



31122403-VD-Appendix-8-Required specification General (VSA) Bird Detection System

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Colophon

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1 Objectives

1.1 Objective Bird Detection System

The customer intends to place a number of Bird Detection Systems on platforms (OSS) and wind turbines (WTG) at wind parks in the North Sea for the benefit of the project MIVSP (Maritime IV Service point) of Rijkswaterstaat, service Central Information Provision (CIV). In the Agreement, work activities are described which the Contractor is required to carry out. In some cases the Contractor is free to propose which measures must be taken to meet the requirements.

As part of the Agreement the Contractor is expected to carry out the following:

- Supply of Bird Detection Systems;
- Implementation/support during acceptance tests;
- Delivery of sensors and systems ready for transport;
- Provide support to Site Integrator for the installation of sensors and systems on platforms;
- test setup and WTG;
- Configuring/fine tuning of sensors and systems on platforms, OSS and WTG;
- Support/implementation of management and maintenance;
- Support/implementation of option for data storage.

1.2 Objectives Bird Detection System (BDS)

With this Agreement and the requirements included in the Requirement Specification (VSE), the customer pursues the objectives below.

1.2.1 **Objective 1: Sufficient quantitative and qualitative actual bird migration information**

The BDS system must continuously provide up-to-date information throughout the year about bird migration intensity at and around the sensor location. This information must be qualitatively sufficient to serve as a basis for the implementation of a mitigation measure to reduce the number of bird collisions.

1.2.2 **Objective 2: Information for modelling of bird migration**

The BDS must provide the necessary information about species-specific bird migration intensity and behaviour. This information is necessary to be able to develop a bird migration model that can sufficiently accurately predict the bird migration intensity across the North Sea to serve as a basis for the implementation of a mitigation measure to limit bird collisions.

1.2.3 **Objective 3: Quantitatively and qualitatively sufficient data of bird flight movements**

The VDS system continuously provides sufficient information throughout the year about bird flight movements at and around the sensor location. This information must be qualitatively sufficient to be used for knowledge development concerning flight paths, avoidance patterns and bird collisions.

1.2.4 **Objective 4: Measurements at sea**

The BDS must be fit to carry out measurements at an offshore location, such as a free standing platform, a distribution platform at the centre of a wind park and/or on wind turbines.



1.3 Background information

1.3.1 *Background wind parks*

1.3.1.1 National Energy Agreement

In the National Energy Agreement has been agreed with more than 40 third parties that by 2023 16% of the energy generated has to be generated sustainably. To achieve this objective several sustainable energy sources are needed. Offshore wind energy is a crucial part of this. It has been agreed that wind energy on sea will generate 4.450 MW of energy by 2023. With which more than 5 million households can be supplied with energy. This means that 3.450 MW has to be built on top of the existing 1.000 MW that has already been built and under construction.

1.3.1.2 Windparks at sea

In September 2014 the Dutch government has chosen three areas where windparks can be developed at sea: offshore of the coast of Zeeland, Noor-Holland and Zuid-Holland. A new system has been set-up for the realization of these windparks and new legislation has been agreed.

The resolution about this are recorded in the "Routekaart". This routecard has the following high-level planning:

- 2015: 2 x 350 = 700 MW Borssele alpha
- 2016: 2 x 350 = 700 MW Borssele beta
- 2017: 2 x 350 = 700 MW Zuid-Holland
- 2018: 2 x 350 = 700 MW Zuid-Holland
- 2019: 2 x 350 = 700 MW Noord-Holland

The Ministry of Economics and Ministry Infrastructure and the Environment, the Netherlands Enterprise Agency and Rijkswaterstaat Sea and Delta work together for the realization of the objectives for the program "Wind op Zee". With the realisation of this program the wind energy sector, stakeholders at sea, coastguard and coastal inhabitants are involved.

1.3.2 *Background Bird Detection System*

1.3.2.1 Measure for windfarm plots to reduce bird collisions with wind turbines

In the windpark on sea plots there has been a mitigating measure incorporated to minimise the effects of the park with regards to (migrating) birds. Therefore a condition has been included that requires that the rotation speed of the wind turbines must be reduced to less than one rotation per minute when large scale bird migration, defined as a mean traffic rate (MTR) of more than 500 echos/km/hour, occurs.

To be able to manage this measure the intensity of the bird migration must be measured near realtime with a Bird Detection System.

1.3.2.2 Coherent projects

The data collected with the BDS will also be used for following projects:

- Development of prediction model for bird migration over the North Sea. The mitigation measure will in future be incurred by a prediction migration model.
- Wind on Sea ecological program (Wozep): determine the flight behavior of birds in an nearby offshore wind farms.

Both projects are not part of this tender. The functional requirements of the BDS are however in alignment with the objectives of these projects.



1.3.2.3 Planned locations BDS

The planned locations for the BDS are chosen based on several criteria of which obtaining the data mentioned for the objectives in the previous paragraph are crucial. Besides these goals the capabilities of the locations to place the required equipment and sensors and the availability of network connections play an important role.

The planned locations can be existing platforms, new build platform and wind turbines.

Existing locations:

- Platform 1 (t.b.d.)
- Platform 2 (windpark, OSS or WTG)

New build locations:

- Borssele Alpha (OSS)
- Borssele windturbine (WTG) kavel I
- Hollandse Kust Zuid Alpha (OSS)
- Hollandse Kust Noord (OSS or WTG)

1.3.2.4 Stakeholders

Stakeholders for the contractor, besides RWS, per location are:

- De Site Integrator;
- De location owner/manager;
- De technical manager;

De owner/managers for the locations are:

- | | |
|--|-------------------------------------|
| • Platform 1 (t.b.d) | stakeholder: platformowner (t.b.d). |
| • Platform 2 (existing windpark, OSS or WTG) | stakeholder: windparkowner |
| • Borssele Alpha (OSS) | stakeholder: TenneT |
| • Borssele windturbine (WTG) kavel I | stakeholder: Dong Energy |
| • Hollandse Kust Zuid Alpha (OSS) | stakeholder: TenneT |
| • Hollandse Kust Noord (OSS or WTG) | stakeholder: TenneT/ windparkowner |

1.3.2.5 Relation with the Site Integrator

The Site Integrator will install and integrate the sensors – including the BDS – on the planned locations. The Site Integrator is responsible for operational delivery of the sensors on the OSS, the existing locations and the wind turbines.

