

Comments of the
Semiconductor Industry Association (SIA)
To the
U.S. Geological Survey (USGS), Department of the Interior (DOI)
On the
Request for Comment
on
Helium Supply Risk
88 Fed. Reg. 5904 (January 30, 2023)
Submitted March 16, 2023

The Semiconductor Industry Association (SIA)¹ welcomes the opportunity to provide input to the U.S. Geological Survey (USGS) on the Request for Comment on Helium Supply Risk. A substantial disruption in the helium supply, either in the short-term through disposition of the Federal Helium System or in the long-term due to geopolitical volatility, would significantly impact U.S. and global semiconductor manufacturing. Helium plays a critical role in semiconductor manufacturing processes, and as of 2016, semiconductor manufacturing comprised 9% of U.S. end uses of helium.²

Helium's role in semiconductor manufacturing

Helium is a critical input to the semiconductor manufacturing process. Helium's unique properties as an inert gas and a high thermal conductor make it ideal for use in functions that require preventing unwanted chemical reactions and ensuring control and precision of wafer temperatures. Accordingly, throughout the semiconductor manufacturing process, high-purity helium is used in numerous industrial applications, including as a carrier gas, in energy and heat transfer with speed and precision, in reaction mediation, for back side and load lock cooling, in photolithography, in vacuum chambers, and for cleaning.³ Many of these are uses for which there are no substitutes for helium, and helium cannot be readily stockpiled. In response to prior disruptions in the helium supply, semiconductor companies have taken steps to reduce helium consumption where possible, as well as to recycle or reclaim helium to the extent possible. Additional opportunities for increased efficiency in the use of helium in semiconductor manufacturing are extremely limited.

In May 2013, Carolyn Duran, a representative of Intel, testified on behalf of SIA to the Senate Committee on Energy and Natural Resources:⁴

“Just like helium leaking out a helium balloon, cylinders of helium lose roughly 1% of the gas each day. Due to this fact alone, we are dependent of regular deliveries to our facility to maintain a stable supply line. Any disruption, even of a few days, could slow production in a semiconductor facility. A significant delay could result in the need to shut a facility down. This is an untenable option for our company and other industries, and for the country as a whole.”

¹ The Semiconductor Industry Association (SIA) is the voice of the semiconductor industry, one of America's top export industries and a key driver of America's economic strength, national security, and global competitiveness. Semiconductors – the tiny chips that enable modern technologies – power incredible products and services that have transformed our lives and our economy. The semiconductor industry directly employs over a quarter of a million workers in the United States, and U.S. semiconductor company sales totaled \$258 billion in 2021. SIA represents 99 percent of the U.S. semiconductor industry by revenue and nearly two-thirds of non-U.S. chip firms. Through this coalition, SIA seeks to strengthen leadership of semiconductor manufacturing, design, and research by working with Congress, the Administration, and key industry stakeholders around the world to encourage policies that fuel innovation, propel business, and drive international competition. Additional information is available at www.semiconductors.org.

² U.S. Geological Survey, *2016 Minerals Yearbook: Helium*, February 2020.

³ Linde, *Helium in Electronics: Enabling leading-edge semiconductor manufacturing*, January 2016

⁴ Intel/SIA, Carolyn Duran, *Testimony to the U.S. Senate Committee on Energy and Natural Resources*, May 2013.

Therefore, the supply of helium for semiconductor manufacturing must be uninterrupted and available on-demand. Helium use for semiconductor applications should be prioritized in the face of any supply constraints due to the critical nature of helium in semiconductor manufacturing, which is important for the U.S. economy, national security, technology leadership, and supply chain resilience. The global semiconductor market is expected to grow at a 6.7% CAGR through 2030⁵, and the helium supply will need to grow accordingly.

