

5.1 TIDAL ENERGY:

- ★ During the rising period of tides, water is stored in a water reservoir constructed behind dams on shore. The potential energy of stored water body is used to generate electrical energy similar to that in a conventional hydropower plant. For the tidal energy method to work effectively, the tidal difference (difference in the height of the high and low tides) should be at least 4m.
- ★ Tides are periodic rises and falls of large bodies of water. Gravity is one major force that creates tides. Ocean tides result from the gravitational attraction of the sun and moon on the oceans of the earth.
- ★ Spring tides are especially strong tides that occur when the earth, the sun, and the moon are in a line. The gravitational forces of the moon and the sun both contribute to the tides. Spring tides occur during the full moon and the new moon.
- ★ Neap tides are especially weak tides. They occur when the gravitational forces of the moon and the sun are perpendicular to one another with respect to the earth. Neap tides occur during quarter moons.

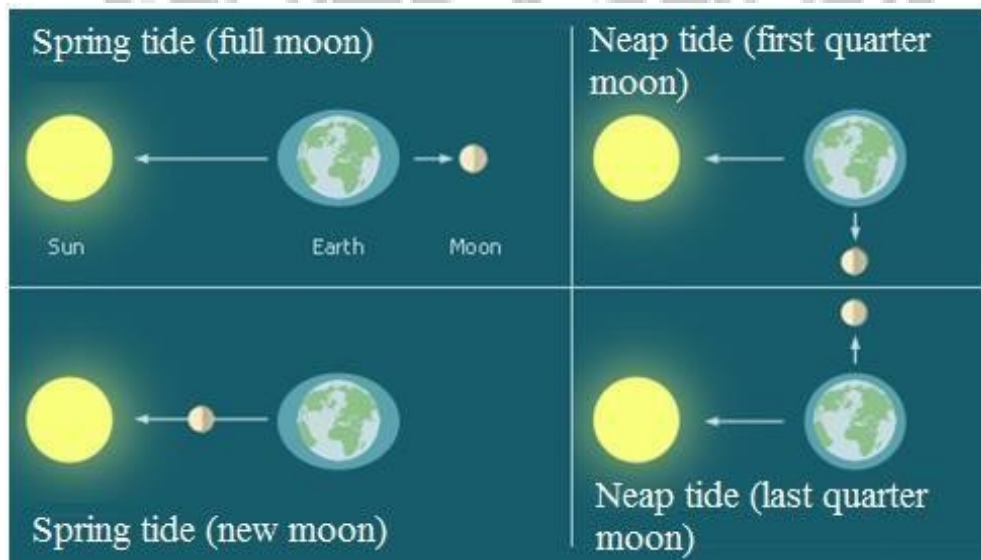


Fig. 5.1. Types of Tide

[Source: "Solar Photovoltaics: Fundamentals, Technologies and Applications" by ChetanSingh Solanki, Page: 375]

- ★ Tidal energy is a form of hydropower that converts the energy of the tides into electricity or other useful forms of power. The tide is created by the gravitational effect of the sun and the moon on
- ★ The earth causing cyclical movement of the seas. Therefore, Tidal energy is an entirely predictable form of renewable energy. Until recently, the common plant for tidal power facilities involved erecting a tidal dam, or barrage, with a sluice across a narrow bay or estuary. As the tide flows in or out, creating uneven water levels on either side of the barrage, the sluice is opened and water flows through low-head hydro turbines to generate electricity. For a tidal barrage to be feasible, the difference between high and low tides must be at least 5m

5.1.1 TIDAL ENERGY RESOURCE

- ♣ Tides are the waves caused due to the gravitational pull of the moon and also the sun (although its pull is very low). The rise of seawater is called high tide and fall in seawater is called low tide and this process of rising and receding of water waves happen twice a day and cause enormous movement of water.
- ♣ Thus, enormous rising and falling movement of water is called tidal energy, which is a large source of energy and can be harnessed in many coastal areas of the world. Tidal dams are built near shores for this purpose in which water flows during high tide and water flows out of dam during low tides. Thus, the head created results in turning the turbine coupled to electrical generator.
- ♣ Tidal energy has been developed on a commercial scale among the various forms of energy contained in the oceans. When the moon, the earth, and the sun are positioned close to a straight line, the highest tides called spring tides occur. When the earth, moon, and sun are at right angles to each other (moon quadrature), the lowest tides called neap tides occur.
- ♣ The water mass moved by the moon's gravitational pull when moon is very close to ocean and results in dramatic rises of the water level (tide cycle). The tide starts receding as the moon continues its travel further over the land, away from the ocean, reducing its gravitational influence on the ocean waters (ebb cycle)

5.1.2 TIDAL POWER GENERATION IN INDIA:

- Long coastline with the estuaries and gulfs in India has a strong tidal range and height to move turbines for electrical power generation. Important site location and estimated power potential of a few Indian tidal energy plant is given in Table below

Site Location	Tide Heights(m)	Estimated Power Potential (MW)
The Gulf of Cambay, Gujarat	11	7000
Gulf of Kutch, Gujarat	8	12000
The Ganges Delta in the Sundarban, West Bengal	5	8000

Table 5.1 Tidal Potential in India

[Source: "Solar Photovoltaics: Fundamentals, Technologies and Applications" by Chetan Singh Solanki, Page:376]

- Many organizations and government agencies are busy in the construction of tidal power plants on all those location and harnessing tidal energy at full capacity. There is an ample prospect for tidal power development in India. It has been investigated that Gulf of Cambay may prove the biggest tidal energy reservoir for India. Extensive exploration on the western coast in Gulf of Kutch (at Mandva), Gulf of Combay (at Hazira), Maharashtra (at Janjira and Dharmata) and also in Hoogali, Chhatarpur, and Puri on Eastern coast may be worth attempting.
- Nevertheless, the possibility of developing tidal power scheme in India may be examined in the following all aspects:
 1. Economic aspects of tidal power schemes when compared to the conventional schemes.
 2. Problems associated with the construction and operation of plant.
 3. Problems related to the hydraulic balance of the system in order to minimize the fluctuation in the power output.
 4. Environmental effects of the schemes.