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August 29, 2022

Dr. Stephanie Johnson
U.S. Department of Energy
Building Technologies Office, Mailstop EE-5B
1000 Independence Avenue, SW
Washington, DC 20585- 0121

Submitted via email: CRE2017STD0007@ee.doe.gov

Re: Notification of Availability – Energy Conservation Program for Appliance Standards: Preliminary Technical Support Document for Commercial Refrigerators, Freezers, and Refrigerator-Freezers, Docket Number EERE-2017-BT-STD-0007

Dear Dr. Johnson:

These comments are submitted by the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) in response to the U.S. Department of Energy's (DOE) Notification of Availability regarding the preliminary technical support document (pTSD) for commercial refrigerators, freezers and refrigerator-freezers, appearing in the *Federal Register* on June 28, 2022.

AHRI is the trade association representing more than 300 manufacturers of heating, cooling, water heating, and refrigeration equipment. AHRI is an internationally recognized advocate for the heating, ventilation, air conditioning, and refrigeration (HVACR) industry and certifies the performance of many of the products manufactured by its members. In North America, the annual economic activity resulting from the HVACR industry is approximately $256 billion. In the United States alone, AHRI's members, along with distributors, contractors, and technicians, employ more than 1.3 million people.

AHRI would like to acknowledge and thank the DOE staff for the time and effort that went into this rulemaking to find a practical and beneficial path forward for this pTSD. AHRI supports many of the changes made in this pTSD to add clarity and reduce test burdens.

AHRI will address certain issues mentioned later in these comments through a survey of our membership. Unfortunately, results from this survey will not be able to be shared until after the comment period closes because additional time is needed to conduct a survey to gather necessary data and information essential to the formation of this pTSD and all stakeholder requests for an extension to the comment period were denied. AHRI is working with members to complete this survey so that we are able to share additional information with the Department as quickly as possible.

AHRI's analysis of the pTSD revealed numerous faulty assumptions that should be addressed. Additionally, while AHRI will make every effort to provide supplemental information to DOE, we encourage DOE to commence the Guidehouse interviews with manufacturers to gain additional insight into the industry.

While AHRI is supportive of many of the changes outlined in the pTSD, we respectfully ask DOE to provide more detail and/or reconsider some of the provisions proposed in the document, specifics outlined below.

Response to DOE Request for comment:

ES.4.1 Equipment Classes

DOE has conducted this analysis on the existing CRE equipment classes, plus additional potential equipment classes for chef bases or griddle stands and high-temperature refrigerators but welcomes comment on whether updates to the existing equipment class structure are appropriate. In particular, DOE requests comment on whether the DOE should maintain the pulldown equipment class and on whether any additional chef base or griddle stand or high temperature refrigerator equipment classes are appropriate. See chapter 3 of this pTSD.

AHRI Response: AHRI requests that DOE clarify whether the vertical self-contained (VSC) class has been removed as a class from the pTSD. AHRI has no objection to the added equipment classes detailed in the pTSD.

ES.4.2 Design Options

DOE requests comments on the technology options and design options it is considering for CRE. See chapters 3 and 5 of this pTSD.

AHRI Response: AHRI cautions DOE that the assumptions about efficiency options outlined in the pTSD may be flawed, as are the baseline efficiency levels and assumptions about incremental costs. The baseline assumptions should include a high-performance door, as manufacturers frequently incorporate high-performance doors into equipment to increase efficiency. This means that including this in the efficiency options is erroneous as they are already part of manufacturers' designs. DOE has assumed a much shorter payback period in their technology and design options that is inconsistent with reality. To achieve the efficiency levels outlined in the pTSD, manufacturers would have to incorporate design elements that are not economically feasible. AHRI also notes that many food retailers are likely to remodel existing structures as opposed to constructing new buildings because of the expense of equipment and a lack of capital.

ES.4.3 Efficiency Levels

DOE requests comment on the efficiency levels considered in this analysis. Specifically, DOE seeks feedback on whether the efficiency levels beyond the baseline are appropriate, including the maximum technology efficiency level. See chapter 5 of this TSD.

AHRI Response: AHRI cautions DOE that there are several inconsistencies with the assumptions made regarding efficiency levels in the pTSD. For example, in the VOP.RCM (open dairy cases) class in the baseline, this type of equipment already has electronically commutated motors (ECM), which should have been included as the baseline motor, and LED lighting contributing to increased efficiency.

AHRI reminds DOE that many states across the U.S. that have adopted the Significant New Alternatives Program (SNAP) Rules do not allow the use of the refrigerant R404A. AHRI requests clarification regarding whether this addresses self-contained cases.

AHRI also notes that DOE has not defined efficiency levels in adequate detail and recommends that DOE verify its analysis for accuracy and consistency.

AHRI may address this issue further after the close of the comment period, depending on survey results from its members.

ES.4.4 Manufacturer Production Costs

DOE requests comment on the cost-efficiency curves developed in this preliminary analysis. DOE seeks information on whether the approach and manufacturer production costs assigned to the considered design options are appropriate for CRE. See chapter 5 of this TSD.

AHRI Response: AHRI advises DOE that while some of the design options included in this pTSD are logical choices, these design options are also largely already incorporated by manufacturers to meet current standards. For example, manufacturers are already using the recommended design options such as high efficiency doors, fans, and motors to name a few. Self-contained cases are already using ECM motors as well. DOE should not double count these options, as they are already factored into current efficiency standards, and counting them a second time will not cause equipment to meet the proposed energy efficiency levels. AHRI mentioned similar concerns with the way DOE has set up levels in issue ES.4.3 and reiterates that DOE is lacking important considerations. Of the recommended design options, vacuum-packed doors and insulation are a few that are not already in use by manufacturers to meet EE standards.

