Rijkswaterstaat
Ministerie van Infrastructuur en Waterstaat

Appendix 2 Question specification Requirements (VSE)

Description of

LiDAR systems for Wind energy areas in the Dutch North Sea

Colophon

Issued by	Ministry of Infrastructure and Watermanagement Rijkswaterstaat Centrale Informatievoorziening (CIV) Derde Werelddreef 1 2622 HA Delft
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CONFIDENTIALITY
The information made available or coming to attention, as part of this tender and the possible assignments deriving from it, must be regarded as confidential.

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1 Introduction

1.1 Interpretation of this document

The Question specification System requirements [VSE] is part of the tender documents of the European tender 'LiDAR systems as part of wind energy areas North Sea, with case number 31173321. The total set of tender documents which are part of this European tender, are stated in the Describing document [BD].

1.2 Purpose of this document

The purpose of this document [VSE] is to provide a listing of all qualitative requirements that systems and products to be delivered need to comply with.

1.2.1 General

The requirements included in this VSE are minimum requirements. The fact that many requirements have a technical nature shouldn't lead to the belief that this VSE is complete and correct in all cases. The Contractor must have thorough knowledge of matters to design, realise and deliver a good quality installation on the basis of these requirements.

If Contractor is of the opinion that one or more requirements in this VSE are not realistic or contravene any laws and/or common standards, Contractor must report this to Client immediately and substantiated.

1.2.2 Reading instructions

The following reading instructions apply to this document:

- The reader is strongly urged to take note of the definitions and abbreviations included as appendices, before reading this document;
- Referrals to specific documents, indicated by means of the notation between brackets "[xxx]", shall be interpreted as a referral to that specific document and to underlying standards and other documents that are referred to in that document.

1.2.3 Interpretation of requirements

With regard to requirements included in this document, the following applies:

- Requirements can be recognised by a unique identification "VSE-nn", followed by a bold printed header that states the requirement in concise terms. Below, a row will follow which is defined by the word "Requirement:", followed by the formal text of the requirement;
- Below the requirement, there is room for an explanatory note. The explanatory note is not part of the requirement, however the requirement should be viewed in conjunction with the explanatory note. The reason for this is that this note offers additional information, so as to support the interpretation of the requirement;
- Finally, below each requirement, a verification method is mentioned. Verification methods are further explained in §1.2.4.

1.2.4 Verification method

Contractor must perform all relevant tests to demonstrate that the delivered installation(s) meet(s) the Directives (DNV-GL, requirements 07 and 63). The different verification methods have been specified in Table 1 below. In each of the requirements in this document, one or more verification methods have been incorporated, each of which must be complied with.

Method	Description
Analysis	Meeting the requirement must be demonstrated by Contractor by means of the implementation of analyses and/or benchmarks and/or simulations and/or calculations and/or by means of the analysis of test data, measurement data, performance data and/or availability data.
Certificate	A document issued by a qualified authority that demonstrates that the current material, component or process meets the required specifications.
Documentation	Meeting the requirement must be demonstrated by Contractor, by means of documentation in which the current material, component or process is described in detail.
Inspection	Meeting the requirement must be demonstrated by Contractor, by means of the visual inspection of delivered and/or installed materials, components, documentation and/or equipment.
Measurement	Meeting the requirement must be demonstrated by Contractor, by means of the implementation of measurements by use of qualified (measuring) equipment.
Test	Meeting the requirement must be demonstrated by Contractor, by means of establishing that the functioning of the (partial) system is meeting the requirement. The testing must take place making use of procedures established ahead of time, and under well-defined circumstances, configuration and data entry, possibly making use of specific testing tools and/or testing facilities.

Table 1: Verification methods

2 Referred documents

This chapter contains a list of documents that are referred to from the requirements in this [VSE].

Identification	Description
BIO	Baseline Information security Government (BIO), 1 January 2020 (www.information securitysdienst.nl)
DNV GL and IEC	DNV GL Rules and standards
[NPR1014]	NPR 1014 "Nederlandse Praktijkgids bliksembeveiliging" ("Dutch Practical Guide Lightning Protection) (issued by NEN as a supplement/explanation of NEN-EN-62305), publication date 1-Nov-2009.
[NEN1010]	NEN-1010:2007 + correction sheet C1:2008: "Veiligheidsbepalingen for laagspanningsinstallations". (Safety Provisions for Low Voltage Installations)
[NEN-EN-IEC60529]	NEN-EN-IEC 60529 "Beschermingsgraden van omhulsels" ("Protection levels of sheaths) (IP-coding)", publication date 1-Mrt-2000.
{1}	National Cyber Security Centre (NCSC), "ICT-security guidelines for Transport Layer Security (TLS)", URL: https://www.ncsc.nl/documenten/publicaties/2019/mei/01/ict-beveiligingsrichtlijnen-voor-transport-layer-security-tls
{3}	Centre for Information security and Privacy (CIP), "Grip on SSD - Security requirements for (web)applications", URL: https://www.cip-overheid.nl/category/producten/secure-software/
{5}	Rijkswaterstaat IRN, "RWS IV Connection conditions/RIVA", URL: Classification RWS Commercially sensitive: https://werkwijzer.cf-prod.intranet.rws.nl/index.html Classification RWS Information: https://www.rijkswaterstaat.nl/zakelijk/zakendoen-met-rijkswaterstaat/werkwijzen/werkwijze-in-iv/index.aspx
{6}	Rijkswaterstaat IRN, "Connection conditions NNV Rijkswaterstaat" The information is not public and will be made available after awarding.
{7}	Open Web Application Security Project (OWASP), "OWASP Top 10" https://www.owasp.org/index.php/Category:OWASP_Top_Ten_Project
IBR-1	Rijkswaterstaat Security Centre, "Directives information security at RWS IV-contract requirements", chapter "Policy for data classification"
IBR-2	Rijkswaterstaat Security Centre, "Directives information security at RWS IV-contract requirements", chapter "Policy for logical access control"
IBR-3	Rijkswaterstaat Security Centre, "Directives information security at RWS IV-contract requirements", chapter "Policy for use of passwords"
IBR-6	Rijkswaterstaat Security Centre, "Directives information security at RWS IV-contract requirements", chapter "Directives for physical security"
IBR-7	Rijkswaterstaat Security Centre, "Directives information security at RWS IV-contract requirements", chapter "Directives for logging". The information is not public and will be made available after awarding.

