BELWIND
OFFSHORE RENEWABLE ENERGY

Annual work report 2022

Offshore wind energy power plant

Belwind

Subject	Version	Author	Reviewer	Approver	Date
Draft report		O&M	DVA/DVE	KVE	13/03/2023
Internal update (Intrusions)	V01	O&M	DVA/DVE	KVE	24/04/2023
Adding positive observations	V02	O&M	DVA	KVE	12/06/2023
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PUBLIC VERSION

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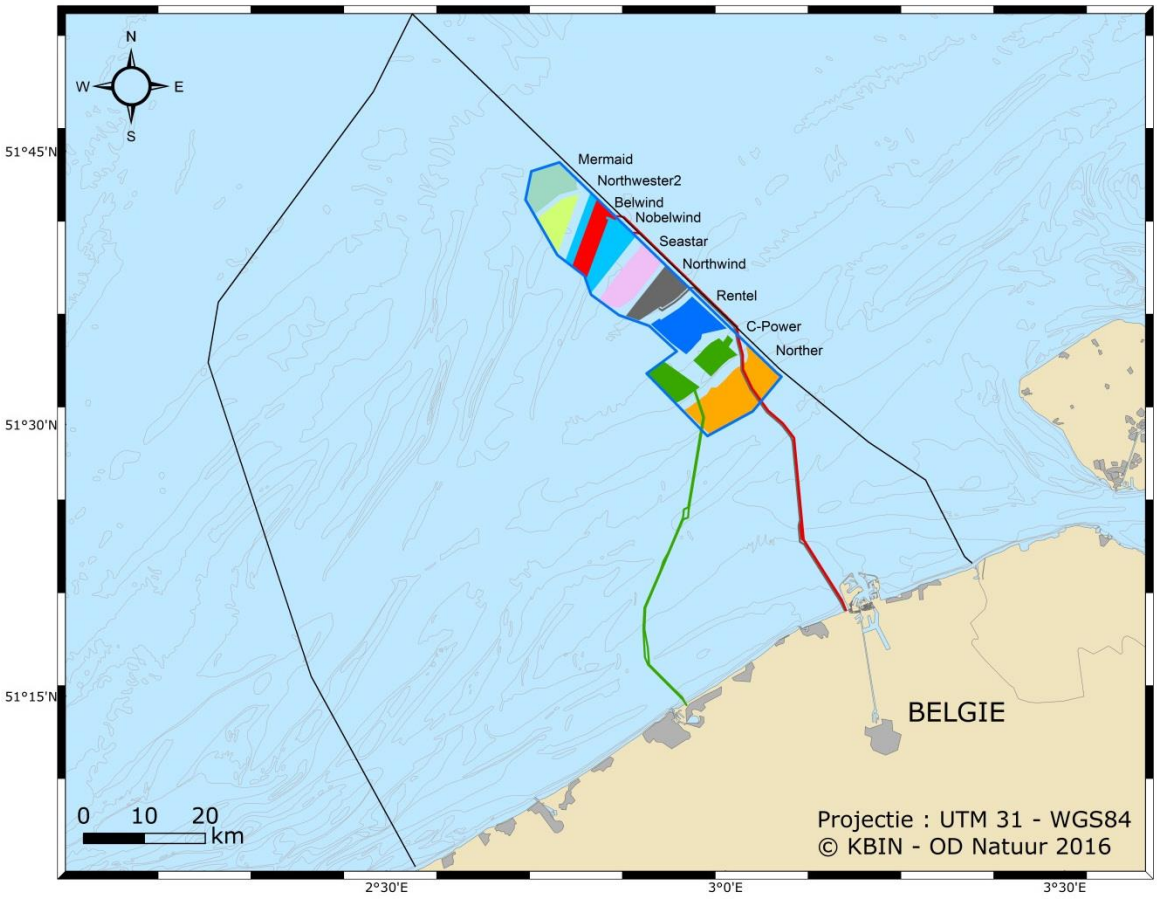
1 Purpose of the document

The present report gives an overview of the main activities and relevant parameters of the Belwind offshore windfarm for the period as from 1 January 2022 up to 31 December 2022.

2 Introduction

The Belwind offshore wind farm is located on the Belgian Continental Shelf, within the Belgian Exclusive Economic zone. The distance from the wind farm to the nearest point at the shore (Zeebrugge) is approximately 49 km.