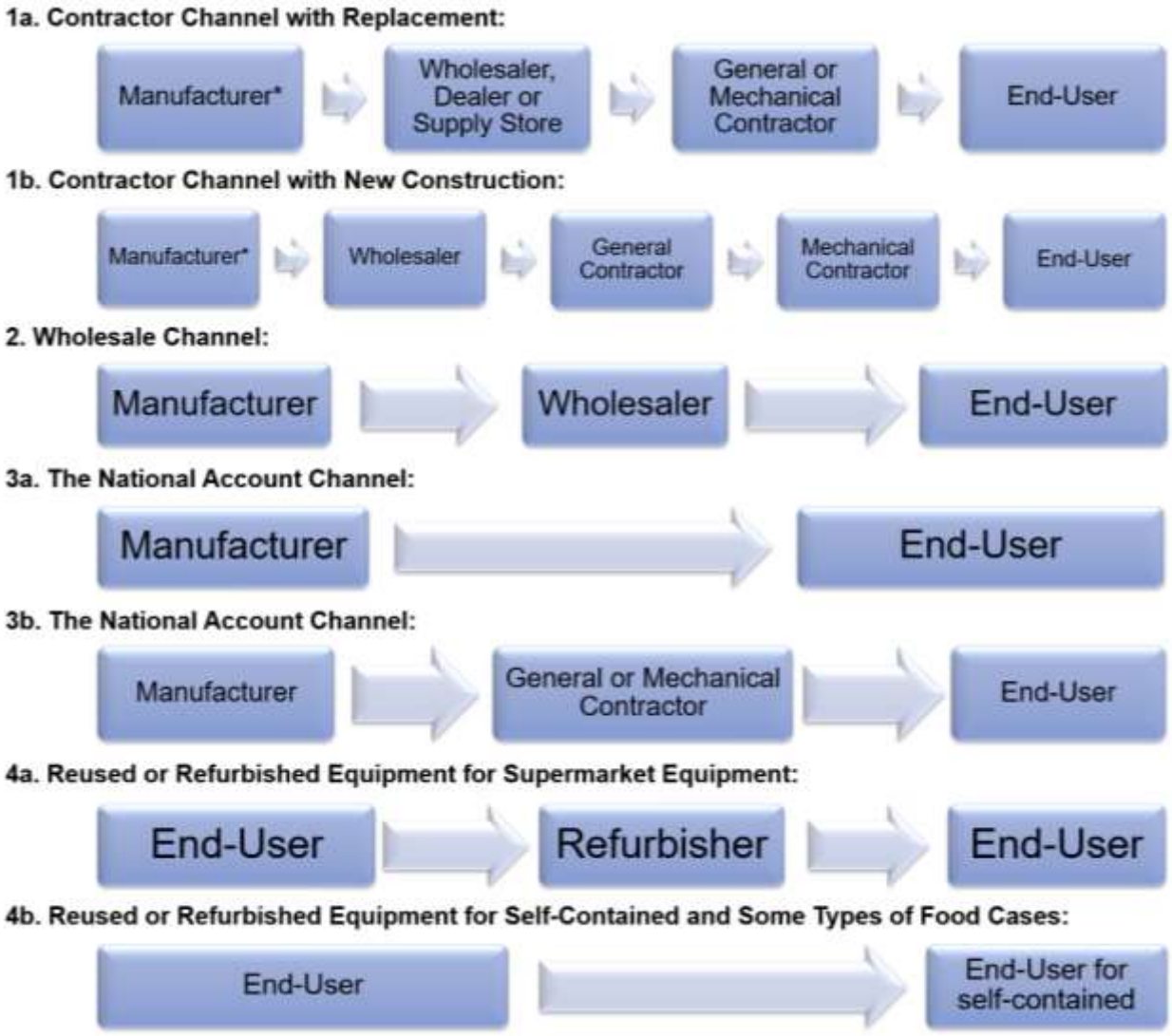
AHRI may address this issue further after the close of the comment period depending on survey results from its members.

ES.4.5 Distribution Channels

DOE requests information on the markups analysis. In particular, DOE requests comment on the CRE distribution channels and the percentage of shipments in each channel. See chapter 6 of this TSD.

AHRI Response: While the CRE distribution channels detailed by DOE were previously supported by AHRI, after further review and discussion with manufacturers, AHRI finds that the added channels explained below are necessary. AHRI recommends DOE slightly revise channels 1a and b (Contractor Channel with Replacement and with New Construction), as well as adding another option to channel 3 (National Account Channel) and creating a fourth channel (4a and 4b) for reused or refurbished equipment. Please see figure below for details.

AHRI recommends that DOE refer to consumers as end-users, as consumer implies a subset of customers including individuals and families. Please note that ‘Manufacturer’ followed by an asterisk indicates that manufacturers can sell to a distributor prior to selling to any of the chains noted above. Other categories DOE may want to consider include Buyer’s Clubs, Restaurant Consortiums, Food Service Consultants, and Governmental Bids (e.g., for the military, prisons, etc., which may also be included in end-users).



AHRI may address this issue further after the close of the comment period depending on survey results from its members.

ES.4.6 Market Efficiency Distributions

DOE developed market share distributions by efficiency level for each equipment class and representative unit for the no-new-standards case in the assumed compliance year. These market share distributions are based on current model count data from DOE's Compliance Certification Database. DOE requests comment on this approach as well as data to further inform these distributions. In particular, DOE also requests comment and data for the newly analyzed CRE equipment classes (high-temperature refrigerators, and chef bases or griddle stands). See chapter 8 of this TSD.

AHRI Response: AHRI is unable to provide efficiency data regarding a product that isn't addressed in the pTSD and for which there is no test procedure. AHRI also reminds DOE that the market dynamic is currently distorted due to the pandemic and the lack of available equipment.

As such, efficiency is a secondary priority for consumers compared to availability and is weighted less heavily than in the past.

ES.4.7 Installation Costs

DOE is not aware of any data suggesting that installation cost changes as a function of efficiency level for CRE. DOE therefore assumed that installation costs do not impact the LCC or PBP analysis. DOE requests comment and data on this assumption. See chapter 8 of this TSD.

