Comments of FluoroFusion Specialty Chemicals, Inc.
on the EPA's Proposed Rule:
Phasedown of Hydrofluorocarbons: Management of Certain Hydrofluorocarbons and Substitutes Under Subsection (h) of the American Innovation and Manufacturing Act of 2020

Docket ID No. EPA-HQ-OAR-2022-0606

Submitted via https://www.regulations.gov.

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U.S. Environmental Protection Agency
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Submitted via https://www.regulations.gov.

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Comments of FluoroFusion Specialty Chemicals, Inc. on the EPA's Proposed Rule, Phasedown of Hydrofluorocarbons: Management of Certain Hydrofluorocarbons and Substitutes Under Subsection (h) of the American Innovation and Manufacturing Act of 2020

Dear Sir or Madam:

FluoroFusion Specialty Chemicals, Inc. (FluoroFusion) respectfully submits the following comments on the U.S. Environmental Protection Agency's (EPA) proposed rule, *Phasedown of Hydrofluorocarbons: Management of Certain Hydrofluorocarbons and Substitutes Under Subsection (h) of the American* ***Innovation*** *and Manufacturing Act of 2020*, 88 Fed. Reg. 72,216 (Oct. 19, 2023) (proposed rule).

FluoroFusion is a small U.S.-based business that develops and produces specialty chemical solutions designed to reduce carbon emissions in the U.S. heating, ventilation, air conditioning and refrigeration (HVAC/R) market. These processes are achieved by employing advanced reclamation technology and complex blending processes, and by developing the next generation of low-GWP refrigerants produced with HFCs recovered by HVAC/R technicians in the U.S. We employ skilled individuals in North Carolina where our primary facility is located. We supply the U.S. HVAC/R market with a diverse product mix of reclaimed hydrochlorofluorocarbon (HCFC) refrigerants, EPA Significant New Alternatives Policy (SNAP)-accepted HFC refrigerant blends, next-generation HFC/HFO refrigerant blends, and near-zero-GWP natural refrigerants.

FluoroFusion is an innovative company with an extensive portfolio of U.S. patents in refrigerant lifecycle management technology. In addition to five existing patents, we also hold a suite of pending lifecycle management patents that allow us to efficiently transform recovered gas mixtures into near-zero-GWP refrigerants. Further, we are licensed to produce 17 patented refrigerants—covering a broad range of both legacy gases and next-generation substitute HFC/HFO blends—for other refrigerant industry stakeholders. We manufacture our cutting-edge

products in our state-of-the-art facility that is designed to manufacture next-generation products, including products containing mildly flammable A2L and flammable A3 refrigerant components.

We have also established and continue to enhance our Carbon Reduction Centers® (CRCs) that are strategically positioned across numerous urban hubs to collect and consolidate recovered refrigerants for reclamation at our Clayton, North Carolina facility. The CRCs play a crucial role in the collection and consolidation of recovered refrigerants.

We are well-positioned to share valuable insights and recommendations regarding the proposed rule because of our prominent presence in the HFC reclamation, import, and blending industry. Our technical expertise and market knowledge drive us to contribute to this crucial initiative. We are dedicated to fostering collaboration among manufacturers, reclaimers, and other refrigerant industry stakeholders to help achieve the American Innovation and Manufacturing Act of 2020's (AIM Act) goal of maximizing the reclamation of HFCs and their substitutes (collectively, HFCs) and minimizing their releases.

FluoroFusion strongly supports most aspects of the proposed rule. Successful carbon reduction initiatives require cooperation among chemical manufacturers, wholesale distributors, technicians, EPA-certified reclaimers, and government agencies. We appreciate the EPA's transparent, collaborative, and market-neutral approach to the HFC allocation, technology transition, and refrigerant management rulemakings.

At the same time, we identify several elements that would strengthen the proposed rule, which we believe are critical to the establishment of a regulatory and market environment that maximizes the potential contribution that reclamation offers for economy-wide GHG emissions reductions at low costs. Overall, our comments demonstrate and emphasize the challenges associated with expanding HFC reclamation and offer innovative solutions aimed at transforming high-GWP HFC waste streams into low-GWP alternatives and next-generation refrigerant formulations. Our comments also stress the importance of the EPA's role in ensuring that the final rule maintains a level playing field and does not encourage offshoring, circumventing U.S. Customs and Border Protection (CBP) antidumping/countervailing duty (AD/CVD) orders, import violations, and transshipping.

We stress, however, that the challenges to the U.S. reclaim market are by no means insurmountable. With the appropriate policy environment – as envisioned by the AIM Act and enabled by an enhanced subsection (h) rule from EPA -- our sector will be well-positioned to provide an ample supply of cost-competitive and environmentally advantageous low-GWP refrigerant to the fulfill the increase demand for circular refrigerant in the United States.
The United States and the entire world are facing a climate emergency, necessitating a bold vision for the future. The implementation of the subsection (h) rule can be a transformative force, particularly in addressing the anemic, historical 1.6% annual rate of HFC reclamation. We expect this rule, once finalized and implemented, to catalyze a substantial shift, resulting in the HFC reclaim market growing from 2500 metric tons annually to over 25,000 metric tons annually by 2032.

Overall, we believe that the 16,700 metric ton reclamation volumes that EPA foresees are highly attainable by 2028. Current U.S. reclaim rates are far lower than they could be, or should be. The rule will instigate a consistent upward trajectory across recovery, investment, and behavioral aspects relating to reclamation in the United States.

The effectiveness of the AIM Act hinges not on the capabilities of U.S. reclaimers, but on overcoming structural barriers in refrigerant pricing. U.S. virgin producers have strategically introduced offshore production and trade barriers, impeding the expansion of the U.S. reclaim market—the most cost-effective choice for American consumers. It is imperative to address these barriers through enhancements to the proposed rule and subsequent rulemakings, coupled with interagency efforts. Doing so is crucial not only for the success of the AIM Act but also for advancing vital environmental initiatives and establishing a genuine circular economy for refrigerants, where reclamation stands as the low-cost solution.

I. IMPORTANT BACKGROUND ON THE CURRENT STATE OF RECLAMATION

We identify below several important background considerations that illustrate the context in which HFC reclaimers currently operate. It is important for the EPA to be aware of these considerations as it implements and enforces the AIM Act and seeks to maximize HFC reclamation. While we understand that EPA has to date declined to assert its authority in the AIM Act to directly address many of these structural impediments, it is important at a minimum for EPA to understand this context so that it can maximize the leverage under subsection (h) of the AIM Act – as well as related authorities in the Clean Air Act and RCRA – in order to help to level the playing field for reclaimers.

As we explain below, imposing controls on leak rates for HFCs is important but also insufficient to establish a regulatory environment that will maximize refrigerant reclamation and minimize adverse GHG impacts from this sector.

A. Current Status of Refrigerant Reclamation & Refrigerant Market Consolidation

Contrary to EPA's suggestion in the preamble to the proposed rule that HFC reclamation is increasing, it is painfully evident to those in the reclamation sector that significant structural, market, and regulatory challenges have limited refrigerant reclamation's growth in the United States over the past decade.

EPA's *Draft Report – Analysis of the U.S. Hydrofluorocarbon Reclamation Market: Stakeholders, Drivers, and Practices* (Oct. 17, 2022) (Draft Report) clearly shows at page 23 that ozone depleting substances (ODS) reclamation is declining, and that HFC reclamation has only shown minimal growth, with just 1.6% of HFC-eligible CO_2e- being reclaimed in the U.S. market on average. Upon reviewing the most recent data from the refrigerant reclamation summary spanning from 2000 to 2022, released by EPA on December 12, 2023, it is evident that in 2022, the HFC reclaim rate experienced a growth to 2.25%. This rate, however, is notably lower than what would be anticipated given the ongoing phase-down. The upturn is attributed to reclamation of single-molecule R134a, two-component blend R-410A, and "Other HFC's", while ODS reclaim materials counterbalanced this marginal increase. Despite expectations of an

increase in reclaim volumes, the overall data indicates a decrease, with 2018 yielding 18.1 million pounds per year, and even with the slight rise in HFCs in 2022, the total pounds amount to 15.4 million pounds for the same year.

Meanwhile, we estimate that approximately 9,000,000 single-use (disposable) cylinders are sold annually in the United States. Assuming that 8,500,000 of these are dedicated to HFCs (with the remainder being used for reclaimed ODS and other uses), and recognizing that each disposable cylinder typically holds approximately 25 pounds of refrigerant, this results in a yearly total of 212,500,000 pounds of HFC-based refrigerant entering the U.S. market each year. If the historic average of 1.6% of that quantity is reclaimed, that suggests upwards of 209,100,000 pounds of HFC-based refrigerants are released into the atmosphere each year in the United States, while 64,000,000 pounds of single use cylinders are landfilled per year.

These concerning trends are taking place against the backdrop of significant consolidation and concentration in the market for imported refrigerants. Of particular concern is the substantial influence held by a small handful of virgin refrigerant producers. For example, the four members of the American HFC Coalition (a coalition of integrated producers who have collaborated on numerous Commerce Department AD/CVD proceedings affecting the refrigerant sector, comprising Chemours, Arkema, Mexichem, and Honeywell), currently control 64% of all HFC consumption allowances. Members of the American HFC Coalition (HFC Coalition), along with BMP/iGas, represent concentrated market power that covers a staggering 73% of the total consumption allowance budget for HFCs. That concentration raises a concern that a small handful of refrigerant industry stakeholders have the ability to wield significant control over the refrigerant supply chain, as described further below, which has led to conditions that make HFC reclamation even more challenging.

B. Trade Considerations and HFC Pricing Pressures

Five key trends have combined over the past decade to significantly undermine the market for reclamation activity in the United States, apart from the EPA regulatory environment:

1. Virgin refrigerant manufacturers (primarily, the members of the HFC Coalition) chose to invest in and outsource a significant quantity of production capacity for “patent-protected” HFC-based refrigerants to China, where production activities benefit from low-cost manufacturing environments that create an unlevel playing field compared to domestic refrigerant production.

2. The HFC Coalition, in their role as virgin refrigerant importers, have exploited the U.S. customs and duty framework to obtain highly advantageous trade treatment. This maneuver allows them to sidestep the imposition of anti-dumping duties on Chinese-produced "next-generation" HFC/HFO’s. Those blends – with artificially low costs -- directly compete with domestically produced reclaim products in the U.S. market.

3. The offshoring practices of the HFC Coalition means that their production activities take place outside the oversight of EPA and watchdog groups such as the Environmental Investigation Agency and the Natural Resources Defense Council. Meanwhile, HFC Coalition members seek to increase regulatory and environmental burdens on domestic

reclaimers, because they view a robust domestic reclamation market as a competitive business threat.

4. U.S.-based companies with Chinese ownership, meanwhile, have exploited both the Montreal Protocol and the preferential duty loopholes created for the HFC Coalition. HFC factories in China needed to run at maximum capacity between 2020 and 2022 to maximize China's HFC baseline under the Kigali Amendment. These factories concentrated on production of high-GWP products like R143a during 2020 and 2021 to maximize China's production levels (which were used to establish its Kigali Amendment baseline). Much of that production was subsequently imported into the United States by companies with Chinese ownership.

5. HFC Coalition members have frequently sought to impede reclamation of their end of life products without a license from the patent-holder. The assertion of such putative IP protection rights has posed a significant and ongoing obstacle to the U.S. reclamation market, particularly when it is combined with the active outsourcing of low cost and duty-free products from China that undercut the price for reclaimed materials.

In short, the tremendous potential of the U.S. reclamation market has to date been unfairly constrained and undercut by these AD/CVD evasions and trade-related measures and anticompetitive practices.

The primary culprit has been the adoption and implementation of the U.S. Department of Commerce's (DOC) *Hydrofluorocarbon Blends from the People's Republic of China: Antidumping Duty Order*, 81 Fed. Reg. 55,436 (Aug. 19, 2016) (2016 Blends Order). While the 2016 Blends Order appears on its face as designed to protect domestic refrigerant producers from unfair foreign practices, its implementation in practice has also served to stifle the domestic reclamation market. That impact arises from the Order's scope, which excludes from otherwise high AD/CVDs on Chinese produced goods, certain low-cost next-generation HFC/HFO blends produced overseas. As a result, these exempted refrigerants—such as HFC/HFO blends, various patented HFC blends that replaced R22, and other blends that importers claim to be exempt from AD/CVD orders despite dubious evidence of their eligibility—are in turn able to be imported for sale in the United States at prices well below those that reclaimed refrigerant suppliers can offer.

The exclusion of certain products from AD/CVDs in the Blends Order directly results in an approximate 200% cost advantage for these low-cost alternatives compared to domestically reclaimed refrigerants. (200% is an estimate, based on a weighted average of imported products from China that are subject to duties; the actual duties vary by refrigerant, and for some components that are important for reclaim, like R125, is as high as 285%.) Consequently, the 2016 Blends Order has in effect operated to promote the importation of virgin refrigerants, institutionalizing the maximization of refrigerant releases, and diminish reclamation efforts, which contradicts the AIM Act's reclamation goal.

