Testimony of

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Mr. Chairman and Ranking Member Murkowski, thank you for the opportunity to testify on behalf of Intel and the Semiconductor Industry Association on the "Helium Stewardship Act of 2013" (S.783). My name is Carolyn Duran, and I am the Director of Chemical Risk and Compliance for Global Sourcing and Procurement at Intel Corporation. In this capacity I am responsible for risk mitigation for chemicals and gases used in our manufacturing technologies globally. I appreciate your efforts to address the critical issue of helium supplies for American industry.

The current BLM authority to operate the Federal Helium Reserve expires October 7, 2013. Currently, the Federal Helium Reserve represents around 40% of the US supply of helium and 30% of global supplies, and closure of the Reserve would result in significant supply line disruptions affecting multiple industries within our country. S.783 is key legislation that directly addresses this risk, ensuring a continued, stable supply of this critical material for the next few years. I am here today not only on behalf of Intel and the Semiconductor Industry Association (SIA), our industry trade association,[1] but also as part of a broader downstream coalition[2] comprised of companies across many manufacturing sectors as well as scientific users of helium, all of whom share similar concerns around the imminent cessation of sales of helium from the Federal Helium Reserve.[3] The existing deadline heightens the criticality of the situation, and we, the downstream users of helium, urge the Senate to mark-up and pass legislation quickly, so that serious supply disruptions can be averted. This important legislation must move forward promptly in order to avoid damage to our economy and to maintain U.S. leadership in advanced manufacturing and scientific leadership.

Founded in 1968, Intel Corporation is the world's largest semiconductor company, with net revenues of $53.3B in 2012. Intel continues to invest in US manufacturing, with over half of our roughly 100,000 person employee base residing in the United States. Intel's latest technologies for microprocessor fabrication, assembly and test are developed and implemented Oregon and Arizona. In 2012 alone, Intel invested over $8.5B in capital in the United States. Additionally, over three quarters of our chip manufacturing occurs in U.S. factories located in Arizona, New Mexico,

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[1] Information on SIA is available at www.semiconductors.org.

[2] Our coalition includes the following companies and organizations: American Physical Society, Applied Materials, Corning Incorporated, Cree, Inc., The Dow Chemical Company, Fairchild Semiconductor, Freescale Semiconductor, General Electric Company, GLOBALFOUNDRIES Inc., Information Technology Industry Council (ITIC), Intel Corporation, IBM Corporation, Kodak, Materials Research Society, Medical Imaging & Technology Alliance (MITA), Micron Technology Incorporated, National Electrical Manufacturers Association (NEMA), ON Semiconductor, Philips, Semiconductor Industry Association (SIA), Siemens, and Texas Instruments Incorporated.

[3] See http://www.energy.senate.gov/public/index.cfm/files/serve?File_id=02eced68-3093-4794-bb52-15a26f3481ef.

Oregon and Massachusetts. Our products are sold globally with more than three quarters of our revenues occurring outside the United States. Helium is a critical element in many aspects of our leading edge technology manufacturing processes.

Semiconductors are a foundational American industry and one in which the U.S. industry has maintained a global lead since its inception. Our sector is the second-leading export industry and employs almost 250,000 employees in jobs with wages that average over $120,000 -- well above the average of the rest of US manufacturing. The broader economic impact of our industry is much greater. SIA studies indicate that in addition to jobs in our sector, those jobs support over a million indirect jobs in related industries throughout the economy. Even broader still, semiconductors and the products they enable are the cornerstone of all modern electronics, which in turn enable virtually every aspect of modern life, from health care to transportation to energy and so on.

But Intel and the semiconductor industry is not alone in our reliance on helium to deliver advanced technologies. Helium is a critical component in the medical industry, where MRI's rely on the extremely low boiling point (4 degrees Kelvin, near absolute zero) to enable the superconducting properties of the magnets necessary to enable the technology. Many companies use helium to create a protective atmosphere for arc welding. Eighteen percent of helium goes to laser welding used in the production of numerous products, including electrical and auto components. An additional six percent is used for testing of air-conditioners for leaks. Additionally, helium is critical to the scientific community, where its unique properties enable advancements in condensed matter physics, brain research and cryogenics, to name a few. In short, helium is critical to important sectors of America's economy and leadership in advanced manufacturing, as well as our country's leadership in scientific advancements.

In order to illustrate the importance of helium in producing today's leading edge semiconductor products, I'd like to take a moment to walk you through the complexities of our manufacturing processes. Our most sophisticated semiconductor products feature more than a billion transistors etched onto silicon die the size of a fingernail. Realizing this level of complexity takes several hundred steps and several weeks on the manufacturing line, all inter-related. The world's leading scientists and engineers use sophisticated equipment and processes to control at the atomic level, across wafers as large as twelve inches in diameter. At each step in the process, researchers develop new processes, using many different chemicals, to deliver the required properties resulting in improved performance and better products. The advancement of semiconductor technology over time, commonly known as "Moore's Law," has driven the semiconductor industry to extraordinary achievements which today result in semiconductor chips that provide phones, tablets and notebooks with more computing power than rooms of computers decades ago. While Intel releases a new technology every two years, behind this is several billion dollars in R&D investment and six or more years of engineering effort. With each new technology requiring roughly twenty-five percent new tools, delivering new technologies is incredibly capital intensive. Leading edge semiconductor manufacturing equipment can cost over $100M per "tool," and a new factory can cost upwards of $5 billion dollars.