Table 2: Referred documents

3 System description

By means of the object-tree, depicted in image below, objects have been identified to which the technical and system requirements apply.

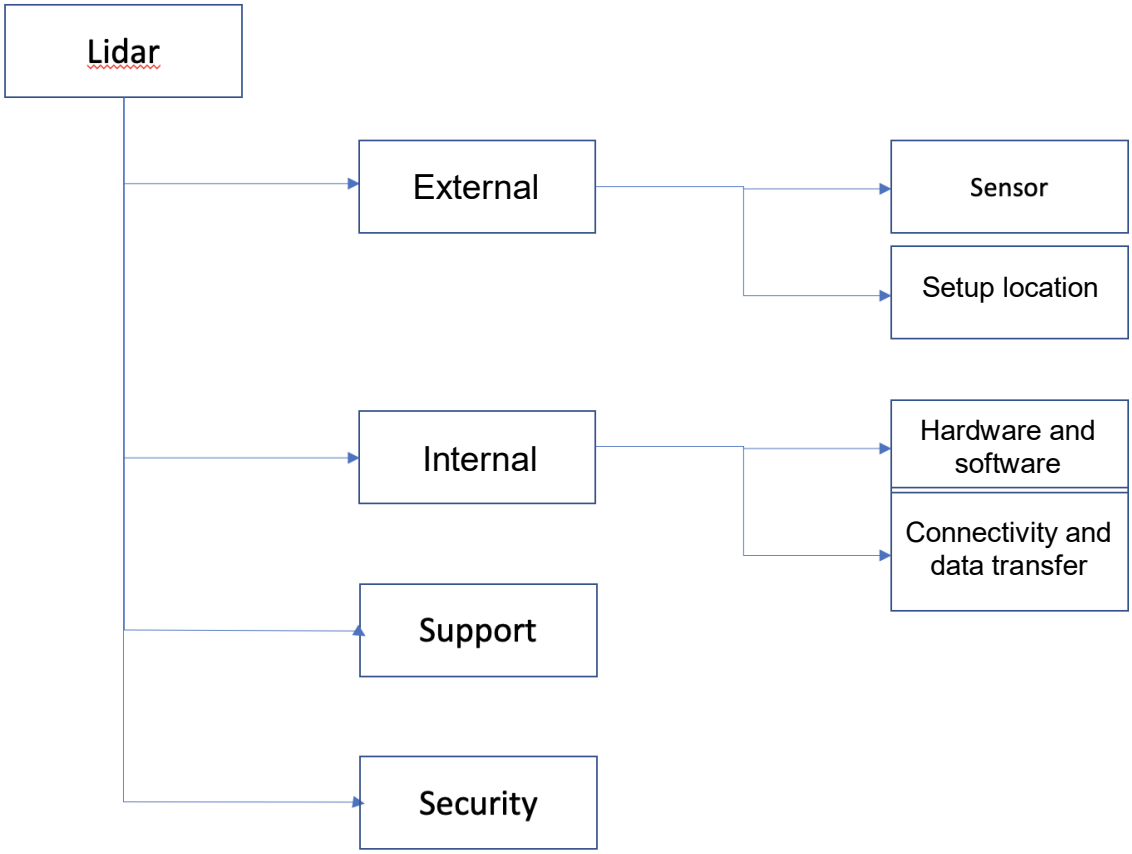

Image 1: System Breakdown Structure technical and system requirements LiDAR

4 Functional, technical and system requirements

The term "LiDAR" is used in the requirements. This concerns "wind LiDAR" (or "Doppler LiDAR"). Hereafter, the wind LiDAR will also be indicated as "LiDAR".

4.1 External

4.1.1 Sensor

The instrument must be a Doppler LiDAR Device (light detection and ranging), to be able to measure the horizontal wind speed and wind direction.

VSE-01	**Product**
Requirement:	The instrument must be a Doppler LiDAR (light detection and ranging) and must be able to measure wind speeds and wind directions.
Note:	The product must be demonstrably reliable.
Verification:	Documentation.

VSE-02	**Hardware**
Requirement:	All (computer) hardware to be delivered within the framework of this contract, must be of the most recent generation (e.g. up-to-date operating system and firmware with the latest functions and improvements).
Note:	Upon request by the Client (OG), Supplier must be able to prove that all hardware is in conformity with the market or of the most recent release/generation.
Verification:	Documentation.

VSE-03	**Operational**
Requirement:	The LiDAR must have an operational uptime of at least 98% (about 8 days of failure per year).
Note:	
Verification:	Documentation

VSE-04	**Wave length**
Requirement:	The LiDAR must operate at a wavelength of 1.5 micrometer.
Note:	The LiDAR should not negatively influence aviation or bystanders in the vicinity of the sensor.
Verification:	Certificate, Documentation.

VSE-05	**Laser class**
Requirement:	The LiDAR must be classified as a laser class 1 or class 1M device, as defined in IEC standard 60825-1.
Note:	The LiDAR should not negatively influence aviation or bystanders in the vicinity of the sensor.
Verification:	Certificate, Documentation.

VSE-06	Circumstances North Sea
Requirement:	The LiDAR and used materials must be resistant in an offshore area of the North Sea and comply with the directives of DNV GL and IEC.
Note:	The LiDAR will be installed on a platform in the North Sea, 40 – 50 metres above sea level.
Verification:	Documentation.

VSE-07	Measurement values
Requirement:	The LiDAR must be able to measure and report the following values: • Wind speed (horizontal and vertical); • Wind direction.
Note:	
Verification:	Documentation.

VSE-08	Height range
Requirement:	The measuring range of the LiDAR must be at least between 40 m and 200 m above the LiDAR device.
Note:	
Verification:	Documentation.

VSE-09	Height measurements
Requirement:	The LiDAR must be able to measure and report wind speed and wind direction for at least ten different heights, which are configured by the user.
Note:	The main operational mode is the vertical profiling of the horizontal and vertical wind speed and the wind direction.
Verification:	Documentation.