On the OSS TenneT performs the scheduled maintenance, the site integrator performs the non-scheduled maintenance. The Site Integrator performs the scheduled and non-scheduled maintenance to the sensors on the existing platforms and the wind turbines. The Site Integrator is the first point of contact for all maintenance and will manage the maintenance.

Because of the important role of the Site Integrator for his project, the tasks and responsibilities of the Site Integrator are clarified in chapter two. The activities of the Site Integrator are tendered via a separate tender.

2 Collaboration with the Site Integrator

2.1 Testing philosophy

2.1.1 Testing approach

As the Site Integrator plays a rather substantial role in the implementation of the project, below an explanation is given of the expected methodology of the Contractor with the Site Integrator.

The support of the Contractor to the Site Integrator can be divided into a preparatory phase, a realisation phase and an implementation phase. These three phases are shown in figure 3 and 4. No rights may be derived from these figures.

The Contractor is required to have designed, tested and delivered the BDS internally, for the preparatory phase. In the preparatory phase and the realisation phase the Contractor is required to further support the design and tested situations, so that these can be integrated, realised and maintained.

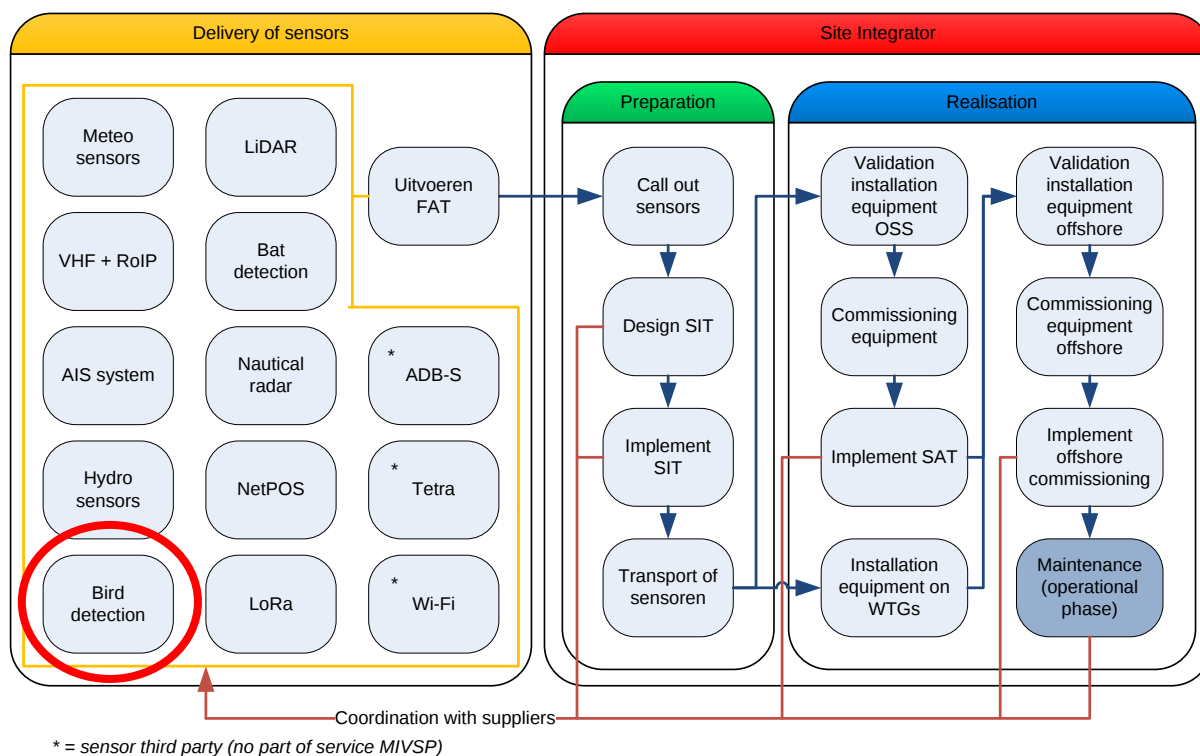


Figure 1: Site Integrator

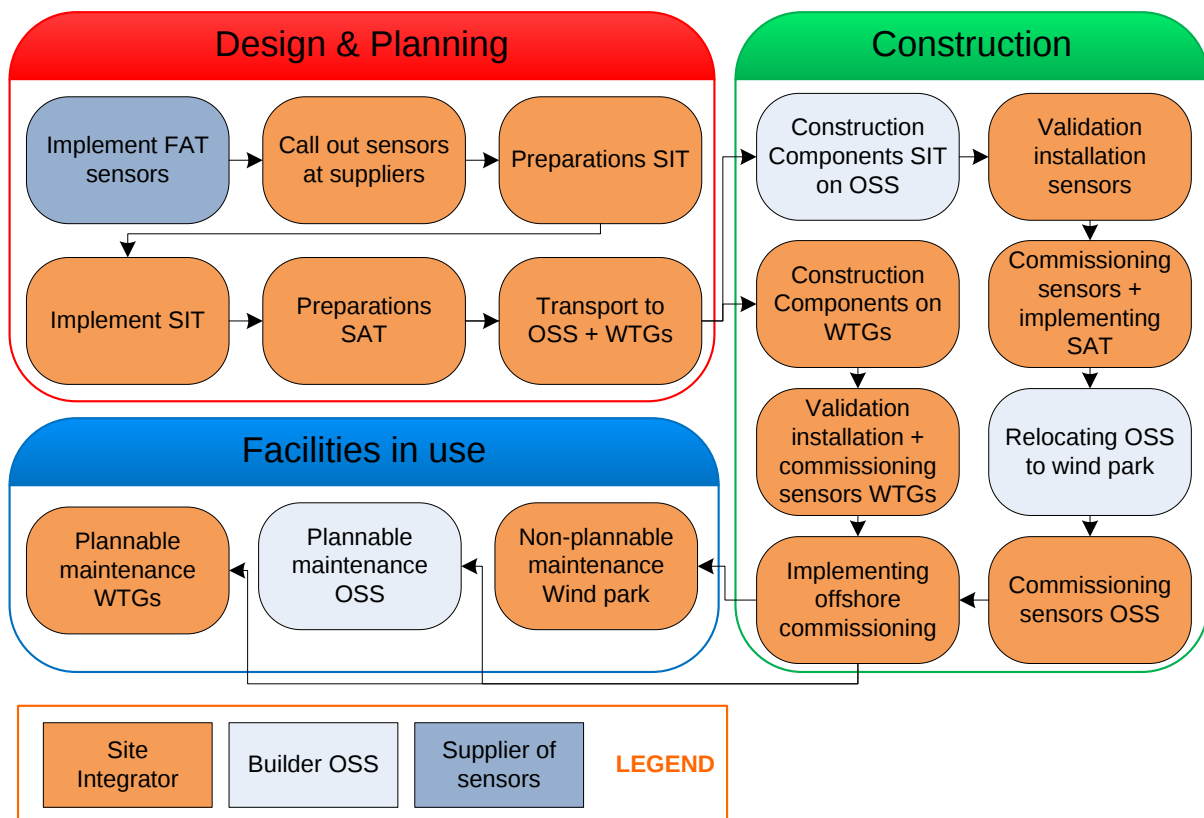


Figure 2: Tasks Site Integrator

The Site Integrator has the following tasks:

- Realisation of the optimal functioning of sensors and systems;
- Transportation of sensors and systems to the wharf;
- Transportation of sensors and systems to the WTGs and existing platforms;
- The installation of sensors and systems onto the WTG and existing platforms;
- The integration of the sensors and sensors into the RWS network.

2.1.2 Validation

On the basis of attending the FAT at the supplier's, the Site Integrator and RWS-CIV can assess whether the BDS to be delivered complies with the imposed requirements and is ready for integration.

By use of the SIT the Site Integrator carries out a test that is attended by the Contractor and RWS-CIV to determine that the BDS still complies with the imposed requirements.

By use of the SAT, the Site Integrator performs a test that is attended by the Contractor and RWS-CIV to determine that the BDS is still in compliance with the imposed requirements on the OSS platform.

After the platform has been positioned in its definitive location, a validation will be done by the Site Integrator and the BDS system will be commissioned in cooperation with the Contractor and RWS-CIV. If this is successful, the system is eligible for maintenance.



