SEMICONDUCTOR INDUSTRY ASSOCIATION

Comments of the
Semiconductor Industry Association (SIA)
To the
General Services Administration
On the
Notice of Inquiry Regarding PFAS in Products (89 FR 26887)
Notice-MVAC 2024-01, Docket No. 2024-0002, Sequence No 16
June 16, 2024

The Semiconductor Industry Association (SIA)[1] appreciates the opportunity to submit these comments to the General Services Administration (GSA) in response to its request for information (RFI) regarding PFAS in products.[2] SIA supports the goal of the federal government reducing procurement of products containing PFAS, but for the reasons set forth below, we believe semiconductor products should not be subject to any procurement limitation resulting from this RFI, nor should products with semiconductor components solely on the basis that it contains a semiconductor as its enabling technology.

Under the auspices of SIA, the Semiconductor PFAS Consortium has published technical papers documenting the industry's use of PFAS in various applications, including information regarding the unique functional properties of particular PFAS in our manufacturing processes, the absence of non-PFAS alternatives in meeting performance requirements, and the technical obstacles and long lead times needed to identify and adopt potential substitute chemicals (typically 5-25 or more years). Each of these technical papers are available for download at https://www.semiconductors.org/pfas/, and we incorporate these papers into these comments by reference.[3] These papers provide the technical basis for our comments urging GSA to consider accommodations for the semiconductor manufacturing industry and its value chain as part of any future rulemaking.

As noted in the RFI, the GSA Acquisition Policy Federal Advisory Committee (GAP FAC) recommended that GSA reduce PFAS through government procurement, specifically considering product categories that have already been identified by other state and federal programs: furniture, carpets, rugs, curtains, cookware, food service ware, food packaging materials, cutlery, dishware, paints, cleaning products, stain and water-resistant treatments, flooring, and floor care products

SIA recommends to GSA that semiconductor products should not be subject to any such procurement limitation, nor should products with semiconductor components solely on the basis that it contains a semiconductor as its enabling technology. As documented in the papers published by the Semiconductor PFAS Consortium, given current industry practices and process technologies, it is not technically feasible to manufacture semiconductors without the use of PFAS. Semiconductors are present in countless products critical to the U.S. government

[1] 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. Semiconductors – the tiny chips that enable modern technologies – power incredible products and services that have transformed our lives and our economy. The semiconductor industry directly employs over a quarter of a million workers in the United States, and U.S. semiconductor company sales totaled $264 billion in 2023. SIA represents 99 percent 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. Additional information is available at www.semiconductors.org.

[2] General Services Administration, "Notice of Inquiry Regarding PFAS in Products," April 16, 2024. Available at: https://www.federalregister.gov/documents/2024/04/16/2024-07927/notice-of-inquiry-regarding-pfas-in-products

[3] We are happy to provide a zip file of these documents, but they are unable to be attached to our submission on regulations.gov. Please contact agordon@semiconductors.org if the zip file is requested.

(IT equipment, telecommunications equipment, data centers, military systems, etc.), both through direct and indirect procurement. Unlike the GAP FAC-recommended categories above, there is limited potential risk of exposure from semiconductors because chemicals are not released from the finished product under normal conditions of use.

Additionally, federally funded microelectronics research activities likely involve the procurement of PFAS-containing products and materials for the use of semiconductor manufacturing in R&D labs and facilities. Likewise, materials science and engineering to develop new PFAS with unique or improved performance characteristics for semiconductor manufacturing are key to basic research activities in various U.S. government research activities. Innovation in PFAS is key to innovation in semiconductor technology. GSA should ensure research and development activities are not affected by any PFAS procurement reduction or prohibition effort.

The Department of Defense confirms in a recent report the importance of PFAS to semiconductor technology:

> Currently, no alternatives to PFAS have been identified that can provide the functional properties required for photolithography or some applications in semiconductor manufacturing equipment. Even if alternative chemicals and technologies were discovered today, due to the extremely complex qualification process throughout the value chain, it would take another 15 years to deploy them in high-volume manufacturing. Therefore, continued access to PFAS is a prerequisite for high-volume and advanced semiconductors. Lack of continued access to PFAS could lead to an inability to produce and supply semiconductor manufacturing technology.[4]

The Department of State likewise commented to the European Union:

> We agree with concerns raised so far during the consultation process about the current lack of technically and economically feasible alternatives for potential critical or essential uses, including those for national security, critical infrastructure, and those for use in certain applications for semiconductors, medical products and devices, and batteries.[5]

EPA Assistant Administrator Dr. Michal Freedhoff also testified before Congress:

> [W]e announced a framework for evaluating new PFAS and new uses of existing PFAS, to ensure they do not pose risks to people's health and the environment before new PFAS are approved for use. We recognize in this framework that PFAS can be used responsibly in many products and critical industries, like semiconductor manufacturing.[6]

We also offer the below comments on GSA's specific questions.

