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January 18, 2018

The Honorable William Wehrum  
Assistant Administrator  
Office of Air and Radiation  
Environmental Protection Agency  
1200 Pennsylvania Avenue, NW  
Washington DC, 20460

Dear Assistant Administrator Wehrum:

The Association of Home Appliance Manufacturers (AHAM) is requesting EPA's Office of Stratospheric Protection Division, Significant New Alternatives Policy Program (SNAP) to amend two rules to modify the transition deadlines for alternative substances for refrigerants and foam blowing agents in household refrigerators and freezers products. SNAP Rule 20 banned the use of certain high Global Warming Potential (GWP) foam blowing agents in rigid polyurethane appliance insulating foam as of January 1, 2020. SNAP Rule 21 banned the use of certain high GWP refrigerants in new household refrigerators and freezers as of January 1, 2021. We write to urge your office to amend these two SNAP rules to ensure an orderly transition to acceptable alternative refrigerants.

The appliance industry is pleased to submit to EPA its consensus agreement to transition out of high-GWP refrigerants and foam blowing agents. This approach will help realize the policy goals of the two SNAP rules in a cost effective manner without detracting from the rules' environmental goals. Our plan is a tiered approach that recognizes different product categories based on technical feasibility. Our members have agreed to transition beginning with a transition out of high-GWP refrigerant and foam blowing agents beginning on January 1, 2021 in certain refrigeration products and completing phase-out in all other refrigerator/freezer categories by January 1, 2023.

Below is AHAM's petition to EPA to amend the two SNAP rules consistent with this industry agreement, the SNAP Program's policy objectives, and protection of the environment. We look forward to working with the SNAP program to advance the recommendations contained in this petition.

Please do not hesitate to contact me if you have any questions or need any further information.

Sincerely,

Charlotte Skidmore  
Senior Director, Environmental & Sustainability Policy

# **Petition to EPA's Significant New Alternatives Policy (SNAP) Program to Amend Regulations to Change Transition Deadlines for Acceptable Substitutes for Household Refrigeration Products for Refrigerants and Foam Blowing Agents**

January 18, 2018

## **Introduction and Overview**

The Association of Home Appliance Manufacturers (AHAM) petitions the U. S. Environmental Protection Agency's (EPA) Significant New Alternatives Policy Program to amend its regulations to allow for the home appliance manufacturing industry's consensus voluntary commitment to transition out of high global warming potential refrigerants and foam blowing agents for all household refrigerators and freezers products (see below). The petition applies to household consumer refrigeration products, including refrigerators, refrigerator-freezers, freezers, coolers and combination coolers.

The home appliance manufacturing industry has committed to voluntarily transition away from the use of high Global Warming Potential (GWP) refrigerants and foam blowing agents in residential consumer refrigeration products. This commitment synchronizes the insulating foam-blowing agent and refrigerant transition timing to reduce repetitive redesign and retooling costs, thereby also reducing consumer product cost. This is an aggressive, environmentally responsible, cost-effective, and tiered transition beginning in 2021 and concluding by 2023.

Over the last 30 years, the appliance industry in the US and globally has undergone several transitions of cooling and insulation systems in ways that have enhanced environmental protection. Since the mid-1980s, the industry has made costly, but environmentally beneficial, transitions from CFCs to HCFCs and to non-ozone-depleting and very energy efficient compounds such as HFCs and, more recently, to hydrocarbons HFOs. Our industry has already largely transitioned out of HFC foam blowing agents. For example, less than 30% of current household refrigerators sold contain HFCs as a foam-blowing agent.

**PRODUCT SCOPE:** Residential Consumer Refrigeration Products are within the scope of this petition (as defined in the Federal Code of Regulations at in 10 CFR 430.2), which include Refrigerators, Refrigerator-Freezers, Freezers, Coolers, Combination Coolers.

**CONTINGENCY:** The voluntary agreement to transition from high-GWP refrigerants and foam is contingent on EPA's final rule authorizing an increase in the allowance for the use of R600a refrigerant charge size to 150 grams. Without this final rule, many products will not be able to transition.

