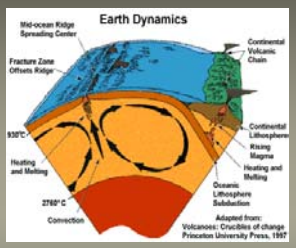
Geothermal Power

We James Olsen, Antoinette Jones, Nichole Doehring, and Rob Rogers, members of the group presenting on geothermal power, give Southern Illinois University Edwardsville permission to put our presentation on e-reserve at Lovejoy Library.

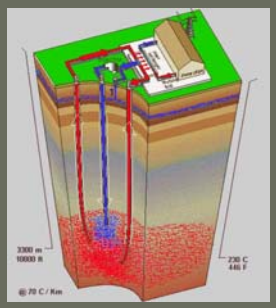
What is Geothermal Power???

- Geothermal means “heat from earth”
- Due to the dynamics of crustal plate movement, high heat is closer to the surface in certain areas
- Deep circulation of ground water brings this heat even closer to the surface
- This is seen with hot spring and geysers



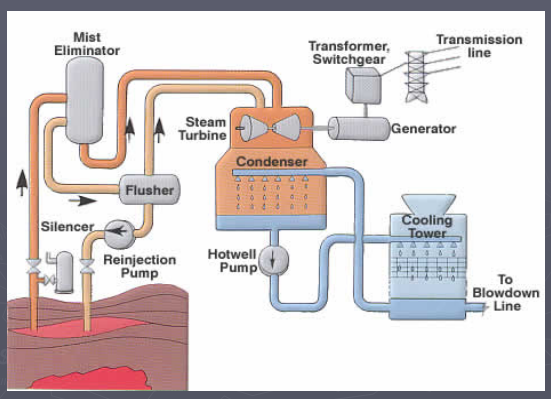
What is Geothermal Power Continued…

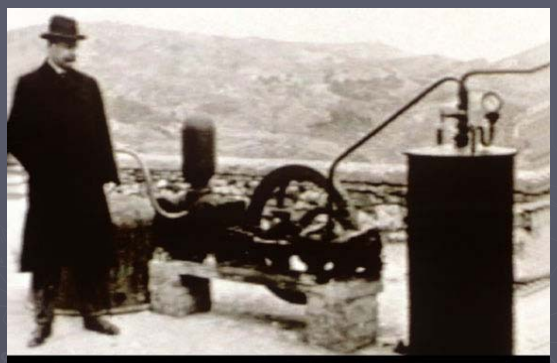
- Hot water is pumped out of the ground and into a plant where it is transformed into energy
- The water is then returned to the ground to be reheated
- This return of the water prevents the ground water supply from being depleted



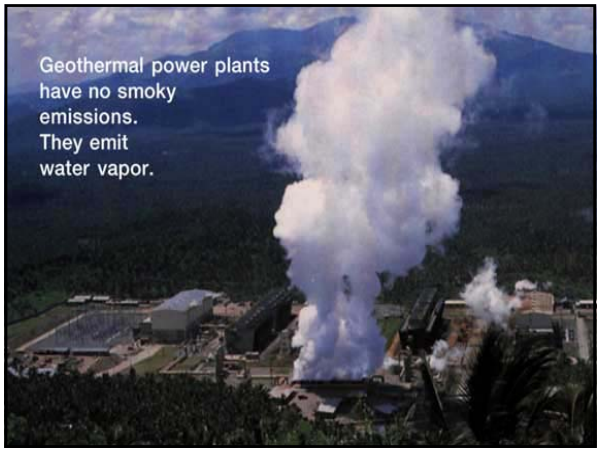
How is the hot water turned into power?

- Steam is separated from the water
- This steam is used to drive a steam turbine
- The turbine drives an electric generator which provides power





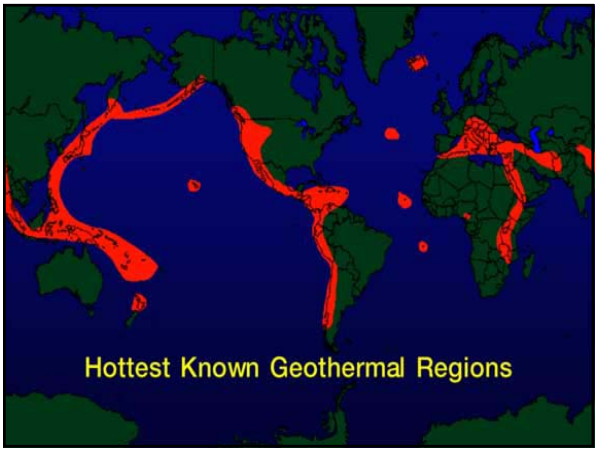
First Geothermal Power Plant, 1904, Larderello, Italy



Compare to Coal Power

Where does Geothermal Power Work Best?