Location offshore wind farm Belwind

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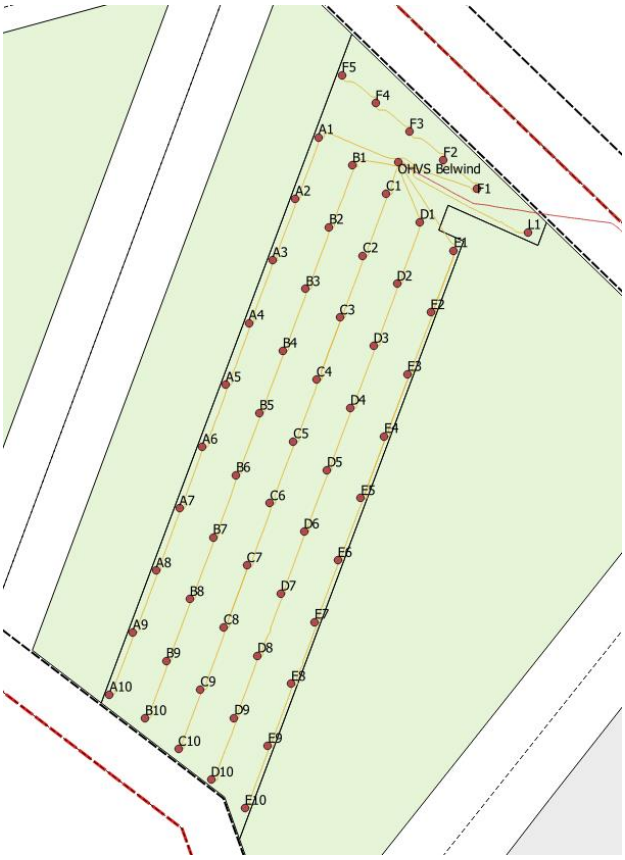
3 Project overview

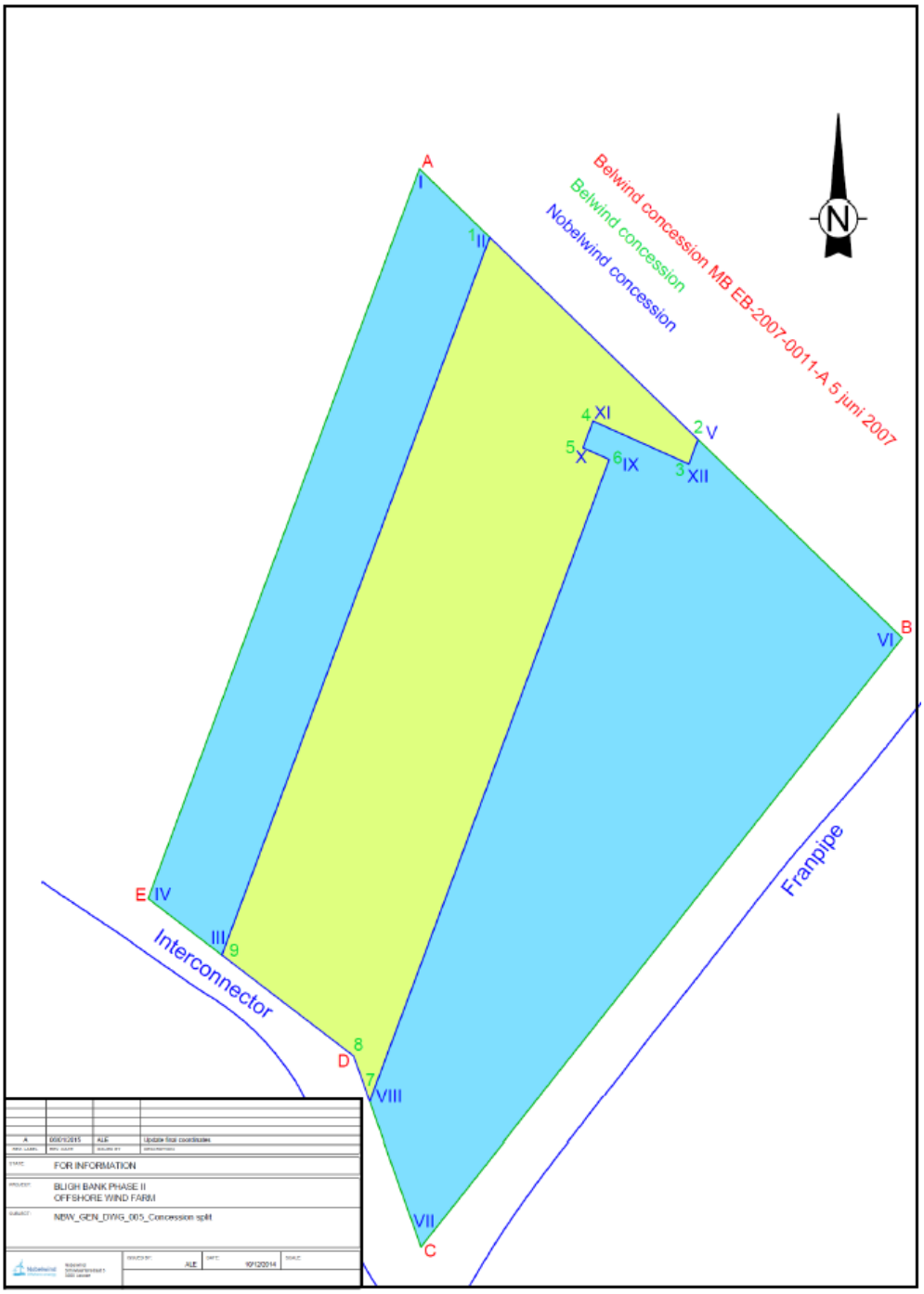
Belwind consists of 55 wind turbines of 3 MW each (Vestas V90) and an Offshore High Voltage Station (OHVS). Via a local grid (33 kV) the wind turbines are connected to the OHVS. The energy is transported to shore by a 150 kV submarine cable. Belwind has been erected in 2009 - 2010 and is fully operational since January 2011.

