

**Figure 8.6: Marine and hydrokinetic technologies**

<p><b>Dams &amp; Current</b></p>	<p><b>Horizontal Axis Turbine</b></p> <p>Typically has two or three blades mounted on a horizontal shaft to form a rotor; the kinetic motion of the water current creates lift on the blades causing the rotor to turn driving a mechanical generator.</p>
	<p><b>Vertical Axis Turbine</b></p> <p>The same mechanics of water current turning the rotor that drives the generator, but the rotor blades are mounted along a vertical instead of a horizontal shaft.</p>
	<p><b>Oscillating Hydrofoil</b></p> <p>Similar to an airplane wing but in water; control systems adjust their angle relative to the water stream, creating lift and drag forces that cause device oscillation; mechanical energy from this oscillation feeds into a power conversion system.</p>
<p><b>Wave</b></p>	<p><b>Attenuator</b></p> <p>Wave energy capture device with principal axis oriented parallel to the direction of the incoming wave that converts the energy due to the relative motion of the parts of the device as the wave passes along it.</p>
	<p><b>Pitching/Surging/Heaving/Sway (PSHS) device</b></p> <p>Any of several devices that capture wave energy directly without a collector by using relative motion between a float/flap/membrane and a fixed reaction point; the float/flap/membrane oscillates along a given axis dependent on the device; mechanical energy is extracted from the relative motion of the body part relative to its fixed reference.</p>
	<p><b>Oscillating Water Column</b></p> <p>Partially submerged structure that encloses a column of air above a column of water; a collector funnels waves into the structure below the waterline, causing the water column to rise and fall; this alternately pressurizes and depressurizes the air column, pushing or pulling it through a turbine.</p>
	<p><b>Overtopping Device</b></p> <p>Partially submerged structure; a collector funnels waves over the top of the structure into a reservoir; water runs back out to the sea from this reservoir through a turbine.</p>
	<p><b>Point Absorber</b></p> <p>Wave energy capture device with principal dimension relatively small</p>

	compared to the wave length and able to capture energy from a wave front greater than the physical dimension of the device.
	<p><b>Submerged Pressure Differential</b></p> <p>Wave energy capture device, which can be considered a fully submerged point absorber; a pressure differential is induced within the device as the wave passes driving a fluid pump to create mechanical energy.</p>
	<p><b>Oscillating Hydrofoil</b></p> <p>Similar to an airplane wing but in water; yaw control systems adjust their angle relative to the water stream, creating lift and drag forces that cause device oscillation; mechanical energy from this oscillation feeds into a power conversion system.</p>
<b>Ocean Thermal Energy Conversion</b>	<p><b>Closed-cycle</b></p> <p>These systems use fluid with a low-boiling point, such as ammonia, to rotate a turbine to generate electricity. Warm surface seawater is pumped through a heat exchanger where the low-boiling-point fluid is vaporized. The expanding vapor turns the turbo-generator. Cold deep-seawater—pumped through a second heat exchanger—condenses the vapor back into a liquid, which is then recycled through the system.</p>
	<p><b>Open-cycle</b></p> <p>These systems use the tropical oceans' warm surface water to make electricity. When warm seawater is placed in a low-pressure container, it boils. The expanding steam drives a low-pressure turbine attached to an electrical generator. The steam, which has left its salt behind in the low-pressure container, is almost pure fresh water. It is condensed back into a liquid by exposure to cold temperatures from deep-ocean water.</p>
	<p><b>Hybrid</b></p> <p>These systems combine the features of both the closed-cycle and open-cycle systems. In a hybrid system, warm seawater enters a vacuum chamber where it is flash-evaporated into steam, similar to the open-cycle evaporation process. The steam vaporizes a low-boiling-point fluid (in a closed-cycle loop) that drives a turbine to produce electricity.</p>

*Marine and Hydrokinetic Technology Glossary*, U.S., Dep't. of Energy, <http://www1.eere.energy.gov/windandhydro/hydrokinetic/techTutorial.aspx> (last visited Aug. 5, 2011), <http://www1.eere.energy.gov/windandhydro/hydrokinetic/techTutorial.aspx> For a database with the latest wind and wave technologies and status, follow this link: <http://www1.eere.energy.gov/windandhydro/hydrokinetic/listings.aspx?type=Tech>