POLICY PROFILE

Alaska Heat Recovery and Rural Power System Upgrade Incentives

Program Description

The Alaska Energy Authority (AEA) Heat Recovery Program provides technical assistance and technology evaluation to rural communities that are interested in innovative heat recovery technology, including combined heat and power (CHP).[1] The Heat Recovery Program is part of the Rural Power Systems Upgrade (RPSU) program, which is authorized under Alaska Administrative Code Title 3, Chapter 108, to provide eligible recipients with financial and technical assistance, including construction management and training.[2]

Quick Facts

LOCATION: Alaska
MARKET SECTOR: State and Utility Collaboration
Program Type: Technical and design assistance, financial incentives
Geography: Rural communities
Program Start: 2008

Power system upgrades may include efficiency improvements, powerhouse upgrades or replacements, line assessments, lines to new customers, demand-side improvements, heat recovery, and repairs to generation and distribution systems. Funding comes from Alaska legislative appropriations, the Denali Commission, and other matching funds. To be eligible, the recipient must contribute to the project in some form such as providing a cash match, property, or services. The AEA may choose to employ a phased approach, including helping with a conceptual design or other planning documents, to determine whether to provide additional assistance.

Diesel engine with attached heat recovery system at the Point Lay Powerhouse in Alaska's North Slope Borough.

SOURCE: AEA

In isolated rural communities throughout Alaska not served by a power transmission system, electricity is generated by small local generation and distribution systems, or microgrids, using diesel fuel at a cost that is three to five times higher than in urban parts of the state.[3] Of the 200 rural Alaska communities, about half are served by cooperatives or another form of utility. Other communities are served by a variety of very small local electrical power suppliers, including many that face technical and administrative challenges due to lack of economies of scale and/or specialized skills.

More than 80 communities in rural Alaska currently use recovered heat from their powerhouses' diesel generators for space heating or other thermal energy needs, such as domestic water supplies or wastewater, both of which must be heated in arctic conditions. The AEA continues to support the design and installation of heat recovery systems in communities where engine heat resources are not utilized and to expand existing heat recovery systems.

Stakeholders and Partnerships

The Alaska Native Tribal Health Consortium (ANTHC)[4], AEA, the Alaska Village Electrical Cooperative, and small, independent electrical cooperatives meet periodically to prioritize communities for heat recovery feasibility studies. Up to seven studies are completed annually with funding from ANTHC and AEA. The studies provide all the required information for a community to apply for design and construction funding.[1] Since 2008, approximately 50 heat recovery systems have been updated or newly installed in rural Alaska. Through the Renewable Energy Fund (REF) grant program and RPSU

[1] AEA Heat Recovery: http://www.akenergyauthority.org/Programs/AEEE/HeatRecovery
[2] Alaska Administrative Code Title 3, Chapter 108: http://www.legis.state.ak.us/basis/aac.asp#3.108.100
[3] AEA Rural Power System Upgrade program: http://www.akenergyauthority.org/Programs/RPSU
[4] ANTHC Rural Energy Initiative: https://anthc.org/what-we-do/rural-energy/rural-energy-initiative/

program, approximately 35 feasibility studies have been completed, with 22 systems recently starting operations and 7 systems in the design and construction phase.

Hoonah Heat Recovery Project

In partnership with AEA, the Inside Passage Electric Cooperative (IPEC) completed a heat recovery project in Hoonah, Alaska, in August 2012.[5] Hoonah is a Tlingit community with a population of about 800. The power plant consists of four gensets: two Caterpillar 3456 engines rated at 455 kW each, which were added with this project, and two Caterpillar 3512 engines rated at 855 kW and 1,000 kW. Heat from engine jacket water and the exhaust manifold is recovered and distributed through underground piping to provide space heating for community buildings, including elder housing, the fire hall, the police hall, a school, a swimming pool, and the old powerhouse. In 2017, 6,950 MMBtu of heat was recovered for space heating, offsetting 50,000 gallons of diesel and saving $158,000 in fuel costs.[6] The project is also anticipated to reduce future capital costs of replacing the power plant's aging, non-compliant fuel systems by reducing on-site fuel storage needs. The total installed cost of the project was $1.3 million. AEA provided a grant of $475,000, covering the cost of the heat recovery system. The Denali Commission and the State of Alaska provided the remaining funds. The economic benefit is split between end users and IPEC through a heat sales agreement.[7]

Unalaska, Alaska

With AEA support, the city of Unalaska installed three 50 kW ElectraTherm "Green Machine" organic rankine cycle (ORC) turbines at the Dutch Harbor Power Plant in 2014. These ORCs generate electricity in a bottoming cycle from the waste heat of the plant's diesel engines, routinely operating between 45 kW and 70 kW, depending on the loads of each engine.[8] A bottoming cycle improves overall plant efficiency in applications that lack a suitable thermal load in close proximity to the diesel plant. To operate at full capacity, each 50 kW Green Machine ORC requires 500 kW of waste heat, indicating that this technology is best suited for communities with 1 MW or more of diesel generation.[9] In 2017, the project generated 686,000 kWh of electricity from waste heat recovery, offsetting 43,000 gallons of diesel generation and saving $93,000 in fuel costs.[6]

ElectraTherm Green Machine ORC turbine

SOURCE: ALASKA CENTER FOR ENERGY AND POWER

Lessons to Share

- Initial testing has shown that ORC economics are challenging when installed as a retrofit for heat recovery from existing generation, even in rural Alaska. Total installed costs of a retrofit project are, in general, two to three times the installed cost of the ORC unit itself.[9] Maintenance costs can also be an impediment to development. ORCs implemented as an integral part of a ground-up new generator design and installation can be more cost-effective.
- Pre-purchase of spare parts to maintain an onsite inventory and to provide redundancy of critical components, such as circulating pumps, is critical for maintaining uptime and maximizing generating potential, especially in remote Alaska locations where getting parts delivered can take months.

For More Information

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ALASKA ENERGY AUTHORITY, HEAT RECOVERY
http://www.akenergyauthority.org/What-We-Do/Energy-Technology-Programs/Heat-Recovery

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http://www.nwchptap.org

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[5] AEA Hoonah Heat Recovery Project
http://www.akenergyauthority.org/Portals/0/Programs/AEEE/Biomass/CaseStudy/Hoonah%20Heat%20Recovery%20Project.pdf?ver=2016-09-07-141018-823

[6] AEA Renewable Energy Fund, "Status Report 2019"
http://www.akenergyauthority.org/Portals/0/Programs/RenewableEnergyFund/Documents/REF%202019%20status%20report%20Electronic%203.18.19.pdf

[7] Alaska Industrial Development and Export Authority, "687 Hoonah Heat Recovery"
ftp://www.aidea.org/RENEWABLE%20ENERGY%20FUND/Round%204%20September%202010/687_IPEC_Hoonah%20Heat%20Recovery%20Project/Hoonah%20HR-REF-Final.Application.pdf

[8] City of Unalaska, Alaska, "Waste Heat Recovery Project" https://www.ci.unalaska.ak.us/publicutilities/page/waste-heat-recovery-project

[9] https://aip.scitation.org/doi/abs/10.1063/1.4986583