

March 04, 2013

Ms. Brenda Edwards
U.S. Department of Energy
Building Technologies Program
Mailstop EE-2J
1000 Independence Avenue, SW
Washington, DC 20585

Re: Energy Conservation Program: Energy Conservation Standards for Small, Large, and Very Large Commercial Package Air Conditioning and Heating Equipment (Docket No. EERE-2013-BT-STD-0007/RIN 1904-AC95)

Dear Ms. Edwards:

The Air-Conditioning, Heating and Refrigeration Institute (AHRI) respectfully submits these comments in response to the Federal Register notice published on February 1, 2013, soliciting information from stakeholders to help the Department of Energy (DOE) determine if more stringent energy conservation standards for commercial package air conditioning and heating equipment can be justified. AHRI is a national trade association whose membership includes the vast majority of U.S. manufacturers of residential and commercial HVAC equipment and water heaters.

AHRI understands that the Energy Policy and Conservation Act (EPCA) requires the Department to review energy conservation standards that are already in place and which have not been amended in six or more years. While we welcome DOE's request for information (RFI), we hope that any analysis that the Department will conduct to assess if more stringent standards can be justified will go beyond just looking at the regulated energy efficiency descriptor. We will elaborate more on this point below. Regarding the adoption of a new energy efficiency descriptor, AHRI will support replacing the EER with IEER only if DOE resolves pending issues related to the Alternative Efficiency Determination Method (AEDM), the definition of basic models and the uncertainty in measurement testing associated with the part-load metric.

ASHRAE 90.1 and Commercial Package Air conditioners

Commercial package air conditioners are covered products that fall under the purview of ASHRAE Standard 90.1. Minimum energy conservation standards for commercial package air conditioners were first established in the 1975 version of ASHRAE 90¹, well before DOE was given the authority to regulate these products. Since that time, the

¹ ASHRAE 90 covered both residential and commercial buildings. In 1983, the standard was split into two – ASHRAE 90.1 for commercial buildings and ASHRAE 90.1 for residential building.

minimum energy conservation standards were amended several times, the last time being in 2013 through addendum CL to ASHRAE 90.1-2010. However, addendum cl amended the minimum IEERs and left unchanged the EERs as the ASHRAE 90.1 committee couldn't justify raising the full load efficiencies.

There is ample evidence that HVAC equipment full load efficiencies are approaching their thermodynamic limits. While energy efficiency gains in the seventies were achieved at a relatively low cost, the efficiency improvements realized recently resulted in significant increase in equipment cost. As illustrated in Figure 1, we are entering a phase where full load energy efficiency gains in the future will be minimal but very costly.

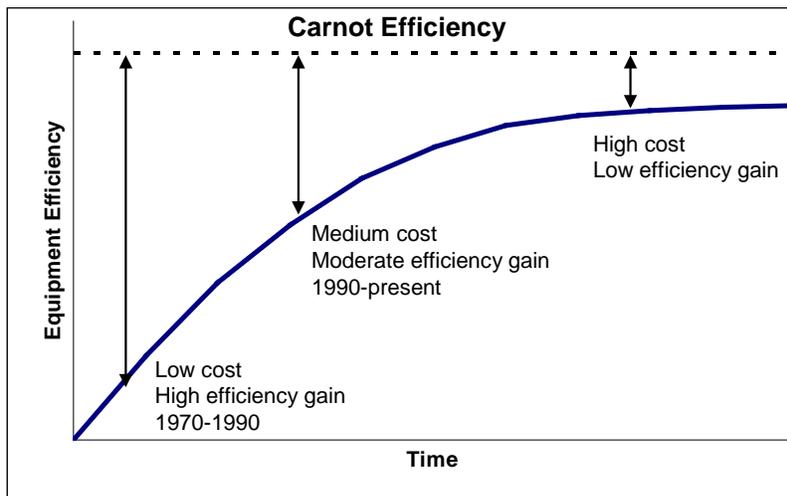


Figure 1: Equipment Costs and Efficiency Gains over Time

Recognizing that the conventional policy of increasing the full load minimum energy efficiency standards of commercial package air conditioners has reached a point of diminishing return (in terms of energy savings), the ASHRAE 90.1 committee has focused its efforts on other areas to reduce the energy consumption of these products. Design requirements were developed and implemented over several years. Examples of such requirements include:

- Mandatory use of economizers on products $\geq 54,000$ Btu/h of cooling capacity in all climate zones at the exception of zones 1a and 1b.
- Modulation of economizer outdoor and return air dampers to provide up to 100% of the design supply air quantity as outdoor air for cooling.
- Tighter damper leakage.
- Additional requirements for supply air reset and static pressure reset on variable air volume systems.
- Integrated economizer control and DX unit capacity staging requirements which necessitate two speed fans and two stages of mechanical cooling for constant volume systems or three or more stages for variable air volume systems.

