Geothermal energy in Iceland

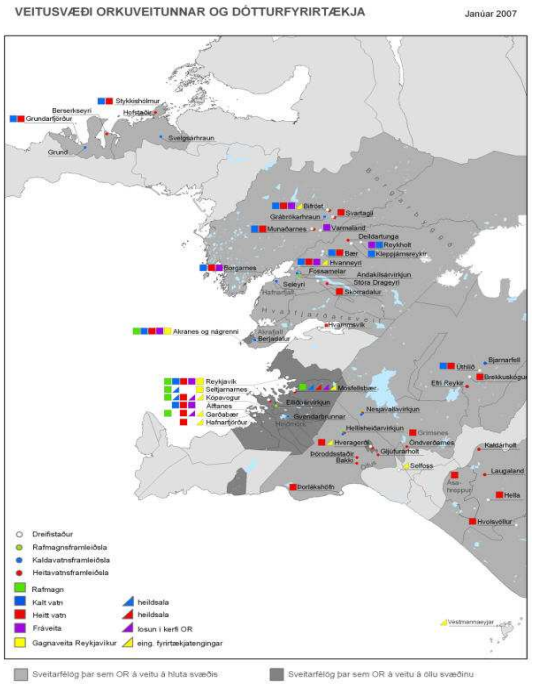
The swimmingpool in Borgarnes

Reykjavik energy

- **Reykjavik energy is an independent utility company owned by three municipalities:**
  - **Reykjavík (93,53 %)**
  - **Akranes (5,52%)**
  - **Borgarbyggð (0,93%)**

A Multi-Utility Company

- **Orkuveita Reykjavíkur operates in 20 municipalities and provides:**
  - **Electricity to 58% of the population of Iceland**
  - **Hot Water to 67%**
  - **Cold Water to 55%**
  - **Sewerage system to 53%**
  - **Runs a state-of-the-art fiber optic network**



Cold Water

- **Cold water is pumped from underground wells**
- **The water is free of any additives, no purification methods are needed and the water is free of any radiation.**

Sewerage

- **A 10 year campaign to clear the Reykjavik shoreline finished in 2006**
- **Combined length of pipelines 800 km**
- **Now also serving Borgarbyggð, Akranes.**

Electricity

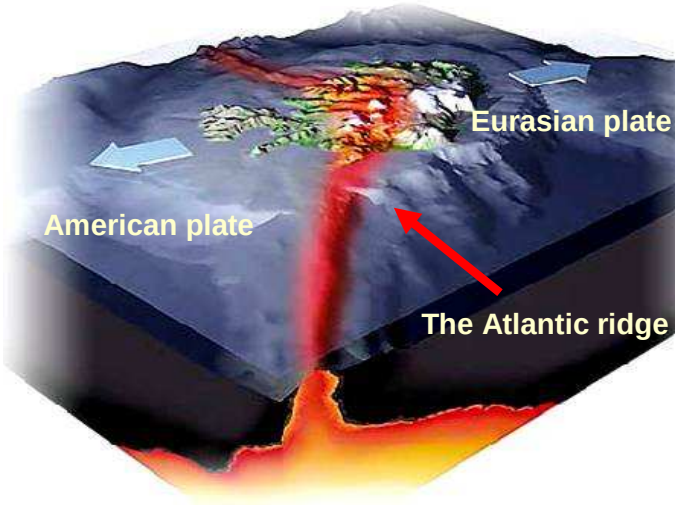
- **Hellisheiði geothermal plant, 213 MWe**
- **Nesjavellir geothermal power station, 120 MWe**
- **Two hydrostations with a combined output of 12 MWe**
- **Additional electricity purchased from Landsvirkjun (National Power Co.)**

Hot Water

- **54 boreholes in low temperature areas, borehole temperature of 70 - 130℃. 60% of total production**
- **Geothermal Power plant “Nesjavellir” high temperature area (heated fresh water) provides 40% of total production**
- **World’s largest geothermal district heating system**