AHRI Response: The following response to issue ES.4.7 is accurate for issue ES.4.7-ES.4.9 and should be taken into consideration for these issues. AHRI advises DOE that more efficient equipment can be more expensive to install and may also require more time to setup as there is frequently more technology and additional programming involved. For certain design options recommended, better performance or energy efficiency (EE) may result, but EE increases are not guaranteed. These more efficient equipment options may also be more expensive to purchase, install, repair, and maintain which should be taken into consideration for issues concerning equipment prices, installation costs, and repair and maintenance costs. Another significant issue is that if equipment case sizes change due to the type of insulation used, remodeling costs increase as adjustments must be made. Technician training must also be taken into consideration, as lengthier, more involved training will increase expenses.

AHRI may address this issue further after the close of the comment period depending on survey results from its members.

ES.4.8 Future Equipment Prices

DOE requests comment and data on its assumptions related to LED price learning and, more specifically, on price trends for other CRE design options such as variable speed compressors and fan motors. See chapter 8 of this TSD.

AHRI Response: AHRI advises DOE that variable speed compressors don't contribute significantly to energy savings in specific products and actually present additional technical challenges for servicers. DOE should also not assume that equipment employing this design option will automatically have an energy efficiency increase of 15-20 percent. This design option is more complex than DOE has considered and requires more careful analysis.

ES.4.9 Repair and Maintenance Costs

DOE requests comment and data on its repair and maintenance cost assumptions as those pertain to the LCC and PBP analysis. See chapter 8 of this TSD.

AHRI Response: AHRI cautions DOE that many of the cost assumptions pertaining to the LCC and PBP analyses do not account for important factors. For example, when damaged, vacuum insulated panels are rendered useless, and must be replaced entirely. In the example of remote commercial refrigerators, the entire case may need replacement. This would require shutting down a continuous line up in a store and would be very expensive. The same is true for microchannel condenser coils, which must be replaced if damaged, as the energy efficiency would be drastically reduced. Repair costs are based on the cost of replacements, and DOE may have left required components (e.g., evaporator fans, condensers, and compressors) out of this analysis. AHRI disagrees with the assumptions regarding maintenance costs for efficiency levels. Specifically, in the example of microchannel condensers, DOE needs to account for more frequent

cleaning, including cleaning coils, and adjustments and setting controls as they change with efficiency levels. The same challenges AHRI references in ES.4.7 apply here, as installation costs are directly related to repair and maintenance costs.

AHRI may address this issue further after the close of the comment period, depending on survey results from its members.

ES.4.10 CRE Lifetime

DOE invites comments and data on the lifetime assumptions used in the LCC and PBP analysis. See chapter 8 of this TSD.

AHRI Response: AHRI advises DOE that the lifetime assumptions in the LCC and PBP analysis do not account for several factors. Fifteen years is on the low end of CRE lifetime, especially for smaller businesses or stores that are more likely to use their equipment 15-25 years due to limited capital to invest in upgrading their CRE more frequently. In some cases, compressor racks may be used for 30-40 years, while display cases are switched out once during this time. It is also worth noting that businesses replacing CRE may buy used equipment, for example, replacing 20-year-old cases with 12-year-old cases, as this equipment can be readily moved, resold, and reutilized. A practice called reskinning includes changing out the sheet metal panels on a case as well as the bumpers on the front of the case, thereby giving the existing structure a newer appearance. This is a common method to get several more years out of cases without buying new ones.

ES.4.11 No-Standards-Case Efficiency Distributions

DOE requests comment on its approach to estimate the no-standards-case efficiency distributions, and market share data by equipment class and efficiency to inform these distributions. See chapter 8 of this TSD.

AHRI Response: AHRI advises DOE that the baseline case should be modified to reflect current market practices, including the use of LED lights and energy efficient doors, enhanced frames, and ECM fan motors. Each of these components were commonly incorporated and upgraded by manufacturers to meet DOE's previous CRE energy efficiency requirements. The no standards case efficiency distribution will need to be amended based on those corrections. In addition, the prices of various design options need to be upgraded for the no standards case efficiency distribution.

AHRI brings to DOE's attention that low temperature VCT classes already employ what DOE refers to as high-efficiency doors. DOE's model is incorrect regarding low temperature VCT equipment classes, as DOE assumes no-sweat anti-heat. DOE's baseline doesn't meet current standards for energy efficiency: the current standard for VCT remote low temperature allowable is 34.46, and DOE is considering a baseline design without design options to be 35.14. AHRI also notes that there is no room for anti-sweat controls under the ASHRAE test conditions, and this technology option is therefore not logical.

ES.4.12 LCC and PBP Methodologies

DOE requests comment on the overall methodology and results of the LCC and PBP analyses. See chapter 8 of this TSD.

AHRI Response: The efficiency levels are not explained in the document and manufacturers are not able to respond to this question without that information.

ES.4.13 CRE Shipments

DOE requests shipments data (in units shipped or linear feet of shipped units) disaggregated by capacity, efficiency, and equipment class. In particular, DOE also requests data for the newly analyzed CRE equipment classes (high-temperature refrigerators, and chef bases or griddle stands). See chapter 9 of this TSD.

AHRI Response: AHRI advises that DOE estimates incorrectly the number of existing units in use, as well as the average life of this equipment. There are significantly more units currently in use than DOE estimates, and the life of this equipment is closer to 15 years on small equipment and 10 years on larger equipment. AHRI suggests that breaking equipment classes into smaller and larger units (e.g., equipment under 30 cubic feet and equipment over 30 cubic feet) could be beneficial.

According to the NAFEM Size and Shape of the Industry Study, blast chiller sales are estimated to have decreased since their previous study. The Size and Shape study is conducted every other year, using information reported by members the prior year. According to the respondents:

- 2019 estimated blast chiller/freezer sales were $54,340,000 (approximately)
- 2021 estimated blast chiller/freezer sales were $45,645,000 (approximately)

According to the members that responded to the study, there is a significant decline in sales due to a variety of market conditions.[1]

AHRI may address this issue further after the close of the comment period depending on survey results of its members.