VSE-10	Vertical Resolution measurement wind speed
Requirement:	The LiDAR must measure the wind speed with a minimal vertical resolution of 20 m at a height range of 80 to 120 m above the device.
Note:	
Verification:	Documentation.

VSE-11	Vertical Resolution measurement wind direction
Requirement:	The LiDAR must measure the wind direction with a minimal vertical resolution of 20 m in a height range of 80 to 120 m above the device.
Note:	
Verification:	Documentation.

VSE-12	Use
Requirement:	The LiDAR must be developed for continuous and unattended use (24 hours per day, 7 days per week).
Note:	
Verification:	Documentation.

VSE-13	Accuracy of the measurement values horizontal wind speed
Requirement:	The maximum deviation in the measurement values of the reported horizontal wind speed is 0.1 metres per second.
Note:	The measuring accuracy must be determined by use of the 10-minute average wind speed and wind direction and must be measured by comparison with nearby wind measurements, obtained by use of the calibrated wind sensors in a meteorological tower.
Verification:	Documentation. Comparison measurement (Test) with a reference by Contractor or a third party.

VSE-14	Accuracy of the wind direction measurement values
Requirement:	The maximum deviation in the measurement values of the reported wind direction is 5 degrees.
Note:	The measuring accuracy must be determined by use of the 10-minute average wind speed and wind direction and must be measured by comparison with nearby wind measurements, obtained by use of the calibrated wind sensors in a meteorological tower.
Verification:	Documentation, Measurement, Test.

VSE-15	Calibration
Requirement:	The Contractor must calibrate the LiDAR.
Note:	Newly delivered instruments or instruments that have been serviced, must have been calibrated, as a result of which the standard calibration period becomes applicable, in order to maximise the operational deployment. Before bringing the LiDAR onshore, it will be replaced by a spare LiDAR. The LiDAR will be offered to Contractor for calibration and maintenance, at the location OEC in Stellendam.
Verification:	Certificate, Documentation.

VSE-16	Delivery LiDAR
Requirement:	The Contractor must deliver every LiDAR within 6 months after order at the latest.
Note:	
Verification:	

VSE-17	Range of wind speeds
Requirement:	The minimal range of the measured and reported wind speeds is 1 to 60 metres per second.
Note:	
Verification:	Documentation.

VSE-18	Range of wind direction
Requirement:	The range of the measured and reported wind direction is 360 degrees.
Note:	
Verification:	Documentation.

VSE-19	Faulty data
Requirement:	The LiDAR reports "quality-controlled (QC)" data.
Note:	The instrument provides QC (quality-controlled) measuring values. The LiDAR must detect, identify, reduce and/or remove faulty data, as a consequence of, for instance, fog, precipitation and clouds.
Verification:	Documentation.

VSE-20	Supplied data
Requirement:	The reported data must at least contain the following: 1. Horizontal and vertical wind speed (in metres per second); 2. Wind direction, degree North; 3. Height, above LiDAR device, of the measurement (in metres); 4. Status information for operative LiDAR, timestamp and location.
Note:	Status information: uptime, available data, carrier to noise ratio (CNR), status flags.
Verification:	Documentation.

VSE-21	Wind speed
Requirement:	The reported numeric value of the wind speed is the arithmetic average over a 10 minute period. See also VSE-20 Ad 1.
Note:	The Contractor must indicate the position of the time stamp, relative to the average.
Verification:	Documentation.

VSE-22	Wind direction
Requirement:	The reported numeric value of the wind direction is the arithmetic average over a 10 minute period. See also VSE-20 Ad 2.
Note:	The Contractor must indicate the position of the time stamp, relative to the average.
Verification:	Documentation.

VSE-23	**Frequency of reporting the data**
Requirement:	All data supplied from VSE-20 must be available at an interval of 10 minutes.
Note:	
Verification:	Documentation.

VSE-24	**Frequency of reporting the raw data**
Requirement:	Of all data reported (see VSE-20), also the raw data (sample values) must be available, with the possibility to read out the raw data in near real-time.
Note:	
Verification:	Documentation.

VSE-25	**Synchronisation with time**
Requirement:	The LiDAR must be equipped with a functionality to be able to synchronise time (Network Time Protocol (NTP)).
Note:	
Verification:	Documentation.

VSE-26	**Maintenance LiDAR**
Requirement:	The LiDAR must be maintained by the Contractor throughout the contract term.
Note:	Preventive maintenance is performed offshore by a third party (by order of Client). The maintenance of the LiDAR must be performed onshore by Contractor, preferably in combination with calibration duties. Before bringing the LiDAR onshore, it will be replaced by a spare LiDAR. The LiDAR will be offered to Contractor for calibration and maintenance at the location OEC in Stellendam.
Verification:	Documentation.

VSE-27	**Documentation LiDAR**
Requirement:	The Contractor must supply documentation of installation and all deliveries, with regard to the LiDAR, to the Client. The documentation must be supplied in English language.
Note:	The Client must install the LiDAR and perform preventive maintenance.
Verification:	Documentation.

VSE-28	Test report LiDAR
Requirement:	Contractor supplies the LiDARs together with a test report (conform directive DNV GL, upon initial delivery and after any regular or non-regular servicing), including a measurement that can be traced directly or indirectly to a mast comparison of the relevant instrument at a height of at least 80 m. The documentation must be supplied in English language.
Note:	The Contractor must demonstrate proper functioning of the LiDAR upon initial delivery and after each calibration and/or maintenance.
Verification:	Documentation.

VSE-29	Training
Requirement:	Optionally, the supplier organises a training at OG, regarding installation, maintenance and use (including software) for at least 5 persons and 10 persons at most. Other maintenance parties, to be designated by OG, can join this training. The documentation must be supplied in English.
Note:	The Client must be enabled to install and use the LiDAR and perform preventive maintenance.
Verification:	Documentation.

VSE-30	Support to Client
Requirement:	Upon request, the Contractor must remotely support the Client. It must be possible to provide support in English language.
Note:	The Client must be enabled to install and use the LiDAR and perform preventive maintenance.
Verification:	Documentation, Inspection, Measurement, Test.

