

Challenges to Providing Recovered Heat

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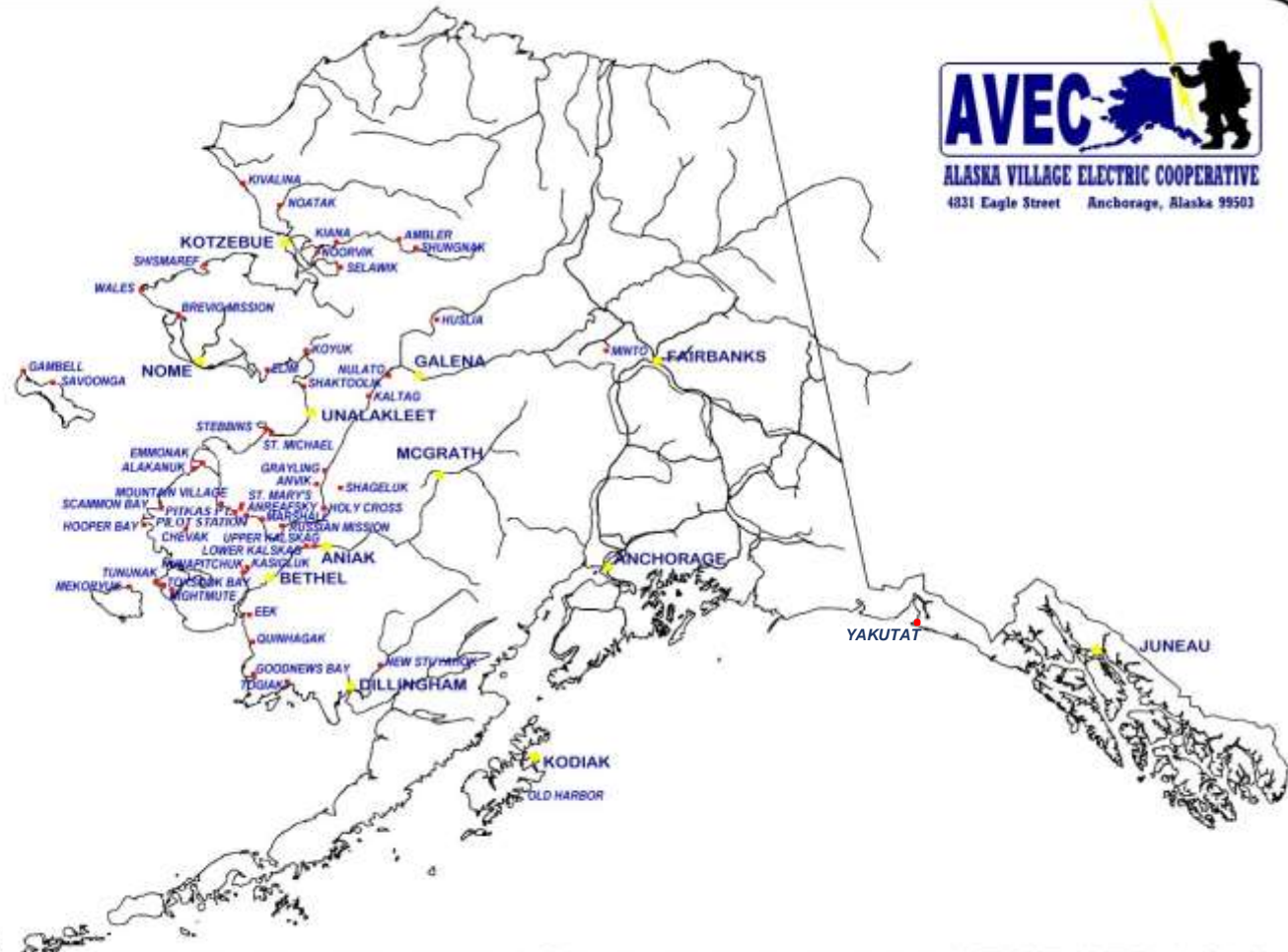
Just some numbers....

- 58 Alaska communities
- 90 full time employees
- 125 village plant operators
- 11,000 services
- 48 power plants
- 170+ diesel generators
- 500+ fuel tanks
- 8.5 million gallons of diesel per year
- 34 wind turbines at 11 sites, serving 15 villages
- 2 Solar PV projects in Kaltag and Noorvik
- Two tug and barge sets





ALASKA VILLAGE ELECTRIC COOPERATIVE
4831 Eagle Street Anchorage, Alaska 99503



MAP OF ALASKA VILLAGE ELECTRIC COOPERATIVE VILLAGES

System Numbers

- 1974: St. Mary's, 1st
- 2017: Russian Mission, last
- 27 installed
- 18 functional
- 4 Wind to Heat
- 6 in progress with ANTHC partnership



Space is a Challenge
New Power Plants cost between \$600 and \$700 per sq foot.



