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**Ocean**


## Ocean Energy Basics

The ocean contains two types of energy: *thermal energy* from the sun's heat, and *mechanical energy* from the tides and waves.

Oceans cover more than 70% of Earth's surface, making them the world's large solar collectors. The sun warms the surface water a lot more than the deep ocean water, and this temperature difference stores thermal energy. Thermal energy is used for many applications, including electricity generation. There are three types of electricity conversion systems: *closed-cycle*, *open-cycle*, and *hybrid*. Closed-cycle systems use the ocean's warm surface water to vaporize a *working fluid*, which has a low-boiling point, such as ammonia. The vapor expands and turns a turbine. The turbine then activates a generator to produce electricity. Open-cycle systems actually boil the seawater by operating at low pressures. This produces steam that passes through a turbine/generator. And hybrid systems combine both closed-cycle and open-cycle systems.

Ocean mechanical energy is quite different from ocean thermal energy. Even though the sun affects all ocean activity, tides are driven primarily by the gravitational pull of the moon, and waves are driven primarily by the winds. A *barrage* (dam) is typically used to convert tidal energy into electricity by forcing the water through a turbine, activating a generator. For wave energy conversion, there are three basic system types: channel systems that funnel the waves into reservoirs, float systems that drive hydraulic pumps, and oscillating water column systems that use the waves to compress air within a container. The mechanical power created from these systems either directly activates a generator or transfers to a working fluid, water, or air, which then drives a turbine/generator.

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