**TRANSITION DATES:** Residential Consumer Refrigeration Products will be fully transitioned out of high-GWP foam blowing agents and

refrigerants based on the below schedule. Many refrigeration products will transition prior to these timeframes.

January 1, 2021: Compact Refrigeration Products (Not Built-Ins)  
*Refrigerators, Refrigerator-Freezers, Freezers, Freestanding Compact Cooler, Compact Combination Coolers*

January 1, 2022: Full-Size Refrigeration Products (Not Built-ins)  
*Refrigerators, Refrigerator-Freezers, Freezers, Freestanding Cooler, Combination Coolers*

January 1, 2023: Built-In Refrigeration Products  
*Refrigerators, Refrigerator-Freezers, Freezers, Built-in Compact Cooler, Built-in Cooler, Built-in Combination Coolers*

### **SNAP Regulations**

Current SNAP regulations designate certain substitutes for refrigerants as unacceptable for new household refrigerators and freezers as of January 1, 2021 (SNAP 21) and certain substitutes for foam blowing agents as unacceptable as of January 1, 2020 (SNAP 20). The transition to alternative chemicals, some of which are flammable, is a feasible but complex technical undertaking for manufacturers, particularly domestic manufacturers requiring substantial capital and product investments at numerous stages of the production process.

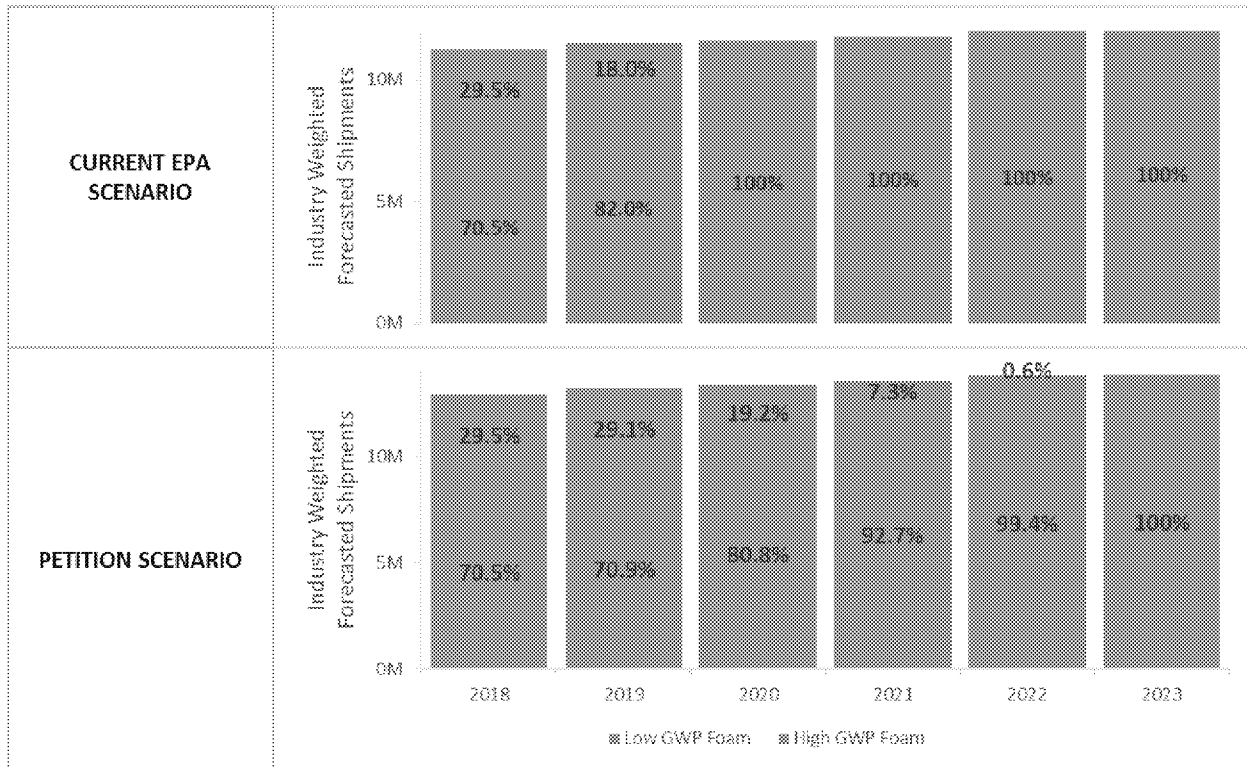
AHAM is requesting EPA to amend the two SNAP regulations to change the applicable deadlines to ensure a smooth transition from high-GWP HFCs in refrigerants and foam in accordance with the transition dates in this petition. This approach will provide manufacturers additional time to transition to flammable refrigerants in all covered products. A phased approach is necessary to ensure the safe use of these alternative refrigerants in all covered products.