ES.4.14 Market Share by Capacity and Equipment Class

DOE assumed that market shares by capacity and equipment class would remain fixed throughout the analysis period. DOE requests data and information on any trends in the market that could be used to forecast expected trends in equipment class market share. See chapter 9 of this TSD.

AHRI Response: Architecture in facilities is anticipated change due to the refrigerant transition. This is due in part to the lack of available refrigerants and the likely consequent growth in market share in self-contained and smaller units. There is currently a great deal of uncertainty about this direction.

ES.4.15 Shipments Methodology

DOE requests comment on its shipments methodology and results. See chapter 9 of this TSD.

AHRI Response: AHRI recommends to DOE that if changes were made to market shares, there would be corresponding changes to shipping methodologies. Retailers are likely to move back toward favoring the use of open cases with some of the requirements that have been imposed. The aesthetic of these cases, specifically decreased visibility due to doors (already considered by retailers to be a barrier between the shopper and product), will become an even larger obstacle.

[1] NAFEM Size and Shape of the Industry Study, 2019 and 2022

Further regulatory complications regarding doors will cause retailers to prefer units without doors or taking doors off units entirely. Many retailers are already divided regarding whether doors should be installed at all, and the proposed changes may cause more retailers to side with removal of doors. This is counter to DOE's efforts to increase energy efficiency and should give the agency pause to consider favoring more practicable options.

There is an unknown impact of the pending refrigerant regulations. Door cases have a greater maximum allowable charge compared to cases with doors. Customers that wish to use A2L refrigerants may choose to use larger commercial refrigerators without doors.

ES.4.16 Subgroup Analysis

DOE welcomes input regarding which, if any, consumer subgroups should be considered when developing potential energy conservation standards for CRE. See chapter 11 of this TSD.

AHRI Response: With the necessary corrections to the available technology to improve energy efficiency, the cost per percent energy efficiency improvement will be very high. These unaffordable prices will present a particular challenge for small business owners to afford, especially restaurants and small retailers as located in rural and urban food deserts, where profit margins are low. AHRI also recommends that replacements need to fit into existing architecture without additional costs to renovation.

ES.4.17 Manufacturer Markups

DOE requests comment on the use of a 1.42 manufacturer markup for all CRE equipment classes in the preliminary analysis. See chapter 12 of this TSD.

AHRI Response: AHRI may address this issue further after the close of the comment period depending on survey results of its members.

ES.4.18 Manufacturer Subgroups

DOE seeks comment on any other potential manufacturer subgroups, besides small business manufacturers, that could be disproportionally affected by amended energy conservation standards for CRE. See chapter 12 of this TSD.

AHRI Response: Manufacturers of chef bases and griddle stands, as well as other types of equipment for which there is no test procedure, would have to spend additional time and funds to determine whether or not a test is effective, and if it is possible for them to meet the energy conservation standards designated by DOE.

ES.4.19 Emissions Analysis

DOE requests comment on its approach to conducting the emissions analysis for CRE. See chapter 13 of this TSD.

AHRI Response: AHRI has no comment on Emissions Analysis at this time.

ES.4.20 Monetization of Emissions Reductions Benefits

DOE invites input on the proposed approach for estimating monetary benefits associated with emissions reductions. See chapter 14 of this TSD.

AHRI Response: The component prices assumed in the pTSD are incorrect, in many cases grossly underestimated, which adversely impacts the accuracy of assumptions regarding monetary benefits associated with emissions reductions. AHRI also notes that base case-components may or may not be used for energy consumption reduction. DOE should not include the social cost of carbon (SCC) in their analysis, however, in the event that DOE does choose to include SCC, DOE should consider the benefits of foam blowing and the refrigerant transition in their analysis.

Social Cost of Carbon

AHRI and its members strive to reduce the carbon footprint of the HVACR industry. Many member companies have individual greenhouse gas (GHG) goals and work together as an association to reduce this footprint. For example, AHRI works very closely with the U.S. Environmental Protection Agency (EPA) and strongly supported the American Innovation and Manufacturing (AIM) Act and the U.S. ratification of the Kigali Amendment to the Montreal Protocol to phase-down of high global warming potential refrigerants. In fact, AHRI petitioned the Office of Air and Radiation in April with an opportunity to reduce the equivalent of another half billion tonnes of carbon dioxide related to HVACR equipment.

AHRI is concerned that DOE's Social Cost of Carbon (SCC) Analysis used to generate the original 2007 and updated 2020 new interim value for the social cost of carbon dioxide extends beyond the statutory authority and the scope contemplated by Congress.2 AHRI believes that DOE should withdraw the social cost of carbon (SCC) values used within this NOPR, and refrain from using the SCC in any other rulemaking or policymaking until the SCC undergoes a more rigorous notice, review and comment process. While AHRI agrees that the SCC should be estimated, presented, and made publicly available for every DOE rule, the SCC has not been adequately reviewed before being used as a factor in calculating net benefits.

DOE Must Act to Remedy Inaccurate Assumptions and Conclusions in Its Social Cost of Carbon (SCC) Analysis.

First, the SCC's time-period for analysis renders its applicability here suspect. The overwhelming majority of benefits claimed by DOE are 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. This reliance on the global impact of SCC and other emissions, over a time-period greatly exceed that used to measure the economic costs, effectively rendering the other required factors that DOE must consider meaningless. In contrast to the timeframe considered for carbon emissions, DOE calculates the present value of the costs of the NOPR to consumers and manufacturers over a 30-year period. 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.

Second, DOE has acknowledged the uncertainty of its SCC claims repeatedly in notices of proposed rulemaking utilizing the SCC, historically citing that the SCC estimates are "provisional

[2] See the technical guidance document, Table ES-1 for a complete set of values from 2020-2050 in 2020 dollars.

and revisable."3 Even the interagency group that developed the SCC recognized that the underlying models were "imperfect and incomplete."4 One of the main reasons the analysis is uncertain is that it relies on the Intergovernmental Panel on Climate Change's (IPCC)analysis concerning climate sensitivity. But the IPCC has conceded that "[n]o best estimate for equilibrium climate sensitivity can now be given because of a lack of agreement on values across assessed lines of evidence and studies." IPCC, 2013: Summary for Policymakers at 16 n.16, available at http://www.climatechange2013.org/images/report/WG1AR5_SPM_FINAL.pdf.

