

**Comments of the Semiconductor Industry Association (SIA) On the Notice of Proposed Rulemaking:
 “Phasedown of Hydrofluorocarbons: Allowance Allocation Methodology for 2024 and Later Years”
 (87 FR 66372, November 3, 2022) [EPA–HQ–OAR–2022–0430]**

Submitted December 19, 2022

The Semiconductor Industry Association (SIA) appreciates the opportunity to submit the following comments on the Notice of Proposed Rulemaking “Phasedown of Hydrofluorocarbons: Allowance Allocation Methodology for 2024 and Later Years” (87 Fed. Reg. 66372 (November 3, 2022)). SIA previously provided comments on July 2, 2021 to the initial Notice of Proposed Rulemaking on the “Phasedown of Hydrofluorocarbons: Establishing the Allowance Allocation and Trading Program Under the American Innovation and Manufacturing Act.” SIA is the trade association representing leading U.S. companies engaged in the design and manufacture of semiconductors. The U.S. is the global leader in the semiconductor industry, and continued U.S. leadership in semiconductor technology is essential to America’s economic growth, technology leadership, and national security. More information about SIA and the semiconductor industry is available at www.semiconductors.org.

Section I of these comments provide background on industry growth projections that should inform EPA’s approach to allocations in future years. Section II covers SIA’s comments on the current proposal. Many of the concerns voiced in SIA’s comments from last year remain unaddressed in the proposed updates to the phasedown allowance allocation methodology for 2024 and later years and are therefore included as part of Section III of this document.

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I. SEMICONDUCTOR GROWTH PROJECTIONS

As discussed in SIA's comments in July 2021, the semiconductor industry is expected to experience significant growth both globally, and in the U.S., and increased manufacturing capacity will be needed to meet this increased market demand. Given these trends, EPA should take into account this projected growth – and the likely increase in the use of inputs such as HFCs – to meet the requirement of the AIM Act to provide “the full allocation of allowances necessary” for the use of HFCs in semiconductor manufacturing.

Due to factors such as increased digitalization of the economy, the shift to electric vehicles and automations driving, and the movement to connected and smarter everything (cities, roads, appliances, etc.), demand for semiconductors is projected to increase in coming years. According to estimates from McKinsey, the industry is expected to almost double in revenues, from \$590 billion in 2021 to over \$1 trillion in 2030, a compound annual growth rate of 6 percent.¹

The U.S. is expected to attract a significant portion of the future growth in semiconductor manufacturing. In 2022, Congress enacted the CHIPS and Science Act (P.L. 117-167) that includes \$52 billion in incentives for semiconductor manufacturing and investments in semiconductor research. From the time the CHIPS Act was introduced in the Spring of 2020 through the months following its enactment, the industry has announced **over 40 new projects in 16 states, with \$200 billion in investments by chipmakers, equipment makers, and materials suppliers, resulting in the creation of 40,000 direct jobs.** Tables 1 & 2 summarizes the announcements to date.

As the U.S. is poised the increase semiconductor manufacturing, the use of HFCs is likely to increase due to advances in manufacturing processes. Because of the increasing complexity of semiconductor devices, with billions of transistors imprinted on a surface of a square centimeter, fabrication of these advanced devices requires an increasing number of mask layers per wafer and a resulting increase in the process steps that require F-GHG. This trend will likely continue in the future. As a result, we anticipate this increasing manufacturing process complexity will necessitate an increase in the use of industrial gases such as HFCs. As stated in our 2021 comments, HFC use by SIA member companies in 2020 was 2 times 2019 levels.²

Although the use of HFCs in semiconductor manufacturing applications is critical to the industry and downstream manufacturing in the United States, HFC usage and emissions from semiconductor manufacturing is extremely small. The U.S. semiconductor industry, in conjunction with international partners, has a long history of leading greenhouse gas emissions reductions through industry established best practices.³ Based on 2019 data, SIA company HFC emissions represent only 0.13% (weighted by CO₂e) of all U.S. HFC emissions attributed to industrial processes and product use (including those due to ODS substitutions), and the entire electronic sector's HFC emissions, of which semiconductors is a subset, were only 0.17% (i.e., 0.3 MMTCO₂e vs. 174.6 MMTCO₂e) of all U.S. HFC emissions (including those due to ODS substitutions).⁴