Our Petition seeks to modify slightly the current SNAP rule transition dates. Our voluntary plan, however, is reasonable, has no material environmental impact and provides certainty to stakeholders.

### **Foam Blowing Agents - Comparison of Dates for Transition to Lower GWP**

Based on AHAM analysis of industry data, the chart below compares the percentage of products shipped with low GWP foam blowing agents under the current EPA SNAP regulatory requirements compared to the dates recommended in this petition. It shows that just 19.2% of the remaining estimated shipments will transition to low GWP foam blowing agents after 2019 with most of the final transition occurring just one year later in 2020.

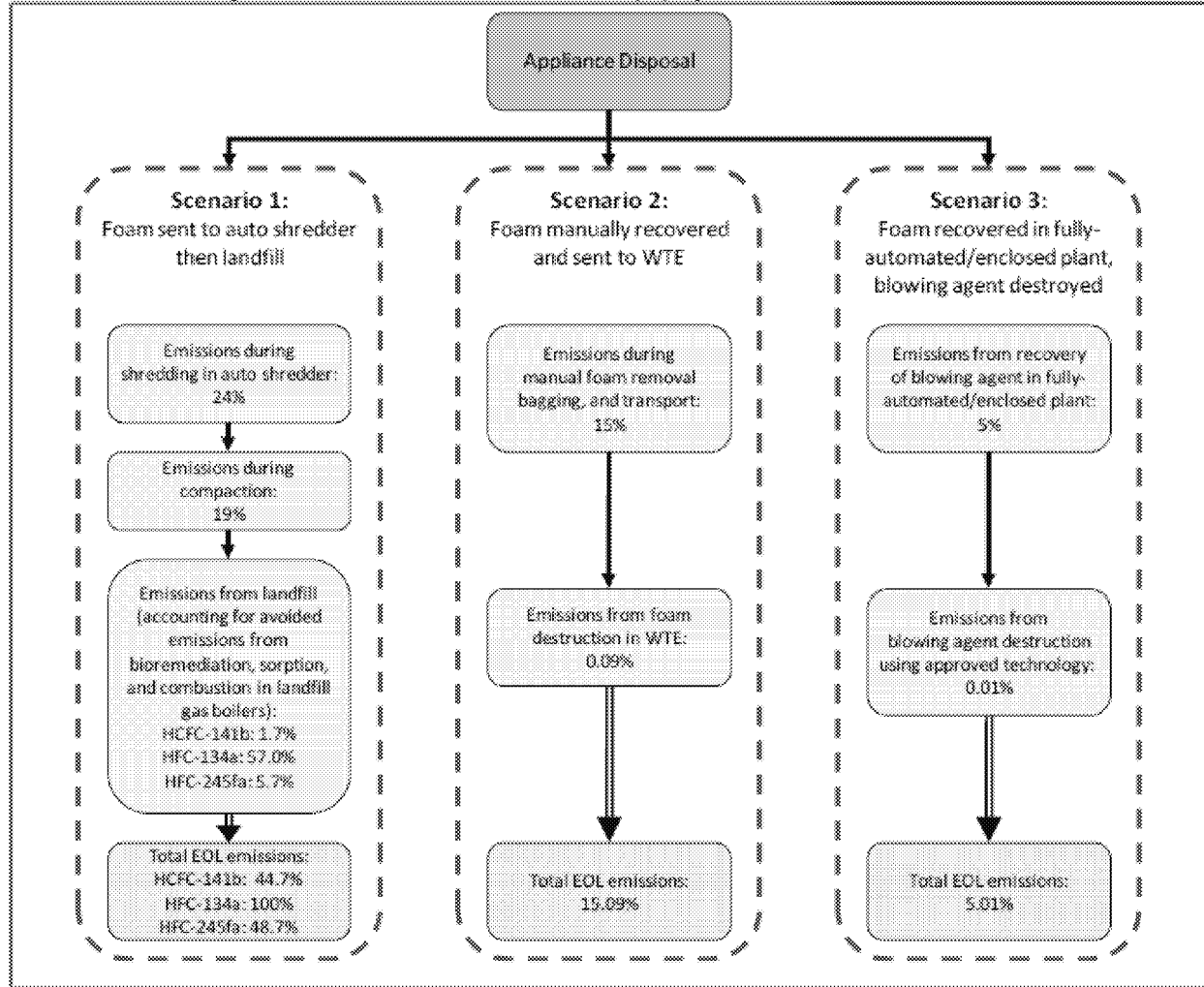
## Comparison of Forecasted Shipments between Current EPA Rule and Petition Dates for Transition to Lower GWP Foam Blowing Agents