Chemicals and gases are critical to the manufacturing process. If one were to look at the periodic table, you would find that many of the elements are used in our manufacturing process. Helium is

one of these gases. In fact, helium is one gas that is used pervasively throughout the process, and without it, our factories would not operate.

This is true for all semiconductor manufacturing, not just Intel. Why is this the case? Helium has unique physical and chemical properties that are utilized not only within the manufacturing process steps, but also to help achieve the ultra-clean manufacturing and assembly environments essential for advanced semiconductor manufacturing.[4] As an inert gas with high thermal conductivity, it is used as a carrier gas for deposition processes, and as a dilutant in plasma etch processes. Its low boiling point (4 Kelvin, near absolute zero) enables specialized wafer cooling applications. Additionally, due to the small size and inertness of the helium molecule, it is an ideal choice for testing equipment for leaks. This is used for safety testing for other chemicals used in the manufacturing process, as well as to maintain the ultra-clean environment needed for these advanced technologies. It is these same properties that make helium compelling for use in semiconductor manufacturing that make helium difficult to manage. The small size of the molecule, while critical for leak testing, results in leakage out of the very containers used to store helium. 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.

Due to prior shortages, over the past several years Intel and other manufacturers have worked to replace helium with alternatives, such as argon or nitrogen, where possible. We continually undergo conservation efforts in both existing and new technologies. In some cases, the degradation in properties or performance associated with alternatives has led to a need to continue utilization of helium. When transitions to alternate gases are feasible, they typically result in costly retrofits to existing tools and equipment used to make our products. When helium is utilized for its low boiling point, as in MRI's and condensed matter physics, there simply are no substitutes.

The helium supply market has experienced and is currently facing supply shortages. Many U.S. users of helium have had to struggle through reduced helium deliveries and significant price increases.

This leads me to the key issue at hand: If U.S. users are already struggling to obtain a stable supply of helium critical to their technology, what would happen if the Federal Helium Reserve ceased sales of 30% of the world's supply to private entities? While the exact results cannot be known, I can say with confidence that it would be disruptive to an already tenuous supply line. The semiconductor industry, already realizing shortages, would be directly impacted. If the supply were to be disrupted for a significant amount of time, the resulting shutdown of our manufacturing facilities would directly impact the overall economy. A shortage impacting our industry will have a broad impact to the very industries that rely on our products, including health care, transportation and the energy sectors. While this outcome is not likely, it is possible, but unacceptable. We have

[4] National Academies of Science, "Selling the Nation's Helium Reserve" (2010) at pp. 63, 67.

seen supply line disruptions in other areas of the semiconductor business that have led to price increases and shortages.

The Helium Stewardship Act of 2013 (S.783)

Congress must take action immediately to prevent significant disruption in the helium market. Without prompt action, BLM's authority to sell helium from the Reserve will expire later this year, and 30% of the world's supply of helium will no longer be available to important sectors of our economy. This potential result would be harmful to our economy, and is completely avoidable. The Helium Stewardship Act of 2013 would help continue the supply of helium, while also transitioning the program to a more market-based, transparent system.

Our broad-based group of industrial and scientific helium end-users developed a set of principles that we hope will guide the efforts of Congress to address the helium supply. These principles include the following:

1. Establish a framework for secure, continuous supplies of helium that can be implemented through long-term contracts with suppliers.
2. Ensure price transparency.
3. Provide for mechanisms to prevent market speculation or manipulation.
4. Adequate transition period to assure continuity in supplies.
5. Promote increased supplies of helium in the future.

The "Helium Stewardship Act of 2013" (S.783) is consistent with the spirit of these principles. The bill provides a framework for a secure supply in the near term by providing for continued operation of the Federal Helium Reserve and the sale of helium to private entities. It provides price transparency through clear reporting requirements for both the BLM and those who purchase helium. The phase-in approach of the auctions addresses the potential of short-term supply instabilities; the gradual phase-in of the auction and annual cadence provides for additional certainty that will enable companies to work with existing suppliers and help support long-term supply contracts. The bill calls for an annual auction, which our coalition believes will enhance the reliability and stability of the helium supply. The bill also contains several important provisions to help increase future supplies of helium.

One improvement we would strongly urge the Committee to consider is to include very clear language that provides that, in the event of an implementation delay of the new auction, for whatever reason, the current process for allocating Helium would remain in place. The current bill includes much-appreciated language aimed at *minimizing* market disruption, but we think it needs to be strengthened and made clearer to ensure a disruption *does not occur*. We have raised this issue with the Committee staff, and we are confident that they understand our concerns and that appropriate revisions to this language can be incorporated into the bill.

Intel Corporation and the rest of the semiconductor industry, as well as our broader coalition, are reliant on a consistent, secure supply of helium to produce our products, and we are appreciative of the extensive work done by Chairman Wyden and Senator Murkowski on this bill to address the

imminent danger posed by lack of action. Once again, we urge the Senate to mark-up and pass legislation quickly to extend the authority of the BLM past the October 7, 2013 expiration date. This is absolutely necessary to prevent disruption to an already tenuous supply line of helium, critical natural resource.

Thank you for the opportunity to testify on behalf of Intel Corporation, the broader US semiconductor industry, and our coalition of industrial and scientific users of helium. I am happy to take any questions.