Active circumvention of AD/CVD orders by other virgin HFC importers continues to compound these pricing challenges. This circumvention – i.e., the act of transshipping goods, relabeling the products, rerouting them to another region, and then ultimately bringing them back to the United

States as a method to bypass duties – has contributed to depressed market prices and adversely affected smaller reclaim industry stakeholders. The practice of importing refrigerants from regions that lack manufacturing facilities is a clear indicator of circumvention. Yet this practice continues with inadequate enforcement or attention.

While the AIM Act is commendable for attempting to foster domestic manufacturing and innovation in the refrigerant industry, related trade issues create impediments for reclaimers and the industry's smaller stakeholders to thrive. For example, FluoroFusion boasts five next-generation patents, with an additional four patents currently pending for life cycle management. Unfortunately, the domestic production of these cutting-edge innovations is burdened by the high AD/CVD duties placed on some of the HFC components that are still needed to produce low-GWP HFC/HFO blends. This burden places innovative companies and reclaimers like us in the predicament of either: (1) manufacturing these products in China to maintain competitiveness; or (2) producing the materials in Europe using Chinese components and importing them into the United States, at the expense of U.S. jobs. Regrettably, opting for domestic production presents formidable challenges to maintaining competitiveness. Despite the AIM Act's intent to support American innovation companies like FluoroFusion, the imposition of anti-competitive AD/CVD orders obstructs our ability to bring our life cycle management patents to fruition in the U.S.

For a full description of how the 2016 Blends Order sets an unlevel playing field based on offshoring from China for the HFC Coalition members, please see Appendix A.

C. Other Market Pressures & Anticompetitive Practices

Refrigerant reclaimers—who represent only a small fraction of the domestic refrigerant industry—often bear the primary burden of downward market pressures on refrigerant pricing. Those pressures, as described above, are closely tied to the policy framework governing import duties. Reclaimers' limited scale, financial constraints, and high holding costs render them highly susceptible to adverse effects from the HFC price declines discussed above, particularly when compared to virgin HFC producers who have manipulated the AD/CVD petition process to give them an advantage over competitors who are not members of the HFC Coalition. While EPA presumably wants reclamation businesses to invest in boosting their reclamation capabilities, the inherent disparities between reclaimers and virgin producers and importers means that refrigerant market pressures have caused some smaller reclaimers to exit the market due to related financial pressures. These market pressures have also increased the cost of capital to reclaimers, which constrains the reclaim sector's ability to invest in new GHG-reducing technologies that lessen the refrigerant sector's climate impacts.

These general pricing pressures, moreover, are exacerbated by other anticompetitive behavior by virgin suppliers that, perhaps by design, have the effect of depressing demand for reclaimed materials. For example:

- We have received feedback that some virgin refrigerant importers and producers have maligned reclaimed HFCs to downstream users as substandard, despite their conformity to the established Air-Conditioning, Heating, and Refrigeration Institute (AHRI) 700-2016 purity standard. This practice makes it even more challenging for reclaimers to

market reclaimed materials relative to virgin materials and undermines the reclamation sector.

- Many of those virgin HFC importers and producers also employ predatory tactics in the marketplace, such as selling virgin products at low prices while purchasing recovered gas at higher prices than they charge for virgin products. The effect of such seemingly irrational practices is to keep the recovered material out of the hands of legitimate reclaimers and in doing so to drive small, U.S.-based reclaimers out of the market.

- HFC Coalition members charge EPA-certified reclaimers above-market prices for key HFC components, especially R125, that are necessary to reblend materials. Those same companies appear to work to keep key components, such as R1234yf, R1234ze(E), R134a, R125, R152a, and R32, out of reclaimers' hands. This supply chain disruption for reclaimers has helped contribute to the limited 1.6% HFC reclamation rate. We see constraint on supply of virgin components as a challenge that reclaimers will need to overcome in order to achieve the 16,700 metric ton supply target for reclaimed refrigerant that EPA has identified in the preamble to the proposed rule. To produce sufficient supply to reach that target, reclaimers will need approximately 2500 metric tons of virgin material (15% of the total volume of "reclaimed" refrigerant). We estimate that two-thirds of that virgin supply requirement (i.e., 1600 metric tons) will need to be R125, given the composition of the end refrigerant market. 1600 metric tons of R125 would require 5,600,000 MTEVe per year of HFC allowances – an amount that alone already exceeds the total volume of allowances allocated to reclaimers. As a result, reclaimers will need to rely on HFC Coalition members to purchase this material. History shows that those suppliers simply will not sell to reclaimers or will sell at predatory prices, while not selling allowances.

Many reclaimers, because of their relatively smaller scale, lack the funding to challenge such behaviors. There are only a few technically sophisticated reclaimers that can handle mixed gases, next generation materials, and A2L (i.e., flammable) materials. We believe no one is quite like FluoroFusion based on our patented fractionation technology and life cycle management patents. However, to achieve sufficient capitalization of the reclamation industry, we—along with other legitimate reclaimers—need a level regulatory playing field to ensure that we can obtain funding from a bank to further develop our reclamation capabilities. At present, without the support that the proposed rule will provide, reclaimers are squeezed in their access to affordable feedstock (necessary for balancing and production of blends to market standards for purity), and also in their access to affordable financing. Predatory HFC/HFO blends and A2L materials will be imported from China without duties and forced upon the U.S. public and reclaim industry without allowances or access to key feedstocks to later recycle these blends.

These challenges are further exacerbated by abusive litigation tactics employed by prominent virgin refrigerant importers. Meritless harassment suits, often styled as patent protection actions, are negatively affecting stakeholders across the reclaim sector by disrupting regular business operations, hindering capital flow for technological innovation, impeding the optimization of reclamation efforts, and creating perpetual market turbulence.

II. WHAT SHOULD EPA DO – *IN ADDITION TO MEASURES ADDRESSED IN THE PROPOSED RULE* -- IN RESPONSE TO THESE STRUCTURAL CHALLENGES?

For these reasons, it is essential to the health of the reclaim market that, in addition to maximizing its support for reclaim through the subsection (h) rulemaking (as discussed in Part III below), EPA must *also* revisit and redouble its focus on the refrigerant market. In particular, it must take additional steps, on its own and in conjunction with other federal agencies, to level the playing field for reclaimers. We recognize that some of these steps may require initiatives that are not a logical outgrowth of the proposed rule, and although we would have preferred to see them included in this rulemaking, we strongly encourage further subsequent rulemaking to give them effect. Other suggestions may require interagency coordination rather than EPA rulemaking. We provide our comments aimed at informing EPA's steps beyond the confines of the current proposed rule in this section. Our comments on the proposed subsection (h) rule itself are set out in Part IV below.

These additional measures are vital steps that EPA must address at a minimum, in addition to the measures it has proposed under subsection (h), in order to help foster an enabling environment for refrigerant reclamation, and to minimize the adverse impacts to reclaimers, U.S. innovation companies, and the public at large from anticompetitive behavior by virgin producers and importers, that are supported by the 2016 Blends Order.

A. Actions that EPA Can Take on Its Own

1. Utilize its SNAP Authority to Promote Reclaim

EPA should revise its implementation of the SNAP program under CAA Title VI to prohibit SNAP approval of substitute refrigerants that include patent or contractual limitations on reclamation. The SNAP program evaluates and approves ODS alternatives in various industrial and commercial applications as part of the Clean Air Act's ODS phase-out program. Under the program, the EPA evaluates and approves or disapproves the use of substitute chemicals and technologies that are considered environmentally safer than ODS. SNAP approval is significant for industries and businesses seeking to transition to more climate friendly alternatives because it provides clear guidance on acceptable substitutes.

We suggest two measures that EPA can adopt within the existing SNAP approval program for acceptable HFC substitutes to address obstacles to reclaim.

First, EPA should prohibit the introduction of any product into the U.S. market if its manufacturer or importer has imposed restrictions on its unencumbered reclamation at end of life, and make such approval conditional on the producer's agreement to forego patent enforcement litigation that is used to harass and impede reclamation. This approach should extend not only to HFCs but also to next-generation substitutes, which the AIM Act authorizes EPA to regulate. Products like R454B—comprising 69% HFC and 31% R1234yf, with production that can be easily offshored to China—are on track to become the next significant focus for certain HFC Coalition members. This emphasis will notably impact the future reclamation of "substitute refrigerants" as defined by the AIM Act. Drawing from the past decade's history, it is apparent that HFC Coalition members may manipulate future rules to limit

access by reclaimers to virgin R1234yf, particularly for purposes of reclamation of R454B and similar products. EPA should anticipate that, as patents expire and EPA-certified reclaimers and other importers begin importing R1234yf, HFC Coalition members may file AD/CVD duties to secure exclusive access to the offshored materials and disrupt reclaimers' supply chains. This strategic approach likely stems from the HFC Coalition members' interest in promoting the adoption of their next molecule where reclamation poses a competitive threat to their next-generation patents.

These potential schemes and the associated drain on limited government resources could be easily avoided if the SNAP approval process – or (to the extent that the reach of the SNAP program is limited by the *Mexichem* decision) a similar process established by EPA under subsection (h) authorities in the AIM Act – applied to HFC/HFO products and required as a condition of approval a life cycle plan for every product upon introduction into the U.S. market. Additionally, a calculation of the refrigerant release rate by refrigerant would help drive a circular economy and minimize long term release (see Section II.A.3 below for more).

Second, EPA should use the SNAP evaluation process to discourage azeotropes blends. As we previously stated in our November 3, 2022 comments on the EPA's Draft Analysis of the U.S. Reclamation Market, many azeotropic refrigerant blends, such as CFC-502, HFC-507, and HFO/HFC-513A, are ODS and high-GWP refrigerant substitutes found in legacy equipment with a propensity for high leak rates. Azeotropes are extremely difficult to reclaim because the components have very close boiling points. Even advanced fractionation technology will have difficulty separating components of azeotropic refrigerant mixtures. Since market demand is low for azeotropic refrigerant blends, and the components cannot be separated and reused to build other popular refrigerant blends, there is no market incentive for reclaimers to reclaim azeotropic refrigerants. We urge EPA to eliminate SNAP approval for azeotropic blends that do not have widespread use and significant demand. We believe manufacturers of azeotropic blends should be capable of, and entirely responsible for, managing the lifecycle of azeotropes. That includes reclaiming or destroying all end-of-life streams of azeotropes in the installed equipment base. We recommend that EPA require any manufacturer of azeotropic refrigerant blends to commit to managing the entire lifecycle and mitigation of such refrigerants as a requirement for gaining SNAP acceptance.

In addition, EPA must take into account in its SNAP and other refrigerant-related regulatory programs that natural refrigerants are not the short-term solution and must be transitioned over a 20-year time horizon. FluoroFusion strongly advocates for the adoption of natural refrigerants such as hydrocarbons, ammonia, and carbon dioxide, recognizing their environmental benefits. However, our extensive experience with these refrigerants urges a cautious approach to their widespread implementation. We recommend a phased introduction over the next two decades, ensuring a thoughtful and systematic method. While carbon dioxide is environmentally friendly, its efficiency is not optimal, and its high-pressure nature demands substantial capital input. Ammonia, though efficient, presents challenges due to its toxicity, with vapors raising safety concerns, especially in large-scale applications. Its effective use requires significant experience and meticulous control under the elements of Process Safety Management, a level of expertise not currently widespread in the U.S. workforce. It is essential to acknowledge that mass transitions from ODS to HFCs and from HFCs to natural refrigerants pose a challenge. These

transitions can easily lock prior generation materials in the atmosphere, offering no avenue for the conversion of the previous generation of products. To avoid exacerbating the release of existing HFCs through substitution, we recommend a careful and considerate approach to alternative refrigerants, preventing the wholesale displacement of the current versions.

2. Utilize its AIM Act Authorities Relating to HFC Allocations to Promote Reclaim

EPA should take steps under its existing authorities, and initiate new rulemakings where necessary, to take full advantage of its authority over HFC allocations to enhance the regulatory environment to foster a robust reclamation market.

a. Fully Utilize Discretionary Authority to Apply Administrative Consequences to Address Anti-Reclaim Abuses

First, EPA should utilize its discretionary authority in 40 C.F.R. § 84.35 to assess administrative consequences under the AIM Act to revoke or retire HFC allowances granted to entities involved in market manipulation, patent misconduct, and unfair trade practices.

Second, EPA should ensure that EPA-certified reclaimers have sufficient access to components necessary to reblend materials—especially R125—at market price. Companies excessively charging above market price for necessary components, including R1234yf, R1234ze(E), R152a, R134a, R125, and R32, should be subject to administrative consequences in 40 C.F.R. § 84.35 for practices that are designed and shown to disrupt the supply chain of necessary materials for reclaimers. Indeed, similar to Chemours public comments in EPA-HQ-OAR-2021-0044-0216 on pages 24-25, we support the more general premise that any company that has engaged in unfair trade practices and utilized the 2016 Blends Order to gain market share at the expense of the U.S. reclaim market be subject to penalties by revoking previously issued allowances and redistributing them to reclaimers harmed by the manipulation of U.S. trade laws. Accordingly, EPA should assess whether any company (including an HFC Coalition member) has manipulated policy through the 2016 Blends Order to disadvantage the reclaim market and drive up their own allocations. While the AIM Act was intended to promote domestic production and investment, companies like Chemours have helped to create a system that permanently inhibits reclaimers and allows them to import duty free materials from China under 2016 Blends Order's exclusion language.

