

Open Ocean Testing of the Azura Prototype Wave Energy Converter in Hawaii

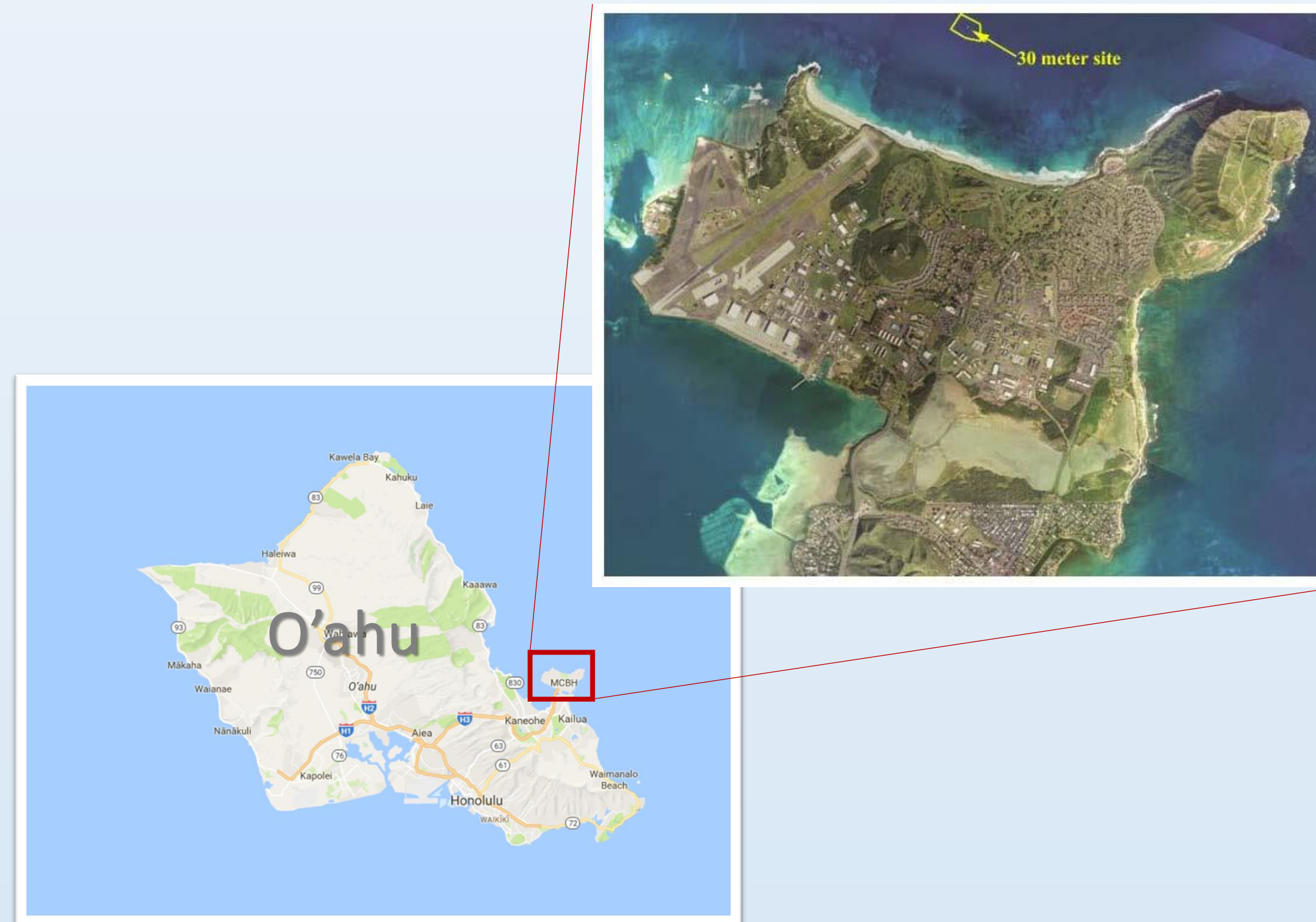
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Test Overview