In 2013 and 2014, the realization of the Belwind Demo project was started. This project consists of the installation of a jacket foundation and a 6 MW windturbine (GE Haliade 6M – rotor diameter 150m) at location L01. The Belwind Demo project received its 33kV cable installation in 2014 during the summer. Once the cable was connected, the commissioning of the Haliade 150 Turbine got on its way. The WTG produces since 2015 green energy via a direct drive concept and had at time of erection the biggest blade rotor size in operation.
In November 2015 the division of Alstom Power has been taking over by GE Renewables. The fifty-six turbines are capable of generating 171 MW.



Locations of the wind turbines and the grid connection of Belwind

The development of Phase 2 of the initial Belwind concession, or Belwind phase 2, was started in 2014. For the development, a new company was created, named Nobelwind in which funds was found for the pre-development. In line with the Royal Decrees 20/12/2000 (Domain concession), 12/03/2002 (Sea-cable) and 07/09/2003 (Marine Environmental permit), the partial split of the initial domain concession, sea-cable permit and Marine Environmental permit, has been applied for by Belwind and Nobelwind. Nobelwind obtained in 2015 the necessary authorization for the construction and exploitation of the windfarm.



Domain concessions Belwind (yellow) and Nobelwind (blue)

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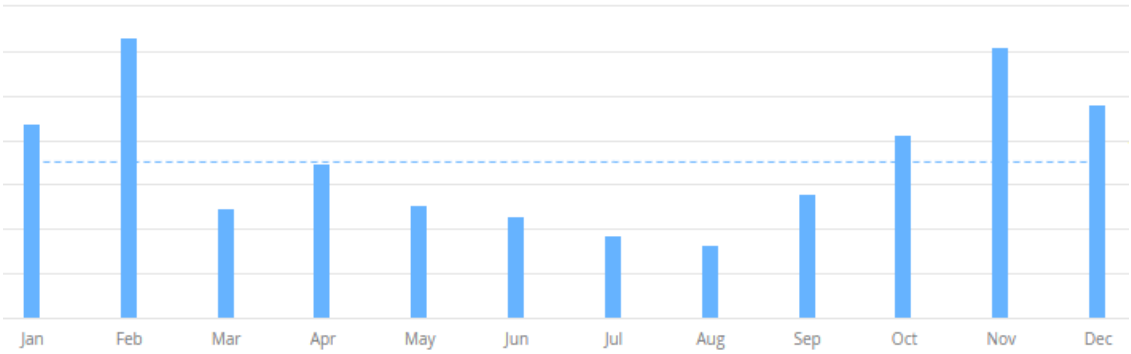
4 Construction works in the Belwind concession

No construction works took place in the Belwind concession during this reporting period.

