



AVINOR AS

Appendix A

Work description

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1 General

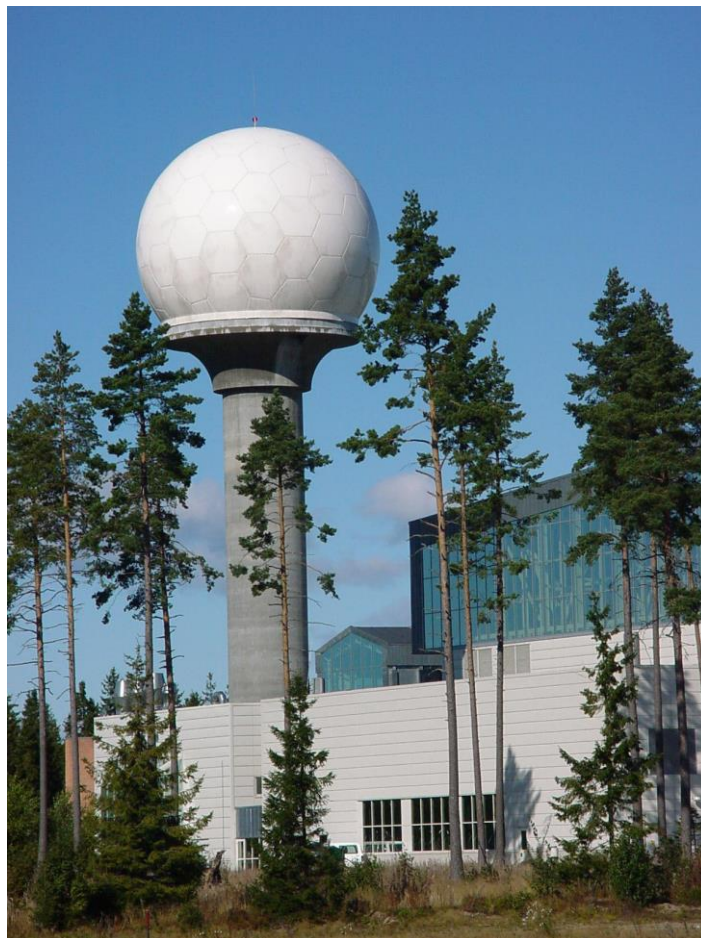
1.1 Introduction

Avinor AS is a state-owned limited company that operates the majority of the civil airports in Norway. The Norwegian state, via the Norwegian Ministry of Transport and Communications, controls 100 per cent of the share capital. The head office is located in Central Oslo. The company is self-financing.

Avinor owns and operates 46 airports in Norway, thereof several in cooperation with the Royal Norwegian Air Force. Operations include air traffic services, both locally at the airports and area control centres (located in Bodø, Stavanger and Oslo), and technical infrastructure for air navigation services.

Avinor has about 3,000 employees, including air traffic control, air navigation services, maintenance, administration and other airport operations personnel.

Avinor has a high focus on safety in all operations and is responsible for maintaining security at all airports in addition to continuously work towards limiting environmentally harmful emissions to air and ground and towards reducing aircraft noise.



Oslo Gardermoen is Norway's main civil airport and essential for Norway's economy. It is therefore important to ensure continuity of safe air traffic operations within this airport and airspace. Oslo Airport Gardermoen has two parallel runways 01R/19L and 01L/19R. Peak runway movements is around 80 movements per hour and approximately 224 000 movements a year.

The Airports Operational environment and more is described in appendix F – The Purchaser's Contributions.

Avinor AS will replace parts of our two oldest x-band Surface Movement Radar (SMR) installations at Oslo airport (Gardermoen). SMR East and West was installed before the opening of the airport in 1998. Major upgrade was done back in 2019 for the electronics, and our current system now is a combined Easat antenna & gear and Terma Scanter 5000 system.

Through this Contract the Contractor replaces mainly the outer parts such as antennas and gear etc.

A separate process will be launched for contracting the radome's.

1.2 Definitions and terminologies

In this appendix the following terminology is used:

Will - is used in connection with an action by Purchaser

Shall - to be used for mandatory requirements which are necessary for the delivery, design, calculations, etc. to comply with the specifications

Should - to be used for indication of a preferred or highly desirable solution and for evaluation, possible among several possible solutions.