4.1.2 Setup location

VSE-31	Offshore installation
Requirement:	It must be possible to have the LiDAR replaced and installed within 4 hours, by 2 persons of the OG, or by a maintenance party selected by OG.
Note:	The LiDAR will be installed on an offshore platform and, if necessary, the LiDAR must also be replaced offshore. That is why the installation of the LiDAR should be relatively simple and performable by 2 technicians holding a secondary vocational education in electrotechnics.
Verification:	Inspection, Documentation.

VSE-32	Positioning LiDAR
Requirement:	The positioning of the LiDAR onto the platform is preferably done precisely and accurately, for which reason it must be possible to have fine-tuning for the LiDAR on the platform, specifically level positioning aiming to the exact north are important.
Note:	
Verification:	Inspection, Documentation.

VSE-33	North arrow
Requirement:	The LiDAR system must have an easily visually recognisable and weather-resistant North arrow. The system must have the possibility to be able to implement software corrections between the 'True North' and the positioning.
Note:	
Verification:	Inspection. Documentation.

VSE-34	Measuring angle
Requirement:	The laser beams of the wind LiDAR are maximally 30° off zenith (forming a cone of full angel 60° maximum).
Note:	The angle should not be greater because the laser beams should not be blocked by obstructions on the platform.
Verification:	Inspection. Documentation.

VSE-35	Dimensions and weight LiDAR
Requirement:	The size of the LiDAR is max. 90x90x100 cm; The weight of the LiDAR is 60 kg maximum.
Note:	The assembled total weight and dimensions include the power unit, without packaging.
Verification:	Inspection. Documentation.

VSE-36	Protective and reusable packaging
Requirement:	The LiDAR must be supplied in a protected, reusable packaging, so the LiDAR can be packed and transported protected in case of removal or replacement.
Note:	During replacement of the LiDARs at sea, the equipment must be transported safely and without damage.
Verification:	Inspection, Documentation.

VSE-37	Offshore transport OSS
Requirement:	The LiDAR (in protective packaging) must be resistant to shocks and forces during transport with a maximum of 0.7G to prevent possible negative impact that could be caused by the offshore transport and installation and/or replacement of the LiDAR.
Note:	Initially, the LiDAR is installed on the platform for maintenance and calibration, at the yard (in accordance with the supplier's calibration schedule).
Verification:	Inspection, Documentation.

VSE-38	Humidity
Requirement:	The LiDAR must be operational in and able to withstand a humidity varying from 0 to 100%.
Note:	
Verification:	Documentation.

VSE-39	Temperature
Requirement:	The LiDAR must be operational in and able to withstand a temperature varying from -30 °C to +45 °C.
Note:	
Verification:	Documentation.

VSE-40	Wind speed
Requirement:	The LiDAR must be operational in and able to withstand a wind speed varying from 0 to 60 metres per second.
Note:	
Verification:	Documentation.

VSE-41	Precipitation
Requirement:	The LiDAR must be operational in and able to withstand precipitation, either liquid or solid.
Note:	
Verification:	Documentation.

VSE-42	Soiling
Requirement:	Soiling caused by precipitation or other causes, e.g. birds' excrements, should not adversely affect the availability of the delivery of the required data (see also VSE-020) of the LiDAR.
Note:	Offshore, the LiDAR could be soiled by various factors.
Verification:	Inspection, Measurement, Test.

VSE-43	Calibration
Requirement:	The LiDAR must supply the required data (VSE-020) for at least two years without intermediate calibration.
Note:	
Verification:	Documentation.

VSE-44	Processing time calibration and maintenance
Requirement:	The calibration of the LiDAR must last 2 calendar months at most. This includes the time required for transport to and from the Client.
Note:	The calibration term starts upon collection in Stellendam up to the moment of return delivery in Stellendam.
Verification:	Documentation.

VSE-45	Transport Calibration and maintenance
Requirement:	The Contractor sees to the transport from the Client's storage (Stellendam) to the location of the Contractor and vice versa.
Note:	
Verification:	Documentation.

VSE-46	Autonomous functioning
Requirement:	The LiDAR must be able to function autonomously (unattended).
Note:	In order to be able to guarantee this autonomous (unattended) functioning, Client will only perform the preventive maintenance (replenishing liquids, replacing a windshield wiper and/or cleaning of the windows).
Verification:	Documentation.

VSE-47	Watertightness
Requirement:	The instrument and the used parts, cables, connections and materials must be IP67 compliant ([NEN-EN-IEC60529]).
Note:	
Verification:	Documentation.

VSE-48	Voltage supply LiDAR
Requirement:	The voltage supply of the LiDAR must occur on the basis of alternating voltage (230V AC).
Note:	Conform NEN1010
Verification:	Test, Documentation.

VSE-49	Maximum capacity
Requirement:	The power consumption of the device is 200 W (AC) maximum.
Note:	
Verification:	Documentation.

VSE-50	Power
Requirement:	The system should continue to function properly at voltage variations of ±10% and/or frequency variations of ± 3%.
Note:	
Verification:	Documentation.

VSE-51	Power failure
Requirement:	After a power failure, the instrument must be able to restore its last configuration and continue the measuring programme without human intervention.
Note:	

Verification:	Documentation, testing.

VSE-52	**RVS flange/bracket**
Requirement:	The instrument must be equipped with a flange/bracket for applicability at the current platforms. This flange/bracket must be designed in INOX 316, standard ISO 8501 3 P3 standard.
Note:	Use the INOX 316 standard ISO 8501 3 P3 standard for application off-shore. The flange/ bracket of the LiDAR must correspond with the pedestal, in conformity with Appendix 2.1 Drawing flange bracket present LiDAR system 300M.
Verification:	Documentation.

VSE-53	**Earthing**
Requirement:	The instrument has the possibility to be properly earthed, in conformity with NEN1010.
Note:	
Verification:	Documentation, Inspection.

VSE-54	**Visibility**
Requirement:	The exterior of the device has a (combination of) colour(s) making the device well visible against a white, blue and/or grey background.
Note:	In order to prevent people from hitting the device, it must be well visible on sunny, cloudy, as well as foggy days.
Verification:	Documentation, Inspection.

VSE-55	**Securing**
Requirement:	The device and accessories must be secured such that it remains in place at wind speeds of at least 60 metres per second.
Note:	The device will be installed in an area that is frequently subject to high winds.
Verification:	Documentation, Inspection.

