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The Tide Is Turning for a New Source of Green Energy

The first underwater turbines are connected to Scotland's power grid.

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A tidal energy turbine is loaded onto a barge in Invergordon, Scotland. (Photo: Jeff J. Mitchell/Getty Images)



SEP 1, 2016 · 3 MIN READ · [COMMENTS](#)



Taylor Hill is an associate editor at TakePart covering environment and wildlife.

[Bio](#)

Two turbines installed off Scotland’s coast aren’t harnessing the country’s winds to generate power. Instead, these blades are spinning underwater, using an even more predictable renewable power source in the region—tides.

The offshore array is the world’s first network of tidal turbines to deliver [electricity to the power grid](#), according to Nova Innovation, the company behind the development.

That’s a big step for green power generation, as it

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shows commercial viability for a **marine-based power source** to create renewable energy. Unlike solar and wind power, where power production stops when the sun isn't shining or when the wind stops blowing, Nova's tidal arrays continuously generate electricity by using perpetual incoming and outgoing tidal currents to spin its underwater turbines 24 hours a day, 365 days a year.

"We are absolutely delighted to be the first company in the world to deploy a fully operational tidal array," said Simon Forrest, managing director of Nova Innovations. "Deploying the second turbine truly sets us apart and showcases our technology."

So far, two 100-kilowatt turbines have been installed in the turbulent tidal stream of Bluemull Sound off the Shetland Islands—an archipelago about 120 miles north of mainland United Kingdom, where the North Sea meets the Atlantic Ocean.



Nova is planning to construct five turbines in the region, providing power to residents and businesses on the Shetland Islands.

The islands aren't connected to the U.K. grid, so its 23,000 residents rely on a diesel-fueled power station for most of their electricity. The 0.5 megawatts expected to come online from the underwater turbines would minimize the need for the tanker-supplied fossil fuels.

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Lang Banks, director at World Wildlife Fund Scotland, said the tidal array is an example of how the technology can help communities reach emissions reduction goals.

“Alongside energy-saving measures, marine renewables—including tidal—will have a critical role to play in helping Scotland reduce climate emissions as we phase out polluting fossil fuels and nuclear power,” Banks said. “Globally, tidal power has huge potential, which is why countries such as Japan are researching this type of energy technology.”

While the \$3.9 million Shetland tidal project is small, marine energy's potential looms large. Renewable energy agency U.K. Carbon Trust estimates a \$165 billion global tidal energy market could be developed by 2050. The thousands of potential

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locations for tidal turbines could boost zero-emission energy, eliminating millions of pounds of greenhouse gas emissions that would otherwise be released through fossil-fuel-burning power plants.

The U.S. Energy Department estimates tidal streams in the U.S. could generate enough electricity to power nearly 30 million homes a year.

The industry, though, is still in its infancy. Some projects in the works include French company [OpenHydro](#), which says it is close to linking two tidal machines off Brittany to create a 1-megawatt tidal array. U.K.-based Tidal Lagoon Power has proposed to build a tidal turbine system called the [Swansea Bay project](#) that would generate 320 megawatts.

In the U.S., companies in Oregon, Washington, and Maine are in various states of trial and testing of tidal power systems. This week, the federal government selected 10 organizations to share

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more than **\$20 million in funding** to be used to explore ways to generate electricity from ocean waves and tidal currents.

The ocean's constant motion is a boon to steady power production but a bane for engineers, who must develop a cost-effective generator capable of withstanding the relentless pounding and corrosive marine environment.

On the Shetland Islands, residents are weighing the environmental impacts that would come with a beefed-up tidal array system against the potential impacts of a planned wind farm. One group, known as Sustainable Shetland, has been fiercely opposed to a proposed 103-turbine, 307-megawatt wind farm that's been in the works since 2008.

Frank Hay, chairman of Sustainable Shetland, said the project would replace environmentally important **peatlands**, and many of the turbines would be placed within 1.5 miles of residences.

"We recognize that renewables must play a part in how we live in the future. However, these schemes must be fit for scale and fit for purpose," Hay said. "A wind farm of this scale is wrong for Shetland."

Hay said the group is not opposed to the smaller-scale tidal array but questions what a big project would look like.

