Theme 5: Renewable energy

Introduction to Geothermal and Tidal energy resources

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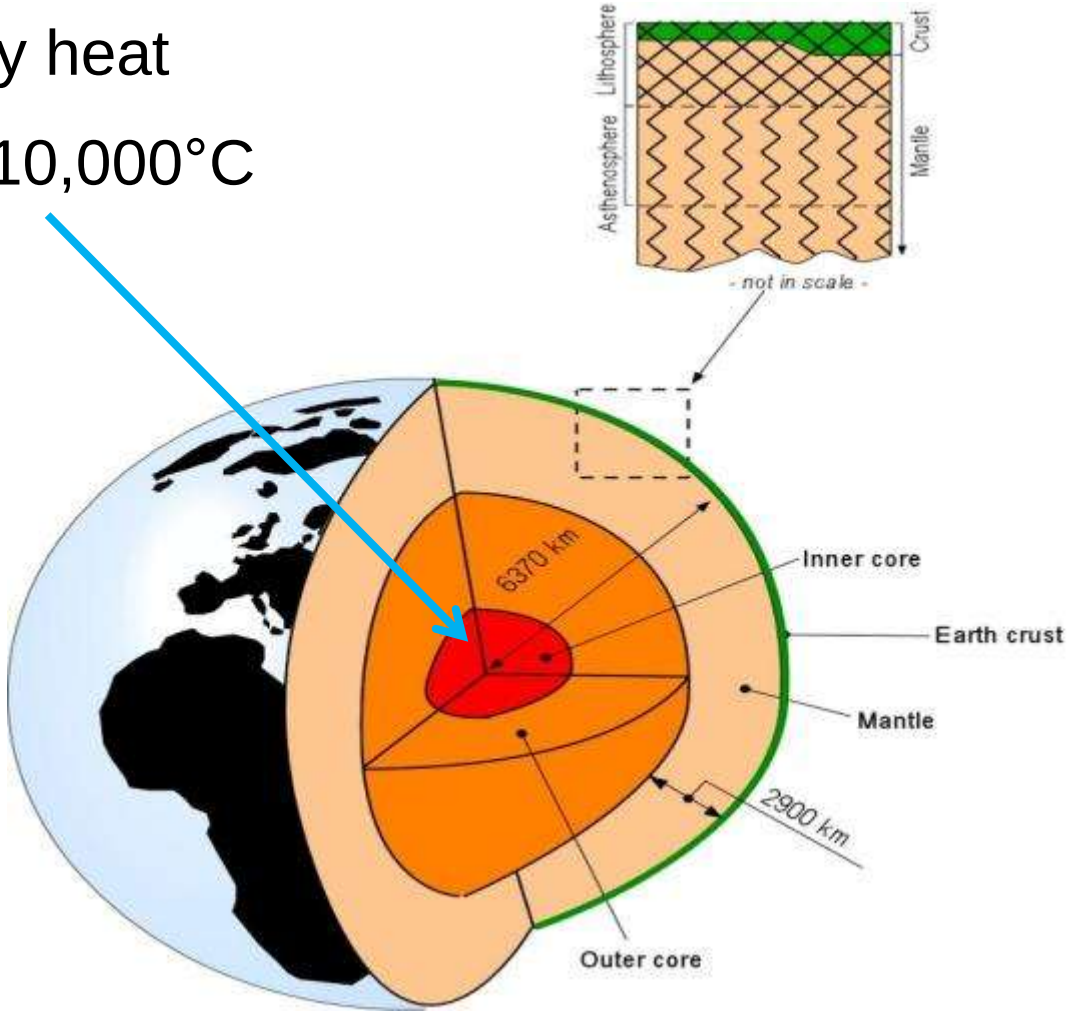
Geothermal and tidal energy

