Bernie Karl
Proprietor of Chena Hot Springs Resort
and Chena Power, LLC

SUSTAINABLE IS ATTAINABLE

Chena Hot Springs Resort

The Chena Vision

Become a self-sustaining community in terms of energy, food, and fuel to the greatest possible extent.

CHENA HOT SPRINGS RESORT

Chena Hot Springs Renewables

Geothermal Generator

Water Ram Irrigation System

Geothermal District Heating System

Year Round Ice Museum

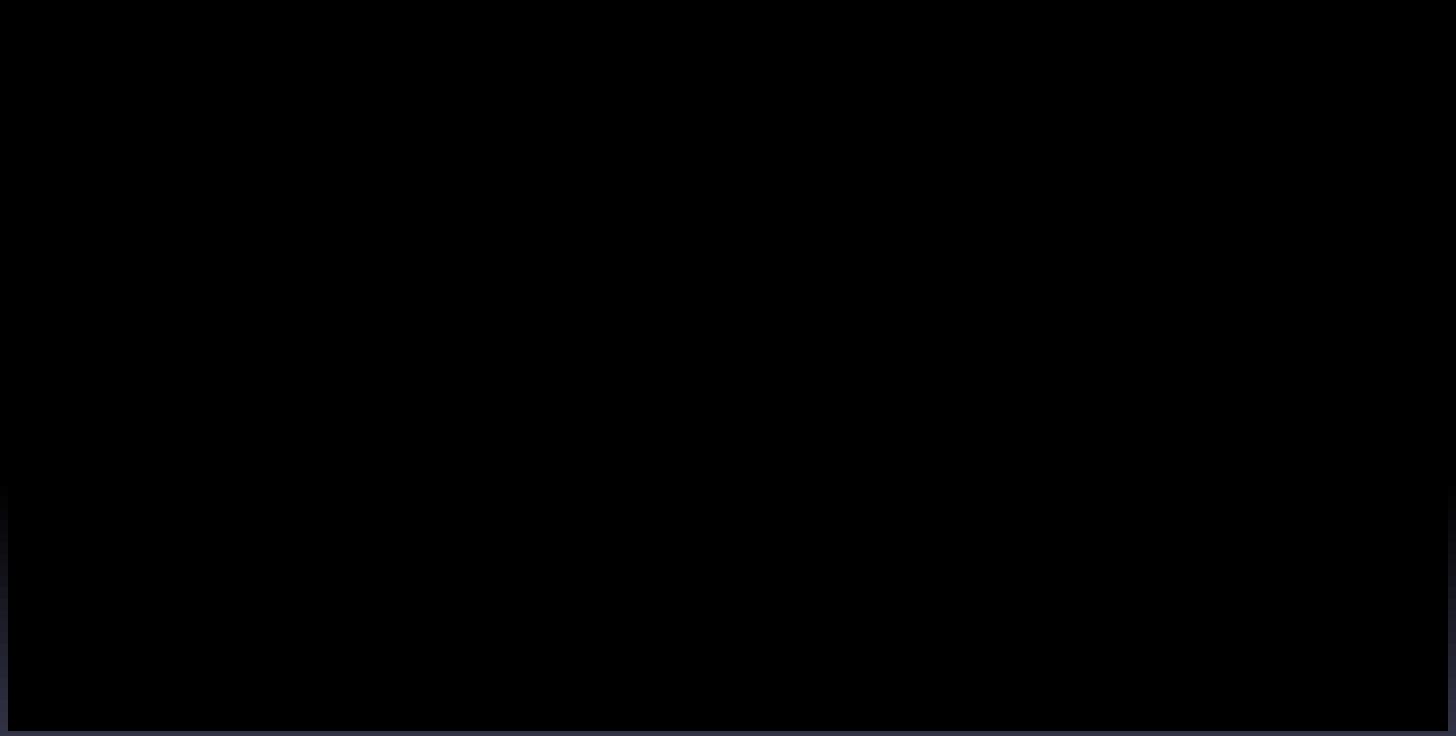
Year Round Production Greenhouse

All Season Feed System

**Just a few of Chena's many renewable projects.*

CHENA HOT SPRINGS RESORT

How an ORC Works



Chena Hot Springs Geothermal Power Plant

- 400 kW net; installed in 2006
- Uses 900 gpm of 160°F water
- Air and water cooled
- Reduced local cost of power from 30¢ to 5¢
- Total project cost $2 million
- Savings of $500,000 in 2009
- Simple Payback: 4 years

CHENA HOT SPRINGS RESORT

Chena Power Mobile Geothermal Power Plant

- Revolutionary Unit
- Operates on waste heat and water from existing oil and gas drill sites
- Assembled in Fairbanks
- If deployed to all existing fields in Texas alone, would generate 10,000 megawatts of power (about 10 nuclear reactors)

CHENA HOT SPRINGS RESORT

Where has the Mobile ORC been?