Third, EPA should revisit the HFC allocations granted to "new market entrants" under its previously finalized allocation rule. European trading desks, misleadingly presenting themselves as domestic new market entrants, secured allocations through the set aside pool in that prior rulemaking. (Notably, despite our comments, EPA did not establish a special allowance pool or multiplier award for reclaimers who needed allowances for virgin components required to complete reclamation processes.) Therefore, we strongly urge the EPA to scrutinize the legitimacy of these set-aside companies. If the EPA uncovers evidence confirming that these entities are European traders concealing their identity to deceive the EPA, we recommend that their allowances be reallocated to legitimate domestic reclaimers in good standing. This approach aims to rectify both deceptive practices and the initial exclusion of reclaimers from the allocation process.

Fourth, EPA should revoke allowances from any company importing Mexican HFC stockpiles into the U.S. market. Between 2022 and 2023, the importation of HFCs into Mexico witnessed a significant 1600% surge, primarily driven by importers aiming to secure future HFC allocations for Mexico. These volumes are currently being and will continue to be imported illicitly into the U.S. market, as it is the only market equipped to handle volumes of this magnitude. EPA should revoke allowances from companies involved in this abuse. We further request that these allowances be redistributed to reclaimers in good standing who are tasked with the responsibility of providing life cycle management with no rebalancing allowances.

Fifth, EPA should withhold approvals for allowance transfers from any entity involved in transshipment activities that are designed to circumvent U.S. AD/CVD orders. In securing EPA approval for allowance transfer or acquiring another allowance holder, it is imperative that any company engaged in activities like market manipulation, transshipping, changing the country of origin, and importing from countries without sufficient production asset infrastructure (e.g., Malaysia, Mexico, Turkey, Spain, Vietnam, etc.) undergoes comprehensive scrutiny. Furthermore, we recommend that such companies be prohibited from allowance acquisition for a period of five years after their identified anti-competitive behavior. This scrutiny is especially crucial if these entities have manipulated the market to evade AD/CVD orders, posing a direct threat to the HFC reclaim sector and compromising the public's protection from carbon pollution.

Sixth, EPA should reallocate all allowances that are revoked pursuant to administrative consequences to EPA-certified reclaimers. Reclaimers were overlooked in a previous HFC rulemaking, and no allowances were granted for their role in achieving a negative carbon footprint. Given the trade abuses identified above and the prolonged wait from 2022 to 2028 for any efforts to enhance reclamation, we propose redirecting these revoked allowances to U.S. reclaimers in good standing, thereby ensuring a fair distribution within the reclamation community.

b. Reallocate Unused Allowances to Reclaimers

Future EPA regulations should allow reclaimers to obtain HFC Coalition members' unused allowances in order to ensure EPA's expected reclaim growth is achieved. There are significant unused HFC allowances from major virgin producers and importers, which could be redirected to reclaimers to promote reclamation.

Data that we have examined from EPA's HFC Data Hub on November 29, 2023 indicates that HFC Coalition companies have been using only roughly half of their available production allowances for domestic production (Arkema used 54% of its production allowances, Chemours 42%, Honeywell 51%, and Mexichem used 76%), while nearly fully utilizing their consumption allowances for imports.

Meanwhile, domestic reclaimers (who generally do not have sufficient import allowances) continue to have significant trouble sourcing virgin components like R134a, R32 and R125 from domestic producers at market prices, or acquiring allowances on the allowance transfer market necessary to import them directly. Those components are essential to the expansion of the reclaim market.

To bolster the reclaim market, we endorse the EIA and other organizations who assert that the current surplus of allowances held by HFC Coalition members and other virgin importers is excessive. We advocate for an expedited reduction of consumption allowances, particularly targeting the top 7 allowance holders importing virgin refrigerants, effective from January 1st, 2025. It is imperative that allowances are not curtailed for HFC reclaimers committed to cleaning up materials. If large allowance holders are unwilling or unable to sell components or excess allowances to U.S. reclaimers at market prices to enable them to purchase virgin components, there is no justification for them to control the vast majority of U.S. HFC allowances.

3. Utilize AIM Act and CAA Title VI Authorities to Adjust the GWP Value of Refrigerants to Promote Reclaim

First, EPA should assign a GWP value of zero to all refrigerants reclaimed in the U.S. by EPA-certified reclaimers to promote the inclusion of reclaimed refrigerants in current and next-generation refrigerant blends. It is essential that reclaimed material be a zero GWP refrigerant or it will not be possible to fulfill the mandates in the newly finalized Technology Transition Rule with respect to low GWP refrigerant use and at the same time fulfill the mandates proposed in this new rule to use only reclaimed refrigerant for certain newly charged equipment. Assigning a GWP value of zero to all refrigerants reclaimed in the U.S. by EPA-certified reclaimers would also be helpful in jurisdictions such as California, Washington, New York, and nine additional states included in the North American Sustainable Refrigeration Council that set maximum GWP limits for HFCs used to charge new equipment or service existing equipment. We understand that the GWP value of a virgin refrigerant is accounted for when it is produced or imported and subsequently used to charge or service equipment. When a refrigerant is recovered from equipment, reclaimed to AHRI 700-2016 Standard, and later used to charge or service equipment, there is no additional GWP impact on the environment. Therefore, the net GWP value of reclaimed refrigerant is zero. Further, a zero-GWP classification should only be assigned to the portion of a refrigerant or refrigerant blend that has been reclaimed and not to the portion that contains virgin material. For example, if a cylinder of HFC-134a contains 50% virgin HFC-134a (1,430 GWP) and 50% reclaimed HFC-134a, the 100-year GWP value of the resulting refrigerant blend in the cylinder should be 715 GWP.

Second, EPA should establish a "life-cycle adjusted GWP" value for new refrigerants to reflect their actual reclaim rate, and therefore their actual impacts on climate change, and use that adjusted GWP value for purposes of all AIM Act regulatory programs. The determination of the GWP for HFCs is based on the radiative force resulting from the release of a unit mass of the gas compared to the radiative forcing of carbon dioxide (CO_2) over a specified time horizon. With a 100-year GWP of 2,088, for example, R410A's GWP value indicates that the warming potential of one kilogram over a century is equivalent to 2,088 kilograms of CO_2. Comparing the GWP of R410A to newer substitute HFC/HFO blends like R454B, which has a GWP of 467 (comprising 68.9% R32 and 31.1% R1234yf), initially suggests that R454B is roughly three times more environmentally friendly than R410A. However, a true assessment of a refrigerant's life-cycle impact would take into account the likelihood that it will be released or reclaimed. Past practices with patented blends like R438A, featuring a 100% release rate, coupled with the effects of the 2016 Blends order and inexpensive Chinese imports, lead to the expectation that R454B will

likely exhibit a significant release rate as well. If we assume that it will effectively be released at its end of life, and its lifespan is 12 years, the calculated true GWP of a non-reclaimed product like R454B amounts to 8.3 venting cycles (100 years/12), resulting in a "life-cycle adjusted GWP" of 3,891.

Using this life-cycle adjusted GWP value would allow a more effective comparison among refrigerants. Products like R410A are highly recyclable, and their "life-cycle-adjusted GWP" would be the same as their measured GWP. Such a refrigerant, even with a higher *initial* GWP, is environmentally preferable from a life-cycle standpoint than R454B, where a system charge will be vented every 12 years.

The same approach can and should be applied to all U.S. refrigerants. It would show, for example, that reclaiming and reusing R32 only once over a 100-year time frame is 38% more environmentally friendly than using virgin R454B and does not support PFAS contamination. Conversely, other patented products such as R463A (with a GWP value of 1494), which is designed as a replacement for R410A and does not allow unencumbered reclaim, are environmentally more detrimental than the R410A they aim to replace.

This approach would also demonstrate that reducing the vent rate and increasing the reclaim rate is a more effective strategy for mitigating climate change caused by HFCs than introducing new molecules or blends without comprehensive life cycle management. For these reasons, EPA should establish a recycle or release rate for every SNAP-approved product, and then apply the "life-cycle adjusted GWP values for all AIM Act purposes.

4. Utilize Additional Authorities Under Subsection (h) of the AIM Act to Further Promote Reclaim Through an Additional Rulemaking or Other Administrative Actions

First, the EPA should use its subsection (h) authority to promulgate an additional rule. This rule should mandate that all recovered refrigerant must be exclusively returned to EPA-certified reclaimers. Furthermore, the certification requirements for reclaimers need to be updated to ensure that recovered refrigerant undergoes proper reclamation procedures and is not subjected to predatory tactics aimed at purchasing recovered material to control market access and disrupt the flow of reclaim to legitimate reclaimers.

Second, EPA should establish a mechanism for reclaimers or third parties to seek EPA intervention to prevent or call attention to anticompetitive practices that harm the reclaim market. In alignment with Chemours' proposal in EPA-HQ-OAR-2021-0044-0216 at page 37, we endorse the establishment of an EPA hotline. This hotline would serve the dual purpose of reporting venting of HFCs and other refrigerants while also having an outlet to disclose instances of illicit trade practices, potential collusion between aftermarket wholesalers and HFC Coalition members to stop reclaim companies by limiting their ability to sell reclaimed refrigerants, and other anti-competitive behavior targeting the reclaim sector. This hotline could also facilitate reclaimers in obtaining access to blend materials and enable them to lodge complaints against HFC Coalition members hindering reclamation efforts.

Third, EPA should create a unified reporting portal for EPA-certified reclaimers featuring a single drop-down menu encompassing ODS, HFCs, HFC/HFO blends, and HFOs. Presently, reclaimers are burdened by a dual reporting system involving the submission of a year-end ODS report through the Section 608 Portal and quarterly reports through the HAWK reporting system. While the Section 608 Portal primarily emphasizes ODS, it includes mandatory reporting for HFCs through drop-down menus. However, complications arise during the comparison of the summed HAWK year-end report with the ODS report, as the latter lacks the same drop-down menu, leading to classification challenges and a substantial increase in workload. The stringent requirement for reports to match within 1kg by HFC category poses an additional hurdle. What makes this situation particularly challenging is that reclaimers, who contribute to just 1.6% of the HFC market, receive no allowances from the AIM Act and face a fourfold increase in reporting criteria. Moreover, reclaimers must ensure a 1.5% de minimis loss on reclaimed material in their possession, while mixed ODS/HFCs lack appropriate drop-down menus for classification. This apparent imbalance becomes more pronounced when considering that HFC coalition members, wholesalers, and contractors enjoy a 98.4% release rate without lifecycle responsibility. In contrast, reclaimers must consistently report without any allowances for reclaim. Given historical issues with unexpected consequences, consolidating all reclamation activities into a single portal would alleviate the complexities faced by reclaimers.

Fourth, considering that certain patent holders prohibit unencumbered reclamation of their patented blends, we suggest that the EPA establish a Refrigerant Release Rate (RRR) measurement for each HFC substitute. This measure should take effect on January 1, 2026, after a comprehensive year of data collection from the shared portal. EPA could develop a new rule providing that refrigerants that do not meet a 15% reclaim rate could be designated as unacceptable substitutes in the SNAP program, and effectively prohibited from the U.S. market.

5. Additional Steps That EPA Should Take Under AIM Act Authorities

a. Fix the “Equipment Containing” Loophole

EPA should close the "equipment-containing” loophole in the Framework Allocation Rule that allows for the unlimited importation of HFCs without the need for allocations, so long as they are already installed in equipment from Mexico or foreign countries. To meaningfully achieve the envisioned transition, this loophole should be closed in a manner not impacting HFC reclamation activities and foster job growth in the U.S. as the AIM Act intends.

b. Measures to Promote Reclaim of A2L Products

As previously discussed, patent holders for some next-generation refrigerants, including new A2L products, actively work to inhibit reclaim of those products at their end of life, by threatening litigation in connection with asserted IP rights. Yet reclaimers such as FluoroFusion are already receiving requests from wholesale partners and contractors to supply recovery cylinders for such products. These recovery cylinders will need to be equipped with special valves and a distinctive red stripe, in anticipation of the upcoming launch of R454B systems. The current situation therefore places reclaimers in a dilemma regarding whether to invest significantly in capital for providing recovery cylinders for such products. This investment comes with the challenge of potentially facing obstacles to our ability to reclaim and sell the

returned products, with the prospect of prolonged storage of materials and potential fire code issues with insurance carriers. Failure to provide these cylinders, however, would likely result in venting.

Another option reclaimers consider is offering ½ ton cylinders or recovery cylinders for wholesalers to fill and store. Unfortunately, this approach almost inevitably leads to fire code violations, especially when factoring in inbound gas alongside reclaim cylinders. Consequently, the substitute product is likely to be vented. Without the ability to resell A2L refrigerants within two years due to patent restrictions, environmental and fire code issues will clog the distribution channel, causing significant challenges for contractors, wholesalers, and reclaimers.