Geothermal energy: Nature

•Radioactive decay heat

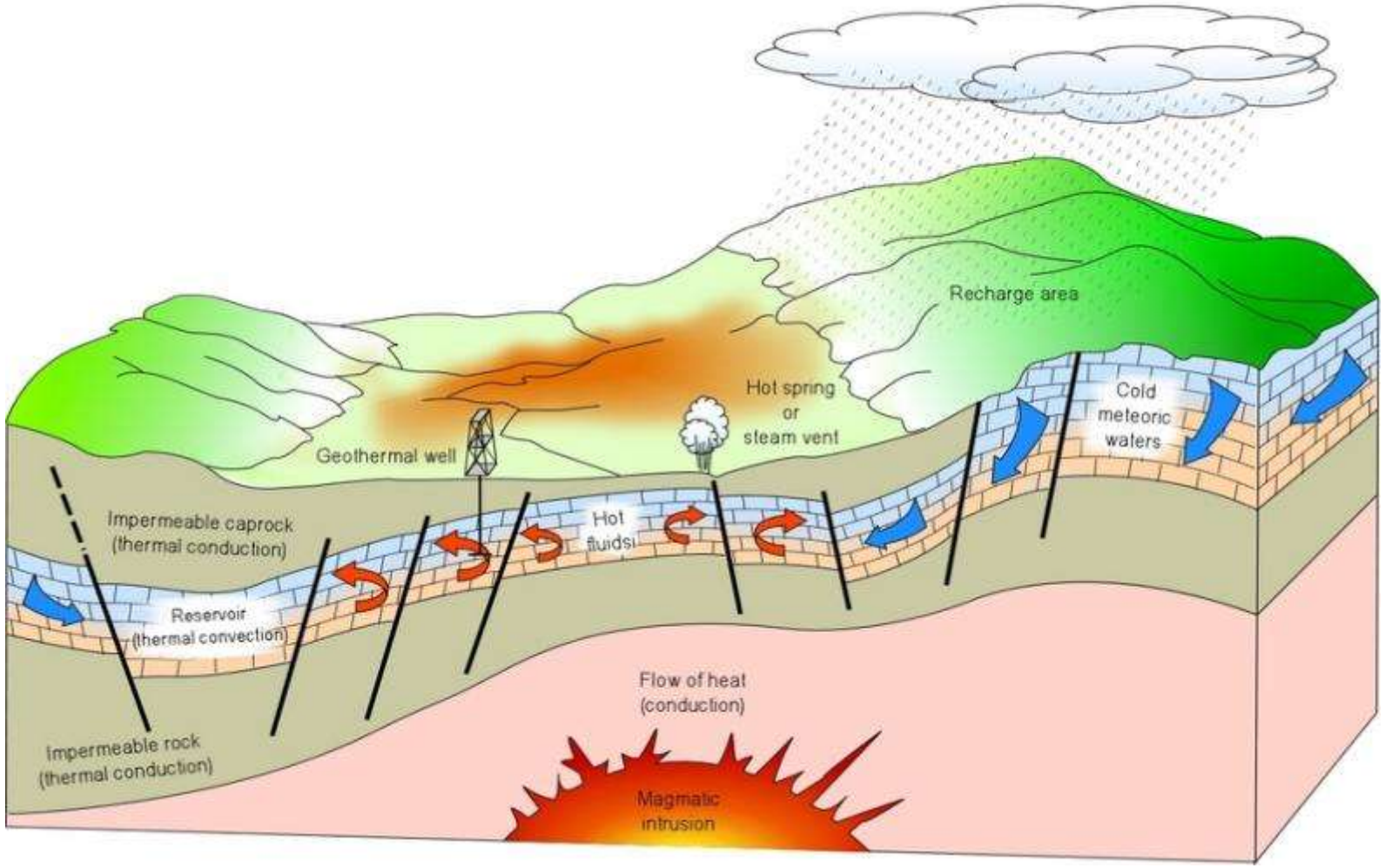
Interior : T=3000-10,000°C



•Continuous heat flow: mean global value at the Earth's surface is 0.063 W/m^2

Geothermal and Tidal energy

Geothermal energy: nature



Geothermal and tidal energy

Geothermal energy: constrains

- the upper strata of the Earth's crust should not be cooled down significantly;
- the technical effort required must not be prohibitively high

→ only a portion of the available geothermal energy is usable.

