AIR-CONDITIONING, HEATING, & REFRIGERATION INSTITUTE
we make life better™

2111 Wilson Boulevard Suite 500 Arlington VA 22201-3001 USA
Phone 703 524 8800 | Fax 703 562 1942
www.ahrinet.org

November 17, 2014

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

Re: Energy Conservation for Program: Energy Conservation Standards for Packaged Terminal Air Conditioners and Packaged Terminal Heat Pumps *[Docket Number EERE–2012–BT–STD–0029]*

Dear Ms. Edwards:

These comments are submitted by the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) in response to the U.S. Department of Energy's (DOE) notice of proposed rulemaking (NOPR) on the energy conservation standard for Packaged Terminal Air Conditioners (PTAC) and Packaged Terminal Heat Pumps (PTHP) appearing in the *Federal Register* on September 16, 2014.

AHRI is the trade association representing manufacturers of heating, cooling, water heating, and commercial refrigeration equipment. More than 300 members strong, AHRI is an internationally recognized advocate for the industry, and develops standards for and certifies the performance of many of the products manufactured by our members. In North America, the annual output of the HVACR industry is worth more than $20 billion. In the United States alone, our members employ approximately 130,000 people, and support some 800,000 dealers, contractors, and technicians.

As discussed in detail below, AHRI has concerns with the regulatory approach of the proposed rule. There are significant issues in the analysis and the current direction of this rulemaking will place a significant burden both on industry and on end users of packaged terminal air conditioners and heat pumps.

DOE's Analysis Fails to Reflect the Fundamentally Different Approach, Established by Congress, for Amending Residential vs. Commercial Efficiency Standards

In this NOPR, DOE has failed to recognize the clear Congressional intent reflected in the differences between the statutory requirements for amending residential and commercial standards. The commercial provisions, which were enacted separately from and five years after the residential provisions, are based upon a fundamentally different approach that recognizes the importance of the collaborative ASHRAE process and the complexity of setting standards for commercial equipment. The ASHRAE process is an open, collaborative process, in which DOE and manufacturers participate. The premise underlying EPCA's commercial provisions is that through this open and collaborative process, the stakeholders, which includes DOE, can collaboratively determine the appropriate standard levels. The provisions of EPCA directing DOE to adopt amended ASHRAE standards unless it can make a "clear and convincing" showing that significant additional energy savings are technologically feasible and economically justified illustrate the Congressional intent to rely on the ASHRAE process while providing DOE an ability to address any situations in which that process is clearly broken. It is not. In the case of the proposed ASHRAE 90.1-2013 amendments related to PTAC and PTHP equipment, DOE participated in the process, and did not question or raise any concerns about the level adopted through the ASHRAE process. In fact, DOE did not even comment on the proposed ASHRAE amended standards for this equipment.

The Congressional intent to rely on the ASHRAE process and grant DOE the ability to establish standards more stringent than amended ASHRAE standards only in exceptional circumstances is evidenced by EPCA's statutory provisions. Under those provisions, DOE is directed to adopt amended ASHRAE 90.1 standards, providing an exception only if a more stringent standard is "supported by clear and convincing evidence" that it would result in significant additional conservation of energy and is technologically feasible and economically justified. 42 U.S.C. § 6313(a)(6)(A)(ii)(I). This language is very different than the statutory language governing amendment of residential standards at 42 U.S.C. §6295(o)(2)(A), which does not include any language regarding "clear and convincing evidence." Additionally, there is no language in the commercial standard provision directing that amended standards are designed "to achieve the maximum improvement in energy efficiency," which is applicable only to residential standards. Congressional intent on this issue is clear from the language of 42 U.S.C. 63169(a), which specifically states that the provisions of subsections (l) through (s) of section 6295 apply to commercial equipment "(other than the equipment specified in the subparagraphs (B), (C), (D), (I), (J), and (K) of section 6311(1)." Section 6311(1)(I) identifies packaged terminal air-conditioners and packaged terminal heat pumps.

In this NOPR DOE has ignored these distinctions. While DOE repeatedly quotes the "clear and convincing" language from the commercial provisions of EPCA, nowhere in the NOPR does DOE attempt to clarify how it reached the determination that the energy savings and cost savings shown reach the higher standard of "clear and convincing." DOE's analysis and approach is identical to its residential analysis, when Congress has imposed additional burdens before DOE can enact standards more stringent than those established by ASHRAE. In fact, the opposite conclusion is evidenced from the standards

adopted at the TSL 2 levels. As addressed in more detail below, DOE's economic justification analysis falls far short of this elevated requirement of proof, and DOE has not clearly and convincingly shown that establishment of standards more stringent than ASHRAE 90.1-2013 should be adopted.

DOE Cannot Rely on Indirect Energy Savings in Determining that an Amended Standard is Economically Justified

In the NOPR, DOE has failed to meet the statutory requirements by undervaluing the real and immediate negative economic impact on manufacturers and most consumers and overvaluing future and global monetized savings from emissions reductions. Congressional intent to analyze the real and immediate costs and benefits from a more stringent standard is evidenced by the separate requirement that DOE analyze the amount of total energy savings likely to result directly from the imposition of the standard. 42 U.S.C. 6313 (a)(6)(B)(ii)(III). Instead, the overwhelming majority of benefits claimed by DOE is speculative and tangential at best, such as full fuel cycle and global social cost of carbon extrapolated out globally over nearly a 100 year period. DOE acknowledges the uncertainty of these claims repeatedly in the NOPR, including that the SCC estimates are "provisional and revisable" and that even the interagency group that developed the SCC recognized that the models were "imperfect and incomplete." This reliance on the global impact of SCC and other emissions, over a time period greatly exceeding that used to measure the economic costs, is to effectively render the other required factors that DOE must consider meaningless. In doing so, DOE is ignoring the clear congressional intent in including the seven factors in the statutory text.

