

Geothermal & Ocean Energy

Slide	Index
1	Introduction
2 – 3	Geothermal Energy:
2	Uses
3	Heating Plants
4 – 10	Ocean Energy:
4	Wave, Tidal & Current
5	Wave Energy
6	Wave Energy
7	Ocean Currents
8	Tidal Currents
9	Generating Electricity
10	Tidal Barrages

Slide 2: *Geothermal Energy: Uses*

- Beneath the earth's crust lies hot, Magma. 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.
- These common in very cold countries like Island.
- Natural warm water springs are examples of geothermal energy.

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

Ocean energy refers to renewable energy source where energy from moving waves or ocean currents is captured using Wave Energy Converters to generate electricity. There are three types of these sources:

- Wave
- Tidal and
- Current

Slide 5: Ocean Energy: Wave Energy

- Wave energy has enough potential to serve the energy demand of the world.
- The image shows the potential of wave energy thought out the world.
- 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.
- For example, when the Sun and the moon align with the earth, the tides are stronger due to the attraction of both the moon and the sun combined.
- 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.