



Market Consultation Document

**Concerning Low Maintenance Radar Systems
Wind farms North Sea**



Colofon

Publisher: Inkoopcentrum IV Rijkswaterstaat
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Date: 01-07-2021

Status: Final

Document 2.1

Version Number:

Case number: 31171177

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1 Introduction

1.1 About Rijkswaterstaat

Rijkswaterstaat (the Directorate General for Public Works and Water Management) is the executive agency of the Ministry of Infrastructure and the Environment dedicated to promoting safety, mobility and the quality of life in the Netherlands and adjacent North Sea.

Rijkswaterstaat (RWS) is and responsible for the design, construction, management, and maintenance of the main infrastructure facilities in the Netherlands, including those in the Dutch Exclusive Economic Zone (EEZ) of the North Sea.

The department *Centrale Informatie Voorziening* (CIV) is responsible for the information systems of Rijkswaterstaat and is the prime partner for the procurement of systems such as primary radar systems, AIS and related information systems.

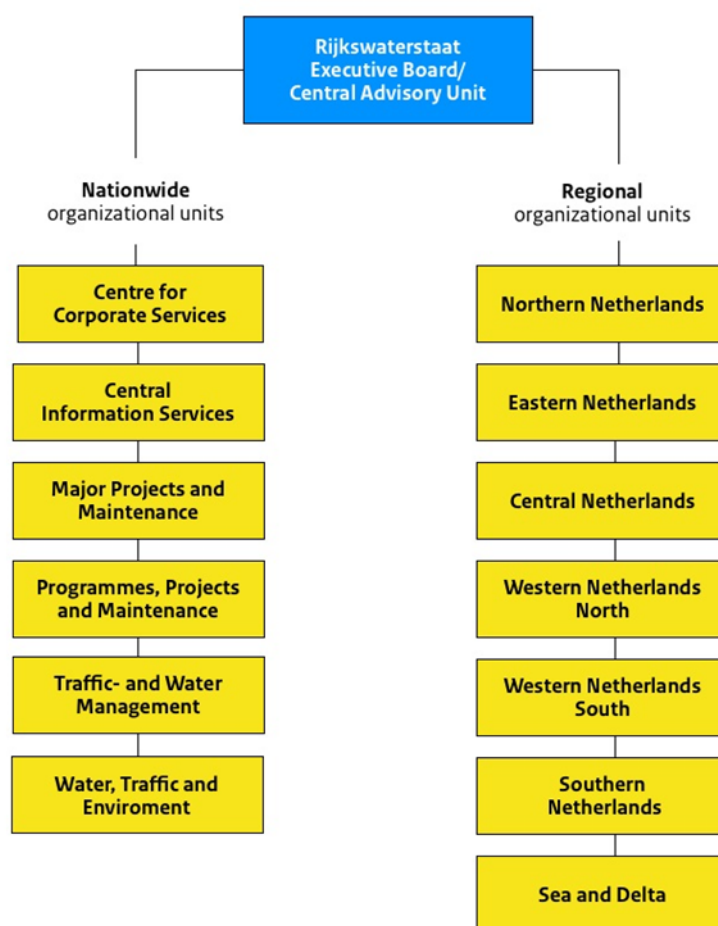


Figure 1: Organisational structure of Rijkswaterstaat



1.2 Policy of Rijkswaterstaat

The emphasis in Rijkswaterstaat policy (Market Vision) is working in cooperation with the market. This means that Rijkswaterstaat and its supply chain and service partners take joint responsibility for, among other things, to manage and extend environmental monitoring systems, surveillance systems, communication systems and related information systems, in a secure, sustainable, and efficient manner.

Along these lines, Rijkswaterstaat would like you to join, as a market player, in the investigation in a feasible and manageable roadmap for the acquisition and maintenance of primary radar systems.

An early approach to the market is one of the tools to make optimal use of market knowledge, skills, and creativity. In this way we will jointly analyse the assignment which RWS is facing, seeking the best solutions, and establishing the most beneficial procurement process and collaboration this is the most suitable.

1.3 Summary of the market consultation

The Netherlands is developing large windfarms on the North Sea to support the energy transition to a carbon footprint free economy (see **[OFSHWND]**). Also, the activities on the North Sea are intensified, due to shipping, fishing, recreational craft, environmental protected areas, creation of artificial reefs etc.