Additionally, while DOE bases its MIA and INPV analysis on a 30 year period, 20 years longer than DOE's stated lifetime of this equipment, it notes that the benefits from SCC extent to the year 2100. This is over 8 times the DOE's median expected lifetime of this equipment. In the NOPR, DOE also notes that costs and benefits include benefits to customers which accrue after 2048 from equipment purchased in 2019-2048, and accounts for incremental variable and fixed costs incurred by manufacturers due to amended standards, some of which may be incurred in preparation for the rule. What benefits can possibly accrue to customers for equipment that is no longer expected to be in use and does not account for the additional costs of purchasing and installing new equipment? While it makes sense to include the R&D and other costs manufacturers will incur in order to comply with the amended standards, DOE provides no justification for the exclusion of any costs that manufacturers might incur after 2048, to match the manner and time period DOE uses to measure the benefits. AHRI agrees with other stakeholders who have commented that in order for DOE's analysis to be accurate and provide a meaningful comparison the timeframes for cost benefit analysis should be the same for all costs and benefits analyzed, and should be for a realistic timeframe that will "clearly and convincingly" show realistic costs and benefits to manufacturers and consumers, and the energy savings that will directly result during that same time period. The analysis proposed by DOE in the NOPR does not only fail to meet the requirements of 42 U.S.C. 6313 its use of different timeframes and assumptions for costs and benefits is clearly arbitrary and capricious.

DOE does not have the Discretion to Disproportionately Measure and Weight Energy Savings in its Determination of Whether a Standard is Economically Justified

As noted above, DOE has not sufficiently recognized or valued each of the seven factors it must consider before it can justify amending an energy conservation standard. EPCA requires that DOE consider seven different factors in determining whether the benefits of a proposed standard exceed its burdens. There is no indication in the statute or otherwise that Congress intended this to be anything other than an equal weighting of factors. Yet through DOE's inclusion of energy efficiency savings tied to indirect emissions and SCC reductions that are provisional, revisable, imperfect and incomplete, and that extend well beyond the life of the equipment and even the relevant period for measuring benefits relative to costs, it has devised an amount of energy savings that is unsupportable, unbelievable, and insurmountable, even if all of the other factors have significant or even extreme burdens to customers and manufacturers. For example, by DOE's only analysis, the standards set at TSL 2 are such that for PTAC customers, over 80% will have either a net cost or no benefit from the amended standard. For those same customers, the average savings are actually negative. The Median Payback Period (PBP) is 9.9 or 12.3 years, meaning that roughly half of all customers of packaged terminal units will never recoup the additional costs incurred as a result of these standards. These costs are in addition to the INPV loss and conversion costs to manufacturers. Particularly when, as noted above, there is no language in the commercial standard provision directing that amended standards are designed "to achieve the maximum improvement in energy efficiency," it is clear that the levels established in ASHRAE 90.1 2013 were appropriate, and that DOE has failed to show with clear and convincing evidence that significant energy savings will result directly from the more stringent levels.

DOE Must Follow an Open and Transparent Process That Allows All Stakeholders the Ability to Review and Comment upon DOE's Analysis

As noted above, one of the clear benefits of the ASHRAE process is that is open and transparent. AHRI objects to the use by DOE of proprietary software such as Crystal Ball to conduct its analysis in a public notice and comment rulemaking. While large manufacturers or trade associations may be able to afford such software, at a significant expense, AHRI is concerned that other stakeholders such as small business and consumer advocacy groups would find its cost prohibitive. If stakeholders cannot fully access and utilize the models that DOE uses for its analysis and assumptions, they are denied the ability to fully evaluate the impact of the rule and analyze how the standard levels are affected by different costs and other assumptions. All of DOE's models, process and software used in rulemaking under the Administrative Procedure Act should be fully and reasonably accessible.

At the October 29, 2014, public meeting, AHRI raised concern that several important documents were not available to the public during the entire comment period. Analysis spreadsheets including the LCC, NIA and GRIM, and the TSD were posted on October 6th and October 10th, respectively. This was significantly after the proposed rule was

published in the Federal Register. So in fact, stakeholders had access to all the information contained in the docket for only 30 days. In addition, as of November 13, 2014, primary and supplementary documents produced during the 2008 rulemaking, EERE-2007-BT-STD-0012 documents, frequently referenced in this rulemaking, were not available on www.regulations.gov, or elsewhere on the internet.

AHRI also does not agree with DOE's statement on page 55542 of the NOPR that while it has concluded that more stringent energy efficiency levels would outweigh projected benefits, it may adopt energy efficiency levels presented in the document that are higher than the proposed standards. DOE has concluded that efficiency standards above TSL 2 are not technologically feasible or economically justified. If DOE reverses that conclusion, which would involve significant additional or revised data and analysis that at this point stakeholders could only guess at, it must issue a supplemental notice and comment period to allow stakeholders to review, evaluate and comment on DOE's revised analysis.

