Appliance Standards Awareness Project
American Council for an Energy Efficient Economy
California Energy Commission
Natural Resources Defense Council
Northeast Energy Efficiency Partnerships

July 1, 2020

Dr. Stephanie Johnson and Ms. Catherine Rivest
U.S. Department of Energy
Office of Energy Efficiency and Renewable Energy
Building Technologies Program, EE-5B
1000 Independence Avenue SW
Washington, DC 20585

RE: Docket Number EERE–2019–BT–STD–0042: Request for Information for Energy Conservation Standards for Air-Cooled Commercial Package Air Conditioning and Heating Equipment and Commercial Warm Air Furnaces

Dear Dr. Johnson and Ms. Rivest:

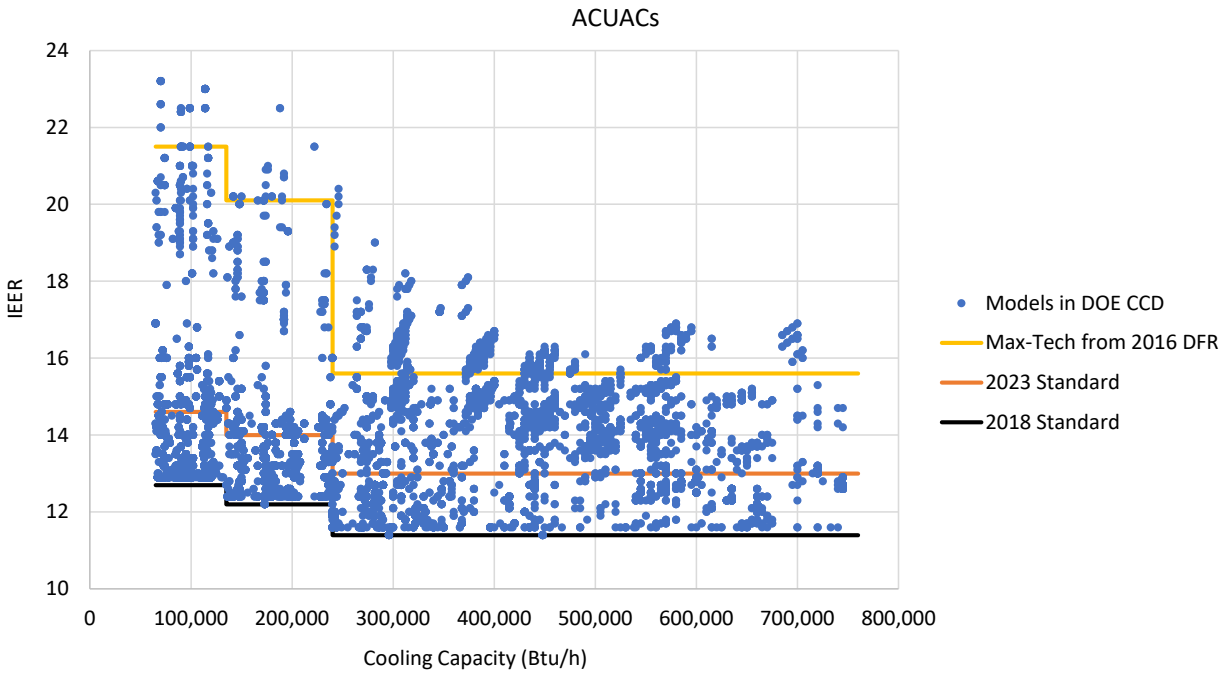
This letter constitutes the comments of the Appliance Standards Awareness Project (ASAP), American Council for an Energy Efficient Economy, California Energy Commission, Natural Resources Defense Council. and Northeast Energy Efficiency Partnerships on the request for information (RFI) for energy conservation standards for air-cooled commercial unitary air conditioners and heat pumps (ACUACs and ACUHPs) and commercial warm air furnaces (CWAFs). 85 Fed. Reg. 27941 (May 12, 2020). We appreciate the opportunity to provide input to the Department.

DOE must conduct a full analysis to evaluate potential amended standards for ACUACs, ACUHPs, and CWAFs. While the standards in the 2016 direct final rule (DFR) for ACUACs, ACUHPs, and CWAFs will achieve enormous savings, very large additional savings are possible. The max-tech levels evaluated in the 2016 DFR represented national energy savings of 8.6 quads for ACUACs and ACUHPs and 2.2 quads for CWAFs relative to the standard levels adopted.[1] Furthermore, greater savings are possible than those estimated in the 2016 DFR. As shown in the graph below, for ACUACs, there are models across the range of capacities with IEER levels that significantly exceed the "max-tech" levels evaluated in the 2016 DFR.[2] In addition, as described below, alternative refrigerants can improve efficiency by at least 5% relative to the refrigerant currently being used (R410A). For CWAFs, as described below, available condensing furnace models demonstrate that it is possible to achieve thermal efficiency levels of at least 93%, while the max-tech level evaluated in the 2016 DFR was 92%.