Short-term risk to volatility in helium supply and pricing

As SIA wrote last summer⁶ to General Services Administration (GSA) Administrator Carnahan, regarding the pending disposition of the Federal Helium System (FHS), “The helium market has been subject to significant volatility in recent years and the FHS has played an important role in ensuring adequate supplies. Currently, supplies of helium are constrained due to a range of market and geopolitical factors. Suppliers are issuing Force Majeure letters and allocating limited supplies. Suppliers also have not been able to commit to meet the increased volumes required in 2023 and beyond to support the expected rapid expansion of our industry. Based on information from our suppliers, we understand the current schedule for disposition of the FHS could result in a lengthy shutdown of the operating system. At this time, we fear the transfer of these assets to new ownership poses a high risk of exacerbating an already constrained supply of this essential gas and further disrupting domestic semiconductor fabrication.”

Similarly, last summer, a group of Storage Contract Holders wrote to GSA urging delay of the disposition of the FHS.⁷ This letter detailed three major issues of concern that should be addressed while the disposal of the FHS is on hold, such as the leasing of the Cliffside Helium Enrichment Unit, incomplete pipeline rights of way, and non-compliance with applicable regulations. SIA echoes the importance of addressing these issues to ensure a continuous, stable supply of helium out of the FHS when the disposal process is executed. USGS should work with GSA, BLM, and other government partners to act on these items, or to continue to delay the disposition of the FHS.

Supply and price volatility have declined since SIA’s July 2022 letter, though some companies continue to face price increases. Importantly, helium supply and price are often cyclical issues and may face future constraints or disruptions. Accordingly, while the U.S. expands domestic semiconductor capacity following enactment of the CHIPS and Science Act, the supply of helium must not be a roadblock to the success of these programs. For this reason, USGS should ensure a stable and sustainable supply of helium for the semiconductor industry, either through the FHS or other supply chain sources, in addition to prioritizing availability for the semiconductor industry in the event of disruption.

Long-term risk to volatility in helium supply and pricing

The global helium supply is generally concentrated in countries and regions of potential geopolitical risk, including Qatar, Russia/Siberia, and Algeria. While Qatar currently produces the majority of the world’s helium, Russia is in the process of ramping up its helium production, with the world’s largest facility expected to come online in Siberia in the next few years, resulting in Russia claiming a projected 25-30 percent of global helium production.⁸ The principal countries that will offset the expected decline in U.S. production are Qatar and Russia, which

⁵ McKinsey & Company/University4Industry, [Semiconductors Demand Outlook](#), November 2022

⁶ Semiconductor Industry Association, [Request to Delay Disposition of the Federal Helium System](#), July 2022

⁷ Letter from FHS Storage Contract Holders, [Delay of the Sale of the Federal Helium System](#), June 2022

⁸ New York Times, [Big Push Into Helium Could Have the World on Russia’s String](#), December 2020

will account for up to 60% of the world's helium production. While regions that pose a lower risk, including in North America, maintain substantial helium reserves, the helium that supplies the semiconductor industry predominantly is sourced from the Middle East and Russia.

Should the supply of helium be immediately disrupted, there would likely be shocks to the global semiconductor manufacturing industry. One industry analyst predicts that the helium supply will be 24 percent short of demand if Russian helium was removed from the supply chain.⁹ While alternative sources of helium may be available, this will likely be accompanied by price spikes and a delay in securing additional supply. In this scenario, USGS should prioritize domestic supply and availability for semiconductor applications.

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SIA recommends that USGS leverage every authority to continue the delay of the disposition of the Federal Helium Supply and consider other options that would allow for a stable supply of helium in order to avoid volatility and supply chain disruptions while maintaining a stable, predictable supply of helium from FHS. A strategic, intergovernmental approach, in addition to working with global partners, can lower the risk of disruption and ensure a sustained helium supply for semiconductor manufacturing uses in the short- and long-term. SIA looks forward to engaging with USGS on this important topic.

⁹ TECHCET, [We Haven't Yet Solved Our Semiconductor Dilemma](#), October 2022