VSE-56	**Maintenance interval liquids**
Requirement:	If the device consumes liquids for regular functioning, the reservoir must be of such a size that replenishing is required only 1x per year.
Note:	
Verification:	Documentation, Inspection.

VSE-57	**Specification of liquids**
Requirement:	If the device consumes liquids for regular functioning, the Contractor must provide insight by issuing specifications regarding suitable liquids.
Note:	
Verification:	Documentation, Inspection.

VSE-58	**Temperature liquids**
Requirement:	If the device consumes liquids for regular functioning these must be enabled to be stored and used at the temperatures specified in VSE-39.
Note:	

Verification:	Documentation.

VSE-59	**Wind speed liquids**
Requirement:	If the device consumes liquids for regular functioning, it should be possible to store and use it at wind speeds as specified in VSE-40.
Note:	
Verification:	Documentation.

VSE-60	**Applicability of liquids**
Requirement:	If the device consumes liquids for regular functioning, these must be suitable for use at offshore locations.
Note:	Also the liquids must comply with the directives of DNV GL and IEC.
Verification:	Documentation, Inspection.

VSE-61	**Shielding the on/off button**
Requirement:	If the device has an external on/off button, it must be possible to shield or detach it, to prevent unintentional deactivation.
Note:	
Verification:	Documentation, Inspection.

4.2 Internal

4.2.1 Hardware and software components

VSE-62	**Storage of data**
Requirement:	The LiDAR must have the possibility to store the standard measuring data for a period of at least one year.
Note:	This refers to the data described in VSE-20
Verification:	Inspection, Documentation.

VSE-63	**Operating system**
Requirement:	The internal operating system (OS) of the instrument must be supported by the supplier of the OS for at least 10 years.
Note:	The system must comply with the Baseline Information Security Government (BIO). The Contractor will be requested to indicate which OS will be used and in which way it will be supported during the 10 years after delivery.
Verification:	Inspection, Documentation.

VSE-64	**Software**
Requirement:	Software for data processing must be available on different operating systems, including Windows.
Note:	
Verification:	Inspection, Documentation.

VSE-65	Software updates
Requirement:	The Contractor is obliged to inform parties, to be determined by Client, in the event of software updates (new software or firmware update, becoming available for the instrument). This comprises new features as well as patches (for problems identified). This information contains the content of the update, the consequences for the use and the estimation whether or not it is critical. All software updates and security updates will be made available without charge, during the entire usage period (at least 10 years).
Note:	Installation of updates must take place after approval by Client.
Verification:	Documentation, (specifications).

4.2.2. Connectivity and Data transfer

VSE-66	Submittal of data
Requirement:	The LiDAR must make the required data available within 2 minutes after the end of the observation-interval.
Note:	
Verification:	Documentation, Inspection, Test.

VSE-67	Data format
Requirement:	The data format of the datafiles must be generally legible, such as ASCII, CSV or NetCDF and not-own (non-proprietary). If the instrument only issues files with an own (proprietary) data format, software must be made available for this without charge, in order to be able to process into a generally legible format.
Note:	This software must also comply with VSE-64.
Verification:	Documentation, Inspection, Test.

VSE-68	Data availability
Requirement:	The wind LiDAR must provide the required QC-data (as explained in VSE-19) with an availability of at least 95% (of the uptime of the device) at a measuring height of 120 m above the LiDAR device.
Note:	Note: Specific weather conditions, such as thick fog or low clouds, may cause limitations to the provision of QC-data. However, given the climatological conditions of the measuring locations provided, the instrument should be able to provide QC-data during 95% of the time (that the instrument is operable), at a height of 120 m above the LiDAR device, over a period of 12 months.
Verification:	Documentation, Inspection.

VSE-69	Network interface
Requirement:	The instrument must have at least one standard ethernet connection, based on the TCP/IP protocol (IPv4) and be equipped with a RJ45 connection. Any other ways of communication must be deactivated manually by the Contractor.

Note:	
Verification:	Inspection, testing. Documentation.

VSE-70	**Ethernet network connection**
Requirement:	The instrument is remotely approachable for reading data as well as operation of the local operating system via an ethernet network connection.
Note:	
Verification:	Inspection, Test, Documentation.

VSE-71	**Data transfer via FTP**
Requirement:	The instrument must have the possibility for data transfer, at least via FTP.
Note:	Secure FTP or API data transfer is preferred.
Verification:	Inspection, Documentation.

VSE-72	**Remote connectivity**
Requirement:	The instrument must be remotely approachable via a separate access (see also VSE-02). The software required for this, forms part of the delivery. Supplier must make use of a common protocol, such as, for instance, Remote Desktop Protocol RDP (in case of windows) where no security issues will occur, because this software is still provided with actual security updates. It must be possible to use the software to resolve problems remotely, for implementation of configuration changes, firmware updates or ad-hoc data recovery.
Note:	External access is imperative due to offshore deployment.
Verification:	Documentation, Inspection, RDP-protocol, Test.

VSE-73	**Protection of connectivity**
Requirement:	The possibility for remote connectivity must be secured by means of a user name and password.
Note:	User name and password must be known to and adjustable for OG.
Verification:	Inspection, Documentation.

4.3 Support

VSE-74	**Availability of parts: Minimal lifespan of components, materials and equipment**
Requirement:	The following requirements apply towards the *minimal* (nor average) lifespan for which all delivered components, materials and equipment are designed, taking account of the operational conditions to be expected: 1. Externally assembled or installed components and materials (including cabling) and equipment, at least 10 years after delivery; 2. Internally assembled or installed equipment (including climatising and Ethernet converters): at least 10 years after delivery; 3. Internally assembled or installed components and materials (including cabling): at least 10 years after delivery.
Note:	
Verification:	Documentation (specifications), Certificate or certificates.

VSE-75	**Support**
Requirement:	The Manufacturer can be reached via telephone or email during office hours (9.00 am to 5.00 pm CET). Responses to enquiries will be issued to Client within 2 working days. Communication must take place in English language.
Note:	
Verification:	Inspection, Documentation.

5 Security

Referrals to external al documents were mentioned as {n} and can be found in chapter 2, referred documents. Referrals to external guidelines were mentioned as IBR-n and can be found in the document Directives Information Security at RWS IV-contract requirements v1.2.