SIA calls on EPA to set allocations that take into account the projected growth of semiconductor manufacturing in the U.S. along with the increasing manufacturing complexity and accompanying usage of HFCs and other F-GHGs, rather than relying solely on historical trends. The goal of the

¹ McKinsey & Company. [The semiconductor decade: a trillion-dollar industry](#). April 1, 2022

² SIA PFC survey.

³ Source: World Semiconductor Council *Best Practice Guidance of PFC Emission Reduction. Final_WSC_Best_Practice_Guidance_26_Sept_2012.pdf* ([semiconductorcouncil.org](#))

⁴ Sources: Source: *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2019, Chapter 4.* <https://www.epa.gov/sites/production/files/2021-04/documents/us-ghg-inventory-2021-chapter-4-industrial-processes-and-product-use.pdf>; EPA FLIGHT data; SIA data.

CHIPS Act is to increase U.S. production of semiconductors and enhance the economy and strengthen national security by building a resilient semiconductor ecosystem in the U.S., and the goals of the AIM Act can be achieved only by considering these growth trends and assure the semiconductor industry has “the full allocation of allowances [of HFCs] necessary” to meet its needs.

Table 1: Semiconductor manufacturing investments in the next 10 years (projects announced from May 2020-December 2022)

State	Company Name	City/ County	Investment	Investment Type	Employment (Direct)	Source
Arizona	Intel	Chandler (2 fabs)	\$20 billion	New	3000 (2 fabs)	Link
	TSMC	Phoenix	\$40 billion	New	4500 (2 fabs)	Link
California	Western Digital	Fremont/ San Jose	\$350 million	Expansion	240	
Florida	SkyWater	Osceola County	\$36.5 million	Expansion	220	Link
Idaho	Micron	Boise	\$15 billion (through 2030)	New	2000	Link
Indiana	SkyWater	West Lafayette	\$1.8 billion	New	750	Link
	NHanced	Odon	\$236 million	New	413	Link
	Everspin Technologies	Odon	Unknown	New	35	Link
	Trusted Semiconductor Solutions	Odon	\$34 million	New	40	Link
Kansas	Radiation Detection Technologies	Manhattan	\$4 million	Expansion	30	Link
New Mexico	Intel	Rio Rancho	\$3.5 billion	Expansion	700	Link
New York	Micron*	Clay	\$20 billion (up to \$100 billion over 20 years)	New	9000 (4 fabs)	Link
	Global Foundries	Malta	\$1 billion	Expansion	1000	Link
North Carolina	Wolfspeed	Chatham County	\$5 billion (over 10 years)	New	1800	Link

State	Company Name	City/ County	Investment	Investment Type	Employment (Direct)	Source
Ohio	Intel*	New Albany (2 fabs)	\$20 billion (up to \$100 billion over 10 years)	New	3000 (2 fabs)	Link
	Analog Devices	Beaverton	\$1 billion	Expansion	280	
Oregon	Rogue Valley Microdevices	Medford	\$44 million	New	Unknown	Gartner Fab Database
	Samsung	Taylor	\$17 billion	New	2000	Link
Texas	Texas Instruments	Sherman (4 fabs)	\$30 billion (through 2030)	New	3000 (for 4 fabs)	Link
	Texas Instruments	Richardson	\$6 billion	Expansion	800	Link
	NXP	Austin/TBD	\$2.6 billion	Expansion	800	Link
Utah	Texas Instruments	Lehi	\$3 billion	Expansion	1100	Link
TOTAL			\$186.6 billion (up to \$345.6 billion)		34,708 jobs	

Source: SIA Analysis.

Note*: Micron announced total investments of up to \$100 billion over a time frame beyond 10 years, however this table only reflects investments made over the next decade.

