#	Requirement	Fulfilled ✓ or *	Evidence and/or declaration
	a. the permit holder must use one or more acoustic deterrent device(s) tuned to the relevant frequencies during piling work, starting half an hour before piling work starts. In its piling plan, the permit holder will outline the types of deterrents it plans to use, including supporting information of their proven effectiveness; b. The piling work must start with a low piling energy, ensuring that porpoises are given an opportunity to swim to a safe location. The piling plan should provide details outlining the duration and power of the low piling energy.		performed in accordance with this piling plan and requirement 4.1 of the Site Decision. See also Appendix 01 - Summary description of realisation, operation and decommissioning - 3.4.1 Foundation installation: "We will achieve the regulatory noise limits during construction and operations by applying deterrence and sound damping technologies, and through operational practices-soft start-up of pile drivers to allow marine mammals time to leave the construction area. As an example CrossWind will apply an Acoustic Deterrent Device (ADD) before piling commences to reduce the possible impact on fish, seals and harbour porpoises. The type of ADD that will be applied is the [redacted] By using specific frequencies, the submitted noise will be as limited as possible, creating no more impacts as aimed for, unlike other ADDs, VOOW has a lot of experience in using the [redacted] for deterring harbour porpoises, the most sensitive animals, e.g. during the construction of Luchterduinen, Gemini and Borssele III & IV." "During piling, VOOW will apply noise mitigation (double big bubble curtain) in combination with the AdBM noise mitigation system. This combination has been applied recently at the Norther and Borssele III & IV projects and has proven to be effective. The AdBM can be deployed from the gripper ensuring efficient cycle times. The combination of bubble curtain and AdBM noise mitigation system has been applied at the Borssele III & IV project, providing further data helping to ensure that maximum allowable sound levels allowed by the Site Decisions are not exceeded."
2.	Measures to prevent disturbance of porpoises, seals and fish (sound emission standard)	✓	CrossWind declares that they take the described mitigation measures and shall create a piling plan and submit it to the Minister of Economic Affairs and Climate at least eight weeks before the commencement of the construction. The work will be performed in accordance with this piling plan and requirement 4.1 and 4.2 of the Site Decision. See also Appendix 01 - Summary description of realisation, operation and decommissioning - 3.4.1 Foundation installation: "We will achieve the regulatory noise limits during construction and operations by applying deterrence and sound damping technologies, and through operational practices-soft start-up of pile drivers to allow marine mammals time to leave the construction area. As an example CrossWind will apply an Acoustic Deterrent Device (ADD) before piling commences to reduce the possible impact on fish, seals and harbour porpoises. The type of ADD that will be applied is the [redacted] By using specific frequencies, the submitted noise will be as limited as possible, creating no more impacts as aimed for,

#	Requirement	Fulfilled ✓ or ✗	Evidence and/or declaration
			unlike other ADDs, VOOW has a lot of experience in using the [redacted] for deterring harbour porpoises, the most sensitive animals, e.g. during the construction of Luchterduinen, Gemini and Borssele III & IV." "During piling, VOOW will apply noise mitigation (double big bubble curtain) in combination with the AdBM noise mitigation system. This combination has been applied recently at the Norther and Borssele III & IV projects and has proven to be effective. The AdBM can be deployed from the gripper ensuring efficient cycle times. The combination of bubble curtain and AdBM noise mitigation system has been applied at the Borssele III & IV project, providing further data helping to ensure that maximum allowable sound levels allowed by the Site Decisions are not exceeded."
	3. Measures to limit collision victims among birds at rotor height during mass bird migration	✓	CrossWind declares that they take the described mitigation measures in requirement 4.3 of the Site Decision and shall produce a report outlining how this Regulation has been implemented over the past six months and submit it to the Minister of Economic Affairs and Climate Policy. See Appendix 01 - Summary description of realisation, operation and decommissioning - 4 Operations: "During times of mass bird migration, the turbines will be shut down to reduce the probability of birds colliding with the turbines. The decision to shut down the wind farm will be aided by a bird radar placed in the wind farm that can detect approaching flocks of migrating birds or by a validated model that can predict bird migration patterns. Eneco is involved in a research project at Luchterduinen to investigating bird migrations with the aim to validate the bird migration model."
	4. Measures to prevent victims of collision amongst bats at rotor level	✓	CrossWind declares that they take the described mitigation measures in requirement 4.4 of the Site Decision and shall report in which way the measures are taken to the Minister of Economic Affairs and Climate Policy within 2 months after September 30th (each year). See Chapter 4 of Appendix 01 - Summary description of realisation, operation and decommissioning. "Eneco is involved in a research programme to better understand the bat migration patterns. During conditions favourable for bat migration, the WTGs will be shut down to reduce probability of collisions of bats with the WTGs as per Site Decision."
	5. Measures to protect archaeology and cultural history	✓	CrossWind declares that they take the described mitigation measures in requirement 4.5 of the Site Decision and will do the necessary research. CrossWind will report the results of the research to the Minister of Economic Affairs and Climate Policy no later than 3 months prior to start of construction.

#	Requirement	Fulfilled ✓ or ✗	Evidence and/or declaration
			See Appendix 1 chapter 4. "The locations of the WTGs and the cable routing is selected such that all known objects of potential archaeological value are avoided. During the UXO studies and combined UXO and archaeology surveys potential archaeological objects may be found. We have included an allowance for rerouting of the inter-array cables to keep at least 100m distance in case potential archaeological objects are encountered. In other cases, measures will be taken to protect archaeology and cultural history in accordance with the Site Decisions." Map 5 in this report shows all wind turbines and cables in relation to the 100 meter buffer zone of possible archaeological objects, wrecks with possible archaeological value and magnetic anomalies.
6.	Measures to reduce light pollution and to reduce the visibility of the wind farm.	✓	CrossWind declares that they take the described mitigation measures in requirement 4.6 of the Site Decision. See Chapter 4 of Appendix 01 - Summary description of realisation, operation and decommissioning. "We will comply with the requirements from the site decisions regarding the reduction of the visibility of the wind farm. Furthermore we see much potential in Aircraft Detection Lighting Systems (ADLS) and are closely monitoring developments of such systems which are already allowed by the corresponding aviation authorities in Canada, Finland, Germany, Norway, Sweden, and the United States."
7.	Measure to promote maritime safety and enforcement in and around the wind farm	✓	CrossWind declares that they take the described mitigation measures in requirement 4.7 of the Site Decision. See Chapter 4 of Appendix 01 - Summary description of realisation, operation and decommissioning. "CrossWind will cooperate with the placement of nautical equipment that can observe the ship movements in and around the wind farm at the location (s) determined by the government. CrossWind will provide access for the management and maintenance of this equipment."
8.	Measures to increase the suitable habitat for species native to the North Sea by means of hollows and cracks of various sizes and settlement substrate.	✓	CrossWind declares that they take the described mitigation measures in requirement 4.8 of the Site Decision. CrossWind will formulate a plan of action for scour protection and submit this plan to the Minister of Economic Affairs and Climate Policy no later than 8 weeks prior to start of construction. See Appendix 1 paragraph 3.2.1.
9.	Measure to ensure the safe accessibility of mining platform Q4C, by helicopter for the purposes of employee transport and Search and Rescue (SAR) operations.	✓	CrossWind declares that they take the described mitigation measures in requirement 4.9 of the Site Decision. CrossWind will set out the method in a procedure and submit this plan to the