Nature of the Market

One of the major demand drivers for PTAC and PTHP equipment is lower cost relative to other HVAC options. This means that increases in the price of such equipment that will be required by the more stringent efficiency standard levels will have a significant impact on the demand for this equipment, which could result in the elimination of some manufacturers, particularly smaller manufacturers from the market. AHRI believes that DOE has understated this impact in Chapter 8 of the TSD with the assumption of a constant price to project future PTAC and PTHP equipment prices. AHRI disagrees with DOE's analysis that future pricing trends are uncertain. Figure 8.2-1 of the TSD clearly shows that since 2004 there has been a steady and significant price increase, a trend that has not been affected by the slowdown in activity since 2008. Because price increases due to more stringent efficiency requirements will be in addition to those that are currently in the marketplace, DOE has underestimated the cost to both manufacturers and customers from the more stringent levels.

The Proposed Standards are not Economically Justified for Consumers

AHRI questions the merits of the Department establishing new minimum efficiency standards when the vast majority of consumers would not benefit from the imposition of such standards. According to the Life Cycle Cost (LCC) analysis, purchasers of standard-size PTACs would on average have an LCC increase between $3.21 and $5.55.

For PTHPs, DOE estimates a meager LCC savings between $2.06 and $4.77, but only for approximately 40% of PTAC purchasers. The remainder of customers would experience either an increase or no change in LCC. Similarly, the average payback period for PTACs is longer than the equipment lifetime. For PTHPs, the payback is over nearly six years, twice as long as the typical three years required by most commercial customers.

We dispute the merit of a proposed standard that will benefit only 25% of customers in the nation and force the rest to buy products with no LCC benefits and with paybacks higher than the lifetime of the product being purchased. However, even for the minority of customers that will experience a positive LCC, the savings are meaningless, less than $5 over the lifetime of the products. The efficiency standards proposed by DOE simply do not make economic sense.

DOE's assertion that the proposed standards are economically justified when the vast majority of customers will not benefit from them is in error. As a result, the proposed standards do not meet EPCA's statutory requirements.

Redesign for ASHRAE 90.1-2013 Issue

DOE is required to consider the cumulative regulatory burden. Yet DOE, in is cost analysis, failed to completely account for the redesign that manufacturers will be required to perform based upon state adoption of ASHRAE 90.1-2013, which is 1.8% more stringent than the current federal standard for PTACs. This is indicated by the identical INPV change numbers within Table 12.5.1 (ASHRAE Baseline) and 12.5.3 (EPCA Baseline) of the TSD. In the EPCA baseline approach, the ASHRAE trigger coupled with the DOE final rule would require manufacturers to undergo two redesign cycles (2015 and 2019) within a seven year period, whereas the ASHRAE baseline approach predicts that manufacturers would undergo a single redesign cycle between 2012 and 2019. Therefore, the INPV change values within the two tables should be different. We strongly urge that DOE revisit the analyses conducted with respect to these two tables and reevaluate the changes in INPV at TSL 2.

Equipment Lifetime Overestimated

In Chapter 3 of the TSD, DOE acknowledged that, individuals with previous experience in manufacturing or distribution of PTACs and PTHPs suggested a typical lifetime of 5 to 10 years and that some experts suggested that the lifetime could be even lower. The DOE goes on to say the equipment is typically replaced about every 5 years for cosmetic reasons during remodeling in lodging applications. Supporting the remodeling estimate is an LA Times article that concludes that frequent renovations are essential to hotel success. There are three construction cycles in a hotel's life refurbishment, basic renovation and complete renovation. The first cycle can occur in the first three to six years: a refurbishment of furniture, fixtures and equipment. After about 12 years comes basic renovation, averaging $20,000 per room. Finally, after about 50 years, comes a massive renovation, which can cost upwards of $100,000 per room.[1]

In this analysis, the DOE justifies selecting a median equipment lifetime of 10 years because the 1995 ASHRAE *Handbook of HVAC Applications* estimates a 15-year lifetime

[1] LA Times, Frequent Renovations Essential to Hotel Success: Business: A number of recent refurbishments support the truism that guests may not return if they think an establishment has seen better days. http://articles.latimes.com/1991-01-06/travel/tr-10505_1_hotel-renovation

for PTACs and PTHPs. The 15-year service life estimate is based on a survey conducted in 1976 under ASHRAE Research Project RP-186 (Akalin 1978). In the 2007 (and 2011) ASHRAE *Handbook of HVAC Applications*, it is noted that these data from Akalin (1978) may be outdated and not statistically relevant. ASHRAE notes, "these [Akalin (1978)] estimates have been useful to a generation of practitioners, but changes in technology, materials, manufacturing technology, and maintenance practices now call into question the continued validity of the original estimates." ASHRAE recommends using these data with caution until enough updated data are accumulated in ASHRAE funded research project TRP-1237 (Abramson et al. 2005).