2.1.3 Transport

The Contractor must supply all materials for the Site Integrator to compose the 'pluggable racks'. These are 19 inch racks/cabinets containing all the necessary hardware. This rack must be placed and connected in the OSS at the wharf. Contractor is also required to deliver the remaining sensors and systems to the Site Integrator. For installation on WTG's and existing locations the Contractor must supply all materials including 'pluggable racks' and 'weather resistant' cabinets.

2.2 Test strategy

In this paragraph the test strategy is described. The test strategy is risk based, which means that first an analysis must be made of the product risks after which time and means are allocated in the test strategy, on the basis of the analysed risks. The testing will focus more on high risk areas and less on low risk areas. The test results will be used to validate the estimated risks, which will be adjusted if necessary.

The tests must be carried out in conformity with the IEC standards, among which EN ISO/IEC 17025. These tests must comply and be reported. The documentation must be delivered in accordance with the J-STD-016.

Tests below focus on an optimal installation of sensors and systems aboard the OSS (Offshore Substation) and WTG (Wind Turbine Generator). With the activities deriving from this, the Customer intends to realise the objectives from paragraph 2.2. In table 1 the activities for this tender are shown in combination with the related responsibilities of the parties involved.

Activity		SI	Contractor	Builder OSS	RWS CIV	TNO	Users	Windpark owners
A1	FAT	I	A, R	I	I	C	-	C
A2	SIT	A, R	S	C	I	C	-	C
A3	Transport to OSS	A, R	C	I	I	-	-	-
A4	Installation sensors on OSS	S	C	A, R	I	C	-	-
A5	Commissioning sensors and systems at SAT	A, R	C	S	I	I	I	-
A6	SAT	A, R	S	S	I	C	C	I
A7	Transport OSS to sea	C	C	A, R	I	-	-	-
A8	Transport to WTG at sea	A, R	C	-	I	C	I	S
A9	Installation sensors on WTG	A, R	C	-	I	C	I	S
A10	Validation and commissioning of sensors and systems at sea (WTG + OSS)	A, R	C	S	I	I	I	S
A11	Offshore	A, R	S	S	I	C	C	S

	commissioning							
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RASCI: R = responsible, A=accountable, S=support, C=consult, I=inform

Table 1: Activities of sensors and systems

The testing activities to be carried out are divided into a series of tests, see figure 5. The purpose of these tests is to detect non-functioning parts at an early stage and improve the integration of the sensors.

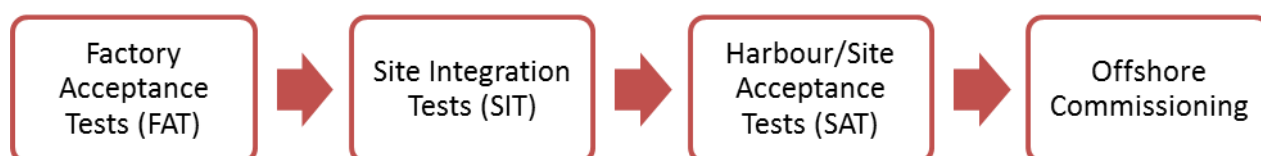


Figure 3: Test sequences

2.2.1.1 Factory Acceptance Test

Objective

In these tests the sensor supplier proves that his product meets the imposed requirements.

