

Green Ocean Energy

Customer Success Story

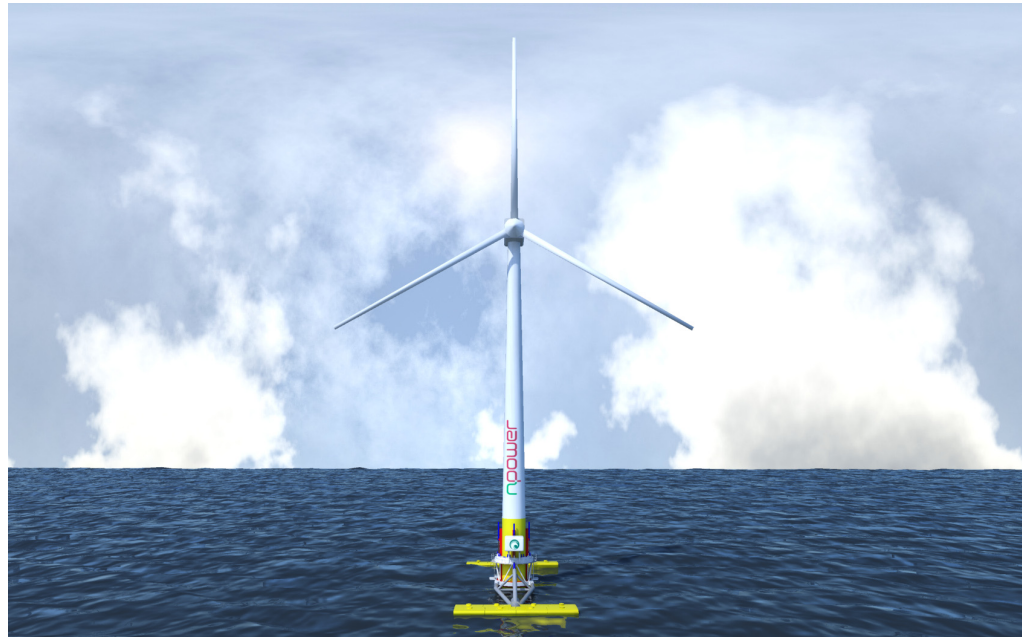
Autodesk® Inventor®
Autodesk® 3ds Max® Design

Everything we do now in Inventor we'll be able to reuse and fine-tune for the next generation. As we build ever more effective devices, we'll continue to lean on the power of Inventor to help us harness the renewable energy of waves.

—George Smith
Founder
Green Ocean Energy

Harnessing wave power.

Green Ocean Energy relies on Autodesk® Inventor® software and Digital Prototyping to develop groundbreaking wave energy devices.



Project Summary

Located in Aberdeen, Scotland, Green Ocean Energy develops technology for harnessing the ocean's power to provide clean, sustainable energy. When George Smith helped found the renewable energy company in 2005, he brought his faith in Autodesk® Inventor® software with him. Previously a consultant for the oil and gas industry, Smith had used Autodesk Inventor for several years, and believed the software was ideal for developing highly innovative wave energy devices. Green Ocean Energy takes advantage of Inventor software to develop its unique, pioneering designs using a streamlined workflow. In addition, the company delivers Inventor models to consultants who import the files into Autodesk® 3ds Max® Design software to create realistic imagery and animations. Both part of the Autodesk solution for Digital Prototyping, Autodesk Inventor and Autodesk 3ds Max Design software are helping Green Ocean Energy to:

- Experiment with unique sponson shapes to maximize device durability
- Validate design concepts before physical prototyping
- Create compelling imagery and animations for investors and partners

The Challenge

The wave energy devices Green Ocean Energy set out to design are like no others. While most wave energy devices are variations on buoys, Green Ocean Energy's devices are meant to float horizontally so they can extract energy from a larger part of the wave as it passes. "There's nothing else like them—nothing even close," says Smith. Designing something completely new presents challenges. Most notably, Green Ocean Energy must be able to communicate its designs to potential investors and partners in a way they can understand.

Green Ocean Energy's wave energy devices will weigh 300 tons and span 50 meters, and must be able to survive harsh storm conditions. With even 1:12.5 scale models measuring 4 meters long, it would be nearly unthinkable to build a full-scale physical prototype to determine design viability. From the outset, Green Ocean Energy knew it needed a way to create digital prototypes that it could subject to rigorous hydrodynamic and structural analysis, and then quickly tweak based on the results. According to Smith, "Autodesk Inventor was the only design software we ever considered. It offered us the Digital Prototyping capabilities we needed to realize our vision."

Autodesk Inventor unleashes the creativity of Green Ocean Energy, pioneers in the wave energy device industry.

The Solution

Initially, Green Ocean Energy focused on its innovative Ocean Treader design, meant to be moored to the ocean floor using anchors and cables. The company then began working on a second device—called the Wave Treader—that will be mounted on a rigid offshore wind turbine pile driven into the seabed. Green Ocean Energy's goal is to have a full-scale prototype of the Wave Treader ocean-ready by 2010, with an Ocean Treader following soon after.