Delivery/ Deliveries/ Deliverables – used to cover the delivery as a whole

1.3 Abbreviations

A-SMGCS	Advanced Surface Movement Guidance and Control System
ACP	Azimuth Change Pulse
ACU	Antenna Control Unit
APOC	Airport Operations Centre
ATC	Air Traffic Control
ATCO	Air Traffic Controller
ATSEP	Air Traffic Safety Electronics Personnel
CE	Conformité Européenne
CENELEC	European Committee for Electrotechnical Standardization
CMS	Control and Monitoring System
CNS	Communication, Navigation and Surveillance
DWG	Drawing file format
DXF	Drawing Exchange Format
ED	EUROCAE Document
ED-87	EUROCAE Document ED-87
ED-116	EUROCAE Document ED-116
EMC	Electromagnetic Compatibility
EUROCAE	European Organisation for Civil Aviation Equipment
FAT	Factory Acceptance Test
ICAO	International Civil Aviation Organization
IFC	Industry Foundation Classes
LAN	Local Area Network
LVP	Low Visibility Procedures
MS	Microsoft
MTTR	Mean Time To Repair
NEK	Norsk Elektroteknisk Komité
OEM	Original Equipment Manufacturer
OSL	Oslo Airport
RST	Radar Service Tool
SAT	Site Acceptance Test

SCADA	Supervisory Control and Data Acquisition
SCANTER	Terma SCANTER radar system
SIT	Site Integration Test
SMR	Surface Movement Radar
TN-S	TN-S earthing system with separate neutral and protective earth conductors
UPS	Uninterruptible Power Supply

2 Delivery Description

2.1 Intention, objective and scope of the delivery

The main objective, scope and delivery of this Contract is to reuse the existing site and electronics' and replace the antenna, gear, cables and related items. See appendix F - The Purchaser's Contribution for Operational environment and site information.

- [REQ 1] The Contractor shall be fully responsible for the delivery and shall include all elements needed to put the SMR back into operation, while meet the performance requirements set out in the Contact. This includes but is not limited to engineering, interface coordination, procurement, manufacturing, provide software, hardware and licenses, testing, installation, verification and prepare for taking into operation as set out in this Contract.
- [REQ 2] The Contractor shall be responsible for delivering all needed parts or similar to integrate to Avinor's existing equipment. E.g. Avinor has an existing waveguide for reuse, the Contractor provides a suitable fitting to interface their equipment.

2.1.1 Major elements within the Delivery of this Contract are:

- Complete Antenna System (Antenne, gear, motor, cables, ACU etc.)
- Safety interlock
- Interface to existing equipment
- System integration (e.g. SCANTER)
- Engineering, decommissioning, installation, testing and Commissioning
- Training
- Optional items

2.1.2 Major elements intended to be provided by the Purchaser through other Contractors:

- Decommissioning of existing radome
- New radome
- Crane - for a limited and reasonable amount of time
Should the Contractor desired/need addition time this is a cost for the Contractor

2.1.3 Major elements intended to be reused by the Purchaser:

- Foundation and metal construction
- SMR electronics (SCANTER)
- Waveguide incl. dehydration unit (Delair)
- Miscellaneous equipment inside radome (heater, dehumidifier etc.)

2.2 Contractor's responsibility

The Contractor's responsibility includes but is not limited to what is outlined below:

- The Contractor are fully responsible for the design and engineering to ensure that the end-result, after replacement, is again a complete functioning and operational SMR System. This includes all equipment's, materials, control systems and subsystems as described in this Contract.
- Provide training, documentation, describe, clarify and find solutions to all interfaces to other contractors or systems/facilities, and whatever else is necessary to ensure that all requirements included in the Contract is fulfilled and operating as intended, e.g. radome.
- Produce all manuals and procedures necessary for installation, testing, start-up, operation and maintenance of the systems.
- The submission and review of documents and drawings in cooperation with the Purchaser as a part of Contractor's own approval system.
- Minimize installation time, site testing time and commissioning costs through early and extensive factory testing and planning.
- Plan, prepare, perform and document all activities related to installation, testing, and start-up activities.
- Prepare and coordinate all documentation required to obtain any necessary approval by the Authorities, with special consideration towards Compliance.