5 Wind farm annual operations information

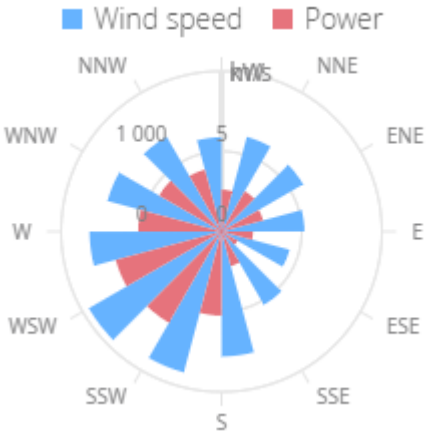
5.1 Production of the wind farm



Monthly production 55 x V90

5.2 Wind rose

The displayed wind rose is a graphical representation of the wind speed and direction measured all over the wind farm.



Wind-rose

5.3 Planned Periodic Maintenance

Parkwind, together with VOW, the service contractor for the Belwind **V90 WTG's**, performed the following planned maintenance and inspections in 2022:

- **12th-yearly service:** Yearly, an annual service is done on all the turbines. Every component is carefully inspected and made sure it will operate correctly for the next year. On 16th December VOW has finished the 12-yearly-maintenance on BW, which takes 5days/turbine. VOW has completed its service within the foreseen timing.
- **Statutory inspections:** on regular intervals, the service elevator (3 months), the Acta crane on the transition piece (1year) and the hook-on points (1 year) are inspected and certified by a 3rd party. Since July 2020 legislation has been changed into yearly inspection for the service elevator (combined inspection).
- **HV inspections:** every year, VOW skilled technicians and a third party inspect and certifies the HV installation. Both the switchgear and the transformer are inspected. The switchgear in the turbines is inspected with ultra-sonic equipment;
- **Blade inspections:** Drone inspections were performed in the summer of 2022.

Parkwind performed the following works of the electrical installation :

Booster station (onshore) :

- Yearly mandatory statutory inspections of high voltage installation;
- Yearly maintenance on all low voltage parts of the installation;
- 3 Monthly visual inspection of the high voltage parts of the installation;
- Annual maintenance of Fire detection & Fire Fighting;
- 3 Monthly maintenance on all SCADA systems and IT infrastructure.
- SCADA upgrade/ replacement

Offshore High Voltage Station:

- Yearly mandatory statutory inspections of high voltage installation carried out by supplier: this inspection was carried out according to legal criteria (AREI) and no major observations were made;
- Yearly maintenance of all equipment by Parkwind: the maintenance focuses on visual inspection, cleaning and functional testing of low voltage systems and components;
- 3-monthly mandatory statutory inspections of all lifting equipment by supplier: all secondary equipment, cables, chains, slings, hooks and the cranes mechanisms are inspected to see if any aging or damage has occurred to the equipment;
- 3-monthly mandatory statutory inspections of all personal protective equipment by supplier: the inspection focuses on the state of all PPE's used and verifies if all PPE are maintained and used as intended by the manufacturer;
- Yearly inspection and maintenance of the fire detection system this maintenance campaign focuses on testing of the fire detection equipment and fire control cabinet functions;
- Yearly inspection and maintenance of the firefighting this maintenance campaign focuses on the firefighting equipment, e.g. pressure on the firefighting gas and portable fire bottles and test of the release valves and activation push buttons;

- Yearly maintenance of HVAC installation: annual replacement of filters, functional tests of all valves & sensors, inspection of the ice water machine and cleaning of the heat exchange condensers is performed;
- Yearly inspection of diesel fuel system: general inspection of the diesel generator, pumps and valves are focused during this yearly maintenance. The diesel tank and its leak detection is also checked;
- Yearly inspection of life saving equipment (life jackets, life raft, immersion suits and portable fire extinguisher) by supplier;
- Thermal Imaging LV, MV and HV equipment: Parkwind carried out regular inspection using thermal imaging camera;
- Ultrasonic inspection of MV and HV equipment: Parkwind carried out regular inspection using ultra sonic measuring equipment;