This calls for an extended monitoring of the North Sea as a whole, by means of, but not limited to, primary radar systems.

However, due to the harsh conditions and difficult accessibility far offshore, it is prevised that the current generation of radar systems used by Rijkswaterstaat have a reduced life span and will have increasing high maintenance costs.

Rijkswaterstaat has analysed the general requirements for future primary radar systems as described in chapter 4.

Rijkswaterstaat wishes to consult the industry about the possibilities, roadmaps, new developments that support the general requirements as formulated in chapter 4.

The procedure for consultation is elaborated in chapter 5 and comprises of:

- A questionnaire to be used as a guidance to compose a paper with current situations, developments, ideas, proposals, and suggestions;
- Individual consultations and brainstorming sessions (videoconference) based on the information provided for in the submitted paper;
- A final report with the results of all discussions will be published, taking confidentiality and legal constraints into account.

1.4 Objective of the market consultation

RWS is investigating a responsible and manageable roadmap for the acquisition and maintenance of primary radar systems and would like you to join us as a market party and partner. This can include a joint venture, a test/prototype environment, a proof of concept.

The objective of this market consultation is to explore the possibilities of primary radar systems, to be used in a sustainable, reliable and cost-effective way, for the surveillance of maritime surface targets in and around North Sea based wind farms and other remote offshore locations (dedicated platforms, solitaire poles).



1.5 Market consultation target group

Any interested party that considers itself able to contribute to this market consultation is requested to reply to the questions (see **[QUEST]**). The target group is primarily market parties such as:

- Radar systems development and production companies and associated research and development partners;
- Independent research companies involved in radar systems development and use of new technologies;
- Universities and departments involved in research and development of new technologies for radar systems.

1.6 Digital procedure

RWS uses TenderNed for all of her digital consultation and tender procedures.

This means that if you are interested in participating in the market consultation, you will have to register digitally to:

- Download all documents of the market consultation;
- Submit your questions and documents;
- Any other issues and remarks w.r.t. the market consultation.

Registered companies and institutions in the Netherlands shall use www.tenderned.nl with eHerkenning.

Foreign companies and institutions can register with username and password. More information about registration on TenderNed can be found on this site:

https://www.tenderned.nl/foreign_registration. If you have any problems with the registration, please send an Email (see *Colofon*) so we can help you.

1.7 Document Organisation

This document is organised as follows:

- Chapter 2** : Comprises the referenced documents.
- Chapter 3** : Gives an overview of the background and context of this market consultation.
- Chapter 4** : Discusses the considerations and general requirements for primary radar systems.
- Chapter 5** : Provides for a description of the procedure to be used in this market consultation.
- Chapter 6** : Gives an overview of the used definitions and abbreviations.

1.8 Appendix

[QUEST]	Market Consultation Questionnaire to be used by interested parties.
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2 Referenced documents

Identifier	Name
[CAT010]	Eurocontrol Specification for Surveillance Data Exchange ASTERIX, Category 010 Transmission of Monosensor Surface Movement Data
[CAT240]	Eurocontrol Specification for Surveillance Data Exchange ASTERIX, Category 240 Radar Video Transmission.
[IALA1111]	IALA Guideline 1111, Preparation of Operational and Technical Performance Requirements for VTS systems, edition 1.0, May 2015. See: http://www.iala-aism.org/product/preparation-of-operational-and-technical-performance-for-vts-equipment/
[NATAGR]	National Climate Agreement - The Netherlands, 28-06-2019 National Climate Agreement - The Netherlands Publicatie Klimaatakkoord
[OFSHWND]	Offshore Wind Energy https://www.noordzeeloket.nl/en/functions-and-use/offshore-wind-energy
[WOZEP]	Wozep ecological programme https://www.noordzeeloket.nl/en/functions-and-use/offshore-wind-energy/ecology/offshore-wind-ecological-programme-wozep/

Table 1: List of referenced documents



3 Background

3.1 National Climate Agreement

The Climate Agreement [**NATAGR**] is part of the Dutch climate policy. It is an agreement between many organisations and companies in the Netherlands to combat climate change. The government's central goal with the National Climate Agreement is to reduce greenhouse gas emissions in the Netherlands by 49% by 2030 compared to 1990 levels.

