

Scientists to tap river currents to create clean energy

January 25 2009, By Tina Lam

In the eerie green glow of flashing lasers in a darkened University of Michigan lab, a cylinder on springs moves methodically up and down in a giant tank as water flows over it, simulating a stream.

Whirligigs of illuminated particles form as the water pours over and under the cylinder in rhythmic patterns.

It looks simple, but it's revolutionary. This is VIVACE, a device to harness energy in slow-moving water currents across the globe and turn it into electricity.

VIVACE, which mimics the way fish swim in currents, is to debut next year in the Detroit River, powering the light for a new wharf between Hart Plaza and the Renaissance Center.

"Everybody is excited by this," said Mike Bernitsas, director of the Marine Renewable Energy Laboratory at the University of Michigan and inventor of the device.

It's one of a handful of new techniques - the first in more than 100 years - to use water to create clean, renewable energy. Since late November, the device has been filmed by Canada's Discovery Channel and discussed in science blogs, journals and the British Sunday Telegraph.

Unlike water-driven mills, turbines or dams, VIVACE doesn't require fast-moving water - most streams on the globe are slow-moving - and

doesn't harm the environment.

VIVACE means "lively" on a musical score, but in this case is an acronym standing for Vortex-Induced Vibrations for Aquatic Clean Energy.

Bernitsas said he is thinking small so far, but someday an array of 1,000 cylinders offshore could produce the same energy as a large nuclear plant. A smaller grouping, as big around as a running track and as tall as a two-story building, could power 1,000 homes.

He came up with the idea four years ago and is developing it with a team of more than 30 students and researchers for commercial use. He patented it and started a company that hopes to manufacture it in Michigan in a few years.

In a stream, small eddies, or vortices, are created above and below an object the current hits. These vortices alternate, creating an up and down lift.

For example, a moored boat will bob up and down, and a stick caught underwater in a stream will quiver. Vortices in the air make your car antenna shake if you drive fast.

In air or water, the vibrations can be dangerous if not controlled.

Bernitsas, 57, has worked for two decades on ways to control these vibrations on offshore oil rigs.

"He was famous for how to kill vortex-induced vibrations," said U-M doctoral student Jim Chang, who works on VIVACE. "Now he'll be known for using them."

What Bernitsas envisions is groups of cylinders in frames on the ocean bed or in streams, perpendicular to currents. As the water flow hits the cylinders, it creates vortices that cause the cylinders to move up and down. That energy drives generators to make electricity, which goes through cables to the electrical grid on land. The size, number and placement of the cylinders depends on the body of water.

In the Detroit River, he plans 21 cylinders, each about 10 inches in diameter and 16 feet long, suspended in frames mid river on the U.S. side, which will create 3 kilowatts of energy around the clock to power lights on the dock.

This electricity is clean, infinitely renewable - "as long as the sun, the Earth and the moon move as they do now," he jokes - and doesn't harm the environment.

The cylinders will be far enough apart that fish can swim through them and deep enough to avoid ships, boats and fishing lines.

"It's a really creative project," said John Kerr, director of economic development for the Detroit/Wayne County Port Authority.

VIVACE's electricity will be cheaper to produce than solar or wind energy - at 5.5 cents per kilowatt hour - and cheaper than coal plants if controlling their carbon emissions is accounted for, he said, because the devices are simple and require little maintenance.

The cylinders should go into the Detroit River within 12 to 14 months, followed by further testing.

Bernitsas said he can't jump up and down until then, since challenges remain.

"Once it's in the Detroit River, I'll be screaming, 'Eureka!' " he said.

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