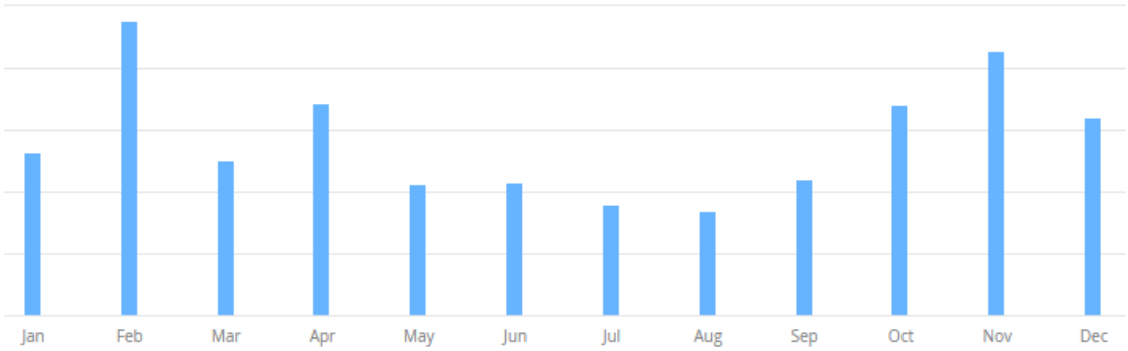
On the BOP (Balance Of Plant : foundations – cables), the following tasks have been performed by Parkwind in 2022 as part of the routine maintenance:

- Inspection, maintenance and recertification of the fall arrest systems: the complete fall arrest system is inspected and recertified by qualified technicians. If any system is non-compliant it gets replaced as soon as possible;
- Inspection of cathodic protection: the cathodic protection needs to prevent/limit the corrosion on the primary and secondary submerged steel. During this campaign the protection is measured and evaluated if the protection grade is still enough compared to design values. The measurement of the actual cathodic protection was done by handheld drop cell Ag/AgCl reference electrode and with an ROV mounted stab probe;
- Survey of inter-array cables: this multibeam survey takes a snapshot of the sea bottom condition and the results are used to determine the depth of burial of the cable assets;
- Internal and external NDT-inspections of welds, bearings and boat landing studs;
- ROV inspection of outer submerged foundation to evaluate the marine growth and presence of ropes, fishing nets, rocks or other debris;
- Inspection of paint by qualified paint inspector and subsequent touch-up, especially on the ladders and top platforms;
- Paint repairs: on selected foundations, repairs were done on some of the circumferential welds, external platform and railing on the topside scope.
- Smart foundation monitoring: the WTG C01 is equipped with several sensors in order to monitor the grout, loads, and vibrations.
- Frequency monitoring: this monitoring is performed on 20% of the foundations. During half an hour the natural frequencies are measured by accelerometers. These results are analyzed and compared against design frequencies and excitation frequencies caused by blades. This to monitor those natural frequencies are in a safe zone where there is no chance of resonance.
- Belwind has stepped into a cable repair framework managed by Parkwind, called Safe Link project. The Safe Link project will ensure that in case of a cable failure, the repair works will be executed within reasonable time to minimize the loss of electricity production, reduce idle time of WTG's and reenergize the cable as soon as possible. To be able to cope with a quick repair, the Safe Link project has been signed with a cable expert contractor and is threefold:

- Carry out preparedness services = be prepared to mobilize personnel and marine spread + equipment within agreed response time and prepared to carry out the repair works
- Carry out repair works on the Belwind export cable and Inter Array Cables
- Carry out the spare parts management

The Safe Link project has an agreement for five years. The preparedness documentation is subject to a yearly review round to implement new working methods and lessons learned. The project is active since September '21. Up to date, the contractor has finalized all pre-engineering required for an offshore cable repair.

6 The Belwind DEMO project 'Haliade' GE



Monthly production GE-Haliade

7 Environmental Research

The MUMM coordinated all the foreseen standard environmental monitoring activities in the field. There was a continuation of the bird assessments, the fish assessments by line fishing and trawl net fishing as further research activities on the fouling organisms on the foundations and scour protection, the seabed and the fauna at the reef balls.

8 Permit conditions

In compliance with the authorization for the construction and a license for the operation of a wind farm on the Bligh Bank in the Belgian sea areas article, we give an overview of the environmental permit conditions as mentioned in the appendix 1 of the authorization for the construction and a license for the operation of a wind farm .