Subject of test

The sensors and systems are tested against the imposed requirements. The focus is on suitability of the sensors.

2.2.1.2 Site Integration Test/Mock-up

Objective

At the SIT, the transfer of the equipment of sensor suppliers takes place by means of a delivery protocol. Upon reception the Site Integrator is responsible for all equipment. Using an SIT it is established that a number of sensors, systems, installations and other related system parts work together in a correct manner and without unintended interferences. The sensors are composed conforming to the TNO antenna plan. For the SIT, the definitive situation is representatively reconstructed at sea.

Subject of test

During these tests connections to the RWS-network and the interferences with other sensors and systems play an important role. If certain network elements have not been completed yet, stubs will need to be built.

2.2.1.3 Harbour/Site Acceptance Test

Objective

After the SIT has been carried out, the equipment is sent to the wharf. After transfer protocol the wharf is liable for the equipment. The Builder of OSS will install the equipment conforming to the design of the Site Integrator.

After installation a validation is done by the Site Integrator before commissioning. The commissioning falls under the responsibility of the Site Integrator. When the installation is completed, the Site Integrator will carry out the SAT at the wharf of the Builder.

Subject of test

During this test it is checked whether the sensors and systems are functioning as expected. In the SAT the sensors and systems are placed at the definitive position on the OSS. The sensors that are to be placed on the WTG are not included in the SAT.

2.2.1.4 Offshore Tests and Commissioning

Objective

After shipping the OSS to its position at sea inspections are carried out by the Site Integrator. Subsequently integration tests are carried out in connection with the operational character to consider in advance, for instance, electro-magnetic fields and WTG.

Subject of test

During this test it is checked whether the sensors and systems are functioning as expected. In the offshore tests the sensors and systems are tested in the final situation. These tests are carried out including the sensors and with systems on the WTG, if present.

2.2.2 Maintenance

The maintenance methods are divided into two main groups.

Plannable: Maintenance that is carried out to prevent future defects.

Non-plannable: Maintenance that is carried out to repair any defects.

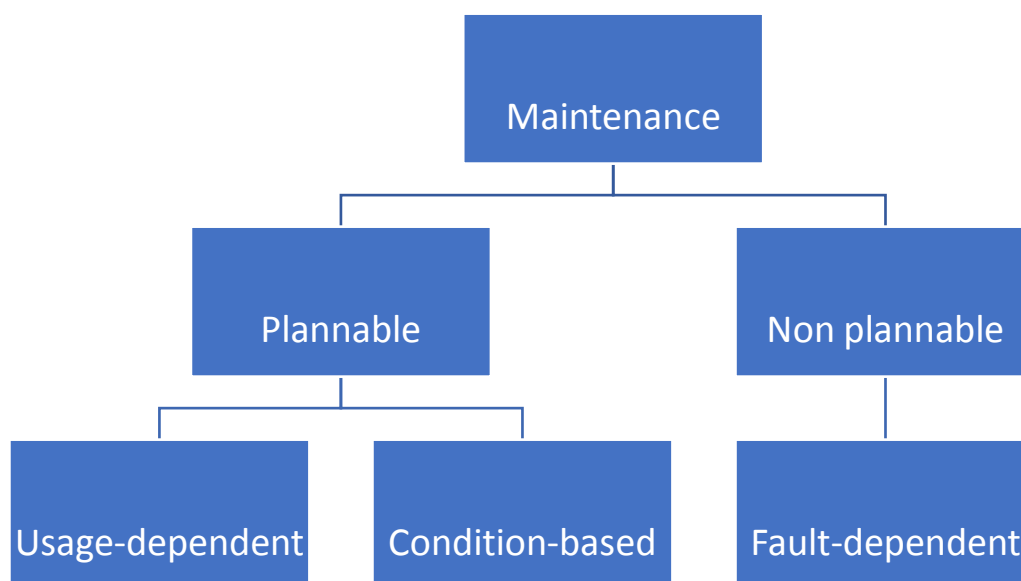


Figure 4: Maintenance

2.2.2.1 Non-plannable maintenance

Non-plannable maintenance is realised through the application of Fault-dependent Maintenance (SAO). The maintenance service will only start acting in case of a (unexpected) malfunction or failure of the production tools.



2.2.2.2 Plannable maintenance

We distinguish two types of plannable maintenance.

1. Condition-based Maintenance (TAO);
2. Usage-dependent Maintenance (GAO).

At TAO the condition of critical parts must be established by means of inspections and diagnosis. The condition of these parts determines whether maintenance is necessary.

At GAO worn parts must be replaced at specific times and either the sensor or the entire system will undergo maintenance. For GAO the following actions are required to be carried out:

- Guarding and managing the uptime of the critical parts;
- Timely planning of the maintenance;
- Reserving necessary parts and auxiliaries;
- Carrying out maintenance accurately and at the time planned.

Maintenance		Site Integrator	ON (BDS)	Builder OSS	RWS CIV	Windpark owners
O1	Plannable maintenance OSS	A, R	C	S	I	-
O2	Plannable maintenance WTG	A, R	C	-	I	S
O3	Non-plannable maintenance OSS	A, R	S	I	I	-
O4	Non-plannable maintenance WTG	A, R	S	-	I	S

RASCI: R = responsible, A=accountable, S=support, C=consult, I=inform

Table 2: Maintenance

2.2.3 Management

In figure 5 the management philosophy for the project MIVSP is displayed. This figure shows that Rijkswaterstaat maintains control via MKO (Mission Critical Support) and TAB SVM (Technical Application Management Shipping Traffic Management). TAB SVM is responsible for the management and coordinates the maintenance via the Site Integrator.

