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**Comments from SEMI Concerning the Advanced Notice of Proposed Rulemaking on the  
Review of Controls for Certain Emerging Technologies  
Docket No. BIS-2018-0024  
January 2019**

SEMI appreciates the opportunity to submit comments to the Bureau of Industry and Security (BIS) on the advanced notice of proposed rulemaking (ANPRM) on the review of controls for certain emerging technologies. These comments are focused on process and other general considerations. Of those considerations, understanding the complex, globally integrated and interdependent semiconductor supply chain as it relates to both production and technology development is of the utmost importance. Similar to sub-components that move through multiple locations around the world to be assembled with other components for a specific application, technology development often involves global collaboration as well.

The type of global collaboration required to support the manufacturing process and continued technology development and innovation warrants a similar multilateral approach regarding export controls. As the world is becoming increasingly connected with respect to technology development, any nation that chooses an exclusionary path for controlling technology development will ultimately be left behind, while the rest of the world collaborates.

SEMI's foundational policy pillars support policies aligned with free and fair trade, open markets, the growth of the integrated semiconductor supply chain and respect for IP, as well as the principle that national security considerations apply to all nations. SEMI supports policies aligned with these fundamental pillars which will benefit the industry as a whole over the long term. As this rule making process evolves, SEMI looks forward to providing its perspective as a representative of companies of all sizes within the end-to-end semiconductor supply chain and contributing to what will be more detailed discussions.

### **Background**

Established in 1970, SEMI is the leading global industry association that works to advance the technology and business of the global electronics manufacturing supply chain. SEMI has more than 2,100 members worldwide and represents the full range of U.S. semiconductor companies, including designers, equipment makers, materials producers, and subcomponent suppliers.<sup>1</sup> While SEMI's membership includes many large companies, more than 85 percent of SEMI members are considered small businesses. Our member companies are the foundation of the \$2 trillion electronics industry. This vital supply chain supports 350,000 high-skill and high-wage jobs across the United States.<sup>2</sup> These companies underpin the U.S. economy and

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<sup>1</sup> "About SEMI," <http://www.semi.org/en/About>, May 2018. A full list of SEMI members can be found here: <http://www1.semi.org/en/Membership/MemberDirectory>.

<sup>2</sup> "Trade Policy," SEMI, <http://www1.semi.org/en/trade-policy>, November 2018.



empower U.S. technological leadership. For decades, SEMI and the U.S. government have worked closely together on many issues.

### **Definitions and Scope**

The central question in the ANPRM is how to define emerging technologies. SEMI recommends that BIS consider several factors in establishing a definition. At the outset, Section 1758 of the Export Control Reform Act (ECRA) provides the foundation for such a definition: technologies that are 1) essential for national security, 2) not subject to other existing controls, and 3) only have availability in the United States.<sup>3</sup>

Beyond that, SEMI recommends other criteria that would be helpful in establishing a definition for emerging technologies. First, any language should be specific and clear. Overly broad or vague language could subject any number of technologies to unnecessary controls. Technology is as complex as it is evolving, and previously sensitive technologies are now a part of daily life. Because of the changing use of technology and the development of new technologies at astonishing rates, language on emerging technology must not be catch-all, and instead, be carefully considered and crafted.

Further, any definition should clearly state that emerging technologies are, in fact, non-mature, and should include the raft of new technologies as well as those technologies that have yet to be created or produced. In either case, emerging technologies are those that are not immediately suited for commercial applications. To this end, a technology should not be categorized as emerging if it is simply any improvement to an existing process that does not actually change the core function of the technology. Generally speaking, emerging technologies could be defined as those technologies that are categorized as Technology Readiness Level (TRL) 3 or below. TRL is a measurement system used to assess the maturity level of a critical technologies. This method is based on a scale of 1 to 9, with 9 representing the most mature technologies. Lastly, any definition should, as required by the ECRA, include provisions that prevent any harm to domestic research in the technology. Related, any definition that is created should be fully congruent and conform with multilateral standards.

