

OCEAN ENERGY AS RENEWABLE ENERGY

Prelims: Governance- Policies

Mains: GS-II- Government Policies and Interventions for development in Various Sectors and issues arising out of their Design and Implementation.

Why in News?

- ▶▶ In a decision that would give a boost to the ocean energy in India, Union Minister of State for Power and New & Renewable Energy (IC) and Skill Development & Entrepreneurship, Shri RK Singh approved a proposal to declare ocean energy as Renewable Energy.

Significance of Ocean Energy:

- ▶▶ Oceans cover 70 per cent of the earth's surface and represent an enormous amount of energy in the form of wave, tidal, marine current and thermal gradient.
- ▶▶ A variety of different technologies are currently under development throughout the world to harness this energy in all its forms.
- ▶▶ Deployment is currently limited but the sector has the potential to grow, fuelling economic growth, reduction of carbon footprint and creating jobs not only along the coasts but also inland along its supply chains.
- ▶▶ India has a long coastline with the estuaries and gulfs. MNRE looks over the horizon at development of new technology and considers the various options available to support its deployment.
- ▶▶ The objective of the technology programme is to accelerate and enhance support for the resource assessment and deployment of ocean energy in the country and to harness it for power generation and to overcome the barriers.
- ▶▶ The potential locations identified at Khambhat & Kutch regions, and large backwaters, where barrage technology could be used.
- ▶▶ The total theoretical potential of wave energy in India along the country's coast is estimated to be less intensive than what is available in more northern and southern latitudes.
- ▶▶ Although currently under-utilised, Ocean energy is mostly exploited by just a few technologies: Wave, Tidal, Current Energy and Ocean Thermal Energy.

Tidal Energy:

- ▶▶ The tidal cycle occurs every 12 hours due to the gravitational force of the moon. The difference in water height from low tide and high tide is potential energy.
- ▶▶ Similar to traditional hydropower generated from dams, tidal water can be captured in a barrage across an estuary during high tide and forced through a hydro-turbine during low tide. The Gulf of Cambay and the Gulf of Kutch in Gujarat on the west coast have the locations in the country where the potential exists.

Wave Energy:

- ▶▶ Wave energy is generated by the movement of a device either floating on the surface of the ocean or moored to the ocean floor. Many different techniques for converting wave energy to electric power have been studied.
- ▶▶ Wave conversion devices that float on the surface have joints hinged together that bend with the waves. This kinetic energy pumps fluid through turbines and creates electric power.
- ▶▶ Stationary wave energy conversion devices use pressure fluctuations produced in long tubes from the waves swelling up and down. This bobbing motion drives a turbine when critical pressure is reached.

Current Energy:

- ▶▶ Marine current is ocean water moving in one direction. This ocean current is known as the Gulf Stream.
- ▶▶ Tides also create currents that flow in two directions. Kinetic energy can be captured from the Gulf Stream and other tidal currents with submerged turbines that are very similar in appearance to miniature wind turbines.

Ocean Thermal Energy Conversion (OTEC):

- ▶▶ Ocean thermal energy conversion, or OTEC, uses ocean temperature differences from the surface to depths lower than 1,000 meters, to extract energy. A temperature difference of only 20°C can yield usable energy.
- ▶▶ Research focuses on two types of OTEC technologies to extract thermal energy and convert it to electric power: closed cycle and open cycle. In the closed cycle method, a working fluid, such as ammonia, is pumped through a heat exchanger and vaporized. This vaporized steam runs a turbine. The cold water found at the depths of the ocean condenses the vapour back to a fluid where it returns to the heat exchanger.
- ▶▶ In the open cycle system, the warm surface water is pressurized in a vacuum chamber and converted to steam to run the turbine. The steam is then condensed using cold ocean water from lower depths.