Iceland’s Unique Position

- The only place where the ridge reaches surface
- The plates drift apart, about 2.5 cm/year
- Main effects:
  - Earthquakes
  - Volcanic activity
  - Presence of the geothermal resource



Iceland

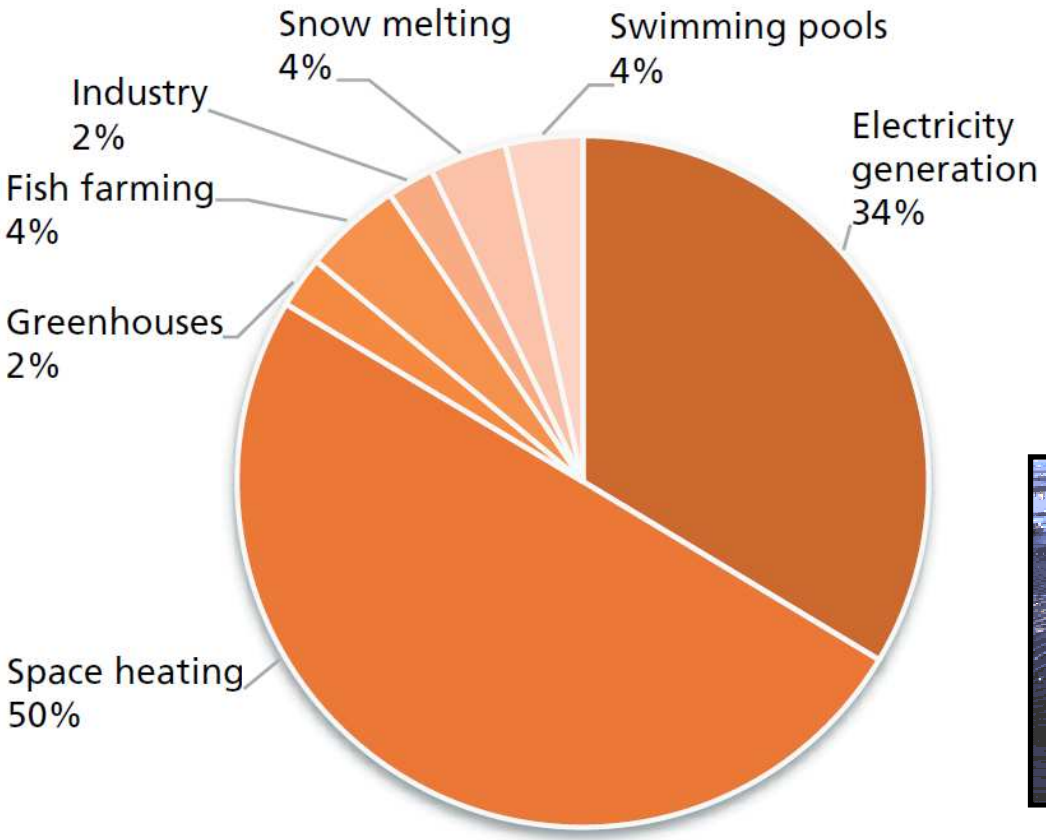
- **In 870 AD Iceland's first settler saw the steam from hot-springs and called his settlement Reykjavik or Smoky Bay**
- **Reykjavik has a long history of employing geothermal power**
- **Systematic use for district heating since 1930**

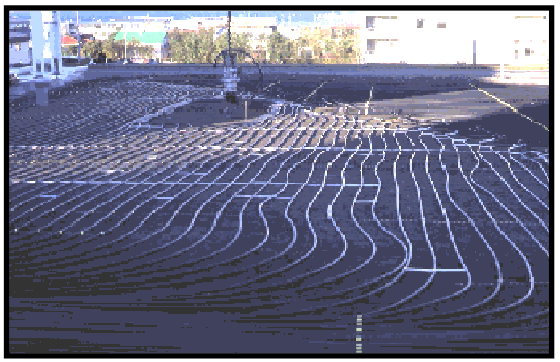
Reykjavik before 1940

Vote for Geothermal District Heating Today!