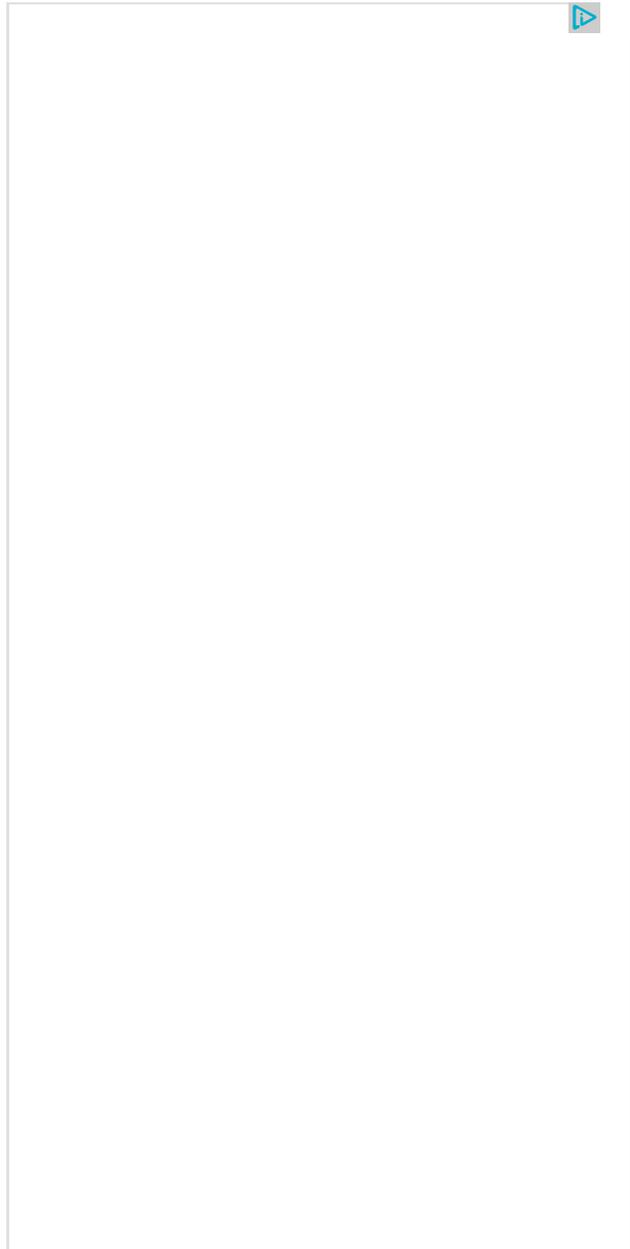
"A major problem for tidal energy is that to make it large-scale it will require a large area of seabed, and this could have issues for fishermen

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as well as marine life in the area,” Hay said. “It would appear that nearly every renewable system would have some negative aspect.”

Government officials have already designated two regions south of Shetland–Pentland Firth and Orkney Waters—as [Marine Energy Parks](#), aimed at streamlining the commercial-scale leasing process to get potential prototypes and projects online faster.

Those locations, Lang said, “offer further opportunity for Scotland’s marine renewable businesses to develop wave and tidal devices. We’re already at the forefront of these important technologies, and energy park status will help speed up the commercial development of marine renewable devices.”



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**Kenneth Pierce**

Yes, but where do tidal/current based power sources get their energy from? 1. Tidal - rotation of the earth, existing tidal power stations like on the mouths of rivers have extracted enough energy from the rotation of earth that it now takes, 0.6 sec longer to complete a full 365 rotations - this is with only a few MW's extracted. Multiply this across the globe and we have a problem. 2 - Current based systems are delicate enough already with massive influxes of meltwater and changes in climate disturbing them already. Start extracting power from these and soon all of our important ocean currents will shut down. They are also very inefficient. I'm all for renewable power, but it has to be a long term solution, and tidal is not it. Nor current, nor wave. As a stop gap to provide some remote capacity, ie the Shetland Islands yes, but not generally.

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**John Stumbles** · Neasden University

You are seriously claiming that the miniscule amount of power we currently get from tidal energy is slowing the Earth's rotation by 0.6 seconds per year? Sources please.

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**Charlie Avalos** · Indiana University-Purdue University Indianapolis (IUPUI)

Not likely to make a significant impact. I'm curious where Kenneth gets his information from. It's certainly better than the enormous amount of greenhouse gasses (7 billion metric tons of CO2 annually) from burning fossil fuels. His analogy is similar to the thinking of a senator in the United States which claimed that wind turbines will deplete wind as a renewable resource and that solar panels would rob the earth of solar energy. It was a ridiculous, uneducated statement.

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