#	Requirement	Fulfilled ✓ or ✗	Evidence and/or declaration
			Minister of Economic Affairs and Climate Policy no later than 8 weeks prior to start of construction. See Appendix 1 chapter 4. Map 4 in this report shows all wind turbines within the downtime measure zone.
5.	**Monitoring and evaluation programme**		
	1. The Minister of Economic Affairs and Climate Policy will create a monitoring and evaluation programme. The permit holder will cooperate in this programme, without financial compensation. The safety regulations applicable to the wind farm will be duly observed.	✓	CrossWind declares that they will cooperate in the monitoring and evaluation programme in a reasonable extent without financial compensation according to requirement 5.1 of the Site Decision. See also appendix 1, paragraph 3.1: "Monitoring that all activities comply with national legislation and work proactively and by implementing the monitoring and evaluation programme established by Minister of Economic Affairs and Climate Policy. CrossWind has the experience and sees the importance of an early involvement in the monitoring and evaluation programme, so that optimal design can be made on installation equipment. For the wind farms Prinses Amaliawindpark and Luchterduinen the monitoring and evaluation programme are already successfully implemented."
	2. The Minister of Economic Affairs and Climate Policy will publish the data arising from the monitoring and evaluation programme.		No evidence needed.
	3. For the benefit of the implementation of the monitoring and evaluation programme, the permit holder will cooperate as follows: • providing access to the wind farm for vessels conducting monitoring and evaluation work; • providing access to the seabed of a wind farm and allowing sampling; • enabling the attachment of equipment such as cameras and bat detectors to/on (parts of) the wind turbines and providing access for the management and maintenance of that equipment; • enabling the attachment of radar equipment to/on (parts of) the wind turbines and providing access for the management and maintenance of those radars; • enabling the attachment of measurement equipment (such as measurement buoys, C-PODS, etc.) within the wind farm and providing access for the management and maintenance of that equipment; • making bandwidth available on the data cable.	✓	CrossWind declares that they will cooperate in the implementing of the monitoring and evaluation programme, according to requirement 5.3 of the Site Decision. See also appendix 1, paragraph 3.1: "Monitoring that all activities comply with national legislation and work proactively and by implementing the monitoring and evaluation programme established by Minister of Economic Affairs and Climate Policy. CrossWind has the experience and sees the importance of an early involvement in the monitoring and evaluation programme, so that optimal design can be made on installation equipment. For the wind farms Prinses Amaliawindpark and Luchterduinen the monitoring and evaluation programme are already successfully implemented."

#	Requirement	Fulfilled ✓ or ✗	Evidence and/or declaration
6.	**Removal**		
	After the power generation operations have stopped, the permit holder will dismantle and remove all elements of the wind farm within two years at the latest, but always within the term of validity of the permit.	✓	CrossWind declares that they dismantle and remove (decommission) the wind farm within two years after the power generation operation have stopped and decommissioning will be completed within the term of validity of the permit. Decommissioning is mentioned in Chapter 5 of appendix 1: "The decommissioning period of the wind farm is to start on September 10th 2049 and planned to finish in September 10th 2050.". This is [redacted] within the 30 year limit of the permits.
7.	**Financial security**		
	1. At the latest, at the moment that the Netherlands Enterprise Agency (RVO.nl) receives proof of "Guarantees of Origin" (GVOs) of electricity produced, the permit holder will guarantee the removal of the wind farm by means of a bank guarantee for the State in the amount of €120,000 per MW installed.	✓	CrossWind declares that the decommissioning reserve will comply with all regulations as mentioned in paragraph 7.1 – 7.4 of the Site Decisions. See chapter 5 of Appendix 1. "As per tender regulations, a decommissioning reserve will be kept by CrossWind for the full scope of the decommissioning of the wind farm. An experienced marine contractor will be contracted for the offshore decommissioning of the wind farm. Method statements, risk assessments, instructions and a recycling plan will be developed in the preparation of the decommissioning. Rijkswaterstaat and the Dutch Coast Guard will be consulted in preparation of such plans. The execution will follow the procedures from the method statements and plans."
	2. The permit holder will annually increase the amount referred to under 7.1 by 2% as a consequence of indexation during a period of 12 years after the issue of the bank guarantee.	✓	See 7.1
	3. After operating for a period of 12 years, operating for a period of 17 years, and 1 year before the date of removal, the permit holder will ask the Minister of Economic Affairs and Climate Policy to redetermine the amount referred to in 7.1 and its indexation.	✓	See 7.1
	4. If a permit is applied for in accordance with Section 3.3 of the Offshore Wind Energy Act, the bank guarantee referred to requirement 7.1 for the removal of the wind farm shall be granted at the time when the first foundation of the wind farm is installed.	✓	See 7.1