[1] 81 Fed. Reg. 2508 (January 15, 2016). The Trial Standard Levels (TSLs) adopted were the "Recommended" TSL for ACUACs and ACUHPs and TSL 2 for CWAFs.

[2] Models listed in the DOE Compliance Certification Database (CCD) as of May 19, 2020. The CCD does not list the heating type. The IEER levels plotted for the 2018 and 2023 standards are for models with "all other types of heating," and the max-tech levels are for units with "electric resistance heating or no heating."

Furthermore, as explained below, amended standards for all equipment types should be based on amended test procedures. An amended test procedure for ACUACs and ACUHPs should better capture fan energy use, while an amended test procedure for CWAFs should capture the impact of improved insulation and auxiliary electrical consumption. These test procedure changes would result in changes to efficiency ratings that would better represent performance during a representative average use cycle for all equipment types, while also allowing additional technology options to be considered for CWAFs.



Amended standards for ACUACs and ACUHPs must be based on an amended test procedure that better captures fan energy use. The current test procedure for ACUACs and ACUHPs assumes unrealistically low external static pressures[3] and does not capture fan energy use in ventilation mode or heating mode. The current test procedure thus significantly underestimates fan energy consumption. DOE's analysis for the 2016 DFR found that for "small" and "large" ACUACs, at the highest efficiency levels the supply fan can consume as much or more energy than the energy required for cooling (compressor and condenser fan energy).[4] For all the representative capacities and efficiency levels analyzed in the 2016 DFR, the supply fan consumes at least half as much energy as the energy required for cooling. Yet this supply fan energy is not fully captured in the test procedure. The resulting impact is that the test procedure is not adequately representing performance during a representative average use cycle, and the efficiency ratings are not providing an accurate relative ranking of performance. For example, while average energy use should decline with increasing efficiency, in the 2016 DFR, the energy use for the 7.5-ton representative unit at EL 3.5 was higher than that at EL 3, meaning that a

[3] The current test procedure specifies minimum external static pressure values of between 0.20 and 0.75 in. H_2O, depending on capacity, while DOE used values of 0.75 and 1.25 in. H_2O in the analysis for the 2016 DFR. https://www.regulations.gov/document?D=EERE-2013-BT-STD-0007-0105. p. 7-5.

[4] https://www.regulations.gov/document?D=EERE-2013-BT-STD-0007-0105. p. 7-10.

customer would incur higher operating costs with the unit meeting EL 3.5 even though that unit would have a higher IEER.[5]

The term sheet from the Appliance Standards and Rulemaking Federal Advisory Committee (ASRAC) working group for ACUACs, ACUHPs, and CWAFs contained a recommendation that DOE amend the test procedure for ACUACs and ACUHPs to better capture total fan energy use, including the impact of alternative static pressures and the energy associated with the operation of the supply fan when the unit is in ventilation mode and heating mode.[6] Amended standards for ACUACs and ACUHPs should be based on an amended test procedure that reflects the recommendations in the term sheet, and we urge DOE to promptly advance a test procedure rulemaking to implement the term sheet recommendations.

Amended standards for CWAFs must be based on an amended test procedure that captures the impact of improved insulation and auxiliary electrical consumption. As we described in our comments on the test procedures RFI for CWAFs,[7] improved insulation can significantly reduce the energy use of CWAFs, but this impact is not captured in the current test procedure. We also urged DOE to capture auxiliary electrical consumption to better capture a representative average use cycle. Amended standards for CWAFs should be based on an amended test procedure that captures the impact of improved insulation and auxiliary electrical consumption.

In its general Request for Information on improving test procedures (the "Test Procedure RFI"), pursuant to EPCA, DOE sought information so that it, "might improve its test procedures to better capture average use cycles or periods of use, while minimizing regulatory test burdens."[8] As described in this letter as well as other submittals to this docket, updates to the test procedures for ACUACs, ACUHPs, and CWAFs would better capture average use cycles. Therefore, in order to be consistent with DOE's Test Procedure RFI and its statutory obligations under 42 U.S.C. sections 6293(b)(2) and 6314(a)(2), DOE must update the test procedures for ACUACs, ACUHPs, and CWAFs, and any subsequent standards must be based on the resulting improved test procedures.