Third, EPCA's focus is exclusively on benefits accruing within this nation. Hence, SCC figures reported by DOE at the global level are beyond the scope and authority of DOE. Global analysis is entirely foreign to EPCA. EPCA originally arose out of the 1970s oil embargo and nothing in its subsequent amendments suggests a different statutory focus other than trying to improve the energy economics of the United States. To try to reframe EPCA into a globally oriented statute focused on greenhouse gases flies in the face of the legislative history and evolution.

Fourth, DOE wrongly assumes that SCC values will increase over time. The Social Cost of CO2 has increased dramatically between the analysis published in 2007 and the version in the Technical Support Document accompanying the preliminary determination.5 Indeed, in 2007, the 2020 SCC, in 2020 dollars, was projected to be $32.83 ($26.3 in 2007 dollars)6 and the new interim value for the social cost of carbon dioxide is $51/metric ton of carbon at a 3% discount rate. This is contrary to historical experience and to economic development science. The more economic development that occurs, the more adaptation and mitigation efforts are both undertaken by humanity and that a population living in a growing economy can afford to undertake. Adaptation and mitigation analysis is well known in climate science circles and we see no indication in this rulemaking that DOE paid any separate mind to this issue. See, e.g., IPCC, Supplementary material to Chapter 18: Inter-relationships between adaptation and mitigation, Climate Change 2007: Impacts, Adaptation and Vulnerability, available at https://www.ipcc.ch/site/assets/uploads/2018/02/ar4-wg2-chapter18-1.pdf.

Adaptation/mitigation is treated in the Interagency Working Group analysis, but one of the three models used does "propagate forward" damage, though the other two do not. Compare Interagency Working Group on SCC, Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866 at 5-6 (Feb. 2010), available at https://www.epa.gov/sites/production/files/2016-12/documents/scc_tsd_2010.pdf (indicating that developed countries can eliminate 90% of the economic impacts of climate change and that developing countries can eventually eliminate 50% of the economic impacts of climate change). Indeed, energy efficient equipment, using low GWP refrigerants, are an adaptation that can be used to mitigate climate change, and one that is incumbent upon DOE to consider as part of this rulemaking.

In sum, 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 this should be for a realistic timeframe that will clearly and convincingly show realistic costs and

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[3] U.S. Department of Energy's (DOE) notice of proposed rulemaking (NOPR) on the Energy Conservation Standards for Small, Large, and Very Large Air-Cooled Commercial Package Air Conditioning and Heating Equipment appearing in the *Federal Register* on September 30, 2014. 79 Fed. Reg. 58,948 (proposed Sept. 30, 2014).

[4] *Id.*

[5] Appendix 14-A of the Technical Support Document for Energy Conservation Standards for Small, Large, and Very Large Air-Cooled Commercial Package Air Conditioning and Heating Equipment, Docket EERE-2013-BT-STD-0007

[6] CPI Inflation Calculator: https://www.officialdata.org/us/inflation/2007?endYear=2020&amount=41.70

benefits to building owners and tenants, and the energy savings that will directly result during that same time period. EPCA is an energy-conservation statute, not an environmental statute, which excludes environmental objectives among the purposes of this EPCA program. Nevertheless, DOE not only considers environmental benefits in its SCC analysis, but it does also so on a global basis.7 For that reason, it would be arbitrary and capricious for DOE to refuse to consider costs on an equally holistic, albeit properly confined domestic basis. Put differently, DOE cannot construct an artificial analysis in which it looks at macroeconomic-level environmental benefits outside the sphere of the built environment in the United States. See, e.g., Cnty. of L.A. v. Shalala, 192 F.3d m1005, 1022 (D.C. Cir. 1999) ("A long line of precedent has established that an agency action is arbitrary when the agency offer[s] insufficient reasons for treating similar situations differently.") (brackets in original) (citation and internal quotation marks omitted)

The SCC should only be included for rulemakings where DOE has clear statutory authority and only after it has resolved the issues with their SCC analysis.

Please see the referenced footnote for previous comments filed by AHRI on the social cost of carbon, for more information.[8]

ES.4.21 Utility Impact Analysis

DOE seeks comment on the planned approach to conduct the utility impact analysis. See chapter 15 of this TSD.

AHRI Response: The components purportedly used in base cases in the pTSD are incorrect. DOE should be aware that whether consumers will tolerate doors on a case impacts the decision-making process when it comes to the use of specific components. Separately, DOE should correct their analysis before making decisions regarding electricity plants for refrigeration equipment.

ES.4.22 Employment Impact Analysis

DOE welcomes input on its proposed approach for assessing national employment impacts. See chapter 16 of this TSD.

AHRI Response: AHRI references DOE back to our response regarding market shift for this issue. AHRI also reminds DOE that a pending change in employment dynamics is dependent on the shifting market refrigerant transition. Service technicians will require higher skillsets and more hours to service equipment, increasing overall market demand for highly skilled technicians.

ES.4.23 Regulatory Impact Analysis

DOE requests any available data or reports that would contribute to the analysis of alternatives to standards for CRE. In particular, DOE seeks information on the effectiveness of existing or past efficiency improvement programs for this equipment. See chapter 17 of this TSD.

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[7] As noted elsewhere in these comments, AHRI maintains that it is erroneous for DOE to consider environmental benefits on a global scale given the statute's plain focus on domestic costs and benefits alone.