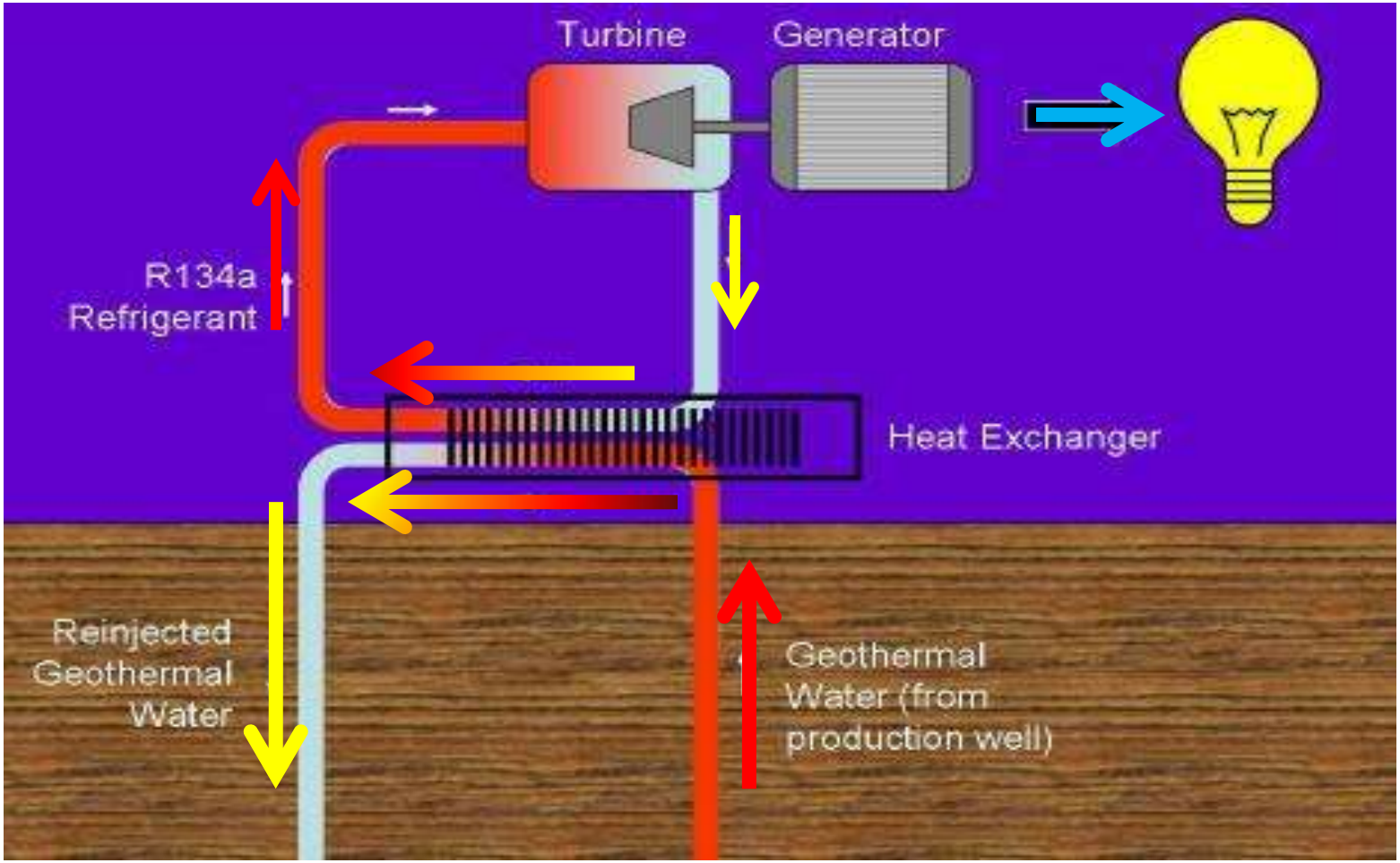
Geothermal and Tidal energy

Geothermal energy: Utilization principle

- Regions with high geothermal anomalies: high temperatures at low depths (e.g., Geysers) (Iceland and The Philippines)
- Hot dry rock method (HDR): a cavity is drilled into hot rocks (300°C) at a depth between 1000 and 10,000 m (still experimental)
- Geothermal heat pumps utilize Earth's surface low heat potential, mainly for space heating.
  - Ecological benefits are low if compressors run on fossil fuel-produced electricity