- Fan controls for both constant volume and VAV units including extending the fan part load power requirements down to ¼ HP.

The design requirements listed above have been added to ASHRAE 90.1 after DOE amended the federal minimum energy conservation standards. However, although these requirements significantly reduce the energy consumption of commercial package air conditioners, most of the energy savings resulting from their implementation is not captured by the test procedure and cannot be translated in an EER improvement. Consequently, we urge the Department to be open-minded and to go beyond just looking at the EER and/or COP when conducting its analysis. We believe that by appropriately modeling these products and the ASHRAE 90.1 design requirements through the use of procedures defined by the ASHRAE 90.1 committee and the Pacific Northwest National Laboratory (PNNL)², DOE will come to the conclusion that the energy consumption of commercial package air conditioners has been significantly reduced over the past few years and that increasing the minimum EER and COP is not a cost-effective way of improving the energy efficiency of these products.

It should also be noted that the minimum federal energy conservation standards became effective on January 1, 2010, just two years ago. The effective date also coincided with the phase-out of R-22, an ozone-depleting refrigerant that was widely used in air conditioning equipment. However, the replacement of ozone-depleting refrigerants necessitated complete equipment redesign, which among other things required design changes to compensate for a loss in efficiency resulting from the use of alternative refrigerants. Consequently, we urge DOE to fully analyze the impact of alternative refrigerants on the performance of commercial package air conditioners.

Energy Efficiency Descriptors

AHRI has a long history in the development and implementation of part-load efficiency metrics. We first introduced the Integrated Part-Load Value (IPLV) in AHRI Standard 340/360 back in 1986. Later in 1989 and with the support of AHRI, ASHRAE 90.1 introduced the first minimum IPLV requirements for commercial packaged air conditioners. In 2007, AHRI developed the IEER metric and submitted a continuous maintenance proposal to ASHRAE 90.1 to replace IPLV minimums with new IEER minimums. The first IEER requirements became effective in 2010. Just two years later, in 2012, ASHRAE released addendum CL to ASHRAE 90.1-2010 which amended the minimum IEERs for commercial packaged air conditioners. The addendum will be published in the 2013 version of ASHRAE 90.1 later this year. These minimum efficiencies were developed through a consensus process which included manufacturers, energy efficiency advocates and other interested parties. In addition, the ASHRAE addendum went through a 45-day public review comment. If DOE decides to switch to the IEER metric, we believe that DOE should simply adopt the minimums in addendum CL and that further analysis is not warranted.

² The modeling procedures were developed by the ASHRAE 90.1 committee and PNNL through a project funded by DOE.

AHRI fully understands the benefits of the IEER metric and welcomes the idea of replacing the existing EER with it. However, our support to such a change is contingent upon DOE addressing and resolving issues related to the Alternative Efficiency Determination Method (AEDM), the basic model definition, the uncertainty in measurement testing and the adoption of the latest version of AHRI 340/360, which will be published in a few months. More specifically, we believe that a switch to the IEER metric is premature and cannot be supported by the industry at the present time unless the following issues are fully addressed and resolved:

Alternative Efficiency Determination Method (AEDM)

The AEDM requirements that were proposed by DOE do not adequately address uncertainties related to part load metrics such as IEER. As currently proposed, manufacturers opting to rate their products with an AEDM would be required to substantiate their AEDMs by testing a minimum of five basic models and verifying that the results obtained from the AEDM output is within 5% of the results obtained from each of the corresponding tests and that the mean of the results from all five tests is within 3% of the of the mean of the AEDM results. While the 5% tolerance might be acceptable for full load efficiency metrics that are well established and have been used by industry for decades, the same is not true for the part-load metrics and in particular the IEER, which has been used by industry for just over five years. More specifically, the IEER metric being considered by DOE requires four tests at 100%, 75%, 50% and 25% of capacity. Because four tests and not just one as in the case of EER are needed to develop an IEER rating, the uncertainty of the test results is greater. For that reason, AHRI uses a 10% tolerance for IEER verification testing in its certification program as compared to a 5% tolerance for EER. DOE will have to reassess upward the AEDM tolerances if it chooses to switch to the IEER metric; otherwise the AEDM will be useless to manufacturers of commercial package air conditioners. We recommend that DOE uses a 10% tolerance as specified in AHRI standard 340/360.