Permit conditions overview

Condition Number	Condition Summary	Current Status
2	Each planned modification must be reported to the Board and will be included in the annual work report.	No modifications in 2022.
4	The holder undertakes to find and recover all floating or sunken objects used for its activities which, for any reason, have ended up in the sea during the construction, operation or dismantling stages.	All dropped objects related to Belwind offshore activities are recorded in the online reporting tool, the SOS system, and reported on a quarter basis. .

Condition Number	Condition Summary	Current Status
14	During construction, all foundations and structures already finished must have a temporary warning light (at the highest point) for shipping and aviation traffic.	No new foundations installed in 2022.
15	The holder must set up the necessary safety systems to assure the signalling of the wind farm and structures at all times.	Since 8 February 2011 all navigation and aviation signalisation are fully operational. All cases of defects or malfunctioning (only Tier 1 events) were reported to the relevant authorities and repaired as soon as possible.
16	All WTG's must be numbered individually at the base of the mast and at the top of the nacelle.	The foundation and the WTGs have been numbered in accordance with the requirements of this condition.
17	All WTGs and transformers must be provided with collection receptacles to prevent liquids from being released in the environment.	The design of the WTG is such that in case of leakage in the nacelle, all fluids are collected in the central part of the nacelle. From here, collection receptacles are installed under the oil pumps and hydraulic systems as standard.
20	During the operation stage, the availability must be facilitated of a specially equipped intervention vessel (or combination of vessels) for assignments concerning the prevention of shipping traffic accidents and cleaning up sea pollution around and in the wind farm	On 22 January 2011, an agreement was signed with Federal authority responsible for the marine environment. Further clarification regarding the practicalities of the agreement have been clarified in vision text signed by the Secretary of State, DG Environment, MUMM and wind farms C-power, Belwind and Northwind.
21	Once or twice a year, the holder must take part in simulated nautical accidents, emergency towing exercises and pollution combating exercises.	On a regular base Belwind MVOW execute internal emergency exercises (see 10.1.4 of this report).
24	Before laying protective mattresses or other artificial erosion protection on the seabed, the holder must verify and certify that all components chosen can be used without any danger of leaching into the marine environment. The composition of the erosion protection must be presented to the Board for approval. The use of monoliths and slag is hereby prohibited.	No new construction material to be approved in 2022.
29.1	The construction materials and rip-rap must be made of natural materials and must not contain any waste materials or a secondary raw material… the use of slag is prohibited.	No new construction material to be approved in 2022.
31.2	Pile driving activity between 1 January and 30 April will be subject to additional, special monitoring in the amount of EUR 50,000 at most, which is not included in the estimated budget and is completely at the expense of the holder	No piling activities have been performed in 2022.
33.1	The lighting of the turbines for the benefit of shipping and aviation traffic must comply with the conditions set by the competent authorities.	Lights are installed according to the Navigational Aids plan and have been fully operational in the O&M reporting period. Since Nobelwind is built around Belwind, the Navigational Aids Plan of Belwind has been changed into a Navigational Aids Plan of the Bligh Bank, considering the whole zone of Belwind and Nobelwind as one zone.

Condition Number	Condition Summary	Current Status
33.2	Foghorns, which come into operation automatically in the event of a meteorological visibility of less than 2 sea miles, must be placed on the corner turbines.	Fog horns are installed according to the Navigational Aids plan and have been fully operational in the O&M reporting period. See also 33.1.
34	The holder must maintain the farm on a regular basis.	All installations are maintained on a regular basis.
35.4	The covering of the cables must be assured at all times. If the annual monitoring shows that the cable is exposed, the necessary work must be done in the shortest possible time, three months at most, so that the cable can be placed at its original depth.	Annual cable burial depth surveys are executed during the operational phase. Based on the result of the cable risk analysis (Cable Risk Management), a reburial campaign will be set up.
48	A logbook must be kept in which the following is specified for each turbine: ➢ Date, time and all relevant data of incidents that occur which have an impact of the environment, stating the measures taken; and ➢ The recording of hazardous waste materials, the date of removal of the relevant batch of waste, the quantity and the name of the carrier and the recognised waste processor must also be recorded.	We confirm that logbooks have been kept for all turbines since start-up of the first WTG and this has continued during operation.

