

*Opening Statement to the Senate Energy and Natural Resources Committee  
Hearing - October 26, 2017*

Madam Chairman Murkowski, Ranking Member Cantwell, Members of the Committee. I am Dr. Duncan Earl, President and Chief Technology Officer at Qubitekk. Thank you for inviting me to appear before you today to discuss the role quantum technology can play in protecting our nation's electrical grid.

The U.S. electrical grid has operated for nearly 150 years without experiencing a large-scale, long-term blackout. This is a testament to the hard work of the men and women who maintain the grid as well as the many smart devices that we depend on to monitor and control it.

However, the grid has never faced a threat of the type and severity as it is experiencing today. Over 70,000 power substations throughout our country rely on smart devices to maintain the delicate balance between energy generation and energy demand. Effective coordination between these devices is possible only when they share data that is accurate and uncompromised.

Unfortunately, as we have seen in other countries, the ability of hackers to infiltrate grid networks and corrupt these communications is real and growing. To prevent a devastating attack on our own nation's electric grid, we must implement the best cybersecurity solutions possible to protect sensitive grid communications.

If you ask utilities today, "At this very moment, are your communication channels secure?" many will admit that they do not know. A new technology - quantum technology – can allow them to answer, "Yes."

Quantum technology enables communications that cannot be intercepted or altered. Any attempt to do so can be immediately detected and thwarted. Fundamentally different from past solutions based on mathematics and software, this new solution is rooted in physics and uses hardware to create a trusted channel that is secure today, tomorrow, and a thousand years from now.

Quantum technology uses the laws of quantum physics to generate secret keys that cannot be cracked. The keys are transmitted as light through optical fibers to devices in the field. Although quantum physics, with its demonstrations of teleportation and particles existing in parallel universes, can sound like science fiction, its application to grid security is real and near-term.

At Qubitekk, with funding from the Department of Energy Office of Electricity's Cybersecurity for Energy Delivery Systems program, or CEDS program, we are conducting preliminary tests of quantum technology with utilities in California and Tennessee. In 2018 and 2019, larger pilot testing within substations is planned. We are also working closely with our industry and national

laboratory partners to develop protocols that allow traditional communication solutions to integrate with these new quantum systems.

To speed the adoption of this technology, though, will require government action. With government support, a nationwide quantum-protected network between substations can be built, creating an impenetrable shield around our grid's communication channels. With increased funding to existing DOE programs, quantum-enhanced cybersecurity solutions can be developed to protect every substation in our country. Ultimately, as occurred with the Internet, early government investment in communication infrastructure and equipment will be needed.

Finally, Senators, let me suggest the most important reason yet why we must embrace and pursue quantum technology. China has already developed and installed the foundations for a nationwide quantum network that leverages both fiber optic and satellite based communications. Last month they demonstrated the first-ever quantum secured video call between China and the European Union. Earlier this month, they committed \$10 billion to the creation of a massive new quantum information laboratory in Eastern China. Although much of the basic science of quantum technology was developed here in the United States, our hesitation in its implementation has left us far behind in the quantum race.

Quantum networks are just the beginning of the quantum revolution. Quantum technology will revolutionize cybersecurity, computers, artificial intelligence, chemistry, medicine, and, ultimately, the world economy. Building a quantum-protected grid will not only strengthen America's security but will also create a sustainable first market for quantum technology here in the U.S. It represents a significant step toward challenging, and eventually overtaking, our counterparts in Asia and the European Union.