[8] AHRI Comments in Response to the Preliminary Analysis of Energy Efficiency Improvements in ANSI/ASHRAE/IES Standard 90.1-2019 *[Docket Number EERE– 2020-BT-DET-0017]*

AHRI Response: AHRI references our earlier remarks regarding the fact that many of the improvement programs suggested by DOE are already in use by manufacturers today, and are standard equipment (e.g., improved motors and high efficiency doors). From a practicality perspective, manufacturers are at maximum technology. When doors are used on cases, they are high efficiency doors, leaving little room for improvement. Any other significant design options proposed either decrease the utility of equipment or are not economically viable, with a 7-10-year PBP that will deter manufacturers and end-users. In many cases, manufacturers take issue with even a 3-year PBP.

Regarding retailers and their sustainability goals, AHRI notes that refrigerants are a preferred method of reaching goals. Some retailers refuse to include doors on their equipment as they "decrease utility". In these cases, retailers are well aware of the benefits from an efficiency standpoint of including doors and have weighed this against the loss in profits from decreased utility and find that it is not worth it to include doors. AHRI advises DOE that triple pane doors are not used in medium temperature cases due to decreased utility and customer perception.

Through a market survey conducted by the National Automated Merchandising Association (NAMA) of brand owners including convenience stores, it was determined that brand owners do not prefer low emissivity (low E) doors and occupancy sensors for lighting. The design options detailed in the pTSD are largely impractical or already in use by manufacturers, and AHRI suggests DOE reconsider these design options.

AHRI will address this issue further depending on survey results, after the close of the comment period.

ES.4.24 General Analytical Assumptions

In addition to the issues identified earlier in this executive summary, DOE welcomes comment on any other aspect of energy conservation standards for CRE.

Additional Considerations:

Fundamental corrections need to be made to the Marketing and Engineering Analysis, which seems to be the basis of the pTSD.

A second low GWP refrigerant transition is imminent, unaccounted for, and more complex and costly than considered in the pTSD.

A preliminary transition is in process, from R-404A, largely to refrigerants with a global warming potential of approximately 1500. Refrigerants used in colder temperature applications have a GWP of 2200. There are some equipment types charged with very low GWP refrigerants, but most lower GWP refrigerants are limited by building codes, as the necessary standard, UL 60335-2-89 was only just published in October of 2021. It is anticipated that the second refrigerant transition will only occur in January 2026. These transitions will have a significant reduction in radiative-forcing, short-lived climate polluting hydrofluorocarbons (HFCs) and should be taken into consideration in the Social Cost of Carbon and environmental impact assessments.

Most lower GWP refrigerants have a different flammability classification than those currently used today. Cost estimates must also include new electrical components that must be "spark-proof" to eliminate the risk of ignition in case of a leak. Motors, wiring, compressors, and others must all comply with this requirement, making them more costly than estimated in the TSD. There is also

a capital investment that must be made to safely handle and store flammable refrigerants at manufacturing facilities. Manufacturers report $0.5-1 million for small facilities that only manufacture self-contained equipment and $2-4 million for medium and larger facilities and equipment for spark-proof and explosion-proof equipment and design[1].

Some companies have made this investment and have transitioned products with smaller charges (114 grams in areas of egress, (i.e., hallways) 150 grams limit in occupied spaces for A3 products, such as propane).

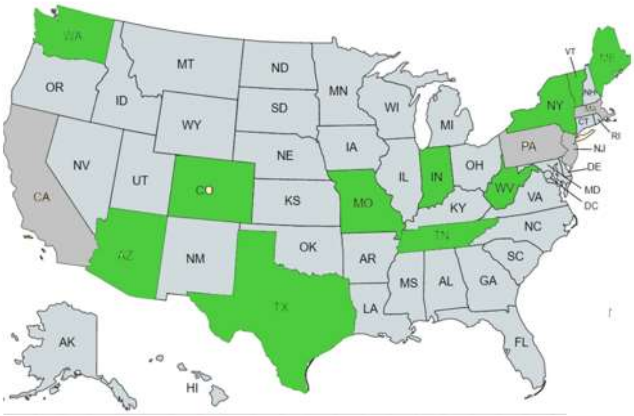
Manufacturers are still testing refrigerants for the 2026 transition. Refrigerant and component manufacturers have largely been focused on larger markets than many of the equipment types sold in the CRE space. As such, not all of the details are known about the impact of specific refrigerants to energy efficiency.

However, it is well known that some of the proposed blends have higher glide and lower efficiencies (some significantly lower efficiencies). than those in use, especially for colder temperature applications. Also, the energy efficiency impact has not been addressed related to the need to continuously operate fans to reduce the risk of reaching a flammable concentration, as an important mitigation strategy related to refrigerants. In some cases, glide is high enough that evaporator re-design is needed, making costs even higher to conform with energy conservation standards.

It should also be noted that, although efficient doors are generally used today, there may be instances where charge sizes are insufficient and may only be allowed to be increased sufficiently if doors are not present on equipment.

The TSD use an example of a transition from an R-134a (ASHRAE Class A1) to an R-290 (propane or an ASHRAE Class A3) compressor as the only required change when other components in the system must also be upgraded to comply with UL60335-2-89 requirements to reduce the risk of ignition, including compressors, switches and other components.

Finally, EPA does not yet allow for these refrigerants to be used and only a handful of the thousands of state and local building codes have been updated to charge refrigeration equipment and store necessary quantities to supply end-user needs. There is significant work to be done to finalize codes prior to the anticipated 2026 transition. States in green below will allow for the use these new refrigerants once they are listed by the EPA.



[9]

Many of the potential energy saving scenarios identified in the pTSD contain elements that have been in use for years or are technically impractical for refrigeration equipment.

It seems that the tear-down analysis must have used equipment built well before 2019 and excluded design features needed to meet current energy conservation standards (ECS). Most equipment is designed with efficient doors and LED lights. Variable speed compressors are impactful with significant changing loads but not for most refrigeration systems.

The analysis also fails to recognize retailer and other concerns with proposed product features. Occupancy lighting is impractical as a light that is off indicates to consumers that equipment is not working properly. Consumers assume that the food is spoiled due to equipment that is not functioning. Retailers don't generally want this design feature.