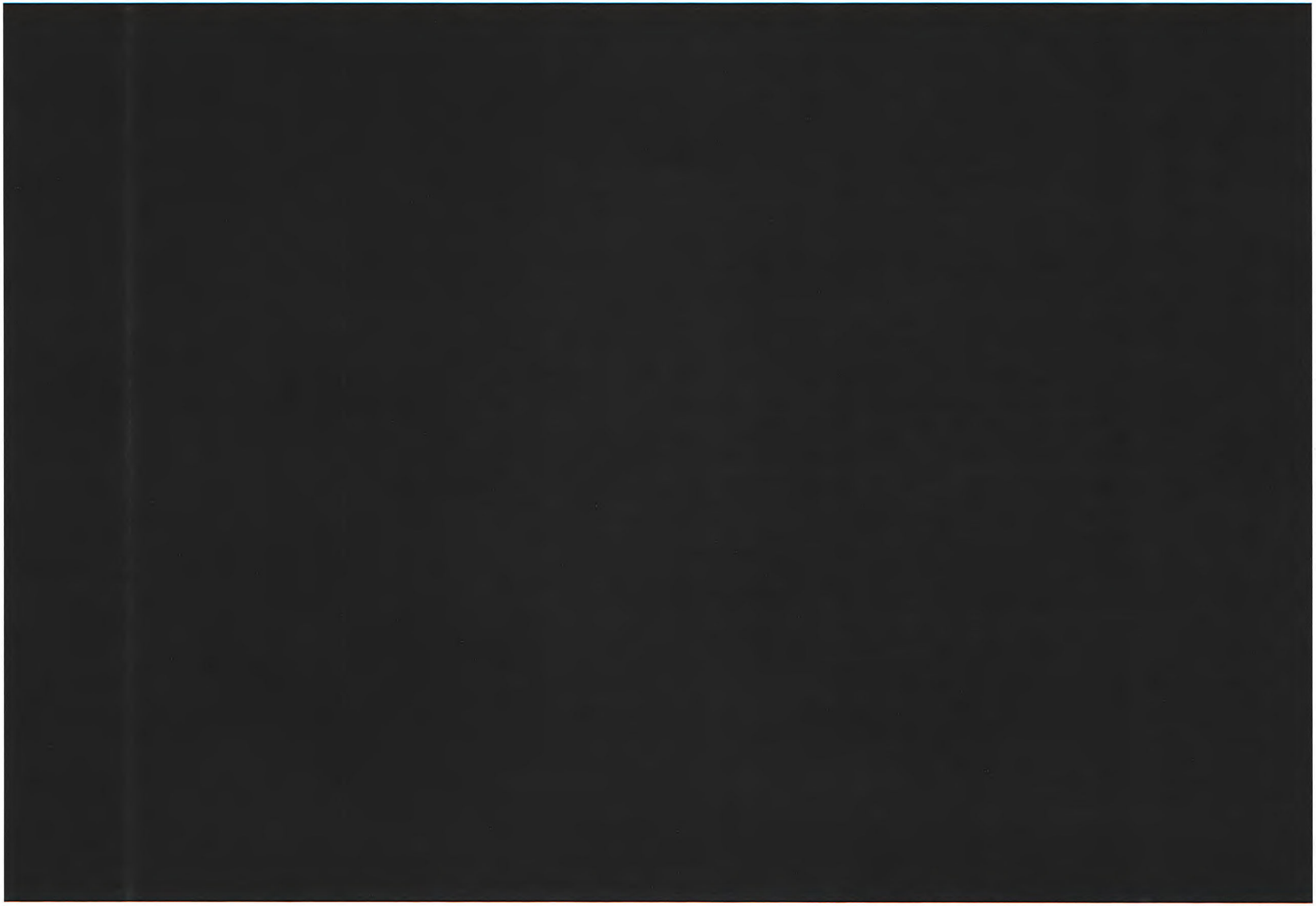
3.3 Conclusion

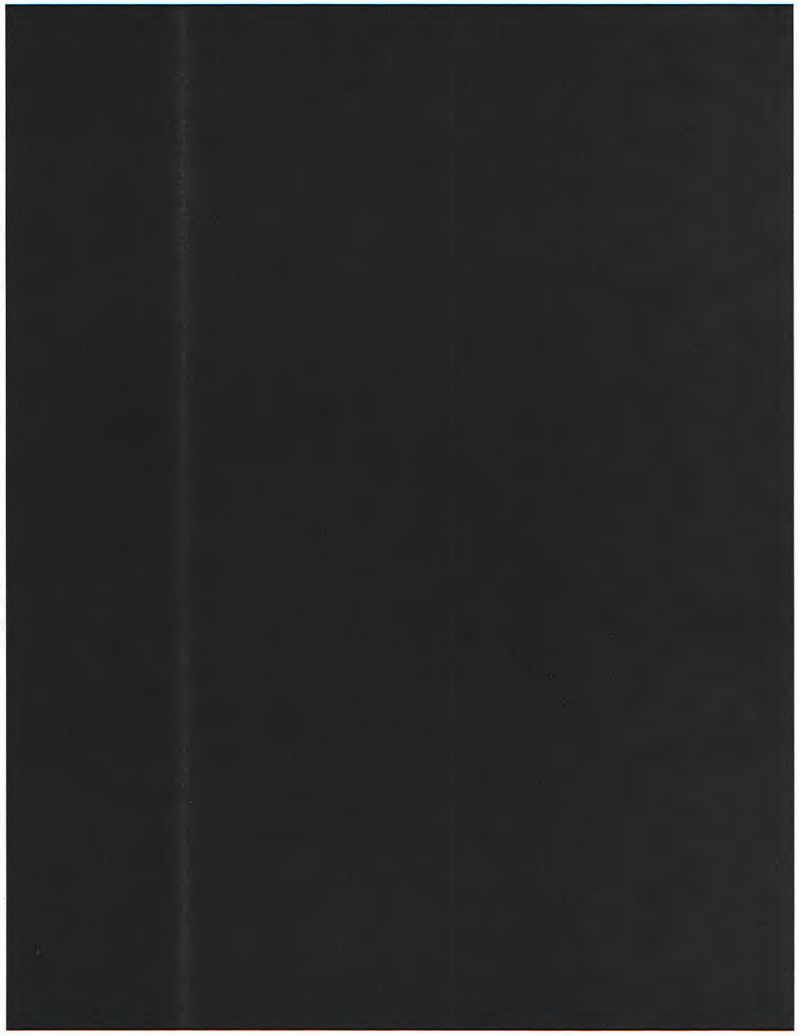
CrossWind complies with all of the requirements of the Site Decision of Hollandse Kust (noord). Pondera Consult also confirms that in accordance with the ministerial regulation of 13 December 2019 (nr. WJZ/ 19201387):

1. The documents of CrossWind make it plausible that the applicable Water Decree is complied with;
2. The documents of CrossWind make it plausible that the statement, referred to in Article 6.16d, first paragraph, under c, of the Water Decree can be submitted in time.

CrossWind can also comply with the concept of the amendment to the site decision (date: 23-03-2020).

APPENDIX





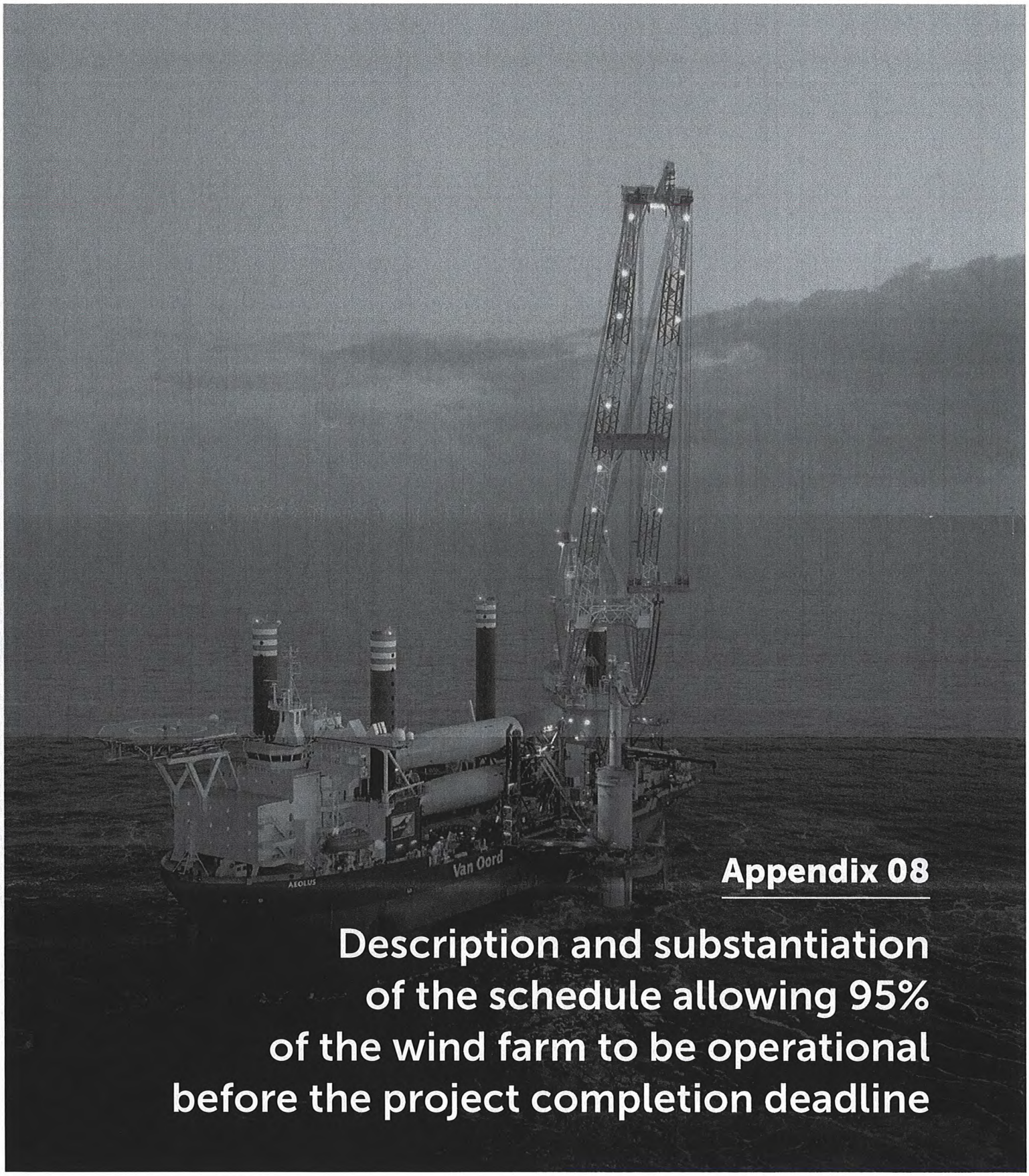
CROSSWIND

Eneco

4.

CROSSWIND

Partnering to drive the Dutch energy transition



Appendix 08

Description and substantiation of the schedule allowing 95% of the wind farm to be operational before the project completion deadline

Contents

CrossWind 95% commissioned on [redacted]

To further propel the Netherlands as a leader in offshore wind energy, deliver projects in record time and ensure efficient use of the offshore grid, CrossWind is taking firm steps to accelerate construction of the wind farm. This Appendix describes how the schedule allows 95% of the wind farm to be in use no later than 39 months after the permit becomes irrevocable.

