REPORT

West of Duddon Sands WDS01
Met Mast Wind Data
Crown Estate

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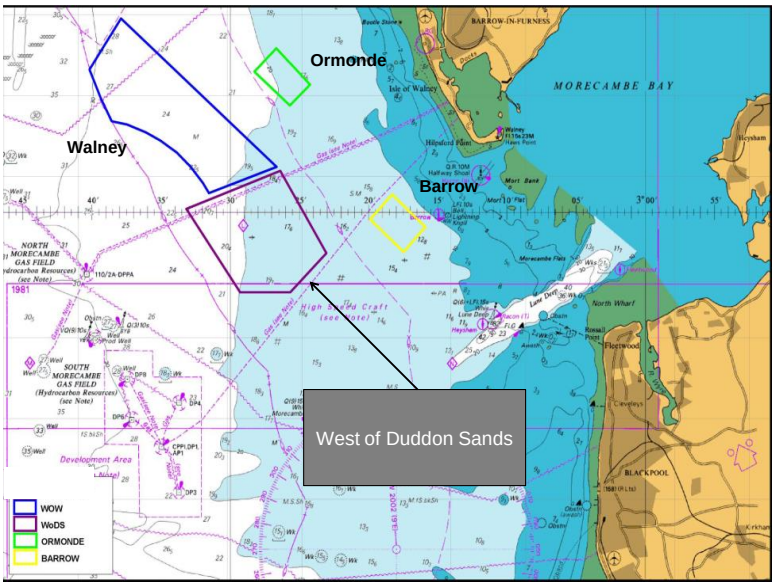
25 May 2016

1. Project Summary

This documents the metadata and origins of the meteorological datasets provided by the loggers on the met mast in West of Duddon Sands, approximately 14km off Walney Island, Cumbria, in the East Irish Sea. The met mast construction was finished in July 2014. It was built and is maintained by RES.

2. Device Coordinates and datum

Wind Farm name	West of Duddon Sands (WDS01)
Geographic Location	Easting 463533, Northing 5983915 Reference system: WGS84 Projection UTM: zone 30N
Initial Deployment	



3. Description of mast

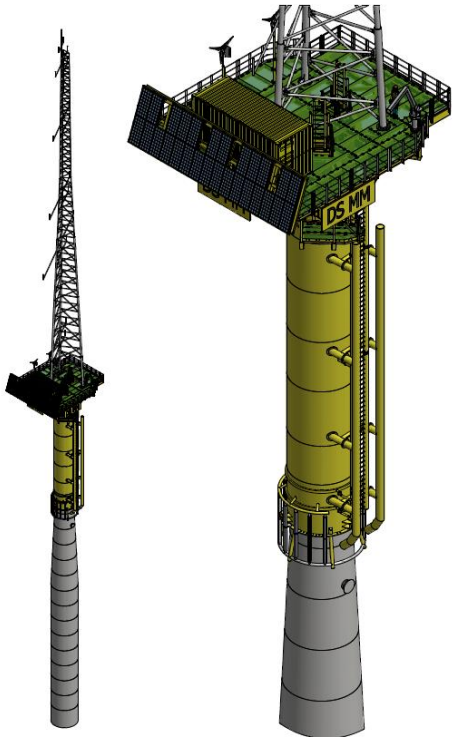
This mast stands 90m tall and measures wind speed and direction, humidity/pressure and temperature, using the following equipment:

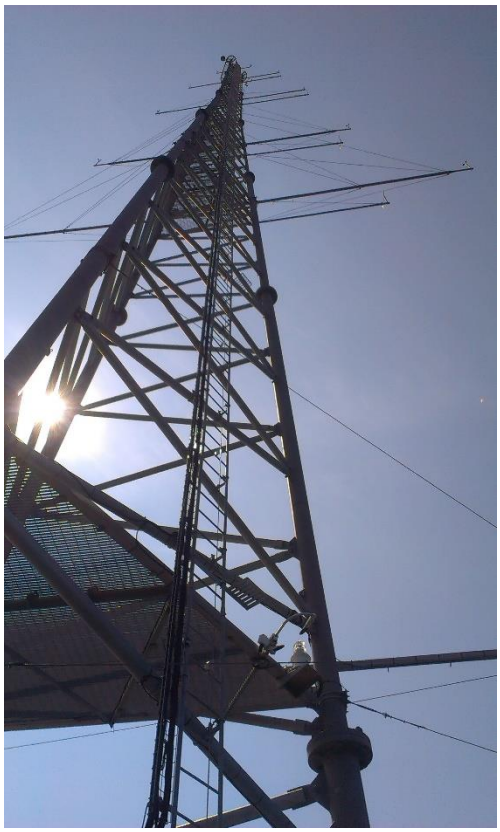
- Anemometers
- Wind vanes
- Temperature sensors
- Barometric pressure sensor
- Relative humidity sensor
- Rain fall gauge
- Sea temperature gauge
- Satellite communication system for data transmission

It also measures wave heights and currents, using a:

- Wave radar (not documented in this report)

Access is by ladder with an intermediate rest platform including safety line to attach to on both ladders.





3.1 Instrumentation system

The instrumentation system on the West of Duddon Sands Met Mast comprises the sensors that measure meteorological or oceanographic parameters and their associated data gathering, recording and storage system.

