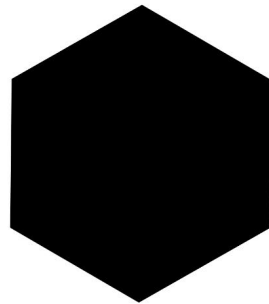
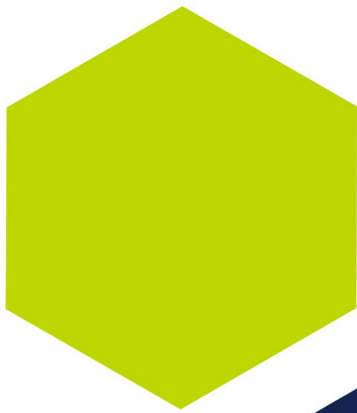




SEMI EUROPE RECOMMENDATIONS FOR THE REVISION OF REACH

The position of the semiconductor ecosystem



Executive Summary

SEMI Europe, a global industry association representing 3,000+ member companies and 300+ European companies from across the microelectronics manufacturing and design supply chain fully supports the European Commission's efforts to strengthen the REACH Regulation as a key tool to protect human health and the environment. The semiconductor industry plays a central role in delivering the technologies that enable Europe's green and digital transitions from energy efficiency to electrification and low-carbon innovation. Our sector is committed not only to meeting ambitious environmental standards, but also to providing the solutions that make these goals achievable. As such, SEMI Europe welcomes the Commission's focus on regulatory simplification and urges a revised REACH framework that recognises the unique characteristics, complexity, and societal value of high-technology manufacturing. This paper outlines key semiconductor industry concerns and proposes constructive recommendations to ensure the revised regulation supports both sustainability and technological resilience within the Union.

Introduction

In the context of the ongoing REACH revision, this paper offers the semiconductor sector's perspective on seven key regulatory areas that are particularly relevant to the complexity and innovation-driven nature of the industry. The aim is to provide constructive input that supports the EU's broader sustainability and industrial policy goals, while also ensuring regulatory frameworks remain proportionate and workable for high-tech manufacturing. The paper identifies key challenges and proposes recommendations in the following areas:

1. **Flexible Derogations**
2. **Restriction Process and Implementation**
3. **Polymer Registration**
4. **Substance Grouping**
5. **Essential Use**
6. **Chemical Substitution**
7. **Nanomaterials**

Each following section highlights specific regulatory considerations and outlines recommendations designed to support the development of a REACH Revision framework that safeguards health and the environment, while enabling Europe's technological leadership and resilience.



1. Flexible Derogations

Concern:

The semiconductor manufacturing process is one of the most complex and technically demanding in modern industry. It involves equipment and components that rely on highly specialised substances, often selected for their unique combination of functional properties. In many cases, no technically or economically feasible alternatives currently exist.

Semiconductor manufacturing-related equipment (SMRE) and semiconductor related industry typically has an operational lifespan exceeding 25 years. SMREs requires maintenance throughout its lifetime with compatible parts, many of which contain substances now under regulatory scrutiny. Due to the highly engineered and historical nature of any type of SMRE, redesign and requalification of such parts is frequently economical or technically impossible.

Furthermore, SMRE or integrated SMRE to perform specific process steps are part of deep, globally integrated supply chains with lead times exceeding 18 months. The gathering of precise substance data across these networks is a time-consuming task, and rapid regulatory changes can create substantial compliance risks and market disruptions. Applying uniform regulatory expectations and transition deadlines, akin to those in the consumer electronics sector, fails to account for these complexities and may undermine strategic initiatives such as the EU Chips Act and broader goals for technological resilience.

Recommendations:

- Provide longer derogation periods (e.g., 12.5 years) for replacement parts (e.g. service and maintenance parts) for existing products/equipment, and for components with no viable alternatives.
- Incorporate flexible and criteria-based derogations/restrictions and their renewals, modelled on the RoHS exemption renewal process where no viable alternative exists.
- Adapt consultation periods to accommodate information gathering from complex global supply chains.



2. Restriction Process and Implementation

Concern:

The current restriction process under REACH would benefit from greater clarity and forward visibility, particularly for downstream users managing complex supply chains. While instruments such as the Registry of Restriction Intentions (RRI), the Community Rolling Action Plan (CoRAP), and Risk Management Option Analysis (RMOAs) provide some indication of potential regulatory action, these tools often do not offer sufficient specificity or predictability in early stages to enable proactive industry preparation. Information gaps persist, particularly of substances of concern that are not yet flagged through mechanisms such as the RMOA, CoRAP, or SVHC listing. While the substance of Very High Concern (SVHC) pathway is part of the authorisation process, lack of cross-linkages and early alerts across regulatory instruments makes it difficult for downstream users to prepare effectively. For complex industrial equipment such as SMRE, identifying and qualifying alternatives to restricted substances is an inherently time- and resource-intensive process that requires early, actionable signals from regulators.