CrossWind will make efficient use of the offshore grid by delivering the wind farm on time (95% of wind farm operational by [redacted]. **We are confident we can achieve the schedule for the following reasons:**

- **Integrated schedule:** CrossWind has established an integrated development plan together with our main contractors SGRE and VOOW [redacted]
- **Extensive experience:** CrossWind's Partners will draw on their combined experience gained through developing, constructing and operating Dutch offshore wind farms, including Offshore Windpark Egmond aan Zee, Prinses Amaliawindpark, Luchterduinen, and Borssele III & IV. Combined with the vast experiences of Siemens Gamesa Renewable Energy (SGRE) and Van Oord Offshore Wind (VOOW), CrossWind is uniquely positioned to deliver Hollandse Kust (noord);
- **Committed contractors:** Through signed Contract Agreements with our main contractors SGRE and VOOW, and binding offers from key subcontractors, availability of production slots and installation equipment are secured;
- **Risk analysed schedule:** The robustness of our Overall Schedule has been thoroughly tested in a Schedule Risk Analysis (SRA) based on thousands of simulated realisations in which the durations of the activities have been probabilistically ranged to simulate generic risks and opportunities, while the main risks and opportunities have been modelled as discrete events.

As pointed out in Appendix 01 (Project description), CrossWind's plan for the Project site consists of a wind farm with 69 Wind Turbine Generators (WTG) on monopile foundations, each rated at 11.00 MW, with a combined capacity of 759 MW. The Inter-Array Cables (IACs) connect the WTGs to the TenneT platform Hollandse Kust (noord) in [redacted] strings. CrossWind defines 100% of the wind farm to comprise the full 759 MW of installed power. Therefore, 95% of the wind farm is commissioned when at least 721 MW (95% of 759 MW) is commissioned. This is the case when 66 WTGs have been commissioned, equaling 726 MW. To avoid delaying the commissioning of the wind farm itself, CrossWind has selected innovations, which – with the exception of the grid friendly turbines (futher described in Appendix 09 (Description demonstration innovation)) – can be installed after the full conventional wind farm is operational. These innovations will be commissioned within the 60 months after the permit becomes irrevocable.

CrossWind's Overall Schedule

Annex 1 of this Appendix contains CrossWind's Overall Schedule, showing the key milestones and key activities across the different phases of the Project. This Overall Schedule is a summary of the Integrated Schedule (see Annex 2) which contains a more detailed breakdown of all major activities. This schedule demonstrates CrossWind's ability to deliver the wind farm on time.

CrossWind's Integrated Schedule

CrossWind's Integrated Schedule has been developed using [redacted] The key inputs are:

- Timetable with most significant milestones as described in RVO's application form of Hollandse Kust (noord);
- Detailed Balance of Plant (BoP) contractor schedule; and
- Detailed WTG contractor schedule.

When planning the detailed BoP and WTG contractor schedules attention was given to the target set by RVO of an earliest commissioning date of 10 December 2023 (21 months earlier than the maximum period of 60 months after the permit becomes irrevocable). [redacted]

[redacted]

[redacted]

[redacted]

[redacted]

D.1.2 The time when at least 95% of the wind farm is in use [1]

Planned date for agreeing, with the grid operator of the national high-voltage grid, the conditions for the connection and transmission of electricity in accordance with the Electricity Act 1998

[redacted]

The Transmission System Operator (TSO), TenneT will provide the connection between the Offshore High Voltage Station (OHVS) and the 380 kV national grid onshore. The wind farm connection will be in accordance with the requirements formulated in the Realisation Agreement (REA) and the Connection and Transmission Agreement (CTA) between CrossWind and TenneT. These agreements will be signed within six months after the permit has become irrevocable. Signing of the REA and CTA is planned to take place latest on [redacted]

Within CrossWind there is a wealth of experience in all aspects of realising grid connections with TenneT. This includes negotiating and securing REAs and CTAs for offshore w ind f arms s uch a s P rinses A maliawindpark, and Luchterduinen, and for major onshore projects. The most recent experience stems from 2017 when Shell and Eneco successfully negotiated and signed the REA and CTA with TenneT for the Borssele III & IV project. The negotiations started shortly after award of the SDE+ subsidy and were negotiated in a constructive and efficient way within six months. Based on this recent experience and the excellent relationship with TenneT, CrossWind

[1] The time when it has been shown plausibly that at least 95% of the wind farm is in use before the maximum period of 60 months after the permit becomes irrevocable. At least 21 months earlier.

Figure 1. CrossWind Overall Schedule from Permit Award until installation of first foundation.

is confident the REA and CTA contracts will be signed within six months of receiving the irrevocable permit for the Project.

Based on input from SGRE for the WTGs and from Van Oord for the IACs, CrossWind has already assessed grid compliance against TenneT requirements for the grid connection infrastructure (i.e. tender information including onshore electrical system, export cable, and offshore electrical system up to 66 kV). This assessment gives confidence that grid compliance will be achieved.

Planned date for awarding contracts to suppliers and installers

[redacted]

CrossWind used the pre-application period to secure the supply chain through signed Contract Agreements with suppliers and installer, [redacted] These were finalised with SGRE for the WTGs and VOOW for the BoP. The Contract Agreements were signed by CrossWind on [redacted]

VOOW has received binding offers and confirmation of committed production availability from Sif and [redacted] for the supply of the foundations and from TKF and [redacted] for the supply of the IACs in line with the Overall Schedule attached as Annex 1 to this Appendix and as reflected in the support letters attached to Appendix 7 (Knowledge and experience) and Appendix 11 (Measures to ensure cost-efficiency). The Dutch parties Sif (foundations) and TKF (IACs) are the preferred suppliers for developing this Project.

Planned date for the installation of the first foundation

[redacted]

Detailed design

The first foundation is scheduled to be installed on [redacted] In order to achieve this milestone, the foundations need to be designed and certified on time and the steel order needs to be placed early to complete the fabrication of the foundations with sufficient float before the scheduled start of installation of the first foundation. From Permit Award, milestone payments with SGRE and VOOW will drive design, procurement and construction. In Figure 1 the planning from Permit Award until installation of first foundation is visualised.

Before the foundation detailed design can start, a basis design is compiled. This contains the site data needed to perform the detailed design calculations which will ensure the foundations are able to withstand all forces acting on them during the design life. The main input for the design basis is the site data provided by RVO. This data covers almost all metocean and geotechnical information required for the site specific design of the foundations. However, while the geotechnical investigation carried out on behalf of RVO provides good information for the initial design, Cone Penetration Tests (CPT) will still be needed at the envisaged locations of the WTG foundations to allow cost-optimised site-specific foundation designs.

Geotechnical site investigation

Fugro has been selected as preferred contractor and confirmed vessel availability supported with a letter attached as Annex 20 to Appendix 11 (Measures to ensure cost-efficiency). [redacted] will carry out CPTs on the wind farm site [redacted] The planned duration of the site investigation is approximately [redacted] which includes vessel mobilisation, performing seabed CPTs, demobilisation and, if needed, mobilising a drilling vessel to carry out downhole CPTs in case a target depth of 40 m below seafloor is not reached at all locations using the seabed CPT system. The drilling vessel can also take additional soil samples, although assessment by [redacted] indicates this is not necessary.

Figure 2. Foundation engineering and design schedule.

Once the site investigation is complete, a factual data report will be drafted. This report will be issued to the Certifying Body (CB) to ensure the data is certifiable and meets the requirements from the relevant standards. Upon finalisation the document will be added to the design basis.

Detailed foundation design

While the geotechnical site investigation is being carried out, CrossWind will commence design activities for the WTG support structures to verify and optimise the current initial designs. The detailed design (Figure 2) of the foundations comprises the following steps: geotechnical design, load calculation, primary steel design and secondary steel design.