Emmonak

In older plants space is hard to come by . . .



Saint Mary's

Sometimes there is no space



Ambler Power Plant with HR Module

Maintaining the Heat Recovery System is a Challenge

- Marine manifolds add to engine maintenance and overhauls
- Additional coolant piping, mixing valves, BTU Meters, Panels



Quinhagak



Emmonak

Additional Costs:

- If the excess heat is not used, the radiator drives and motors will need to operate more to dispose of the extra heat
- Additional pumping adds to station service
- Plant Operators monitoring system
- Engineering / Operations trouble shooting problems
- Mechanics for system repairs



Flat plate heat exchanger in AVEC's Stebbins Power Plant.

How AVEC Funds Costs for Recovered Heat

AVEC charges end users 30% of offset fuel cost:

- For example, a building in Quinhagak utilizes 5,000 gallons of heating fuel a year. Engineering determines the heat recovery system will be able to supply 5,000 gallons of equivalent heat.
 - Without HR: 5,000 gallons x \$5/gallon [2016 heating fuel cost in Quinhagak per 2016 Fuel Report] = \$25,000/year
 - With HR: 5,000 gallons x (\$2.637/gallon [2016 AVEC Cost Delivered] x 30%) = \$3,956/year
 - Recipient saves \$25,000 - \$3,956 = \$21,045/year

That's \$21,045 that stays in the Village!

AVEC Recovered Heat Policy

- Where available, and not incompatible with electric power generation operations, AVEC will make excess engine jacket water heat available for sale and purchase to qualified users on an interruptible basis.
- AVEC will not make engine exhaust heat available through stack recovery systems due to their maintenance and cleaning requirements.



Toksook Bay



Minto



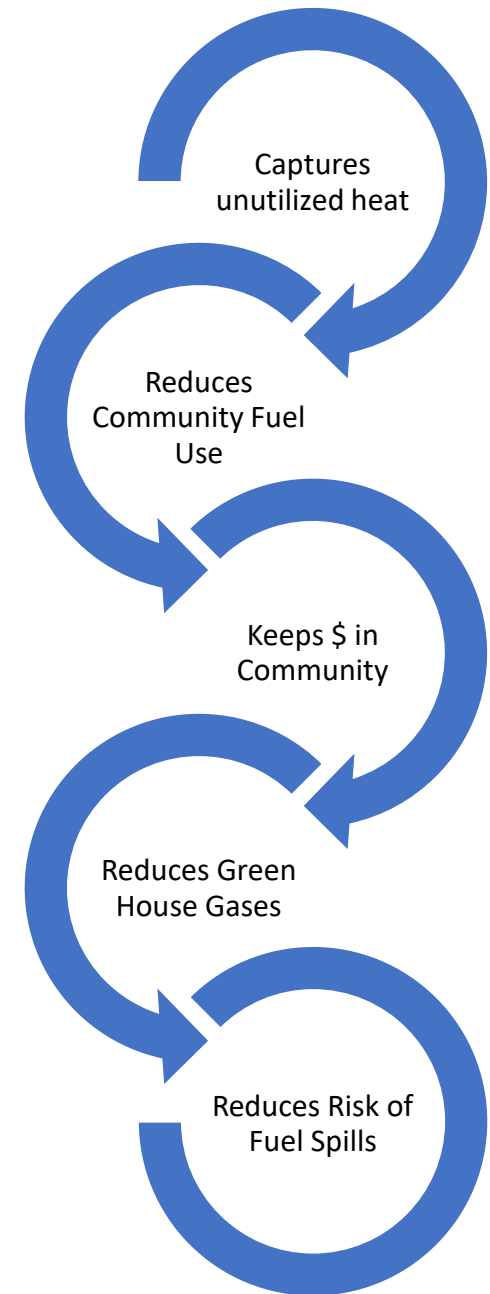
Goodnews Bay


Heat Sales Agreement

- Contractual Responsibilities
 - Provider
 - Supply the Heat
 - Maintain the system up to the demarcation point
 - Purchaser
 - Pay for the Heat
 - Maintain the system from the demarcation point

Benefits of Recovered Heat

- Captures unutilized energy generated by power plant
- Reduces community building heating fuel usage
- May lower utility rates (water & sewer)
- Keeps money in the community
- Reduces green house gases
- Reduces chance of fuel spills in the community



A group of children in winter gear are playing in the snow in front of a building with a "Post Office" sign. The children are wearing various winter coats, hats, and gloves. Some are waving or running towards the camera. The scene is bright and sunny, with shadows cast on the snow. The building in the background is blue and white, with a "Post Office" sign featuring the eagle logo. There are also some vehicles, possibly snowmobiles, parked in the background.

Thank you!

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