At the same time, national security lacks a definition. While neither the ANPRM nor the ECRA define national security, the ANPRM stipulates that technologies subject to review are those that have “potential conventional weapons, intelligence collection, weapons of mass destruction, or terrorist applications or could provide the United States with a qualitative military or intelligence advantage.”<sup>4</sup>

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<sup>3</sup> Kevin Wolf, Partner at Akin Gump, has offered a definition of emerging technologies. While there are certain questions about the definitions, SEMI broadly supports the ideas behind this definition. See: <https://www.akingump.com/images/content/9/9/v2/99232/Commerce-Gives-Industry-30-Days-to-Provide-Comments-Regarding-Po.pdf>

<sup>4</sup> See “Review of Controls for Certain Emerging Technologies,” Bureau of Industry and Security, Department of Commerce, <https://www.federalregister.gov/documents/2018/11/19/2018-25221/review-of-controls-for-certain-emerging-technologies>, November 19, 2018.

There has been an increased push to treat economic security as national security. Indeed, many U.S. government documents, including the 2017 National Security Strategy, equate national security and economic security, specifically addressing the need to “promote exports and to further America’s technological edge.”<sup>5</sup> Speeches by senior members of the Trump Administration have directly and regularly tied these two concepts together.<sup>6</sup> Further, official government statements have clearly stated that sacrificing U.S. technological leadership would be tantamount to ceding U.S. national security strength.<sup>7</sup> SEMI believes the definition of national security should not be overly broad. Central to this should be the direct effect of technologies on systems and applications that support the warfighter as well as defense and intelligence capabilities required to maintain military superiority. Exercising restraint with respect to the scope of national security is a fundamental component of U.S. leadership in international trade. If the United States does not exercise some discipline with respect to national security, there will be no bounds to its use by other nations to justify unfair trade practices. That being said, in the event a control harms the semiconductor industry and/or the ability for a company within the supply chain to compete, it should be understood that the strategic nature of the industry may warrant taking a different approach so as not to harm U.S. suppliers’ ability to compete in, and have access to, the global marketplace.

Semiconductor manufacturing equipment and materials technology are quite mature and are already subject to traditional export controls by virtue of its connection to controlled articles set forth on the Commodity Control List. Unlike information technology for artificial intelligence or communications, which is independent of particular hardware, any newly emerging technology arising in the semiconductor manufacturing equipment and materials industry is most likely to be designed for and tightly coupled to semiconductor manufacturing equipment and materials, which again are already set forth on the Commodity Control List.

**BIS should properly justify any new controls, explaining what the new controls would address.**

The semiconductor industry, as you know, is no stranger to export controls, and SEMI member companies have worked within this regime for decades.<sup>8</sup> However, before imposing new controls, there must be a broader evaluation on the need for new controls and what these new controls will accomplish (where past controls fell short).

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<sup>5</sup> See Pillar II of the National Security Strategy, released in December 2017: <https://www.whitehouse.gov/wp-content/uploads/2017/12/NSS-Final-12-18-2017-0905.pdf>.

<sup>6</sup> Peter Navarro, Director of the Office of Trade and Manufacturing Policy at the White House, delivered a speech at the Center for Strategic and International Studies titled “Economic Security as National Security” on November 13, 2018. More recently, Navarro also published an article titled “Why Economic Security is National Security” in *RealClearPolitics* on December 9, 2018.

<sup>7</sup> In notices from the Treasury Department on the Broadcom-Qualcomm deal, the government explains that commercial applications, such as 5G, are central to U.S. technological leadership, which seemingly was the rationale for the disapproval of this transaction.

<sup>8</sup> This industry is subject to controls on various products, which includes, for example, implant (3B001.b), lithography (3B001.f), and EPI (3B001.a.1 and 3B001.a.2).