The load calculation is carried out in a joint effort by VOOW and SGRE and is executed in several calculation loops where VOOW determines the foundation stiffness and wave loads and shares these with SGRE. SGRE integrates the foundation stiffness and the wave loads in their simulation software and performs an integrated load analysis including wind loading on the turbine. Upon completion of this load analysis, the resulting loads on the foundation are returned to VOOW allowing them to optimise the foundation design. SGRE in turn uses the resulting loads to optimise the tower design. The optimised foundation may have a different stiffness than the original structure and hence the dynamic interaction with wind and waves may lead to different loads on the structure. Therefore it is necessary to perform several of these loops, or so-called load iterations, to ensure that the loads converge. CrossWind has planned for [redacted] full load iterations, each taking approximately [redacted] to complete. To avoid the need for subsequent load iterations due to poor convergence of loads, CrossWind will perform an initial load iteration while the geotechnical site investigation and subsequent data processing and reporting is ongoing from [redacted] While the geotechnical part of the design basis is not yet complete, this initial load iteration will allow SGRE and VOOW to agree a suitable initial design that has dynamic properties close to those of the final design and therefore will generate representative loads in the first full load iteration.

After completion of the [redacted] full load iteration cycles, the primary steel design is optimised. In this phase the risk of delays in the design process are limited since the design concept is well established from previous projects, such as [redacted] also designed by VOOW, and Luchterduinen. The secondary steel design is carried out in a parallel track. This design activity also relies on the experience and lessons learnt from [redacted] Once these design activities are finalised, the CB can perform the final design reviews, leading to a conformity statement for the foundation design by [redacted]

Certification

The main sources of potential delays in the support structure certification process are not being aligned with the CB on design assumptions or differing interpretation of standards. CrossWind will engage with the CB in an early stage to ensure alignment on design assumptions from the start of the design process. To prevent having to redo certain design work due to errors in the design assumptions, the design basis will be certified before commencing the detailed design activities. Review of design documentation will be done early on to avoid undetected design errors at a late stage. The CB will carry out an independent load analysis to verify load calculation results. This activity will run in parallel with the first and second load iteration so that the confirmation of the loads will be given as soon as the final primary steel

Figure 3. Procurement and manufacturing timeline for 69 WTG foundations and 1 innovation foundation.

design optimisations starts. Sufficient time is included in the engineering programme to allow review by CB and subsequent updating of the design reports based on comments by the CB. The certification programme is agreed with the CB at the very start of the design process to ensure that the CB can meet our timeline.

While the detailed design is ongoing, the SG DD-200 turbine will be undergoing type certification. The provisional type certificate is expected to be issued in Q4 2021, see Appendix 13 (Certification Plan). The final type certificate is expected in June 2022, well in advance of the start of the installation of the wind farm. Typically, the WTG type certificate is available before the foundation design is completed. In this Project, the foundation design may even be completed before the provisional WTG type certificate is released by the CB. The most prominent risk for the foundation design is a misalignment of the loads used in the design with the loads as approved as part of the type certificate, thereby preventing the foundation design to acquire a final conformity statement. To counter this risk, SGRE will perform load calculations using a model which is deliberately slightly conservative. This load calculation model has been used for all previous large direct drive WTGs produced by SGRE based on the same platform. By the time the load calculations for the foundation design for this Project are carried out, the SG DD-193 will have achieved final certification, confirming that the load calculation model provides reliable results. This SG DD-193 is the SG DD-200's closest relative, consisting of the same components -with the exception of the blades, which for the SG DD-200 are extended by three meters. Furthermore, SGRE have stated that the WTG loads as part of the type certification process will be confirmed by June 2021, well on time to adjust the design without production being delayed to such extent that it would have a delaying impact on foundation installation.

In the highly improbable event that the SG DD-200 cannot be certified in the foreseen timeline,

Order primary steel

When the detailed design of the foundations has been completed and is approved for construction, the foundation manufacturer starts preparations for steel supply, which includes producing shop drawings (Figure 3). After the preparations are complete the steel order is placed. To prevent delays in delivery of steel plates, VOOW, through its preferred supplier for the foundation manufacturer Sif, will reserve a production slot at the steel mill. The exact steel quantities and plate dimensions will be confirmed before actual production of the plates. Once sufficient plates have been produced for the first monopiles, the plates are transported to the monopile production facility in Roermond.

Fabrication primary steel

Once a sufficient number of steel plates have arrived at the monopile production facility in Roermond, fabrication of the can sections starts. The Sif production facility in Roermond has four production lines for cutting, rolling and welding can sections and is able to feed two assembly lines for the monopiles. Top sections and bottom sections of the foundations are assembled separately and transported by barge to the monopile marshalling harbour at and welded together, after which coating is applied. The completed monopiles are placed in storage on site until needed for installation.

The production of a single monopile takes approximately Once production is ramped up, the average production rate is monopiles per The final monopiles are completed and transported to the foundation at and placed in storage by This means that the final monopile is ready in storage before it being picked up for installation, giving an ample buffer for any corrective actions that need to be carried out in case of non-conformities during production.

Figure 4. Foundation installation cycle time for the first monopile.

In case Sif would not be able to deliver the foundations due to e.g. bankruptcy or a catastrophic event in the supply chain, a back-up option is available through the binding offer VOOW received from [redacted] indicated in their support letter included in Annex 12 of Appendix 07 (Knowledge and experience) that they have the production capacity available to meet our Overall Schedule without constraints.

Fabrication secondary steel

VOOW has received several offers for the fabrication of secondary steel, confirming the capacity to produce the secondary steel according to CrossWind's foundation design and according to our Overall Schedule without constraints. The supply of secondary steel will be contracted after Permit Award. Production will start in [redacted] and will continue until [redacted] Secondary steel will be transported from the production facility to the [redacted] ready for installation by [redacted]

Installation first foundation

Prior to the installation of the foundations, the scour protection is installed by [redacted] Installation of the filter layer is done in [redacted] followed by the armour layer. Scour protection installation is completed by the beginning of [redacted] The cycle time for the installation of the first foundation can be found in Figure 4.

The first foundation is planned to be installed on [redacted] by VOOW's Jack-Up installation Vessel (JUV) Aeolus. VOOW guarantees the availability of this vessel from this date. Prior to the installation of the first foundation the Aeolus will be mobilised in the Port of Rotterdam, where grillage and seafastening will be installed to handle [redacted] monopiles per round trip. The risk of a delayed start due to unavailability of the foundations is negligible, since the first monopile has been produced [redacted] earlier, providing a generous buffer within the programme.

As soon as the Aeolus crew has verified that the foundation has been installed within tolerances and according to requirements, a cover is installed onto the foundation and the Aeolus can jack down and move to the next WTG position within the site. Aeolus will not install the secondary structures, allowing optimisation of deck space such that each round trip can carry [redacted] monopiles.

By using a separate vessel for the installation of the secondary structures, the Aeolus can make good progress with the installation of the primary structures to ensure to ensure that sufficient foundations are installed before the first WTGs are due to be installed. The secondary steel will be installed using the VOOW owned JUV MPI Resolution. The MPI Resolution can take on board [redacted] of secondary structures, comprising [redacted]

The most weather sensitive and time critical operation of the secondary structure installation is installing the boat-landing. VOOW will deploy its specially developed Boat Landing Installation Tool (BLIT), hereby increasing safety and reducing potential weather delays.

Figure 5. WTG procurement, manufacturing and pre-assembly timeline.

Planned date for the installation of the first wind turbine

Order long lead items and manufacturing

Long lead items, including steel for towers, WTG components and blades, are ordered in The production of the first WTG begins in Production of towers and nacelles takes approximately for the first units to be delivered from the production facility. When sufficient units have been produced, nacelles, towers and blades are transported to the marshalling harbour. The first batch will be delivered in the marshalling harbour towards the thereby creating a significant buffer of at least WTGs, sufficient for round trips of the MPI Adventure, for pre-assembly ahead of start of installation on In order to optimise the storage area required in while maintaining sufficient stock to avoid disrupting the installation process, SGRE will monitor the installation progress and adjust the shipment of blades, nacelles and towers as necessary. If needed the shipment rate can be accelerated to ensure stock does not run out and the will not need to wait for pre-assembled WTGs to be ready at the quayside.

