Geothermal & Ocean Energy

Slide 2: ***Geothermal Energy: Uses***

- Beneath the earth's crust lies hot, molten rock. The energy it contains is called geothermal or earth energy.
- Geothermal energy is used in many ways, e.g. for heat pumps and heating of living space.
- Geothermal power plants use the earth's natural heat to vaporise water or an organic medium.
- The steam drives a turbine that generates electricity.

Slide 3: ***Geothermal Energy: Heating Plants***

- Geothermal heat plants require lower temperatures and the heated water is used directly.
- If near the source, the heat can be used directly to heat homes, buildings and hot-water supplies.

Slide 4: ***Ocean Energy: Wave, Tidal & Current***

Ocean energy refers to three types of energy:

- Wave,
- Tidal and
- Current

Slide 5: ***Ocean Energy: Wave Energy***

- Ocean waves are formed when offshore winds transfer kinetic energy onto the ocean surface

- Surfers use wave energy (kinetic energy) to lift them upwards and drive them forward.
- The kinetic and potential energy in waves can be used to generate electricity.
- Wave Energy Converters (WECs) use the vertical displacement of the waves to generate electricity.

Slide 6: ***Ocean Energy: Wave Energy***

- Wave Energy Converters (WECs) are structures which interact with incoming waves, converting this energy into electricity through a hydraulic, mechanical or pneumatic power take-off system.
- WECs are kept in position by a mooring system or placed directly on the seabed/seashore.
- Power is transmitted to the shore by a sub-sea electrical cable or a high pressure hydraulic pipe system.

Slide 7: ***Ocean Energy: Ocean Currents***

- Ocean currents refer to moving bodies of water.
- Ocean currents are caused mainly due to the rise and fall of the tides because of the gravitational interactions between earth, moon and sun.
- Other effects such as regional differences in temperature, salinity and the Coriolis Effect due to the rotation of the earth are also major influences.
- These types of currents are similar to tidal currents but aren't exactly the same.

Slide 8: ***Ocean Energy: Tidal Currents***

- Tidal energy is the energy present in massive bodies of water which move through the ocean due to gravitational interactions between earth, moon and sun causing tidal currents.
- Tidal currents are caused mainly by the rise and fall of the tides resulting from the gravitational interactions between earth, moon and sun, causing the whole sea to flow.
- Tidal currents occur close to the shoreline.
- The kinetic energy of tidal currents can be converted in much the same way that a wind turbine extracts energy from the wind, using various types of open-flow rotors.
- There is a huge potential for generating electric power from ocean tidal currents.

Slide 9: ***Tidal Energy: Generating Electricity***

- Tidal energy can also be harnessed by constructing a dam or a barrage across an estuary or bay with a suitable tidal range.
- Water is channeled through turbines to generate electricity.
- Bi-directional turbines are used to generate electricity when the tide comes in and when it goes out.

Slide 10: ***Tidal Energy: Tidal Barrages***

- Tidal barrages have been built across estuaries in France, Canada and China.
- High cost and environmental objections have limited further expansion of this technology.