This petition, therefore, would have a negligible impact on GHG emissions as it relates to foam blowing agents. During the recycling of these products, much of the foam blowing agent is captured. There are a few studies in this area, but ICF International completed research for the Appliance Research Corporation and found that about half (48.7%) of the most commonly used foam blowing agent in the landfill scenario (see scenario 1 in Exhibit 1) is emitted, and even less for the other scenarios (15.09% and 5.01%).<sup>1</sup>

<sup>1</sup> ICF International, *Assessment of Refrigerator/Freezer Foam End-of-Life Management Options*, December 2010.

**Exhibit 1: Summary of BA Emission Profiles at EOL (%) by Scenario**



In addition, the California Air Resources Board (CARB) funded a study in 2016 that showed waste appliance insulation foam, once landfilled, is not a very significant source of GHG emissions.<sup>2</sup> The research results show that with bioremediation and in modern landfills with methane collection and combustion systems, the blowing agent emissions are quite low, ranging as low as 0.06% (see Table 1.9 from CARB study below).

<sup>2</sup> Yesiller et al, *Emissions of Potent Greenhouse Gases from Appliance and Building Waste in Landfills*, CARB Agreement Number 11-308, May 31, 2016.

Table 1.9 – Summary of Predicted BA Emissions from the Landfill Environment at End of Life