Availability of marshalling harbour

CrossWind has selected Maasvlakte 2 as the marshalling harbour for the WTG assembly and load out. The availability of the marshalling harbour from is critical to the project.

CrossWind has mitigated this risk by ensuring VOOW has selected Sif as prefered supplier. Sif will expand the terrain they presently have available for storage of WTG components; an additional m^2 storage area and additional reinforced quayside will be available through Sif from 2021. Adjacent to the Sif site, an additional storage area may be leased to further extend the site in should this be required. As such, the risk of non-availability of the marshalling harbour is deemed small.

Availability of installation vessel(s)

The installation of the first WTGs will be carried out by the VOOW owned JUV MPI Adventure. This vessel is capable of installing WTGs per round trip. VOOW has guaranteed the availability of this vessel in the envisaged period, see Annex 12 of Appendix 11 (Measures to ensure cost-efficiency). The MPI adventure will start the mobilisation on to allow loading of the first WTGs on With approximately hours sailing time to the wind farm site, MPI adventure will jack-up on site and finish installation of the tower, nacelle and blades of the first WTG on

Availability of foundations

The timing of the start of the foundations has been chosen such that even in adverse weather conditions, there is no risk of the foundation installation being overtaken by the WTG installation. In the P90 scenario, all monopiles are installed by which means that approximately foundations will be in place upon the start of WTG installation Installation of secondary steel follows the primary steel installation closely.

IAC installation will start in are deployed in this activity: VOOW's purpose-built Cable-Lay Vessel (CLV) Nexus Since weather limitations differ for both activities, this setup optimises the IAC installation and takes the cable burial off the critical path. Cable pull-in at the foundations can only start when sufficient foundations are in place, since the cable installation will progress faster than the foundation installation. After the cables have been pulled in, they will be coiled for storage until the WTG has been installed and the cables can be terminated into the switchgear in the WTG tower.

CrossWind's installation schedule is planned such that there is ample float between the completion of the BoP activities of installing foundations and IACs being ready and the start of the WTG installation, as shown in Figure 6. This gives VOOW sufficient opportunity to optimise the installation activities to ensure an early completion while avoiding that The ample buffer between completion of the cable laying and start of WTG installation avoids any knock-on delay effects between BoP scope activities and WTG supplier scope.

Availability of OHVS

The TenneT substation availability is guaranteed from From this date, the platform can be accessed

1 Based on information provided by RVO, the date of completion for the Tennet Alpha Platform is 31 March 20203. The first day after the delivery date is the first possible date on which the successful tenderer can have access to the platform.

Figure 6. Installation sequence and buffers.

to pull-in IACs. Access to the substation is also required for switching power to the IACs. For these reasons, WTG installation will only start once the substation is available, since the WTGs cannot be energised without connection to the substation.

Planned starting date for the supply of electricity

Commissioning plan

On the first WTG will be installed (Figure 7). The estimated time for installation of the tower, nacelle and three blades, including the necessary preparations for lifting and removal of tools is hrs. CrossWind believes this to be a robust estimate, as we have seen shorter installation durations in earlier projects. A round trip WTG installation cycle for the MPI Adventure is shown in Figure 7. Once the JUV leaves the WTG location, VOOW will deploy a team onto the WTG to perform termination of the IACs into the switchgear. VOOW will transport the termination teams to the WTGs using a Walk-to-Work vessel, thereby limiting weather downtime. Termination and testing takes on average per WTG.

Energisation of the string will be done after terminations have been completed on all WTGs of a string. To this end, power is switched onto the cable from the substation. As soon as the complete string is connected, VOOW can perform a very low frequency test to confirm the integrity of all cables of the string.

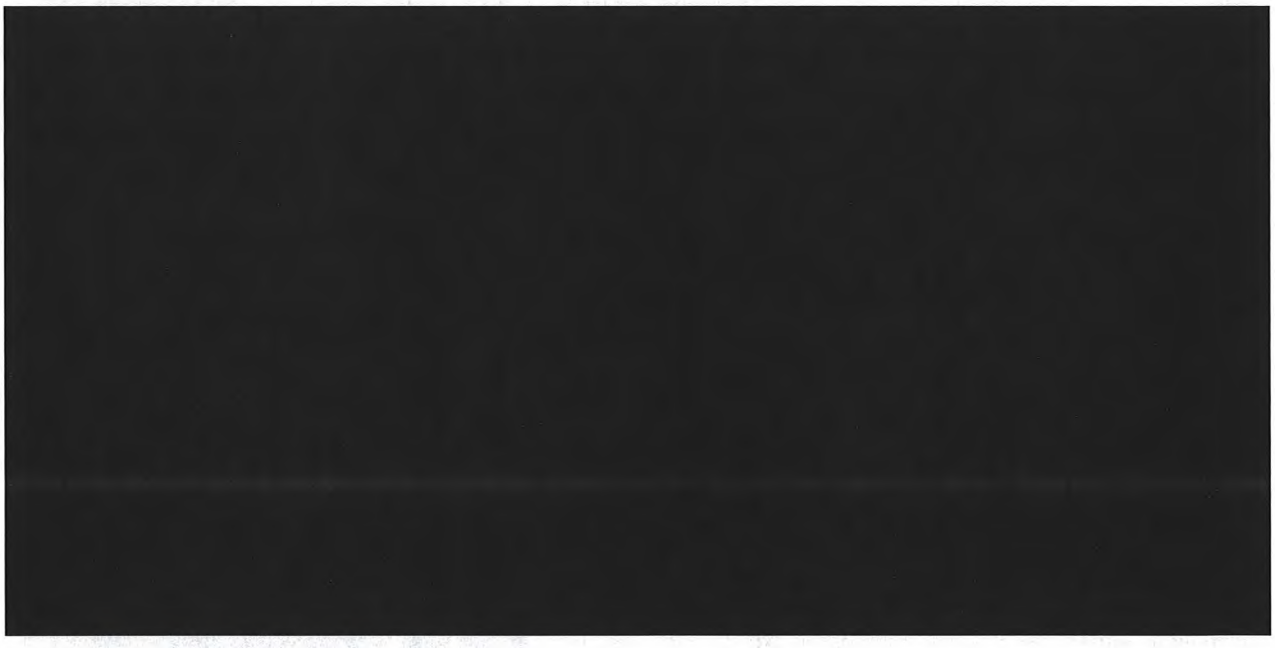


Figure 7. Installation cycle time for the first WTG.

[redacted]

Figure 8. WTG installation timeline.

With the WTGs energised, SGRE commences hot-commissioning. The commissioning comprises the following activities:

- Soaking of the transformer, during which nobody is allowed on the WTG for approximately [redacted]
- Functional testing of all switches, sensors, smoke detectors, service lift etc;
- North verification of nacelle and blade pitch 0-setting; and
- Start of WTG and functional testing, comprising testing of brake functions, shut down procedure, emergency shut down and Supervisory and Control Data and Acuisition (SCADA).

Following the hot-commissioning, the WTGs are subject to a [redacted] reliability test period, during which the WTG already produces electricity. The first electricity production is therefore expected on [redacted] in a P50 scenario.

