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November 10, 2022

Ms. Kerri Malinowski Farris
Maine Department of Environmental Protection
17 State House Station
Augusta, ME 04333-0017

By email to: PFASProducts@Maine.gov

Dear Ms. Malinowski Farris,

On behalf of SEMI – the industry association serving the global semiconductor design and manufacturing supply chain – we write regarding the "Second Concept Draft" of proposed regulations that details the notification requirements and sales prohibitions for products containing Intentionally Added PFAS under Maine's Act to Stop Perfluoroalkyl and Polyfluoroalkyl Substances Pollution, 38 M.R.S. §1614. As currently drafted, this legislation would require reporting on thousands of PFAS substances that are estimated to be present in millions of components used in semiconductor manufacturing equipment.

While we fully support a goal of limiting the release of harmful PFAS substances into the environment, we cannot conceive of how to comply with the regulation in its current draft.

In response to this "Second Concept Draft" and for the reasons detailed below;

I. We are requesting on behalf of our member companies that semiconductor manufacturing related products and product components be exempted from the reporting requirements.

II. As an alternative, we request that a waiver be granted to manufacturers of semiconductor manufacturing related products and product components regarding the following points of section 3.A.(1):

- (a)(i) Global Product Classification brick category and code; → many, if not most, semiconductor manufacturing related equipment and components do not have such a code.
- (b) The purpose for which PFAS are used in the product, including PFAS in any product component; → Particularly where PFAS is Hidden (see PIH, below) this information is not reasonably available.
- (c) The amount of each of the PFAS as a concentration… etc. → Particularly where PFAS is Hidden (see PIH, below) this information is not reasonably available.

Which leaves the following points un-waived:

- (a)(ii) Estimated sales volume in the State or nationally for the full calendar year following the year in which the product is being reported.
- (a)(ii) The general type of the product.
- (a)(iii) Its [the product's] intended use.

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- (d) The name and address of the reporting manufacturer, and the name, address, email address, and phone number of a responsible official for the manufacturer.

III. At a minimum, we request that a 6-month reporting extension be granted for semiconductor manufacturing related products and product components, although we have no reason to believe this is sufficient additional time.

A. PFAS Definition

It is quite likely product manufacturers (or their suppliers) who must respond to the Maine regulation will also have reporting or restriction obligations at the US federal level and in other regions such as the European Union. The PFAS definitions currently expected (and in play) in these regulatory arenas are not aligned and are technically different. A single supplier could get requests to supply "pfas information" based variously on all three definition styles. It is only the most skilled supplier (a very few number) that will have staff able to understand the difference among the three definition styles and organize their reporting to customers accordingly.

The narrowest definition of PFAS is the OECD definition[1]. The cited OECD document provides extensive rationale for their exclusion decisions. The OECD definition is most likely to be the basis for an EU PFAS definition[2]:

> "PFASs are defined as fluorinated substances that contain at least one fully fluorinated methyl or methylene carbon atom (without any H/Cl/Br/I atom attached to it)…"

The US Federal definition not only includes Cl, Br, or I atoms in the position of R, R', or R", but also it differs from the OECD's by requiring at least 2 Carbon atoms in the "PFAS unit". The US Federal definition is most likely to be used in the developing Federal PFAS reporting rule or other Federal PFAS legislation:

> *"Per- and polyfluoroalkyl substances or PFAS, for the purpose of this part, means any chemical substance or mixture that structurally contains the unit R-(CF2)-C(F)(R')R". Both the CF2 and CF moieties are saturated carbons. None of the R groups (R, R' or R") can be hydrogen."*

The US state definitions (including Maine's) seem to be aligning on a much broader definition that would include all the substances that are excluded by the OECD and Federal definitions. One of the challenges of the state definitions (including Maines) is that, if taken literally, could be read as describing just the single substance which has a carbon that is 'fully fluorinated'- carbon tetrafluoride (CF_4)

Further, we must underscore for the sake of clarity that all these definitions include fluoropolymers such as PTFE, PVDF and others.

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[1] Refer to https://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=ENV/CBC/MONO(2021)25&docLanguage=En

[2] The draft Annex XV report for a PFAS restriction on firefighting foams has "…any substance that contains at least one fully fluorinated methyl (CF3) or methylene (CF2) carbon atom (without any H/Cl/Br/I attached to it)."