3.2 Planned wind farms North Sea

The Dutch government has selected and reserved areas on the Dutch Exclusive Economic Zone (EEZ) of the North Sea for the development of windfarms (see Figure 2).

The current plans are:

Blue colour: wind farms to be realised in 2023:

- Borssele (nearly ready for operation);
- Hollandse Kust Zuid;
- Hollandse Kust Noord.

These wind farms are relatively close to the shore and are therefore easy accessible for servicing (weather permitting) from harbours on shore.

Green colour: wind farms to be realised in 2030:

- Hollandse Kust West (2024-2025);
- Ten Noorden van de Waddeneilanden (2026);
- IJmuiden Ver (2027-2030).

These wind farms are more remotely located on the North Sea, making it more difficult to reach, have higher wear and tear and therefore it is expected that the cost for maintenance and transport will be much higher and repair time longer, reducing the availability of radar target data.

Remark:

Rijkswaterstaat will start in 2023 the procurement for primary radar systems to be installed in the Wind farm Hollandse Kust West.

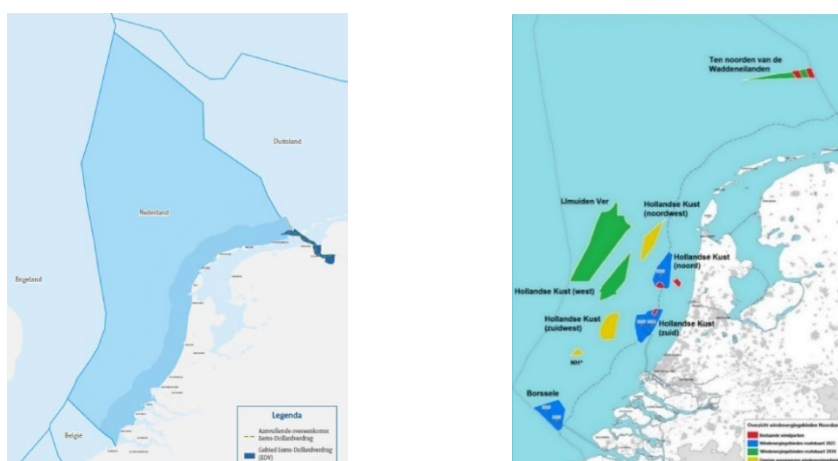


Figure 2: Developments in the Dutch Exclusive Economic Zone



3.3 Future developments

Additionally, to the 2030 plan, new wind energy areas, on top of the 2030 plan, will be allocated even further offshore at the North Sea. Those wind farms require enhanced monitoring (by means of, but not limited to, primary radar systems).

Also, to enhance the environmental conditions and facilitate sustainable and balanced nature on the North Sea, ideas are circulating to create artificial reefs, mussel beds etc (see [WOZEP]).

3.4 Enhanced monitoring of the North Sea

All developments previously mentioned will result in a multi-use North Sea including intensive shipping (commercial and recreational), fishing, wind farms and nature development.

To manage all these activities, more monitoring and communication systems, like sensors for wind, waves, temperature, currents, bird (flock) tracking, traffic detection and tracking and for Search and Rescue (SAR) operations (VHF-, AIS-, radar systems) will be needed.

It is envisaged that enhanced monitoring also in some cases will require the construction of solitary poles/masts equipped with primary radar, AIS, VHF and other sensors at remote offshore locations.

It is important to note that these solitary masts/poles must have their own carbon emission free energy production facility, as undersea cables are not economically feasible.

3.5 Participation of Rijkswaterstaat

Rijkswaterstaat is assigned to install and maintain all types of sensors (including primary radar systems) on the **Offshore Sub Stations (OSS)**, **Wind Turbine Generators (WTG)** and any other future offshore construction deemed necessary, collect all data and routing all data through a glass fibre network from WTG's, OSS to an onshore data distribution point. From this point Rijkswaterstaat acts as an information broker and will distribute data to stakeholders such as:

- Kustwacht (Coastguard);
- Harbour Traffic management;
- Weather Agency (KNMI);
- Environmental agencies;
- Owners of the WTG;
- Owners of the OSS.

3.6 Facilities of Rijkswaterstaat

Rijkswaterstaat has available an Offshore Expertise Centre with onshore testing facilities for experimenting, testing and acceptance of primary radar systems and other sensors, and system integration testing with existing VTS systems.



