STATEMENT BY

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ON ADVANCING AMERICAN LEADERSHIP IN QUANTUM TECHNOLOGY

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Chair Lucas, Ranking Member Lofgren, and Members of the Committee, I am honored to again be before this Committee, my favorite authorizing committee, but please don't tell E&C. I am honored to be here discussing quantum technologies, how this committee's leadership five years ago triggered a technology revolution, and how this next Act can continue the momentum.

Not long ago, prospects of quantum moving from the science lab to applications seemed far-fetched. Barely six qubits could be fabricated on a chip. Quantum teleportation was a science experiment from Berkeley.

Your Act from five years ago directed significant investments that led to results, with goals of the NQI including:

- Build on historical efforts from NSF, NIST and DOE;
- Provide additional support for universities, a commercial consortium, and five NQI R&D centers; and

- Coordinate national efforts.

At DOE, we stood up those research centers. With over seventy participants, from national labs, academia, and the private sector. This was the first time that a DOE discovery program included the private sector.

Major accomplishments include:

- Oak Ridge developed a quantum computing hub;
- Extensive quantum networks were tested by Caltech, Brookhaven, Fermilab, and Argonne;
- IBM fabricated a QPU with a record 433 qubits, on its path to a quantum supercomputer;
- Google developed a high-fidelity quantum processor, and developed quantum simulations including a wormhole teleportation protocol; and
- Berkeley Lab researchers received the Nobel prize for experientially proving quantum teleportation networking, and are fabricating a 200 ion trap chip.

But your accomplishments were far beyond direct NQI programs. Your efforts were the seed round that triggered massive other investments. In academia, a wide set of universities started programs. UChicago's Molecular Engineering school, Caltech's quantum networking, the Columbia Quantum Initiative, Oklahoma State's Lahiri group, and Santa Clara University's engineering physics program. You triggered foundations to invest, notably the Pritzker foundation. And you triggered a vast set of private investments. Since the NQI, over $6 billion has been invested by the private sector, about five times what you funded. On Wall Street, that's called "leverage." My quantum networking company, Bohr Quantum, and many other companies benefited from this ecosystem. And not only have American companies grown, quantum companies from overseas moved operations to the U.S., following your leadership.

As you consider a NQI reauthorization, here are thoughts on how to build on your successes.

- We need to bridge the gap between research, quantum products, and users, including for computational discovery and applications like energy;
- While still advancing science, it is imperative to support first generation applications to deploy, including private companies' quantum computers, an enhanced QUEST program, and network systems;
- Stand up a program to design, procure and deploy at the national labs first quantum centric HPC's and large area quantum networks; and
- Deploy a U.S. quantum communications satellite.

Here are ideas for consideration in the second NQI Act:

- Maintain core research programs and the five NQI Research Centers, adding funding to advance research;

- Authorize new programs that direct steps to deployment of first usable quantum computing, networking and sensing;

- Authorize a Quantum Centric HPC program. Authorize DOE to start a $200 million p.a. post-Exascale computing program that will incorporate quantum in the architecture. The NQI should build on the momentum from announcement by IBM, UChicago and two DOE labs to build a 100,000 qubit computer;

- A joint DOE/NASA quantum networking satellite and ground stations program connected to the terrestrial quantum networks authorized in *CHIPS and Science Act*. The U.S. is quite behind China on quantum satellite efforts;

- Direct DOE Science to scale existing Helium-3 production at Savannah River to support science and commercial uses;

- Create a new quantum foundry and instrumentation infrastructure program; and

- Authorize that funding is allowed for joint programs with allied nations.

Importantly, this topic is crucial to national security. It is no coincidence that right after Snowden defected to China and divulged all he knew on our signals intelligence capabilities, China ramped up construction of the world's largest quantum network for security, and development of their quantum computing. Using this technology to decrypt weapons codes, would cause tremendous damage in a conflict. And the only certain defense for this is entangled networks, and these network systems are needed for scaling quantum computers. China is right on our heels of quantum computer and networking efforts.

America has the lead in this crucial future technology, that will impact the economy and security. Now is the time to accelerate research, and deployment of quantum computers and networks. We should build on the lead you have already enabled.