Planned date when 95% of the wind farm will be commissioned

[redacted]

WTG Installation completion

Key to reaching completion of 95% of the wind farm before 10 December 2023 is to avoid running into the autumn season, which has a high probability of accumulating weather downtime days. Therefore CrossWind has decided to use two wind turbine installation vessels, to accelerate the installation schedule. The primary installation vessel will be VOOW's JUV MPI Adventure, which can carry two WTGs per round trip. The secondary WTG installation vessel is VOOW's JUV Aeolus. Since the Aeolus will also install the monopile foundations, starting from [redacted] this vessel will not be available on [redacted] In the P90 scenario, Aeolus will have completed monopile installation on [redacted] The vessel will then need to re-mobilise to prepare for WTG installation. This remobilisation takes [redacted] during which the grillage and seafastening for the monopiles is removed and replaced by grillage and seafastening for the WTGs. Furthermore, the vessel will undergo an upgrade of the crane reach by installing a jib on the boom, allowing the vessel to lift the nacelles and blades up to hub height. With these timelines, the Aeolus is expected to start installing WTGs no later than [redacted] being able to take [redacted] WTGs on each round trip.

Due to the relatively limited distance from the marshalling harbour to the Site, both vessels have round trip cycle time durations of around [redacted] with Aeolus outpacing MPI Adventure by [redacted] per round trip. With the increased installation rate, the [redacted] WTG is planned to be installed on [redacted] and the final WTG is expected to be installed on [redacted] in a P50 scenario. The WTG installation timeline can be found in Figure 8.

WTG commissioning completion

The WTGs will be commissioned string by string, each string consisting of [redacted] WTGs, as soon as each string is energised. SGRE will deploy sufficient teams to achieve earliest power production from all WTGs. To this end SGRE will, in the base case, commission the WTGs using CTVs from the commissioning base in [redacted] Taking weather conditions into account, we expect the hot-commissioning for all WTGs to be completed by [redacted] in a P50 scenario. Upon completion of hot-commissioning each WTG undergoes a [redacted] reliability test, followed by a further operational period during which final tests on the SCADA system, and finally the take over of the WTGs.

Milestone 95% of the wind farm commissioned

With a full capacity of the wind farm of 759 MW, the milestone of 95% of the wind farm commissioned is reached when more than 721 MW has been installed, commissioned and taken over. The date on which at least 66 WTGs, making up 726 MW, are commissioned and taken over, is [redacted] in a P50 scenario. This is well in advance of the deadline of 39 months after the permit has become irrevocable (10 December 2023). The entire wind farm, consisting of all 69 WTGs, will be commissioned and taken over on [redacted] (P50).

Even if discrete events delaying the Project are considered in a SRA (including delayed vessel mobilisation, WTGs are not ready on time, space constraint at the marshalling harbour, vessel breakdown, damages during installation, and supply chain interruptions) the probability of completing commissioning 95% of the wind farm before 10 December 2023 is [redacted]%, as shown in Figure 9. This figure illustrates the results of a [redacted] The histogram shows the distribution of the resulting end dates of the different realisations, while the curve

Figure 9. Schedule Risk Analysis results.

shows the cumulative probability covering all realisations.

Innovation demonstration

With all WTGs commissioned, some installation activities relating to the innovative solutions still remain to be carried out. These activities need to be executed in time to allow demonstration of the innovations before 10 September 2025. The CrossWind Innovation Plan comprises of five specific, committed work packages, as further described in Appendix 09 (Description demonstration innovation), including four offshore pilot projects delivered by 2025, to demonstrate that offshore wind can be made flexible.

The innovative concept of the grid friendly turbine includes a [redacted]

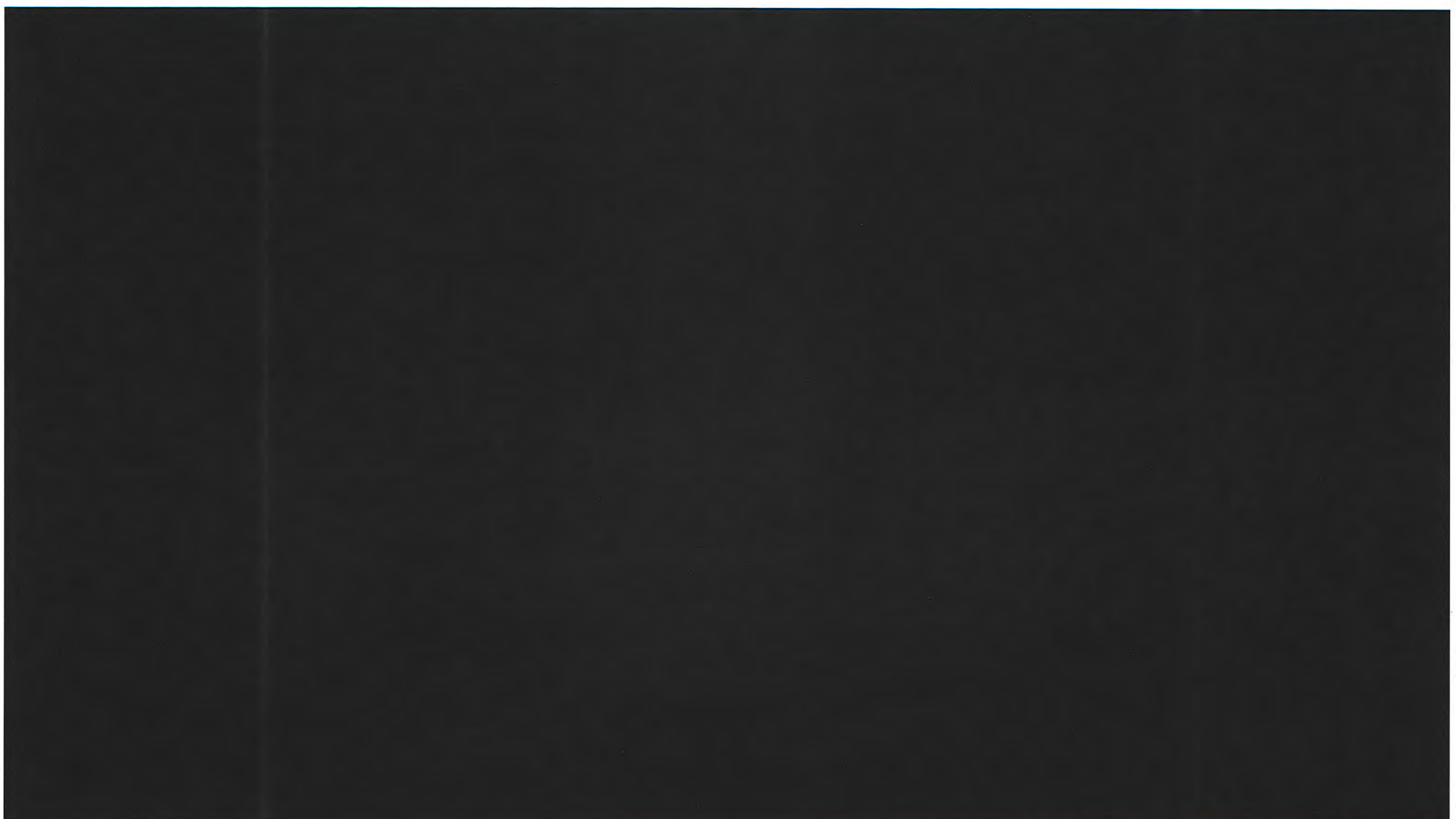
The baseload power hub will be installed on a dedicated foundation. The monopile and IAC connecting the baseload power hub to the end of one of the strings will be installed as part of the foundation and IAC installation campaigns and will be completed before the end of [redacted] The baseload power hub will be installed on a [redacted] For the wind farm control, measurement devices will installed in [redacted] WTGs before the demonstration will start in 2025. [redacted] The timeline for the deployment of the innovations can be viewed in the Overall Schedule in Annex 1 to this Appendix and in the Intergated Schedule presented in Annex 2 to this Appendix.

