Responses of the
Semiconductor Industry Association (SIA)

Questions for the Record (QFR)
From the
Environment and the Economy Subcommittee
Of the
House Energy and Commerce Committee

Hearing on
"Regulation of New Chemicals, Protection of Confidential Business Information, and Innovation"
July 11, 2013

Response submitted August 13, 2013

The Semiconductor Industry Association (SIA) is pleased to provide this response to the Question for the Record posed by Chairman Shimkus in his letter of August 1, 2013. Each question is set forth below in bold text, followed by our response. We appreciate the opportunity to provide our views to the Committee.

Questions by Chairman Shimkus

Question 1. ***You spoke in your testimony of the importance to long-term investment decisions by your members.***

a. ***Can your members adjust to abrupt swings in the chemical marketplace? Please give examples.***

The semiconductor industry is characterized by rapid innovation and technological change, but the industry would find it difficult to adjust to sudden changes in the market when it comes to the availability and use of essential chemicals. As stated in our testimony, the industry utilizes specialty chemicals with unique chemical and physical properties that make possible the production of advanced semiconductors, and the industry employs advanced manufacturing tools that are designed to operate using these specific chemicals. As a result, there are typically no "drop-in" replacements for many of the chemicals currently in use in any given manufacturing process. For this reason, the industry depends on a stable supply of these essential chemicals. Furthermore, the manufacturing technology development process in our industry is usually quite long (10 or more years), and therefore changes in manufacturing process technology are very difficult to implement quickly.

The potential challenges with an abrupt change in the chemicals marketplace are illustrated by the industry's experience in responding to the European Union directive on the Restriction of Hazardous Substances in Electrical and Electronic Equipment (RoHS) and the proposed ban several years ago on perfluorooctane sulfonic acid (PFOS) and related precursors. In both instances, the transition to lead-free solders and the phase-out of PFOS were complex undertakings that took several years to implement. Both situations involved identifying and qualifying suitable substitutes, integrating new materials into manufacturing and assembly equipment, and evaluating product reliability. Both instances also resulted in the imposition of

high costs on the industry and required the granting of certain critical exemptions when substitutes were unavailable for specific applications.

The challenge of an abrupt change in the availability of a critical material for the semiconductor industry is further illustrated by the current situation concerning helium, a critical input into the semiconductor manufacturing process. Although this material is not a regulated chemical under TSCA, it nonetheless illustrates the difficulties inherent in sudden limitations on the availability of essential materials. Helium has certain unique physical and chemical properties have made it critical to a broad range of applications in the manufacture of semiconductors, and there is no known substitute for helium in many of these applications. There is currently a global shortage in the supply of helium, and this shortage may become more severe due to the impending cessation of sales of helium from the Federal Helium Reserve, a federal facility that provides 50 percent of domestic supplies and 30 percent of global supplies. Semiconductor companies and other industries that rely on helium are implementing a series of measures to address this shortage, including conservation and recycling efforts and the investigation of substitutes. But in the absence of legislation to authorize continued sales of helium from the Reserve the industry may face a significant disruption. The House has passed bipartisan legislation (H.R. 527) and a Senate committee has approved bipartisan legislation (S. 783), but it is essential that the Congress act promptly to authorize the Reserve to continue sales of helium to private users and avoid damage to critical sectors of the American economy.

b. Should appropriate replacements be available when a chemical is removed from commerce?

In the semiconductor industry, it is critical that the industry has access to appropriate substitutes to any chemical that might be removed from commerce. Several years ago EPA and other countries considered a ban on perfluorooctane sulfonic acid (PFOS) and related precursors, a set of chemicals previously used in the industry in numerous applications, including anti-reflective coatings, photoacid generators (an element of photoresists used in the critical photolithography patterning process), and as a surfactant. Because of the essential uses of PFOS at that time and the absence of available substitutes, an abrupt restriction on this chemical would have been highly disruptive to our industry and our continued ability to produce advanced semiconductors. Fortunately, the industry worked with EPA and others to obtain exemptions for critical uses of PFOS in our industry, with sufficient time to identify and adopt substitutes for this material. As a result, the global semiconductor industry has eliminated the use of this chemical in most applications and reduced 99 percent of emissions of this substance.

Of course, there may be instances where the exposure and risks to humans and the environment are so significant that regulatory bodies must act without replacements being available. But we believe such instances are likely to be rare and inapplicable to the highly controlled uses of chemicals in the semiconductor industry.

<u>Question 2.</u> Your testimony was careful to point out the importance of prioritizing and tailoring the regulatory look to expected uses of the chemical. Why do you consider the exposure part of the risk equation to be so essential?

Chemical risk is a function of hazard (toxicity) and exposure – if there is no exposure, there is no risk. SIA believes that the regulation of chemical substances should be prioritized to focus on chemicals with a high risk, i.e., when the hazard of a chemical and its exposure scenario(s) result in the potential for adverse impacts on human health and/or the environment. Sound

application of basic risk assessment principles necessitates that the chemical assessment process should be tailored to evaluate the specific conditions of use of a chemical.

