Department of Commerce Bureau of Industry and Security
Request for Public Comments on Risks in the Semiconductor Supply Chain
Docket Number BIS-2021-0036
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Entegris overview

Entegris is a leading supplier of advanced materials and process solutions for the semiconductor and other high-technology industries. Our mission is to help our customers improve their productivity, performance, and technology by providing solutions for the most advanced manufacturing environments. We leverage our unique breadth of capabilities to create mission-critical microcontamination control products, specialty chemicals and advanced materials handling solutions that maximize manufacturing yields, reduce manufacturing costs and enable higher device performance for our customers.

Entegris plays a critical role in the advanced semiconductor manufacturing ecosystem that will become more significant as semiconductors become even more complex in the coming years. To meet the requirements for improved chip performance and density, semiconductor manufacturing processes have rapidly become increasingly complicated by moving to smaller geometries, adopting new device architectures and utilizing new and innovative materials. These complex processes require new materials of ever-increasing purity, quality and stability to improve and maximize yields. These two intersecting themes demonstrate the growing importance of process materials and materials purity, and the impact they have on semiconductor performance, cost and reliability.

Our specialized materials solutions enable the highest levels of performance essential to the manufacture of semiconductors. As our customers introduce more complex architectures and search for new materials with better electrical and structural properties to improve the performance of their devices, they rely on Entegris as a trusted partner to address these challenges. We understand these challenges and have solutions to address them, such as our advanced deposition materials, implant gases, formulated cleaning chemistries and selective etch chemistries. Our customers also require greater end-to-end materials purity and integrity in their manufacturing processes that, when combined with smaller dimensions and more complex architectures, can be challenging to achieve. To enable the use of new metals and the further miniaturization of chips, and to maximize yield and increase long-term device reliability, we provide equipment and products such as our advanced liquid and gas filtration and purification products that help to selectively remove

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new classes of contaminants throughout the semiconductor supply chain. In addition, to ensure purity levels are maintained across the entire supply chain, from bulk manufacturing, to transportation to and delivery through a fab, to application onto the wafer, we provide high-purity packaging and materials handling equipment and products.

Is your organization considering increasing its capacity? If Yes, in what ways, over what timeframe, and what impediments exist to such an increase?

Entegris has planned expansion in all areas of production. Several expansion projects are under evaluation in the US, covering the broad spectrum of products Entegris provides to the Semiconductor ecosystem.

Entegris currently maintains extensive and broad manufacturing capability in 13 states in the US spanning all product categories we support. Nearly all facilities are operating at or near capacity.

What factors does your organization consider when evaluating whether to increase capacity?

Ability to serve customers, long term business outlook, availability of human and infrastructure skilled resources, cost, available incentives, and geopolitical complexity including Tariffs, Export Controls and other risks and benefits.

Has your organization changed its material and/or equipment purchasing levels or practices in the past three years?

Entegris continues to build transparency and trust with key partners along the end-to-end supply chain which has been pivotal in our ability to withstand impacts and serve our customers. To that end, Entegris has increased investment commensurate with growth to build redundancies in our manufacturing supply chain to respond to our customers' evolving needs. Entegris has re-examined supply chain locations and sources to improve resiliency. Building in redundancies and adaptability to ensure continuity is absolutely a cost challenge - but is necessary to thrive and be agile amidst this changing geopolitical landscape.

Further, Entegris projects that this trajectory will continue. This is necessary to position the company for the future, since global supply chain constraints will likely become even more challenging as our client needs evolve. Scenario planning and business continuity planning are both important tools in addressing the evolution of requirements of the supply chain and looking forward to that next frontier of supply chain advantage for this rapidly evolving industry.

What change would significantly increase your ability to supply semiconductor products in the next six months?

Policymakers can: 1) look for ways to address labor and logistics challenges, including working with our allies to increase the availability of skilled labor and 2) support regional semiconductor materials supply chain manufacturing capital expansion to support U.S. semiconductor manufacturing.

Labor and Logistics Challenges: To build a strong and resilient semiconductor supply chain, we will need a skilled workforce that is able to support the semiconductor supply chain at every point, including: construction, materials science, logistics, analytics, digitalization and AI. Without developing a skilled workforce to support our semiconductor supply chain, companies may be left without the workforce needed to manufacture semiconductors locally.

Support for Materials and Equipment Supply Chain Manufacturing. While Congress authorized funding to promote semiconductor manufacturing and federal investments in semiconductor research in the FY 2021 National Defense Authorization Act, authorization of the program will do little to help address semiconductor supply chain issues without funding the program. We understand the Senate included funding for this critical program in the U.S. Innovation and Competition Act (USICA). We urge Congress, whether it be through USICA or some other legislative vehicle, to fully fund this program.

While this important work continues, the Department of Commerce should make clear that domestic materials and equipment manufacturing will be included in the forthcoming program to implement the FY 2021 NDAA. If the Department is unable to do so, we urge the Department to work with Congress to ensure the domestic materials and equipment manufacturing are included in the program. Doing so will enable the expansion of capacity of chips but also ensure the chips can be produced with as much local content as possible.

We also need to be sure that expansion opportunities and incentives in the US are shared across the semiconductor supply chain - otherwise companies may be attracted to utilize incentives in other countries, further increasing the dependence on non-US production along the supply chain. For example, as part of its "K-semiconductor belt" initiative, South Korea is expressly incentivizing materials and equipment support as part of the country's strategy to fund construction of a semiconductor supply chain. The goal of the initiative is to localize chip materials and supplies to help semiconductor companies and suppliers working in a clustered approach on an end-to-end basis. News reports indicate as part of the initiative, 50 suppliers and partners have committed to joining a production base for materials, parts and equipment, which South Korea plans to build in Yongin.[1] This kind of clustered investment will enable South Korea to attract global companies and allow local companies to work with global partners on end-to-end semiconductor manufacturing.

[1] *See* Lim Sung-hyun, Lee Jong-hyuk and Minu Kim, *Korea vows to build world's largest semiconductor supply chain by 2030* (May 14, 2021).

Specific Constraints we are experiencing:

While not a semiconductor provider or large consumer of semiconductors, Entegris is experiencing many of the same constraints. Strong demand from semiconductor customers along with challenges in transportation reliability have resulted in extended leadtimes.

In addition to constraints in skilled labor, transportation constraints including resource and equipment shortages, and port congestion are causing significant disruption and uncertainty in the supply chain. Further, shortages in electronic components, steel, resins, and chemicals are also prevalent.