Table 2: Semiconductor supplier investments in the next 10 years (projects announced from May 2020-December 2022)

State	Company Name	City/ County	Investment	Material	Investment Type	Employment (Direct)	Source
Arizona	Linde	Phoenix	\$600 million	Gas	New	Unknown	Link
	Sunlit Chemical	Phoenix	\$100 million	Chemical	New	Unknown	Link
	Air Liquide	Phoenix	\$60 million	Gas	New	Unknown	Link
	Kanto/ Chemtrade Joint Venture	Casa Grande	\$175-250 million	Chemical	New	65	Link
	Chang Chun Group	Casa Grande	\$400 million	Chemical	New	209	Link

State	Company Name	City/ County	Investment	Material	Investment Type	Employment (Direct)	Source
	LCY Chemical	Casa Grande	\$100 million	Chemical	New	57	Link
	Solvay	Casa Grande	\$60 million	Chemical	New	30	Link
	Fujifilm Electronic Materials	Mesa	\$88 million	Chemical	Expansion/ R&D lab	120	Link
	JX Nippon Mining & Metal	Mesa	Unknown	Metals	New	100	Link
	EMD Electronics	Chandler	\$28 million	Equipment	New	Unknown	Link
	Edwards Vacuum	Chandler	Unknown	Vacuum	New	200	Link
	Yield Engineering Systems	Chandler	Unknown	Equipment	New	100	Link
Connecticut	ASML	Wilton	\$200 million	Equipment	Expansion	1000	Link
Georgia	Absolics	Covington	\$600 million	Substrates	New	400	Link
Michigan	Hemlock Semiconductor	Thomas Township	\$375 million	Materials	Expansion	170	Link
	SK Siltron CSS	Bay City	\$300 million	Wafers	Expansion	150	Link
New York	Edwards Vacuum	Genesee County	\$319 million	Vacuum	New	600	Link
	Corning	Monroe County	\$139 million	Substrates	Expansion	270	Link
Oregon	Mitsubishi Gas Chemicals	TBD	\$372 million	Chemicals	Expansion/ New Facility	Unknown	Link
Texas	Global Wafers	Sherman	\$5 billion	Wafers	New	1500	Link
TOTAL			\$9 billion			5,100 jobs	

Source: SIA Analysis.

II. COMMENTS ON NOVEMBER 3, 2022 PROPOSED RULEMAKING AMENDMENTS

A. Application-specific allowances

EPA’s proposal states “the existing application-specific allowance allocation methodology codified at 40 CFR 84.13 will continue to apply as finalized in the Framework Rule.” As discussed in section I and in our prior comments, the semiconductor industry is growing at a rate in which the existing rule language does not support continued growth and the inclusion of new companies within the US semiconductor industry (see Tables 1 & 2). EPA must reevaluate the application-specific allowance rule language to support continued growth and investments in the semiconductor industry.

B. Regulatory Timeframe

The proposed language “establish[es] a methodology for issuing [HFC] production and consumption allowances for calendar years 2024 through 2028.” A 4-year regulatory framework does not support strategic fab construction or semiconductor technology roadmap planning. Semiconductor technologies require at least 10 years from fundamental research to high volume manufacturing to innovate and implement new technologies and their associated raw materials. Semiconductor fabs cost \$1 to \$20 billion dollars (and some projects have multiple fabs and phases of construction) and require many years to plan, build, and equip with specialized manufacturing tools, followed by a number of years to ramp high volume manufacturing. A 4-year regulatory framework for critical semiconductor chemicals increases risk to manufacturing in the U.S. With the anticipated growth of the semiconductor industry as referenced above in Tables 1 & 2, the semiconductor industry requires continued availability of application-specific allowances through the entirety of the HFC phasedown rule (2035) and possibly beyond.

C. Baseline year calculation

Although EPA is proposing to continue to use the 2011 through 2019 data to set baseline allocation values, EPA requests comment on “whether to expand the range of years to use to develop each allowance holder’s high three-year average to include 2020 and 2021.” As noted above, 2020 HFC use by SIA members was 2.08 times 2019 levels.

