

ASX ANNOUNCEMENT

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Tank Testing Commenced to Validate Carnegie's Wave Predictor

- Wave tank testing campaign has now commenced following COVID-19 delays
- Wave Predictor sensor array optimised
- Tank testing data to be used to validate Carnegie's Wave Predictor

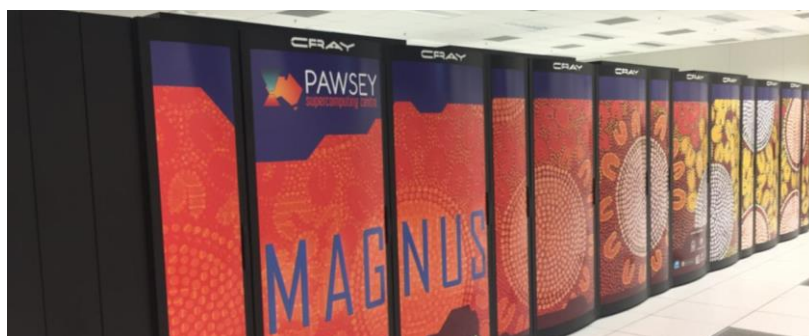
Carnegie has commenced its planned wave tank testing campaign at the Cantabria Coastal and Ocean Basin in Spain in order to generate detailed physical wave data that will be used to validate Carnegie's machine learning based Wave Predictor.

What is Carnegie's Wave Predictor?

Carnegie previously announced the development of a machine learning based Wave Predictor capable of predicting the characteristics of waves that will reach the CETO Unit up to 30 seconds in the future. This is the first product in Carnegie's suite of control products using artificial intelligence which seek to increase the energy captured from the waves and thereby increase the annual electric power yield of a CETO Unit.

The Wave Predictor is significant for Carnegie as it enables the CETO technology to respond to wave conditions in a manner that optimises power production, thus improving the commercial performance of the technology. Carnegie's Wave Predictor could also benefit other applications in the marine industry, including aquaculture, offshore wind and shipping. Offshore operations such as crew transfer, refuelling, ship loading and vessel manoeuvring could potentially be made safer and more efficient with an accurate short-term wave predictor.

To develop the Wave Predictor, Carnegie's data analysis team utilised the Pawsey Supercomputing Centre's state of the art Magnus supercomputer to run simulations. These generated over 250 GB of wave data used to train the neural network (an artificial brain) to predict waves in complex sea states, including directionally spread waves.



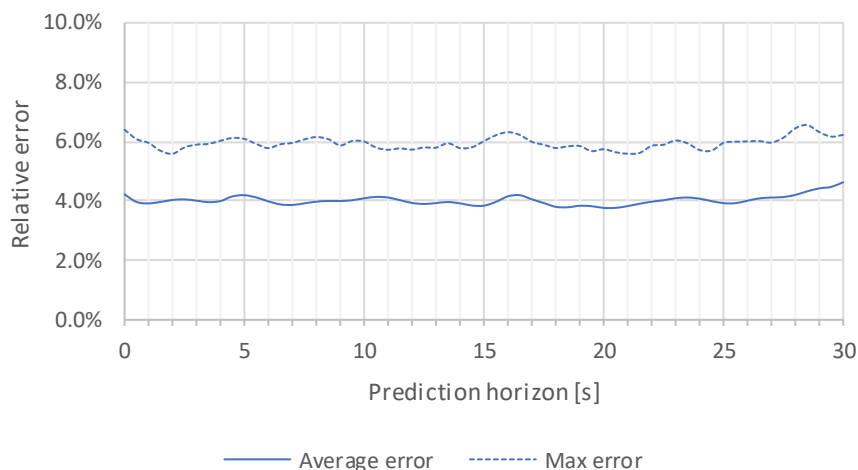
The Magnus supercomputer at Pawsey generated the training data

What does this tank testing campaign deliver?

With the wave predictor originally trained using virtual wave data generated by the supercomputer, this tank testing campaign will now deliver physical wave data measured by an array of equipment installed in the tank. The extensive physical data gathered through this campaign will be used to validate the Wave Predictor's accuracy in wave conditions similar to those encountered at potential offshore deployment sites for CETO.

The tank testing campaign was delayed due to the COVID-19 pandemic but the Carnegie team used the opportunity to refine the size of the array of wave sensor used to perform the prediction. The team has been able to reduce the number of sensors by half with no impact on the accuracy of the prediction. Excellent prediction accuracies averaging 4 % have been achieved using this optimised sensor array. This optimisation will significantly reduce the cost of the Wave Predictor product and make its deployment simpler.

Wave predictor performance



Carnegie's wave predictor performance showing excellent accuracy over a range of prediction horizons using the optimised wave sensor array.

