

CASE STUDY

Hydro Green Energy, LLC

NATIONWIDE OFFICES

Corporate

25 Nashua Road
Bedford, New Hampshire 03110
603.472.5191

New Hampshire

Hampton
Westmoreland

Delaware

Lewes

Maine

Falmouth

Massachusetts

Falmouth

New York

West Haverstraw

Pennsylvania

Drumore
Stowe

South Carolina

Aiken

Washington

Stevenson
Vancouver
Wenatchee

Wisconsin

Verona

www.normandeau.com

Hydro Green Energy, LLC

BACKGROUND

Hydro Green Energy, LLC is a renewable energy project developer and integrator that designs, builds and operates kinetic hydro power projects that generate electricity by the patented hydro power turbine arrays (HTA), exclusively from moving water (river currents, tidal currents and ocean currents) without having to construct dams, impoundments, conduits or other infrastructure projects.

The concept behind the Hydro Green Energy is to reduce the cost of non emitting renewable energy production so that it is competitive with fossil fuel generated power (www.hgenergy.com). For one of Hydro Green's first projects, the City of Hastings, MN will apply for a FERC license amendment to add Hydro Green Energy's hydrokinetic units in the tailrace of the City's existing conventional hydroelectric power project (the Hastings Project) located on the Mississippi River at Lock & Dam No. 2.



Hastings Project

(Photo Courtesy: US Army Corps of Engineers)

THE CHALLENGE

Hydro Green Energy's kinetic Hydropower Turbine Arrays operate differently than a traditional hydropower plant. Hydro Green Energy's Krouse Turbines are kinetic turbines that generate energy from the velocity of moving water be it river, tidal or ocean currents. The Hydro Green Energy Hydropower Turbine Arrays are inexpensive to manufacture, can be engineered and designed for many different types of conditions and produce the lowest cost hydropower commercially available. The amount of environmental damage due to infrastructure creation and modification

(continued on reverse side)

is significantly reduced with Hydropower Turbine Arrays compared to other kinetic hydropower designs and especially when compared to traditional hydropower. While the use of kinetic turbines provides a cost effective renewable energy source, because this is a new technology challenges similar to those of traditional hydro power energy production exist. Natural resource agencies and FERC require power producers to estimate the impacts to fish, water quality, and perhaps other aquatic issues and to provide solutions that minimize these impacts.

THE SOLUTION

Hydro Green Energy contracted Normandeau Associates, Inc. to provide strategic consulting services for assistance with the development of a FERC license amendment. Normandeau developed a study plan to evaluate fish passage survival using Normandeau's patented HI-Z Turb'N Tag® technology. Additional studies include water quality and zebra mussel control protocols.



The three primary objectives for the initial phase of this work include:

- Estimating the 'fish friendliness' of the Hydro Green Energy hydrokinetic unit by tagging fish and introducing them through the hydrokinetic unit (treatment group) then recapturing them to estimate the survival and injury rates relative to a control group;
- Evaluating effects of the hydrokinetic units on the water quality parameters of temperature, dissolved oxygen, and turbidity and;
- Developing a protocol for assuring that work and operations conducted by Hydro Green Energy and their contractors will not result in the spread of zebra mussels to any other water body.

The license amendment request will soon be reviewed by FERC. If the amendment is granted timely, field evaluation of the Hydro Green Energy turbine will proceed in mid-2008.

About Normandeau Associates

Normandeau Associates, Inc., an employee-owned company, was founded in 1970 as an environmental consulting firm. Today, Normandeau is considered one of the nation's foremost companies in the field. Our deep and broad background as both environmental and public involvement consultants provides a wealth of knowledge and experience in disciplines ranging from environmental assessment and permitting to stakeholder interviews and facilitation.

From offices nationwide, Normandeau's staff of over 150 professionals work closely with clients, regulators, and the public to seek solutions that enhance economic development, meet regulatory requirements, protect and restore our natural resources, and improve communities.

Our diverse team includes marine, aquatic, wetland, and terrestrial ecologists; environmental planners; fisheries biologists and limnologists; ornithologists and botanists; soil scientists, geologists, and hydrologists; engineers; statisticians and data processing specialists; report production personnel; and public involvement professionals.

Normandeau Associates, Inc., combines experience, continuous training, hard work, and a rigorous commitment to excellence to deliver the highest possible level of service to our clients.