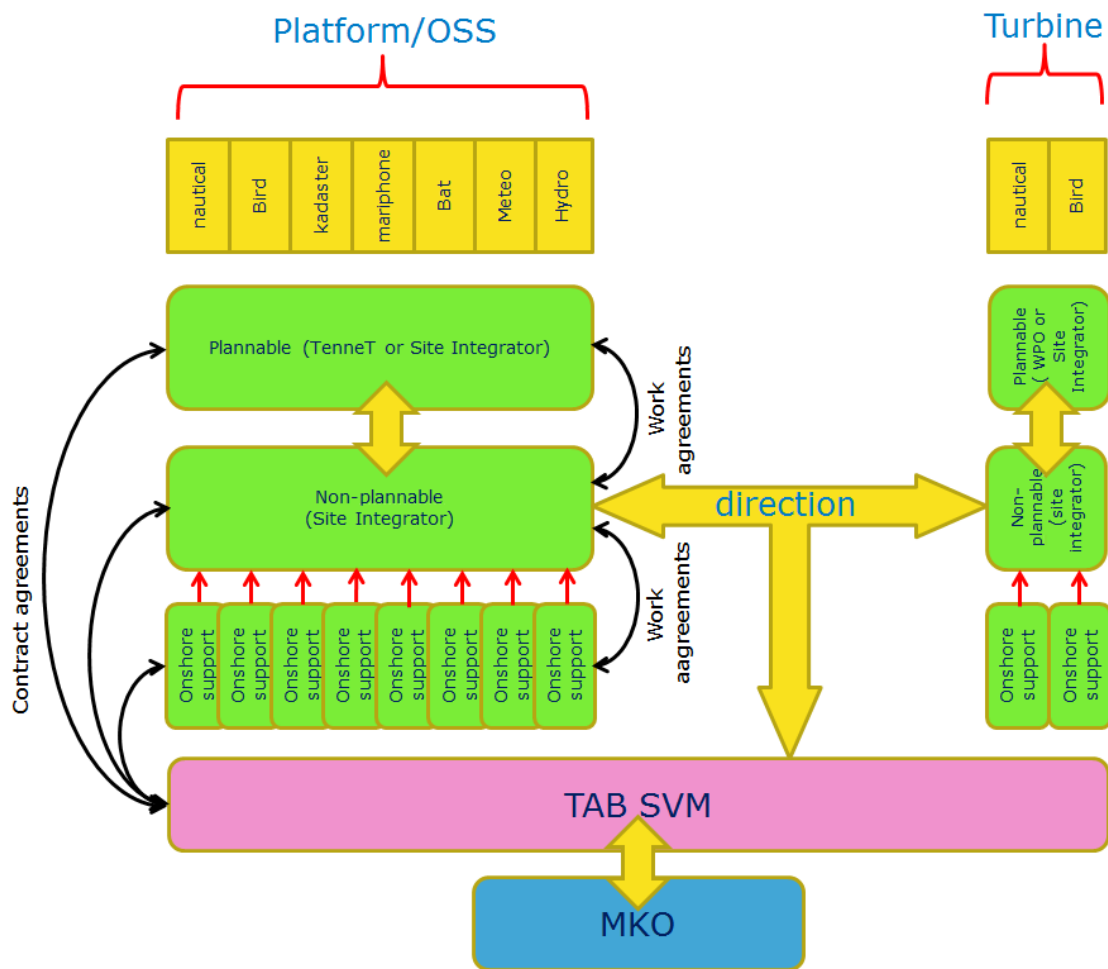


Figure 5: Management philosophy



3 Scope and Work activities according to the Agreement

3.1 Scope

See reference (ref. Ax) table 1, RASCI Table activities Contractor or reference (ref. Ox) table 2 maintenance.

3.1.1 **Activity 1: (ref. A1) Early detection of non-functioning components, FAT**

The contractor implements the FAT for ensuring detection non-functioning parts.

3.1.2 **Activity 2: (ref A2) Deliver documentation, materials, and support for assembling BDS**

Work activities of the SIT shall be implementing as result that all systems in place are easy installed, transported and meet the expectations. De contractor delivers installation manuals, materials and support for the work activities to the Site Integrator for proper functioning of the Nautical Radar.

3.1.3 **Activity 3: (ref. A3) Supporting SIT**

Activities of the Contractor must be performed in such a way that the sensors and systems can be connected to the RWS network. This must make it possible to transfer the collected data to the users. In addition, the Sensor Suppliers must be able to perform maintenance remotely. One risk is that certain components of the RWS network are not being ready yet upon commencement of the tests. In that case, the Site Integrator is required to build stubs to be able to simulate these components.

The contractor shall deliver a stub to support the Site Integrator (for example RDP, test tool, temporary building block of missing parts).

3.1.4 **Activity 4: (ref. A4) Deliver information and support installation BDS on OSS for SAT**

The builder of the OSS shall install the systems in accordance with the design. The validation is done by the Site Integrator after installation.

If necessary, the contractor supports the Site Integrator with the installation and validation of the Nautical Radarsensor on the OSS.

3.1.5 **Activity 5: (ref. A5) Deliver support for commissioning of the BDS for the SAT on the OSS.**

If necessary the contractor supports the Site Integrator for commissioning of the Nautical Radarsensor on the OSS. Inclusive the additional required tools for commissioning.

3.1.6 **Activity 6: (ref. A6) Supporting SAT**

The final situation (sensors wind farm, incl. OSS) shall be tested in the SAT to ensure the quality. The contractor delivers the needed support for correctly technical delivery and delivers support for testing (SAT).