Accordingly, our recommendation is two-fold:

- HFC Coalition members should invest in holding tanks on a one-to-one basis for every kilogram of product sold, encompassing various types such as ½ tons, ISO tanks, storage tanks, and red-striped recovery tanks specifically designed for A2L products.

- EPA should require, as a condition of SNAP approval, unencumbered reclaim and resale back into the market because the prohibition on reclamation over the past two decades has quietly evolved from an environmental concern into an imminent fire safety issue within the market.

Reclaimers cannot be expected to retain substantial quantities of A2L refrigerants on-site without the ability to sell them. Otherwise, we would be de facto subsidizing the business operations of virgin producers and importers.

B. Actions that EPA Should Take in Coordination with Other Agencies

EPA should enhance its engagement with DOC and CBP to ensure that the Federal Government acts in a coordinated way to address anticompetitive behavior by virgin refrigerant producers and ensure a level playing field that facilitates and supports the growth of the reclamation market for both climate and consumer protection reasons. Specific examples of such coordination could include, for example:

1. Establish a comprehensive review procedure for antidumping and countervailing duties (AD/CVD) proceedings that have been initiated by the HFC Coalition or its representatives. The aim of this review procedure would be to assess whether these AD/CVD measures are designed to impede, or otherwise have the effect of impeding, domestic reclaimer access to essential components or otherwise undermine U.S. capabilities to reclaim refrigerants.

   The HFC Coalition has manipulated the AD/CVD system through the 2016 Blends Order and through subsequent enforcement proceedings that target reclaim companies. We urge the EPA to scrutinize these activities and assess their impact on the reclaim segment.

EPA should participate in all DOC enforcement proceedings involving the 2016 Blends Order to raise concerns where there is evidence that those proceedings have the intent or effect of undermining reclaim.

2. Examine all "exclusion" language in any proposed AD/CVD orders from the Department of Commerce relating to imported refrigerants because, as per historical precedent, such provisions could lead to carbon pollution and adversely affect consumers.

3. More generally, EPA should thoroughly review AD/CVD inquiries and investigations initiated by the HFC Coalition or its representatives to assess the AD/CVD measures' potential environmental and consumer impacts.

4. Initiate an interagency examination scrutinizing any language similar to that adopted in the recent R125 AD, R134A AD, and R32 AD orders, aiming to prevent the DOC from further institutionalizing anti-competitive practices into law. EPA should not leave it to reclaimers alone to try to limit the reclaim-impeding effects of AD/CVD cases. In particular, EPA should evaluate any AD/CVD cases relating to refrigerants initiated within two years of the AIM Act's passage, with a specific focus on understanding how the case would impact the refrigerant reclamation sector.

5. EPA should work with DOC to reassess the patent exclusions received at the very beginning of the 2016 Blends Order to ensure that a patent actually existed for importers who claimed AD/CVD order exclusions. For example, from recent Panjiva data, R421B with limited market use in the United States, is imported from China, benefiting from a patent exclusion from AD/CVD orders, and could then be combined with legacy R143A to produce R404A in the United States. The result is that the widespread availability of this low-cost virgin product disrupts the reclamation of R404A (the highest GWP refrigerant) by depressing the market price for reclaimed materials. While we recognize that EPA is not directly responsible for trade law enforcement proceedings, the close relationship between the AD/CVD regime and the viability of the U.S. reclaim market warrants more active EPA coordination with the agencies that bear this responsibility.

6. Finally, we strongly encourage the EPA to continue leading an inter-agency effort to address the climate emergency. We have highlighted numerous instances of market manipulation hindering the progress of HFC reclaim. We also present practical steps through the EPA SNAP approval process that can be taken immediately. EPA should use these authorities, in conjunction with DOC, to mitigate the adverse impacts of the AD/CVD "exclusions" under the 2016 Blends Order. To maximize reclaim and minimize release of HFCs and their substitutes, all HFC blends should have their AD/CVD order exclusions eliminated except for the 5 products directly covered by the 2016 Blends Order (R404A, R507, R410A, R407A and R407C).

In sum, exclusions from the AD/CVD requirements in the 2016 Blends Order were inserted by HFC Coalition members and are now being exploited by other importers to evade AD/CVD orders. The effect is an artificially low pricing for China-made refrigerants, resulting in an adverse environment for reclaimed products and a likely release rate near 100% for those imported refrigerants. EPA should use its SNAP authorities and work with its sister agencies in

the trade enforcement field to reduce the systemic barriers to the full life-cycle management of refrigerants.

C. Actions that State and Local Governments Should Take with EPA Support

We suggest that CARB, along with other state and local government agencies and regulatory bodies, consider imposing fees on all newly manufactured HFC/HFO refrigerant products. This measure aims to counterbalance the price difference imposed by manufacturers on reclaimers seeking access to components for the purpose of environmental reclamation and protection.

III. COMMENTS ON THE PROPOSED RULE ITSELF

We turn now to the specific measures that EPA has proposed to promote reclamation in the subsection (h) proposed rulemaking. As discussed earlier, we largely support what EPA has proposed, but believe that EPA should do more in this rule under subsection (h) to create an enabling regulatory and market environment for reclamation.

A. Recovery of Remnants to Qualify as Reclaimed

To enhance reclamation efforts, FluoroFusion suggests that recovered refrigerant from single-use (disposable) cylinders' remnants should be categorized as reclaimed material. Extensive evidence suggests that residual material frequently deviates from specifications, being mixed, inaccurately labeled, and consolidated, making it unsuitable for field use. Consequently, this material should not be exempt from reclaimer reporting obligations. It is imperative that this material undergoes the reclamation process and adheres to the HAWK reporting criteria established for certified EPA Reclaimers.

B. Filling Over a Heel is Not Reclamation

We agree with the proposed rule, and EPA should confirm in the final rule, that merely refilling a reusable cylinder with virgin material does not involve "reclamation" that can qualify for the reclaim mandates in the final rule. Such an approach would significantly undermine the reclaim market and lead to very high risks of abuse.

To ensure transparency and accurate representation of data, it is crucial to recognize that virgin refrigerant manufacturers may fill a container's heel with imported virgin gas from China while claiming a commitment to reclamation and responsible refrigerant life cycle management. However, genuine reclamation involves gases sourced from EPA-certified reclaimers and the broader market. This distinction is essential to counteract greenwashing tactics, prevent the misrepresentation of reclamation activities, uphold the integrity of the reclamation industry, and thwart the sidelining of legitimate reclaimers.

C. Imposing a Mandatory Reclamation Obligation

We advocate for mandatory reclamation of all refrigerants within the United States, including but not limited to all HFCs and HFC blends that are "regulated substances" within the scope of the

proposed rule, with the only exception to the general requirement for reclaim being hydrocarbons that have a 50-year history in the domestic market.

The AIM Act requires EPA to maximize reclaim and minimize the release of HFCs *and their substitutes*. Many HFC substitutes are HFCs themselves. Of potentially even greater concern from an environmental impact standpoint are HFOs like R1234yf, for reasons described in more detail in Appendix B.

Given the historical issues with refrigerants like CFCs, HCFCs, HFCs, patented ODS replacement HFCs, and HFC/HFO blends, we anticipate that transitioning to HCFO or other molecules may pose environmental concerns without requiring a life cycle management plan under the SNAP approval process. At a minimum, however, EPA should impose a mandatory requirement for recovery, collection and transportation to an EPA certified reclaimer for all recovered refrigerants.

D. Mandating QR Code Tracking of Containers and Related Measures

To safeguard public and environmental health, especially for vulnerable populations, we strongly urge the EPA to implement QR code tracking on all refrigerants, establish a Refrigerant Release Rate for each, and monitor the distribution of reclaimed materials to ensure sourcing from the EPA-certified reclaimer list.

E. Reclaimed Content Mandates – Using Reclaimed Refrigerant for Initial Charges

The annual release rate for HFCs—as well as most refrigerants—currently stands at 98.4% and results in the accumulation of millions of pounds of refrigerants in the atmosphere.

We support the proposed rule's requirements to require reclaim in initial charge for new refrigerant-containing equipment using HFCs, as a minimum initial step. However, we strongly urge EPA to expand the scope of equipment covered by this mandate, and to accelerate the timeline for these requirements.

Prioritizing the use of domestic reclaimed refrigerants in *all* applications, including initial charges, is feasible with no significant technical obstacles. Finalizing the proposed rule's mandates on both the quantity and percentage of reclaim usage, at a minimum, and extending those requirements to other sectors, will incentivize the right practices for all domestic refrigerant industry stakeholders.

FluoroFusion urges the EPA to not delay implementation of the initial charge requirement until January 1, 2028, and instead move it forward to January 1, 2026, at the latest. We also believe that, to the extent that EPA adopts a phased-in schedule for these mandates, as we suggest below, it should be sector neutral (not sector-specific) and differentiated where necessary only on a product-by-product basis. (see Appendix 1 for more detail)

We believe that the EPA is well-positioned to implement mandates for reclaimed content in HFC- containing refrigerants, particularly in preparation for the 2029 phasedown. FluoroFusion

endorses a phased approach with a 25% mandate for reclaimed content in 2026, increasing to 50% in 2027, 75% in 2028, and reaching 90% in 2029.

There should be no exemptions for new products (such as R32, R454A/B, R448A, R449A, R450, R456A, R444A, or others), especially if these products do not allow unencumbered reclaim. The era of hindering reclamation through patent language, evading life cycle management responsibilities, blaming technicians for recovery lapses, and obstructing access to components necessary for rebalancing reclaim materials should come to an end, and the practices of the top 73% of allowance holders should be transparently disclosed.

F. Defining Eligible Reclaimed Content

The proposed rule would require that 85% reclaimed content and 15% virgin HFCs be used for rebalancing in blends with three or more components. However, specifying such a high reclamation content will pose technical challenges to achieving the AIM Act's goal of maximizing reclamation where blends have three or more components.

Accordingly, we think that this requirement should be adjusted by allowing for 65% reclaimed content and 35% (by weight) virgin HFCs where blends have three or more components. This change would account for minor additions in some products and address issues like leak fractionation, especially in the transition from high-pressure to low-pressure components. This change would also accommodate a range of materials from R32 to Isopentane within these blends.

We support EPA's proposal that a minimum of 85% reclaimed content and 15% virgin material would comprise certified reclaimed refrigerant for blends that have less than three components. This clarity is important for the industry.

Furthermore, we advocate for the stipulation that all reclaimed material must originate within the U.S. and not be transferred from abroad.

G. There Will be an Adequate Supply of Reclaimed HFCs for Refrigerant-Containing Equipment in the Covered Subsectors

As noted above, we fully support the proposed rule's core provisions to mandate use of reclaimed material, which will provide an essential demand-driving incentive to bolster investment in and growth of the reclaim sector to achieve the AIM Act's ambitious climate protection objectives. Importantly, there is strong evidence to support EPA's assumption that the reclaim sector can deliver sufficient supply to satisfy these requirements in a manner that is cost-effective for refrigerant purchasers.

FluoroFusion's analysis indicates that achieving EPA's 16,700 metric ton target for reclaimed HFCs by 2028 is feasible. Our in-depth review of the rule, coupled with calculations based on extensive experience in the reclamation business, leads us to project that it is fully reasonable to expect that reclaimed supply will not only reach 16,800 metric tons by 2028, but exceed 25,000 metric tons by 2030. This growth is expected as cylinder tracking and recovery rates continue to improve.

We support each of the main provisions in the proposed rule that provide the necessary scaffolding to achieve those goals, including the requirement that all contractors register with the EPA, and the requirements to use a specific AIM Act code for refrigerant purchases. This registered code can also be employed by reclaimers during the return of materials and can be reported through the HAWK database, allowing the EPA to calculate mass balance both by sector and at the company level.

For example, FluoroFusion itself is implementing large-scale technology designed specifically to address challenging mixed ODS/HFC streams, minimizing destruction requirements. The proposed rule will help support such capital investments by driving demand for reclamation through requirements on the OEM sector.

We anticipate that virgin refrigerant manufacturers will assert that the reclaim supply will be inadequate and that the timelines for reclaim use should be postponed. EPA should not be deterred based on such assertions. The factors that have held back the reclaim sector to date are fully explained in Part I of our comments and in Appendix A. In the absence of anticompetitive pricing that virgin manufacturers have achieved through the 2016 Blends Order, reclaimed materials would be the low-cost option for refrigerant users in the United States, and they fully have the potential in the future to bring that value throughout the U.S. supply chain.

To address this issue, we urge EPA to take steps, discussed in Part II of our comments, to integrate responsible life cycle management requirements into the EPA SNAP program approvals. Taking that step alone would significantly reduce the price of reclaimed materials, because it would eliminate the incentive for virgin producers to impose restrictions or price premiums on reclaimers' access to virgin components required for reclaim production.

H. AHRI 700-2016 Reclamation Standard

We support the EPA's proposal for purity verification by referring to the AHRI 700-2016 standard. While this standard is generally seen as a quality assurance measure, it has also occasionally presented challenges for new entrants to the reclamation market. FluoroFusion, with a solid foundation of five U.S. lifecycle patents and over 17 current and future generation patents, is confident in our technical expertise and advanced equipment's ability to achieve the required purity through reclamation. We are open to discussions regarding AHRI 700-2016 certification processes for labs, offering flexibility in their adherence to AHRI 700-2016 guidelines.