| Reference                 | Modeling Period (years) | Blowing Agent | Initial Release | Short-Term Release            | Fraction Microbially Degraded (%) <sup>4</sup> | Fraction Remaining in Landfill (%) | Fraction of Long Term Release with LFG (%) | Fraction of Release with Leachate (%) | Fraction Released to Atmosphere (%) <sup>1</sup> | Fraction Released after Combustion by Gas System (%) <sup>2</sup> | Total Emissions from Landfill at End of Life (%) |
|---------------------------|-------------------------|---------------|-----------------|-------------------------------|--|------------------------------------|--|---------------------------------------|--|---|--|
|                           |                         |               | Compaction (%)  | Microbiol Inactive Period (%) |  |                                    |  |                                       |  |   |  |
| Scheutz et al. (2003a)    | 2                       | CFC-11        | N/A             | N/A                           | 0 to 99.7                                      | 0.3 to 68                          | 0.2 to 32                                  | <0.01 to 0.08                         | 0.05 to 6  | 0.01 to 1.4   | 0.06 to 9.4                                      |
|                           | 20                      |               | N/A             | N/A                           | 0 to 99.7                                      | 0.1 to 8.8                         | 0.2 to 91                                  | <0.01 to 0.24                         | 0.05 to 23                                       | 0.01 to 4   | 0.06 to 27                                       |
|                           | 2                       | HCFC-141b     | N/A             | N/A                           | 0 to 89.7                                      | 8 to 89                            | 2.2 to 11                                  | 0.83 to 0.12                          | 0.8 to 2.8                                       | 0.1 to 0.5  | 0.7 to 3.3                                       |
|                           | 20                      |               | N/A             | N/A                           | 0 to 97  | 0.5 to 35.3                        | 2.4 to 64                                  | 0.83 to 0.75                          | 0.8 to 16.3                                      | 0.11 to 3   | 0.71 to 16.3                                     |
| Fredenslund et al. (2005) | 20                      | CFC-11        | 15              | 3 to 39                       | 7 to 36  | 5 to 21                            | 0 to 2                                     | N/A                                   | 0 to 0.5   | 0 to 0.1  | 0 to 65  |
|                           | 20                      |               | 5               | 0                             | 40 to 80                                       | 10 to 29                           | 1 to 4                                     | N/A                                   | 0.25 to 1  | 0.05 to 0.2   | 5.7 to 6.3                                       |
| Scheutz et al. (2007c)    | 20                      | CFC-11        | N/A             | N/A                           | 94 to 99                                       | 0.5 to 1                           | 0.5 to 5                                   | N/A                                   | 0.13 to 1.25                                     | 0.02 to 0.23  | 0.15 to 1.5                                      |
|                           |                         | HCFC-141b     |                 |                               | 46 to 92                                       | 2 to 33                            | 6 to 29                                    | N/A                                   | 1.5 to 7.25                                      | 0.3 to 1.3  | 2 to 9   |
|                           |                         | CFC-12        |                 |                               | 80 to 92                                       | 0 to 2                             | 6 to 40                                    | N/A                                   | 1.5 to 10  | 0.3 to 2  | 2 to 12  |
|                           |                         | HCFC-22       |                 |                               | 43 to 88                                       | 0                                  | 12 to 57                                   | N/A                                   | 3 to 14.3  | 0.5 to 3  | 3.5 to 17.3                                      |
| ICF (2011) <sup>3</sup>   | 1                       | HCFC-141b     | 19              | N/A                           | 46   | 23                                 | 29   | N/A                                   | 3  | 2.35  | 5.35   |
|                           |                         | HFC-134a      |                 |                               | 0  | 0                                  | 100  | N/A                                   | 100  | 0   | 100  |
|                           |                         | HFC-245fa     |                 |                               | 0  | 0                                  | 100  | N/A                                   | 10   | 8.1   | 18.1   |

<sup>1</sup> Calculated from long term LFG release assuming a collection efficiency of 75% (SCS 2008)  
<sup>2</sup> Calculated from long term LFG release assuming a destruction efficiency of 94% (Cianciarelli and Bourgeau 2002, Greer and Cianciarelli 2005)  
<sup>3</sup> Study assumed a collection efficiency of 90%, and destruction efficiency of 91% (ICF 2011)  
<sup>4</sup> Fraction microbially degraded includes the oxidation in the cover soil and anaerobic degradation in the waste layers  
 N/A: Not applicable to study

The CARB funded study also found that only 0.08% of CO<sub>2</sub> equivalent emissions were attributable to HFC-245fa, which is the predominantly used foam blowing agent in residential refrigerator/freezers prior to transitioning to low GWP alternatives (see Table 3.52 below).

Table 3.51 – Total CO<sub>2</sub> Equivalent Emissions of the Test Gases (Annual) with CO<sub>2</sub>

| Compound   | Surface Emissions (CO <sub>2</sub> eq Tonnes) |               |                 |               |
|--|---|---------------|-----------------|---------------|
|  | Minimum                                       | %             | Maximum         | %             |
| CFC-11   | 6.23E+02                                      | 2.52          | 2.40E+03        | 2.40          |
| CFC-12   | 5.53E+01                                      | 0.22          | 1.56E+02        | 0.16          |
| CFC-113  | 1.20E+00                                      | 0.00          | 2.29E+00        | 0.00          |
| CFC-114  | 1.68E+01                                      | 0.07          | 3.45E+01        | 0.03          |
| HCFC-21  | 2.30E+01                                      | 0.09          | 9.26E+01        | 0.09          |
| HCFC-22  | 1.11E+01                                      | 0.04          | 2.37E+01        | 0.02          |
| HCFC-141b  | 1.91E+02                                      | 0.77          | 4.21E+02        | 0.42          |
| HCFC-142b  | 1.28E+01                                      | 0.05          | 1.86E+01        | 0.02          |
| HCFC-151a  | N/A   | N/A           | N/A             | N/A           |
| HFC-134a   | 4.52E+01                                      | 0.18          | 1.10E+02        | 0.11          |
| HFC-152a   | 4.51E+00                                      | 0.02          | 1.68E+01        | 0.02          |
| HFC-245fa  | 2.17E+01                                      | 0.09          | 8.41E+01        | 0.08          |
| <b>Total F-Gas Emissions</b>   | <b>1.01E+03</b>                               | <b>4.06</b>   | <b>3.36E+03</b> | <b>3.35</b>   |
| CH <sub>4</sub>  | 1.69E+04                                      | 68.31         | 7.74E+04        | 77.34         |
| CO <sub>2</sub>  | 6.84E+03                                      | 27.63         | 1.93E+04        | 19.30         |
| <b>Total Surface Emissions (F-Gases + CH<sub>4</sub> + CO<sub>2</sub>)</b> | <b>2.47E+04</b>                               | <b>100.00</b> | <b>1.00E+05</b> | <b>100.00</b> |