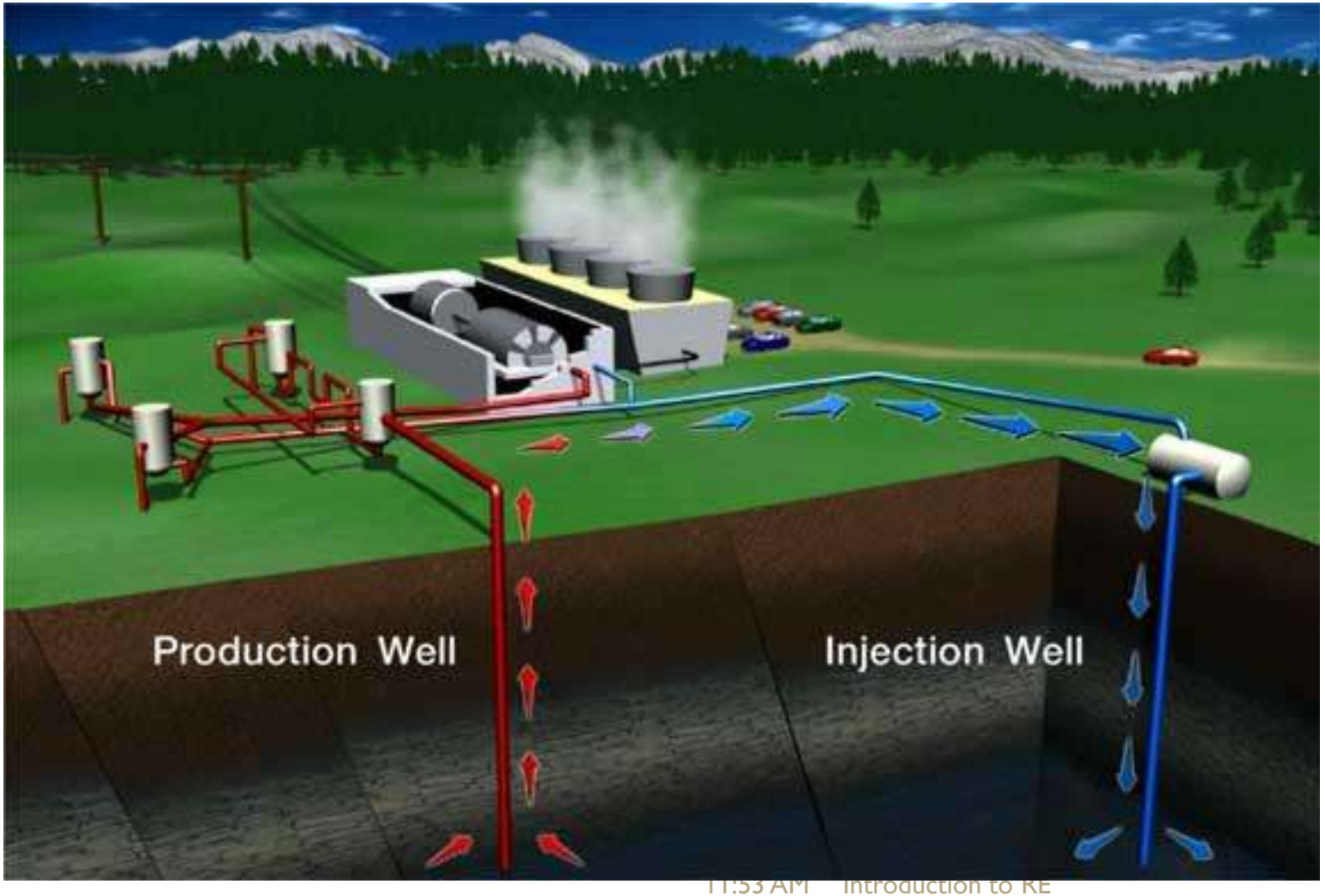
Geothermal and tidal energy

Geothermal energy: Utilization principle



Geothermal and tidal energy

Geothermal energy: Utilization principle



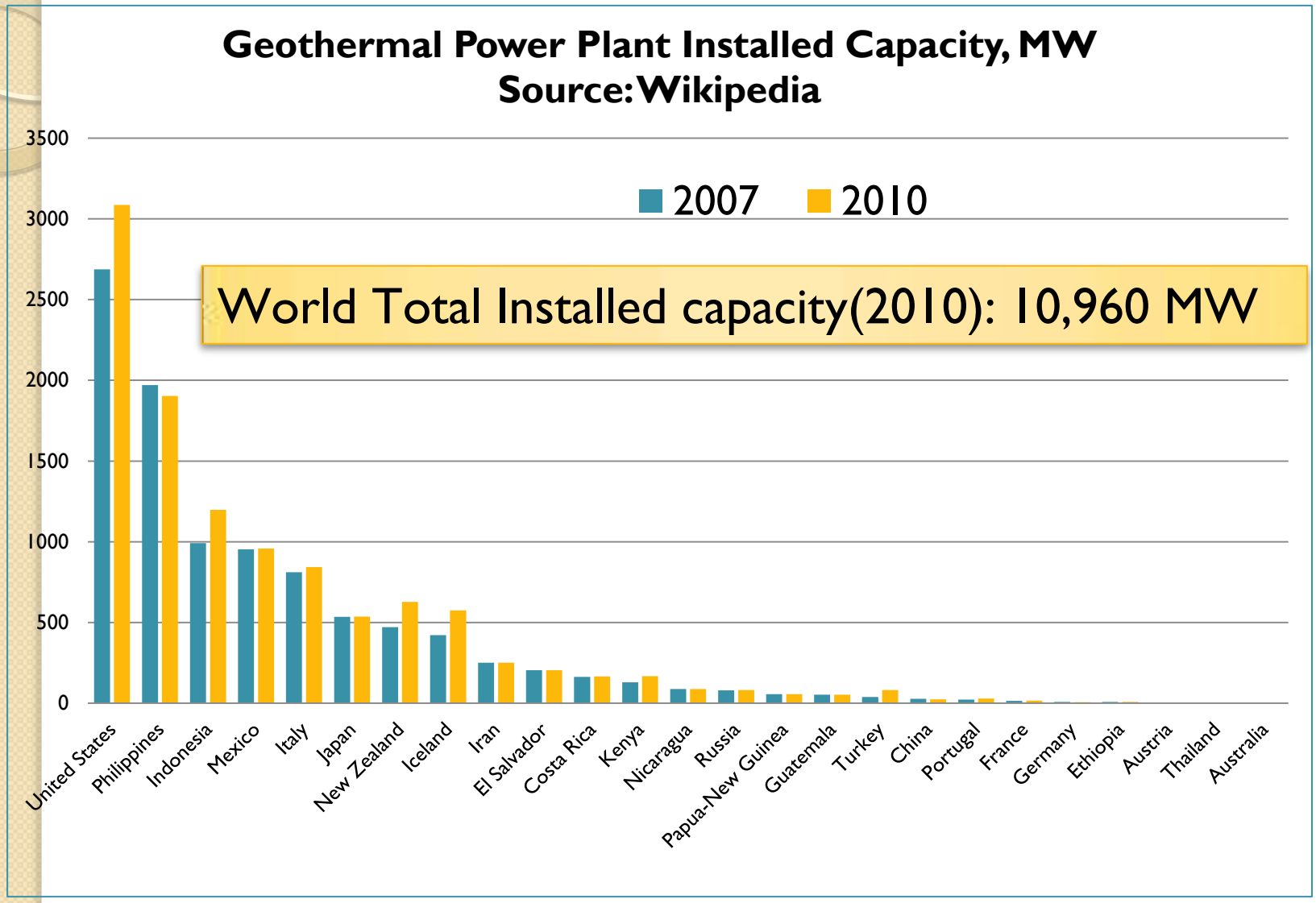
Geothermal and tidal energy

Geothermal energy: Utilization principle