SIA supports the inclusion of 2020 and 2021 data within the baseline calculation due to the industry’s increasing growth and device complexity.

As shown in Tables 1 & 2, in conjunction with the CHIPS and Science Act and increases in the demand for semiconductors, there are estimated to be 22 new or expanded fab facilities (as well as supplier facilities) over the next decade. The proposed baseline timeframe does not include this industry growth. The semiconductor industry requires allocations to accommodate this growth.

D. Set Aside Pool

Although “the number of consumption allowance holders doubled from the initial allocation” and “EPA does not view further allocations for a set-aside pool and/or allowances for entities who have not previously produced and imported HFCs as supporting the AIM Act’s objectives,” SIA believes that updated consumption and production allowances are still unlikely to be sufficient. The semiconductor industry is estimated to grow as much as three times between 2020 and 2030. The full HFC supply chain, now and in the future, is not reflected within the current production and consumption allowances.

As suggested in SIA’s previous comments in July 2021, SIA suggests EPA create an entirely separate and additional pool of allowances that would be available to accommodate growth in the semiconductor sector (see Tables 1 & 2) that is not otherwise addressed in the initial allocation or in subsequent allocation rounds. EPA should consider an allocation system that creates a separate and additional set-aside safety margin pool for use by the semiconductor sector. A pool that reserves, for example, 3 times the 2020 baseline data attributed to semiconductor uses would be appropriate to reflect the need for future growth, including amounts that might be needed by new market entrants after both initial allowance allocation periods are closed, and the concern that baseline data does not capture all of the technology needs for the sector.

In addition to the existing application-specific allowance holders identified within the semiconductor industry, projects associated with new market entrants are anticipated over the next decade (see Tables 1 & 2). SIA suggests a mechanism to enable new semiconductor companies manufacturing in the U.S.

E. Sampling and testing

In addition to the sampling proposed for any “person producing, importing, reclaiming, recycling for fire suppression, or repackaging regulated substances”..., EPA also “seeks comment on whether to extend the testing and sampling requirements to additional entities, including other that sell or distribute regulated substances, or that offer them for sale and distribution as well as those that transform, use as a process agent, destroy, or receive application-specific allowances...” The scope of the proposed sampling and testing includes “...samples of single component regulated substance shall be quantitatively analyzed for the component on the label, air and other non-condensable compounds, impurities (both volatile impurities and halogenated unsaturated volatile impurities), and high boiling residue.”

Requiring semiconductor device manufacturers to sample the gas would be redundant and could risk gas contamination, which would be harmful to the process and specialized manufacturing equipment. Device manufacturers have strict quality requirements and already require suppliers to provide certificates of analysis and purity guarantees when gases are delivered to the manufacturing locations (for example: chemical identity, purity, and particle counts). Commercially synthesized HFCs are specified to 95%-97% purity levels (30,000-50,000 ppm of impurities). Purifiers and refiners in our supply chain then purify those HFC to meet the high purity requirements of end device manufacturers, converting 95% pure raw materials into 99.999% or greater purity materials. Any issues with a gas would affect device yield and process uniformity in the manufacturing process. Device manufacturers do not currently perform gas purity checks on site and this additional step should not be required. Additionally, special equipment is required for high purity gas analysis, which is typically only available from gas suppliers.

F. Compliance data submittal extensions

Per 40 CFR Part 84.31 (h), EPA will not consider any data unless submitted through e-GGRT and submitted by the due date. SIA requests EPA to specify that if the reporting deadline falls on a Saturday or Sunday, EPA will accept forms submitted on the following Monday. This language is consistent with other EPA programs.

40 CFR Part 98, Greenhouse Gas Mandatory Reporting Rule: “Unless otherwise stated, if the final day of any time period falls on a weekend or a federal holiday, the time period shall be extended to the next business day.”

Additionally, SIA requests EPA provide a mechanism to submit updated or amended reports after the submission date. This language is consistent with other EPA programs.

40 CFR Part 98, Greenhouse Gas Mandatory Reporting Rule: “The owner or operator shall submit a revised annual GHG report within 45 days of discovering that an annual GHG report that the owner or operator previously submitted contains one or more substantive errors. The revised report must correct all substantive errors.”

