

**Comments of the
Semiconductor Industry Association (SIA)
On the Notice of Proposed Rulemaking:
“Phasedown of Hydrofluorocarbons: Management of Certain Hydrofluorocarbons and
Substitutes Under Subsection (h) of the American Innovation and Manufacturing Act of
2020”**

(88 FR 72216, October 19, 2023)

[EPA-HQ-OAR-2022-0606]

Submitted December 18, 2023

The Semiconductor Industry Association (SIA)¹ appreciates the opportunity to submit the following comments on the Notice of Proposed Rulemaking on “Phasedown of Hydrofluorocarbons: Management of Certain Hydrofluorocarbons and Substitutes Under Subsection (h) of the American Innovation and Manufacturing (AIM) Act of 2020” (88 FR 72216, October 19, 2023). SIA supports efforts to reduce greenhouse gas emissions through reasonable management practices of hydrofluorocarbons and their substitutes.

1. Industrial process refrigeration in the semiconductor industry

Typical high-volume manufacturing semiconductor facilities use industrial process refrigeration (IPR) which the Environmental Protection Agency (EPA) has determined is in scope of the AIM Act. The uniqueness of semiconductor manufacturing is that the industry uses a large number of small, tightly controlled IPR, a use that is not comprehended in the AIM Act rules. EPA proposes dropping the charge size from 50 lbs. to 15 lbs. and requests comments on further reducing it to 5 lbs. Based on discussions with SIA members, a typical high-volume semiconductor manufacturing facility may have between 35-200 chillers greater than 50 lbs. If the threshold were lowered to greater than or equal to 15 lbs., an additional 20-200 chillers per facility are brought into scope. If the threshold is lowered even further to greater than or equal to 5 lbs., an additional 200-500 chillers per facility are brought into scope.

SIA recommends that the threshold of applicability be increased to 50 lbs., which is consistent with the threshold for leak repair and applicable recordkeeping and reporting requirements in 40 CFR Part 82 Protection of Stratospheric Ozone.

The leak rate and monitoring provisions are meant to allow continued operation of a large chiller and EPA is proposing to allow a 30% leak rate for large chillers – an amount that is much greater than the total charge of a small chiller. The proposed provisions become less practical as the chiller size decreases. Repairing small chillers in place is not applicable because the leaking chiller is generally removed from service, making the leak rate concept invalid. Small chillers with refrigerant charges less than 50 lbs. used with semiconductor manufacturing

¹ The Semiconductor Industry Association (SIA) is the voice of the semiconductor industry, one of America’s top export industries and a key driver of America’s economic strength, national security, and global competitiveness. SIA represents 99% of the U.S. semiconductor industry by revenue and nearly two-thirds of non-U.S. chip firms. Through this coalition, SIA seeks to strengthen leadership of semiconductor manufacturing, design, and research by working with Congress, the Administration, and key industry stakeholders around the world to encourage policies that fuel innovation, propel business, and drive international competition. Learn more at www.semiconductors.org.

equipment will not function properly if experiencing leaks of refrigerant at the thresholds currently defined in the rule. As a result, to reiterate, leak verification as specified in the rule for a chiller less than 50 lbs. is impractical and burdensome. ***SIA requests confirmation that if equipment is removed from service, it is exempt from leak rate tracking and verification.***

SIA also recommends that EPA clarify that leak testing should only apply to operational chillers. If the proposed threshold is less than 50 lbs., SIA requests that verification and leak monitoring can be demonstrated using operational parameters and does not require certified technicians to complete the verification and monitoring.

Under §84.106 (I), as proposed, owners or operators have 60 days to determine the full charge of all refrigerant-containing appliances with 15 or more pounds of refrigerant (or upon installation of new equipment) and maintain numerous records. Many affected sources rely on refrigerant management software (RMS) to manage inventories. Updating inventory records may require physical audits of fabrication space as well as storage areas, and correspondence with suppliers to complete.

SIA recommends that chillers with charges less than 50 lbs. be excluded from inventory requirements. The implementation date for chillers greater than 50 lbs. should be extended from 60 days to 365 days following date of publication of the final rule in the Federal Register to allow affected owners or operators to determine and implement a business process to manage the required records in this subpart. If EPA were to include appliances with charges less than 50 lbs., the implementation date for those units should be extended to 24 months.