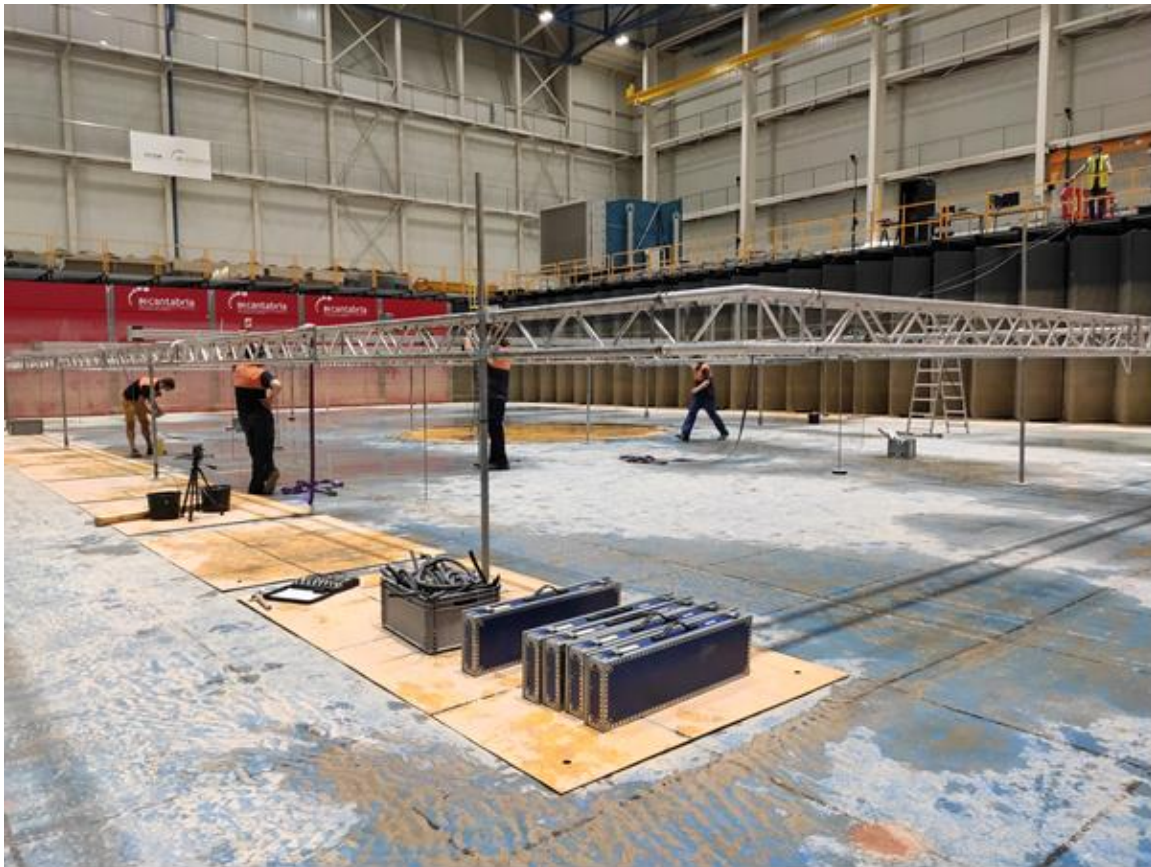
What is happening during the tank testing campaign?

Carnegie was awarded funding through the European funded Marinet2 Project to access the wave basin at the Cantabria Coastal and Ocean Basin in Spain. This provides free access to the facility which reduces the Wave Predictor development cost to Carnegie and enables the team to access time at this unique international resource.

The testing was originally scheduled to be undertaken in May, however had to be postponed as the facility was shut down during the COVID-19 pandemic. Following its reopening, the team at Cantabria has been working hard to recover from these delays. These efforts allowed Carnegie's testing campaign to commence yesterday.

At the end of last week, the facility was prepared for the testing and wave sensors were installed in the basin. A total of 24 instruments were deployed, comprising of capacitive

gauges used to measure the wave elevation at specific location in the basin as well as acoustic doppler velocity sensors used to measure wave direction. These sophisticated sensors are required to validate the Wave Predictor for waves coming from multi-directions.



Preparation of the Wave Basin for Carnegie's test at Cantabria.

Due to current travel restrictions, the Carnegie team is not able to physically attend the testing campaign, but a live stream video has been set up. This allows Carnegie to engage in the progression of the test and provide direct feedback to the operational team at Cantabria. The time difference between Spain and Perth allows Carnegie to analyse the data produced during each day of test and suggest any adjustments before the next day of testing starts.

The testing will span over the week, running two shift of seven hours per day in order to fast-track the testing. More than 200 testing runs will be conducted which will produce the equivalent of 230 hours of full-scale wave data. These test runs will cover a wide range of sea states with wave period ranging from 6 to 16 seconds and significant wave height ranging from 1 to 8 m. Three different wave directional spread will also be tested.

This campaign will thus deliver an extensive database of physical wave measurements representative of real ocean conditions expected at future CETO deployment sites. The data

will be used to validate and optimise the Wave Predictor which has been developed using synthetic data.

The campaign is conducted in collaboration with the Wave Energy Research Centre from the University of Western Australia (UWA). UWA has been working on wave prediction methods using physics-based models, in parallel with the complementary machine learning based model developed at Carnegie. The data produced during the test will also help UWA validate their physics-based predictions algorithms.



Cantabria Coastal and Ocean Basin – Carnegie’s free access provided through the European funded MaRINET2 Project

What happens next?

Once the tank testing is complete, Carnegie will utilise the wealth of new physical data generated in the tank to validate and optimise the Wave Predictor.

This is a significant step in Carnegie’s Digital Development Pathway as the Wave Predictor is part of the suite of products which enables the development of Carnegie’s Intelligent Controller which will optimise the performance of the CETO technology and enable cost reductions.

For more information

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