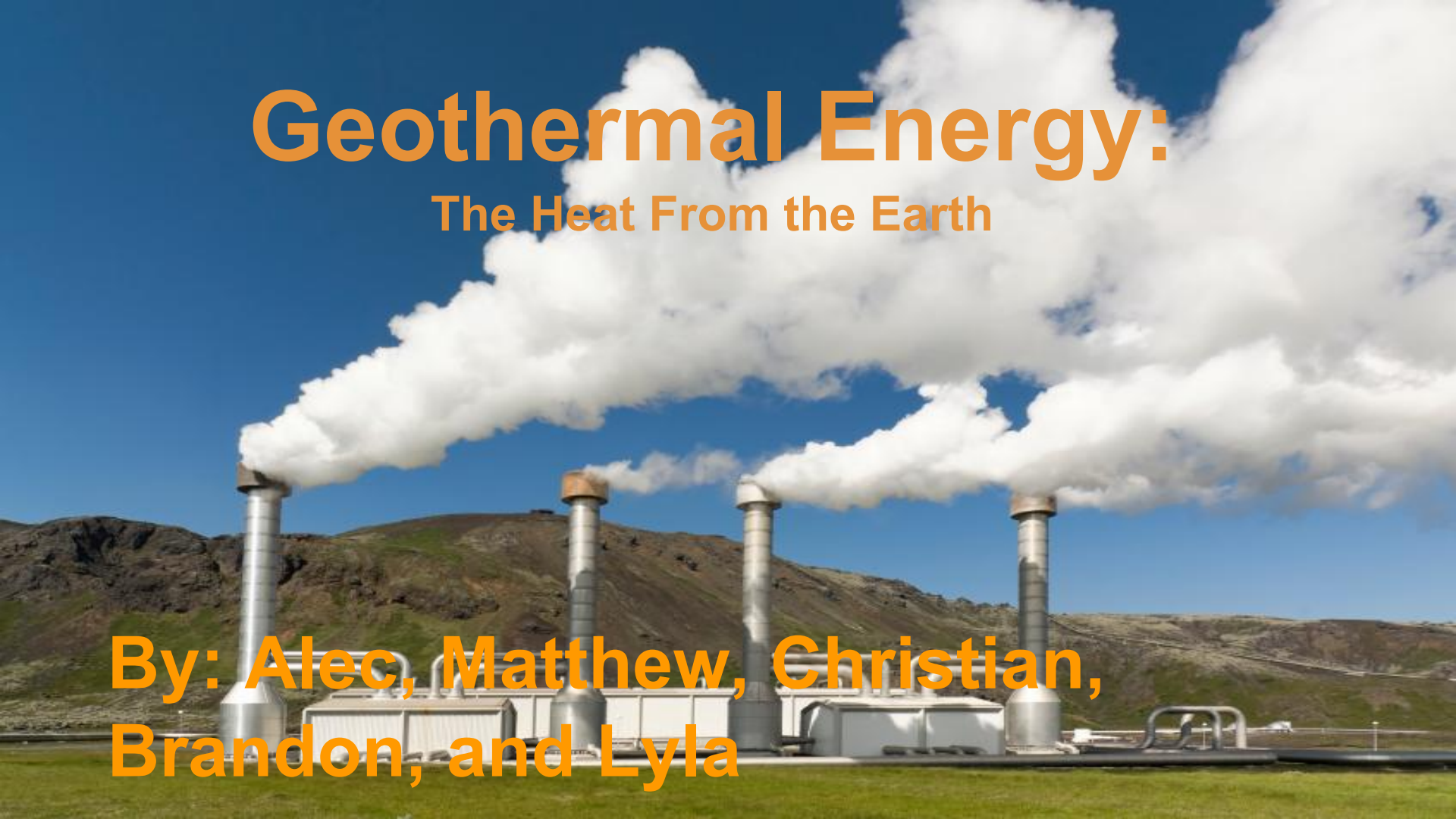


# Geothermal Energy:

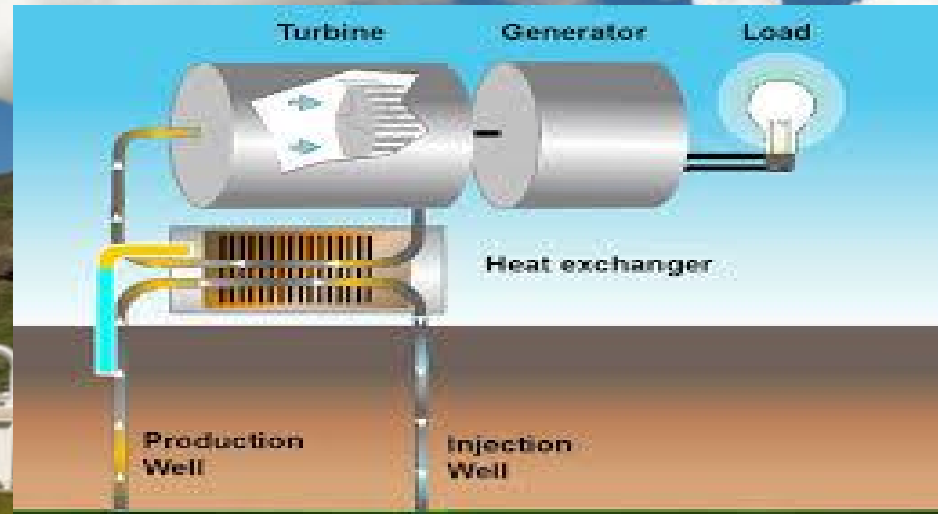
The Heat From the Earth

By: Alec, Matthew, Christian,  
Brandon, and Lyla



# Energy Production

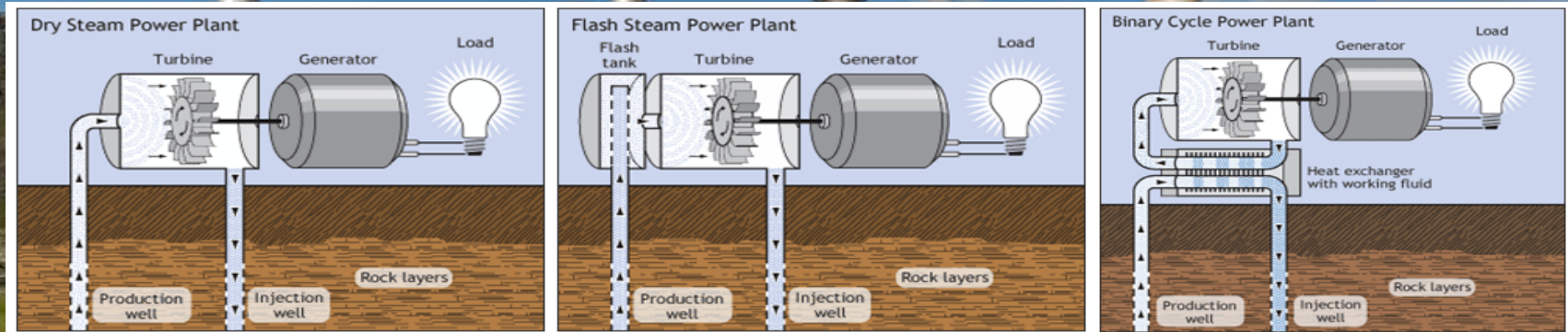
- Geothermal energy isn't entirely renewable—it will run out when the Earth does. In about 5 billion years.
- Geothermal power plants use steam produced from reservoirs of hot water found a few miles or more below the Earth's surface to produce electricity. The steam rotates a turbine that activates a generator, which produces electricity.



# Energy Production

There are three types of geothermal power plants: dry steam, flash steam, and binary cycle.