The system measures the following meteorological parameters: wind speed, wind direction, air temperature, atmospheric air pressure and relative humidity. The sensors are located at various heights above mean sea level, either on instrument booms, mounted on the mast itself or on the platform. In addition there are two oceanographic devices: a wave radar located under the platform

grating which measures wave height and two sea temperature probes located at the bottom of the transition piece which measure the sea temperature.

The meteorological and oceanographic data from the instrumentation sensors are divided into two sub systems, A and B. The systems are similar in structure and are integrated into Campbell Scientific CR3000 data loggers located within the power supply container. The instruments are evenly distributed between these systems to reduce the impacts of a single system failure. Data is stored locally on the individual data loggers before transmission to shore.

For a complete graphic overview of the met mast refer to document 03039D5001-04 Instrumentation Configuration.pdf

3.2 Aids to navigation system

The aids to navigation system on the West Of Duddon Sands Met Mast comprises the nautical and aviation markings and warning systems installed on the met mast to warn vessels and aircraft of the presence of the mast. The system is similar in design to the aids to navigation systems deployed on other structures in the adjoining West of Duddon Sands Wind Farm.

The aids to navigation system is comprised of: an aviation warning light mounted at the top of the meteorological mast, three navigation lanterns located at the tower base and a fog warning system mounted on top of the power supply container.

The aids to navigation system has a dedicated control and monitoring system located within the power supply container.

3.3 Condition monitoring & control system

The condition monitoring and control system on the West of Duddon Sands Met Mast comprises the systems installed on the met mast to monitor, verify and record that the aids to navigation and power supply system are functioning correctly. In addition the system has the functionality to trigger alarms, and in some cases react automatically, should an issue occur. It is divided into two independent systems which are labelled Control and Condition Monitoring Systems C and D.

4. Installation record

Site reference	West of Duddon Sands (WDS01)	
Summary information		
Date of visit	23/6/2014	Scheduled works
Purpose of visit		
Survey start	Logger A data collection commenced 15-05-2014 12:50:00 Logger B data collection commenced 09-06-2014 00:50:00	

Survey end	Logger A and B data collection still ongoing, this survey ended 24-05-2016 00:00:00
Working time	
Weather days	
Standby days	
Equipment schedule	
Data	Data from two loggers installed.
Antennas	Good condition; no problems noted with either antenna or cabling
Telemetry	Satellite data successfully received at Fugro EMU
Mast / Structure	Good condition; no problems noted. Visual condition of the mast/ Straightness of Boom arms: Conditions of the met mast is new build as of June 2014, boom arms are straight and sighted from the vessels at 330 and 180 degrees. Steel Structure. Manufactured in accordance with - EN 1993-1-1. Design of steel structures – General rules. - EN 1090-1 and -2. Execution class EXC3 “Comprehensive quality requirements.” - NSSS 5th edition. National Structural Steelwork Specification for Building Construction. - DNV-OS-C401. Fabrication and Testing of Offshore Structures. - EN 3834-2. Welding “Comprehensive quality requirements.” - EN 5817. Welding quality level acc. to Welding Plan, 9195-WP01. - EN ISO 15613 and EN ISO 15614-1. Specification and qualification of welding procedures for metallic materials.
Solar panels	Good condition; no problems noted
Biofouling	None, new deployment

5. Photos

Table 1 Met Mast Overview

Table 2 WaveRadar on Met Mast

The WaveGuide Sensor

The WaveGuide server

6. Sensor list

Table 3 Met Mast sensors

EQUIPMENT	HEIGHT (M)	SERIAL NUMBER [Make/ Model]	LOGGER CHANNEL	MOUNTING (BOOM/ STUB)	ORIENTATION & ADJUSTMENT (0 - 360˚) (Actual in Brackets e.g. W-(267°)
ANEMOMETERS	A1	Thies	Logger A	90.3M LAT	330 +/- 180
	A2	Thies	Logger B	90.3M LAT	330 +/- 180
	A3	Thies	Logger A	75M LAT	330 +/- 180
	S1	Metek uSonic	Logger B	87M LAT	330 +/- 180
	A4	Thies	Logger A	75M LAT	330 +/- 180
	A5	Thies	Logger B	75M LAT	330 +/- 180
	A6	Thies	Logger A	60M LAT	330 +/- 180
	A7	Thies	Logger B	60M LAT	330 +/- 180
	A8	Thies	Logger B	50M LAT	330 +/- 180
	S2	Metek uSonic	Logger A	50M LAT	330 +/- 180
	A9	Thies	Logger A	30M LAT	330 +/- 180
	A10	Thies	Logger B	30M LAT	330 +/- 180
WIND VANES	WV1	Thies	Logger A	84.5M LAT	330 +/- 180
	WV2	Thies	Logger B	72.5M LAT	330 +/- 180
	WV3	Thies	Logger A	57.5M LAT	330 +/- 180
	WV4	Thies	Logger B	47.5M LAT	330 +/- 180
	WV5	Thies	Logger A	27.5M LAT	330 +/- 180

LOGGER A LOGGER B Pass1979	**Serial No.**	**6823**
	Date	23-july-2014
	Time	12:19
LOGGER	**Serial No.**	**6824**
	Date	23-july-2014
	Time	12:19

Description of each column on the data files can be found with the complementary file DSMM Loggers Data Tables Definition.xls

Full list of instruments, refer to complementary folder: Instrumentation Tracker.

7. Calibration Reports

See accompanying collection of calibration certificates.