Development of the National Offshore Wind Turbine Test Facility (NOWTTF) at Hunterston

Dave Scott
May 2016
NOWTTF - Site Location / Features

- Part of former Marine Construction Yard at Hunterston, North Ayrshire.
- Quayside access for direct sea deliveries of turbine components.
- Connected to land by a jetty to the south.
- Provides environment for testing offshore turbines without weather delays, safety risks of accessing turbines at sea, and associated costs of building offshore foundations.
NOWTTF – Site Layout

- Dedicated facility for testing next generation offshore wind turbines.
- Planning permission granted 2012.
- 3 turbine bays
- Siemens SWT 6.0-154.
- Mitsubishi MWT167H/7.0.
- Scottish Enterprise to develop third bay.
- Development supported by funding from DECC / TSB through OSW Components Scheme and BIS through the Efficient Offshore Wind Programme.

Layout of site showing 3 turbine bays
NOWTTF - Unloading Turbine Components

- Siemens turbine components, including tower sections and blades were delivered to the site in September 2013.

- Marine transport and offloading experience transferable to future offshore projects.

- Identification of opportunities for improvement, sharing of knowledge to ensure better planning, project implementation, and minimising risk.
NOWTTF - Siemens SWT 6.0-154 Testing

- Siemens 6MW direct drive turbine – tip height of 177m with a rotor diameter of 154m.
- This turbine was the first to be erected on site in October 2013.
- Following commissioning phase testing began in March 2014.
- The turbine at Hunterston was used for the Type Certification of the turbine model by Siemens.
- Extended programme of testing being carried out by Siemens R&D on site.
- SSE access to turbine, on site testing and access to turbine data all key to success of operation of facility.
A power quality measurement campaign has been carried out on the turbine covering a large array of tests to comply with various standards. A wide range of other testing is ongoing and planned throughout 2016. 

Key aspects of the testing regime include:
- Low Voltage Ride Through (LVRT) testing to comply with UK grid compliance
- Single Convertor Operation Functionality (SCO)
- Power Boost function testing
- High Temperature Ride Through to ensure that the turbine does not trip in periods of high temperature.
NOWTTF – Beatrice Offshore Wind Farm

• Key aim of NOWTTF was to enable SSE to test the next generation of offshore wind turbines in preparation for deployment in SSE’s offshore wind sites.
• Information obtained from the testing of the Siemens turbine at Hunterston has been used in the design of the Beatrice Offshore Wind Farm.
• The testing and inspection carried out at Hunterston has also been instrumental in the Beatrice Project Team selection of the Siemens SWT-7.0-154 (an upgrade version of the same turbine platform) as the preferred turbine for the project.
View from Siemens SWT 6.0-154

Mitsubishi 7MW turbine – tip height of 193.5m with a rotor diameter of 167m
Hunterston NOWTTF - MWT167H/7.0

• MHI’s 7MW prototype turbine at Hunterston features a Digital Displacement controlled hydraulic drive train.
• Onshore verification testing taking place at Hunterston.
• MHI have also installed a second hydraulically driven wind turbine on a floating platform within a wind farm verification research project being implemented offshore from Fukushima, Japan.
• Subject to successful verification testing at Hunterston and Fukushima MHI intends to supply the new hydraulic drive train to MHI Vestas Offshore Wind, a joint venture dedicated to offshore wind turbine market development with Vestas Wind Systems.
NOWTTF – Next Steps

• NOWTTF has provided multiple benefits with regard to the development and testing of offshore turbine technology.
• The test facility brings major benefit to UK offshore wind research by enabling testing and innovative research of turbines onshore in a marine environment.
• Planning Permission for operation of the NOWTTF at Hunterston is currently restricted to October 2017.
• Potential to build on success by Hunterston extending operating capacity beyond 2017, subject to further planning permission being obtained.