Furthermore, crucial elements encompass the selection of liquid phase gas chromatographs, precise calibration, real-time blend monitoring, and a steadfast commitment to AHRI 700-2016 methodologies. While there have been isolated incidents of unscrupulous practices, it is important to note that reclaimers constitute only 1.6% of the HFC market. We advocate for the adoption of AHRI 700-2016's analytical methodology without imposing excessive "certification" costs or erecting barriers to entry.

AHRI-700 standards were changed to move the quality standard for reclaim to 99.5% from 98%. We also ask the EPA to reject comments from HFC Coalition members now trying to backtrack

on imposing this on reclaimers by asking for "performance based reclaim" similar to the automotive sector. EPA should likewise reject arguments that reclaim goals cannot be met due to challenges in recovery practices by technicians, or that a new category of service gas (that is less than 85% reclaim) can be used in the secondary market. We believe that these arguments are intended to cast doubt on the ability of reclaimers to provide a sufficient amount of reclaimed refrigerants for the U.S. market. We urge the EPA not to water down the proposed requirements relating to reclaim purity. We further urge the EPA to reject comments from HFC Coalition members that lobbied to implement the 99.5% purity standard on reclaimers (via the AHRI standards), and who may now seek to move the standard down to 98%, while reclaimers have already spent millions of dollars creating labs and blending facilities capable of achieving these standards. High purity standards are also essential to maintain consumer confidence in reclaimed materials.

I. Reducing Administrative Burdens on Reclaimers

We believe that addressing the 98.4% HFC release rate resulting in the annual venting of 209,000,000 pounds of refrigerants into the atmosphere is of the utmost importance. Solving that problem will require fundamental shifts in the regulatory environment and trade enforcement framework. The EPA should therefore focus on the big picture and avoid overburdening the few reclamation companies with unnecessary administrative requirements.

Notably, some refrigerant industry stakeholders are attempting to impose substantial administrative and safety compliance costs on domestic reclaimers and competitors while also outsourcing the blending of alternative A2L refrigerants to China under an exemption from a 200% AD/CVD rate. This situation highlights the uneven playing field that reclaimers face relative to other industry stakeholders, especially when reclaimers are required to provide detailed reports on all inputs and outputs, down to the exact kilogram, ensuring a 1.5% de minimis release rate.

We believe that special tracking requirements for HFC reclaimers regarding the content of reclaimed HFCs is excessively burdensome when the EPA already possesses the data in the HAWK database and the Agency can readily conduct mass-balance calculations. While we generally support the EPA's goals, we believe that the Agency should focus on reducing the current 98.4% release rate and tracking HFC reclamation growth rates through collaboration with original equipment manufacturers and other HFC industry stakeholders.

J. Sending Disposable Cylinders to Domestic Reclaimers

FluoroFusion supports EPA's proposal mandating the redirection of all disposable cylinders to EPA-certified reclaimers to mitigate HFC releases from high-GWP liquid and vapor heels. On average, a disposable cylinder contains 1.5 pounds of material. A recent study in Mexico on 20,000 disposable cylinders indicated an average recovery of 1.25 pounds. Extrapolating this data across 8 to 9 million disposable cylinders highlights a significant opportunity for optimizing reclamation and minimizing releases.

FluoroFusion sees this as the initial step toward addressing the accountability issue. The low return rate of disposable cylinders, just 0.003%, poses expected challenges for the industry to

maximize refrigerant reclamation and minimize releases. While less efficient practices may persist until all products are equipped with QR codes, potential solutions and processes can expedite this transition.

By January 1, 2025, an estimated 13,500,000 disposable cylinders will be filled in the supply chain, potentially yielding more reclaimed refrigerant than the entire market currently receives, even with a lower-than-ideal adoption rate. The same channels used for returning reclaimed refrigerant today can be utilized for returning disposable cylinders. We are committed to bringing on additional capital equipment and highly trained technicians to meet the disposable cylinder demand at our main plant(s) and at our urban Carbon Reduction Centers®. This technology is an extension of the processes that we do every day as well as using the same supply chain that we use today. FluoroFusion is very close to bringing on its large-scale fractionation capacity that will be at a scale not seen in the U.S. market, but this comes with concerns that the HFC coalition will try to stop the assets from coming to market.

For the reasons specified above, FluoroFusion also supports the EPA's proposed requirement that the remaining heel in containers should not be classified as virgin regulated substances. It is imperative that this material undergoes the reclamation process, regardless of whether it is handled by consolidation entities or reclaimers. Moreover, it is highly advantageous to return these cylinders to an EPA-certified reclaimer, enabling the EPA to promptly assess the return rates and gauge the program's success through the existing HAWK reporting system.

While FluoroFusion supports the proposed requirement that disposable cylinders be sent to U.S.-based reclaimers, we must reiterate our position that the proposed ban on disposable cylinders in the Allocation Framework Rule would have been a more effective measure. The inevitable shift to refillable cylinders with full traceability within the U.S. is necessary to curb illegal imports. Our support for this ban was grounded in our direct observations of annual releases of ODS and HFC refrigerants. We believed that this ban was the most prudent approach to reducing releases and maximizing reclamation. Further, the proposed ban would have addressed the significant issue of the annual discarding of a staggering 68,000,000 pounds of steel from disposable cylinders.

K. Sending Refillable Cylinders to Domestic Reclaimers

FluoroFusion suggests an expansion of this proposal by recommending the mandatory processing of returnable cylinders at certified EPA reclaim facilities. The 2016 Blends Order, in conjunction with other trade schemes, allows the import of HFC/HFO blends without AD/CVDs on the HFC component, along with the use of duty-free Chinese refillable cylinders, putting U.S. cylinder manufacturers at a competitive disadvantage. While refillable cylinders might initially seem to address the heel venting issue, challenges arise, as observed in the European F-GAS regulation. The potential use of low-cost refillable cylinders from China for HFC Coalition members' duty-free HFC/HFO blends presents difficulties. Similar to the European F-GAS scenario, the refrigerants' value significantly surpasses that of the refillable cylinder, treating it as a de facto disposable item rarely returned, leading to venting.

Even when HFC Coalition members opt for returnable cylinders, these cylinders also tend to vanish similarly to the European scenario, contributing to an influx of virgin gas from China that

maintains the 98.4% release rate. We urge the EPA to scrutinize returnable cylinders as it would disposable ones, ensuring their return after gas usage to curb future venting. There's a crucial need to monitor and enforce the proper disposal of substitutes, distinguishing between refillable and disposable cylinders, and necessitating their routing to a reclaimer for the appropriate disposition of the heel.

Considering the flammability of A2L materials, the supply chain from producer to wholesaler to contractor will require holding lower volumes of materials both as filled containers and as reclaim heels. Fire codes will classify a vapor heel as potentially containing a full charge. While GWP decreases, flammability increases. In light of fire safety regulations, it's important to note that wholesalers can only store around 1000 to 2000 cylinders of A2L refrigerants (both virgin and recovered) within a 40,000 square-foot space. This will lead to a reduction in the future supply chain, preventing the storage of 20,000 cylinders, as some wholesalers currently do. Refilling returnable cylinders for these applications becomes a more sensible approach. Considering these factors, refillable cylinders returned to EPA-certified reclaimers for heel consolidation emerge as a more viable and sustainable packaging solution in the U.S. compared to disposable cylinders from foreign countries, even if equipped with QR codes.

L. Blending and Packaging Should be Done in the U.S. by EPA-Certified Reclaimers

A significant portion of refrigerants that enter the U.S. market are manufactured in China and falsely labeled as a product of the UAE, Mexico, Vietnam, Turkey, Malaysia, etc., to circumvent U.S. antidumping and countervailing duties.

We are concerned that similar issues will arise for future reclaim streams.

To address this, we propose that, starting January 1, 2025, all refrigerant blending and packaging operations involving reclaimed materials should occur domestically. This requirement will maximize the introduction of reclaim into each batch and avoid the risks associated with packaging operations outside the purview of U.S. regulatory oversight. Laser-inscribed QR codes should be affixed during filling for traceability and accountability. Filling refrigerants at EPA-certified reclaimers allows reclaim material to be added to every batch. FluoroFusion already reports these “adds” and batch data quarterly on the HAWK reporting system. We have the capability to implement this system today, incorporating approved laser etched QR code tracking for responsible refrigerant management, especially for next-generation A2L refrigerants with the addition of the reclaim.

M. Tracking Methods

We endorse the EPA's proposal to implement QR codes on each cylinder with traceability at the batch level. Contrary to Chemours' assertion on pages 37 and 38 of EPA-HQ-OAR-2021-0044-0216 that QR codes do not facilitate batch-level traceability for each ISO, we firmly believe that transparency in the U.S. supply chain necessitates chain of custody and traceability at this level. We are concerned that bulk transshipped stockpiles may be imported from China, and that the Mexican stockpile is already finding its way into U.S., UAE, and other markets, where it is co-mingled into bulk tanks and finished batches.

In contrast, EPA-certified reclaimers operate under an extensive chain of custody requirements, tracking every cylinder from the source throughout the entire process and ensuring a balance within 1kg, accompanied by a de minimis release rate of 1.5%. FluoroFusion currently tracks this material from the imported ISO to the domestic supplier while also having a batch sheet signifying the amount of reclaim (traceable to the source) for every batch.

We ask in turn for a level playing field where the 73% of allowance holders are also required to demonstrate chain of custody to the ISO and country of origin. Specifically, FluoroFusion proposes the implementation of a machine-generated laser-engraved, unalterable QR code on each unique cylinder. Additionally, we advocate for the inclusion of a minimum 3% reclaim in every batch to encourage the utilization of legacy reclaim products and discourage the use "virgin" (offshored) assets in locations lacking environmental oversight that do not maximize reclamation.

The data embedded in the QR code should encompass the following details:

1. Filling company name;
2. Filler's AIM Act number;
3. Filler's contact person;
4. Filler's contact email address;
5. Filler's phone number;
6. Physical location (address, city, state, zip code, and country of origin);
7. Associated ISO numbers used in the blends;
8. Company from which ISO was purchased;
9. Origin country of ISO;
10. Cylinder serial number;
11. Cylinder type (e.g., 30, 50, disposable, refillable, 123, 240);
12. Batch ID/reference code (e.g., Julian Date);
13. Name/Brand substance is being sold and/or marketed under;
14. Refrigerant type;
15. Percentage of reclaimed material (minimum 3% US-based reclaimed material required);
16. Percentage of virgin material;
17. Certification of contents (e.g., Blend number);
18. Fill date;
19. Circular Partner Code (domestic EPA-certified reclamation partner with an address in the U.S. that will reclaim the material);
20. Cylinder QR Code ID; and
21. Cylinder QR Code Link.

N. Importing Reclaim, Virgin or Other Materials for Carbon Credits

No "reclaimed" or virgin material should be imported for the purpose of destruction for carbon credits. With the meager 1.6% HFC reclamation rate, we advocate prioritizing recovery and reclaim in the U.S. market, particularly emphasizing reclamation efforts.

O. Tracking Every Molecule of Refrigerant Back to Reclamation

We support the EPA requiring that regulated substances under this proposed rule be registered in the EPA's database, which would include providing the CAA Section 608 certification number and all other relevant data. This registration ensures that each cylinder of refrigerant can be traced back to its final disposition and reclamation. It is crucial that this tracking system is implemented in a manner that does not allow for manipulation using proprietary systems that could prevent reclaimers and new reclamation market entrants from accessing the market.

P. R1234yf Should Never Be Vented

The AIM Act directs and authorizes the EPA to maximize reclamation and minimize release of HFC's and their substitutes. Despite R1234yf serving as a low-global-warming replacement for the higher-GWP R134a, it is critical that this material, in particular, be subject to strong mandatory recycling rates, whether in "neat" refrigerants or in blends, as well as be subject to mandatory reporting. As we have seen repeatedly over the past 30 years in the refrigerant sector, there is a historical track record of unforeseen environmental consequences that flow from technological transitions from older refrigerants subject to regulatory control to newer refrigerants that are introduced under patent protection.

The presence of PFAS in R1234yf requires heightened attention. We believe that the final rule should prohibit venting R1234yf in any form because of the unique environmental risks associated with the potential for surface water contamination from reaction products associated with R1234yf in the atmosphere. See Appendix B for more information.

Q. RCRA Standards

We strongly support the widest possible exclusion from burdensome RCRA requirements for reclaimers, including that (a) the scope of the proposed alternative standards should include Class 1, Class 2, Class 2L, *and* Class 3 flammable substances; (b) the limits for speculative accumulation are eliminated or significantly adjusted to reflect production facility requirements at fractionation facilities; (c) the proposed requirement that reclamation facilities processing ignitable refrigerants meet the standards under 40 CFR part 261, subpart M, Emergency Preparedness and Response for Management of Excluded Hazardous Secondary Materials should be eliminated; and (d) the requirement that all batches of reclaimed material meet ASHRAE standards (or manage the off-spec material under RCRA) should be lifted.