9 R&D project

9.1 United project :

Horizon 2020 call : "Multiuse of oceans & coastal waters
Belgian partners :

- Ugent (coordinator)
- ODNature
- Jan de Nul
- Brevisco
- Colruyt Groep
- Parkwind

Project objectives:

- Restoration of flat oysters and the development of an aquaculture activity of the species:
  - New type of scour protection (matrasses)
  - Defining equipment for holding oysters for aquaculture (broodstock and spat)
- Comparing growth of seaweed offshore and nearshore

Duration **:** 01/01/2020 -> 31/12/2023

Activities by Belwind :

In **2021**, restoration (oyster) tables were installed at scour protections of A04 (2 tables) and A07 (2 tables with adult oysters). Each table has 6 gabions (sampling). The sampling of one gabion from table at A04 was also done.

Activities that took place in **2022**:
UXO surveys (2 zones selected for longlines installation and installation of screw anchors (4 in total) for oyster and seaweed longlines:

UXO survey and longline installation on UNITED

Pending offshore activities to be performed in **2023**:

- ✓ Harvesting of the seaweed (May & June)
- ✓ Cleaning, sampling and decommissioning of oyster and seaweed structures. Longlines will be re-used for next aquaculture project, ULTFarms.
- ✓

10 Operations Management

10.1 Health Safety and environment

10.1.1 Unwanted events over the reporting period

No unwanted events (with LTI) happened during the reporting period.

10.1.2 Positive observations

In the light of the fishing for litter project, the offshore vessels and teams are requested to collect floating objects. In 2022 examples of objects that were retrieved in the BlighBank concession included, but are not limited to:

- Two plastic drums attached to a long rope
- Garbage
- Balloon
- Floating objects
- Etc.

10.1.3 Proactive safety initiatives

Similar to previous years, to ensure that our O&M employees continue their good HSSE progress of recent years and a real HSSE culture is established, the company decided to establish a KPI for all O&M Teams. In 2022 the HSSE department decided on several topics, translated into toolboxes, that had to be discussed within all O&M Teams. Every month, two obligatory HSSE toolboxes where created. Topics included: tailored PPE such as prescription safety glasses, safe driving, results of environmental monitoring within the concessions, PPE – gloves, IMCA HSSE statistics of 2021, Drugs and Alcohol Policy, No jewelry policy, the importance of buddy checks, the importance of work permits, organization of safety exercises, responsibilities of and the procedure on confidential counselors, Emergency Response Planning, etc. The KPI had to be reported on a monthly basis to ensure follow-up. In December the toolboxes were replaced by an end quiz, including questions on all toolbox topics discussed during the previous months to ensure the most important messages were refreshed and captured by all.

In continuation, to provide our employees and Contractors with a better understanding of our HSSE procedures and requirements, additional online inductions were developed, and existing inductions were revised in our Online learning platform. The Online learning platform is linked to the online "SoS" reporting system this to make sure that training certificates and induction certificates of both our employees and contractors are followed up on. Additionally, some online HSSE trainings such as the Alcohol & Drugs Induction, Evacuation of the offices Training, Training on Transgressive behavior and the role of the Confidential Counselor, …, were also integrated into our Intuo system, available to all Parkwind employees.

The Online "SoS" system was also further developed in 2022, including some additional functionalities. For example, all concessions ERP's and main HSSE procedures are now available to all (own and contractor personnel) via the SoS key-document section. Also, safety alerts are being distributed via the SoS system to all relevant parties, and as such an actual up to date overview of applicable safety alerts is available via the SoS system.

The reporting scope in the Online SoS system was also expanded, making a clear distinction in reporting, follow up and reporting of on the one hand HSSE related events and Quality related events. This, to allow a better follow-up.