Ground-source Heat Pump

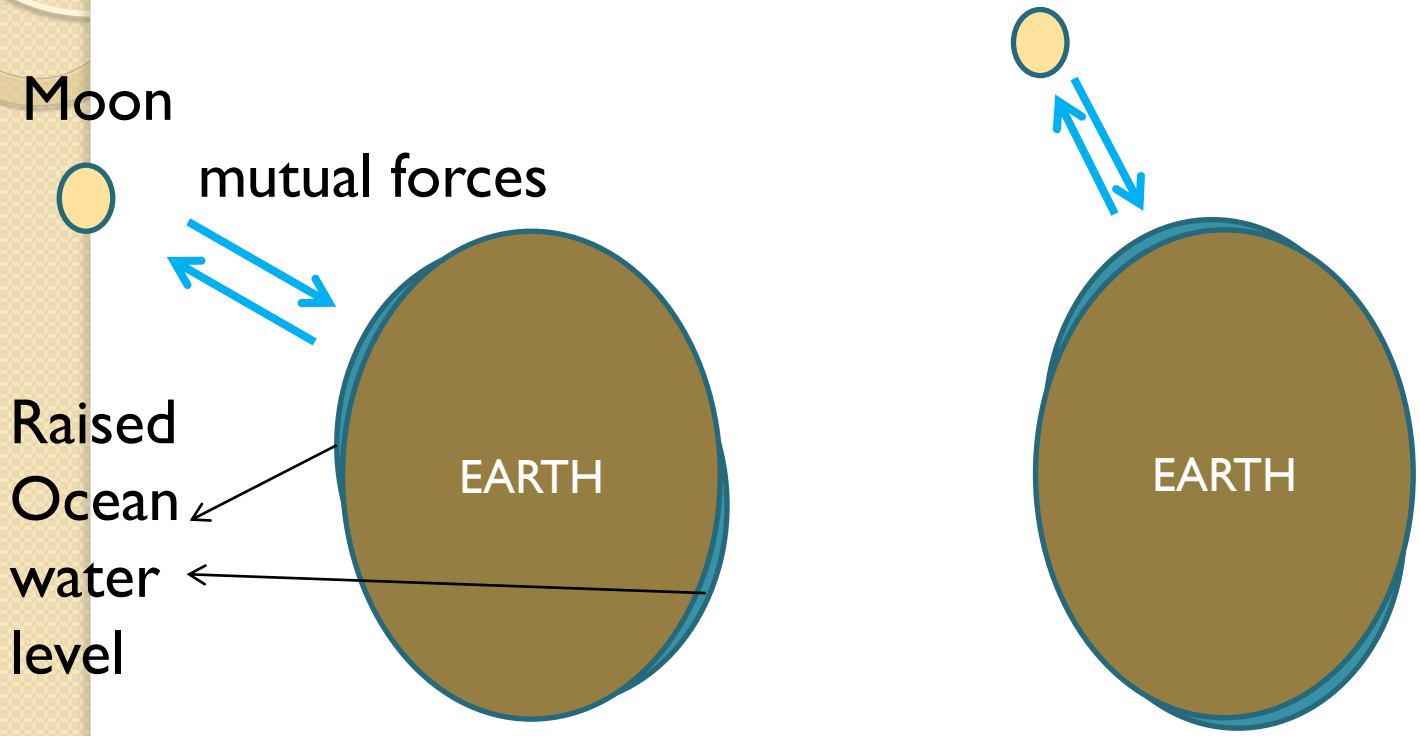
Source: RETscreen.net

Geothermal and tidal energy



Geothermal and tidal energy

Planetary (gravitational) energy: Nature



The tides: movement of enormous water masses in the oceans → involves enormous amount of energy → tidal energy resources