The application of RCRA to HFC recycling exemplifies one of the substantial administrative and financial burdens that, if imposed on EPA-certified reclaimers, would increase the challenges for reclamation to reach its full and expected potential. We therefore support the widest possible application of the alternative RCRA standards, with the fewest possible conditions, at least with respect to operations that take place at EPA-certified off-site reclamation facilities. Particularly in advanced facilities designed to safely fractionate former patented blends of HFCs and small waste streams, it is unreasonable and unnecessary to propose the costliest solutions considering the 1.6% reclamation rate. Given the 98.4% release rate, it is unlikely that substantial quantities of hydrocarbon-containing former patent blends of HFCs will return to EPA-certified reclaimers. Accordingly, we recommend that the EPA instead allow insurance companies and local fire and building code authorities for each reclaimer to identify key risk characteristics and develop mitigation strategies, rather than imposing huge and unnecessary administrative and cost burdens on HFC reclaimers via default RCRA requirements.

First, we do not support the EPA's proposal to exclude Class 3 flammable substances, either in their pure form or typically found as components in Class A1 low flammability products like Chemours M099 (R438A), from the RCRA alternative handling standards. In particular, the act of reclaiming Class 1 materials that may contain minimal Class 3 flammables should not trigger costly process safety management compliance or RCRA compliance at the reclamation facility.

Second, we do not support the proposed requirement that the alternative standards apply only if storage at the off-site reclamation facility falls below the existing thresholds for "RCRA speculative accumulation," and that large volumes of ignitable refrigerants destined for reclamation can be safely accumulated and handled and need not fall into a specified category of RCRA-regulated wastes when accumulating ignitable spent refrigerants for fractionation. Accordingly, such accumulations should not be misconstrued as speculative storage of flammable components. Expanding reclamation capacity, including through fractionation, will necessarily lead to the short-term accumulation of refrigerants before processing due to the size of assets requiring larger inbound feed volumes than currently available. The RCRA speculative

accumulation limits for reclamation feedstock, and likewise the emergency preparedness requirements – neither of which apply to analogous virgin production facilities despite identical risks associated with ignitable virgin components – create an unlevel playing field between reclaimers and virgin HFC producers.

Moreover, it is crucial to highlight that the presence of mixed HFCs in railcars across various HFC Coalition member facilities renders the impracticality of processing all reclaims within a single year, introducing an additional obstacle to mitigating the 98.4% refrigerant release rate. The focus should pivot from the 1.6% adherence to responsible practices to tackling the 98.4% release rate on a product-specific basis. As advocated by Chemours in its comments on page 53 of EPA-HQ-OAR-2021-0044-0216, the EPA should acknowledge that reclaimed feedstocks sourced domestically and awaiting blending or fractionation should be treated similarly to imports for transformation, with no time limit under 40 CFR § 84.25. Addressing legacy streams in preparation for fractionation or blending should be treated equivalently to streams imported for destruction or transformation. We advocate for these streams to be categorized as "feedstocks for transformation," as previously suggested by Chemours, with no time limit on hold.

Lastly, mandating that reclaimers confirm the compliance of each batch of reclaimed refrigerant with ASHRAE specifications or manage off-spec materials in accordance with RCRA requirements for off-specification commercial chemical products under 40 CFR § 261.2(c) is unduly cumbersome.

R. CBI and Public Availability of Data Under the Proposed Rule

FluoroFusion supports the proposed rule's data collection requirements and encourages the EPA to expand the public availability of data on the composition and volumes of refrigerants on the U.S. market, including expanded transparency requirements imposed on virgin producers in order to facilitate end of life fractionation and reclamation.

We also believe that virgin importers who sell or transfer their HFC allowances should be required to disclose their intentions to sell or transfer those allowances publicly prior to sale or transfer, to allow reclaimers an opportunity to bid on equal terms to acquire those importation rights. Access to virgin components is essential to a vibrant reclamation market, and we are concerned that virgin producers may seek to restrict reclaimer access to such materials for anticompetitive purposes that are inconsistent with a robust circular economy for these materials.

While FluoroFusion supports greater data transparency, we also support the EPA treating domestic business relationships—such as the company that filled the container containing HFCs and the chain of custody beyond the two parties involved in any specific transaction, including an indication if the person receiving the HFCs is an intermediate supplier or final customer—as confidential business information.

S. Becoming a U.S. EPA-Certified Reclaimer

Many current EPA-certified companies and set-aside firms are finding it difficult to compete in the current market, as outlined in Appendix A. Like other domestic reclaimers and small HFC allocation holders, FluoroFusion has also faced offers from large importers, who manipulated

market prices downward, to acquire our allocations. The trend is concerning, and small allocation holders and domestic reclaimers are being rapidly pushed out of the market and acquired by well-funded multinational companies. It appears that only these well-funded multinational companies with valuations exceeding a billion dollars can weather the short-term market losses necessary to acquire small allocation holders and reclaimers.

While the EPA is better positioned for a comprehensive review, our daily involvement in the reclaim and blending markets suggests that the upper 76% of allowance holders of virgin importers are artificially manipulating the market to eliminate smaller players, particularly U.S. EPA reclaimers, as discussed throughout these comments. The AIM Act, based on the proposed rule, will be nearly at the 60% reduction level compared to U.S. baseline levels by the time the reclaim-promoting demand-enhancing measures in the proposed rule take effect. That delay will make it challenging for small reclaimers to survive in a market so heavily impacted by import schemes.

Currently, we observe global companies that are not EPA reclaimers attempting to control market access without being a reclaimer of record. Many of these multinational companies, with international shareholders in China, Japan, Europe, South America, Australia, aim to "recover" as much gas as possible but lack sufficient plants to "reclaim" the material back to AHRI-700 standards. Lacking reclaim assets, blend plants, allocations, fractionation capability, and chemistry labs, these multinational companies are striving to secure a place in what they believe may be a lucrative future market. These large original equipment manufacturer and international companies may not fully comprehend the entire life of being an EPA-certified reclaimer until they read this document or they may not be so quick to pretend to be one in the market.

FluoroFusion will likely wait and fractionate these collected materials in the next couple of years as every tank in the industry becomes full. This behavior underscores a recurring theme where individuals lacking an understanding of refrigerant complexities squeeze out legitimate reclaim companies and true American innovation companies due to their larger scale. We do not believe this aligns with the intent of the AIM Act and does not contribute to maximizing reclaim and minimizing release. To purchase reclaim materials in the market, we believe a company should first have to be an EPA-certified reclaimer, have reporting responsibility under HAWK management, demonstrate analytical chemistry and blending capabilities, avoid engaging in transshipping or various import schemes, demonstrate chain of custody ability, have a fleet of refillable cylinders, and maintain a physical reclamation facility in the United States. They should not be engaged in simply drop-shipping refrigerants to actual EPA-certified reclaimers to control access to the market. Similarly, as mentioned above, no company involved in market manipulation or illegal imports should be allowed to grow market share by forcing small reclaimers out of the market and purchasing their allowances.

Given the increased emphasis the proposed rule places on the role of EPA-certified reclaimers, we recommend that the EPA develop enhanced requirements for reviewing the qualifications of certified reclaimers. This process should also include the inclusion of individuals on their Hotline who are not reclaimers but are buying material.

T. The 53 GWP Cutoff for the Leak Repair Provisions Should Not Be Applied to Reclaim-Related Mandates

Although we take no position on the exclusion of GWP below 53 GWP from the leak detection and repair mandates in the proposed rule, we appreciate that EPA recognizes that it has authority under the AIM Act to extend those requirements to lower GWP products in the future. More importantly from FluoroFusion's perspective, we strongly urge EPA not to make changes to the proposed rule (or future rules designed to further bolster reclaim, particularly as we enter future stages of the HFC step-down process under the AIM Act) that would exempt low GWP refrigerants from reclaim-related requirements. There are strong environmental protection and circular economy reasons – beyond the climate change impacts – that warrant robust and broad reclaim requirements. These include, for example, measures to control the releases of PFAS in refrigerant blends.

IV. CONCLUSION

If the risks and impacts of climate change are real – and we have no doubt that they are – then the current regulatory framework (including but not limited to the AIM Act alone) will need to change in order to mitigate the impacts of high GWP refrigerants. The proposed subsection (h) rule is a good start, but additional reform is required to unwind the effects of a system in which large U.S. virgin refrigerant producers have used a range of anticompetitive market tactics to advantage their own interests at the disadvantage of the environment.

We thank the EPA for its continued efforts protecting our environment by reducing emissions of ODS and high-GWP refrigerants and helping the HFC industry manage the lifecycle of refrigerants and cylinders in an environmentally responsible manner. FluoroFusion looks forward to working with the EPA on these and future endeavors while collaborating with our fellow industry stakeholders to develop next-generation refrigerants and reclamation technologies. Please feel free to contact us with any questions.

Respectfully Submitted,

David L. Couchot
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APPENDIX A: ADDITIONAL INFORMATION ON THE ADVERSE IMPACTS ON THE U.S. RECLAMATION SECTOR OF CUSTOMS DUTY ABUSE AND OTHER ANTICOMPETITIVE BEHAVIOR

As summarized in Part II of our comment letter above, the reclamation sector in the United States faces an existential threat from various anticompetitive practices that have been deployed for many years by virgin refrigerant producers and importers. This appendix provides additional context and background information about those challenges. Although some of these practices may involve activities that are outside the scope of the proposed rule, it is essential that EPA and other federal and state policymakers who wish to foster a vibrant reclamation sector: (a) fully understand these challenges; (b) take all available steps within their statutory authority to mitigate and compensate for these challenges; and (c) take further steps, in consultation with affected stakeholders, to identify additional interagency coordination and legislative efforts to address them.

A. Virgin Refrigerants Producers and Importers Have Shifted Most U.S. Refrigerant Production Capacity to China, and Have Used the Department of Commerce's Antidumping Rules – Especially the 2016 Blends Order – to Secure Highly Favored Trade Treatment for Virgin Producers with Dire Impacts on Reclaimers

The 2016 *Hydrofluorocarbon Blends from the People's Republic of China Antidumping Duty Order* ("2016 Blends Order") restricts the import of specific blends like R404A, R507A, R410A, R407A, and R407C by imposing a significant 285% duty for most importers. Although the stated aim of such AD/CVD duties is to prevent these blends from entering the U.S. market at prices that could undercut domestic producers, the Blends Order has been weaponized far beyond its nominally intended function of protecting U.S. domestic producers from unfair Chinese practices.

Instead, the Blends Order serves to restrict the most popular HFC blends from entering the market by nearly quadrupling the cost of these refrigerant blends in a manner that has been designed by virgin producers to secure future cost advantages for their patented HFC replacements for R22 as well as future HFC/HFO blends. These types of measures adversely impact the domestic reclaim market because the next-generation replacement refrigerants can be, and often are, priced just below the cost of reclaiming the refrigerant it replaces.

A basic understanding of the 2016 Blends Order is fundamental to understanding the current state of the U.S. refrigerants market. Specifically, it is essential to understand that the 2016 Blends Order included – at the request of virgin producers – an exclusion for certain refrigerants that were produced in China under patent. It provides in relevant part:

> *Any blend that includes an HFC component other than R–32, R–125, R–143a, or R–134a is excluded from the scope of this Order.*
>
> *Excluded from this Order are blends of refrigerant chemicals that include products other than HFCs, such as blends including chlorofluorocarbons (CFCs),*

hydrochlorofluorocarbons (HCFCs), hydrocarbons (HCs), or hydrofluoroolefins (HFOs).

Also excluded from the Order are patented HFC blends, including, but not limited to, ISCEON® blends, including MO99TM (R–438A), MO79 (R–422A), MO59 (R–417A), MO49PlusTM (R–437A), and MO29TM (R–422D), Genetron® PerformaxTM LT (R–407F), Choice® R–421A, and Choice® R–421B.

A recap of recent history in the refrigerants sector is instructive to understand the dynamic at work today. The EPA's *Draft Report – Analysis of the U.S. Hydrofluorocarbon Reclamation Market: Stakeholders, Drivers, and Practices* (October 2022) shows an average annual decline in the reclamation of R22. It is easy to assume that this decline is solely due to annual reductions in the R-22 installed equipment base. However, our experience is that patented R-22 replacements, like HFC-R-438A, were being manufactured in China and imported into the U.S. without AD/CVD duty so they could be sold at a price significantly lower than reclaimed R-22. That outcome was possible because the manufacturer of R-438 was successful in specifically excluding their patented alternative refrigerant from the 2016 Blends Order.

U.S. producers in turn made a choice to invest in overseas production facilities for their R-22 alternatives in China, presumably to avoid environmental and regulatory challenges associated with the production in the United States of complex HFC blends containing class III flammable hydrocarbons. Their high-GWP R-22 alternatives were then imported into the United States, where they were aggressively priced and often added to R-22 in existing AC/R systems. This practice has significantly reduced the buyback rates of recovered R-22 that reclaimers can offer technicians, because they encourage technicians instead to simply to "top-off" leaking R-22 equipment with an R-22 alternative "drop-in." As a result of these inexpensive replacement refrigerants and poor refrigerant management practices by technicians, the amount of recovered R-22 refrigerants coming back to reclaimers predictably dropped considerably. When those mixed refrigerants are eventually recovered, moreover, these practices have led to complex mixtures of recovered HCFC, HFC, and hydrocarbon refrigerants that cannot be safely separated using legacy HCFC reclamation technology. As explained more fully below, these practices have significantly limited capital investment in reclamation technology that is sorely needed today.