Basic Model Definition

AHRI has in many occasions stated that the current basic model definition is not adequate for commercial HVAC equipment and significantly increases the number of basic models and tests that are necessary to comply with the DOE certification and reporting requirements. At issue here is the requirement that every model in a basic model must have the same efficiency rating. We explained that models with similar physical characteristics could have different energy consumption or energy efficiency rating. The basic model definition issue will be further amplified if IEER becomes the regulated metric as IEER is more affected by control schemes and capacity modulation. Without a change in the basic model definition as previously requested by AHRI, the number of basic models that currently exists will significantly increase, resulting in more testing burden on manufacturers.

Uncertainty in Measurement Testing

As noted above, the uncertainty associated with an IEER test is significantly greater than for EER. Consequently, the sampling plan in 10 CFR part 429.43 will have to be revised and adjusted accordingly. This is also true for any assessment testing that DOE

may conduct as part of section 429.70 and/or any enforcement testing conducted under section 429.110.

Adoption of AHRI 340/360-2013

AHRI is currently revising AHRI 340/360. We expect the revisions to be completed by mid-year. Instead of adopting an outdated version of the standard, we strongly recommend that DOE consider the adoption of the 2013 version of the standard as the federal test procedure.

Market Assessment

In the past, the Department has taken the position that every product category for which there is a minimum energy conservation standard is a product class. For example, a large package air conditioner having a cooling capacity between 135,000 and 240,000 Btu/h with electric resistance (or none) is a different product class than the same product with a gas heating element because the latter has a slightly lower EER. This product classification does not make sense. DOE should consider these two products as a single product class. Product classes should be delineated based on cooling capacity and on whether the unit is an air conditioner or a heat pump. We see no reason why the same product class couldn't have two different efficiency levels assigned to it: one for products with electric resistance heat (or none) and the other for products with all other types of heating element.

Shipment Information

Unfortunately, AHRI is not in a position to respond to the majority of the questions raised in the RFI. Most of the data requested is not readily available, and would require weeks if not months to assemble. However, AHRI is willing to share certain shipment information on a confidential basis. Therefore, we invite DOE's contractors to contact AHRI directly so we could properly assess what shipment information can be provided to DOE.

Conclusion

The Air-Conditioning, Heating and Refrigeration Institute, and many other interested parties including DOE, have invested a great amount of time and effort in developing the consensus amended efficiency levels in ASHRAE 90.1. We strongly believe that the ASHRAE process is credible and offers all parties, including DOE, with ample opportunities to provide input. In fact, the ASHRAE 90.1 process is not much different than the negotiated rulemaking process that DOE is trying to implement for some covered equipment.

There is irrefutable evidence that the energy consumption of commercial package air conditioners has been significantly reduced since DOE last amended the energy conservation standards. These energy savings stem from several design requirements that were implemented in ASHRAE 90.1 over the past few years, and which are not

captured in the EER metric. We ask that DOE properly accounts for these energy savings and does not simply limit its analysis to improvements in EER, which as previously discussed, have reached a point of diminishing returns.

We caution DOE against switching to IEER before addressing and resolving issues related to the AEDM, the basic model definition and the uncertainty in testing measurements due to the use of part-load metrics. If DOE resolves these issues, then it should simply adopt the minimum IEER levels proposed in Addendum CL to ASHRAE 90.1-2010. These minimums were developed through a consensus process and have the support of many stakeholders, including manufacturers and energy efficiency advocates. Adopting the ASHRAE 90.1 IEERs will help DOE meet its statutory deadline given that the Department has less than a year to complete its analyses.

Thank you for the opportunity to provide these comments. If you have questions about this submission or need further clarifications, please do not hesitate to contact me.

Sincerely,

A handwritten signature in black ink, appearing to read 'K Amrane', written in a cursive style.

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