

Hywind Scotland Pilot Park Project Plan for Operation and Maintenance

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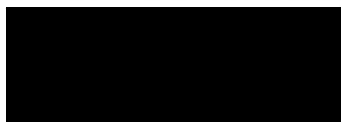
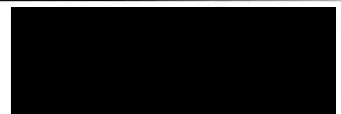

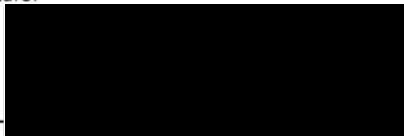
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1 Introduction

1.1 Background

Statoil ASA received a Marine Licence on the 30th October 2015 to develop the Hywind Scotland Pilot Park Project ("Hywind Scotland"). Five floating wind turbines (FWTs) will be installed, each with a generating capacity of 6 MW giving a total generating capacity of 30 MW, approximately 25 km off the coast of Peterhead. Each turbine will be anchored by a three-point mooring spread, and they will be connected by inter-array cables (figure 1.1). An export cable will transport the generated electricity to the shore. The application, Marine Licence decision documents and other documentation are placed on Marine Scotland's web page¹.



Figure 1.1. Graphical illustration of the Hywind Scotland Pilot Park Project

1.2 Document objective

This document outlines the procedures and working practices for the operation and maintenance of the FWTs and cable network for Hywind Scotland Pilot Park. The purpose of the document is to provide the information which will enable the Licensing Authority to discharge consent conditions given in the Marine Licence for the Hywind Scotland Pilot Park Project (Licence number 05515/15/0) related to the operation phase of the project. Statoil has agreed with Marine

¹ <http://www.gov.scot/Topics/marine/Licensing/marine/scoping/Hywind>

Scotland to develop an operation and maintenance plan, covering the relevant licence conditions in one document, rather than preparing separate documents or plans for each condition. The issues covered are listed below, with reference to the relevant conditions to be discharged:

- Operation and Maintenance Programme – OMP, ref. condition 3.2.2.9, including cable maintenance and inspection (ref. condition 3.2.2.10 f) and g); Cable Plan);
- Vessel Management Plan – VMP, ref. condition 3.2.2.7;
- Navigational Safety Plan – NSP, ref. condition 3.2.2.8;
- Environmental Management Plan – EMP, ref. condition 3.2.1.2, including chemical usage (ref. condition 3.1.7) and environmental protection (condition 3.1.8);
- Emergency Response Co-operation Plans – ERCoP (including emergency response and HSE incidents reporting (brief description, conditions 3.2.1.7 and 3.2.1.10 to be discharged through separate documents)

Statoil has agreed with the Maritime and Coastguard Agency (MCA) to prepare two Emergency Response and Co-operation Plans (ERCoPs) following a standard template; one for the construction phase and one for the operational phase. Emergency response and reporting of health and safety incidents (ref conditions 3.2.1.7 and 3.2.1.10) is therefore only briefly covered in this operation and maintenance plan.

1.3 Target group

The target group for this document is the Licensing Authority and statutory consultees such as JNCC, SNH, SEPA, MCA, NLB, AC and any such other advisors or organisations as may be required at the discretion of the Licensing Authority.