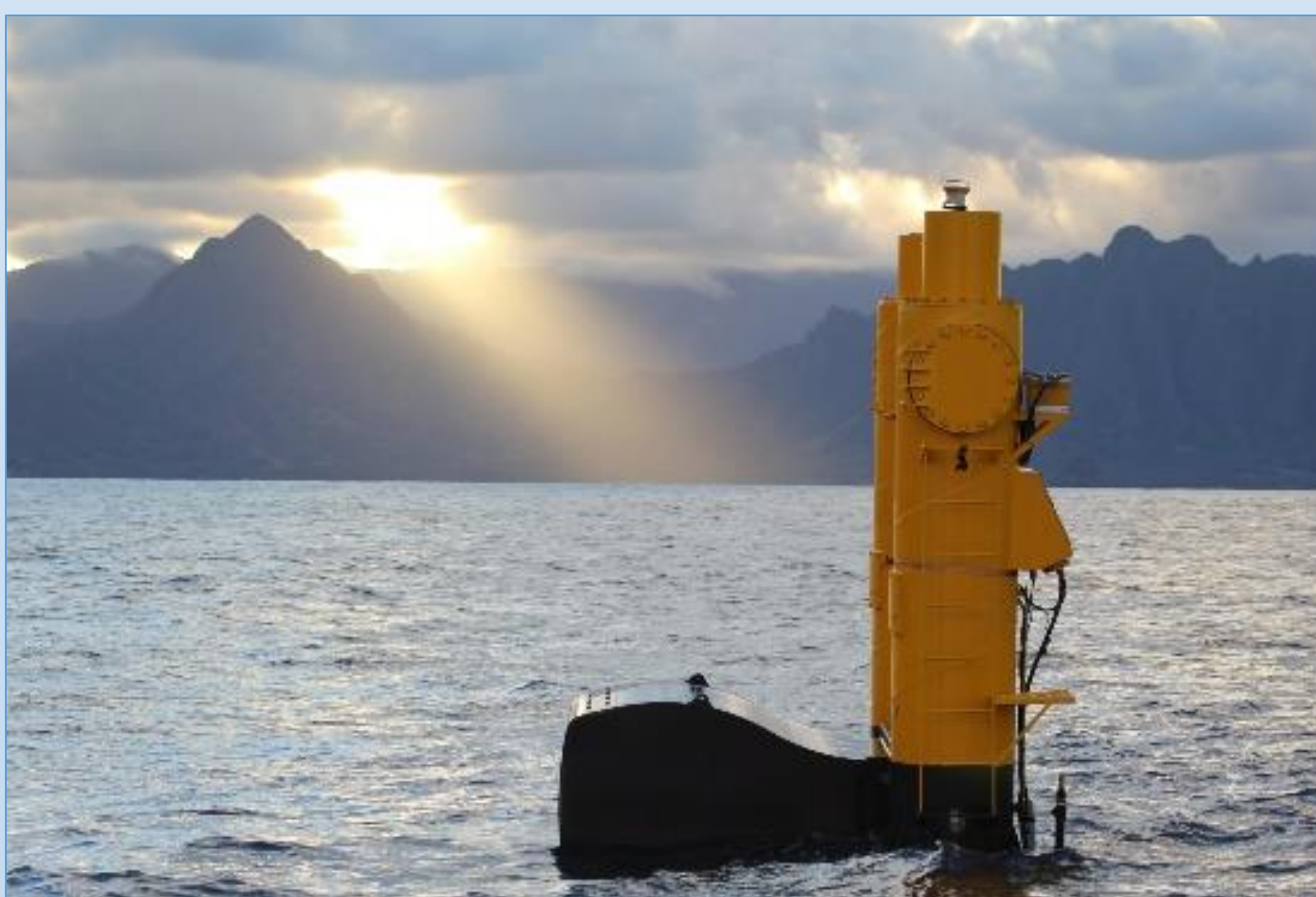
Who: Azura Wave Energy
What: Grid-Connected Scaled Azura Prototype Device
Duration: 19 Months of Continuous deployment
Where: US Navy Wave Energy Test Site (WETS), 30 meter berth

Major Accomplishments:

- Demonstration of a robust design
- Validation of Computer Simulations
- Marine Operations Experience
- Independent party evaluation and documentation of power performance based on IEC specifications



Location of WETS 30m Test Berth

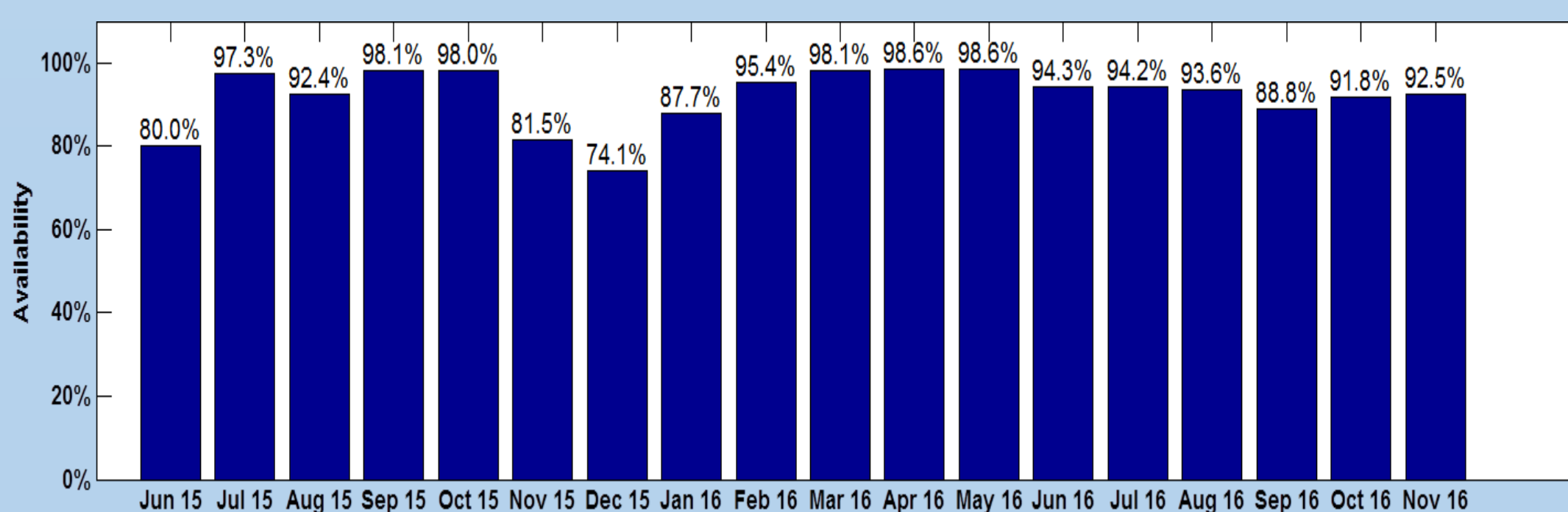


Azura Deployed at the WETS 30m Test Berth

Survivability and Reliability

The Azura survived Hurricane Ignacio, seeing a maximum significant wave height of 4.5 m. The Azura continued to operate and produce power throughout the storm.