3.1.7 **Activity 7: (ref. A9) Deliver information and support for installation BDS on WTG**

The final situation (sensors wind farm, incl. OSS) shall be tested in the SAT to ensure the quality. The Site Integrator installed the Nautical Radarsensor on the WTG / transition piece. This situation is tested in the SIT, accordance the design in the SIT.

If necessary, the contractor support the Site Integrator to install the Nautical Radarsensor on the WTG/ transition piece.



3.1.8 Activity 8: (ref. A10) Deliver information and support for commissioning BDS on OSS

If necessary, the contractor delivers support to the Site Integrator for commissioning the BDS offshore.

3.1.9 Activities 9: (ref. A11) Offshore tests & commissioning

If necessary, the contractor delivers support to the Site Integrator for the integration tests of the BDS offshore.

3.1.10 Activity 10: (ref O1/O2) Supporting Site Integrator for carrying out maintenance on sensors

The Site Integrator is responsible for the maintenance of the sensors in the wind park. Plannable maintenance on the OSS is carried out by the owner. If necessary, the contractor shall support the Site Integrator for carrying out maintenance. On the WTG the Site Integrator is responsible for non- and plannable maintenance.

The contractor delivers remote maintenance if it is appropriate to do so.

3.1.11 Activity 11: (ref O3/O4) Supporting Site Integrator for carrying out maintenance on sensors

The Site Integrator is responsible for the maintenance of the sensors in the wind park. The Site Integrator is responsible for the non-plannable maintenance on the OSS. If necessary, the contractor shall support the Site Integrator for carrying out maintenance. The contractor delivers support for remote maintenance if it is appropriate to do so.

3.2 Relation contractor with basic service MIVSP

The basic service of MIVSP is to collect and transfer data to other parties. Figure 6 illustrates the basic service.

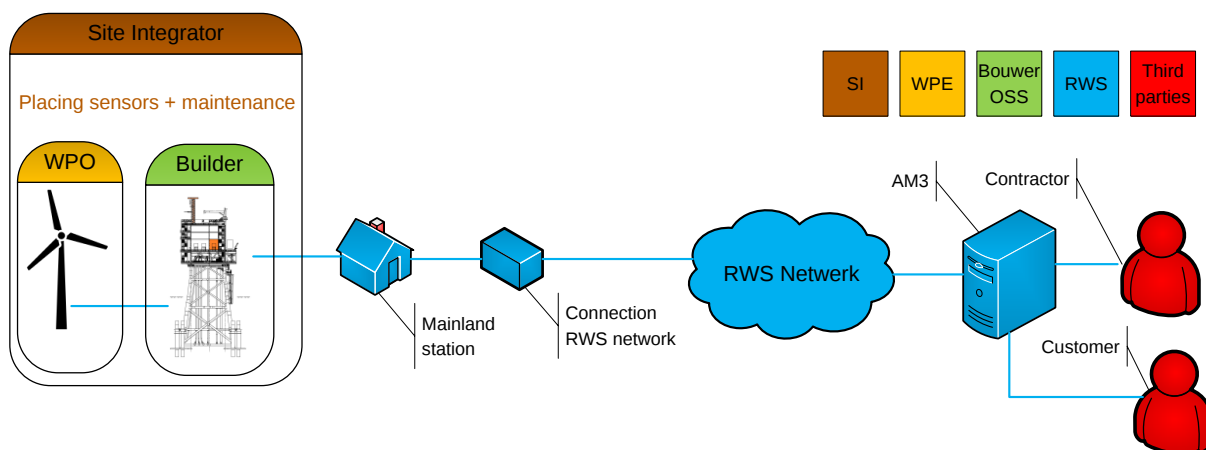


Figure 6: Basic service MIVSP

The work activities of the Contractor can be broken down into three main tasks:

1. Delivery and when required installation of the Bird Detection System;
2. Support of the Site Integrator for testing activities;
3. Support of the Site Integrator for maintenance of sensors.

The SIT must imitate a similar situation of the sensors and systems in the entire wind park (OSS+WTG). Figure 7 provides a sketch of the SIT. No rights may be derived from the sketches.