As a result, the table below shows that the total estimated additional GHG emissions attributable to the petition’s timing versus the current regulations related to foam blowing agents is only 1.33 MMTCO<sub>2</sub>. These emissions estimates use EPA’s Vintage Model rates for loss at manufacturing (4%) and leakage (3.75%). We assumed that 25% of the foam blowing agent would be emitted during recycling. According to EPA’s 2015 U.S. Greenhouse Gas Emissions, of the total GHG emissions of 6,587 MMTCO<sub>2</sub>, fluorinated gasses were just 3% of that total or 197.6 MMTCO<sub>2</sub>.<sup>3</sup> Therefore, this petition’s impact of 1.33 MMTCO<sub>2</sub> does not even represent a rounding error at only 0.02% of the total GHG emissions or 0.67% of fluorinated emissions. However, importantly, it provides much needed flexibility to manufacturers in an industry already experiencing extensive cumulative regulatory burden.

**Additional Carbon Emissions For Petition Scenario for Foam (MMTCO<sub>2</sub>)**

| Product                             | 2020        | 2021                     | 2022 |
|-------------------------------------|-------------|--------------------------|------|
| Refrigerators / Freezers Total      | 0.97        | 0.29                     | 0.08 |
| <b>Cumulative Total (all years)</b> | <b>1.33</b> | <b>MMTCO<sub>2</sub></b> |      |

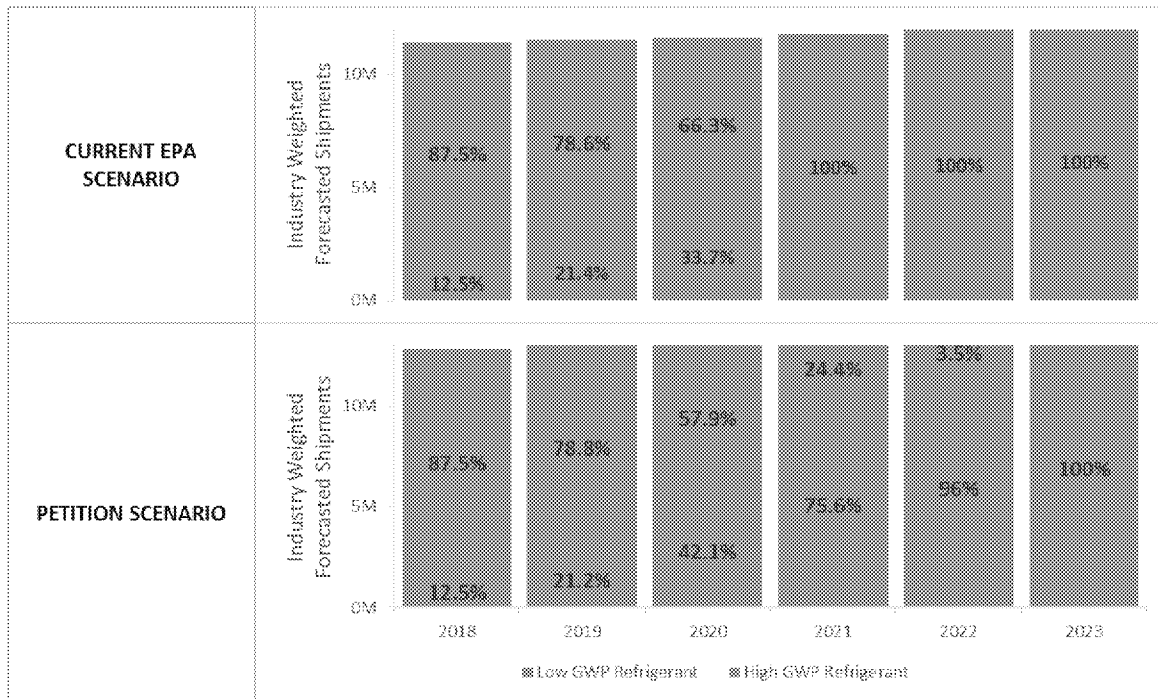
**Refrigerants - Comparison of Dates for Transition to Lower GWP**