2. Definitions

A. Refrigerant

§84.102, as proposed, broadly defines refrigerant:

“Refrigerant, for purposes of this subpart, means any substance, including blends and mixtures, consisting in part of or whole of a regulated substance or a substitute for a regulated substance that is used for heat transfer purposes, including those that provide a cooling effect.”

SIA does not believe it is the EPA's intent to regulate heat transfer fluids in general, including F-HTFs, which are already tracked and reported within the Mandatory Greenhouse Gas Reporting program (40 CFR Part 98) for electronics manufacturing. First, the industry's uses of F-HTFs are outside the definition of a “refrigerant” because they do not “provide a cooling effect.”

In a prior rulemaking implementing Section 608 of the Clean Air Act, EPA explained that the Agency added the phrase “provide a cooling effect” to the definition of the term “refrigerant” for that rule to “make certain that the definition does not capture substances that provide for heat transfer but do not provide a cooling effect.” 69 Fed. Reg. 11,946, 11,957 (March 12, 2004). EPA characterized its aim in so defining the term to “[address] the ODSs and substitutes covered by the technical and common definitions of refrigerant.” *Id.* at 11,958. Thus, under EPA's definition, EPA expressly intended to distinguish and exclude from the definition of “refrigerant” for purposes of Section 608 a substance that is heat transfer agent but *does not* provide a cooling effect. F-HTFs as used in chillers and heat exchangers in semiconductor manufacturing function to transfer heat away from the silicon wafer and control temperature, but they do not independently provide a cooling effect, as they do not reduce temperature below ambient. The function of the F-HTF is thus temperature control and heat transfer, not cooling in the manner refrigerants commonly achieve.

Second, the proposed regulations apply to substances that serve as a “substitute” for a class I or II ODS, and the semiconductor industry’s use of F-HTF’s are not a substitute for ozone depleting substances. F-HTFs have not replaced ODSs either immediately in this specific use, or as a replacement for another substitute for an ODS. Prior to use of F-HTFs in their current application in semiconductor manufacturing, the industry used water or deionized water-glycol mixtures, neither of which are class I or II ODSs, to control the temperature of the silicon wafers.

SIA recommends clarifying the refrigerant definition:

Refrigerant, for purposes of this subpart, means any gaseous substance, including blends and mixtures, consisting in part of or whole of a regulated substance or a substitute for a regulated substance that is used in a heat cycle, and reversibly undergoes a phase change from a gas to a liquid, to provide a cooling effect.

B. Fire suppression equipment

§84.102, as proposed, defines fire suppression equipment as:

“Fire suppression equipment means any device that is connected to or associated with a regulated substance or substitute for a regulated substance, including blends and mixtures, consisting in part or whole of a regulated substance or a substitute for a regulated substance, and that is used for fire suppression purposes. [...]”

SIA recommends revising the definition to explicitly exclude individual fire extinguishers from the definition of fire suppression equipment.

3. Implementation date of recycled substances for fire suppression equipment

§ 84.110 (c) states that as of January 1, 2025, recycled regulated substances under this rule must be used for the initial installation of new fire suppression equipment and for the servicing and/or repair of existing fire suppression equipment in the U.S.

SIA requests that EPA extend the date of implementation to January 1, 2027 to allow proper time for fire suppression equipment manufacturers to assess any safety concerns or unexpected impacts of transitioning to recycled substances and development of the reclaimed HFC supply.

4. Proposed use of reclaimed refrigerant for the initial charge

U.S.-based semiconductor manufacturing is a high priority for the U.S. and over a dozen new and expanding facilities are currently under construction. Modern fabs require a large number of new tools, using approximately 700-1000 (or more) chillers per new fab. With enactment of the CHIPS and Science Act of 2022,² the U.S. government is investing heavily in incentivizing the growth of the domestic semiconductor manufacturing industry in order to strengthen national security, supply chain resilience, and the economy. The CHIPS Act will also ensure the U.S. can capture a significant share of the growing global semiconductor market, which is projected to exceed \$1 trillion by 2030.³

² Public Law 117-167. Available at: <https://www.congress.gov/bill/117th-congress/house-bill/4346>