Source: Morgunblaðið Daily, January 30 1938

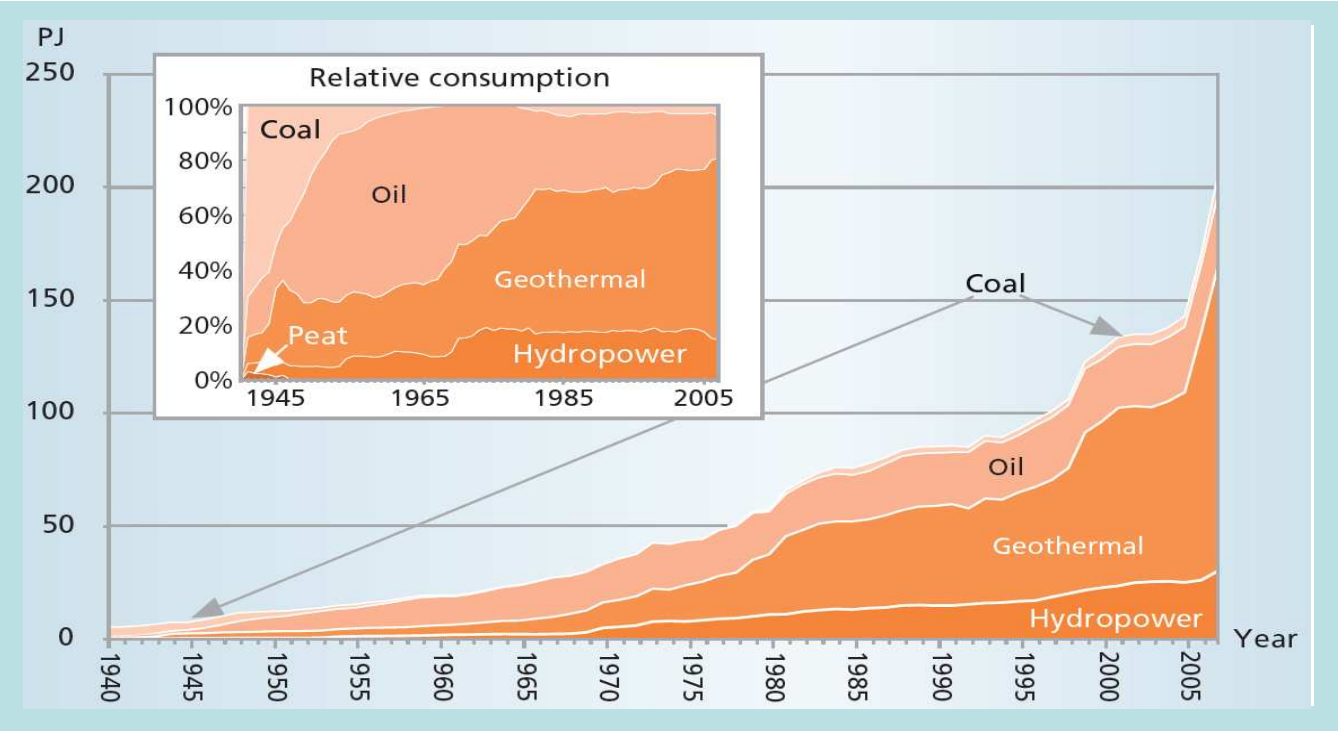
Geothermal use in Iceland





Source: National Energy Authority 2008

Primary Energy Use in Iceland



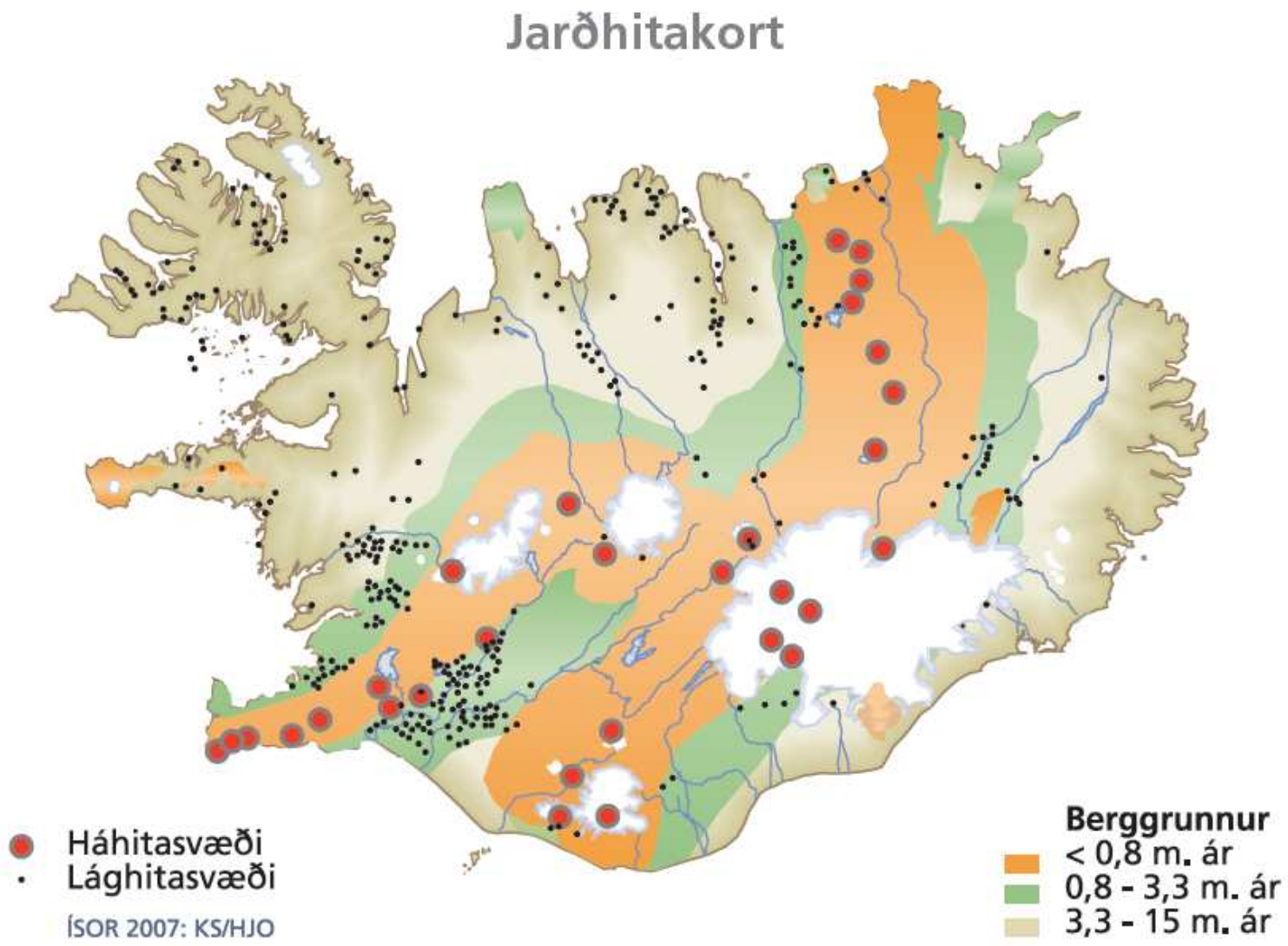
Source: National Energy Authority 2008

Two Types of Geothermal Areas

- **Low - temperature areas**
  - **Temperature lower than 150 ℃ at 1000 m depth.**

- **High - temperature areas**
  - **Temperature higher than 200 ℃ at 1000 m depth.**

High and low temperature areas



Hotwater production from lowtemperature areas.

Temperatures from 70℃ to 130℃.

Hot geothermal water to the consumer.

Hot water production from high temperature areas.

Temperatures from 200℃ to 370℃.

Uppheated fresh water to the consumer.