4 What are we looking for

4.1 Considerations

The conditions at the North Sea create a harsh environment for operational equipment:

- Weather: damp, salty atmosphere, high winds from different directions, temperature ranging from freezing to summer temperatures, heavy rain, snow, fog.
- Sea: high waves, strong currents and tides;
- Wind Turbines: (up to 200 metres tall), creating shock and vibrations, the high speed of the rotor blade tips creating vortices that can give heavy shock wind loads from different directions on the installed radar antenna systems.

These conditions jeopardize the availability and maintainability of radar systems:

1. Moisture and corrosion problems causing faster degradation than usual;
2. Shock and heavy vibrations creating extra fatigue on mechanical constructions, materials, and electronics;
3. Wind loads (especially vortices) can cause a breakdown of rotating components;
4. Availability is hampered, as a defect is not easily and quickly repairable due to weather and sea conditions. As a result, radar data may be unavailable for weeks, or even months;
5. Preventive maintenance is time consuming and costly. A ship must be rented for more than two or three days for remote offshore locations, schedules can change, due to the harsh weather predictions;
6. Corrective maintenance is difficult. Defects are not easy to repair. Firstly, you must be able to analyse the problem *onshore*, and what spare parts are needed. Secondly, you have to organise a repair team, rent a ship with crew or even sometimes a big offshore operatable crane for hosting heavy equipment. Also, the availability of spare parts can be an issue if not readily available.

It is envisaged that for traditional radar systems this will lead to complex maintenance schedules, a reduction of the life span and a high Total Cost of Ownership (TCO).

4.2 General requirements

Rijkswaterstaat is investigating existing primary radar systems and/or innovative developments that provide for enhanced availability, reduced maintenance, and better life span, resulting in a reduced TCO w.r.t. the current primary radar systems installed and in operation on the wind farms of the North Sea.

4.2.1 Climate conditions North Sea (Dutch EEZ)

The conditions are specified in [IALA111], table 7, Cold and basic.

- Temperature range: -30° to +45 ° C;
- Corrosion Category: C5-M (Aggressive marine atmosphere);
- Salt mist, hail;
- Wind measurements on the North Sea: up to 36 m/s average, up to 56 m/s wind gusts.

We are looking for radar systems that can withstand these harsh conditions with very low preventive and corrective maintenance requirements.



4.2.2 Conditions created by the WTG

The OSS is located in the wind farm and will be equipped with a radar system on a special radar tower with a total height of approx. 60 to 70 meter above sea level.

The WTG itself consists of steel monopiles with a diameter of up to 10 m. Radar systems are installed on small platforms, attached to the towers at a height of 20 to 30 m. The WTG introduces by its construction and operation:

1. *Shocks and vibrations.*
The severity is not known. Rijkswaterstaat is planning to install sensors for monitoring and measurement in the second half of this year;
2. *Vortices generated by rotor tips.*
As the rotor tips are moving at high speed, severe vortices are expected. Rijkswaterstaat currently has no information available with respect to the severity and the consequences of these vortices. We hypothesize that they induce added stresses on (especially) the moving parts of the radar antenna, both in the horizontal as in the vertical plane, and that increased fatigue can be expected, or even a breakdown.

We are looking for radar system that can cope with these conditions and withstand fatigue. Ideal will be a rigid construction with minimum or no moving/rotating parts.

4.2.3 Target Acquisition

Target acquisition requirements are specified in **[IALA1111]** table 10, with target position accuracies as specified in table 17, **X-band** with a radar cross section as specified in table 8, **X band** and a sea state as specified in table 12.

These capabilities are aimed at radar types "Standard" and "Advanced", as it is expected that both types will be needed, possibly with different instrumented ranges, depending on the position in and around the wind farms. We are aware that sometimes a trade-off must be made between performance, maintenance, and TCO.

We are looking for 2D (range-azimuth) radar systems that will meet these requirements (approximately, depending on construction and price).

4.2.4 Information processing and distribution

As transmission protocol for radar display video data, the EUROCONTROL Asterix Cat 240 as defined in **[CAT240]** is used. Discussions are ongoing to use also Asterix CAT 010 as defined in **[CAT010]** for plot and track messages. Ideally, these protocols must be supported to enable easy integration in our existing radar data processing systems such as surveillance systems and VTS systems.

We are looking for radar systems that can support these protocols as a minimum. Additional protocols are welcome if additional functionality is available and useful.