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B. ESSENTIAL FOR HEALTH, SAFETY, OR THE FUNCTIONING OF SOCIETY

Semiconductors enable everything digital and shape our modern society. In fact, many of the policy priorities championed by policy makers, such as: the transition to electric vehicles; expansion of renewable energy and related complex grid control instrumentation; environmental sensors and monitoring networks; data collection, hosting, and analysis infrastructure; and new advances in medical innovation are dependent on a vibrant semiconductor industry. As a necessary component of semiconductors and other fundamental electronic components (e.g., resistors, capacitors, transistors, wiring, printed circuit boards) PFAS substances should be expected in essentially every electronic item manufactured in or imported into the state.

Based on SEMI industry investigations into the non-polymer PFAS substance PFOA and our review of the polymer PFAS substances such as PTFE which are fundamental to our equipment, we have a good awareness of the number of component types that would likely contain a PFAS substance. They include wires, capacitors, resistors, potentiometers, printed circuit boards, batteries, cables, controllers, displays & monitors, switches, tubing, polymer piping and related fittings, valves, gaskets, o-rings, integrated circuits, sensors, chassis, cabling, WiFi and Bluetooth enabled devices, electric motors, solar panels, LED lamps, paints, polymer chemical bottles and tubes – and, of course, any product that includes these items such as computers, industrial control systems, automobiles, servers, communications infrastructure elements, traffic control systems, smart devices, and cell phones. Further, PFAS substances are also essential for many of the process chemicals used in the production of semiconductor devices manufactured in the State of Maine.

C. US COMPETITIVENESS

As you are likely aware chip shortages resulting from manufacturing disruptions caused by the COVID-19 Pandemic continue to impact global supply chains for several key industries and have highlighted the United States' dependence on overseas suppliers of semiconductors and chips. Addressing these shortages has been one of the most bipartisan issues at the federal level with the Biden Administration and Congress working together to incentive the reshoring of semiconductor and chip manufacturing to the United States.

Unfortunately, as currently drafted, this legislation runs counter to the bipartisan effort to improve U.S. competitiveness in semiconductor and microchip development by adding costly and largely impracticable reporting requirements for PFAS in the semiconductor manufacturing process and in components of nearly all commercial and consumer electronic goods.

D. NO ALTERNATIVES

Unlike consumer goods, food packaging, apparel, carpets, and similar products that will be covered by this legislation, chip processing chemicals (including photosensitive chemicals) are essential to the production of semiconductors, and there are no known replacements for many of them, and chip manufacturing equipment components containing PFASs are so numerous and added by the decision of hundreds to thousands of suppliers far up the supply chain that truly change from week to week, there is no alternative to using most of the components given the timing foreseen in the current text. Even if

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an alternative component can be found, the engineering and administrative resources required to change one component for another can take hundreds of person-hours.

Given its very short timing and extremely broad scope, as currently drafted, this legislation would force a shutdown of the supply semiconductor manufacturing equipment, support products, and replacement parts to the state, and most likely scores of other complex 'business-to-business' sector equipment types, and possibly the migration to alternatives for which long term use studies are not yet available. Those alternatives could prove to be worse than the substances they replace.

E. REPORTING CHALLENGES

A representative piece of semiconductor manufacturing equipment can be composed of several thousand fundamental items (made or purchased), and most of those items are made of several to hundreds of 'components' as defined by the proposed legislation. A large percentage of these components are likely to be made entirely or partly from one or more PFAS fluoropolymers or are likely to contain a non-polymer PFAS processing residue. Even non-PFAS polymers such as linear low-density polyethylene (LLDPE), high-density polyethylene (HDPE), polypropylene (PP), copolymers of ethylene, propylene and hexadiene (EDPM) can contain fluoropolymer PFASs as extrusion processing aids.