The DOE defines lifetime as the age at which the PTAC or PTHP equipment is retired from service; however, the Weibull distribution calculation described in Section 8.2.2.6 of the TSD only accounts for failures in the determination of the distribution (shape of the curve). Considering that this equipment is replaced during property refurbishment far more frequently than a service-related failure, we question the DOE's determination to only consider the "time-to-failure" rather than the "service life." Service life is a function of time when the equipment is replaced. Replacement may be for any reason, and in this case, the most important factors to consider are equipment failure and hotel renovation schedules. The DOE should recalibrate the Weibull probability distribution of lifetimes, with mean lifetime for the equipment to be five years, rather than the assumed 10 years, and a maximum lifetime of 12 years, based on a realistic consideration of how this equipment is used.

The Energy Use Analysis from the 2008 Rulemaking is no Longer Valid

DOE's approach to the LCC analysis relied on 1,224 unit energy consumption values from the 2008 rulemaking developed based on whole-building simulation data. Appendix e of the 2008 final rule TSD explains that LCC and payback periods were presented in terms of national average LCC, national average LCC savings from the baseline efficiency level, which corresponded to ASHRAE Standard 90.1-1999. Even back in 2008, DOE should have used more current information and should have based its analysis on a more recent version of ASHRAE 90.1(i.e. ASHRAE 90.1-2007). However, DOE's decision to base the analysis on the same outdated ASHRAE 90.1-1999 when the standard went through five subsequent revisions is flawed and defies common sense. DOE should base its analysis on the 2013 version of ASHRAE 90.1. Several changes were made to increase the stringency of ASHRAE 90.1 since 1999, including envelop, lighting and mechanical systems requirements. At a minimum, DOE should account for the following provisions which lower the annual unit energy consumption (UEC) of packaged terminal equipment;

- section 6.3.2g mandates that the system be controlled by a manual changeover or dual set point thermostat;
- section 6.3.2h, applicable to PTHPs with auxiliary internal electric resistance heaters, mandates that controls must be provided to prevent supplemental heater operation when the heating load can be met by the heat pump alone during both steady-state operation and setback recovery; and
- section 6.4.3.1 requires zone thermostatic controls to include off-hour controls, automatic shutdown and setback controls.

Another error that appears to have been carried over from the 2008 rulemaking is that the building load for lobby/lounge space was included in the energy use calculation. This space is typically not conditioned by PTAC/PTHPs, so it is unclear why DOE included the additional load for this space in its calculation.

DOE must revise the energy use analysis to reflect current code requirements as well as eliminate assumptions of hotel installation and use that unreasonable and entirely unsupported.

Outdated Shipment Information

At the October 29, 2014 public meeting, DOE requested current information on shipments by capacity. AHRI plans to provide PTAC and PTHP shipments by capacity level for 2008 through 2013 directly to DOE's contractor. These data should be received no later than November 24, 2014.

Due to unrepresentative market conditions during the financial crisis of 2008–2010, DOE used historical data from its previous analysis to determine the value for the PTAC and PTHP saturation that was used for each year of the analysis period. We feel that by providing current shipment information, the DOE will be able to correct the national energy savings (NES) projections in this rulemaking.

Discrepancies between ASHRAE 90.1 NODA and PTAC/PTHP Rulemaking

The Energy Policy and Conservation Act (EPCA) directs that if ASHRAE 90.1 is amended, the Department of Energy (DOE) must adopt an amended standard at the ASHRAE 90.1 level, unless clear and convincing evidence supports that the adoption of a more stringent level as a national standard would produce significant additional energy savings and be technologically feasible and economically justified. During our review of this rulemaking, we noticed several inconsistencies between this NOPR and the ASHRAE 90.1 Notice of Data Availability (NODA) appearing in the *Federal Register* on April 11, 2014. These inconsistencies all skew DOE's findings toward underestimating the potential savings from adopting the ASHRAE 90.1-2013 levels as the new Federal Minimum.

First, Table III.20 of 90.1 NODA states that there are no potential energy savings for PTACs <7,000 Btu/h in Level 1 (ASHRAE, 11.9 EER) and Level 2 (12.2 EER). This is incorrect. Based on the evaluation of OEM listings in AHRI's Directory, 50% of these available models are between the current Federal Minimum and Level 1. The other 50% are barely above Level 2. DOE's findings in Table III.20 also conflict with its base case efficiency market shares for 2019 where it stated that 63 percent of the market would roll up to Level 2 (12.2 EER). How would this roll-up scenario be possible if 100 percent of the market was already above Level 3 (12.6 EER)?

Second, while both the 90.1 NODA and this NOPR stated the same background and method to establish annual unit energy consumption (UEC) of PTAC and PTHP equipment at the considered equipment classes, the national UEC estimates for PTACs are lower in Table III.3 of the 90.1 NODA than those presented in TSD Table 7.3.1 of this rulemaking. How is it possible for DOE to have increased the UEC in this NOPR for the baseline though efficiency level 5 where identical efficiency levels, and cooling capacities, backgrounds and methods were used?

DOE notes in the ASHRAE 90.1 NODA that several Directory listings fell below the current Federal Minimum Standard. It is not clear when the DOE accessed the AHRI Directory to obtain this information, or if it included discontinued models, which are no longer being manufactured, in its analysis. During AHRI's review of the Directory during this rulemaking, no active listings fell below current Federal Standards.