2 Operation and Maintenance Programme - OMP

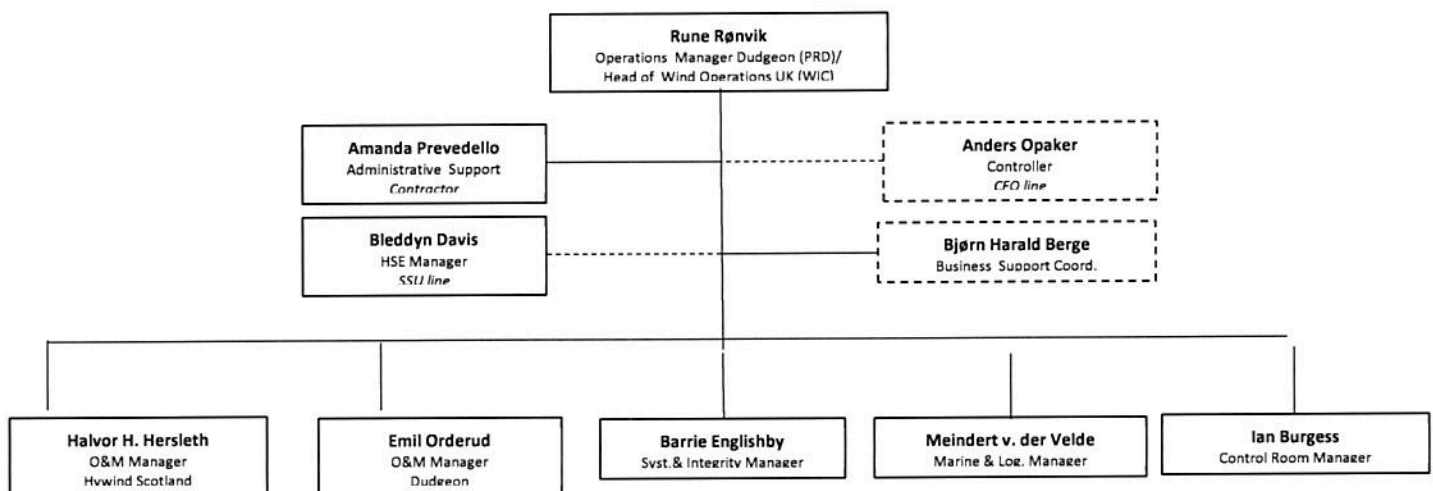
2.1 Operation and maintenance principles

The Hywind Scotland operation and maintenance philosophy follows the same operation and maintenance principles as used for any other wind project in Statoil. This chapter aims to give a holistic overview of the operation and maintenance programme for Hywind Scotland.

The operation and maintenance of a wind turbine placed on a floating foundation using the Hywind concept is comparable to a bottom fixed turbine for all normal maintenance tasks. Operational experience from the Hywind Demo turbine has verified this assumption. Main component failures and work related to the substructure and mooring system will be different from a bottom fixed wind turbine. Inspection and maintenance of the substructures and mooring systems will be conducted on a campaign basis, using relevant competency within Statoil. Main component exchange requires further planning, and will, if necessary, be performed as a small stand-alone project.

2.2 Roles and responsibilities

The Hywind Scotland project organisation is fully responsible for the necessary preparation prior to stable operations. This responsibility ends upon handover from the project organisation to Statoil's wind operations unit (NES WIC WOPS), see figure 2.1.1. The planned hand-over date is 31 December 2017. Hywind Scotland will have a dedicated operation and maintenance manager reporting to the Head of Statoil Wind Operations UK after the handover.

Figure 2.1.1 Hywind Scotland Prepare for Operations Organisation

Figure 2.1.1 Statoil UK wind operations

Requirements for follow-up, reporting and interfaces towards stakeholders and governmental bodies will be the same for HYS as for any other wind farm.

2.3 Operation and maintenance strategy

The planning assumptions for a SWT6.0-154 turbine are five days scheduled maintenance and on average ten days unscheduled maintenance per year; which sums up to about 75 days of maintenance for Hywind Scotland per year. In addition, there will be some visits for maintenance and certification of other equipment on the structures. The ambition is to schedule these events on the same visits as the scheduled turbine maintenance.

The resource strategy selected for Hywind Scotland is to have dedicated technicians and a crew transfer vessel stationed in Peterhead. This organisation will be ready to work on the turbines every day when the weather allows sailing and safe access to the turbines. Siemens will be able to handle normal operations without Statoil's physical presence. Siemens can also handle the daily interface towards the vessel provider. Statoil will therefore not be permanently present at the operational base in Peterhead during normal operation. This operation and maintenance strategy is based on Statoil's current assumptions and will be revisited after a year in operation, based on operational experience.

2.3.1 Wind turbine maintenance

Hywind Scotland has a five-year service agreement with Siemens Service UK. The scope of this contract covers the maintenance of the turbines, tower internals, high voltage switchgear, SCADA and instrumentation and the statutory certification of lifting equipment, anchor/rescue points, fall arrest and pressurised systems. The turbine supply agreement comes with a five-year defect notification period, covering spare parts. Siemens technicians will be ready to work every day when the weather allows for safe access to the turbines. The ambition is that Siemens Service will handle the maintenance for all equipment located on the turbine. Siemens will during this initial service agreement period also do the

monitoring and alarm handling for the wind turbines from their centralised control room in Newcastle. After the five-year period, Statoil will evaluate the way forward, and chose either to continue with Siemens Service or a similar service provider, or take the maintenance of the wind turbines in house.