Exposure scenarios will be different for each specific use of a chemical and the conditions of that use. A chemical may be likely to pose minimal risk for some intended conditions of use but not others. For example, a chemical used as an intermediate or in an enclosed industrial process (as is the case in most semiconductor manufacturing processes) would not be likely to present any risk of concern under such conditions, but the risk profile could be very different if the chemical were an ingredient in a consumer product or otherwise presented a likelihood of exposure.

The semiconductor manufacturing process is designed to minimize exposure to workers and to minimize releases to the environment. The process is highly controlled and performed to exacting standards, with significant and often redundant controls and safety measures, in order to ensure quality and consistency in the production process. The entire process is conducted in a tightly controlled clean room environment, where there are specific controls on temperature, humidity and air contamination, to achieve optimal production results.

The conditions of use of chemicals in the semiconductor industry are different from most other uses of chemicals, and the type or level of regulation of a chemical should take into account the high levels of controls – and resulting low levels of exposure – present in the semiconductor industry. While it might be appropriate to regulate the use of a chemical in some applications that lack the levels of control applicable to our industry, it would be inappropriate to subject the uses of that same chemical in the semiconductor industry to the same levels of control.

Appropriate consideration of uses also is critical for ensuring that the chemical management assessment process functions efficiently. We think that EPA should have clear authority to make decisions at each stage of the process about the appropriate scope of its inquiry and any resulting determinations and requirements. We hope that any legislation would allow and encourage the Agency to focus its attention (and available resources) on the uses and exposures that warrant most attention from a risk perspective.

Question 3. ***I noticed that you wanted to see more financial resources given to EPA for review of chemicals. Is this because you support more robust reviews or because the timeliness of EPA decision is crucial to your own ability to innovate?***

We believe that the Environmental Protection Agency (EPA) should have sufficient resources in order to conduct robust reviews and to do so in a prompt and timely manner. This is important to protect our ability to innovate, but we also think it is necessary for any chemical management system that aims to protect human health and the environmental.

The semiconductor industry is characterized by rapid innovation and technological change, and part of our ability to innovate is linked to the ability to use new chemicals and materials. "Time to market" is a critical factor in our industry, because products typically have short lifespans and processes are continually subject to improvement, and therefore, predictable and prompt review of chemicals is vital to our industry. Given the importance of an effective and efficient system for regulating chemicals to the semiconductor industry, SIA supports providing the EPA with sufficient resources for the review of chemicals. Providing EPA with sufficient resources to conduct appropriate reviews of chemicals will instill a greater level of confidence in the chemical review process among all stakeholders, and therefore provide greater certainty for the continuing use of chemicals that are critical to the semiconductor manufacturing process.

It is important that EPA conduct reviews of chemicals in a manner that includes an evaluation of the specific conditions of use of a chemical, such as in the semiconductor industry, not just the inherent hazards of a chemical. EPA needs sufficient resources to conduct assessments that are tailored to the exposure conditions associated with different uses.

Question 4. Could you please explain your views of TSCA treatment of articles and the use of existing TSCA authority to deal with any questions about them?

Finished semiconductor devices are considered to be "articles" for purposes of U.S. chemicals regulation. Semiconductors are packaged into modules that are then incorporated into larger products that may also be deemed to be "articles." In addition, the specialized manufacturing "tools" – the highly complex manufacturing equipment designed to work with specific chemicals in the manufacturing process that are critical to the success of the industry – are also classified as "articles." Thus, the treatment of articles under TSCA is very important to our industry.

EPA has exercised its TSCA authority as applied to articles in an appropriate manner. Under current regulations, articles generally are exempt from the import certification and export notification requirements of TSCA. While the import and export provisions of the original TSCA do not exclude them, EPA and Customs exempted articles from these provisions as part of the initial implementing regulations promulgated in the early 1980s. (In the case of the import certification obligation, EPA and Customs reserved their right to require import certification for articles on a case by case basis.) Because semiconductors are among the top export industries of the United States and are traded globally in a highly competitive market, maintaining the current import and export exemptions found in TSCA implementing regulations are particularly important to our industry.

The current ability to import and export without onerous notification and certification requirements makes sense as applied to semiconductors. Semiconductors may contain chemicals or materials subject to regulation under the TSCA, but these chemicals and materials are present in extremely small volumes (most semiconductors weigh no more than a few grams and are about 2 cm squared in size). Furthermore, these small volumes of chemicals are etched or otherwise formed into the layers and sections of the metals, organic-metallic complexes, organics and other materials in the semiconductor product, and these materials are bound to the device in a monolithic fashion that cannot be separated from the device or released to the environment without taking extreme and unusual destructive measures.

Thus, it is critical that articles continue to be exempt from the import certification or export notification requirements of TSCA, and that the new chemical review process continue to exclude chemicals that are imported as part of an article. EPA has the authority to regulate chemicals in articles, and it may be appropriate for EPA to exercise this authority under special circumstances where a significant health or environmental risk cannot be adequately addressed through direct regulation of chemical substances or mixtures.