- Dry steam power plants draw from underground sources of steam. The steam is piped directly from underground wells to the power plant where it is directed into a turbine/generator unit.
- Flash steam power plants are the most common and use geothermal reservoirs of water with temperatures greater than 360°F (182°C). Binary cycle power plants operate on water at lower temperatures of about 225°–360°F (107°–182°C).
- Binary cycle plants use the heat from the hot water to boil a working fluid, usually an organic compound with a low boiling point.





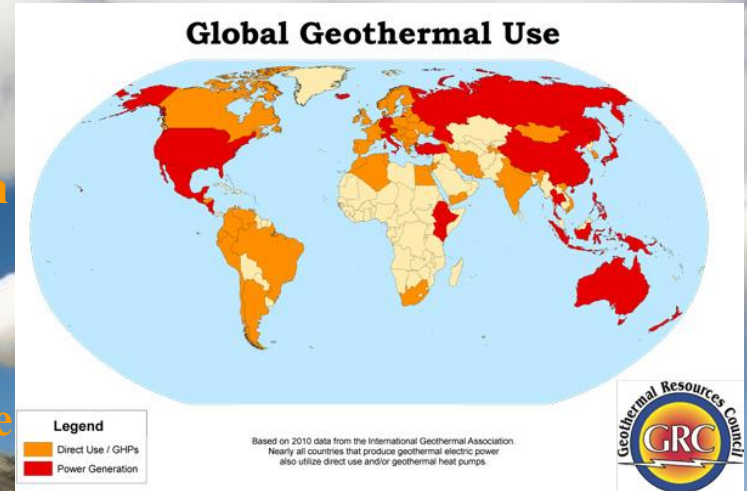
# Waste Products

- Silica- found in effluents after drilling operations for geothermal operations
  - concentrations are low enough to not be considered harmful
- Drilling cuttings- soil, rock fragments, and other materials removed after a borehole
  - they are stored in “sumps” which store undesired wastewater, and other chemicals



# Where is it found?

- Geothermal energy is technically found everywhere, but is more economically accessible in some places than others.
- This type of energy is most commonly used in places with natural hot springs, where the water is used to either directly heat homes or is used to power electric generators.
- Geothermal energy requires no storages since used water is pumped back into the ground.





# Environment-Advantages & Disadvantages

## Advantages:

- Creates little to no gas pollution (closed-loop system)
- Fossil fuel dependence will decrease
- Use of geothermal fluids (coolant) reduces impact on water

## Disadvantages:

- Often contains high levels of Sulfur, salt, and other minerals
- Open-loop systems emit Hydrogen Sulfide, CO<sub>2</sub>, Ammonia, Methane, and Boron
- Can lead to greater earthquake frequency or land subsidence (sinking)

## ENVIRONMENTAL IMPACT

Installing geo  
(In a typical home)

=



1 acre of trees

OR



Removing 2 cars from the road

# Economy-Advantages & Disadvantages

## Advantages:

- Creates more jobs (repairing and creating the systems)
- Great long term energy investment (low operating cost)
- Quiet operation (no outdoor unit)

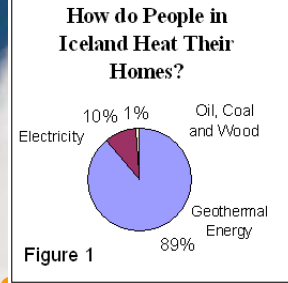
## Disadvantages:

- Steep initial investment
- Local only (costs more resources to make multiple minor units than one major unit)
- Sites can be rendered useless (cooled too much)





