

December 13, 2021  
Via Electronic Mail



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U.S. Environmental Protection Agency (EPA)  
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1200 Pennsylvania Avenue, NW  
Washington, D.C. 20460  
[LCHVAC@energystar.gov](mailto:LCHVAC@energystar.gov)

Re: ENERGY STAR Light Commercial HVAC Version 4.0 Draft Specification

Dear Ms. Daken,

Northwest Energy Efficiency Alliance (NEEA) submits the following comments in response to the Environmental Protection Agency (EPA) request for stakeholder review and comments regarding the ENERGY STAR Light Commercial (LC) HVAC Version 4.0 Draft Specification released on November 1, 2021.<sup>1</sup>

NEEA is a non-profit organization working to encourage the development and adoption of energy-efficient products, practices, and services. Funded by the regional utilities, NEEA is a collaboration of 140 utilities and efficiency organizations working together to advance energy efficiency in the Northwest on behalf of more than 13 million consumers. This unique partnership has helped make the Northwest region a national leader in energy efficiency.

In these comments, we support EPA's proposed expansion of the Light Commercial HVAC (LC HVAC) product scope to components that save gas energy, and recommend EPA consider adopting additional gas heating efficiency requirements for LC HVAC units. We also request that EPA shares supporting research showing the known gas savings from modulating furnaces to support evaluation of this technology alongside other energy saving options.

## Comments

1. We recommend EPA establish heating season efficiency requirements for all light commercial gas equipment within the ENERGY STAR scope and recommend EPA consider the CSA P.8 test procedure and associated heating performance metrics as the heating season efficiency measurement.

NEEA supports EPA's consideration of the gas consumption and heating efficiency of LC HVAC equipment, but we believe there is significant opportunity for energy savings beyond ENERGY STAR's proposed requirement to include modulating and staged furnaces.

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<sup>1</sup> [https://www.energystar.gov/products/spec/energy\\_star\\_light\\_commercial\\_hvac\\_version\\_4\\_0\\_pd](https://www.energystar.gov/products/spec/energy_star_light_commercial_hvac_version_4_0_pd)

NEEA recently commented on DOE's commercial warm air furnace (CWF) request for information (RFI) recommending DOE consider a whole box approach for rating the efficiency of CWF, expanding beyond the existing test method using thermal efficiency (TE) at full fire.<sup>2</sup> We recommend EPA also considers this approach for ENERGY STAR LC HVAC product specification, which covers equipment with gas furnaces including gas rooftop units (RTUs).

Currently, gas equipment in the U.S. is rated using the ANSI Z21.47 test method, which tests the efficiency of a gas furnace at full fire. This rating covers the TE of the furnace at full fire – one component of an RTU in one specific operating condition. NEEA sponsored an energy modeling study that showed a gas RTU in the heating season spends a relatively low percentage of time in full fire mode, indicating the TE rating does not capture the full operating efficiency of a unit over an average period of use.<sup>3</sup> Furthermore, TE does not include the impact of other components of an RTU that affect gas consumption, specifically the presence of a heat or energy recovery ventilation (HRV/ERV) system, cabinet insulation levels, fan efficiency, and outside air damper leakage. Because of these reasons, we believe that the thermal efficiency metric is not representative of an average period of use and does not provide enough information on the efficiency of gas fired RTUs.

Instead of ENERGY STAR adopting TE requirements for gas equipment that are more aggressive than DOE's current standard, NEEA recommends ENERGY STAR instead adopt a test procedure and heating efficiency requirements that are inclusive of all features affecting gas and energy consumption over an average period of use. This high-level approach is better aligned with integrated energy efficiency ratio (IEER), the cooling metric EPA and DOE currently use to set minimum cooling efficiency requirements which accounts for all cooling-related electric consumption through tests at multiple load points.