Intuitive Innovation

Inventor software has played a key role in helping Smith's team refine the designs using virtual models. "A big benefit of Inventor is that we can design intuitively and iteratively," Smith explains.

Everyone on the company's design team uses Inventor, as do the subcontractors tapped to provide expertise not available in-house. All work is integrated into a single digital model for each device. "Thanks to our streamlined workflow, our designs progress very efficiently," says Smith. "For a fairly small company, we've achieved a lot in a short period of time."

Groundbreaking Design

Horizontally floating elements, called sponsons, set Green Ocean Energy's designs apart from all other wave energy devices. On the wind turbine-mounted Wave Treader, an approaching wave raises the forward sponson, lifting up the forward arm of the device and stroking a hydraulic cylinder compressing hydraulic fluid. The fluid drives a hydraulic motor, which in turn rotates an electric generator. The process is repeated with the aft sponson as the wave passes. The electricity is exported through the cable shared with the wind turbine. The sponsons help Green Ocean Energy's devices capture more energy from every wave.

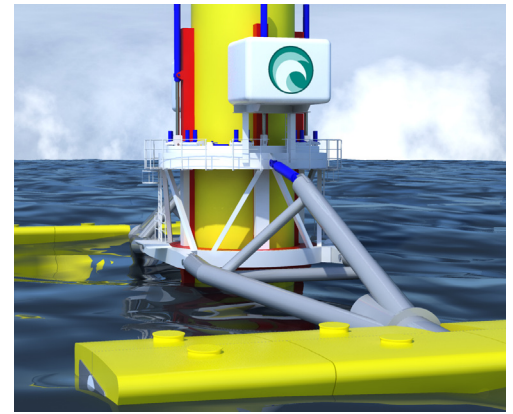
Using Inventor software to work with constraints such as ballast and masses, the company has made huge strides perfecting the landmark design. "The sponsons must harness wave energy vertically during normal operation but also survive stormy conditions," Smith explains. "Inventor has been very useful in helping us balance strength versus weight, and optimizing the sponsons' shape so that they can shed storm wave energy."

Digital Prototyping Benefits

By developing digital prototypes in Inventor, Green Ocean Energy has confidence that when it develops physical prototypes, the devices will work as planned. "A full-size wave energy device will cost more than \$5 million," notes Smith. "By the time we build a to-scale physical model, we will have completed a huge amount hydrodynamic and mathematical analysis on our digital prototypes to validate our concepts."

Another benefit is that the company can export its Inventor data straight into the computer-numerically controlled machines used by manufacturers. "With the unique shape of our sponsons, it's been a big bonus that our partners don't need to interpret our designs," says Smith. "The sponsons are molded directly from Inventor data, so they are absolutely impeccable."

Thanks to digital prototyping, Green Ocean Energy has also been able to easily communicate its design to investors and partners. "When you're working on a completely groundbreaking design, it can be hard to explain how it will work," says Smith. "It's been a huge help that our marketing partners can import our Inventor data into Autodesk 3ds Max Design to create realistic imagery and animations for us. We're using these on our website and to demonstrate our concepts to investors and utility companies to get their support."



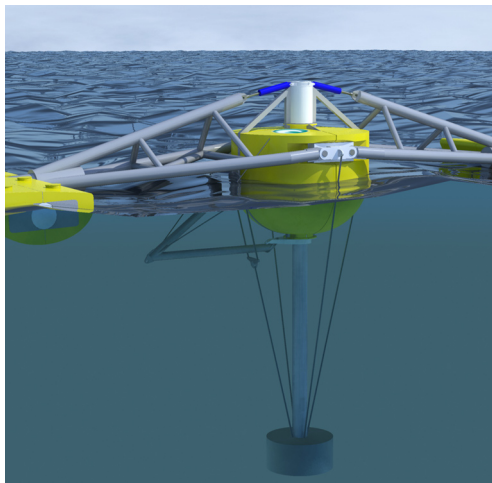
The Result

What does Green Ocean Energy like best about Inventor? Smith says, "To be honest, it would have been difficult, nearly impossible, to design our wave energy devices using a 2D CAD tool. It's an added bonus that Inventor is intuitive to use, has fast response times, and is highly stable."

Green Ocean Energy's current designs are laying the foundation for future generation wave devices. "Everything we do now in Inventor we'll be able to reuse and fine-tune for the next generation," Smith notes. "As we build ever more effective devices, we'll continue to lean on the power of Inventor to help us harness the renewable energy of waves."

For More Information

To find out how Autodesk Inventor can help you increase innovation by moving you beyond 3D to Digital Prototyping, visit www.autodesk.com/inventor.



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Images courtesy of Green Ocean Energy

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