2.3.2 Electrical infrastructure maintenance

The maintenance for the electrical infrastructure in Peterhead will be tendered to local service providers. The contract will be monitored by the Statoil back-office organisation.

2.3.3 Maintenance and monitoring of foundation, mooring system and subsea cables

Inspection and maintenance of the foundations, including scour, mooring systems and subsea cables will be campaign based and done according to Statoil's internal procedures. The current assumption is that the inspections will be done every second year in the beginning, with a slightly increasing interval as no major findings are assumed. A review of the DFI (design, fabrication and installation) documentation will be done after the marine installation to formalize the inspection frequency.

The relevant competence areas in Statoil will be involved in the planning and execution of foundation, mooring system and subsea cable inspection and maintenance. These competence areas have decades of relevant experience from subsea inspections of foundations, mooring systems and subsea cables for offshore oil and gas installations. Subsea scope will most likely be executed using ROVs.

2.3.4 High voltage switching

Statoil is responsible for providing this service. This will cover both HV switching on the turbines and on the onshore substation. All high voltage switching and works will be conducted in accordance with Statoil UK wind safety rules, with operational switching conducted remotely from Statoil's Wind Control Centre in Great Yarmouth. Senior Authorized Persons will put local safety measures into place prior to high voltage works. Potential providing parties for SAP resources are; personnel in Statoil's UK wind organisation, the grid operator (SSE) or another third party. A decision on this will be taken within 2017.

2.3.5 Heavy component exchange

The platform crane and the crew transfer vessel is designed to handle all standard components and spare parts, with a maximum limit of 2 tonnes. This will cover everything, excluding the main components, i.e. transformer, generator/main bearing, yaw bearing, blade bearing, blades and the hub.

Transformer exchange will be done using a standard DP offshore service vessel. The transformer will be lowered externally from the nacelle to the platform before being lifted off using the service vessel crane.

For the other main components, the lifting operation will be at nacelle height (about 100 m). The water depth is too great for jack-up vessels, meaning that the lift will have to be between two floaters. This operation is very sensitive to motions and is not feasible in offshore environment outside of Peterhead. The turbines will therefore have to be towed back to

sheltered waters for such components to be exchanged. The most likely location for major component exchange is the Norwegian fjords.

2.4 Location of offices

2.4.1 Local base Peterhead – ASCO with Statoil Aberdeen

The local base will cover office facilities for maintenance planning and reporting, spare part storage and quay facilities for loading and unloading the crew transfer vessel.

Statoil Aberdeen has entered into a contract with ASCO in Peterhead for their base services for Mariner. Hywind Scotland Pilot Park has entered into an agreement with Statoil Aberdeen, allowing the use of the ASCO base services. This agreement includes local offices, changing rooms, spare part storage, quay for vessel, waste handling, return of goods and lifting and transportation services on demand.

2.4.2 Back office organisation

Back-office functions such as the follow-up of O&M activities, monitoring of asset integrity, production forecasting and following up service contracts will be shared with other Statoil wind farms within the Statoil UK wind organisation. This allows the use of existing competence and capacity.

Control room – Great Yarmouth

Hywind Scotland will buy services from the control room that currently is established in Dudgeon's offices in Great Yarmouth. This control room will handle:

- Work permit activation/deactivation
- 24/7 function – grid connection requirements
- EDT
- HV switching
- Personnel and vessel tracking – marine surveillance
- Alarm and performance follow-up towards Siemens
- Monitoring and alarm handling of the WTGs (after the contract with Siemens expires)

Emergency response

Statoil UK has the responsibility for Statoil's UK wind operations and will also cover Hywind Scotland. This function will be covered from Dudgeon's offices in Great Yarmouth.