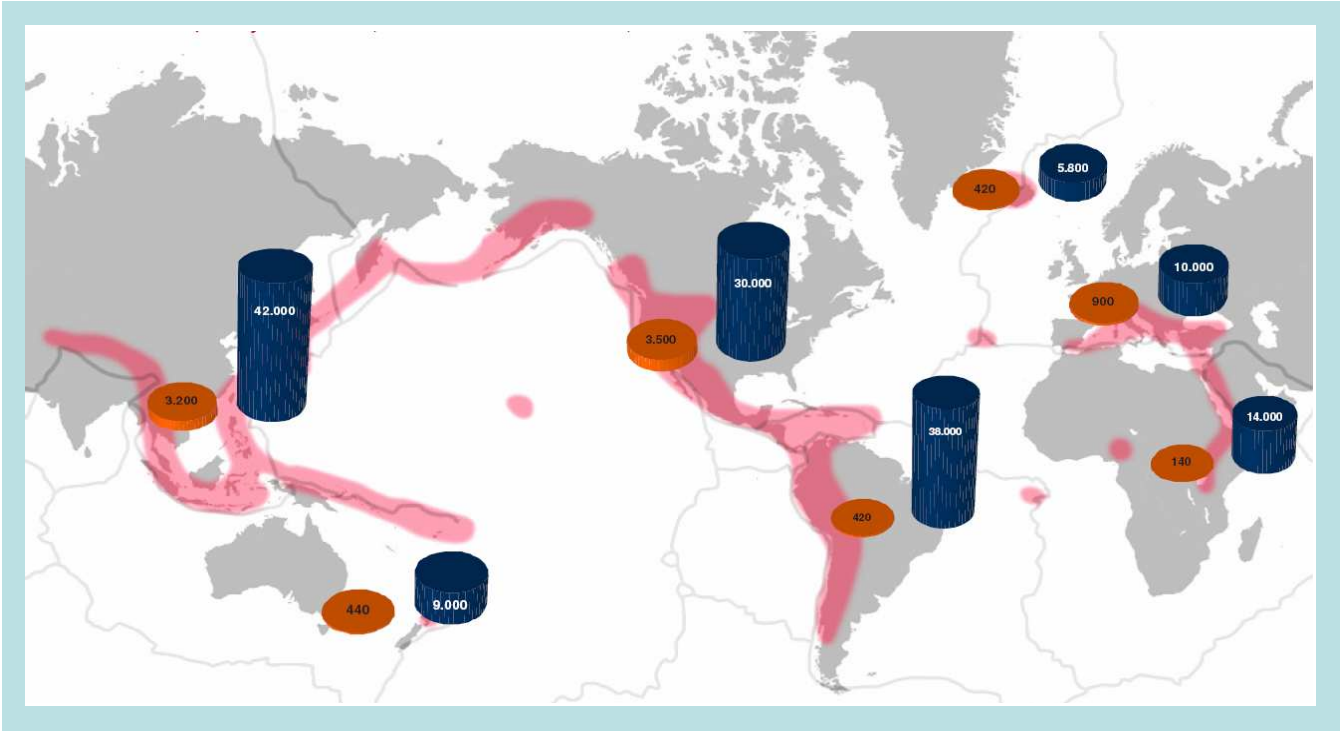
Geothermal power plants in Iceland

- **Hellisheiði: 300 MW_e + 400 MW_{th}**
- **Nesjavellir: 120 MW_e + 300 MW_{th}**
- **Svartsengi: 75 MW_e + 125 MW_{th}**
- **Krafla: 60 MW_e**
- **Bjarnarflag: 3 MW_e**
- **Reykjanes: 100 MW_e**

