Testimony Before
The House Natural Resources Committee
Energy & Minerals Resources Subcommittee

Legislative Hearing on Discussion Draft of H.R. ____
"Helium Extraction Act of 2017"

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Chairman Gosar, Ranking Member Lowenthal and other members of the Subcommittee, thank you for inviting me to testify today on the importance of helium to the scientific community, the need for an affordable and stable helium supply, and how my laboratory has benefited from investing in new equipment that allows us to recycle and reuse helium.

I am a Professor of Physics at the University of California, Los Angeles (UCLA) and a fellow of the American Physical Society.

My research group focuses on the properties of electronic materials at very low temperatures. We are most interested in phases of matter which could be summarized as macroscopic manifestations of quantum mechanical phenomena. Superconductivity and various magnetic phases can be described this way. These studies require cooling to very low temperatures.

Liquid helium is unique in that it remains liquid at ultra-cold temperatures approaching absolute zero – meaning that it is ideal for use as a refrigerant in investigations of the special properties of materials only observed near absolute zero. Liquid helium is the only way I, and thousands of physicists across the country, can reach the cryogenic temperatures needed to carry out our research.

Liquid Helium Vital To America's Research Enterprise

But physicists aren't the only ones who rely on liquid helium. In fact, it is critical to America's scientific ecosystem. Chemists, materials scientists, biologists and engineers use liquid helium or liquid helium-enabled instrumentation for their pioneering research. There are breakthrough

advances in medicine, national security, computer technology and fundamental science that are made possible by the use of liquid helium.

A familiar example is the use of liquid helium required to operate the MRI instruments located in thousands of hospitals, universities and medical facilities across the country, providing essential – and often live-saving – diagnostic information to patients.

Need for Stable Supply and Price

Having access to affordable liquid helium with reliable delivery is essential for the academic community. Because my colleagues and I operate on what are essentially fixed budgets, escalating helium prices – and especially unpredictable price spikes – are severely impacting our community.

During the last decade, the price of helium has increased by as much as 250% for some researchers, while grants have increased by roughly 10%. The detrimental results of rising costs include:

- Hiring of fewer graduate students by faculty investigators;
- Abandonment by individual investigators of research areas requiring liquid helium;
- A reluctance on the part of universities to hire faculty whose research requires liquid helium.

Any one of these is cause for concern; taken together they jeopardize the future health of critical areas of research.

But price is only part of the challenge for academic researchers; the other is our critical dependence on a reliable delivery schedule.

I offer the activities of my research group as an example. Typically, we conduct experiments requiring several months to complete, and liquid helium must be used to maintain the ultra-cold environment for the duration. We plan ahead and schedule our liquid helium deliveries to best ensure that we do not run out before the experiment is completed. But when supply disruptions occur – like they did in 2011 – there is almost nothing we can do. Even if we can afford to purchase liquid helium at a premium price, we may not have timely access to it.

The result of supply interruptions could mean considerable lost time and effort. We must restart the experiment and months of data must be regenerated. Consequently, grant funds are wasted, and the graduate student's progress is badly delayed.

Recycling is a Solution

Liquefied helium has been a mainstay of my scientific research since I was a graduate student in the late 1980's. Later, as a Principal Investigator, it was a burdensome but manageable cost of operating a program centered on low-temperature materials physics. In 2011, university researchers, myself among them, saw the beginning of sharp price increases, product rationing, and unscheduled delivery interruptions. As could be expected, all of these aspects negatively impacted productivity, but aborting a measurement for lack of liquid helium was particularly damaging.

In response to these changes and fearing worse, we began to put together a recycling facility in 2014. We were fortunate to be assisted in our endeavor by our Dean at UCLA, and by the National Science Foundation through its program in Condensed Matter Physics. The facility allows the vast majority of helium to be reused – I dramatically reduce my lab's annual liquid helium costs while conserving this finite, irreplaceable resource. It also protects my research group from helium supply disruptions, which, as described before, can be devastating.

This solution is not unique to me. For many of my colleagues, investing in new equipment with helium recycling capabilities makes economic sense. This type of investment can pay for itself in fewer than 10 years by reducing their annual helium expenditures.

Congressional Action Required

But most academic researchers do not have sufficient funds to make the initial capital investment necessary to purchase equipment that enables helium recycling. And, with notable exceptions, federal agencies have not budgeted to support wide-range adoption of helium recycling technology that is necessary – despite the fact that investing in recycling can substantially reduce the government's expenditures on helium over time. Unless new funding streams are created to help address the issue, the United States risks losing vital areas of research enabled by liquid helium.

Congress can help address this issue and I urge you to take action.

> This Subcommittee should consider legislation that provides support to federal agencies to sponsor programs aimed at reducing researchers' helium consumption and expenditures without compromising the vitality of their research programs. By providing researchers funding to purchase equipment that dramatically reduces their helium usage and expenditures, Congress can save the government money and ensure the U.S. retains its critical research capabilities in areas of physics, chemistry, biology and engineering.

Thank you for the opportunity to testify. I look forward to working with the Subcommittee to manage the helium challenges and maintain the world-class research enterprise that continues to contribute to the nation's economic competitiveness and its security.