2.5 Operation and maintenance vessel

A single crew transfer vessel will be available 365 days a year in Peterhead. The vessel will be a catamaran type vessel of 20+ meters able to transport technicians, spares and equipment to the turbines. The base case is that the vessel will be based in Peterhead. For the initial period, World Marine has gotten the CTV contract, and will deliver World Passat, a 25m WindServer swath vessel, for the first operational period. Statoil is responsible for the vessel contract. The delivery date for the vessel is flexible, between June and September 2017.

3 Environmental Management Plan - EMP

As a company, Statoil has a clear goal to ensure sustainable development and is committed to minimising environmental impacts. The Statoil environmental management system is fully compatible with recognised environmental management standards, including ISO 14001. Furthermore, our contractors are required to meet the ISO 14001 standard. A commitment register including all commitments made during the Environmental Impact Assessment phase was included in the Environmental Statement, supplemented by requirements given in the marine licence.

Statoil will ensure that all vessels and their crew are made aware, of and are required to adhere to the Scottish Marine Wildlife Watching Code. Statoil will also ensure that all vessels involved in the installation works adhere to relevant IMO guidance on ballast water and transfer of non-native marine species (ref. MGN 81, Guidelines for the Control and Management of Ship's Ballast Water to Minimise the Transfer of Harmful Aquatic Organisms and Pathogens).

Statoil do have internal waste handling procedures which all projects and contractors have to adhere to. These requirements build on a strategy where priority is on avoiding waste generation. Where waste generation cannot be avoided, technical and operational measures, including separation, collection and disposal solutions for different classes of waste, shall be implemented to optimise the reuse, material recycling or energy recovery of the waste. Waste shall be stored and transported in such a way that accidental releases are prevented.

In the Hywind Scotland Pilot Park Project no particular waste generation issues are foreseen, and vessels involved are expected to primarily bring any household waste or other waste to their home port for disposal. Should there be a need to bring any waste ashore in Scotland, this will be done in consultation with SEPA (Robert MacDonald, SEPA Elgin Office, Shaw House, Mid Street, Fraserburgh, AB43, tel.: 01346 510502), and only licenced carriers will be used to handle any waste.

Statoil Wind Operations UK will be responsible for following up environmental management during operation. For project specific environmental monitoring it is referred to the Project Environmental Monitoring Programme (PEMP).

4 Emergency response and HSE incidents

Statoil do have a well-established companywide system for emergency response upon which a specific emergency response and reporting procedures will be established also for Hywind Scotland, as well as a stringent safety management system². Statoil uses SYNERGY for recording and reporting any incidents, and our contractors are required to use this system as well. If any serious health and safety incidents occurs on the site, Statoil will report this to the Health and Safety Executive as well as notify Marine Scotland within 24 hours of the incident occurring. Further details on the emergency response and reporting of HSE incidents during operation, will be given in the separate ERCoP for the operation phase, and is not included in this document.

5 Navigational Safety Plan - NSP

Mariners will be made aware of the wind farm at Buchan Deep through navigational lights and markings (Navigational lighting and marking is described in the Navigational Safety Plan, ref. Plan for Construction Activities 2017, chapter 3). Furthermore, Statoil will ensure that local mariners, fishermen's organisations, UK Hydrographic Office ("UKHO") and the HM Coastguard (National Maritime Operation Centre) are made fully aware of site specific details above and under water

² <http://www.statoil.com/en/EnvironmentSociety/security/Pages/Safety.aspx>

through local Notice to Mariners and other means as appropriate. The site will also be charted on the Kingfisher Information Service - Offshore Renewable & Cable Awareness project (KIS-ORCA).

The Hywind turbines differ from traditional bottom fixed wind turbines with its floating concept and floating power cables running from the turbines down to the seabed. Statoil finds it important to highlight the essential differences for other users of the Buchan Deep area by applying for individual mandatory safety zones in addition to providing relevant information about the concept included into the charts covering this area. As a consequence, and with Statoil's best intention to raise the awareness of marines planning to operate inside the site, Statoil has applied for a 50-meter safety zone around each turbine during operation. BEIS has not yet concluded the application, but in a meeting the 7th of December informed Statoil that they are uncertain about the value of such mandatory safety zone and believe an advisory safety zone would be sufficient. Final conclusion is expected by the end of 2016.

Statoil will be happy to participate in local information meetings arranged by local stakeholders in order to contribute to a best possible level of information being present locally about the Hywind wind turbines.