---

[4] U.S. Department of Defense, "Report on Critical Per- and Polyfluoroalkyl Substance Uses," August 2023. Available at: https://www.acq.osd.mil/eie/eer/ecc/pfas/docs/reports/Report-on-Critical-PFAS-Substance-Uses.pdf (pages 7-8).

[5] U.S. Department of State, "Comments on Per- and Polyfluoroalkyl Substances (PFAS), EU-ECHA Proposed PFAS Restrictions," September 25, 2023. Available at: https://echa.europa.eu/documents/10162/17233/rest_pfas_rcom_part123_en.docx/614c1aa2-3d5d-c127-f6e7-cc6ed3935ff2?t=1698664932555&download=true (Submission #9587)

[6] U.S. Senate Committee on Environment & Public Works, Hearing on Oversight of Toxic Substances Control Act Amendments Implementation, Written Testimony of Dr. Michael Freedhoff, January 24, 2024. Available at: https://www.epw.senate.gov/public/_cache/files/e/8/e8243202-117c-456d-952f-53bf141c839a/525CB57776C75592CCC48AEF442B4EFC.01-24-2024-freedhoff-testimony.pdf

III.1. Aside from a product's ecolabel, are there other ways to identify if a product contains PFAS?

With respect to the semiconductor industry, at this time, there is no public documentation regarding whether semiconductor products contain PFAS. Likewise, some semiconductor providers may not be able to certify whether or not their product contains PFAS due to a lack of visibility in the semiconductor manufacturing supply chain. An effort is underway in the Semiconductor PFAS Consortium to identify the type and quantity of any PFAS remaining in the final product, but this will likely be a multi-year effort before completion. In the meantime, in developing regulation on PFAS, GSA should recognize the challenges, complexity, and time needed to identify and quantify any PFAS in semiconductor products.

III.3. What should GSA consider in terms of defining if a product has reduced or eliminated PFAS?

Among other factors, GSA should consider supply chain complexity for given product, such as in the semiconductor industry, which has thousands of suppliers and hundreds of manufacturing process steps. Additionally, GSA should consider the availability of alternatives and the potential for regrettable substitutions. GSA should also recognize that the presence or use of PFAS does not connote risk or exposure, and different types of PFAS have different health and environmental risk profiles.

III.4. What product areas should GSA exclude at this time and why?

At this time, GSA should exclude semiconductor products and products used in government semiconductor manufacturing. Additionally, semiconductor components should not be the sole cause for semiconductor-containing products to be included within scope of any reduction or prohibition. Semiconductor products include packaged semiconductors and those integrated into electronic products and printed circuit boards.

For the vast majority of applications, no known alternatives for PFAS in semiconductor manufacturing currently exist. Therefore, it is unlikely that any semiconductor manufacturer would be able to successfully comply with any PFAS reduction or prohibition. It is pre-mature for GSA to include semiconductors within scope of any proposal.

Semiconductors form the foundation of the digital economy, enabling innovations that make the world smarter, greener, more efficient, and better connected. Critical uses of semiconductors in government procurement include those in defense and aerospace, healthcare and medical technology, infrastructure and transportation, communications, energy, agriculture, and more.

SIA urges GSA to focus its resources on those consumer-facing products identified by the GAP FAC and to exclude semiconductors, semiconductors as components, and materials used in government semiconductor manufacturing.[7]

[7] The Maine state legislature recently enacted LD 1537, which included an exemption, among several exemptions, from the state's PFAS restriction for "A semiconductor, including semiconductors incorporated in electronic equipment, and equipment and materials used in the manufacture of semiconductors." Available at: https://www.mainelegislature.org/legis/bills/getPDF.asp?paper=SP0610&item=3&snum=131.

III.5. Are there unintended impacts GSA should anticipate?

Inclusion of semiconductors and products containing semiconductors within the scope of the targets for GSA procurement could impact or disrupt U.S. government supply chains across a range of uses.

III.6. What is the potential impact on domestic manufacturing if GSA establishes PFAS reduction requirements that reduce or prohibit PFAS, or eliminate them entirely?