Chena Power Mobile Geothermal Power Plant

Chena Hot Springs Resort, Chena Hot Springs, Alaska

Aurora Energy, Fairbanks, Alaska

Pepper Mill Resort & Casino, Reno, Nevada

Gardner Green Energy, Beryl, Utah

CHENA HOT SPRINGS RESORT

Chena Fresh Greenhouse

- Completed in 2006 (43,825 hours of operation so far)
- Cooperative project between UAF and Chena
- Approximately 5000ft^2 plus 1600ft^2 addition
- Requires 60kW for lighting
- Crops include Tomatoes, herbs, lettuce, green beans, bedding plants, cucumbers
- 150-300 lbs tomatoes harvested per week
- 40 heads lettuce/day

CHENA HOT SPRINGS RESORT

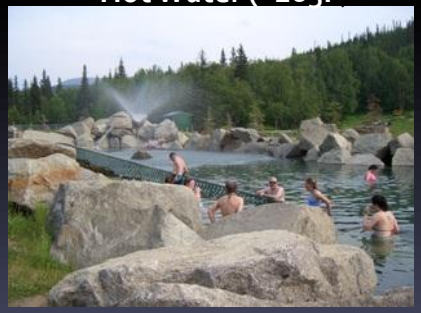
Three Pressure Absorption Chiller

CHENA HOT SPRINGS RESORT

Three Pressure Absorption Chiller

Monument Creek Provides Cooling Water (~40F)

Geothermal Wells Provide Hot Water (~165F



Approximately 15 tons of Refrigeration Required for Ice Museum (180,000 BTU per hour)

CHENA HOT SPRINGS RESORT

Future Drilling at Chena

- A team from the University of Alaska Fairbanks conducted interference testing on the wells at Chena Hot Springs to gather data from the reservoir in 2009.
- From the data collected they inferred that production could benefit if the water could be re-injected at greater depths, thus allowing it to be closer to the geothermal source for a longer period allowing for increased heat extraction.
- **Chena believes that deepening well TG-8 and well 2 will provide the best chance to increase the geothermal capacity of the reservoir.**
- **Chena intends to drill two usable wells: a production well at 2,500ft and a reinjection well at 2,700ft**.

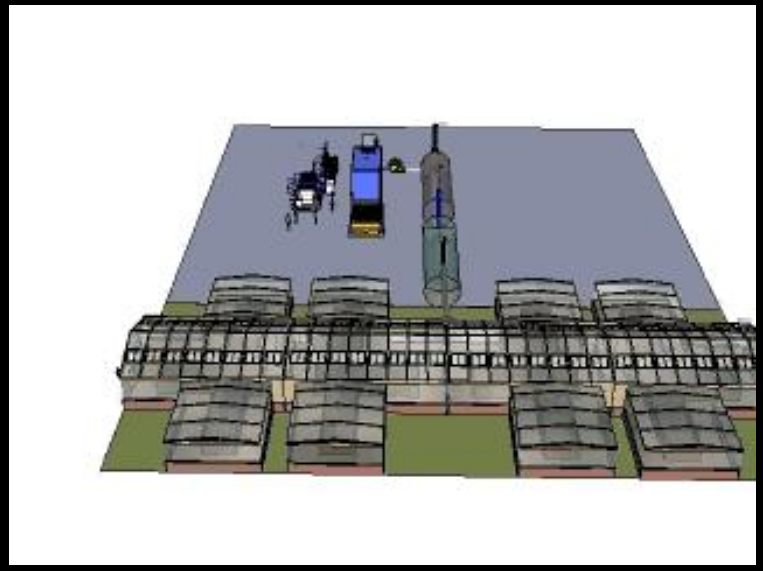
- The geochemical indicators that were studied in the mid 2000s were indicative of a resource in the 200°F temperature range. **If we find such temperatures we would then be able to expand the capacity of the Chena geothermal power plant. This would allow for economically viable expansion at the Resort, as well as the possibility of tying Chena into the local power grid, thus providing Golden Valley Electric Association, and FNSB residents with more sources of renewable energy.** Chena currently has the equipment to generate an additional 250kW of electricity when additional heat is recovered and has the necessary shop space to install equipment capable of producing **4.5MW of electricity**.
- The total project cost to drill the two wells will be an estimated $2,112,000.00

Drilling at Chena is accomplished using 2000 psi of air and 300 gpm of water.

CHENA HOT SPRINGS RESORT

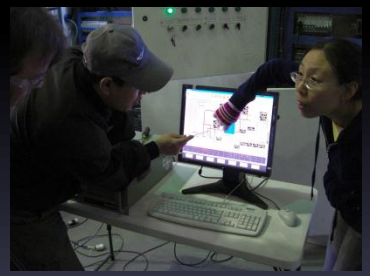
Chena Power, LLC
Clean Biomass Power Plant

- 600kW gross, 500kW net output
- Fuel is 5000 tons of paper, cardboard and brush supplemented with farmed willow
- Designed for rural village application – thermal oil boiler
- Increased efficiency over geothermal installation through addition of a topping cycle
- Co-located with heat load (space heating, greenhouses)
- CO_2 capture through food production and algae based biofuel production



Cardboard bales ready to be used as fuel to power the power plant

Boiler fuel intake



Engineers doing a system check

CHENA HOT SPRINGS RESORT

Sustainable is Attainable

CHENA HOT SPRINGS RESORT

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CHENA POWER

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"Do what you can, with what you have, where you are."
-President Theodore Roosevelt

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