Market Characterization Incorrect

In Chapter 3 of the TSD, DOE combined information from the 2013 AHRI Directory of Certified Product Performance (2013 AHRI directory) with other publicly available data from manufacturer catalogs of PTACs and PTHPs to develop an understanding of the industry. The AHRI Directory contains listing from Original Equipment Manufacturers (OEMs) and Private Brand Manufacturers (PBMs). External users of the Directory are not able to differentiate between OEMs and PBMs because this relationship is confidential. What DOE was not able to capture in their market characterization is that less than one-fourth of the listings belong to OEMs. The number of certified models at each capacity (Figures 3.2.1 and 3.2.2) are significantly inflated by PBM sales. At the October 29th public meeting AHRI presented an impact analysis of proposed DOE minimum efficiency levels for PTAC and PTHP for OEMs.

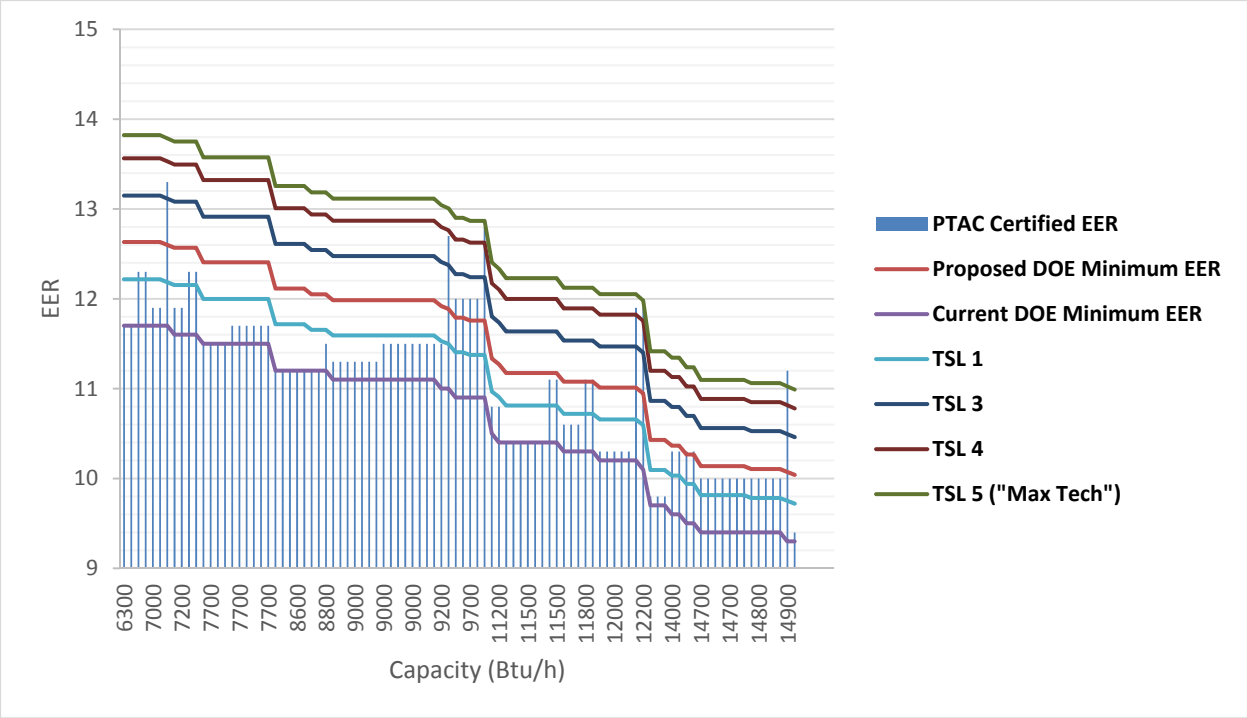

Figure 1 Impact Analysis of Proposed DOE Minimum Efficiency Levels for PTAC

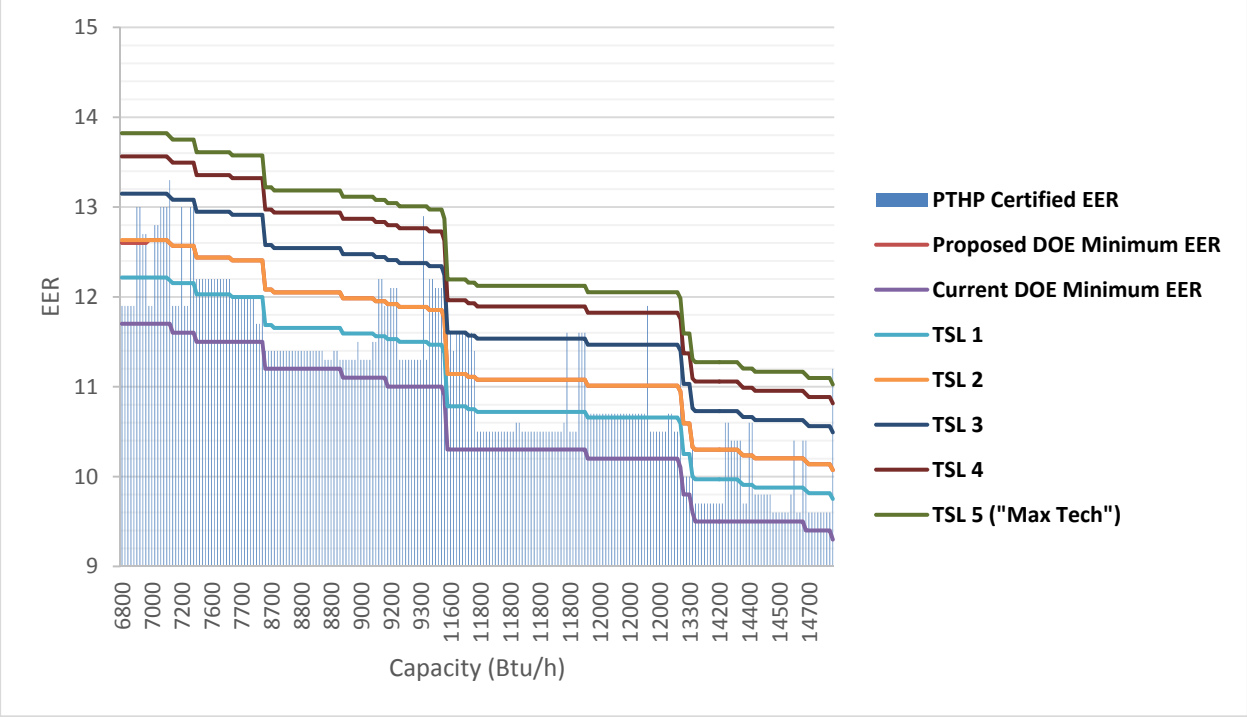

Figure 2 Impact Analysis of Proposed DOE Minimum Efficiency Levels for PTHP

This same information is presented in Figures 1 and 2, above, for PTACs and PTHPs, respectively, with TSL levels below 7,000 Btu/h and above 15,000 Btu/h corrected to show the leveling off of the minimum EER. It is important to note that this oversight had

no impact on the percent of models which will require redesign at each level which was presented during the public meeting.

Since DOE used the model availability in the Directory, the DOE underestimated the percent of models which actually require redesign and therefore underestimated the industry conversion costs. By AHRI's analysis of the Directory, 85% of all OEM PTAC models and 77% of all OEM PTHP models will require redesign at TSL 2. The DOE did not consider such a significant impact on industry in its analysis and should revise its analysis to reflect this updated and more accurate information.

Cost to Redesign Underestimated

DOE has significantly underestimated the industry-wide product conversion costs presented in Section 12.4.6.2 of the TSD. For TSL 2, DOE states a product conversion cost of $4.7 million dollars. At the lowest estimate of R&D costs per model ($50,000), this means that, at the maximum, DOE only identified 94 PTAC and PTHP models in the entire industry that require a redesign to meet TSL 2. This is grossly underestimated. If DOE has assumed that similar models of PTACs and PTHPs will only require one set of R&D costs, this is also incorrect. Efficiency requirements made to increase the EER of a PTHP often do not help increase the COP, so the design of two similar products, with respect to energy efficiency, is a separate process. As discussed at the October 29, 2014 public meeting, 85 percent of PTACs and 77 percent of PTHPs will require redesign to meet TSL 2. The correct range for product conversion costs, using $50,000 to $200,000 per OEM model for R&D is between $13,250,000 and $53,000,000. AHRI would like to remind the Department that R&D costs will fall disproportionately on the three manufacturers with production assets that, by DOE's estimate, account for approximately 80 percent of the domestic PTAC and PTHP market, and are expected to bear 89 percent of the industry total product conversion costs.