Geothermal power plants in the world

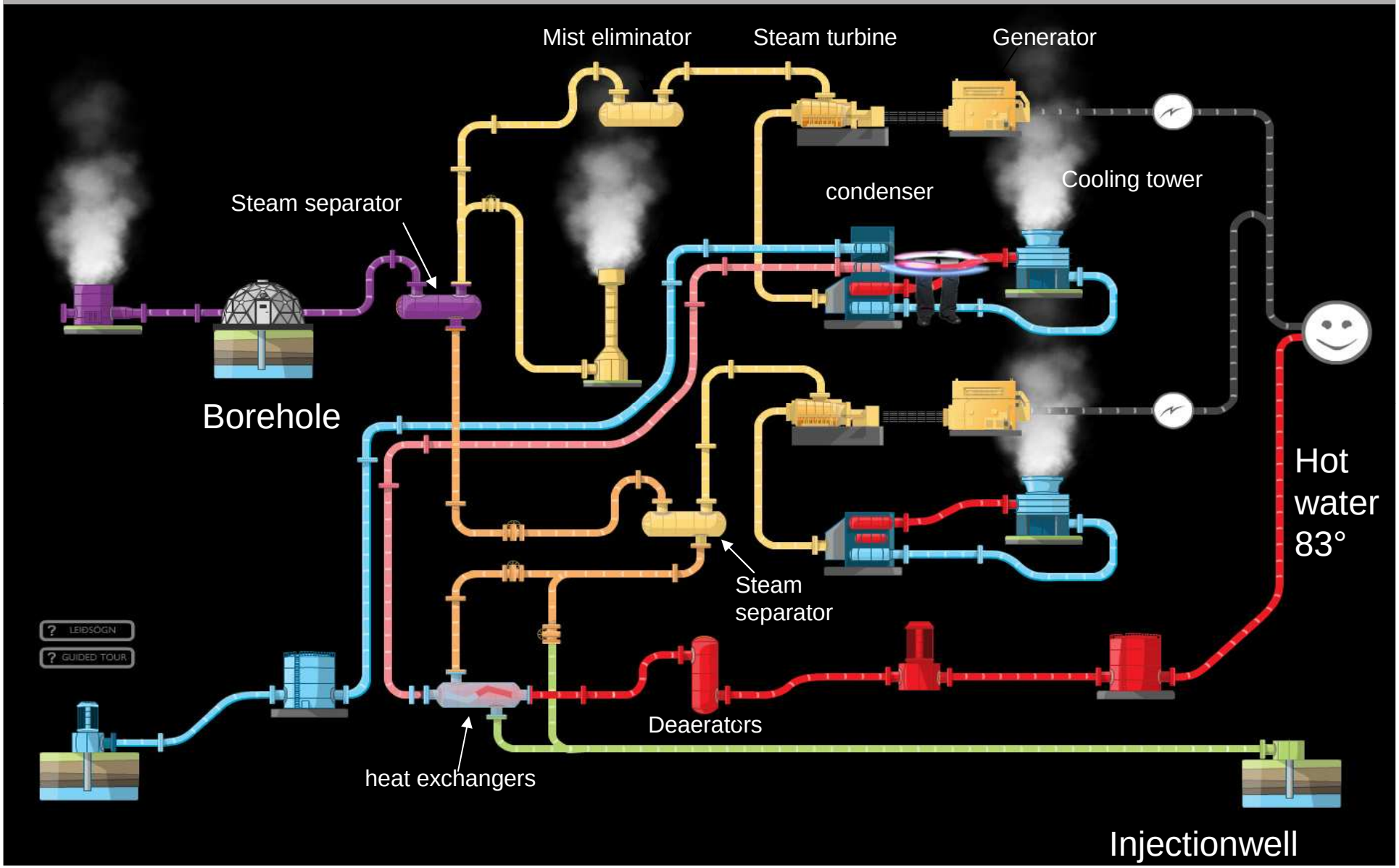
- **Larderello, Italy: 487 MW_e**
- **Mahanagdong, Philippines: 180 MW_e**
- **Mutnov, Russia: 50 MW_e**
- **McLachlan, New Zealand: 110 MW_e**
- **Los Azurfres, Mexico: 198 MW_e**
- **Zunil, Guatemala: 24 MW_e**

Installed Geothermal Power and Potentials



Source: Bertani 2005, Glitnir Bank 2007.

Production Process



Ambitious Iceland

- **Almost 90% of houses in Iceland are heated with geothermal energy**
- **Sustainable energy sources (geothermal and hydro) provide over 70% of energy used in Iceland**
- **Iceland aims to be the first nation to use only renewable energy as an energy resource**
- **Orkuveita Reykjavíkur is fully cooperating and participating in this ambitious goal**