The components used in semiconductor manufacturing equipment can be divided into 3 fundamental classes:

- **FFP** – Fabricated From PFAS – the equipment manufacturer controls the design of the component – particularly the materials and finishes used to make the component – and they have specified the component to be made (in whole or in part) from a PFAS substance. Examples include custom PTFE tanks and PVDF brackets.
- **SAP** – Selected As PFAS – the equipment manufacturer selected the component or assembly of components ('off the shelf') and it is overtly identified (i.e., by title or in primary catalogue selection information) as being made in whole or in part from a PFAS substance. Examples include PTFE insulated wire, a PVDF coated temperature sensor, and PFA tubing and fittings.
- **PIH** - PFAS Is Hidden - the equipment manufacturer selected the component or component assembly ('off the shelf') and it is **not** overtly identified as being made in whole or in part from PFAS but the manufacturer has come to know or strongly suspects (e.g., by supply chain inquiry or independent analysis) that it is made in whole or in part from a PFAS substance. Examples include: a potentiometer with a PTFE shim and PFOA surfactant in the potentiometer resistive ink; a power supply in a user-interface monitor contains a tantalum capacitor with a PTFE bead insulating one lead.

Many tiers of suppliers feed into the direct materials purchased by the industry, a vast majority of the component manufacturers in the supply chain are not direct suppliers, and a large portion are not based in the United States.

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While it is conceivable that FFP and SAP components could be identified by a dedicated analysis team with enough time, it is not yet conceivable of how PIH components could be identified, and all reporting data collected in any meaningful way. A key aspect of the PIH components is that they most like represent a majority of the components present in any piece of equipment (for semiconductor manufacturing or any other purpose) and their bills of material are not under the control of the equipment manufacturer. An upstream supplier that made the PFAS-add decision (such as what type and size of insulation bead to install in their tantalum capacitor) could decide to change the size or type of insulation bead from one week to the next with no obligation to inform the ultimate downstream integrator. A micro-management of the supply chain to facilitate such a communication would take dozens of years to develop, additional staff, and would exponentially increase the cost of related equipment.

As a very simplistic example of the reporting challenges, the components under consideration might not even have Global Product Classification Code or an accessible reason for why a PFAS was used in the component.

F. CONFIDENTIAL BUSINESS INFORMATION

The chemical mixtures used in chip production (chip processing chemicals) frequently contain PFAS substances and are strongly protected business confidential information. Even the disclosure of which substances are used in a mixture without further information about the quantity used can compromise the chemical producer's intellectual property. The draft does not appear to provide any protection for confidential business information made publicly accessible. Such disclosures may be in violation of Federal Law under Export Control and are contrary to EPA confidentiality provisions. The industry needs to more time to understand if the Confidential Business Information under the Uniform Trade Secrets Acts 10 M.R.S. 1452(4)(A)& (B) will be sufficient to protect the above-mentioned uses.

G. US FEDERAL / EUROPEAN LEGISLATION UNDERWAY

Lastly, it is important to note that SEMI and its member companies are currently engaged in discussions regarding PFAS regulatory efforts in the United States EPA and the European Union. Enacting additional regulatory and reporting requirements at the state level before federal and international standards are finalized will likely result in duplicative and/or contradictory standards which can lead to inadvertent non-compliance with reporting requirements, exacerbate the supply chain crisis, undermine efforts to reduce reliance on overseas manufacturing of semiconductors, and ultimately further fuel inflation and increase costs for consumers.

H. COMMENTS SPECIFIC TO THE 2nd CONCEPT DRAFT

1. Regarding the definition of “Commercially available analytical method”
    a. The definition provided essentially accepts any method that is offered by a laboratory, regardless of applicability, accuracy, and precision, and regardless of what sort of firm is offering the service.

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b. Considering the vast number of solid matrix polymer components that appear to be in scope of this regulation, it is important to note that there is no analytical method recognized at the federal level nor by any experienced standards development organization (SDO) for quantifying PFAS in a solid polymer matrix.

c. It seems entirely unreasonable that the State would accept any firms 'best guess' as a method.

d. The State should impose at least some discriminating criteria on the method (or accept that a commercially available analytical method does not actually exist). We recommend that the discriminating criteria for an analytical method should include aspects related to:

- The standing of the organization that developed the method (e.g., developed by the federal government or an SDO experienced in the development of such methods) with a view to limiting the acceptable organizations to those that provide a reasonable opportunity for peer and citizen review of the method.
- The precision of the method – particularly stating clearly what level may be considered "non-detectible".
- The media the method is designed for, paying particular attention to the fact that many potential PFAS containing components will be solid matrix polymers and other solid matrix materials, and that methods intended for blood, soil or water are wholly inappropriate for such matrix types, and focusing particularly on solid matrix sample preparation. Some of our members have experience with very well-known and reputable national labs simply putting cryogenically cooled solid-matrix samples in a blender for a while to 'particulate' them, with no accompanying analysis of how the achieved 'particulation' relates to an extrapolated PFAS concentration value given the increase in sample surface area.
- Allowing for the use of a statistically relevant representative sample to stand as the finding for a larger group.
- The accuracy of the result, particularly stating whether the center point or maximum extreme of the range must be taken as the reported value.