Recommendations:

- Provide early and clear roadmaps for substances targeted for restriction, for example including the in the SVHC.
- Base restriction decisions on a full risk assessment (rather than hazard), including use and exposure context.
- Prioritise restriction measures primarily on uses with highest exposure potential.

3. Polymer Registration

Concern:

The semiconductor industry utilises over 1,000 polymers. Many of these materials are proprietary, with compositions protected under confidentiality agreements and export controls under the Dual Use Regulation. Polymer Registration or notification would add administrative burdens while providing limited additional safety benefits, as risk data for monomers or reactants is already available. The obligation to register monomer substances, which are less numerous than polymers, makes information available not only



on the risks specific to those substances but also on those of monomers found as residues after polymerisation or in monomer form after the possible degradation of the polymer. Classification, Labelling and Packaging (CLP) regulation also provides for a mandatory classification of polymers and products containing polymers.

A notification or registration requirements for polymers would not be in line with the goal to reduce ambitiously reporting burdens as communicated in A Competitiveness Compass for the EU.

Recommendations:

- Avoid mandatory registration or notification for process polymers used in semiconductor manufacturing.
- Rely on existing monomer registration requirements for risk data.
- If the REACH revision includes polymer notification or registration, it should consider confidentiality, administrative burden, and a well-defined concept of polymer sameness.

4. Substance Grouping

Concern:

Grouping chemicals with similar hazard and risk profiles is a recognised regulatory practice that can support efforts to protect human health and the environment. However, recent applications such as the broad grouping approach taken under the proposed universal PFAS restriction have shown that overly extensive groupings can lead to unintended consequences. When substances are grouped without sufficient consideration of their distinct chemical, physical, toxicological, and environmental characteristics, the result is often disproportionate and scientifically unsound regulatory outcomes.

Particularly concerning is the grouping of substances based solely on their persistence in the environment. While persistence indicates that a substance remains stable over time, it does not in itself imply toxicity, mobility, or bio accumulative behaviour. In industrial applications such as semiconductor manufacturing, persistence is often a desirable property, contributing to product durability, performance reliability, and extended service life, especially in closed and highly controlled systems that prevent environmental or human exposure.



To ensure effective and credible regulatory outcomes, it is essential that grouping methodologies differentiate between substances based on their actual behaviour and impact. A more targeted approach, one that considers specific environmental and toxicological properties rather than chemical structure or single criteria such as persistence enables regulatory efforts to focus where the real risks lie, without undermining the safe use of critical substances in advanced technologies.

Recommendation:

Amend definition of grouping of substances in section 1.5 of Annex XI of REACH to provide that grouping should not just be based on structural similarity and likelihood of similar properties but also based on an evaluation of evidence related to the actual properties and behaviours of a substance, including physicochemical properties, bioavailability, bioaccumulation, stability at environmentally relevant temperatures, GHS toxicity/ecotoxicity hazard classification.

5. Essential Use

Concern:

The concept of ‘essential use’ presents a valuable opportunity to align Europe’s chemical regulatory framework with its broader sustainability and industrial policy objectives. For the semiconductor industry, it could serve as a pragmatic and science-based tool to ensure continued access to critical substances that are indispensable for innovation, reliability, and safety, particularly in cases where no technically or economically viable alternatives exist.

However, to fully realise this potential, there is an urgent need for clarity on how the concept will be implemented under the REACH framework. Key uncertainties remain, including whether the essential use assessment will form part of the restriction process and which authority or a dedicated body will be responsible for determining essentiality.

Moreover, the operational parameters of the concept must be clearly defined. This includes the criteria for assessing essentiality, the duration of essential use status, and the regulatory outcome such as whether it leads to a formal derogation or other risk management measure.

It is also important to note that the essential use concept should not be used as a substitute for robust risk assessments. Nor should it be applied indiscriminately to broad groups of substances based solely on hazard classifications or structural similarity.



Ensuring the concept is clearly defined and appropriately targeted will be critical to maintaining regulatory certainty and supporting science-based decision-making.

Recommendations:

- Provide early and transparent guidance on how the essential use concept will be integrated into the REACH framework, particularly in the context of the restriction and authorisation process.
- Clearly identify the responsible decision-making body for evaluating essential use cases, ensuring consistency and predictability across applications.
- Define robust, sector-relevant criteria for determining essentiality, taking into account technical feasibility, absence of alternatives, and the societal or strategic importance of the substance's use.
- Establish clear rules on the duration of essential use status—whether linked to the availability of alternatives or limited to fixed transition periods—and specify the regulatory outcomes (e.g. derogation or conditional use).
- Ensure that the essential use concept complements, rather than replaces, thorough risk assessments based on actual exposure and context of use.
- Avoid applying the essential use concept broadly to groups of substances defined only by hazard or structural characteristics.
- Apply the essential use framework transparently and case-by-case, allowing continued access to critical substances, particularly where no exposure risk exists and the use is confined to enclosed or highly controlled systems.