AHRI urges that DOE reevaluate the industry-wide product conversion costs and consider this disproportionate impact of this proposed standard on manufacturers with production assets.

Additionally, DOE has partially recognized the fact that the industry would first need to make certain design changes by January 1, 2015 in order to meet the increased PTAC EER due to the ASHRAE 90.1-2013 trigger, and subsequently undergo a second round of design changes to meet the federal energy conservation standards that are expected to go into effect in 2019. However, in the attempt to use ASHRAE 90.1-2013 levels as a baseline for this rulemaking, DOE has overlooked some costs associated with moving from the "EPCA Baseline," in effect today, and the "ASHRAE Baseline" which must be accounted for in the INPV and the economic justification of this rulemaking.

Concerns with the Screening and Engineering Analyses

Another issue DOE overlooked in its attempt to use ASHRAE 90.1-2013 as the baseline, is that it cannot screen in technology options that manufacturers must use to increase the efficiency of their PTAC models by 1.8 percent to meet this level, such as rotary compressors. In its entire analysis, DOE assumes that PTACs and PTHPs are fundamentally the same and therefore, should be able to meet the same efficiency levels with the same technology options. This simply isn't the case. There are certain intrinsic characteristics which allow PTHPs to operate more efficiently than PTACs.

The reversing valve contained in a PTHP is used primarily to switch the refrigerant flow direction from cooling to reverse cycle heating, but as an adjunct also creates a heat exchange between the hot compressor discharge gas and the cold suction gas exiting the evaporator. If the construction between a given PTAC and PTHP is essentially the same (same coils, refrigerant circuiting, components, etc…), and differs only by the presence of a reversing valve, then for a given design target superheat at the compressor inlet, there is an opportunity for the PTHP to operate the evaporator at a lower outlet superheat. This is because some reheating of the suction gas (recovery of superheat) occurs as the refrigerant picks up some heat lost by the compressor discharge gas as the gasses pass through the reversing valve body. In other words, there is reheating of cold suction gas on the way to the compressor suction port beyond just the heat being picked up by the surroundings. Typically, being able to operate the evaporator refrigerant outlet condition at a lower superheat increases the PTHPs effectiveness by allowing more of the coil tubes in the final passes of the evaporator to be wetted with un-evaporated refrigerant before exiting as gas. Any increase in evaporating capacity causes a little more load for the condenser, but the cooling (desuperheating) effect on the hot discharge gas as it exchanges (loses) heat to the superheating evaporator gas reduces the load on the condenser and tends to normalize the energy consumption. So, more evaporating capacity can be obtained for a trade of little or no more total power input. Hence PTHPs are able to operate at higher cooling efficiency (EER) than the same basic construction as a PTAC.