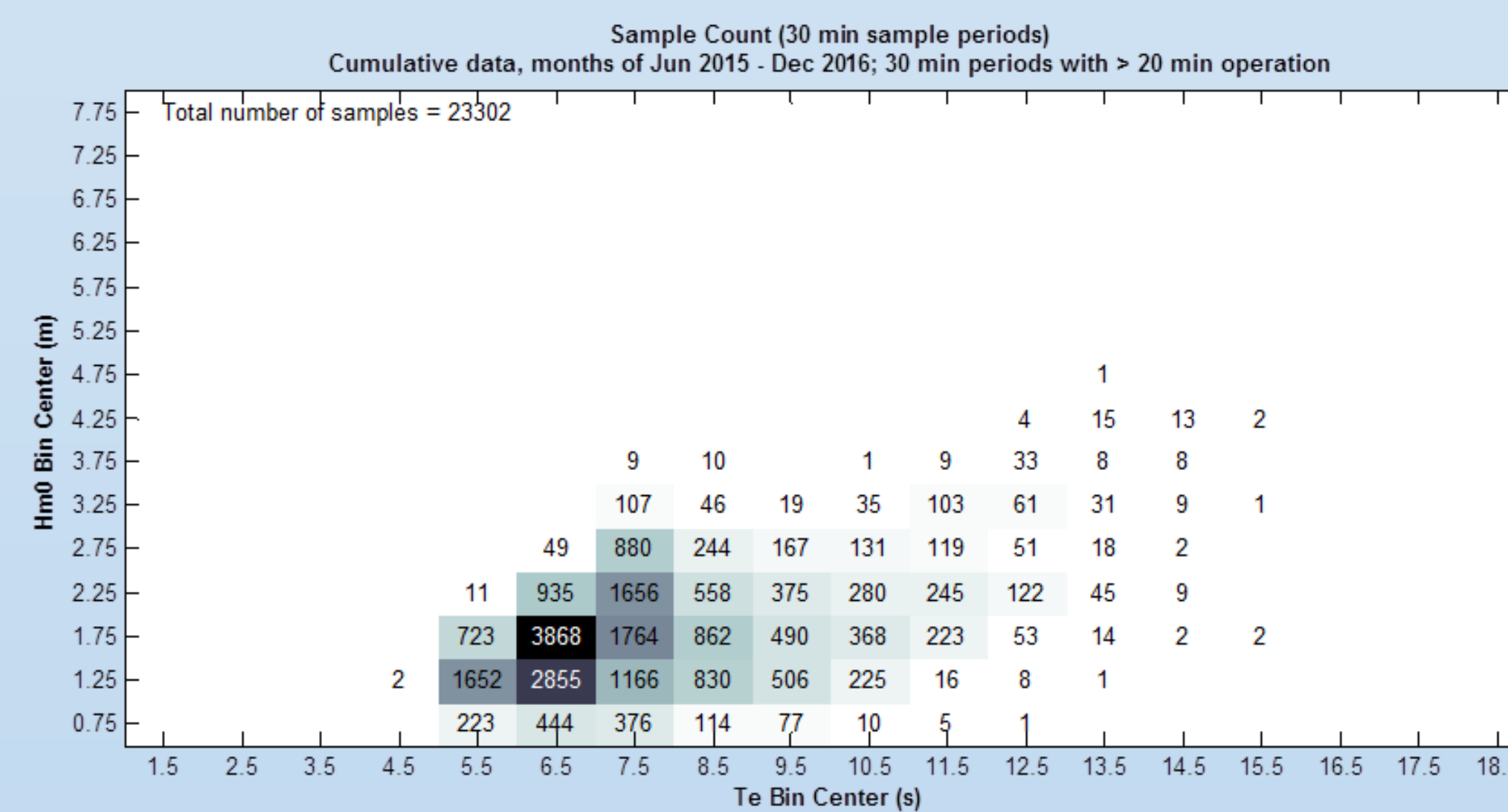
The Azura operated with 96% system availability for the duration of the deployment.