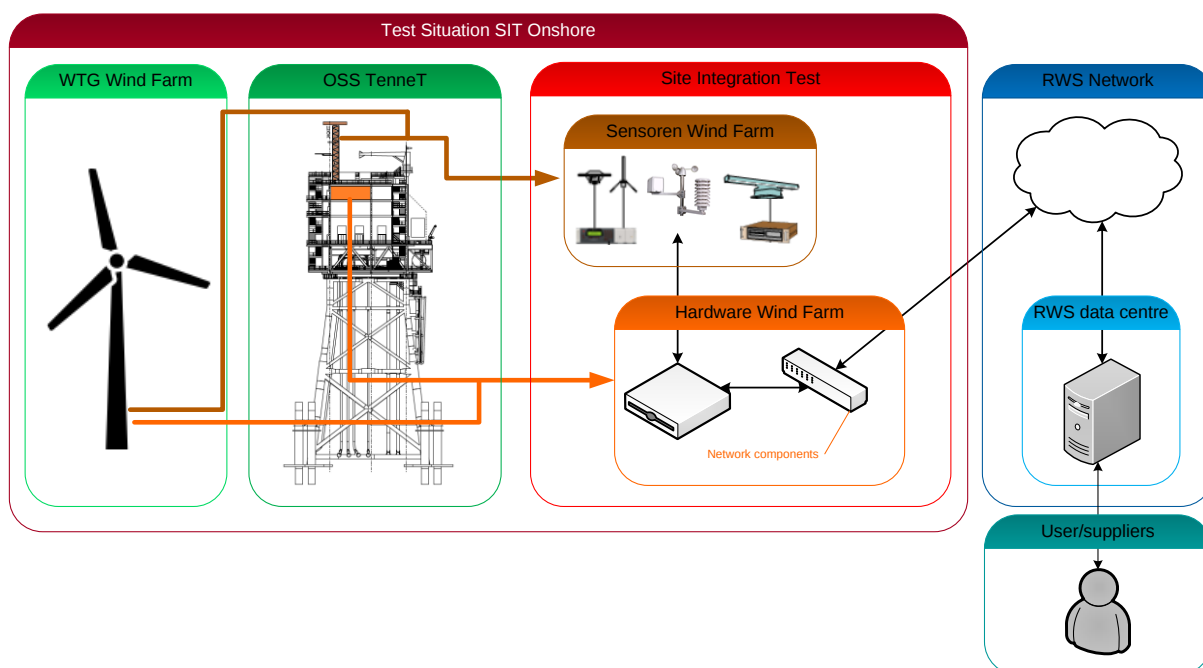


Figure 7: Test situation Onshore

In the final situation all sensors and systems will be installed in the wind park in the offshore windfarm. During tests the situation at sea will be simulated. At the test location all factors that may influence the functioning of the sensors and systems at sea, will be taken into account. These factors are simulated in the tests to be able to test the final situation at an early stage.

On the OSS different sensors are installed. They are delivered to the Site Integrator. The following sensors are involved:

- ADB-S;
- AIS/AtoN;
- Differential GPS;
- Hydro;
- LiDAR;
- LoRa;
- Maritime radar;
- Meteo;
- Tetra;
- VHF+RoIP;
- Bat detector;
- Bird detection system;
- Wi-Fi.

On the OSS Borssele Alpha several sensors from the list above will be positioned. On the other OSS variations may be applied on the basis of increased insight.

Within the scope of MIVSP Nautical Radars and Bird Detection Systems are also installed and maintained on Wind Turbine Generators.



3.2.1 **Summary**

The work activities to be carried out by the Site Integrator for the benefit of the realisation and the management include at least the list below. For these work activities support can be requested from the Contractor for at least:

- General work activities:
 - Project management;
 - Technical management;
 - Contact sensor suppliers.
- Work activities preparatory phase;
 - Design of SIT;
 - Define, plan and execute work tasks;
 - Implementation;
 - Simulate final situation, build stubs if necessary;
 - Testing;
 - Inspections and acceptance;
 - Preparational work activities for SAT.
- Work activities realisation phase
 - Design SAT;
 - Support building SAT;
 - Validate SAT and Offshore Commissioning;
 - Commissioning general;
 - Testing;
 - Create and deliver documentation;
 - Realising sensors in the wind park (with the exception of the OSS).
- Work activities usage-phase:
 - Contact sensor suppliers;
 - Management & maintenance.



3.2.2 Planning

The planning of the work activities of the Site Integrator are largely dependent on the planning of TenneT for the realisation of the OSS. In table below an indication of the planning's main points is described.

For the BDS, a deviation of the standard MIVSP planning applies, as it is preferred to place one or two systems on existing platforms in advance.

Indication Planning of integration of sensors				
	SIT	SAT	Sensors WTG	Offshore Commissioning
Platform 1	Q1/2018	NA	NA	Q2/2018
Platform 2 (OSS or WTG)	Q1/2018	NA	NA	Q2/2018
Borssele Alpha OSS	Q1/2018	Q3/2018	NA	Q1/2019
Borssele WTG	Q1/2019	NVT	Q1/2020	Q1/2020
Dutch coast south Alpha Alpha OSS	Q3/2019	Q1/2020	NA	Q3/2020
Dutch coast north (OSS or WTG)	Q3/2021	Q1/2022	Q3/2022	Q3/2022

Table 3: Planning realisation sensors



4 Definitions and abbreviations

4.1 Definitions

Term	Definition
Stub	Temporary (IT)- function of test tool

Table 4: Definitions

4.2 Abbreviations

Abbreviation	Description
AIS	Automatic Identification System (IALA)
AtoN of A-to-N	Aids to Navigation
AWS	Automatic Weather station
CIV (RWS-)	RWS Central Information Provision
DGNSS	Differential Global Navigation Satellite System; DGNSS data is used to improve the integrity and accuracy of via GNSS received position data.
FAT	Factory Acceptance Test
GAO	Usage-dependent Maintenance
GPS	Global Positioning System: a satellite based system of the Ministry of Defence of the USA that suitable receivers on earth can accurately determine their position with.
HAT	Harbour Acceptance Test
I&C	Integrator & Coordinator
IALA	International Association of marine aids to navigation and Lighthouse Authorities
IEEE	Institute of Electrical and Electronic Engineers
IVEF	Inter VTS Exchange Format
IT	Information Technology
ITU	International Telecommunications Union
LAN	Local Area Network
Lat/Long	Latitude/Longitude Coordinates (WGS84 date, unless indicated otherwise)
LSS	Logical Shore Station (IALA-AIS-WG)
MKO	Mission Critical Support
MMSI	Maritime Mobile Service Identity
MPLS	Multi-Protocol Label Switching
NM	Nautical Mile
NNV	New Network Facilities (nationwide RWS network)
OSS	Offshore Substation
PMR	Project Management Requirements
QoS	Quality-of-Service
RF	Radio Frequency
RFC	Request For Comments
RFI	Request For Information
RFP	Request For Proposal



Abbreviation	Description
RTCM	Radio Technical Commission for Maritime Services. The RTCM is for instance involved with establishment of standards related to GNSS and DGNSS.
RWS	Rijkswaterstaat, Director General of the Ministry of Infrastructure and the Environment – implementation organisation
RWS-CIV	RWS-Central Information Provision
SAO	Fault-dependent Maintenance
SAT	Site Acceptance Test
SBAS	Satellite Based Augmentation System
SCB	System-focused Contract control
SIT	Site Integration Test
TAB SVM	Technical Application Management Shipping Traffic management
TAO	Condition-based Maintenance
TNO	Netherlands Organisation for Applied Scientific Research
BDS	Bird detection system
VHF	Very High Frequency
VPN	Virtual Private Network
VTM	Vessel Traffic Management
VTs	Vessel Traffic Services
WTG	Wind Turbine Generator
WPE	Wind park Owner

Table 5: Abbreviations



5 Aspect requirements

5.1 Introduction

In addition to the technical and system requirements, *aspect requirements* are identified. These requirements should be interpreted as preconditions that the installations delivered by the Site Integrator must comply with.