DOE has also screened in two design options, which when implemented together, will have a conflicting impact on energy efficiency.

Bent heat exchangers may impose an additional pressure drop that the indoor fan must overcome, thus they may not improve EER of the equipment. If both bent heat exchangers and "improved air flow and fan design" are implemented as design options, significant additional design, evaluation and testing would be required to optimize the system to achieve the desired efficiency. DOE has not accounted for this conflict, nor the cost associated to resolve it in the analysis.

Cost of Repairs is not Accounted for After Five Years

The cost of repairs present in Table 10.4.3 of the TSD makes it clear that DOE used warranty contracts to establish repair costs and that DOE did not account for any repair costs after five years. DOE has provided no basis for this unrealistic assumption. It is arbitrary and unreasonable to conclude that simply because the warranty has expired, a piece of equipment would not need to be repaired. Should DOE wish to assume that equipment will not be repaired after five years, the Weibull distribution needs to be revised to reflect this by reducing the maximum possible lifetime and median service life. Alternately, DOE can either speak with contractor's associations or appropriately scale repair costs experienced in the first five years. As we all know, repairs are significantly more expensive after the warranty has expired.

Issues on Which DOE Seeks Comments

AHRI appreciates the opportunity to comment on issues in which the DOE has expressed interest.

1. DOE did not consider alternate refrigerants in the analysis because DOE is not aware of any SNAP-approved refrigerants that are known to have better efficiency than R–410A for PTAC and PTHP equipment. DOE requests feedback on the efficacy of alternative refrigerants in PTAC and PTHP equipment.

   AHRI Response: From the question, it appears that DOE will only consider the impact of alternative refrigerants if some are known to have a better efficiency than R-410A. We disagree. We believe that DOE has an obligation to look at alternative refrigerants if there is evidence that the use of current refrigerants could be restricted in the future. In fact there is plenty of evidence that this will indeed be the case. International activities at the Montreal Protocol where the U.S. proposal to phase down hydrochlorofluorocarbons (HFCs) has been introduced and current actions under the SNAP program of the U.S. Environmental Protection Agency (EPA) are indications that the use of high global warming potential (GWP) refrigerants such as R-410A is in jeopardy. While there are no EPA regulations in place today that restrict the use of R-410A in PTACs/PTHPs, there is a high probability that restrictions could be in place by the time the minimum energy conservation standards are effective. Therefore, we request that DOE conduct a sensitivity analysis to assess the impact of alternative refrigerants on the LCC analysis.

2. To estimate the number and type of distribution channels and the distribution of the shipments through the distribution channels, DOE leveraged the information from the 2008 PTAC and PTHP final rule. (73 FR 58772). DOE requests comment regarding the selected channels and distribution of shipments through the channels.

AHRI Response: DOE assumed that no replacements are made through direct sales from the manufacturer to the customer. This is not correct. Some national accounts purchase replacements through direct sales.

DOE Response to AHRI Comments on the Preliminary Analysis was not Adequate

In AHRI's comments to the preliminary analysis of this rulemaking, AHRI noted that newly implemented filter requirements in Section 5.8 of ASHRAE 62.1-2010 would increase pressure drop and increase fan power. In response, DOE noted that a simulation- and field-based study found that the extent of the impact on energy consumption due to the change in filter effectiveness at the levels finalized is less than 1%. However, what DOE failed to mention in the NOPR was that this study[2] focused exclusively on filtration in residential central forced air systems. Results obtained on residential central air conditioners cannot be extrapolated to packaged terminal equipment as the configuration of both systems is significantly different. During the review process of this addendum to 62.1-2010, in the ASHRAE Standing Standards Project Committee (SSPC) 62.1 meeting, manufacturers commented that this change would likely increase fan energy consumption by 5 to 10-percent in products designed to operate at low static pressure, such as packaged terminal equipment. As more jurisdictions adopt ASHRAE 62.1-2010, and later editions, into building code, manufacturers must design to meet this requirement. DOE cannot discount this concern for *non-ducted*, commercial terminal equipment with studies of *ducted* residential central forced air systems which are designed to operate with higher static pressures. As such, DOE must consider both the energy and monetary implications to implement this increased filtration requirement on this equipment.

Social Cost of Carbon

AHRI believes that DOE should refrain from using the SCC in rulemakings until the SCC undergoes a more rigorous notice, review, and comment process. While the DOE may rely upon the SCC in determining the CO2 emissions reductions in this NOPR, that does not change the fact that the SCC has not been adequately noticed and reviewed before being used in this NOPR or any other rulemaking. Pursuant to the Information Quality Act, a petition for correction was submitted by various associations stating that the 2010 and 2013 SCC estimates should be withdrawn and not used in any rulemaking and policymaking for the following reasons:

- The SCC estimates fail in terms of process and transparency. The SCC estimates fail to comply with the Office of Management and Budget (OMB) guidance for developing influential policy-relevant information under the Information Quality Act. The SCC estimates are the product of an opaque process and any pretensions to their supposed accuracy (and therefore usefulness in policymaking) are unsupportable.
- The modeling systems used for the SCC estimates and the subsequent analyses were not subject to peer review as appropriate.