4.2.5 Availability and reliability

As the radars are situated on the Dutch Exclusive Economic Zone (see Figure 2), accessibility for maintenance and repair is difficult. If a malfunction occurs, repair time will be in the order of weeks, or even months, before a ship with crew is rented, necessary components are ordered and delivered. Also, weather conditions can result extra delay for weeks before a suitable weather window is found, especially in winter season. This will reduce availability of radar data and will endanger the monitoring of the North Sea

We are looking for radar systems with no single point of failure and the capability of "graceful degradation", meaning target acquisition is still possible, although in a reduced mode. This will enhance the availability and gives more time to repair

4.2.6 Maintainability

4.2.6.1 Preventive maintenance

Regular preventive maintenance with short intervals is expensive and difficult. Renting ships and crew for one or more days to perform simple maintenance tasks for a few hours, weather permitting, difficult accessibility and comprehensive safety measures and training will increase the Total Cost of Ownership considerable.

We are looking for radar systems that minimizes the need for regular preventive maintenance, using remote condition-based maintenance methodology to minimise the necessary maintenance and lengthen the maintenance interval period.

4.2.6.2 Corrective maintenance

Repairs can be elaborate and difficult to perform. If heavy components are needed offshore, a ship-based crane could be needed, which is very expensive. Also, if there are many different components, the required stock of spare parts could be space consuming and costly.

To determine onshore which components are defective or malfunctioning, adequate built-in test functionality (BITE) would be extremely helpful.

We are looking for radar systems, fitted with comprehensive build-in test and monitoring capability, comprising of a minimum of different components, lightweight and small enough to be handled without a crane, and easily exchangeable based on "repair by replacement philosophy".

4.2.6.3 Adaptive maintenance

Tuning, the settings of the system, implementation of software (security) patches and new software versions will be needed regularly, such as operating systems, drivers, application/radar software. The availability of on shore performance monitoring and easy installation/implementation practices for medium skilled personnel will be necessary.

We are looking for an onshore based service capability for remote performance monitoring and remote adaptive maintenance. This also means that used hardware is "future proof" and does not need much upgrading during the life cycle¹.

¹ 15-20 years



4.2.7 Energy consumption

Especially *low power consumption* of the primary radar system is important to support the construction of solitary masts/poles at remote locations that will have their own energy production with solar panels and other means of carbon free energy production.

We are looking for radar systems that have reduced energy consumption so that local carbon emission free energy and maintenance free energy production is feasible.

4.2.8 Sustainability

4.2.8.1 Sustainable systems/products

The Dutch Government policy is to procure systems and products that uses environmentally friendly materials that can be recycled, are easy to repair without waste, do not use environmental toxic paints and reduces the risk of fire.

We are looking for radar systems that comprises of materials that comply with the sustainability requirements as stated above.

4.2.8.2 Sustainable production

The Dutch Government policy prioritises sustainability as a major requirement in all cases of procurement and related services. This includes efficient production, minimising the needed energy used for production and transport, used materials, waste reduction and environmentally friendly waste disposal.

We are looking for radar systems that at least comply on all the aforementioned items on sustainability and energy consumption, at least in the near future.

4.3 Total Cost of Ownership

The investment does not only apply to the procurement of the radar system. It also includes engineering construction of the platform, cabling, installation, testing, shipping, setting to work, documentation, establish a maintenance organisation, reserve transport, etc.

However, a trade-off must be made between the investment costs and the operational cost (including spare parts, maintenance and possibly upgrades) during the life cycle (15 to 20 years). Ultimately, the Total Cost of Ownership is the most important parameter (based on net present value and including inflation).

We are looking for radar systems that minimise the Total Cost of Ownership (TCO), within the boundaries of a reasonable investment cost.



5 Market Consultation

5.1 Procedure

The market consultation will be launched with the publications of this document. The market consultation will be structured as described below:

1. *Questionnaire*
Rijkswaterstaat has prepared a questionnaire **[QUEST]** for all interested parties. The questionnaire is intended to provide RWS with an overview of relevant options available on the market. The market consultation starts by publishing this document containing the questions from RWS on TenderNed. Interested parties are invited to present, based on these questions, their views, ideas, and possibilities. Interested parties are not limited to these questions. If deemed necessary and relevant, additional items may be added.
2. *Submission of questions*
Any interested party may ask additional questions with respect to the questionnaire, using the facilities of TenderNed, enhancing the questions or any other subject or introduce other items, deemed relevant for this market consultation
3. *Submission of answers*
Rijkswaterstaat will combine all answers to each question from each interested party, without disclosure of the originator of the questions.
4. *Submission of questionnaire*
Interested parties are invited to submit the questionnaire **[QUEST]** with their views, ideas, possibilities, proposals, but not limited to these questions.