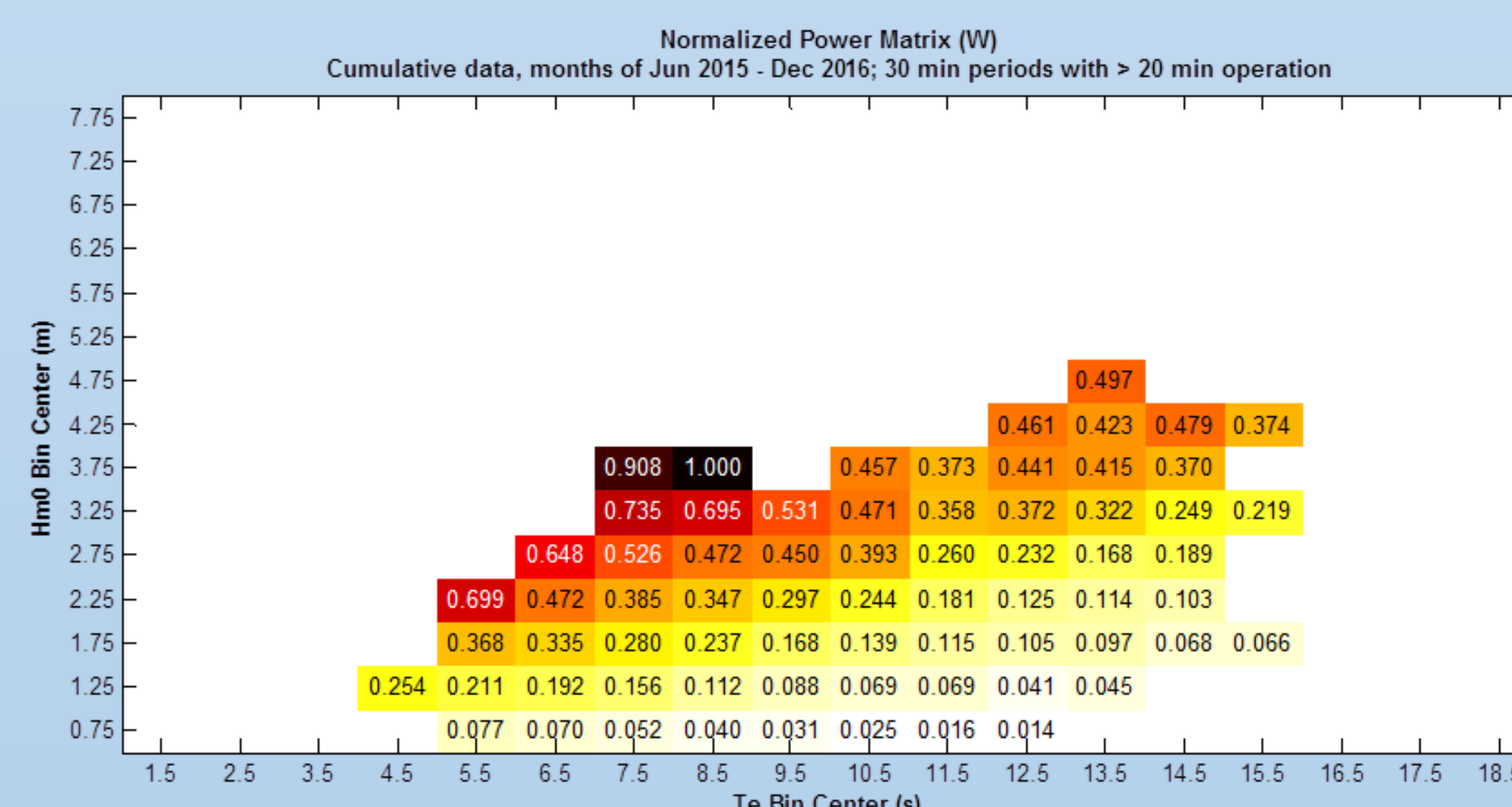
Azura availability for each month in the deployment.

Data Processing

All post processing was done by HNEI, providing independent data validation. Analysis was performed following IEC Standard 62600-100.



Occurrence matrix showing number of data sets collected in each bin of the IEC power matrix.



Normalized Power Matrix, generated following IEC Standard. Note all power values are divided by the maximum power observed during testing.

Instrumentation Details

Two independent cRIO systems were installed on the Azura. One was maintained by Azura, and was responsible for control and measurement of the PTO system and some miscellaneous systems. The other system was designed and maintained by NREL, and measured motion data at mooring loads.

The grid-connection allowed for making remote changes to the cRIO software, remote control of the Hydraulic PTO system, and immediate downloading of data sets.