6. Chemical Substitution

Concern:

The upcoming REACH revision may introduce new requirements making the continued use of certain chemicals conditional upon the inclusion of substitution plans in restriction applications, with the stated aim of accelerating the development and adoption of safer alternatives. These proposed measures are part of a broader shift toward a more hazard-based framework for chemical regulation, particularly under the restriction pathway, as promoted by the Commission. The goal is to establish a clearer regulatory route for phasing out SVHCs that may come into contact with humans or the environment.



While the intent to encourage innovation in safer chemical alternatives is understood, this approach presents significant challenges when applied to high-technology sectors such as semiconductors. The performance and safety requirements in semiconductor manufacturing are uniquely stringent and highly specialised. Substitution is not a simple material swap it often involves multi-year R&D cycles, requalification of processes, and compliance with global standards. Mandating substitution planning without considering technical feasibility, functional equivalence, or the absence of viable alternatives risks disrupting production, destabilising global supply chains, and eroding Europe's technological competitiveness.

Additionally, the establishment of proposed Chemical Substitution Centre networks while potentially beneficial to some sectors, offers limited relevance to the semiconductor industry. These centres are expected to provide generalised support for substitution identification and implementation, but they are unlikely to address the deep process integration, proprietary technologies, or nanoscale performance standards that define chemical use in semiconductor fabrication. As such, without tailored mechanisms for complex industrial sectors, the substitution planning framework risks imposing requirements that are misaligned with the operational and innovation realities of the industry.

Although redesign, requalification, and safety testing for substitutes can take 10+ years, there is no guarantee that available alternatives to critical chemicals match the nanoscale level of performance and precision required in the fabrication of semiconductors. Investing in R&D for substitution does not guarantee the timely availability of economic feasibility or functionally equivalent alternatives. If legally mandated substitutions force the industry to adopt sub-optimal replacements, this could lead to significant disruptions, if not interruption, in semiconductors' production.

Critical chemicals used in close manufacturing systems (e.g., in semiconductor production process) may face authorisation or restriction under the revised REACH framework, despite posing zero exposure risk. This could occur due to the proposed shift toward a hazard-based approach, where the intrinsic properties of a substance outweigh actual exposure levels in regulatory decisions.

Recommendations:

- Preserve a risk-based approach that considers real-world exposure, not hazard alone. Regulatory action should reflect how substances are used, not only what they are.



- Design sector-specific frameworks for substitution, especially for industries with highly complex and safety-critical processes.
- Base authorisation and restriction decisions on the actual availability of functionally equivalent, economic feasible substitutes, not theoretical potential.
- Align regulatory timelines with technological realities, recognising that the development and qualification of substitutes may take 10+ years.

7. Nanomaterials

Concern:

Nanomaterials are indispensable to semiconductor manufacturing, enabling precision, performance, and miniaturisation in advanced technologies. Their use, however, also requires a regulatory approach that safeguards human health and the environment while remaining technically feasible and proportionate. Although important steps have been taken in recent years to address nanomaterials within the REACH framework, critical gaps remain.

In particular, substances exhibiting quantum effects, those whose nanoscale properties differ significantly from their bulk form, present challenges for current regulatory tools. Safety Data Sheets (SDS) often lack adequate detail to support nanomaterials-specific risk assessments in occupational settings. Moreover, standard testing requirements may not sufficiently account for the unique physicochemical behaviour of nanomaterials, calling into question the suitability of existing methodologies.

The recent revision of the EU definition of nanomaterials provides a timely opportunity to ensure regulatory alignment. As part of the broader REACH revision, this updated definition can and should be fully and legally integrated into the regulation to support a coherent and enforceable framework.

Recommendations:

- Integrate the revised EU definition of nanomaterials into the REACH regulation in a legally binding manner, to ensure consistency and enforceability.
- Promote continued scientific review of REACH test guidelines and supporting guidance to ensure they remain fit-for-purpose in addressing the unique properties of nanomaterials.



Conclusions

SEMI Europe and its members fully embrace the European Union's vision for a greener, safer, and more sustainable future. The semiconductor industry is not only aligned with the objectives of the European Green Deal and the Chemicals Strategy for Sustainability—it is a vital enabler of the technologies that make these goals achievable, from digitalisation and energy efficiency to clean mobility and climate innovation.

The revision of the REACH Regulation presents a unique opportunity to build a modern, future-proof chemicals framework—one that both protects human health and the environment, and empowers strategic sectors to innovate, grow, and lead. With the right balance of scientific rigour, regulatory clarity, and practical implementation, REACH can continue to serve as a global benchmark for responsible chemical management.

SEMI Europe stands ready to collaborate with EU institutions, regulators, and stakeholders to support a successful REACH revision. Together, we can ensure that Europe remains at the forefront of sustainable industrial transformation—delivering environmental leadership, technological excellence, and long-term resilience for generations to come.

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