[2] Walker, I.S., et al., ''System Effects of High Efficiency Filters in Homes,'' Lawrence Berkeley National Laboratory, LBNL–6144E, 2013.

- Moreover, even if the SCC estimate development process was transparent, rigorous, and peer-reviewed, the modeling conducted in this effort does not offer a reasonably acceptable range of accuracy for use in policymaking.
- The federal Interagency Working Group (IWG) has failed to disclose and quantify key uncertainties to inform decision makers and the public about the effects and uncertainties of alternative regulatory actions as required by OMB.
- By presenting only global SCC estimates and downplaying domestic SCC estimates in 2013, the IWG has severely limited the utility of the SCC for use in benefit-cost analysis and policymaking.

An important principle of cost-benefit analysis is that costs and benefits must be compared over the same time frame and within the same scope. The cost-benefit analysis within this NOPR violates this principle. With respect to the time frame, DOE calculates the present value of the costs of the NOPR to consumers and manufacturers over a 30-year period. The SCC values, on the other hand, reflect the present value of future climate related impacts well beyond 2100. DOE's comparison of 30 years of cost to hundreds of years of presumed, future benefits is inconsistent and improper. Although the national operating cost savings are domestic U.S. customer monetary savings that occur as a result of market transactions, the SCC values that are referenced within the NOPR are global and offer a worldwide perspective. DOE did not take any steps to modify those SCC values in a manner that is representative of domestic CO2 emissions. Hence, DOE's estimated CO2 emissions reductions within the NOPR are unnecessarily inflated and not representative of the emissions within the U.S.

The SCC values in Table IV.17 of the NOPR only describe the SCC values for a particular year without accounting for any prior changes from baseline emissions trends in previous years. For example, the $66 SCC value at a 3% discount rate for the year 2045 is estimated based on the assumption that no policy changes or regulations impacting CO2 emissions would occur until 2045. Therefore, the value of $66 in 2045 would not be appropriate if emissions reductions measures have occurred in each prior year since 2017, as is the case with the PTAC rulemaking. This is yet another observation that leads us to believe that the claimed CO2 emissions reductions benefits within the NOPR have been overestimated.

The NOPR also fails to take into account in the U.S. Environmental Protection Agency's (EPA) planned greenhouse gas (GHG) regulations for new and existing power plants. In the June 25, 2013 Climate Action Plan, the White House directed EPA to propose and issue regulations reducing GHG emissions from new and existing power plants. The Climate Action Plan and accompanying Presidential memorandum outlined detailed rulemaking schedules for both new and existing power plants. However, DOE failed to consider the impact of EPA's planned GHG power plant regulations on the PTAC rulemaking. This is significant because the EPA's planned GHG regulations will materially affect the projections of CO2 emissions reductions on which the DOE's SCC-derived benefit calculations are based. The DOE's projections of baseline CO2 emissions over the 2019-2048 timeframe assume the continuation of existing patterns of electricity generation by fuel types. It is well known, however, that EPA's planned GHG regulations

on power plants, as well as other existing and proposed regulations, can be reasonably expected to change the baseline pattern of energy generation, including the types of fuels used for electricity generation and the extent to which they are used. Consequently, in failing to consider EPA's planned GHG regulations on power plants, DOE's projections of CO2 emissions reductions in this NOPR are likely invalid.

The EPA example highlights a significant problem with the application of SCC-derived benefit calculations by regulatory agencies. When different agencies are simultaneously pursuing regulatory agendas that address similar sources of CO2 emissions, the likelihood of double-counting of the same presumed SCC benefits is high. The result may be to promote excessive and economically unjustified regulations because the actual benefits have been overestimated by duplicative emissions reduction claims. Both the DOE and EPA should not take credit for a reduction of the same amount of CO2 emissions, and neither agency should claim benefits from the reduction in more than one of its own regulations. Indeed, the potential effects of EPA's planned GHG regulations on power plants may very well overwhelm any emissions reduction claims that DOE may project for its energy conservation standards. Consequently, we believe that the analysis within this NOPR is severely flawed due to DOE's failure to consider EPA's planned GHG regulations on power plants, as well as other related EPA regulations that lead to a reduction in emissions.

Summary

Significant energy would be saved by adopting ASHRAE 90.1-2013 levels. Clear and convincing evidence has not been presented supporting the notion that the adoption of a more stringent level as a national standard would produce significant additional energy savings *and* be technologically feasible and economically justified. The proposed level, TSL 2, presented in this NOPR is neither economically justified for the manufacturers nor the consumers of this product.

AHRI appreciates the opportunity to provide these comments. If you have any questions regarding this submission, please do not hesitate to contact me.

Sincerely,

Laura Petrillo-Groh, PE
Engineering Manager, Regulatory Affairs
Direct: (703) 600-0335
Email: LPetrillo-Groh@ahrinet.org