III. SIA PREVIOUSLY SUBMITTED AND UNADDRESSED COMMENTS FROM JULY 2, 2021

Full text of previously submitted SIA comments posted July 5, 2021 can be found in the Federal Register docket for 86 Fed. Reg. 27,150, May 19, 2021 at <https://www.regulations.gov/comment/EPA-HQ-OAR-2021-0044-0107>. The following is a synopsis of these previous comments.

A. Third party auditing

Language updated: EPA’s final rule extends third-party auditing requirements to anyone “receiving” production allowances, consumption allowances, or application-specific allowances.⁵ The AIM Act ultimately regulates two things: the production and import of HFCs. Accordingly, SIA continues to believe these extensive and costly auditing requirements should only apply to the conduct that Congress was actually concerned about restricting, rather than to the industries like semiconductor manufacturers that Congress wanted to alleviate of any restrictive phasedown effects.

As the third-party auditing requirement is maintained in the final rule (even for application-specific allowance holders), EPA should eliminate the requirement that the audit be conducted by certified public accountants (CPA). CPAs do not have the relevant auditing expertise to evaluate the validity of reports of this nature. Requiring a CPA audit will needlessly complicate, increase the costs of any third-party auditing requirement, and the number of CPA’s with required expertise may not be sufficient to meet this requirement.

B. Calculating Application-Specific Allowances

It is unreasonable to determine “the full quantity of allowances necessary” for the semiconductor industry based solely on an historical linear growth rate. Recent federal reports, orders, and legislation emphasize the importance and inevitable growth of the semiconductor industry (See Tables 1 & 2). The use of HFCs is anticipated to increase due to increased demands for HFCs for advances in manufacturing technologies. Adoption of new

⁵ 40 C.F.R. § 84.33(a).

manufacturing technologies in existing facilities, new tool installations and new fab startup require additional HFC allocations.

Recommendation: EPA should adopt a sector-specific methodology for fast-growing sectors, like semiconductors, for the initial allocation, and should provide a fallback allocation pool for semiconductor specific allocations to cover underallocations and new mid-year entrants in our sector. (See Section I of the comments above)

C. Appeals of Improper Allocation

In some cases, a company may believe that EPA has erred in its calculations, or otherwise disagree with EPA's decision regarding whether certain uses of HFCs fall within the mandatory allocation categories. The final rule does not provide a process for challenging or appealing allocations. For the benefit of allowance-holders, and EPA itself, the Agency should create a process documenting any unique decision-making regarding a company's allocation so that the agency has an administrative record to support the allocation upon judicial review. EPA must establish an efficient process for companies to quickly challenge (and the Agency to reconsider) any allocation.

D. Transfer of allowances

While the final rule maintains a five percent offset for the transfer of allowances, SIA opposes such offset for application-specific allowances as it detracts from the goal of providing full industry allocations. An offset for application-specific allowances would result in a net loss of allowances to this critical sector, contrary to the clear congressional intent to immunize this sector from the earliest effects of the phasedown.

E. Alternative Allowance Allocation System for Semiconductor Manufacturing

As emphasized throughout these comments and in our prior comments, SIA encourages EPA to establish a distinct allowance allocation system for semiconductor production. Such an approach would be justified, taking into account (1) the critical nature of the semiconductor manufacturing sector to the U.S. supply chain, (2) the uniquely dynamic and high-growth nature of the sector, (3) the extremely small proportional contribution of HFC emissions from the sector, (4) the unique nature of the semiconductor uses of HFCs, a substantial proportion of which are fully consumed and transformed when they are ionized in plasmas (in contrast to more dispersive uses in refrigerants and propellants); and (5) our concerns about the availability of sufficient HFC allowances under the rule as proposed. EPA's proposed rule establishes allocations based on past needs, not projected trends, and will therefore be unlikely to provide a "full allocation" for the semiconductor industry as required by the AIM Act. SIA urges EPA to revise its allocation system consistent with the recommendations in these comments and our prior comments.