Also, additional (standard available) information, specifications, drawings and reports can be provided as appendixes.

Rijkswaterstaat will analyse the answers on the questionnaire and appendixes in preparation of the individual consultations.

5. *Individual consultations*
On the basis of the submitted reactions RWS keeps the option to invite a selection of parties to provide additional explanations to their answers one-on-one orally in response to the answers on the questionnaire by the parties. RWS will contact these parties to make an appointment (using MS teams meeting facility of Rijkswaterstaat).

The meeting could be supported by a presentation by the invited party. Participants of Rijkswaterstaat will be market analyst, procurement advisor, radar specialists and a management representative.

Rijkswaterstaat will coordinate the agendas and invitations for the meetings.

6. *Final Report*
Based on all received information (written and by the individual consultations) Rijkswaterstaat will compose a report. The report will be published on TenderNed.



5.2 Time schedule

We propose the following procedure and time schedule:

Nr	Activity	Remarks	Date
1	Publication on TenderNed by Rijkswaterstaat www.tenderned.nl (In the top-left corner you can change the language tot English)	Formal publication of the Market Consultation with questionnaire	02-07-2021
2	Questions w.r.t. the market consultation and questionnaire by interested parties	Latest moment for submission of questions	22-07-2021
3	Answers by Rijkswaterstaat w.r.t. the questions on the market consultation and questionnaire	Publication date of answers	26-07-2021
4	Submission of answers of the questionnaire by interested parties	Latest date	17-09-2021
5	Individual consultations for invited parties	Discussions based on submitted papers	4-10-2021 to 22-10-2021
6	Consultation Report	Publication of Market Consultation Report	Approx. 13-12-2021

Interested parties cannot derive any rights from the above schedule. Rijkswaterstaat reserves the right to change the dates of the schedule. The above schedule is therefore indicative, whereby the greatest possible care is taken to adhere to the schedule. The schedule published on TenderNed is leading.

5.3 Confidentiality

Rijkswaterstaat will *not disclose* any paper submitted and the minutes of the individual consultations in their entirety. Rijkswaterstaat shall disclose this information exclusively to selected employees and advisers who are directly involved in the Market Consultation and/or involved in the procurement, installation, and maintenance of radar systems, unless Rijkswaterstaat is bound by statutory regulations to make a more elaborated disclosure.

Rijkswaterstaat will use the information provided for the sole purpose of formulating a procurement policy, reserve the required budgets, drafting tender documents in a way that provides for a level playfield. Rijkswaterstaat will not include any specific references to participants or commercially sensitive information in the tender documents.



5.4 Other provisions

The Market Consultation is not part of any tender. In order to avoid putting Market Consultation participants in a privileged position, Rijkswaterstaat will disclose only necessary parts of the outcomes of the Market Consultation in the tender documents.

There will be no difference in the tender process between companies who have and those who have not taken part in this Market Consultation.

Information in this Market Consultation may differ from the information provided in any procurement process. No rights can be derived from the information provided in the context of the Market Consultation.

RWS will not, due to the government policy, award any payment to participants in the Market Consultation.



6 Definitions and abbreviations

6.1 Definitions

Definition	Description
Radar Data	The data output from a radar system to be distributed to the surveillance systems of the stakeholders such as: 1. Video presentation (display video); 2. Plot/tracks; 3. Health monitoring data. 4. Remote control of the radar.
Radar System	As defined in IALA guideline 1111; the transmitting, receiving and signal handling apparatus, delivering radar information w.r.t. tracking and presentation.

6.2 Abbreviations

Abbreviation	Description
BITE	Built-in Test Equipment
CIV	Rijkswaterstaat, Centrale Informatievoorziening
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities
OSS	Offshore Substation
RWS	Rijkswaterstaat
SAR	Search and Rescue
TCO	Total Cost of Ownership
WTG	Wind Turbine Generator