



**CORDOVA
ELECTRIC
COOPERATIVE, INC**

**Written Testimony of Clay Koplin
CEO of Cordova Electric Cooperative, Inc. and Mayor of Cordova, Alaska
On behalf of Cordova Electric Cooperative and The City of Cordova
Before the Senate Energy and Natural Resources Committee
Hearing to Receive Testimony on Innovation in Action, Microgrids and Hybrid Energy Systems
10:00AM, Saturday, June 10, 2017**

Good morning Chairman Murkowski and ranking member Cantwell. I am Clay Koplin, Mayor of Cordova, Alaska and CEO of Cordova Electric Cooperative (CEC). Cordova is an ideal location for witnessing the street-smart innovation, resilient microgrid architecture, and hybrid energy systems characteristic of many Alaskan electric utilities, which represent approximately 12% of the world's microgrids. I have lived in Cordova for nearly 19 years, the bulk of my professional career, and I am constantly impressed by the creative, persistent, can-do initiative of this community, and the successes that have resulted from that pioneering spirit. This beautiful facility that we are meeting in is just one example of years of planning, strategizing, and executing a vision to achieve a dream of a main-street community center that serves a wide range of community needs. Last week CEC joined Meera Kohler of Alaska Village Electric Cooperative in hosting the Canadian Off-Grid Utility Association's Prime Power Diesel Inter-Utility Conference, a biennial Canadian conference that for the first time in their 50-year history met outside of Canada. They were seeking relationships with Alaskan utilities that have raised the bar for integrating renewables into our microgrid systems. Gwen Holdmann also attended that event on behalf of the Alaska Center for Energy and Power, an arctic energy skunk works that has been a leader in Alaskan innovation around their technology laboratory and team.

Just down the street from my home here in Cordova are my neighbors, the Hagmueller family. The son Alex pursued a career as a diesel mechanic and worked in and around the fishing industry. He worked in a boat fabrication shop, as a diesel mechanic on shore and at sea, and as a commercial fisherman. He decided to advance his career by returning to university in Oregon where he pursued a mechanical engineering degree. He observed wave energy generator design and testing in progress at the university laboratories and decided to partner with Max Ginsberg to found Aqua harmonics and pursue a dream of developing their own wave energy generator. They worked out of pocket from their garage. As they finished building their prototype, they realized that they would not be able to afford the fees for access to a wave energy testing lab. When they became aware of the U.S. Department of Energy's (DOE) wave energy challenge, which offered finalists device testing access for proof of concept, they joined the competition against a field of 96 teams. This winter and spring, Aquaharmonics won the \$1.4 million dollar DOE prize against teams that were better staffed, were better funded and supported by universities and industry, and had a longer development timeline than Max and Alex. The Aquaharmonics device not only met the DOE threshold of doubling the ratio of electric output to device cost ratio of the current leading technology, but smashed it with a five-times multiplier with their simple, functional design. They are now gathering partners and pursuing commercial development of their technology to pioneer a new generation of wave energy technology. This success is a tribute to the Department of Energy and to innovation on the low-end. But despite a national history of back-lot, neighborhood garage, and farmyard innovations from iconic innovators like Wilbur and Orville Wright, Harley and Davidson,

Hewlett and Packard, Jobs and Wozniak, I fear that we are currently overlooking the successes of the small contributors on the fringe. Out here on the bleeding edge of the energy frontier, the practical and affordable solutions developed by the survival-driven players can complement the world-class universities, corporations, and national laboratories which work from an entirely different resource base and paradigm.

Here in Cordova, a submarine transmission line from Cordova Electric's remote Humpback Creek Hydroelectric Project was damaged by a delivery barge dragging their tow chain on the ocean floor in 2004. CEC used a simple but effective fault locating method developed by two Alaskan electrical engineers in the 1970's to precisely locate the fault in the three and a half-mile long cable using nothing but a car battery, jumper cables, and a 30-year old voltage meter. The cable was repaired using local fishing vessels, divers, and linemen at a cost of under \$60,000 over three months. A conventional repair would likely have approached \$500,000 and taken up to a year to execute. There are hundreds of examples of similar innovative solutions that Alaskan utilities apply to their daily challenges and frankly we need to be capturing them.

So how does this innovation happen and what is the end result? Here in Cordova we will have the opportunity to show you the 100% underground power lines that result in some of the highest system reliability in the country. Cordova's 100% LED street lighting saves thousands of gallons of diesel fuel and tens of thousands of dollars in energy bills annually while reducing light pollution and improving air quality. Later today we will tour Power Creek Hydroelectric plant; a run-of-river hydro project that provides 60% of the community's electric energy annually. The fully automated and remotely operated Humpback Creek Hydroelectric project contributes 15% of the community's power annually and joins Power Creek in keeping the grid on 100% renewable energy over half of the time. The remaining one-fourth of the community's annual energy needs are provided by the Orca diesel generation plant.