Energy saving opportunities are much lower once the design options are eliminated that are technically infeasible, already in use or cost prohibitive.

Design options are also limited by the footprint of equipment that replaces existing equipment. For example, larger compressors or additional insulation requirements will increase case sizes or reduce storage capacity of equipment creating less utility or equipment will simply not fit into current spaces creating additional costs to remodel facilities. The pTSD also does not address the impact of Design Options on performance and other desirable design features, including temperature.

AHRI offers the example of the VCT.RCM equipment class. Some OEMs have found that the only way to be compliant with this equipment class is to begin incorporating high efficiency triple pane doors, as well as increasing insulation. The baseline components include evaporator fans which are shaded pole motors, haven't been used in years.

Cost estimates were antiquated and low in 2019 and are now significantly underestimated related to pandemic-related scarcity pricing that is unlikely to be resolved in the next few years.

[9] AHRI refrigerant transition map, 2022.

AHRI plans to complete a survey to provide the Department with additional information on these topics, but there was insufficient time with this rulemaking to complete such a survey prior to the thirty-day deadline, especially given the same day comment timing for the Test Procedure and the Walk-in Coolers and Freezers pTSD.

It should also be noted that components, beyond just computer chips, are difficult to procure with extended timeframes for shipping. This impacts research and development and testing timelines in addition to the timelines for listing through Nationally Recognized Testing Laboratories (NRTLs). This should be considered in the timing and rulemaking process.

The cost of labor and time needed to service equipment will increase in new systems as well, and this is unaccounted for the pTSD analysis. Technicians must have advanced skills for more efficient equipment and for next generation, more flammable refrigerants and it will take more time to service this equipment. Current labor shortages will further exacerbate the cost of servicing equipment. Manufacturers do not know when, or if, supply chain issues and labor shortages will be resolved.

There is also no consideration of refurbished equipment that is reused in the market. Significantly higher cost equipment will drive growth of this market and continued operation of older equipment having lower efficiencies, higher GWP refrigerants, and potential higher leak rates. It should be noted that refurbished equipment does not generally experience any or substantive changes to energy efficiency.

The capital investment in the pTSD is not amortized. The cost of different components appears to be inconsistent for the various equipment types without explanation.

Finally, please note that AHRI is working to complete a survey on the cost of various components, and that this survey will be complete after comment period closes. With this survey AHRI will be able to clarify the cost of vacuum panels (estimated by DOE to be considerably less expensive than is accurate) among other components.

AHRI notes that members ask that DOE correct the fundamental errors in this analysis prior to drawing any conclusions related to appropriate energy conservation standards and appreciates DOE's consideration of these concerns.

Feedback on the Table 4.3.1 "Retained Design Options", including current use by manufacturers, economic viability, reduced utility, technical viability, limited market, and viable design options:

1. Already in Use in to Meet the Current standard
    a. Improved transparent doors
    b. Higher efficiency lighting
    c. ECM motors
    d. Evaporator and condenser fans, motors, blades and controls (closed self-contained cases) [10]
    e. Compressors
    f. Variable speed compressor HCT.SCI (specific to some specific smaller self-contained equipment – already used in some equipment)

[10] As noted earlier, fans used to dissipate flammable refrigerant in case of a leak cannot be turned down or off, controlled with variable speed etc.

2. Not economically viable
    a. Vacuum insulated glass
3. Reduced Utility
    a. Thicker insulation
    b. Synchronous speed motors[11]
    c. Larger evaporators (reduced utility due to space constraints)
4. Not technically viable (here, AHRI addresses options that in previous comments to DOE were considered to be max tech, but after further consultation with members, realizes are not technically viable design options).
    a. Vacuum insulated panels (prone to puncture, can't be repaired)
    b. Microchannel condensers (leak and plug during operation)
    c. Evaporator and condenser fans, motors, blades and controls (open cases)
    d. High-tech defrost fans (doesn't necessarily save energy, according to manufacturer studies and is unreliable)
    e. Variable defrost systems[12] (does not reduce energy consumption)
    f. Expansion valves
        i. often modified by end-user, resulting in higher energy consumption
        ii. flammable refrigerant charge limited, making expansion valve impractical because of need of liquid line to be available to expand
    g. Larger evaporators (limitations due to flammable refrigerants) [13]
5. Limited Market (not as desirable)
    a. Antisweat controls and night curtains
    b. Occupancy sensors
6. Viable Design Options
    a. Variable speed compressor (specific to some specific smaller self-contained equipment – already used in some equipment. However, costs for computerized control systems does not seem to have been included in the analysis)

AHRI members are facing significant regulatory burdens that will require a series of re-designs, re-tooling, testing and listing of equipment that should be considered as DOE contemplates new efficiency levels.

New regulations related to the recent inclusion of special/definite purpose motors as regulated; state-mandated refrigerant emissions limits, which coincide with a change in the safety standard for commercial refrigeration equipment and new regulations requiring elimination of the use of phenyl isopropylated phosphate (PIP 3:1) in components.[14]

DOE has recently made drastic changes to the scope of test procedures for electric motors that would include definite purpose motors and special purpose motors destined for particular applications in Commercial Refrigeration Equipment (CRE).[15] Embedded motor testing, and ultimately energy conservation standards, significantly increase the burden on manufacturers if

[11] Note that the minimum speed for synchronous speed motors is 1800 rpm, resulting in excessive noise.
[12] Variable defrost systems in remote commercial refrigerators applications are unreliable. Sensing frost build up anywhere in a 12 ft long coil is challenging. An iced coil could result in a service call costing $1,000.
[13] Larger coils are designed to reduce the temperature differential. The smaller temperature differential is not sufficient to allow for superheating of refrigerant which would create the EE opportunity, and risk of compressor damage especially in cases for doors.
[14] https://www.federalregister.gov/documents/2021/01/06/2020-28692/phenol-isopropylated-phosphate-31-pip-31-regulation-of-persistent-bioaccumulative-and-toxic
[15] DOE Pre-Published Final Rule on Test Procedures for Electric Motors; Docket No. EERE-2020-BT-TP-0011

all products using special and definite purpose motors were suddenly forced to certify compliance with standards for component parts, including the testing, paperwork, and record-keeping requirements that accompany certification. Efficient electric motors destined for finished products are already a major part of the energy equation when OEMs consider what design options to apply to meet new standards, as is evidenced by the TSD. These costs were not accounted for in the TSD.