Then, in the years leading up to 2020, as the patents for their HFC-based R-22 replacements began expiring, the virgin refrigerant producers ramped up lobbying efforts to pass legislation designed to phase down production and importing of HFC refrigerants. Critically, they also simultaneously initiated Department of Commerce (DOC) antidumping investigations into imports of HFC refrigerant components. These DOC efforts began on January 23, 2020, when a U.S. HFC producer filed a DOC antidumping duty petition concerning imports of difluoromethane (R-32) from China. The final affirmative determination, published on March 22, 2021, placed an antidumping duty of 161% to 221% on all imports of R-32. In the meantime, the AIM Act had been signed on December 27, 2020, and required to implement a national phasedown of the production and import of HFC refrigerants. Six weeks later, on February 3, 2021, another U.S. HFC producer petitioned DOC to initiate antidumping and countervailing duty investigations into imports of pentafluoroethane (R–125) from China. The final affirmative

determination published March 9, 2022, placed an antidumping and countervailing duty of at least 277%.

The combined effect of these two-pronged efforts by US virgin HFC producers was that they have successfully used parallel U.S. government proceedings to build a market for imported, next-generation HFC/HFO refrigerants. Specifically:

- They have excluded from the scope of the antidumping duty/CVD regime their patented next-generation HFC/HFO refrigerants, thanks to the exclusion language found in the 2016 Blends Order, which has preserved their ability to continue production in low cost, foreign manufacturing plants. These regulations make it significantly more cost-effective to import HFC and HFC/HFO refrigerant blends from China.

- And meanwhile, they are poised to disproportionally benefit from the phasedown in HFC production and consumption under the AIM Act, including EPA's decisions to allocate HFC allowances based on historical import data.

The result of these efforts is a deep and systemic harm to the entire refrigerant reclamation industry. These practices artificially triple the market price of virgin HFC blends, while simultaneously increasing the cost of virgin HFC components that the U.S. EPA certified reclaimers need in order to reclaim recovered HFC blends back to their original specification. This scenario gives the U.S. virgin producers' next-generation HFC/HFO blends a significant price advantage over reclaimed HFCs. Ultimately, the availability of low cost HFC/HFO blends places an effective ceiling on the market price of reclaimed refrigerant. That ceiling in turn leads to low buyback prices that reclaimers can offer for recovered HFC blends, which in turn discourage HVAC/R technicians from recovering refrigerant. And that is why we see a 98.4% release rate of HFC refrigerants today.

B. The Future of Reclamation Requires Fundamental Changes to the 2016 Blends Order

As explained in our comments above, EPA's proposed subsection (h) rules will, particularly if strengthened further as we suggest, help to provide corrective measures, most notably by creating a stable and predictable demand for reclaimed refrigerant. U.S. reclaimers, including FluoroFusion, stand ready to invest and are fully capable of delivering to market the reclaimed materials necessary to supply the demand that the proposed subsection (h) rules envision. But those changes will not be sufficient on their own to further bolster the reclamation market in the manner that is required in order to meet the current climate change crisis.

While the AIM Act holds commendable intentions for fostering American Manufacturing and Innovation within the sector, the smaller companies that define the reclaim sector today lack the financial resources to compete on a level playing field with the regulatory and, especially, the AD/CVD proceedings that are brought by incumbent virgin refrigerant producers and importers to protect their market share and weaken the reclamation sector. Moreover, these challenges are exacerbated by the cumulative effects of trade and environmental regulations, which reinforce the substantial cost advantages enjoyed by the virgin refrigerant producers – most notably, the members of the American HFC Coalition. Reclaimers, who represent a tiny minority of the

domestic refrigerant market, face significant financial limitations when seeking to contest layers of government-backed protections that grant U.S. and foreign multinationals cost advantages while relieving them of life cycle cost responsibilities for the virgin products that they place on the market.

FluoroFusion strongly supports U.S. manufacturing, innovation, and life cycle management, with a commitment to fair trade. However, it's evident that antidumping proceedings have been exploited to gain long-term cost advantages through government-endorsed loopholes. Examining the history, background, and impact of the 2016 HFC Blends Order reveals a deliberate strategy by virgin refrigerant producers: as popular blends like R404A, R407C, R407A, R507, and R410A approached the end of their patents, they used the R22 phasedown to position newer patented HFC next-generation blends against ozone-depleting substances and high GWP alternatives, securing a 285% cost advantage over reclaimers and importers in the United States.

Specifically, U.S. HFC producers leveraged the DOC to phase out off-patent products in favor of their patented replacements, ostensibly in the name of eliminating ozone-depleting substances and high GWP alternatives. They also continued to offshore the production of R32, R125, and R134a to China at low prices, ensuring an advantage in future import allowances. As the AIM Act came into effect, high costs were imposed on future importers who had to secure HFC allowances, while the virgin producers in the HFC Coalition positioned themselves to continue to import lower cost HFC/HFO blends from China, while obstructing others from doing so.

These strategies have long-standing ramifications, the first of which is an unhealthy reclaim industry where 98.4% of every product ends up in the atmosphere, because low-cost Chinese products are favored over utilizing the waste streams from prior production of products. It's essential to acknowledge the significant challenges – past and future – faced by U.S.-based reclaimers due to the patent exclusion language in the 2016 HFC Blends Order. This exclusion severely limits reclaimers' ability to market reclaimed refrigerants at competitive prices when they must compete against ultra-low-cost offshore-produced next-generation HFC/HFO blends.

Moreover, smaller companies lack the financial means to contest individual rulings regarding the implementation of the 2016 Blends Order at the DOC. This encourages the HFC Coalition members – who control 64% of HFC consumption allowances under the AIM Act – to continue to produce in, and import from China their next-generation blends, thus institutionalizing the maximization of release and minimizing reclamation, which runs counter to the EPA AIM Act.

HFC Coalition members heavily rely on patent exclusion language to maintain perpetually low costs for their "next generation" HFC/HFO blends, which primarily consist of 70% HFCs. Meanwhile, however, this loophole in the trade regime imposes a substantial burden on government resources, who are confronted with complex AD/CVD order circumvention efforts that hinder and complicate effective enforcement. For example, a prominent legal case revolves around the import by a non-HFC Coalition allowance holder of R421A, using a claimed exemption from AD/CVDs under the 2016 Blends Order and its subsequent transformation into blends like R407C and R407A. This case is often cited by HFC Coalition members as they "strive" to combat the illicit import of HFC blends and assist the DOC in identifying misconduct. Numerous instances can be cited to illustrate how patent exclusions have incentivized importers

to engage in similar circumvention practices. Those practices in turn lead to constant circumvention inquiries and enforcement efforts even on legitimate import activities, creating disruptions in the reclamation industry and market in general.

The Department of Commerce's 2020 R421A anticircumvention inquiry, *Hydrofluorocarbon Blends From the People's Republic of China: Final Scope Ruling on Unpatented R–421A; Affirmative Final Determination of Circumvention of the Antidumping Duty Order for Unpatented R–421A,* 85 Fed. Reg. 34416 (June 4, 2020), illustrates some of the issues that reclaimers face in the market with competition against low cost imported Chinese material. This 2020 inquiry covered "imports of unpatented R-421A, a blend of HFC components R-125 (also known as Pentafluoroethane) and R-134a (also known as 1,1,1,2-Tetrafluoroethane), from China that are further processed in the United States to create an HFC blend that would be subject to the Order." *Id*. Although the complaint refers to "unpatented R421A," the importer leveraged the patent exclusion in the 2016 Blends Order to bring the material into the U.S. without incurring a 285% duty. Subsequently, DOC found that this material was converted into blends like R407A and R407C, resulting in an immediate and adverse impact on competitors/reclaimers in the U.S. market. The investigations carried out by ITC and DOC also seem to indicate no evidence of a patent for R421-A.

The entry into the United States of unpatented R421A under favorable trade terms based on the patent exclusion in the 2016 Blends Order raises obvious concerns about the enforceability of the Blends Order. How can a product have a patent exclusion and receive a 285% duty advantage while having an unpatented version per the findings of the ITC? This incident also raises questions that EPA has a direct interest in, including the ASHRAE certification and SNAP approval status of the refrigerant in question.

We use the above example only to illustrate the long-term impact on reclamation in the U.S. of the current situation: in addition to the actions of the virgin producers like the HFC Coalition members, a sophisticated group of experienced importers, well-versed in DOC procedures, understands how to manipulate the current AD/CVD framework to unfairly compete with reclaimed refrigerants. This strategy entails making use of patent exclusions in the 2016 Blends Order and relying on an outdated DOC anti-circumvention process.

Although this case is cited repeatedly by HFC Coalition members, it is almost an inevitable outcome of the patent exclusion loophole that the HFC Coalition members themselves sought and secured in the 2016 Blends Order. More importantly for the subsection (h) context, this type of AD/CVD circumvention, which is encouraged by the 2016 Blends Order, poses challenges for HFC reclaimers as these artificially priced products compete with reclaimed content products and hinder investments in the sector. The importation, conversion, and sale of this material continued despite anti-circumvention efforts, and it took months to bring an end to this process. This prolonged legal battle has had far-reaching consequences, including implications for the EPA phasedown of HFC refrigerants, as mandated by the AIM Act.

There are many other such examples. For instance, in September 2023, there were reports of the importation of nearly 80 ISO tanks filled with R421B, a blend that had been excluded from the 2016 Blends Order duties due to its patent status. R421B comprises 85% R125 and 15% R134a.

While this product may not have any or minimal established applications as a direct refrigerant, it excels at avoiding duties and can be further processed into various blends that, if they had been imported as such, would be subject to the 2016 Blends Order duty, such as R404A, R407A and R407C. The resulting refrigerants will take years to move through the supply chain as they enter the U.S. marketplace, all the while cannibalizing market share from importers playing by the rules, as well as unfairly lowering prices and impacting reclaim activities.

Experienced importers, well-versed in the nuances of patent exclusion language, proactively seek ways to gain a competitive edge. When they possess assets in the U.S., they target alternative products that can be transformed into popular subject blends within the country. Notably, the 2016 HFC Blends Order outlines just five subject blends (R404A, R507, R407A, R407C, and R410A). Observing the success of HFC Coalition members in manipulating the DOC process seems to embolden these non-patent holding importers to test the boundaries further by importing products such as R410B (converted into R410A), R407G (transformed into R407C), and an array of partial blends, semi-finished blends, transshipping, and various other forms of refrigerants whose eligibility for the duty exclusion under the Blends Order is dubious.

In sum, it is evident that the patent exclusion in the 2016 Blends Order has the effect of incentivizing questionable import practices, which in turn artificially lowers the prices of virgin refrigerants, thereby undermining the objectives of the AIM Act. The central issue is the time it takes to file circumvention cases against such behavior, especially when foreign entities are benefiting from moving these illicit practices from one country to another. In the end, however, the result is the same: artificially low-priced HFCs ultimately arrive in the United States, and have a 98.4% chance of being released. It can be argued that U.S. air and drinking water become the dumping ground for Chinese HFC's and now HFC/HFO blends.

There are many other adverse effects that flow from these artificially cheap HFC imports that arrive through abuse of the 2016 Blends Order's patent exclusion, beyond the 200% price advantage over other refrigerants. These effects include the creation of *de facto* monopolies by certain allowance holders, who import virgin refrigerants that are unencumbered by AD/CVDs as well as by life cycle management responsibilities for their products.

Although we understand that EPA has no control over the content of the 2016 Blends Order, it is long past time for the federal government as a whole to coordinate its environmental and trade policies across agencies. Concentrating solely on authorities arising under the AIM Act, while commendable and helpful to a degree, will fail to adequately safeguard the U.S. environment and the reclaim industry. We do want to point out that the 2016 Blends order currently trumps the AIM Act's goals of maximizing reclaim and minimizing release.

C. The Blends Order Will Facilitate Future Imports of Low GWP Substitutes that will Further Harm the U.S. Reclaim Market

In addition to the adverse impacts to the U.S. reclamation sector that arise by operation of the 2016 Blends Order and its impacts on pricing discussed above, various other adverse environmental impacts flow from the order's patent exclusion clauses. We explain this dynamic further below.

It is essential to understand that refrigerant products commonly referred to as HFO refrigerants are in fact primarily HFC/HFO blends, with HFC content ranging from 44% to 80%. Under the 2016 Blends Order, the complete value of the HFCs in such imported blends is exempt from the antidumping duties imposed by that Order. As explained above, the patent exclusion in the 2016 Blends Order creates a substantial 200% cost advantage for products imported from China. This poses a significant concern for these HFO blends, which are designed in ways that are inherently more expensive and more problematic to manage from a lifecycle management standpoint.