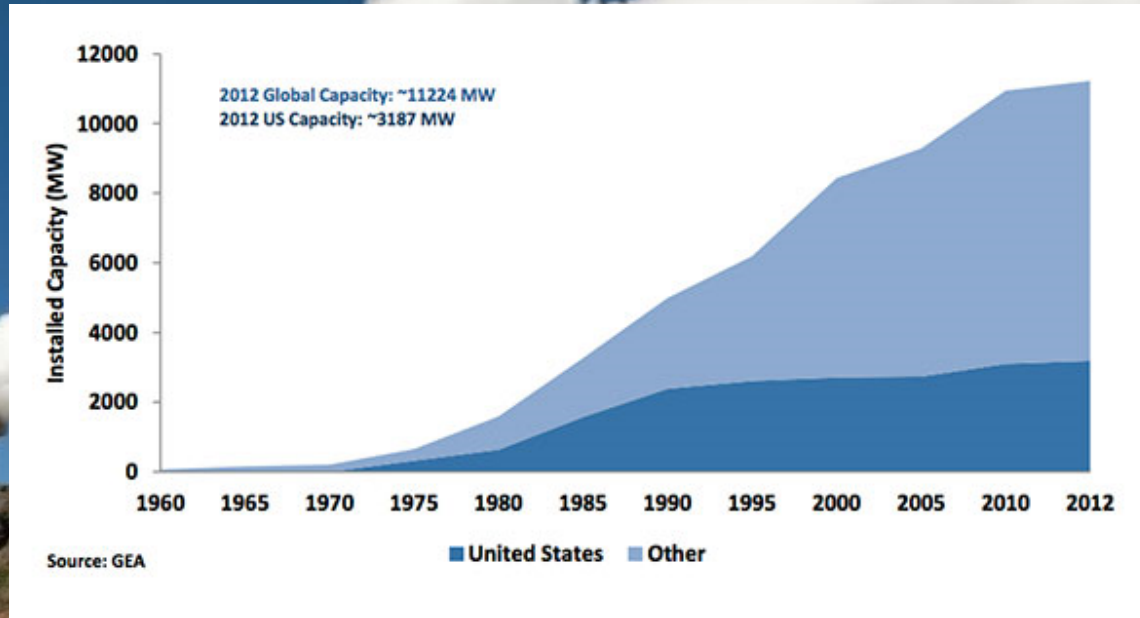
# Interesting Facts



- Humans have enjoyed geothermal energy in the form of hot springs for thousands of years
- In some parts of Iceland, hot water runs from geothermal power plants under pavements and roads to help melt ice, 80% of homes, 30% energy
- Measured in Watts
- Hawaii is the state most dependant on fossil fuels, could be an opportunity (70%)
- Puna - only one, cable to other islands in the future
- 1991 - open venting and dumping, blowout
- 2013 - another blowout and leak
- Hydraulic fracking - not just nat. gas: cold water, hot rock, highest bidder may cause earthquakes
- Drilling is an attack on Pele, but the energy could be a gift from her
- Innovations Development Group (IDG) is helping native Hawaiians like they did the Maoris



# Important Facts



Amount of Energy the United States produced in 2012 using Geothermal Energy compared to other countries

# Bibliography

(n.d.). Retrieved March 22, 2015, from [http://conserve-energy-future.com/Images/Geothermal\\_Energy.jpg](http://conserve-energy-future.com/Images/Geothermal_Energy.jpg)

Drilling sump photos. (n.d.). Retrieved March 21, 2015.

Geothermal Energy Production Wastes. (n.d.). Retrieved March 21, 2015.