Based on AHAM analysis of industry data, the chart below compares the percentage of products shipped with low GWP refrigerants under the current EPA SNAP regulatory requirements and under the dates recommended in this petition. It shows that the just 24.4% of the remaining estimated shipments will transition to low GWP refrigerant after 2020 with most of the final transition occurring just one year later in 2021.

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<sup>3</sup> EPA, *Overview of Greenhouse Gases*, <https://www.epa.gov/ghgemissions/overview-greenhouse-gases>, accessed January 9, 2018.

## Comparison of Forecasted Shipments between Current EPA Rule and Petition Dates for Transition to Lower GWP Refrigerants



This petition also would have a negligible impact in greenhouse gas (GHG) emissions as it relates to refrigerants. Venting high GWP refrigerants into the atmosphere is illegal under EPA’s regulations. Therefore, no emissions should be occurring when the product is recycled.

Nevertheless, as the table below shows, the total estimated additional GHG emissions attributable to the petition’s timing versus the current regulations related to refrigerants is only 1.65 MMTCO<sub>2</sub>. These emission estimates use EPA’s Vintage Model rates for loss at servicing, which includes leakage (0.6%). We also assumed that 60% of the refrigerant is improperly vented into the atmosphere during recycling even though it is illegal. According to EPA’s 2015 U.S. Greenhouse Gas Emissions, total GHG emissions were 6,587 MMTCO<sub>2</sub> and fluorinated gasses were just 3% of that total or 197.6 MMTCO<sub>2</sub>.<sup>4</sup> Therefore, this petition’s impact of 1.65 MMTCO<sub>2</sub> does not even represent a rounding error at only 0.025% of the total GHG emissions or 0.84% of fluorinated emissions. However, importantly, it provides much needed flexibility to manufacturers in an industry already experiencing extensive cumulative regulatory burden.