At the current time and given the current state of technology, any action to require reduced PFAS or a prohibition of PFAS in semiconductors would mean that the U.S. government would not be able to procure semiconductors or semiconductor-containing products.

III.7. What limitations exist for you to identify PFAS in the products that you offer?

The semiconductor industry is characterized by a complex, global supply chain, and in many cases, the type and concentration of PFAS in a substance is treated as confidential business information. Semiconductor manufacturers and their suppliers are working to improve supply chain visibility, but at the moment such limitation means that semiconductor providers are unable to determine complete information about the PFAS in their product.

III.10. How long should GSA give contractors to reduce PFAS?

Considering the lack of available alternatives, for the semiconductor industry, GSA should provide an indefinite extension until additional information becomes available.

III.11. What type of exception process should GSA consider?

SIA does not have a comment on the exception process, but does recommend that, as a starting point, GSA consider exceptions for those sectors on the Critical and Emerging Technologies List, which includes semiconductors and microelectronics.[8]

III.12. What information is readily available for you to determine if your products contain PFAS chemicals?

Semiconductor companies are in the process of working with their suppliers to identify the types and quantities of PFAS used in semiconductor manufacturing, as well as any PFAS remaining in the final packaged product.

III.12.a. If there is not information readily available, what type of tools would help you determine if PFAS is present (*e.g.,* supply chain mapping, specific ecolabels, etc.)

While supply chain mapping would be helpful, there are immense challenges regarding company confidential business information that would be difficult to overcome. Additionally, the complexity of the semiconductor manufacturing process makes it difficult in some cases to identify the different use pathways of various PFAS-containing substances.

[8] The White House National Science and Technology Council, "Critical and Emerging Technologies List Update," February 2024. Available at: https://www.whitehouse.gov/wp-content/uploads/2024/02/Critical-and-Emerging-Technologies-List-2024-Update.pdf

IV.1. What will the estimated costs be to either reduce or eliminate PFAS within your industry?

A report from the Ministry of Environment of Denmark which includes a socioeconomic analysis of the European REACH restriction summarizes:

> It is generally understood in the semiconductor manufacturing supply chain that any transition of a material, particularly one that may be present 'close to the process' (i.e., close to the wafer or the processing chemicals used on the wafer […]) can require test runs of 10s of thousands of wafers (both test wafers and real productions pieces) in order to establish with sufficient statistical certainty that the transition towards or away from a particular substance has no significant negative impact on production yields, and if it does, what alternate steps are effective in mitigating the impact. The costs of these requalification investigations should be understood as part of the reformulation costs and can easily extend into the hundreds of thousands of Euros. Impacts on semiconductor yield can be as high as millions of Euros per day, per factory.[9]

In addition, the research and development costs to invent and identify PFAS-free substances for each of the more than 100 applications of PFAS could result extraordinary costs over multiple decades. Additionally, the re-engineering of semiconductor manufacturing equipment and process steps, as well as possible equipment replacement, could result in costs exceeding hundreds of billions of dollars globally.

GSA should also be aware of two reports published by the Semiconductor PFAS Consortium which highlight the socioeconomic impacts of potential PFAS restrictions for the semiconductor industry.

- The Impact of a Potential PFAS Restriction on the Semiconductor Sector[10]
- The Socio-economic Impact of a Potential PFAS Restriction on the Semiconductor Value Chain in Europe[11]

IV. 4. To what extent is your industry already moving to better understand and reduce the presence of PFAS in products as a result of broader market forces or policies being considered or enacted by entities other than the federal government?

Both as individual companies and in collaborative venues, the semiconductor industry is investing substantial resources into understanding the use of PFAS and innovating to develop alternatives and manufacturing processes that reduce the use of PFAS. The semiconductor industry also seeks to minimize releases of PFAS to the environment.

+ + +

SIA appreciates the opportunity to submit these comments and looks forward to continuing to work with GSA in the development and implementation of any proposal. Please contact Alex Gordon at agordon@semiconductors.org with any questions.

---

[9] Ministry of Environment of Denmark, "PFAS and fluorine-free alternatives in lubricants and construction products," January 2024. Available at: https://www2.mst.dk/Udgiv/publications/2024/01/978-87-7038-527-5.pdf

[10] Available for download at: https://www.semiconductors.org/the-impact-of-a-potential-pfas-restriction-on-the-semiconductor-sector/

[11] Available for download at: https://www.semiconductors.org/the-socio-economic-impact-of-a-potential-pfas-restriction-on-the-semiconductor-value-chain-in-europe-2/