Annex 1

CrossWind's Overall Schedule

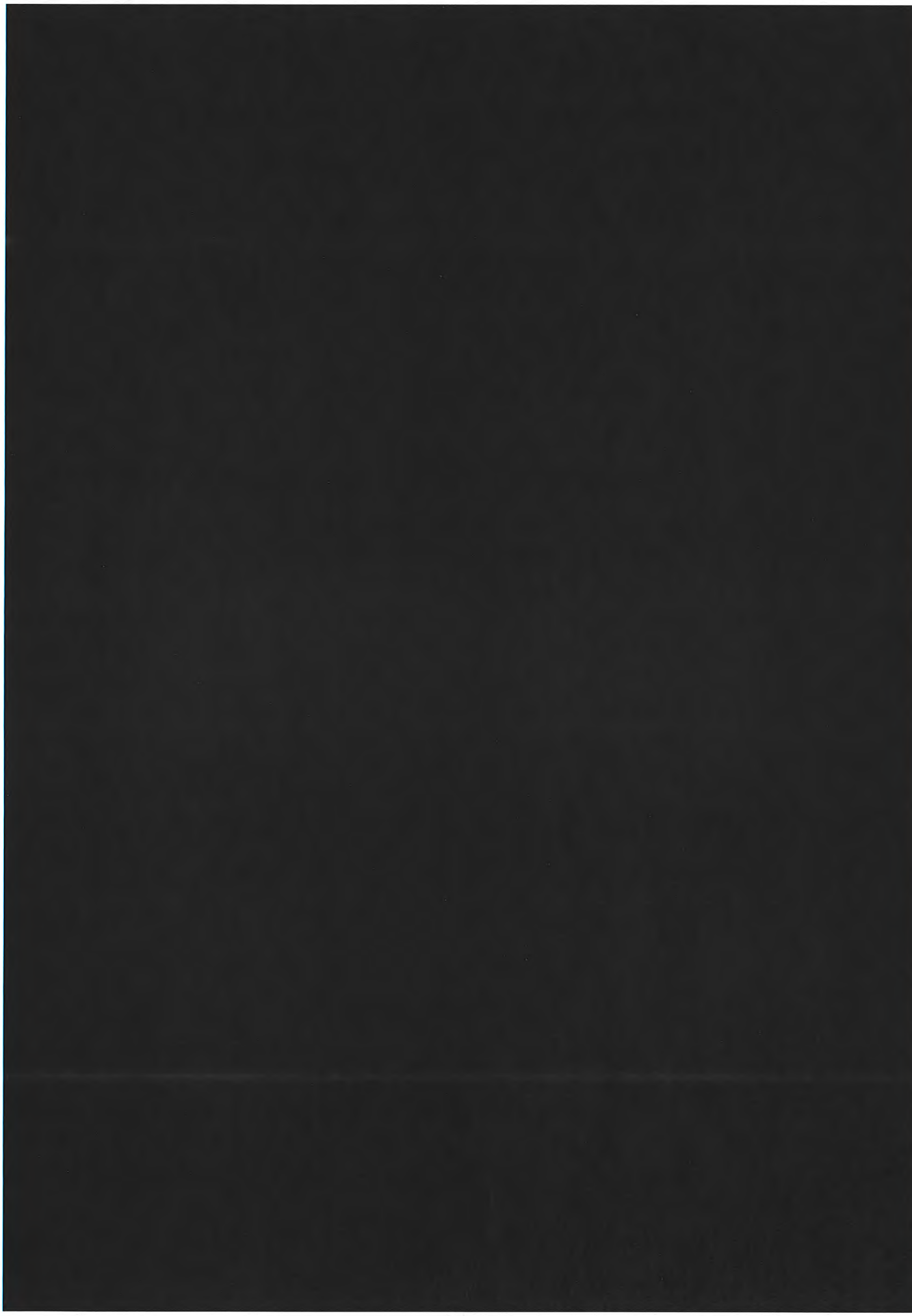
CrossWind Overall Schedule

Schematical representation of the CrossWind Project Hollandse Kust noord (HKN)



Annex 2

CrossWind's Integrated Schedule



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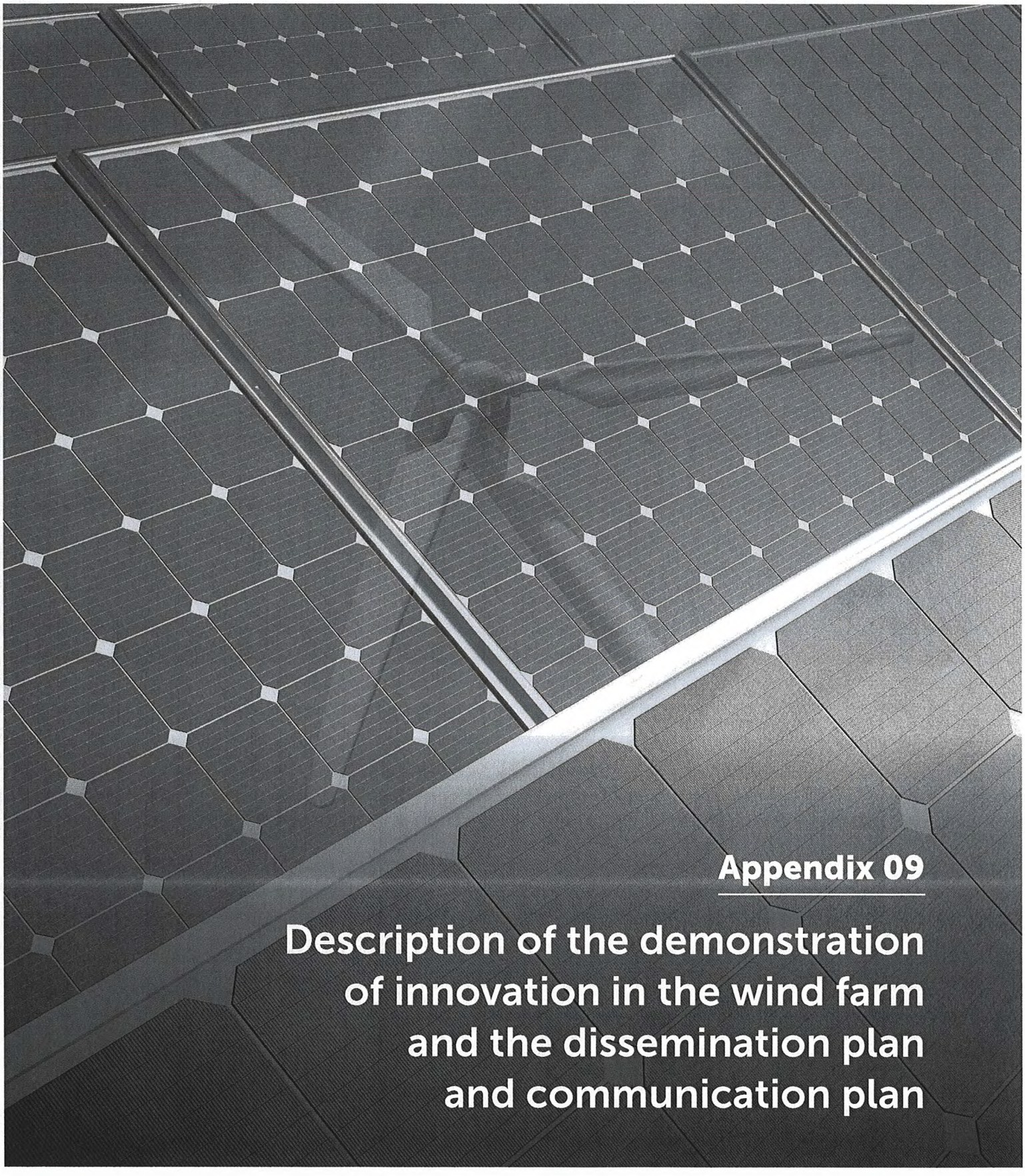

Appendix 09

Description of the demonstration of innovation in the wind farm and the dissemination plan and communication plan

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