SEMI believes that the government should provide a gap analysis, showcasing the existing threats that are not addressed by current controls, and how new controls will allay those concerns. Further, any analysis also must account for future threats and how new controls will address those concerns. SEMI believes that this explanation should also include commentary on what specific technologies BIS is aiming to control and why and how these technologies will undermine U.S. national security. While the onus falls on the government to explain the goal of any increased or enhanced controls, the process requires input from the private sector in order to be successful. Providing clear explanations will allow for more productive input from the private sector.

**BIS needs to assess foreign availability of technologies potentially subject to controls.**

The United States is the global leader in the \$60 billion semiconductor manufacturing equipment market and in the \$50 billion global semiconductor materials market.<sup>9</sup> Across both segments, the United States holds more than 40 percent of the global market share and maintains a trade surplus.<sup>10</sup> The global semiconductor manufacturing industry operates across the global economy and is heavily reliant on trade and a vast network of supply chains that traverse the globe, with tens of thousands of suppliers participating. This industry—perhaps more than most industries—is one in which constituent parts cross borders many times.

While U.S. companies are market leaders in a number of segments in the semiconductor industry, it is important to note that for nearly every specific tool, process, material or finished device, there is a capable foreign competitor. This underscores this guiding principle: if foreign availability exists in terms of quality and cost, any unilateral export control by the United States will primarily affect U.S.-based companies, stifling their ability to export technologies, but not preventing these same technologies from being sent by non-U.S. companies to countries of concern. This, of course, could erode U.S. companies' market share, and potentially push the development of technologies overseas.

By imposing license requirements or creating other regulatory barriers, a company that would have to comply with these requirements would be at a significant competitive disadvantage relative to foreign competitors that would not face such burdens. This would ultimately undercut the U.S. semiconductor industry and the U.S. economy. SEMI strongly urges BIS to consider that unilateral controls will be ineffective and ultimately more harmful to the U.S. economy. The U.S. government should not seek to impose license requirements unilaterally or multilaterally with the intention of delaying or denying license applications related to a specific technology or country. However, if controls, as a last resort, must be introduced, SEMI strongly believes that any such controls need to be accomplished multilaterally with other interested countries and in full compliance with the foundational policy pillars outlined earlier in this document. This will ensure that all parties are competing on a level playing field.

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<sup>9</sup> "Trade Policy," SEMI, <http://www1.semi.org/en/trade-policy>, November 2018.

<sup>10</sup> "Trade Policy," SEMI, <http://www1.semi.org/en/trade-policy>, November 2018.

**BIS needs to consider the impact of any controls, proposed or realized, to all facets of the U.S. economy.**

As noted previously, this industry has worked within the export control regime for decades and is well aware of the rules and regulations. Imposing controls on emerging technologies without due consideration and justification could have significant and detrimental impact on the U.S. economy, the semiconductor industry, and/or specific businesses. In addition, undue controls could stifle investments in technology development in the United States. Developing new technologies requires large investments in talent, time, and funding. Companies make these investments in order to meet and match market demands. If prevented from tapping into markets, future investment will be negatively impacted, ultimately causing a shift in supply chain investments to other countries.

Based on a member-level assessment, SEMI estimates that potential controls could render a substantial revenue loss for companies in the industry. Beyond that, controls could also mean lost business, curbed research and development (R&D) budgets, increased costs, lost jobs, and other impacts.<sup>11</sup> These actions, which would happen at a company level, would reduce the overall competitiveness of the U.S. semiconductor industry. Following the regulations in the ECRA, we request that before any action—from possible control to imposition—BIS fully analyzes the broader impact of the action. Imposition of controls, especially unilaterally, would ultimately harm U.S.-based companies, while business flows to foreign firms.

