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Battery-Electric Fishing Vessel Marks a Sea Change for Small Commercial Fishers

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Modeling and analysis from NREL transportation researchers showed that a small commercial fishing vessel named *I Gotta* could be retrofitted with a hybrid battery-diesel system. The boat will make history as one of the first low-emissions fishing vessels ever deployed in Alaska. *Photo by Eric Jordan*

On a brisk morning next spring, a 46-foot commercial fishing boat will cruise into the cold waters of Sitka, Alaska, and cut the diesel engine. In that moment of near silence, an electric motor will whir to life. This moment will mark a sea change for Sitka's small-boat commercial fishing industry: a transition to energy-efficient commercial fishing, powered by low- and zero-emissions propulsion systems.

The boat in question, a small commercial salmon troller named *I Gotta*, will make history as one of the first low-emissions fishing vessels ever deployed in Alaska. Using a unique parallel hybrid battery-diesel system, the boat can travel at full speed using its diesel engine, then switch to a battery-electric motor when fishing. In this way, *I Gotta's* captain, Eric Jordan, will be able to cut the boat's fuel use by 80%.

Hybridizing the vessel has taken a village—and several years of collaboration. The project began when the Sitka-based [Alaska Longline Fishermen's Association](#) (ALFA) applied for support from the U.S. Department of Energy's (DOE's) [Energy Transitions Initiative Partnership Project](#) (ETIPP) to assess fishing vessel hybridization options. ETIPP paired the association with commercial vehicle

researchers from the National Renewable Energy Laboratory (NREL) and Sandia National Laboratories. And *I Gotta's* retrofitting has been funded with grant support from AgWest Farm Credit and Acme Seafoods and coordination and data support from Kempy Energetics.

But the partnership has goals far greater than hybridizing a single fishing boat. ALFA aims to inspire decarbonization efforts across its entire fleet—and beyond.

Making Headway To Lower-Emissions Operations

The shift to lower-emissions fishing has been slow to start—but not for lack of interest, said Linda Behnken, ALFA's executive director.

"We tend to be leaders in the climate and environmental space up here," said Behnken, who leads ALFA's Sitka-based cooperative of more than 160 small-boat commercial fishers, each committed to sustaining salmon fishing for future generations. "Our fishermen are really eager to reduce their greenhouse gas emissions and their fuel costs."

But, Behnken said, small fishers cannot risk being early adopters of a new technology if it might jeopardize their fishing season, even when high fuel costs eat up as much as 30% of their revenue.

To take some of the risk out of the equation, Behnken applied to join ETIPP, a network of regional organizations and DOE national laboratories that helps remote and island communities shift their energy systems toward renewable options.

Typically, ETIPP supports land-based communities. "But I thought, 'Well, we're a community of fishing boats. Let's see if they would support us advancing energy efficiency in our fleet,'" Behnken said.



Linda Behnken is the executive director of the Alaska Longline Fishermen's Association (ALFA). Photo by Bethany Goodrich

ALFA was accepted to the program in 2021, and ETIPP matched the fishing cooperative with NREL and Sandia transportation energy researchers who specialize in technical assistance for commercial vehicle decarbonization.

They faced a question: Which technologies would help a small fishing boat cut its fuel dependency without sacrificing speed or range?

Using years of operational data from ALFA's fleet, the NREL and Sandia research team considered potential solutions.

"Our teammates from Sandia looked at running the boat off of next-generation fuels like hydrogen, ammonia, and biofuels. We also considered fully battery-electric scenarios and the charging and filling infrastructure that would be needed," said NREL's Michael Lammert, a commercial vehicle electrification researcher and the project's principal investigator. "Once we looked at the data, built the models, and ran the analysis, it became clear that a plug-in hybrid model was the right path forward for this boat."

Together, NREL researchers and ALFA project partners selected the **Transfluid hybrid propulsion system** that will allow *I Gotta* to switch between a diesel engine for top speeds and a battery-electric motor to cruise through favored fishing spots. The electricity to run the boat will come from Sitka's hydroelectric dams, meaning that it will come from 100% renewable sources and therefore significantly reduce the boat's greenhouse gas emissions. Moreover, *I Gotta's* hybrid system will be "smart"—capable of optimizing the use of both the engine and motor—and the boat will be equipped with data loggers to measure the actual achieved fuel efficiency.