CSA Group recently published for public review<sup>4</sup> the third edition of the CSA P.8 test standard, which produces both a TE and a heating season total coefficient of performance (TCOP<sub>HS</sub>) rating for packaged gas heating equipment. The TCOP<sub>HS</sub> rating is developed using both tested data and an energy balance calculation, and accounts for multiple operating modes including low and high fire, ventilation, and standby modes. It also accounts for several energy using and saving components of the equipment including furnace TE, electricity consumption, presence of HRV/ERV, enclosure insulation levels, and damper leakage. We recommend EPA consider the CSA P.8 test procedure and TCOP<sub>HS</sub> metric for setting efficiency requirements for gas equipment. This approach will allow greater flexibility in how manufacturers meet efficiency

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<sup>2</sup> NEEA CWF RFI Test Procedure Comments 6 4 2020 <https://www.regulations.gov/comment/EERE-2019-BT-TP-0041-0010>

<sup>3</sup> Energy Modeling of Commercial Gas Rooftop Units in Support of CSA P.8 Standard

<https://neea.org/resources/energy-modeling-of-commercial-gas-rooftop-units-in-support-of-csa-p-8-standard>

<sup>4</sup> The public comment period for CSA P.8 edition 3 has closed, details on the draft test standard and publication timeline may be available through CSA Group. <https://publicreview.csa.ca/Home/Expired/4340>

requirements, such as through a condensing furnace, HRV/ERV, or through a combination of insulation and damper upgrades.

NEEA is also developing a specification for RTUs that references the CSA P.8 test ratings in its performance path thresholds, in addition to an analogous prescriptive path. NEEA is open to sharing additional data and research that has been collected during the development of this specification to support EPA in establishing more comprehensive ENERGY STAR gas efficiency requirements that would result in greater gas savings from efficient LC HVAC equipment.

2. We support EPA's inclusion of product features that save gas and request EPA shares supporting research on the increased heating efficiency of modulating and staged furnaces to evaluate this strategy alongside other energy saving options.

In the memo introducing the ENERGY STAR LC HVAC Version 4.0 Draft Specification,<sup>5</sup> EPA states that multi-capacity heating technologies are known to save energy and cost and thus includes multi-capacity heating technologies as a prescriptive requirement in the draft specification. NEEA is interested in learning more about the documented savings that EPA references, as NEEA has not yet found conclusive evidence that modulating furnaces consistently save significant energy in commercial applications.

NEEA has reviewed several research reports investigating the impact of modulating furnaces in both commercial and residential applications. While a modulating furnace saved significant energy in one residential application, other reports found that efficiency gains from gas modulation in commercial applications were negligible, in that the savings were within the uncertainty from instrumentation precision and simulation error.

In these projects, manufacturers reported that the more tangible benefit of modulating furnaces was to extend the life of the equipment and increase occupant comfort. This previous research did find that gas savings were more distinct in residential applications where air flow turns on and off with the furnace, resulting in greater off-cycle losses without furnace modulation. In contrast, in commercial applications, airflow may continue even when the furnace is off which reduces the off-cycle period losses in comparison to residential applications and thus reduces the potential savings from modulating furnaces. The reports also found that in commercial applications the potential savings from modulating furnaces is dependent on the furnace efficiency at low fire, which may be lower than the furnace efficiency at high fire and thus may not result in significant gas savings.

The inconclusive findings from these previous studies suggests that more research is needed to determine the relative impact of gas savings associated with commercial modulating furnaces compared to the gas savings from other strategies such as increased cabinet insulation or decreased damper leakage as we discussed in our previous comment. Because EPA is including

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<sup>5</sup> <https://www.energystar.gov/sites/default/files/ENERGY%20STAR%20LC%20HVAC%20Version%204%20Draft%201%20Cover%20Memo.pdf>

modulating furnaces as a prescriptive requirement for this draft specification, we suggest that EPA shares the source of the known savings from modulating furnaces so the impact of that measure can be evaluated along with other energy saving measures that are assessed through the TCOP<sub>HS</sub> metric.

## Summary

We appreciate EPA's consideration of our comments on the updated LC HVAC Version 4.0 Draft Specifications. In particular, we suggest EPA pursue the following recommendations:

1. We recommend EPA establish heating season efficiency requirements for all light commercial gas equipment within the ENERGY STAR scope and encourage EPA to consider the CSA P.8 test procedure and associated heating performance metrics as the heating season efficiency measurement.

We support EPA's inclusion of product features that save gas and request EPA shares supporting research on the increased heating efficiency of modulating and staged furnaces to evaluate this strategy alongside other energy saving options.

Thank you for considering our comments.

Sincerely,

*Mark Rehley*

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