DOE should evaluate whether the current capacity breakpoints for the equipment classes for ACUACs and ACUHPs are appropriate. The current equipment classes for ACUACs and ACUHPs include capacity ranges of ≥65,000 and <135,000 Btu/h, ≥135,000 and <240,000 Btu/h, and ≥240,000 and <760,000 Btu/h. As shown in the graph above, within the ≥240,000 and <760,000 Btu/h capacity range, the most efficient models at the lower end of the capacity range have higher IEERs than those at the higher end of the capacity range. We note that current model availability does not necessarily reflect technological potential. Nevertheless, we encourage DOE to evaluate whether the current capacity breakpoints for the equipment classes for ACUACs and ACUHPs are appropriate.

DOE should evaluate alternative refrigerants, including R452B, R454B, and R32, as technology options for ACUACs and ACUHPs. We understand that by 2023, manufacturers will be transitioning to alternative refrigerants to replace R410A. There are multiple potential alternatives that can be used in ACUACs and ACUHPs including R452B, R454B, and R32. Testing conducted by Oak Ridge National Laboratory (ORNL) in partnership with Trane found that using R452B as a drop-in replacement improves

[5] Ibid.
[6] https://www.regulations.gov/document?D=EERE-2013-BT-STD-0007-0093.
[7] https://www.regulations.gov/document?D=EERE-2019-BT-TP-0041-0005.
[8] 84 Fed. Reg. 9721 (March 18, 2019).

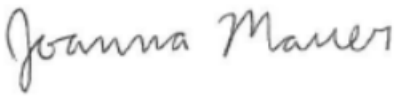
efficiency by 5%.[9] R454B and R32 (with equipment optimized for R32) can also boost efficiency relative to R410A.[10] DOE should evaluate these alternative refrigerants along with any other potential alternatives as technology options to improve the efficiency of ACUACs and ACUHPs.

DOE should consider insulation improvements and improved electrical efficiency as technology options for CWAFs. In the 2016 DFR, DOE explained that using insulation comprised of foam, a vacuum, inert gases, aerogel, or evacuated panels are all examples of insulation improvements that would not increase the insulation thickness.[11] The Northwest Energy Efficiency Alliance (NEEA) found that increased enclosure insulation could reduce energy consumption by up to 11%.[12] There may also be ways to reduce the auxiliary electrical consumption associated with CWAFs when in heating mode. DOE should consider these technology options based on an amended test procedure.

DOE should analyze max-tech levels for ACUACs, ACUHPs, and CWAFs that are higher than those in the 2016 DFR and that reflect the incorporation of all potential technology options. As shown in the graph above, for ACUACs, there are models across the range of capacities with IEER levels that significantly exceed the max-tech levels evaluated in the 2016 DFR. Furthermore, the most-efficient units on the market today may not incorporate all potential technology options. For CWAFs, the max-tech level in the 2016 DFR reflected a thermal efficiency of 92%, while available condensing furnace models demonstrate that it is possible to achieve thermal efficiencies of at least 93%.[13] In addition, the max-tech level for CWAFs should incorporate additional technology options not evaluated in the 2016 DFR including improved insulation and improved electrical efficiency based on an amended test procedure.

Thank you for considering these comments.

Sincerely,



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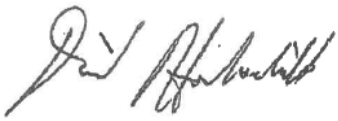
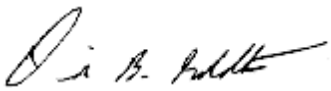


David Hochschild
Chair
California Energy Commission



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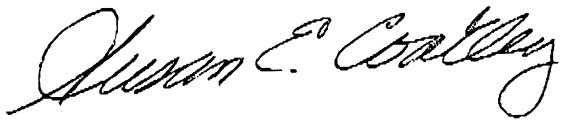
[9] https://www.energy.gov/sites/prod/files/2017/04/f34/10_32226f_Shen_031417-1430.pdf. p. 13.
[10] https://www.aceee.org/files/proceedings/2016/data/papers/3_406.pdf.
[11] https://www.regulations.gov/document?D=EERE-2013-BT-STD-0021-0050. p. 4-4.
[12] https://neea.org/img/documents/Energy-Modeling-of-Commercial-Gas-Rooftop-Units-in-Support-of-CSA-P.8-Standard.pdf. p. 16.
[13] https://www.gti.energy/wp-content/uploads/2018/11/Condensing-Roof-Top-Units-Technology-Snapshot-02-2017.pdf.



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