



Power and Heat for Remote Alaska Communities

Alaska Village Electric Cooperative

Program Description

The Alaska Village Electric Cooperative (AVEC) is a non-profit electrical utility that provides electrical energy to 58 communities in rural Alaska. AVEC's 90 full-time employees and 95 part-time village powerplant operators maintain and run over 170 diesel engine generators at 58 remote sites. The typical village served by the cooperative has a population of about 400 individuals with an average load of 140 kW. The total number of AVEC connected meters is 11,431. In 2018, AVEC consumed about 8.5 million gallons of diesel fuel to generate a total of 126.2 million kWh of electrical energy.

The Alaska Energy Authority's (AEA's) Rural Power System Upgrade program has provided resources to include heat recovery in powerhouses. The heat is recovered from the diesel engines and sold to offset fuel oil use at water systems, schools, health clinics, and other public buildings.

Quick Facts

Location: Villages throughout western Alaska

Market Sector: Community power and thermal energy sales

Cooperative Size: 170 diesel generators and 36 wind turbines serving 11,431 customers

Equipment: 58 CHP projects with over 170 diesel engines and 500+ fuel tanks

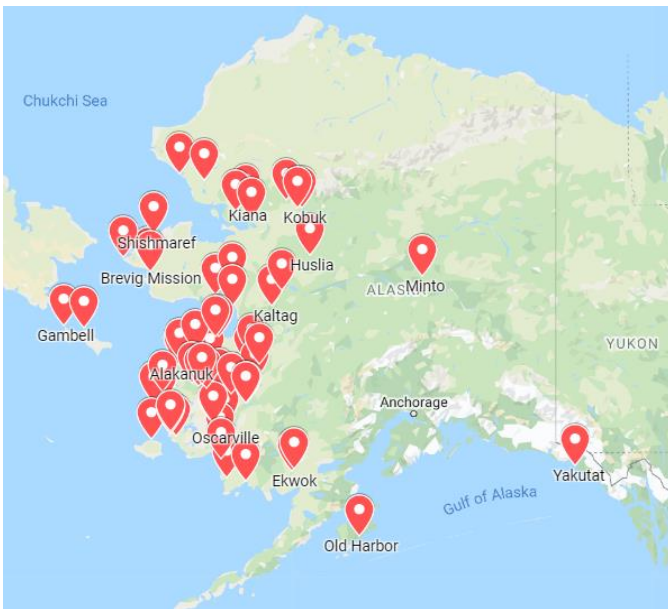
Fuel: 8.5 million gallons per year of diesel fuel use

Thermal Energy: Waste heat used in district heating loops for water treatment plant, school, health clinic, and other public building heating

Yearly Energy Generation: Annual sales of 118,333,000 kWh (2018)

CHP Operation Start: 1968

Formation of the Electric Cooperative



The member-owned Alaska Village Electric Cooperative operates over 170 diesel generators to provide electrical service to 58 rural villages in Alaska.

Remote village members of the cooperative practice subsistence lifestyles, including fishing (from nets to fish wheels), whaling, hunting, trapping, and private enterprise. Almost all the remote communities are accessible only by airplane or marine vessel. In the 1960s, nearly none of the remote villages had central station electricity, and families would burn whale or seal oil for light. There were no sanitation services, so illness was prevalent.

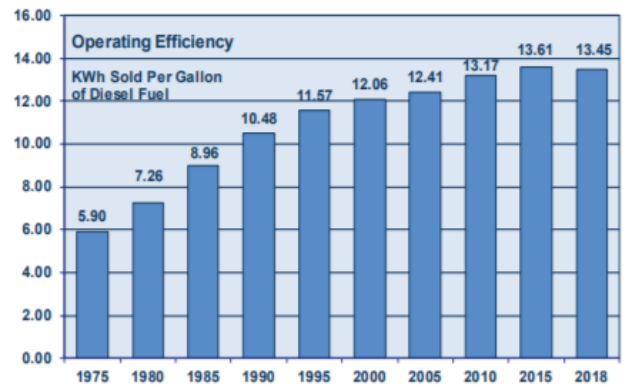
The state governor at that time convened a task force to examine ways to bring electrical service to rural Alaskan communities. It was determined that no individual small community was capable of supporting a viable, self-sustaining utility, so an amalgamated model was required. Hence AVEC was established in 1967, with electrical service available to its first three community members in 1968.

Managing Fuel Costs and Improving Efficiency

Diesel fuel is expensive in the remote Alaska villages, with delivery and storage often exceeding the cost of the fuel itself. There are no economies of scale, and in 2018, residential electricity costs amounted to about \$0.4845/kWh,

with commercial sector energy costs at about \$0.3816/kWh. AVEC has developed multiple strategies to reduce energy costs, including adding new communities to the cooperative, interconnecting remote villages when possible, improving diesel engine efficiency, adding renewables (wind and solar) when feasible, reducing line losses, and recovering and selling more waste heat.

Interconnecting communities improves diesel efficiencies and may enable the shut-down of a power plant, but the intertied village may lose its ability to recover heat. Current practice is to sell recovered heat for 30% to 50% of its fuel value. Thermal sales allow AVEC to absorb cost increases without raising electrical energy rates.



Diesel engine upgrades improve powerplant efficiency. AVEC now gets about 13.5 kWh per gallon of diesel fuel consumed.

AVEC's Newest Powerplant Upgrade

AVEC's newest fuel-efficient powerplant, located in Togiak, Alaska, underwent commissioning in 2018. This project consisted of constructing a new powerhouse designed to meet future electrical demand. The plant contains a total generating capacity of 2,687 kW: two Caterpillar 3456 engines rated at 570 kW, one Caterpillar 3512 rated at 1102 kW, and one Caterpillar 3456 rated at 445 kW. The original powerhouse was retired. The project also included placing 12 new 30,000-gallon bulk fuel storage tanks in a fenced and earthen-lined secondary containment system. Switchgear and feeder equipment for the power plant were replaced. Recovered heat from the engines is provided to the water treatment plant, city office, and library/garage facilities. This approach is expected to save 13,690 gallons per year of fuel oil.



AVEC built a new 360,000-gallon bulk fuel storage facility.

Decreasing Diesel Fuel Dependence

AVEC constructed and operates two tug and barge sets, facilitating diesel fuel delivery and scheduling and reducing transportation costs. The operation also delivers fuel to non-AVEC communities, as well as conveying equipment and other deck cargo, leading to additional cost savings. AVEC has also constructed two solar systems and installed 36 wind turbines serving twenty customer communities. In 2018, the wind turbines generated 4.95 million kWh (3.4% of total generation) and displaced an estimated 360,000 gallons of diesel fuel.

Joining the Cooperative

By constructing microgrids, AVEC has introduced a stable supply of electrical energy to member communities. A community may join AVEC if a management assessment is favorable. The assessment examines power plant condition, fuel storage, distribution system condition, thermal sales, and the ability of energy sales to cover incremental costs.

For more information about the AEA Rural Power System Upgrade Program, visit www.akenergyauthority.org/What-We-Do/Rural-Energy-Assistance/Rural-Power-System-Upgrade-Program.

For More Information

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