An examination of some of these HFC/HFO "available substitutes," as defined in the AIM Act Technology Transition rule, offers specific examples that illustrate the structural barriers hindering reclamation efforts for these products in order to minimize their release. As explained further below, these are products that should only be permitted on the U.S. market if they are subject to lifecycle management control measures.

- R448A is a blend composed of 26% R32, 26% R125, 21% R134A, 20% 1234yf, and 7% 1234ze(E), and is positioned as a substitute for R404A. The advantage of importing this product from China lies in a substantial 73% HFC content, benefiting from a 200% duty exemption allocated to the HFC component, as stipulated in the HFC Blends Order. Importing it in single-use cylinders without QR code tracking and the absence of reclaim usage further exacerbates the issue.

  This refrigerant highlights the urgent need for increased reclamation, especially since the product can be efficiently blended/manufactured in the U.S. using reclaimed materials like R407C, R410A/R407A, R407F, and others, in conjunction with 1234yf and 1234ze(E). Unfortunately, the manufacturer of R448A appears likely to use its claimed patent protection status to obstruct reclamation efforts, notwithstanding claims that it intends to "enable" qualified reclaimers who are able to meet its self-imposed criteria to conduct reclaim operations on the patented blend.

  While U.S. reclamation faces obstacles in navigating patent-based controls here, the patent holders freely import the virgin product from China, employing virgin HFC components without incurring antidumping duties on the HFC content and evading long-term life cycle responsibilities. As a result, the importation of R448A undermines the recycling of the high GWP product R404A (with a GWP of 3922), as virgin R448A is less expensive than the reclamation of R404A. Indeed, since the introduction of R448A into the U.S., the reclamation of R404A has decreased by at least 15%.

- R463A, which comprises 36% R32, 30% R125, 14% R134A, 6% CO2, and only 14% 1234yf, enjoys a 200% antidumping duty exemption due to its nearly 80% HFC content. This product would be perfect for reclaim content to blend from reclaimed product streams in the U.S. like R407A, R407C and many others combined with CO2 and the 1234yf additive. Sadly, having a 200% cost advantage from China, while not allowing reclaim, will result in a 100% vent rate. The decision to opt for an outsourcing approach in China, involving the use of one-time use cylinders free from duties, presents a considerably more cost-effective option compared to using reclaimed material. This approach not only contributes to a reduction in costs, but also enables future low cost

import of 1234yf because when the 1234yf patent is finished, the importer will claim harm from China, starting the cycle over again or requesting another phasedown of PFAS ingredients to maintain control of the market and ensure the maximization of future release of HFC/PFAS.

- R513A, comprising 44% R134A and 56% 1234yf, could easily be produced in a manner that maximizes the demand for reclaim, by combining recycled R134A from domestic reclaim with 1234yf from domestic reclaim. Unfortunately, little incentive under the current regulatory and trade framework exists to not use the duty exemptions to bring this material in from China in virgin form, and in doing so undermine American reclamation efforts. (As we discuss in our comments, moreover, azeotropic blends like R513A should not exist and have a nearly 100% release rate.)

- R454B, comprising approximately 69% R32 and 31% 1234yf, serves as an excellent illustration of a product that should prioritize the use of reclaimed materials from domestic sources rather than relying on global logistics. While R32 may not currently be in a full lifecycle position, it is expected to be by 2028. Consequently, this product should be mandated to incorporate reclaimed R32, reducing the need for global asset transportation. Recycled R410A is far superior to R454B on a 100 year GWP if it is recycled four times, while R454B has a 100% release rate.

FluoroFusion could provide numerous additional instances where regulated substances can be blended with small quantities of HFOs in China and then imported in virgin form, rather than produced in the United States with reclaimed HFCs. Absent a major change, we see a future where major allowance holders continue to outsource production to China, duty-free, offering more substantial profits. These duty exemptions create enticing opportunities for larger allowance holders to exert downward pressure on U.S. market pricing, while simultaneously restricting access to crucial components necessary for effective reclamation.

It's not our intent to pass judgment on these major allowance holder's use of their scale to exploit governmental advantages. However, the overarching priority must be the urgent need to combat human-induced climate change and prevent the release of over 209,000,000 pounds of refrigerant per year. It is not socially just to place profit for the few above the crucial imperative of addressing climate change. Wherever feasible, our focus must be on prioritizing the reuse of previously produced products in future blends to prevent unnecessary releases into the atmosphere.

D. These Problems are Compounded by Market Pressure on Reclaimers and Anticompetitive Practices by Virgin Producers and Importers

The cost pressures resulting from the cheap Chinese imports described above ultimately originate with the patent exclusion in the 2016 Blends Order. As the EPA knows, the average market price of refrigerants since October 2022 has fallen 89%. We know what comes next for U.S. reclaimers, unfortunately. Those low costs of virgin materials create disincentives for U.S. based reclaimers to invest capital that is required to maximize HFC capture and reclamation. This

situation presents several challenges to the reclamation market's growth beyond 2024, primarily due to structural barriers and the institutionalized release of refrigerants.

Here are specific examples of those structural barriers and the reasons behind them, which highlight these challenges:

- Allowance holders exploit other strategies to avoid duties while shifting the duty burden onto smaller companies. They import various refrigerants like R410A from Oman, R125 from Vietnam, and R32 from the UAE, even though there is little evidence that the refrigerants are produced in those markets. Subsequently, these significant allowance holders artificially lower market prices, undercutting the competitiveness of smaller firms and reclaimers. This manipulation forces smaller American manufacturing and reclamation companies to exit the market or to sell allowances and exit the market.

- Some HFC Coalition members actively campaign against reclaim gas and obstruct the ability of reclaimers to sell in the market by depressing prices for virgin refrigerants. In some cases, for example, we understand that refrigerant wholesalers have been told that access to next generation products will be dependent on sole-sourcing from virgin refrigerant importers. Although in a fair marketplace reclaimed material would be the most cost-effective option, virgin producers actively work to undermine the marketplace for reclaimed products.

- Several HFC coalition members label reclaim gas as substandard, despite the established standard of AHRI700. Smaller companies find it challenging to market against this tactic due to the coalition's majority of allowances and extensive resources. This labeling undermines the reclamation industry, hindering its efforts to provide high-quality products and compete with coalition members selling virgin gas.

- Predatory tactics are employed, such as selling products at low prices while attacking individual reclaimers by purchasing mixed reclaim gas at higher rates than they actually sell virgin products. Many reclaimers lack the funding to file unfair competition cases, resulting in difficulties accessing feedstock and market sales.

- The act of transshipping goods originating in China to Mexico (increasing allowances there), relabeling the products, rerouting them to the Middle East, and ultimately bringing them back to the U.S. as a method to bypass duties has resulted in depressed market prices and adversely affected smaller allowance holders. The practice of importing from regions that lack manufacturing facilities is a clear indicator of circumvention, compelling smaller reclaimers to exit the market due to financial pressures.

The reclamation sector, being a relatively small player in the industry, bears the primary burden of these challenges. Its limited scale, financial constraints, and high holding costs render it susceptible to the adverse effects of market price declines, precisely when stability and investment are most critical. Reclamation businesses are encouraged to invest in their assets to boost their reclaim capabilities. However, the significant financial disparity, combined with the lack of prospects beyond chemical releases, deters potential investments from banks and private

equity firms. The prevalence of such extensive practices designed to bypass the system appears to be a direct outcome of unjust regulations aimed at undermining the AIM Act before its implementation.

E. What Can EPA Do About the Blends Order's Adverse Impacts?

Consistent with our prior communications, we strongly urge the EPA to take comprehensive action, utilizing its authority to revoke or retire allowances from entities involved in market manipulation and patent misconduct. EPA should in particular commence a comprehensive examination of imports where the importer has asserted a patent exclusion under the Blends Order. In cases where a company is discovered to have falsely claimed a patent, imported without a patent while claiming a patent, engaged in fraudulent activities against the U.S. Patent Office, DOC, CBP, ITC, or the EPA, the appropriate consequence should be the permanent retirement of all their allowances. Disruption of an industry by these means cannot be tolerated.

We also believe that EPA should initiate a multi-agency review, under White House oversight, that takes a comprehensive assessment of the relationship between U.S. antidumping rules under the 2016 Blends Order and the climate objectives of the AIM Act, with the goal of identifying additional measures that each agency can take, within its own statutory authorities, to maximize fairness in the application of U.S. trade rules while also utilizing all available tools to increase demand for and supply of reclaimed materials.

These measures are vital to safeguard U.S. innovation companies, reclaimers, and the public at large from the adverse impacts of the 2016 Blends Order. This proactive approach is essential to reinstate a fair and equitable playing field for American Innovation Manufacturers, ensuring that both foreign corporations, major multinational entities, and significant domestic importers adhere to the established regulations. It is disheartening to witness the AIM Act, symbolizing the American Innovation in Manufacturing Act, undermined by the influence of larger allowance holders to the detriment of U.S. innovation companies and reclaimers.

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APPENDIX B: BACKGROUND ON ENVIRONMENTAL RISKS OF VENTING R-1234YF

This appendix provides information about one illustrative example of a component that has been introduced by HFC Coalition members into patented blends in recent years, which means it will be required in order to reclaim those blends, but which presents significant environmental impacts. Those environmental impacts are likely to lead to future restrictions that in turn further complicate or prevent the reclamation of blends that contain this component. The result of this dynamic is that virgin producers effectively transfer the cost burden of future refrigerant management onto reclaimers and society more generally.

R-1234yf transforms into TFF (CF3COF) upon reacting with water in the atmosphere, ultimately leading to the formation of TFA. The widespread contamination of water supplies globally by TFA has raised concerns. In contrast, R-1234ze(E) exhibits a significantly shorter atmospheric lifetime of approximately 4 days and does not manifest similar behavior. It is crucial to emphasize that all HFOs are not uniform in their characteristics. Our primary objective is to enlighten stakeholders about the profound consequences of obstructing the reclamation of products containing 1234yf. A meager 1.6% reclaim rate for such products could result in catastrophic environmental impacts for municipalities and cities. While coalition members with long-term chemical-producing assets may dispute this, we underscore the potential trajectory of these products, such as refrigerant R454B, entering the water supply by elucidating the underlying chemistry.

In the atmosphere there are two decomposition pathways that R-1234yf undergoes. The first pathway is the reaction with hydroxyl radicals (-OH), which produces a 100% yield of trifluoroacetyl fluoride (CF3COF, TFF) while reaction with chlorine radicals produces a 92% yield of TFF:

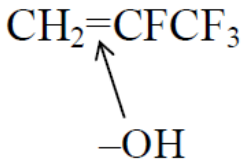
$$CH_2{=}CFCF_3 + \text{-}OH \rightarrow CH_3COF + H_2O + XO_2 \quad (1)$$

$$CH_2{=}CFCF_3 + Cl\text{-} \rightarrow 0.92\ CF_3COF + 0.568\ HC(O)Cl + XO_2 + CO \quad (2)$$

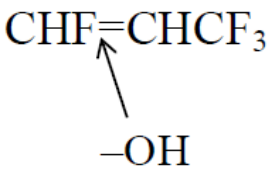
The products (intermediates) of pathway (1) are TFF and formaldehyde (HCHO) and pathway (2) TFF and formyl chloride (HC(O)Cl). TFF then reacts rapidly with atmospheric moisture (H_2O) to form trifluoroacetic trifluoroacetic acid (CF_3COOH, TFA):

$$CF_3COF + H_2O \rightarrow CF_3COOH + CO_2 + HF \quad (3).$$

R-1234yf has four fluorine atoms on one side of the double bond, where the structure is CH2=CFCF3. The attack is thus:



The result is that all four fluorine atoms are present in the decomposition product CF_3COF (TFF), representing the decomposition product from the right side of the double bond. For 1234ze(E), one fluorine is on the left side of the double bond and three fluorines on the right side of the double bond. The attack is thus:



The breakdown of 1234yf yields two oxygenated byproducts, HCOF and CF_3COH, a result of the molecule's cleavage at its double bond. It is noteworthy that the once-unknown repercussions of 1234yf are now recognized.

This specific example is shown to demonstrate the historical and future impact of patented refrigerants touted as being the cure to environmental issues. R11 and R12 were created to solve flammability when compared to hydrocarbons (R290, R600a) but resulted in an unintended consequence of creating a hole in the ozone layer. It is crucial to note that the same HFC coalition members amassed considerable profits during the shift from hydrocarbon refrigerants to CFCs, accumulating billions. As the patents for CFCs expired, these companies continued to reap substantial profits by transitioning to patented HCFCs like R22, contributing to a reduction in the ozone layer depletion. Following the expiration of these patents, the same companies accumulated substantial wealth through the use of HFCs, including patented variations that contributed to global warming, while impeding reclaim. The evolution of subsequent generations of products still involves patented versions of HFCs with HFO additives like 1234yf. When 1234yf loses its patent protection, a new PFAS phasedown is anticipated, impacting the U.S. population and restricting access for reclaimers to 1234yf while introducing the next molecule to address the previously created problem. In consideration of these environmental windfalls, it is imperative that these companies, which have reaped significant profits, actively endorse unencumbered reclaim initiatives and life cycle management responsibilities to rectify the pollution they unleashed and prevent its entry into the U.S. water supply.

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