Geothermal and tidal energy

Planetary energy: Utilization

- The amount of power that can be theoretically produced by tidal power plants globally is relatively low

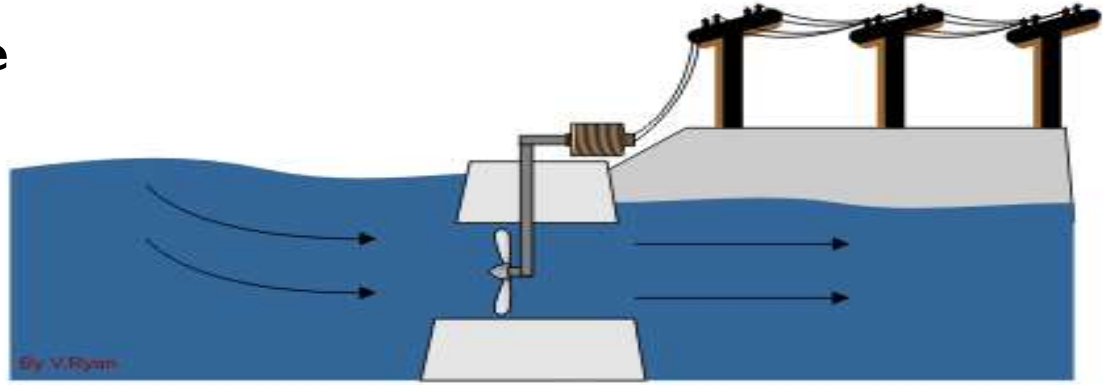
- Tidal power plants always have large impacts on nature.