2. Regarding the definition of "Consumer"

a. It remains ambiguous if business-to-business transactions are considered to be in scope of "offering for sale". The common understanding of "consumer" (and indeed the understanding implied by, for example, information at the Maine Office of the AG on Consumer Protection – link) is, in effect, a householder.

b. The Maine Consumer Credit code limits consumers to "card holders or natural persons".

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c. The Maine Regulation of Transient Sales limits consumers to "any person who purchases or contracts for the purchase of merchandise for any purpose except resale in the ordinary course of trade or business."

d. The latter (point c) seems a reasonable definition for this reporting rule.

3. Regarding the definition of "Currently Unavoidable Use"

a. This definition remains fundamentally ambiguous because there is no specific meaning for "not reasonably available" – it does not address the important questions of not reasonable to whom and in consideration of what.

b. For example, in consideration of a PFAS-containing component with only a minor role in a product with a thousand components, and an alternative component that has all the necessary functional characteristics to replace it; It may seem quite feasible, and take only take a few dozen person-hours to design in the alternative part, which includes:

- Creating a buyer's specification for the alternative,
- structuring the alternative into the product's bill of materials,
- deciding the disposition of the unused original components in stock and staged on the assembly line,
- reworking products on the production floor,
- and rewriting any instructions that reference the component,

However, if that component is *critical* to the functioning of the product it might additionally take weeks or months of testing to determine: if the proposed alternative can be used and provide the same product reliability; and whether the product can be used with the same maintenance schedule.

Furthermore, if there are many PFAS containing components in the product to consider, even though each one on its own might be addressed with a few dozen person-hours, having to change 10 or 20 or 100 or 1000 components on the same timeline might be entirely unreasonable.

c. We would recommend that the determination of "reasonably available" should at least take into consideration all the components in all the products a given manufacturer aims to provide or has recently provided into the State, the technology of the product (i.e., is it's functioning more, or less, sensitive to characteristics of its components – which speaks not only to the challenge of finding alternatives, but also the skill set required of the related engineering/design staff needed to make the change),

4. Regarding the definition of "Essential for Health, Safety, or the Functioning of Society"

a. The definition only acknowledges first tier contributors to the goal, leaving products that enable those contributors with an ambiguous status, rather like stating housing is critical without acknowledging the importance of hand tools and power tools.

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b. Considering adding a line to the effect of "Products that are Essential for Health, Safety or the Functioning of Society include those that are required by Federal or State Laws and Regulations, and products which significantly enable the development or production of such products."

5. Regarding the definition of "Fully Fluorinated Carbon Atom"

   a. While the definition is aligned with 15 USC § 8931, the Federal proposal of a PFAS reporting rule (with similar purpose as the Maine proposal) has a definition of "Per- and polyfluoroalkyl substances or PFAS, for the purpose of this part, means any chemical substance or mixture that structurally contains the unit R-(CF2)-C(F)(R')R". Both the CF2 and CF moieties are saturated carbons. None of the R groups (R, R' or R") can be hydrogen." This definition is more aligned with the OECD definition (refer to https://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=ENV/CBC/MONO(2021)25&docLanguage=En).

   b. The OECD definition is most likely to become the norm for the global supply chain and it is preferred to avoid confusion – "PFASs are fluorinated substances that contain at least one fully fluorinated methyl or methylene carbon atom (without any H/Cl/Br/I atom attached to it)"

Finally, SEMI and its member companies are committed to working with you to protect the health and safety of all by narrowing the legislation to target the most relevant substances and products. SEMI is grateful for the opportunity to engage on this legislation and is available to meet at your convenience to further elaborate on these issues. Please include me in all your communication regarding the rulemaking process and implementation moving forward.

Thank you for your attention to these important concerns.

Sincerely,

James H. Amano

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