Each of these investments will help ALFA's fishers chart a path forward to lower-emissions operations.

Low- and Zero-Emissions Operations To Ripple Across Alaska

Later this year, ALFA will contract with local boat builders to begin retrofitting *I Gotta* with its hybrid system. But the work will not stop there. Renewed funding from DOE's Office of Energy Efficiency and Renewable Energy will allow ALFA to begin testing not one but three novel propulsion systems that consider different ways fishing boats travel.

The first, a series hybrid system, will allow fishing boats the flexibility to travel either short or long distances while minimizing diesel fuel use. The series system uses an electric motor to power the propeller at all boat speeds and a battery to power the motor, allowing boats to travel their typical 10- to 20-mile routes under battery-electric power. These batteries can be charged at a dock using Sitka's 100% renewable hydroelectric dams. In the rare case that a captain needs to travel hundreds of miles for an extended trip, they can recharge the boat's batteries with an onboard diesel generator.

ALFA will also test a fully battery-electric system for mariculture vessels, which cultivate fish, shellfish, and aquatic plants. These vessels stay within 10 miles of shore and follow regular transit schedules, making them candidates for full electrification. Most importantly, by transitioning these vessels to zero-emissions operations, ALFA will eliminate the risk of fuel spills close to shore or near vulnerable aquatic species.

Finally, ALFA will assess an additional parallel hybrid system, like the one chosen for *I Gotta*, to demonstrate its effectiveness in different operating conditions.

Most importantly, local boatbuilders will handle the installations for each vessel, helping Sitkans learn how to install and service low- and zero-emissions systems. ALFA is planning significant outreach, training, and education opportunities to familiarize the Sitka community with opportunities to get involved in the effort and to make the fishing fleet aware of the project.

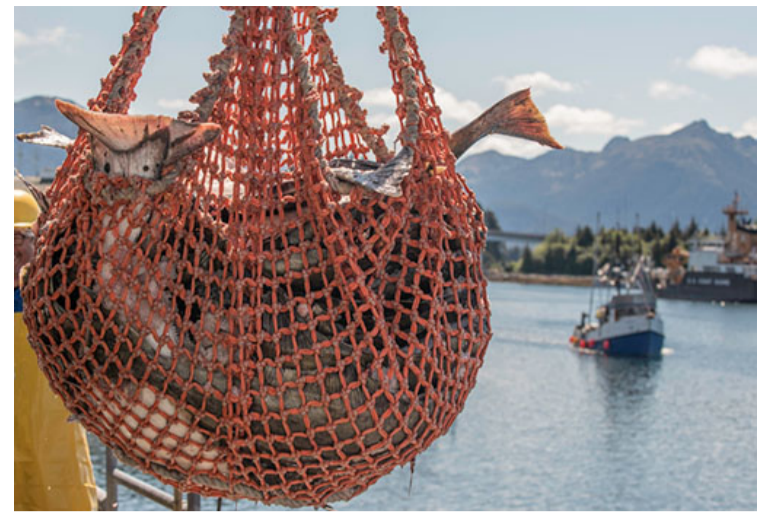
This is all part of Behnken's vision: to build local expertise in low-emissions propulsion systems, de-risk emerging technologies, and remove the barriers to deep decarbonization of the marine space.

"Everybody who fishes up here cares about the ocean. We care about our legacy to the next generation of fishermen and people who live in these coastal communities," Behnken said. "This isn't just a way to earn a living—it's a way of life. And this is a way to honor our deep commitment to the ocean, all while we become better at what we do."

The community of Sitka, Behnken said, is the right place to begin this work. But she also plans for the work to ripple outward into the maritime community as a whole.

"Our goal is to inspire decarbonization across more fleets," she said. "We hope to set an example by walking the walk and showing how it can be done. We're building local capacity here in Sitka knowing that the lessons we learn here can be applied elsewhere. And we really hope they will."

Learn more about NREL's [sustainable transportation and mobility research](#) and its specific focus on [commercial vehicle decarbonization](#). And sign up for NREL's quarterly transportation and mobility research newsletter, [Sustainable Mobility Matters](#), to stay current on the latest news.



Since 1978, ALFA has worked to safeguard ocean health and improve the economic viability of small boat fishing. *Photo courtesy of ASMI, Josh Roper Photography*

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