These energy system assets and attributes are impressive given the remote, logistically challenging, resource-constrained environment and daunting economies of scale of our community of 2,300 residents. Perhaps more noteworthy, however, are the agile and innovative processes applied to the development and operation of this system. Many Alaskan electric utilities combine key ingredients of innovation; necessity, collaboration and marshalling of community resources, broad and practical skillsets, and an agile trial-and-error "fail forward" approach fueled by an optimistic belief that solutions exist if we can discover them. Simple, practical, and affordable solutions evolve organically in our frontier laboratory microgrid systems. Here, innovation is a live-fire exercise from which we don't leave the field of battle until the lights are back on. In a recent assessment of Alaskan utilities and their capabilities, Peter Larsen, PhD, of Lawrence-Berkeley National Laboratory (LBNL) characterized Cordova Electric and a handful of other Alaskan utilities as "leaders and innovators". National Renewable Energy Laboratory (NREL) staff worked with the Native Village of Eyak (NVE) this April to evaluate the Cordova Renewable Energy Working group (CREW) and their successes. The CREW was founded by NVE and CEC in response to the energy and economic crisis of 2008. NREL concluded that Cordova can serve as a best-practices model and is a compelling site for a national laboratory outpost. This would marry the high technology of universities, national labs, and industry to field applications that refine and improve the technologies as they are integrated into the micro grid.

I want to underscore the importance of partnering. Cordova has organized many collaborations between utilities, the tribes and native corporations, NGO's, state and federal agencies, and the City. The soft technologies of planning, coordinating, and structuring these relationships and partnerships are often more critical to success than overcoming the financial or technical barriers.

Our hydro-diesel hybrid microgrid system operates on a highly automated, “smart grid” platform that maximizes the production of renewable hydropower and minimizes the use of diesel fuel. This improves economics and system reliability. The system is far from perfect, however, and our work is far from done. Several projects currently in progress will reduce diesel fuel use and build capacity and resiliency in the grid to move toward a fully automated and integrated smart grid. A smart grid will store excess energy or operate customer appliances and applications when renewables are available, or draw from storage and minimize customer use when renewables are not available.

CEC has just completed a joint effort with Sandia National Laboratories and ACEP that used over a decade of high-resolution data from CEC’s automation system to model energy storage on the Cordova grid. Adding energy storage will result in a sharp reduction of diesel fuel use and improved operating quality of the system. A request for proposals for implementing this storage project will consider alternatives for utility, tribal, private sector, or public partnerships on the commercial side, and various technologies for energy storage.

In my March testimony on infrastructure to this committee, I briefly discussed the Crater Lake Water and Power project. A Federal infrastructure investment in this shovel-ready water and renewable energy supply project to Cordova would result in the water and energy needed to create direct and supporting jobs, economy, and improved national trade balance for our growing fishing industry.

This year we are implementing fuel-saving energy efficiency improvements to our Orca diesel generation plant and deployment of electric vehicle and charging stations in Cordova. We are now researching variable-speed generator technologies and ultra-capacitor energy storage devices showcased at the Canadian off-grid conference in Cordova last week. We are working with our communications partner Cordova Telephone Cooperative to evaluate installation of fiber optic cables in existing, active, power supply conduits. This has been successfully practiced by Anchorage utilities to better utilize existing infrastructure, and would provide a necessary building block for full smart-grid capabilities. We are working with industry partners like Schweitzer Engineering Labs and ABB to continue our march toward full smart-grid capability and 100% local, renewable sourcing of our energy supply.

Our electric vehicle initiative is currently contemplating a partnership with the US Air Force (USAF) and local GSA partners Native Village of Eyak, City of Cordova, US Coast Guard, and US Forest Service to conclude a USAF pilot project to evaluate grid charge and discharge of electric vehicles. ACEP is facilitating the partnership. CEC’s microgrid offers the opportunity to test this capability and cold-weather performance of the vehicles, while building smart grid and storage capabilities and expertise for CEC. This also provides the opportunity for Cordova and Department of Defense and military branches to start partnering to develop remote and micro-grid applications on which we both rely. The US Coast Guard is currently considering Cordova as one of a handful of potential sites to deploy two new fast class cutters. We feel that our local grid capabilities and energy initiatives complement our low exposure to tsunamis, our top ranked public safety and schools and our proximity to Alaska pipeline oil tanker lanes and the largest commercial fishing fleet in the state of Alaska as an excellent location for Coast Guard assets to live and work in performing their mission of protecting our coastal communities and environment.

In summary, Cordova and other Alaskan utilities, tribes, organizations and partners are a unique contrast of need and capability that rely on the technical innovation and financial partnership of federally supported programs and projects. In return, we can deliver multiple value streams back to the Federal Government and industry partners.

Thank you for this opportunity to testify. I would encourage any questions you might ask, and strongly encourage you to support investments and partnerships in Cordova and other Alaskan opportunities where we have already established a foundation from which we can build a bright future.

Respectfully,

Clay Koplin