Azura cRIO Signals

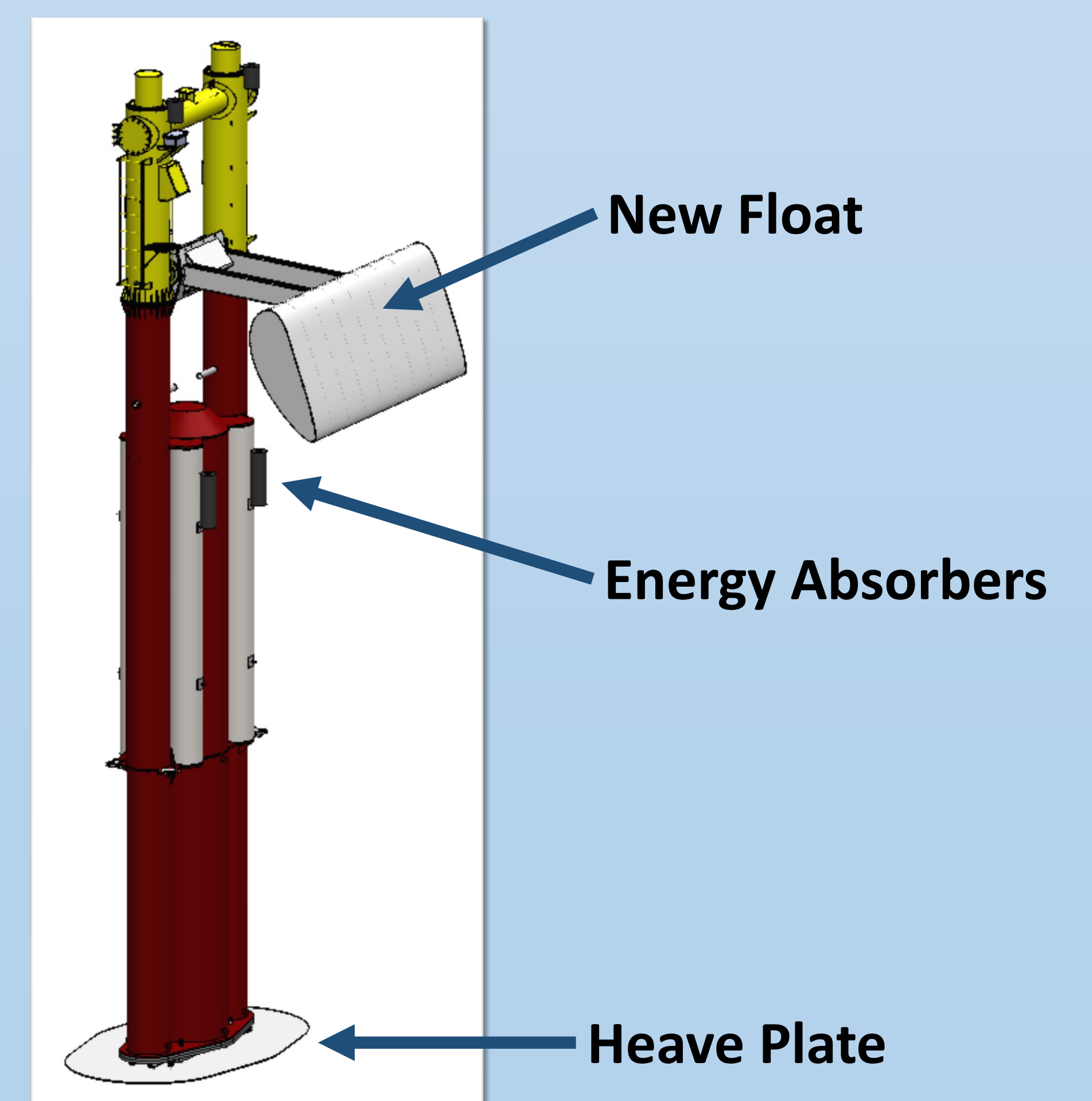
- Hydraulic pressures
- Hydraulic Flow
- Motor Speed Sensor
- Generator Current, Power, Voltage
- Float Angle Sensors
- Water Pressure Sensors

NREL cRIO Signals

- Motion Data
- GPS Data
- Mooring Load Cells
- Magnetic Heading

Future Testing

An additional 6 months of testing is planned at the WETS 30m test berth. A new float shape will be tested, and a heave plate will be added to the vertical spar. These modifications will provide additional motion and performance data to further refine the numerical models of the Azura. This additional information helps to continually improve the performance of the Azura prototype.



Acknowledgements

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