DOE has not considered the impact of new motor designs on CRE. For products yet to be produced, the impact could range from retesting/recertification to safety standards to a full product redesign to accommodate a new, larger, motor. To products already installed in businesses around the country, the impact could be devastating – motors could no longer be available as replacement parts, thereby forcing consumers to prematurely discard products that could have otherwise been repaired, imposing significant additional costs on consumers, and generating environmental impacts that would likely entirely offset any marginal gains from the increased scope. The decrease in useful life from this component regulation was not accounted for in the product's LCC calculations.

Once the electric motors test procedure is finalized, motor manufacturers will have 180 days to comply with the new procedure. This timeline puts the need to consider the impact of motor test procedures into this analysis. AHRI calculated and submitted a detailed cost analysis of changing an embedded motor totaling - $304,000 for one model of commercial HVAC equipment in response to the Electric Motor rulemaking.[16] CRE will likely face similar costs.

Changes proposed in the electric motors regulation also expand the definition of "manufacturer" for the purpose of compliance with certification requirements. In the case of air over motors, often an impeller is attached at a different manufacturing location and well after the initial core motor is manufactured. It stands to reason that for any finished goods manufactured overseas, under DOE's new Electric Motors regime, OEM would be redefined as the electric motor manufacturer and be put in the position to comply with these proposed certification requirements – a burden DOE has not accounted for in this analysis.

Industry Burdens

We remind DOE that there are additional industry-wide burdens that contradict the proposal to include special/definite purpose motors into the test procedure scope, including state-mandated refrigerant transitions, which coincide with a change in the safety standard for cooling equipment. The existing safety standard, UL Standard 1995, will sunset on January 1, 2024, and a new safety standard, UL 60335-2-89 edition 3, will be required for all cooling product distributed in the U.S. and Canada. All products currently listed to UL 1995 will need to be tested and certified to 60335-2-89 edition 3 if any modifications are made. In addition to meeting new codes and standards requirements, manufacturers must also redesign products, amend literature, update all regulatory certification requirements, and educate their distributors and customers about the change by January 1, 2024.

EPA's ENERGY STAR® program for central air conditioners and heat pumps released a new version (v6.1) that will see all currently certified v5.0 models removed from listing as of January 2023 and requires manufacturers to retest and possibly redesign products to comply with

[16] AHRI-AHAM Joint Comments to the Notice of Proposed Rulemaking on Test Procedures for Electric Motors; Docket No. EERE-2020-BT-TP-0011

version 6.1. ENERGY STAR® has also expressed an intention to expand currently optional requirements to become mandatory in the near future, which would require more redesign, testing, literature updates, and education.

The AIM Act, enacted in December 2020, requires the phase-down of the supply of high-global warming potential (GWP) hydrofluorocarbons (HFCs) used in commercial refrigeration equipment. These regulations will require manufacturers to use lower GWP refrigerants that have different flammability characteristics than those in use today.[17] All refrigeration equipment will also be impacted by use restrictions under the AIM Act, which is anticipated to ban refrigerants with a GWP over 1500 in 2024 and set a GWP limit of 150 (or 300, depending on product class) by 2026.[18] This regulation, and any other state GWP regulations, will require the development of a third product line for all equipment using new generations of low-GWP refrigerants.

New low-GWP refrigerants will have a significant impact on the HVAC industry and compliant products will likely be required in certain states prior to the compliance date of this regulation (such as California in 2022).[19] Since nearly all of these new low-GWP refrigerants have been designated flammable (A2L, lower flammability, and A3, higher flammability), all new safety standards address the application of these new flammable refrigerants and subsequent leak mitigation. Flammable refrigerant sensors will likely be employed with significant redesign of equipment needed to achieve required mitigation capability and all equipment will require certification to these new standards, which include a number of additional requirements due to the combination of multiple standards. All equipment will also need to eliminate potential ignition sources. Compressor manufacturers are working hard to develop full product lines to accommodate A2L and A3 refrigerants, but this effort is not complete for all technologies in all capacities needed for OEM product lines.

The safety standards that cover these products have also incorporated other safety features. In addition, other changes to safety requirements have been incorporated into the new safety standards for A2Ls which will require additional testing to confirm compliance. It should be noted that once these changes are included in equipment design that equipment will have to be re-tested and listed before being sold. Testing requirements include efficiency testing, vibration testing and many others and take approximately 18 months to complete. The queue at the Nationally Recognized Testing Laboratories is also much longer due to delays associated with pandemic-related quarantines and staffing and supply chain shortages, meaning commercialization may be delayed further.

AHRI appreciates DOE's efforts and requests that manufacturers and AHRI be contacted by Guidehouse and DOE to provide an accurate basis for analysis for any rulemaking. Please do not hesitate to contact me with any questions or for further discussion regarding this submission.

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[17] EPA's SNAP 21 prohibits the use of R-410A and R-134a in chillers as of January 1, 2024.

[18] AHRI submitted a petition to the EPA on March 24, 2022, now under review, to restrict the use of HFCs in certain commercial refrigeration equipment.(EPA-HQ-OAR-2021-0289-0054) This March 24, 2022 petition builds on AHRI's American Innovation in Manufacturing Act of 2020 (AIM Act) petition for refrigeration applications under a 'step 2' approach and more stringent GWP levels were proposed as UL 60335-2-89 and ASHRAE 15 provisions have been updated to clarify the safe use of A2L and A3 refrigerants in these refrigeration applications.

[19] California Air Resources Board Final Statement of Reasons, https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2020/hfc2020/frorevised.pdf.

Sincerely,

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