



## Free Flow Systems

Verdant Power's Free Flow systems are turnkey renewable energy solutions that employ underwater turbines to generate electricity from the natural water currents of **tides and rivers**. The systems do not require dams, impoundments or major civil works. They operate automatically, fully underwater and invisible from shore. Simple and modular in design, Free Flow systems can be scaled for use in a wide range of sites worldwide.

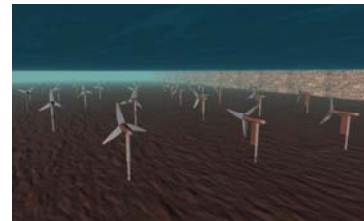
### Free Flow Turbine

Resembling and operating similarly to present-day wind turbines, Verdant Power's Free Flow turbine has a horizontal-axis rotor with three blades designed for high efficiency over a large range of speeds. The turbine rotor is spun slowly and steadily (~32 rpm) by the natural currents of tides and rivers.



This motion drives a speed increaser, which in turn drives a grid-connected generator, both of which are encased in a waterproof streamlined nacelle mounted on a streamlined pylon.

Free Flow turbines deployed in tidal settings are assembled with internal yaw bearings, which allow the turbines to pivot with the changing tide and capture energy for the majority of the day. Turbines deployed in rivers are fixed and generate power on the continuous flow of the river throughout the day, providing nearly '24-hour power'. Depending on the site, various types of devices can be used to anchor the turbines underwater.



Verdant Power's Free Flow systems can be scaled for village or utility-scale power.

### Pilot Projects: Free Flow Systems

The Roosevelt Island Tidal Energy (RITE) Project (East River - New York, NY)	
Tidal Free Flow System	
<ul style="list-style-type: none"> <li>• World's first grid-connected field of tidal turbines</li> <li>• ~50 MWh of energy delivered to customers (world leader)</li> <li>• 7,000+ operational hours (world leader)</li> <li>• Potential for 10 MW installed capacity at site</li> <li>• Partnerships with New York State, New York City</li> </ul>	

The Cornwall Ontario River Energy (CORE) Project (St. Lawrence River - Cornwall, Ontario)	
River Free Flow System	
<ul style="list-style-type: none"> <li>• First demonstration of Free Flow system in river setting</li> <li>• System is projected to operate with 80-90% capacity factors</li> <li>• Potential for 15 MW installed capacity at site</li> <li>• Partnerships with Ontario and Federal Canadian governments</li> </ul>	



Verdant Power's Free Flow turbine being installed into NYC's East River in December 2006

## Advantages of Verdant Power Systems

- ✓ **Out of Sight and Silent:** Verdant Power systems operate silently and automatically, fully underwater and out of sight from shore. This aspect of the technology reduces the visual disruption and 'NIMBY' issues related to other sources of renewable energy, especially wind farms.
- ✓ **Renewable and Predictable Energy:** Water currents provide a predictable, if not constant, source of renewable energy. This creates an advantage for Verdant Power technologies over wind and solar systems, which offer intermittent power more subject to daily changes in weather and blackout scenarios. In fact, Verdant Power anticipates that its river-based systems will achieve 80-90% capacity factors, approximately double those of wind and solar power systems.
- ✓ **Simple and Scalable:** Verdant Power systems are simple and modular in design and can be scaled to produce cost-effective power at a wide variety of sites—from placement directly in population centers to use in deep offshore ocean locales. The simple nature and few moving parts in the systems also decrease operations & maintenance costs. Additionally, the systems do not require dams, impoundments or other major civil works, thus causing minimal public and environmental impact and minimizing upfront capital costs—an aspect that makes them especially suitable for use in developing countries.
- ✓ **Placement in Population Centers:** Because of their minimal public impact and scalable nature, Verdant Power systems can be placed directly in population centers ranging from major urban areas to small villages. This not only provides power where it is needed most, but, by eliminating the need for transmission lines, the technology is also safer, more energy efficient and cost-effective.
- ✓ **Clean Water Integration:** Simply designed and already deployed in water, Verdant Power systems can be integrated with water purification technology. This further enhances the systems' applicability in developing countries, which report the world's highest demands for both clean energy and water.



Verdant Power's Free Flow systems operate out of sight and silently underwater. Simple and modular, the systems can be scaled for placement directly in population centers ranging from cities to villages.



Based in New York, NY, Verdant Power is a world leader in the design and application of marine renewable energy solutions. Verdant Power systems employ underwater turbines to generate renewable and reliable clean energy from the currents of tides, rivers and manmade channels. In addition to designing and commercializing its own technology, Verdant Power also develops projects around the world.