Related, SEMI is pleased that ECRA regulations clearly establish that any controls should not harm, in any way, domestic research into these emerging technologies. The material and equipment segments in the semiconductor industry invest about 15 percent of revenue, or about \$20 billion in nominal terms, into R&D annually.<sup>12</sup> R&D investment from just the top 10 device makers adds an additional \$36 billion of the over \$60 billion total spent by companies in that segment.<sup>13</sup> This level of R&D spending is among the highest in any industry. This allows semiconductor companies to meet market demands. As discussed, semiconductors are used in countless products on which we rely for business, communication, transportation, healthcare, research, and more. SEMI member companies provide the innovations and manufacturing technologies that enable faster, more powerful, and more affordable electronic systems and applications.

This industry has recently entered a new era of growth, ushered in by the continued development of emerging technologies and the creation of new technological segments, such as smart healthcare, autonomous driving, next generation communications (5G), quantum computing, artificial intelligence, and the broader Internet of Things ecosystem. Not only do these connected devices and applications require chips to operate, but these products produce

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<sup>11</sup> This is based on conversations with representatives from semiconductor companies.

<sup>12</sup> "Trade Policy," SEMI, <http://www1.semi.org/en/trade-policy>, November 2018.

<sup>13</sup> "Top 10 Semiconductor R&D Spenders Increase Outlays 6% in 2017," IC Insights Research Bulletin, <http://www.icinsights.com/data/articles/documents/1045.pdf>, February 16, 2018.



terabytes of data, which are processed and stored on servers, which again requires semiconductors.

However, few industries rely on market access to the extent the semiconductor supply chain does. Access to foreign markets has enabled increased market growth, which has fueled R&D and innovation. In this industry, trade and innovation are intrinsically intertwined. Indeed, a change to either affects the other; without trade opportunities, innovation dries up, and without innovation, opportunities to export slow.

**BIS should implement several good governance provisions, all of which will enhance transparency and allow for industry engagement.**

Industry and the government should operate as partners. Industry is in a position to provide information on technologies and capabilities. SEMI strongly urges BIS to engage and take full advantage of industry experts in any form.

To this end, SEMI believes that there should be a process to weigh in and file comments in a fully confidential manner. While ‘business confidential’ filings protect the disclosure of proprietary information, they reveal that a company has submitted comments, which, in this extremely competitive industry, could be a point of concern. SEMI requests the use of a fully confidential process, to which no party outside of the submitters and a select group of government authorities would be privy. SEMI believes that the establishment of a process to file fully confidential documents will increase both the number as well as the quality of responses. If the goal is to ultimately share information freely, this step will engender greater cooperation and transparency.

Further, SEMI supports BIS’ efforts to create the Emerging Technologies Technical Advisory Committee (ETTAC). This body is charged with identifying and assessing emerging technologies in the United States and abroad.<sup>14</sup> However, with this review on emerging technologies ongoing, SEMI believes that BIS would be best served by expediting the approval of qualified candidates and hosting the inaugural meeting of the ETTAC post haste. Having this group in place will allow the BIS to take advantage of the collective expertise these technologists provide, and to use this group as a sounding board on the current state and future of emerging technologies.

**Closing**

In closing, SEMI appreciates the opportunity to weigh in on this advanced notice of proposed rulemaking on emerging technologies. This process—reviewing and updating control lists that preserve U.S. national security while not hampering the ability of the semiconductor industry to innovate and grow—is a critical, yet exceedingly complex task. SEMI stands ready to assist BIS and all government agencies and officials involved to better understand the complexities of the

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<sup>14</sup> See Emerging Technology Technical Advisory Committee (ETTAC); Notice of Recruitment of Private-Sector Members, <https://www.federalregister.gov/documents/2018/08/08/2018-16893/emerging-technology-technical-advisory-committee-ettac-notice-of-recruitment-of-private-sector>.



globally integrated and interdependent semiconductor supply chain, and to help identify the emerging technologies that warrant multilateral control. Doing so requires the ability to fully understand not only the technologies involved, but how new controls will ultimately impact SEMI's member companies and, more broadly, the entire semiconductor industry supply chain.