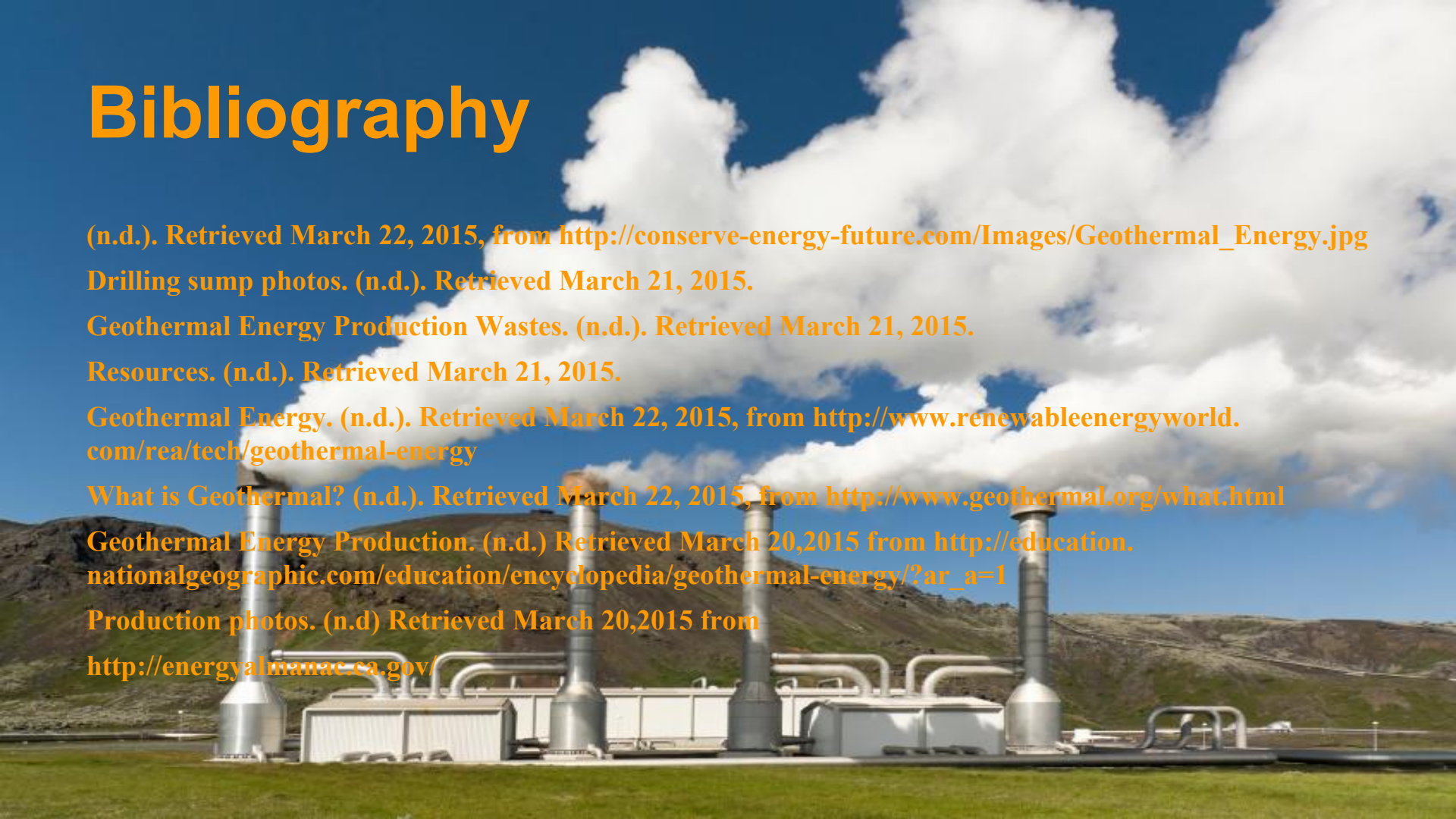
Resources. (n.d.). Retrieved March 21, 2015.

Geothermal Energy. (n.d.). Retrieved March 22, 2015, from <http://www.renewableenergyworld.com/rea/tech/geothermal-energy>

What is Geothermal? (n.d.). Retrieved March 22, 2015, from <http://www.geothermal.org/what.html>

Geothermal Energy Production. (n.d.) Retrieved March 20,2015 from [http://education.nationalgeographic.com/education/encyclopedia/geothermal-energy/?ar\\_a=1](http://education.nationalgeographic.com/education/encyclopedia/geothermal-energy/?ar_a=1)

Production photos. (n.d) Retrieved March 20,2015 from <http://energyalmanac.ca.gov/>





# Who Did What

- Production: Alec
- Waste: Christian
- Location: Matt
- Advantages/Disadvantages: Brandon
- Interesting facts: Lyla