### Additional Carbon Emissions For Petition Scenario for Refrigerant (MMTCO<sub>2</sub>)

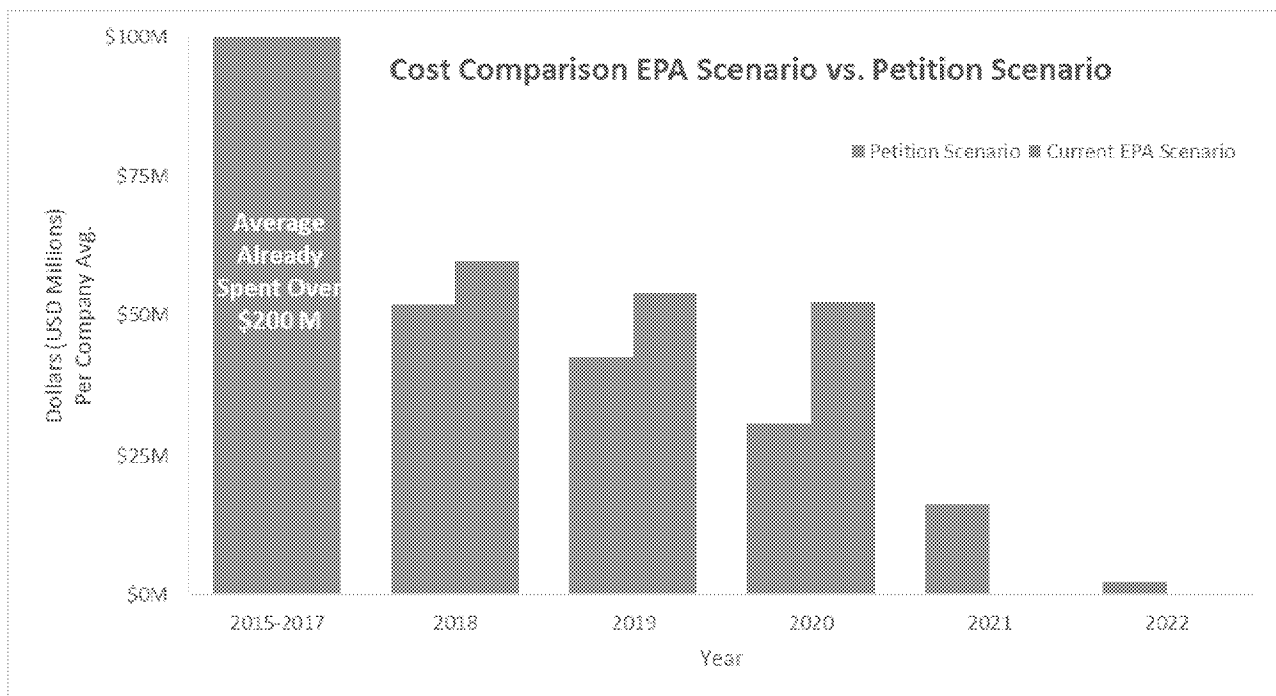
| Product                             | 2020        | 2021                     | 2022 |
|-------------------------------------|-------------|--------------------------|------|
| Refrigerators / Freezers Total      | 1.08        | 0.48                     | 0.10 |
| <b>Cumulative Total (all years)</b> | <b>1.65</b> | <b>MMTCO<sub>2</sub></b> |      |

<sup>4</sup> EPA, *Overview of Greenhouse Gases*, <https://www.epa.gov/ghgemissions/overview-greenhouse-gases>, accessed January 9, 2018.

### **Costs for Many Previous Transitions**

The appliance industry has been at the forefront of taking progressive actions with respect to the environment. We already have transitioned our refrigeration products from CFCs to HCFCs to HFCs. There have been double investments for foam and refrigerant. Now our industry is dedicated to moving beyond high GWP HFCs. As noted in AHAM comments to the previous SNAP rule, substantial progress in that area in refrigerator foam occurred well before EPA required it. While the appliance industry is moving to replace HFC refrigerants in our products and has in fact produced and sold hundreds of millions of units safely around the world using hydrocarbon (HC) alternatives, this transition process is expensive and time-consuming, and in the United States carries additional safety requirements. The industry's experience in Europe, Asia and elsewhere has shown that HC refrigerants can and have been used safely for years. Similarly, in the U.S., substantial numbers (around 80%) of compact refrigerators (7.75 cubic feet in volume or less) are currently sold with hydrocarbon refrigerant. Full size models are also in transition. Compacts represent 15% of total refrigerator shipments. The industry's voluntary progress on these products should be recognized and considered when amending the SNAP regulations for a full transition of the sector away from HFCs.

The chart below indicates the substantial transition costs (\$200 million) the industry has already incurred to transition to lower GWP foam blowing agents and refrigerants and compares costs between the current EPA scenario and the recommended petition scenario. The total savings, based on industry data, attributable to a more rational phase-out period is approximately \$23 million.



### **EPA SNAP Appeal Status and Timing**

Due to the recent DC Circuit Court decision on August 8, 2017, there is increased uncertainty how the SNAP program will be implemented. Despite the request by intervenors for a rehearing by the original panel and a rehearing en banc in September 2017, there is no court rule requiring

a deadline for the court to respond or act on the request further adding to the uncertainty for manufacturers. As of this petition, the Court has not acted upon the request for further review of its decision. Manufacturers must move forward and prepare for the upcoming deadlines and need EPA consideration and action on the AHAM petition to amend the regulations to accommodate the industry agreement. It is critical that EPA act quickly to change these dates so that manufacturers can properly plan their investments.