Renewable energies:

Planetary energy: Utilization principle

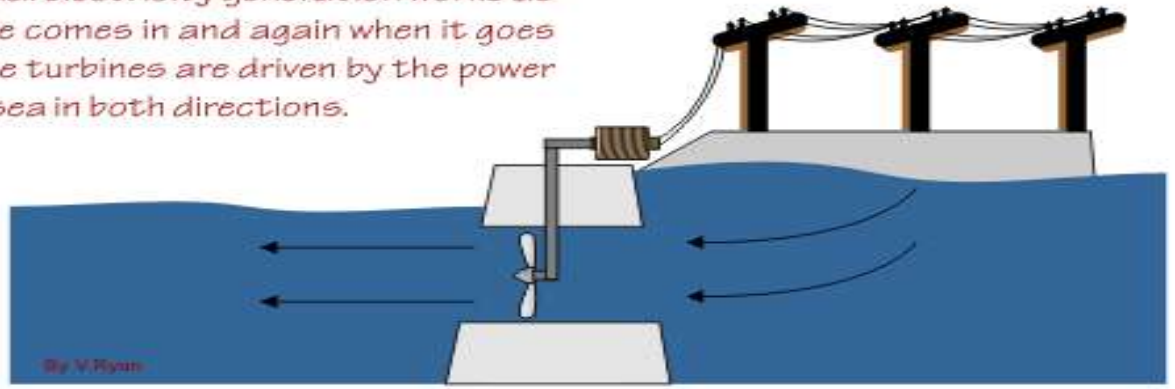
Sea side Reservoir side

Tidal barrage



TIDE COMING IN

This tidal electricity generation works as the tide comes in and again when it goes out. The turbines are driven by the power of the sea in both directions.

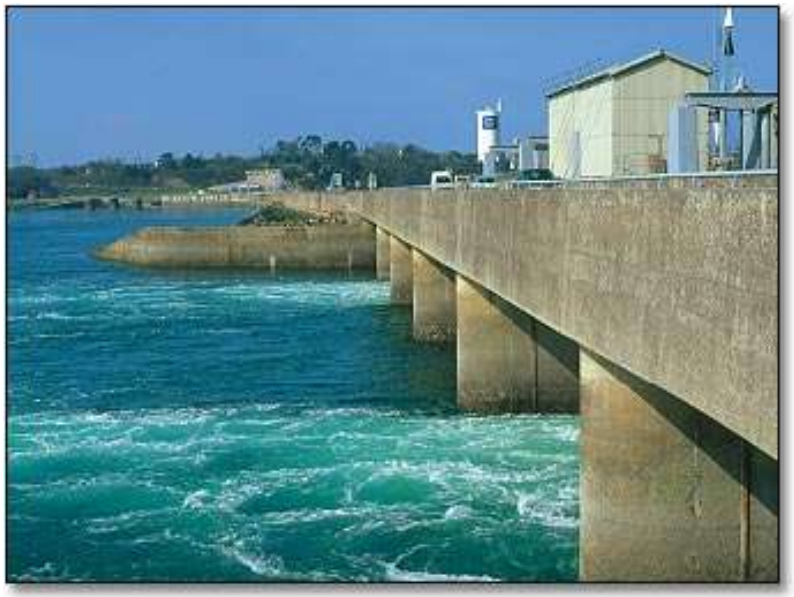


TIDE GOING OUT

Renewable energies:

Planetary energy: Utilization

la Rance tidal power plant



The largest tidal power plant (240 MW)

Renewable energies:

Planetary energy: Utilization

Tidal stream generator

The world's first commercial-scale and grid-connected tidal stream generator – SeaGen – in Strangford Lough

End of Geothermal and Tidal energy resources