Tidal Power and Its Development

Ocean can produce two types of energy: thermal energy from the sun's heat, and mechanical energy from the tides and waves. The fact that the marine renewable sector is less well developed than other energy industries presents companies with both opportunities and challenges. Like most other renewable energy areas, tidal energy does not have anything new as far as the idea of producing power from the oceans is concerned. Many ideas have been generated, and a lot of experimental projects are being funded both by governments and commercially. These range from technologies and schemes which produce small amounts of energy for local, often dedicated use, to large scale projects which can or will be capable of supplying energy in quantities sufficient to feed into a grid.

Tidal Energy

Basic Principle:

Tides are generated by gravitational forces of the sun and the moon on the earth's waters. The moon roughly exerts twice the tide raising force of the sun due to the proximity of the moon. Very simply put, the gravitational forces of the moon and the sun create bulges" in the earth's oceans. These bulges result on the two tides of the earth a day. This is the dominant tidal pattern in most of the oceans of the world.

Advantages of Tidal Power

1) Regularity of predicted power production from year to year
2) Low term operation lifetime of plant
3) Protects vulnerable coastline from strong waves and floods
4) Provides a non-polluting and inexhaustible supply of energy
5) Allowing the turbine to optimally capture the flowing water
6) Does not emit greenhouse gases
7) The system is easy to operate & maintain
8) It is non-polluting and almost silent when running

Tidal Power Development

The first tidal power station was the **Rance Tidal Power Station**, located on the estuary of the Rance River in Brittany, France. Opened on the 26th November 1966, it is currently operated by Electricite de France, and is the second largest tidal power station in the world, in terms of installed capacity. With a peak rating of 240 Megawatts, generated by its 24 turbines, it supplies 0.012% of the power demand of France. With a capacity factor of approximately 40%, it supplies an average 96 Megawatts, giving an annual output of approximately 600 GWh.

Figure 1: Rance Tidal Power Station, France

Sihwa Lake Tidal Power Station, located in South Korea is the world's largest tidal power installation, with a total power output capacity of 254 MW, surpassing the 240 MW Rance Tidal Power Station. The tidal power plants have also been developed in Canada, Russia, China and United Kingdom.

The following table lists tidal power stations that are in operation as of 2010.

Power Station	Capacity(MW)	Country	Year of Commencement
Sihwa Lake Tidal Power Station	254	South Korea	2011
Rance Tidal Power Station	240	France	1966
Annapolis Royal Generating Station	20	Canada	1984
Jiangxia Tidal Power Station	3.2	China	1980
Kislaya Guba Tidal Power Station	1.7	Russia	1968
Uldolmok Tidal Power Station	1.5	South Korea	2009
Strangford Lough SeaGen	1.2	United Kingdom	2008

Tidal Power Development in India

India has always played an active role in researching and developing new the technologies. The main objective of the tidal energy programme executed by the Ministry of New and Renewable Energy, Govt. of India is to study, testing and assessment of the potential of tidal energy in the country and to harness it for power generation.

Among the various forms of energy contained in the seas and oceans, tidal energy, has been developed on a commercial scale. India has a long coastline with the estuaries and gulfs where tides are strong enough to move turbines for electrical power generation. The Gulf of Cambay and the Gulf of Kutch in Gujarat on the west coast have the maximum tidal range of 11m and 8m with average tidal range of 6.77m and 5.23m respectively. The Ganges Delta in the Sundarbans is approximately 5m with an average tidal range of 2.97m. The identified economic power potential is of the order of 8000 MW with about 7000 MW in the Gulf of Cambay, about 1200 MW in the Gulf of Kutch in the State of Gujarat and about 100 MW in the Gangetic Delta in the Sunderbans region in the State of West Bengal.

The Ministry sanctioned a project for setting up a 3.75 MW demonstration tidal power plant at Durgaduani Creek in Sunderbans, West Bengal to the West Bengal Renewable Energy Development Agency (WBREDA), Kolkata. The National Hydro Power Corporation Ltd. (NHPC) is executing the project on a turnkey basis.

The State Government of Gujarat formed a Special Purpose Vehicles (SPVs) with public private partnership and sponsored a study for large scale exploitation of tidal energy across the coastline of Gujarat. This study is based on one of the advanced technologies developed so for. In this technology kinetic energy of tidal currents has been proposed to be harnessed under the water and along the flow of water and without using the conventional methods like water wheel or other types of turbines.

Also the state of Gujarat is ready to host Asia's first commercial based tidal power station. The company Atlantis Resources Corporation is to install a 50MW tidal farm in the Gulf of Kutch on India's west coast, with the construction starting early this year. The company has signed a MoU with the government of Gujarat to set up the power plant by 2013. The plant is likely to be scaled up to a capacity of 250 MW at a cost of about $165 million. The project will be developed in partnership with the Gujarat Power Corporation Limited.

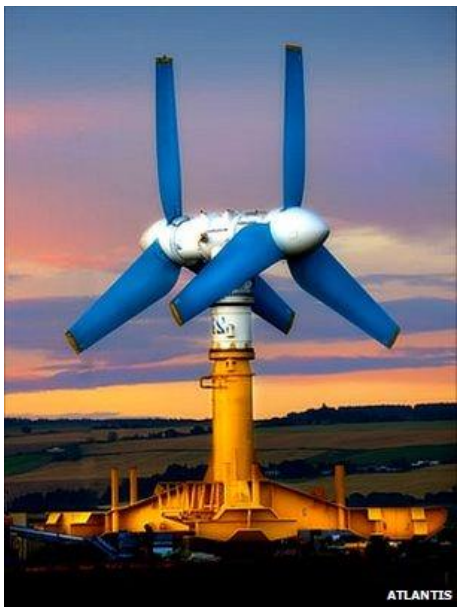

Figure 2: Atlantis turbines to be installed at Gulf of Kutch

Figure 3: Location of the First Asian Tidal Power Plant in India