Terms starting with a capital are proper names and refer to specific meanings in the ARBIT and ARVODI contract texts. Other terms correspond with the definitions mentioned in the Dutch version of NEN/IEC ISO 27000. For all other terms we refer to the generic meaning in the Van Dale Groot Woordenboek of the Nederlandse taal (Van Dale's Great Dictionary of the Dutch Language). Background information with the numbering of requirements used can be found in paragraph 5.1.1.8.

Numbering of contract requirements security
The numbering of the contract requirements refers to the corresponding three-point standards in the NEN document "ISO/IEC 27002:2013: IT Security Techniques – Practical guideline with control measures in the area of information security" and primarily serves for internal RWS use. Since this proved practical however, in some cases there was a deviation from this numbering. The following deviations are concerned:

1. In some cases a requirement was split in two; in that instance, an "a" or a "b" were placed behind the three-point standard to be able to make a distinction.
2. In some cases the three-point standards were combined under one two-point standard, into a single contract requirement, where the third digit in the three-point standard-notation was replaced by an "x".
   Requirements from the RWS Security Centre itself, for which no corresponding requirement exists within ISO/IEC 27002, were added to a corresponding two-point standard, with "SC-*n*" as a third "digit" in the three-point standard, whereby "n" corresponds with the number on the list of SC-requirements.

VSE-76	**Hardening**
Requirement: refert 12.2.SC-13	The Contractor must 'harden' the information systems involved with the Prestation, by: • Deactivating non-required data network services; • Remove (patching) known vulnerabilities; Client be autonomously capable of installing his patches and after becoming available, the patch must availed to the Client within 48; • All unnecessary ports can be deactivated/blocked; • The default account to be disengaged in conformity with the password policy; • Making use of the security options of the suppliers, if available; • Following the standard hardening profiles for the common platforms, see, for instance the 'Security Benchmarks' of CIS: http://www.cisecurity.org/.
Note:	
Verification:	Inspection, testing

VSE-77	**Complying with security demands**
Requirement:	The Contractor must see to compliance of the information systems involved with the Performance to all requirements mentioned in this chapter. For each requirement it must be indicated whether it applies to the delivery and if so, how this will be structured.
Note:	The security requirements included are Rijksoverheid security requirements and must be observed. If a requirement cannot be observed, the deviation must be

	made visible and additional mitigating measures, to be taken by Contractor, will be inevitable. It could also happen that requirements in the RWS-organisation were already or must be covered. In that case, this must also be indicated explicitly.
Verification:	Inspection.

VSE-78	**Ref ISO 27000**	**Security - Organising information security**
Requirement:	**6.1.2**	**Information systems involved with the Performance must have been set up with an authorisation model and facilities that unauthorised access to company resources can be observed or prevented with.**
Note:		**NOTE: If the Performance solely consists of the purchase of information systems this text must be interpreted such that the information system can dispose of the functionality as standard.**
Verification:		**Documentation, Measurement, Test conform NEN/IEC ISO 27000.**

VSE-79	**Ref ISO 27000**	**Security - Organising information security**
Requirement:	**6.2.1**	**Mobile equipment used by Staff must store data, related to the Performance, encrypted, in conformity with directive IBR-1 Policy for data classification of Client, by means of cryptographic applications for which only algorithms and settings are used with the indication "good", from the most recent version of the NCSC document Directives for Transport Layer Security (TLS) {1}.**
Note:		**NOTE: If the Performance solely consists of the purchase of information systems this text must be interpreted such that the information system can dispose of the functionality as standard.**
Verification:		**Documentation, Measurement, Test conform NEN/IEC ISO 27000.**

VSE-80	**Ref ISO 27000**	**Security - Access control**
Requirement:	**9.1.2**	**Information systems involved with the Performance only contain standard for software-required functional accounts or accounts that were supplied by the prevailing authorisation process.**
Note:		**NOTE: If the Performance solely consists of the purchase of information systems this text must be interpreted such that the information system can dispose of the functionality as standard.**
Verification:		**Documentation, Measurement, Test conform NEN/IEC ISO 27000.**

VSE-81	Ref ISO 27000	Security - Access control
Requirement:	9.4.1	Accounts on information systems involved with the Performance only have access rights linked to roles allocated via the prevailing authorisation process.
Note:		NOTE: If the Performance solely consists of the purchase of information systems, this text must be interpreted such that the information system can dispose of the functionality as standard.
Verification:		Documentation, Measurement, Test conform NEN/IEC ISO 27000.

VSE-82	Ref ISO 27000	Security - Access control
Requirement:	9.4.2	Information systems involved with the Performance have a secured login procedure, in conformity with the directive IBR-2 Policy for logical access control of Client.
Note:		NOTE: If the Performance solely consists of the purchase of information systems, this text must be interpreted such that the information system can dispose of the functionality as standard.
Verification:		Documentation, Measurement, Test conform NEN/IEC ISO 27000.

VSE-83	Ref ISO 27000	Security - Access control
Requirement:	9.4.3	Information systems involved with the Performance have password control facilities that force the use of strong passwords, that comply at least with the Client's directive IBR-3 Policy for password use.
Note:		NOTE: If the Performance solely consists of the purchase of information systems this text must be interpreted such that the information system can dispose of the functionality as standard.
Verification:		Documentation, Measurement, Test conform NEN/IEC ISO 27000.

VSE-84	Ref ISO 27000	Security - Physical security and security of the surroundings
Requirement:	11.1.x	Information processing facilities involved with the Performance shall be at least physically secured in accordance with the Client's directive IBR-6 Directives for physical security.
Note:		NOTE: If the Performance solely consists of the purchase of information systems, this text must be interpreted such that the information system can dispose of the functionality as standard.
Verification:		Documentation, Measurement, Test conform NEN/IEC ISO 27000.

VSE-85	Ref ISO 27000	Security - Physical security and security of the surroundings
Requirement:	11.2.x	Information systems involved with the Performance are protected against loss, theft, compromise or interruption, whereby at least the requirements are implemented from the Client's directive IBR-6 Directives for physical security.
Note:		NOTE: If the Performance solely consists of the purchase of information systems, this text must be interpreted such that the information system can dispose of the functionality as standard.
Verification:		Documentation, Measurement, Test conform NEN/IEC ISO 27000.

