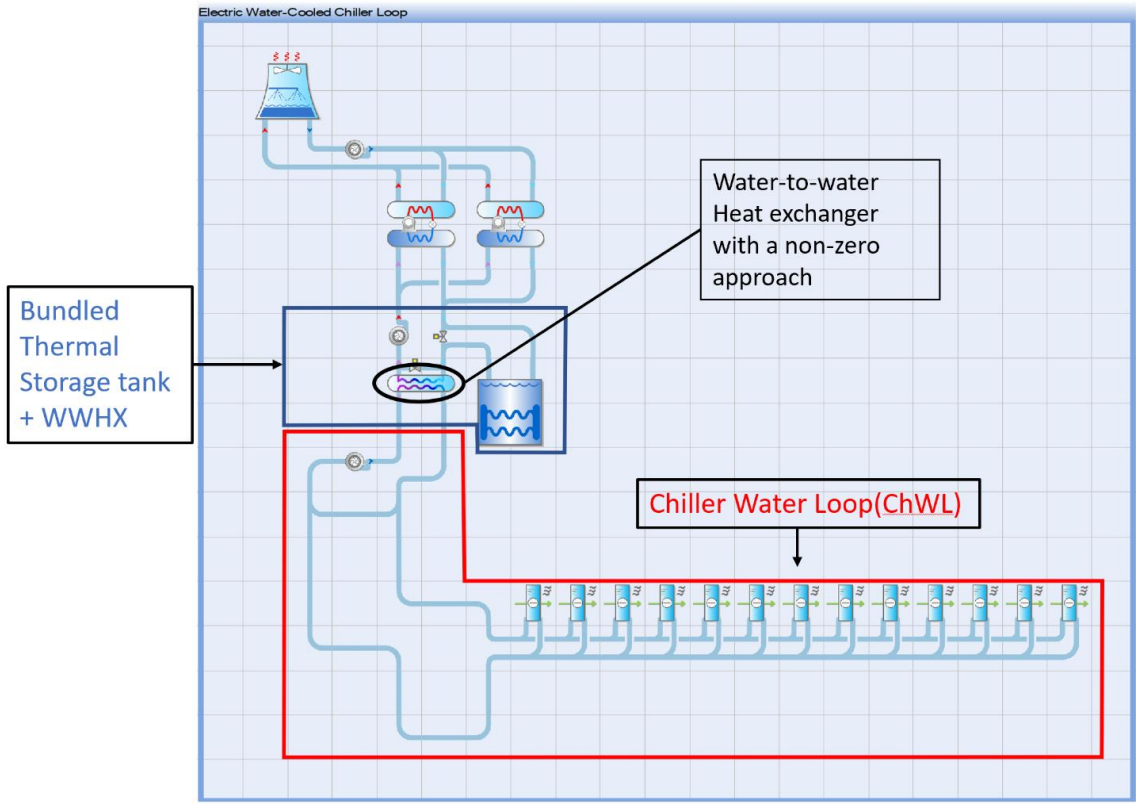

Figure 1: IESVE TES loop and ChWL

However, the baseline model (400006) does not have a WWHX. As a result, the chiller water leaving temperature is 44°F.

Since the chillers in the TES model has to cool the water to a lower temperature (to account for the temperature drop in the WWHX) the chillers consume more energy than the baseline chiller. This has therefore been reflected in the output values of the model.

Observations:

1) During the period when the TES is not operating the TES output is higher than the baseline output. We believe this is because the TES system has to cool the water to a lower temperature to account for the temperature drop in the WWHX.
2) During the TES operation period we can see that the output of the TES model is lower than the output of the baseline model. i.e. it's operating as expected.

Conclusion:

WWHX (no bypass), in the TES model 0418506, is causing a year-round inefficiency, especially during periods where the TES is not operational, because the WWHX cannot be bypassed. Baseline model 400006 has no WWHX; therefore the baseline is not penalized for the inherently inefficient WWHX.