10.1.4 Safety Exercises

Overview emergency exercises 2022	
WTG	09/10/2022: Contractor; Evacuation from lift
	08/12/2022: Contractor; rescue with sked through a hatch
OHVS	22/06/2022: Parkwind; SALA rescue
	13/10/2022: Security exercise BEL SEC SPN-SF OHVS BW1
Onshore	07/07/2022: Parkwind; Desktop Drill: Security Incident

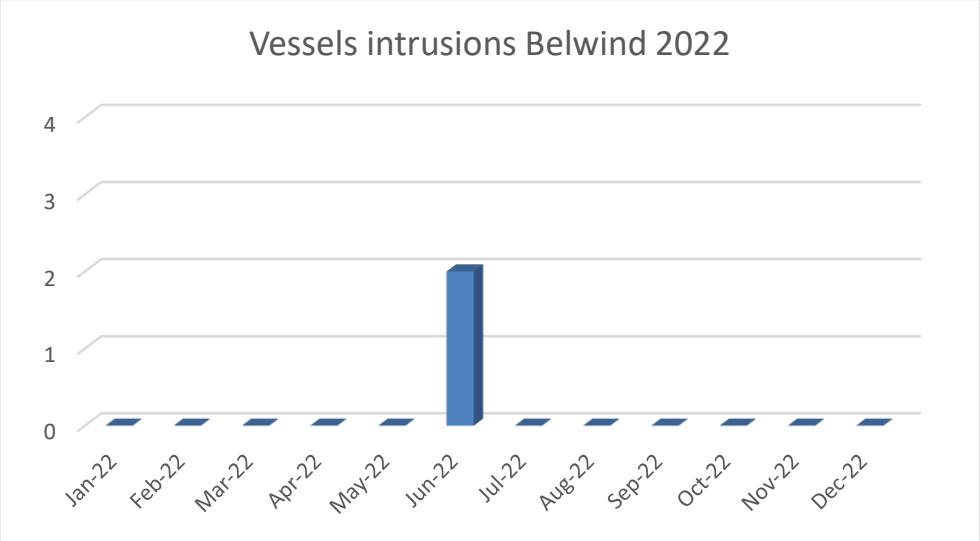
It has been agreed that, to ensure a higher level of safety, environmental protection and security, the knowledge and participation gained from exercises conducted within the lager area of offshore wind, shall be shared amongst the several Windfarm owners. Two pollution exercises were carried out successfully, as well as a rescue and security exercise, focusing on the recovery of refugees from an offshore wind asset (both in cooperative and non-cooperative scenarios) See above. In 2022, no Search and Rescue exercises were conducted, after successful winching demonstrations in 2021.

10.1.5 Emergency actions (TIER2)

In 2022 no Tier 2 situations were reported.

10.1.6 Intrusions

In 2022 we had 2 intrusion (third party) reported on the Belwind concession.



Overview intrusions 2022

As the intrusions were related to activities of neighbouring windfarms and only included small crossings of the safety zone (Proximity Agreement), these intrusions were managed between Belwind Marine Coordinator and the Marine Coordinators of the applicable neighbouring wind parks. Thus, these intrusions were not reported towards the authorities, using the MRCC intrusion template.

All intrusions are logged in the SOS system and are during the periodic Supervisory Committee meetings communicated to the Authorities. In case of intrusions by civilians (e.g. fishing boats) the MRCC template is used to report towards the Authorities; considered a TIER situation.

10.2 Vessel & accessibility

For maintenance on the turbines the Esvagt Mercator is used as hotel/mother ship in combination with STB`s. For the maintenance of the OHVS and the foundations secondary steel Parkwind uses CTV`s starting from shore per the vessel pooling agreement.
When required specific Work Vessel can be added to the logistics mix for specific tasks such as surveys, ROV works, Cable or scour repair actions or Major component exchange.

10.3 O&M office Parkwind

O&M team offices are located in the harbor of Ostend: Esplanadestraat 10B, 8400 Oostende

11 Conclusion and outlook

The green power production in 2022 was slightly below the production of 2021, which was also below expectations given the actual wind speeds is below the expected long term wind speed.

In 2022, the availability of the windfarm was good with a system (technical) availability above 96%.

We are happy to report that no big HSSE incidents were recorded and that all tasks as mentioned under the operational permits are well managed.
We foresee a further rolling out of the HSSE master plan in 2023 supported by the Parkwind HSSE team.

Belwind, managed by the Parkwind organization, will keep striving for innovation in terms of maintenance procedures, preventive actions, O&M inspection tools, etc. as it has been doing in the past. Next to the standard maintenance, it is expected that some issues might start showing after 12 years in operation which might need some more dedicated attention with age settling in. However, with a strong managing contractor as Parkwind, we are confident that any concern can be tackled adequately and preferably in a proactive matter.