VSE-86	Ref ISO 27000	Security - Security business operation
Requirement:	12.1.4	Contractor must have demonstrably (logically or physically) separated development, testing, production and, where ordered, educative environments for all information systems involved with the Performance. Separation implies that all the necessary must be done to prevent interference between the environments and that the reliability of the production systems is guaranteed. The acceptation and educative environments must be representative for the production environment, to such an extent that the test or exercise results reflect the behaviour of the functionality in the production environment.
Note:		NOTE: If the Performance solely consists of the purchase of information systems, this text must be interpreted such that the information system can dispose of the functionality as standard.
Verification:		Documentation, Measurement, Test conform NEN/IEC ISO 27000.

VSE-87	Ref ISO 27000	Security - Security business operation
Requirement:	12.2.1	Information systems involved with the Performance are equipped with detective and preventive measures against malware.
Note:		NOTE: If the Performance solely consists of the purchase of information systems, this text must be interpreted such that the information system can dispose of the functionality as standard.
Verification:		Documentation, Measurement, Test conform NEN/IEC ISO 27000.

VSE-88	Ref ISO 27000	Security - Security business operation
Requirement:	12.2.SC-13	The Contractor must 'harden' information systems involved with the Performance by: Deactivating non-required data network services; • Remove (patch) known vulnerabilities; • Deactivate/block all unnecessary ports; • Disengaging the default account in conformity with the password policy; • Making use of the security options of the suppliers, if available; • Following the standard hardening profiles for the common platforms, see, for instance the 'Security Benchmarks' of CIS: http://www.cisecurity.org/.
Note:		NOTE: If the Performance solely consists of the purchase of information systems, this text must be interpreted such that the information system can dispose of the functionality as standard.
Verification:		Documentation, Measurement, Test conform NEN/IEC ISO 27000.

VSE-89	Ref ISO 27000	Security - Security business operation
Requirement:	12.3.1	Information systems involved with the Performance have facilities to be able to make back-ups of all information and software present here. If information systems are situated in the infrastructure of the Client, this must be possible to be done towards the central back-up facility of the Client.
Note:		NOTE: If the Performance solely consists of the purchase of information systems, this text must be interpreted such that the information system can dispose of the functionality as standard.
Verification:		Documentation, measurement, test conform NEN/IEC ISO 27000

VSE-90	Ref ISO 27000	Security - Security business operation
Requirement:	12.4.x	Information systems involved with the Performance document events where at least the requirements mentioned in the Client's directive IBR-7 Directives for logging have been complied with
Note:		NOTE: If the Performance solely consists of the purchase of information systems, this text must be interpreted such that the information system can dispose of the functionality as standard.
Verification:		Documentation, Measurement, Test conform NEN/IEC ISO 27000.

VSE-91	Ref ISO 27000	Security - Communication security
Requirement:	13.1.3	Groups of information systems and users involved with the Performance can be separated in logical or physical network domains, on the basis of function, role and/or classification, in accordance with a zoning model. For information systems installed in the Client's infrastructure, the Client's design (conform PSA) must be observed.
Note:		NOTE: If the Performance solely consists of the purchase of information systems, this text must be interpreted such that the information system can dispose of the functionality as standard.
Verification:		Documentation, Measurement, Test conform NEN/IEC ISO 27000.

VSE-92	Ref ISO 27000	Security - Communication security
Requirement:	13.2.3	Information systems involved with the Performance that make use of electronic messages containing data of which the confidentiality and/or integrity must be guaranteed, must make use of encryption, where the underlying algorithms and settings used can only have the indication "good", in the most recent version of the NCSC document Directives for Transport Layer Security (TLS) {1}.
Note:		NOTE: If the Performance solely consists of the purchase of information systems, this text must be interpreted such that the information system can dispose of the functionality as standard.
Verification:		Documentation, Measurement, Test conform NEN/IEC ISO 27000.

VSE-93	Ref ISO 27000	Security - Acquisition, development and maintenance of equipment and software
Requirement:	14.1.1	In the software that is part of information systems involved with the Performance at least the measures implemented are mentioned in

		the CIP document Grip on SSD - Security requirements for (web)applications {3}.
Note:		**NOTE: If the Performance solely consists of the purchase of information systems, this text must be interpreted such that the information system can dispose of the functionality as standard.**
Verification:		**Documentation, Measurement, Test conform NEN/IEC ISO 27000.**

VSE-94	**Ref ISO 27000**	**Security - Acquisition, development and maintenance of equipment and software**
Requirement:	**14.1.2**	**Information systems involved with the Performance that exchange information via public networks, must always make use of encrypted protocols, where the underlying algorithms and settings used can only have the indication "good", in the most recent version of the NCSC document Directives for Transport Layer Security (TLS) {1}.**
Note:		**NOTE: If the Performance solely consists of the purchase of information systems, this text must be interpreted such that the information system can dispose of the functionality as standard.**
Verification:		**Documentation, Measurement, Test conform NEN/IEC ISO 27000.**

VSE-95	**Ref ISO 27000**	**Security - Acquisition, development and maintenance of equipment and software**
Requirement:	**14.1.3**	**Information systems involved with the Performance and which are part of a chain must, depending on the classification of the data exchanged, guarantee the integrity or confidentiality of these data at all times, by means of encryption, whereby the underlying encryption algorithms and settings used can only have the indication "good", in the most recent version of the NCSC document Directives for Transport Layer Security (TLS) {1}.**
Note:		**NOTE: If the Performance solely consists of the purchase of information systems, this text must be interpreted such that the information system can dispose of the functionality as standard.**
Verification:		**Documentation, Measurement, Test conform NEN/IEC ISO 27000.**

VSE-96	**Ref ISO 27000**	**Security - Acquisition, development and maintenance of equipment and software**
Requirement:	**14.1.SC-03**	**In terms of remote access and for management purposes, information systems involved with the Performance cannot be approached in any other way than by means of encrypted protocols, whereby the underlying encryption algorithms and settings used can only have the indication "good", in the most recent version of the NCSC document Directives for Transport Layer Security (TLS) {1}.**