5.2 Types of aspect requirements

The types of aspect requirements applicable to this VSE are shown below.

Aspect	Description	See
HSE	Requirements with regard to safety during realisation and safety in the usage-phase of realised installations, for both the user and the environment.	§6.3
Reachability	Requirements with regard to availability of (parts of) the installation and the lifespan of (parts of) the installation.	§6.4
Sustainability	Requirements with regard to, inter alia, environmental impact (for instance avoiding scarce and toxic raw materials and energy inefficient devices) and social aspects (among which the working conditions and the like).	§5.6
Offshore Substation	Requirements with regard to the Offshore Substation.	§5.7

5.3 Safety

5.3.1 General

VSA-01	Electro-Magnetic Interference (EMI)
Requirement:	The Site Integrator must take measures for working safely around the installation locations.
Explanation:	The Site Integrator must, for instance, consider the EMI of the radar sensors.
Verification:	Inspection, documentation, measurements

VSA-02	Remote shut down sensors
Requirement:	The Site Integrator needs to take measures for safe working on sensors, they need to be able to be shut down from a safe distance by means of a emergency shut down button.
Explanation:	The Site Integrator need to realise a possibility to shut down the sensors of the bird detection system.
Verification:	Inspection, documentation, test



5.3.2 *Electrical installations and equipment*

VSA-03	Electrical installations and equipment
Requirement:	All work activities on electrical installations (up to 1000V) and electrical equipment will be carried out in accordance with NEN1010, NEN3140, EN50110 and RWS_ELEC.
Explanation:	
Verification:	Inspection, measurements

VSA-04	Electrical protection general
Requirement:	All protections against lightning and overvoltage are required to conforming to the applicable standards and directives, including IEC62305 and NEN1010.
Explanation:	
Verification:	Inspection, measurements

VSA-05	Safety grounding of 19" rack
Requirement:	The metal frame of the 19" rack must be equipped with an own protective earth.
Explanation:	
Verification:	Inspection, measurements

VSA-06	Grounding and potential equalisation
Requirement:	All conductive metal frames positioned or relocated during the work are required to be grounded. Earthing cables, measuring points and connections to the main earthing rail must be fitted with detachable connections to be able to perform measurements.
Explanation:	
Verification:	Inspection, measurements

5.3.3 *Fire safety installations*

VSA-07	Fire protection of applied cabling
Requirement:	All cabling supplied by Site Integrator must be halogen-free and extremely fire-resistant, and issue little smoke in case of incineration.
Explanation:	
Verification:	Documentation, certificate or certificates

VSA-08	Fireproof cable glands
Requirement:	All cable glands must be fireproof and prevent air displacement between mutual spaces and the roof.
Explanation:	
Verification:	Inspection

5.3.4 *Mechanical safety*

VSA-09	Security against tipping over
Requirement:	All positioned constructions, including the 19" racks and antenna installations must be sufficiently secured against tipping over.



Explanation:	Causes of tipping over in any case include light and unintentional pressure by persons near the construction and the implementation of work activities on that construction (among which adding or removal of equipment and/or parts). At locations in The Netherlands where earth tremors may occur, this should be considered in particular.
Verification:	Inspection

VSA-10	Proper wall fitting
Requirement:	Objects fitted to walls must be affixed by means of a suitable and proper method.
Explanation:	
Verification:	Inspection

VSA-11	No cables on floors
Requirement:	For hygienic and safety reasons (preventing tripping) it is not permitted to have cables lying on the floor.
Explanation:	
Verification:	Inspection

VSA-12	Avoiding protruding of (sharp) elements
Requirement:	Protruding parts are not permitted at locations where persons tend to be present. At other locations the presence of protruding parts must be prevented as much as possible and if that turns out to be impossible, they must be marked by means of clear colours. Sharp protruding parts must be finalised burr-free or covered.
Explanation:	This concerns for instance cable clamps on antenna masts/tubular piles, parts of 19" racks, cable ducts and so on.
Verification:	Inspection

5.4 Availability

VSA-13	Minimal lifespan of components, materials and equipment
Requirement:	Unless explicitly indicated otherwise, the following requirements apply with respect to the <i>minimal</i> (not average) lifespan for which all components, materials and equipment, delivered by Site Integrator, were designed, taking account of the operational conditions to be expected: 1. Externally mounted or positioned components, materials (including cabling) and equipment: at least 15 years; 2. Internally mounted or positioned equipment (including climate control and Ethernet converters): at least 10 years; 3. Internally mounted or positioned components and materials (including cabling): at least 15 years.
Explanation:	
Verification:	Documentation (specifications), certificate or certificates



5.5 Sustainability

VSA-14	Sustainability general
Requirement:	Site Integrator is required to apply sustainable materials. In any case of reasonable option, the use of environmentally harmful (including toxic) materials and energy inefficient active components must be avoided.
Explanation:	For instance in the event of climate control installations the more economical units are preferred.
Verification:	Inspection, documentation (specifications), certificate or certificates

5.6 Offshore Substation

VSA-15	Employer's Requirements
Requirement:	The Site Integrator must comply with the Employer's requirements TenneT, ONL-TTB-03871.
Explanation:	TenneT is responsible for the Offshore Substation
Verification:	Documentation, inspection

5.7 Dong WTG

VSA-16	Employer's Requirements WTG
Requirement:	The Site Integrator must comply with the Training and Medical Requirements, GI 08-01-10, DONG Energy Wind Power
Explanation:	DONG is responsible for the Offshore Substation
Verification:	Documentation, inspection