- In areas with a great deal of plate movement
  - Subduction Zones: Where the Earth's oceanic and crustal plates collide and one slide beneath another
  - These areas contain volcanic "hot spots" under the crust… even though there may or may not be actual volcanoes present.
  - Examples
    - The Pacific Ring of Fire
    - The San Andreas Fault area
    - The Aleutian Range in Alaska
- In other geological "hot spots"
  - Such as Yellowstone National Park



Will Geothermal Power work in Illinois???

- Not for traditional geothermal power plants
  - No significant tectonic or volcanic activity in this area
- However, It will work to heat and cool buildings
  - The Earth's temperature just below ground is relatively constant everywhere in the world
  - Air temperature changes in Winter and Summer, but the subsurface stays a constant temperature (about 45 – 58 degrees F)
  - Geothermal Heat Pumps are designed to take advantage of this and heat/cool buildings

So what is a geothermal heat pump and how does it work?

- Water is pumped in a loop going from the ground into a home
- The temperature of the water is used to cool and/or heat the home

Is a geothermal heat pump practical?

- EPA states that geothermal heat pump technology is THE MOST energy-efficient, environmentally clean and cost-effective space conditioning system available.
  - Energy costs are 25-50% less than other HVAC systems.
- Iceland homes
  - 89% geothermal energy
  - 10% electricity
  - 1% wood, coal, and oil

IN FACT…

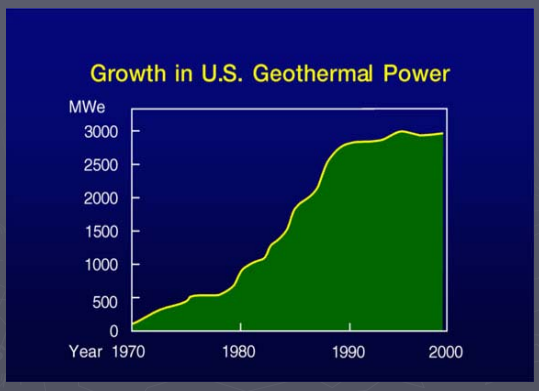
- The 500,000+ geothermal heat pumps currently installed in the US result in an annual savings of 4 billion kilowatt- hours of electricity
  - This eliminates the need for 20 trillion BTU's of fossil fuels
  - It cuts peak electricity demand by 1.3 million kilowatts
  - Also cuts greenhouse gas emissions by 3 million tons of CO_2
- This would be equivalent to:
  - Converting 650,000 cars to zero-emission vehicles
  - Reducing the reliance on foreign fuels by 11 million barrels of crude oil per year
  - Eliminating on 1,300 MW power plant

What does it cost?

- Costs of geothermal electricity vary dependent on the quality of the resource and the size of the plant
- Costs currently range from 2.5 to over 10 cents per kilowatt hour
- Major factors affecting cost are the depth and temperature of the resource
- Other factors such as environmental compliance, economic factors, and financing effect the cost of geothermal energy
- Wind Power is the cheapest on average at 3.3 to 6 cents per kilowatt hour
- Solar Power sometimes costs less at 6 cents per kilowatt hour

Consider the effect of solar and wind power on the landscape

- This is not to say that these forms of power are bad. Rather the point is to show one of the positive aspects of geothermal power relative to these forms.



Problems with Geothermal Power

- Just like in Yellowstone, the water used in geothermal power plants creates calcium deposits
  - These deposits must be cleaned in order to ensure proper water flow
- Not available in many regions

In Conclusion…

- Geothermal power is an extremely environmentally friendly source of energy
- Depending on the quality of the source, the costs of geothermal energy are potentially cheaper than even wind power
- Geothermal power plants have a low impact on their immediate surroundings
  - Crops may be grown next to them

Resources

- Geothermal Energy Association - http://www.geo-energy.org/
- Geothermal Resources Council - http://www.geothermal.org/
- U.S. Department of Energy - http://www.eere.energy.gov/
- Energy Manager Training .com - http://www.energymanagertraining.com/new_index.php
- The World Bank - Geothermal Energy – http://www.worldbank.org/html/fdp/energy/geothermal
- Geothermal Education Office – http://geothermal.marin.org/pwtheat.html
- Geo Alliance – http://www.aiec.coop/html/geotherm.htm