³ McKinsey & Company, *The semiconductor decade: A trillion-dollar industry*. Available at: <https://www.mckinsey.com/industries/%20semiconductors/our-insights/the-semiconductor-decade-a-trillion-dollar-industry>

Constructing and equipping a new fab typically takes between 3-5 years and, in general, the process equipment specifications are determined early in the timeline. For the fabs currently planned for the coming years, device makers have thousands of process tools that are already specified. Facilities infrastructure is already designed – any design changes to meet the requirements could cause delay (e.g., the use of NH₃ as a refrigerant is associated with an American National Standards Institute/American Society of Heating, Refrigerating and Air-Conditioning Engineers Standard 34 safety classification rating of B2L, where B indicates a refrigerant for which there is evidence of toxicity at concentrations below 400 ppm per volume, and 2L indicates a refrigerant that is mildly flammable. This classification is associated with building and fire-code requirements that often necessitate the installation of NH₃- refrigerant chillers in a separate building with NH₃ monitoring and other controls, such as pressure relief valves and associated abatement.).

Recently issued AIM Act rules including the proposed management rule would require redesign and delay the construction and startup of these new semiconductor facilities – an impact not identified in the proposed rule or supporting documents on the docket. It is important that tools are installed on time if these facilities are to come online on schedule.

§84.112(e)(3), as proposed, requires that reclaimed refrigerant must be used for the initial charge for new refrigerant-containing equipment installed in the U.S. in industrial process refrigerators (IPR) as of January 1, 2028. SIA and its member companies are concerned that the lack of provisions which allow for the continued use of virgin regulated substances may interrupt the planned manufacturing industry growth in the United States because there does not exist a high-volume supply chain for reclaimed HFCs and other regulated substances that could be used for initial charges of new equipment. SIA is concerned about the expectation for a HFC reclaim market to be developed in time to meet the proposed implementation deadline and have the capability of supporting the high-volume manufacturing growth planned by the industry.

In addition, SIA sees a conflict between the expectation of developing a HFC reclaim market with the published requirements in the Technology Transitions rule for IPR to transition to new refrigerants with a lower global warming potential in the next few years. The IPR semiconductor manufacturing equipment which meet the requirements published in the Technology Transitions rule have not been developed including selection of refrigerants which can meet the rigorous manufacturing performance requirements. Until new refrigerants are selected and put into service, the development of a reclaim refrigerant supply chain will be delayed.

SIA also is concerned that there will be no incentive to develop a reclaim market for refrigerants currently in use to support any transition period because there are no exemptions for reclaimed refrigerants within the Technology Transitions rule to allow for their continued use in IPR equipment. The rule as proposed is not conducive to a viable reclaim market as EPA envisions in “Updated HFC Reclamation Market Report” (EPA-HQ-OAR-2022-0606-0021). More importantly, on p. 28 – EPA specifically says, “As modeled, the anticipated demand for HFCs in the cold storage warehouse and IPR subsectors is essentially zero. In the model, EPA anticipates that these subsectors will have likely transitioned out of using HFCs and will primarily be using other refrigerants, such as ammonia. Nonetheless, EPA is proposing to include these subsectors in the case where HFCs may be used in the initial charge of equipment.”

This provides evidence that EPA did not consider small chillers and especially small chillers used in semiconductor manufacturing in their impact assessment with the statement that all IPR equipment could be transitioned to other non HFCs by 2028. The industry forecasts needing ~700-1000+ new small chillers per new fab. The use of ammonia is not feasible in this application for process and worker safety reasons.

The final Technology Transitions rule extended the compliance date for the sales prohibition on factory-completed products to three years after the manufacture and import compliance date. This extension will delay widespread implementation of low GWP refrigerants and hence delay development of a reclaim market for these materials.

SIA requests that EPA provide an exemption for chillers directly installed as a part of semiconductor manufacturing equipment. Moreover, the rule should include provisions for use of virgin material for a period of at least three years after the Technology Transitions rule prohibition goes into effect to ensure an appropriate implementation timeline and time for a reclaim market for refrigerant to be created.

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SIA appreciates the opportunity to comment on this proposal and we look forward to continuing to work with EPA in the development and implementation of these rules.