HPC-enabled clean energy

Images: Albatern

WaveNET is a radical new wave-energy device from Albatern that captures energy from ocean waves and converts it into sustainable low-carbon electricity. Built from individual SQUID generating units, WaveNET arrays are coupled, modular and scalable three-dimensional structures that represent a step-change in wave energy technology and offer dramatic improvements in operational efficiency at lower cost.

The challenge

The Squid units and their link-arms contain mechanisms to generate power by capturing the motion of the waves via hydraulics. This technology offers a highly-scalable, modular wave-power generator.

But product development is complex as wave-energy physical prototypes are large and expensive to produce. Virtual prototyping presents an opportunity to reduce these costs. However the associated models are complex and a coupled numerical model for large interconnected arrays is required to fully optimise the system. Simulation models must be run thousands of times to characterise the system response to different environmental conditions (wave height, period, spectral shape, directional spectrum, tidal loading, etc) and this process must be repeated hundreds of times to characterise the concept space through a parametric optimisation process. Access to significant modelling capability and HPC resources is required to support the computational, data analytics and post-processing requirements of this modelling process.

How we helped

EPCC undertook the development of software that would be capable of simulating a large-scale Wavenet array (100 or more units) on a high-performance computing (HPC) system. The solution was designed to build on Albatern's in-house expertise, and can be easily expanded to model larger arrays. The complexity of the model can also be incrementally increased. In the main, this work was carried out through the European PRACE project, via their SHAPE initiative which aims to increase business competitiveness through facilitating access to advanced computing resources and services.

The benefits

The work produced a clear development concept for the implementation of an HPC-based simulation method capable of carrying out large-scale simulations of SQUID prototypes.

The computer visualisations and power-generation data that is produced from the simulations will be useful to Albatern not only in accelerating product development but also in supporting investor confidence in product viability. This will greatly increase the chances of securing the continued investment needed to allow Albatern to achieve its ambitious business goals.

"Simulations demonstrating the potential cost and performance improvements gained through deploying extremely large, coupled wave energy arrays will be a breakthrough for the industry. The project has helped Albatern develop in-house software that will directly aid expanding the scope of their simulation capability." **Dr William Edwards, Albatern**

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To discuss our services for business, contact George Graham at EPCC:

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