

Ground Source Heat Pumps: An Energy Solution For Sustainable Alaskan Communities

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Our Purpose

The Alaska Native Tribal Health Consortium's (ANTHC) Rural Energy Initiative works with communities to implement innovative energy efficiency and renewable energy solutions to make public infrastructure affordable for the people we serve across Alaska.





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Ground Source Heat Pump Basics

- GSHP captures heat from the ground via geothermal wells or loop field
- Using electric power, heat energy is transferred to facility using circulating pumps, where it is extracted with a water-to-water heat pump
- Typical COP: 2 4 (200-400% efficient)
- GSHP Components
 - Ground Loop
 - Heat Pump
 - Building Heat Distribution
- Basic Configurations:
 - Closed vs. Open Loop
 - Horizontal vs. Vertical Loops





Ground Source Heat Pump Basics





Ground Source Heat Pump Basics





- Energy savings from GSHPs comes with a high upfront capital cost
- Less costly if part of new construction vs. retrofit
- Best paybacks where climate is mild, electric costs are low and heating fuel costs are high
- Utility grid stability considerations:
 - Added electric load if transitioning from oil
 - Decreased load if replacing resistive heating
- Subsurface impacts in cold regions:
 - Creation of permafrost and damage due to frost heaving

































ALASKA NATIVE TRIBAL HEALTH CONSORTIUM

- Vertical Well GSHP system will replace oil fired heating at the Lepquinum Pool & Wellness Center
- 750,000 BTU/hr GSHP will cover 94% of yearly heating load
- Building heating system upgrades include:
 - Covert heating system from 180 deg to 115 deg
 - New heating coils in air handling units
 - Efficient variable speed heat system pumps and fan motors
 - Domestic hot water GSHP pre-heat and boost heat
 - Replace old HVAC controls with modern Direct Digital Control (DDC) system
- 2 existing oil-fired boilers will remain as backup and for peak heating











- 58 Boreholes: 350 feet deep, 6" diameter
- Approx. 40,000 feet of 1" 3" HDPE piping



- The GSHP produces heat at 275% efficiency, vs. 70% for oil boilers and 95% for electric boilers.
- Future pricing of geothermal heat is also more consistent and less prone to inflation compared to fossil fuels



From Metlakatla GSHP Feasibility Analysis by Alaska Energy Engineering



- The Lepquinum GSSHP system is projected to:
 - Displace 47,200 gal of heating fuel per year
 - Save \$203,000 in annual energy costs
 - Reduce annual energy costs by 73%

	Fuel Oil		Electricity		Total	
Option	Gallons	Cost	kWh	Cost	Cost	%
Existing Building	49,500	\$244,000	296,000	\$34,000	\$278,000	100%
Ground Source Heat Pump	-47,200	-\$233,000	269,000	\$30,000	-\$203,000	73%
Total	2,300	\$11,000	564,000	\$64,000	\$75,000	27%

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Thank You

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For more information, please visit: http://anthc.org/what-we-do/rural-energy/