Note:		**NOTE: If the Performance solely consists of the purchase of information systems, this text must be interpreted such that the information system can dispose of the functionality as standard.**
Verification:		**Documentation, Measurement, Test conform NEN/IEC ISO 27000.**

VSE-97	**Ref ISO 27000**	**Security - Acquisition, development and maintenance of equipment and software**
Requirement:	**14.1.SC-26**	**For the development and maintenance of mobile applications, at least the measures from the Guidelines Mobile App Development and Management for the Rijksoverheid {4} must be applied.**
Note:		**NOTE: If the Performance solely consists of the purchase of information systems, this text must be interpreted such that the information system can dispose of the functionality as standard.**
Verification:		**Documentation, Measurement, Test conform NEN/IEC ISO 27000.**

VSE-98	**Ref ISO 27000**	**Security - Acquisition, development and maintenance of equipment and software**
Requirement:	**14.1.SC-04a**	**Information systems involved with the Performance that will be installed in the Client's infrastructure must have been set up in accordance with the standard connection conditions {5} of Client.**
Note:		**NOTE: If the Performance solely consists of the purchase of information systems, this text must be interpreted such that the information system can dispose of the functionality as standard.**
Verification:		**Documentation, Measurement, Test conform NEN/IEC ISO 27000.**

VSE-99	**Ref ISO 27000**	**Security - Acquisition, development and maintenance of equipment and software**
Requirement:	**14.1.SC-04b**	**Information systems involved with the Performance that will be installed in the Client's infrastructure must make use of the Client's standard network services {6}.**
Note:		**NOTE: If the Performance solely consists of the purchase of information systems, this text must be interpreted such that the information system can dispose of the functionality as standard.**
Verification:		**Documentation, Measurement, Test conform NEN/IEC ISO 27000.**

VSE-100		Ref ISO 27000	Security - Acquisition, development and maintenance of equipment and software
Requirement:		14.2.8 a	Information systems involved with the Performance were demonstrably tested on vulnerabilities, by means of common test methods before being taken into production. In the event of software, the testing methodology used will at least comprise the OWASP Top-10 {7}.
Note:			NOTE: If the Performance solely consists of the purchase of information systems, this text must be interpreted such that the information system can dispose of the functionality as standard.
Verification:			Documentation, Measurement, Test conform NEN/IEC ISO 27000.

VSE-101	Ref ISO 27000	Security - Acquisition, development and maintenance of equipment and software
Requirement:	14.2.8 b	All known vulnerabilities on information systems involved with the Performance were resolved before these information systems are taken into production.
Note:		NOTE: If the Performance solely consists of the purchase of information systems, this text must be interpreted such that the information system can dispose of the functionality as standard.
Verification:		Documentation, Measurement, Test conform NEN/IEC ISO 27000.

VSE-102	Ref ISO 27000	Security - Acquisition, development and maintenance of equipment and software
Requirement:	14.2.9 a	Information systems involved with the Performance must have been subject to an acceptance test on all system requirements mentioned in this agreement before these systems are taken into production.
Note:		NOTE: If the Performance solely consists of the purchase of information systems, this text must be interpreted such that the information system can dispose of the functionality as standard.
Verification:		Documentation, Measurement, Test conform NEN/IEC ISO 27000.

VSE-103	Ref ISO 27000	Security - Acquisition, development and maintenance of equipment and software
Requirement:	14.2.9 b	Information systems involved with the Performance must not be taken into production before all the findings from the acceptance test were resolved.

Note:		**NOTE: If the Performance solely consists of the purchase of information systems, this text must be interpreted such that the information system can dispose of the functionality as standard.**
Verification:		**Documentation, Measurement, Test conform NEN/IEC ISO 27000.**

VSE-104	**Ref ISO 27000**	**Security - Compliance**
Requirement:	18.1.5	Information systems involved with the Performance protect information, by means of cryptographic measures, in conformity with relevant agreements, laws and regulations. In this case only algorithms may be applied with the indication "good", in the most recent version of the NCSC document ICT-security guidelines for Transport Layer Security (TLS) {1}.
Note:		NOTE: If the Performance solely consists of the purchase of information systems, this text must be interpreted such that the information system can dispose of the functionality as standard.
Verification:		Documentation, Measurement, Test conform *NEN/IEC ISO 27000*.

6 Social Return

VSE-105	Social Return
Requirement:	Supplier has an obligation to make an effort and will make a constructive contribution on a voluntary basis, to come to impacted implementation, with respect to Social Return on Investment. For more information, go to: https://www.maatwerkvoormensen.nl/documents/brochures/2019/10/21/voorbeeldbestektekst-bij-hantering-social-return-als-award criterium
Note:	During the initial meeting, supplier and Client will further agree about the concrete structure of SROI, in relation to this assignment. More arrangements will be documented as the supplier is to deliver an action plan or report. 1. Supplier will supply information as to how this branch deals with SROI and will come up with ideas and suggestions regarding how the impact can be increased by means of an action plan to be provided. 2. Supplier supplies an annual report about the final results. This report contains a clear, visible and measurable overview of the finally realised results and impact in the area of Employment and/or Social Impact.
Verification:	Inspection, Documentation.

7 Definitions and abbreviations

7.1 Definitions

Term	Definition
Critical update	A solution for a specific problem that was marked as critical – not security related - in computer software.

7.2 Abbreviations

Abbreviation	Description
CIV (RWS-)	RWS Central Information provision
FAT	Factory Acceptance Test
IT	Information Technology
ITU	International Telecommunications Union
LAN	Local Area Network
Lat/Long	Latitude/Longitude coordinates (WGS84 date, unless indicated otherwise)
LiDAR	Light Detection and Ranging
MKO	Mission Critical Support
NM	Nautical Mile
OG	Client
ON	Contractor
OSS	Offshore Substation
RWS	Rijkswaterstaat, Directeur General of the Ministry of Infrastructure and Waterways implementing organisation
RWS-CIV	RWS Central Information provision
SAT	Site Acceptance Test
SIT	Site Integration Test
TAB SVM	Technical Application Management for Shipping Traffic management
VSA	Question specification General
VSE	Question specification Requirements
WTG	Wind Turbine Generator
WPE/WPO	Wind park Owner/Wind Park Owner