2.3 Standards and regulations

[REQ 3] The design, execution and delivery should comply with the last revision of all relevant health and safety legislation, standards or code of practice for Europe and Norway. Please describe and show compliance with the following:

- ICAO Annex 10 & Doc 9830 A-SMGCS Manual
- EASA Commission Implementing Regulation (EU) 2017/373
- Relevant EUROCAE ED's
- ETSI EN 303 213-series
- 2014/53/EU Radio Equipment Directive
- 2014/30/EU EMC directive
- CE Certification of the Delivery
- Norwegian Machinery Directive
- NEK 400:2026 (Electrical low voltage installations) (NEK 400 is a Norwegian version of the IEC 60364 series, CENELEC HD 60364 series including some complementary national standards)

3 Design and performance requirements

3.1 General System requirements

The following items are key design criteria for the Delivery:

- a) Compliance with codes and regulatory requirements
- b) Detection of non-cooperative target
- c) Provision of situational awareness
- d) Minimize and safe execution of maintenance
- e) High availability
- f) Life Cycle Cost
- g) Energy efficiency

- h) Proven technology
- i) Robust and hardwearing

3.1.1 General

The Contractor must provide an advanced proven system, preferable “state-of-the-art” that do not require any further research and development, is in current production and in service in a number of other locations. Any requirements on the Purchaser’s side triggering development, or the Contractor’s own need for development to comply must be clearly stated in the Tender.

- [REQ 4] The delivery should be based on established/proven but future-oriented technology and solutions.
- [REQ 5] All parts of the delivery should be designed to provide good and safe conditions for personnel using, operating, maintaining or in other ways move close to the system.
- [REQ 6] The delivery shall be integrated with the existing SMR electronics, Terma Scanter 5502, which again is integrated to our A-SMGCS provided by SAAB.
- [REQ 7] The Contractor should be responsible for interfacing Scanter 5502 and further actively collaborate with the Purchaser (and our suppliers) to ensure ALL parties are coordinated and has the needed information to integrate the new Delivery for operational use.

3.1.2 Reliability and Availability requirements

The Delivery must support the airports need for high regularity. Availability, Reliability and Maintenance are characteristics of the overall system which shall be specified, designed, implemented, tested, validated and documented. The requirements below include interfaces.

- [REQ 8] The Delivery should be designed and constructed to operate 24 hours a day, all year around, for a minimum of 20 years. Availability, allowing for necessary maintenance, should be > 99.99%. The Contractor should provide calculations on the availability and reliability of the Delivery and clearly indicate all assumptions and conditions applicable to the calculations.
- [REQ 9] The Contractor should describe their level of redundancy for their Delivery.

3.1.3 System environmental requirements

The Delivery must be designed to perform within the environmental condition at the Purchaser’s premises. Tenderer must describe the systems design capabilities to handle the environment requirements within this section.

The Purchaser typically maintains a stable temperature in the equipment room between 20-23 degrees and will continue to have some heaters during winter inside the radome.

- [REQ 10] Deliveries installed equipment room should minimum be designed to operate within the limits of +10°C to +30°C, and a relative humidity from 10% to 80%.
- [REQ 11] Deliveries installed exterior to the equipment room should be designed to operate within the following conditions:
 - Temperatures from -35°C to +55°C
 - Relative humidity up to 100%
 - Hail up to a diameter of 12 mm at 17 m/s (exterior)
 - Rainfall up to 16 mm/hour
 - Icing up to 70 mm thick
 - Live load roof deck: 2,5 kN/m² (snow load)

- Max wind speed (3 second gust) for operation not less than 80 knots (41 m/s)
- Max wind speed (3 second gust) for survival not less than 120 knots (62 m/s)

3.1.4 Site and Infrastructure Requirements

The Purchaser will reuse the existing sites. Information and available drawings for the existing facilities is described in Appendix E - Other specifications and drawings and Appendix F – The Purchaser's Contribution.

The Purchaser will also separately purchase new radome's and replace them in the same period as the antenna system would be replaced.

- [REQ 12] The delivery shall be designed to fit into the existing facilities available and the Contractor shall provide design drawings (arrangement, layout, sections, structures etc.) as needed and clearly highlight and address possible optimization, *alternatives and critical points etc. e.g. antenna drive system mounting using/adapting to existing hole.

3.1.4.1 Cabling requirements

- [REQ 13] All cables installed indoors shall be halogen free, and outdoor as far as practical.
- [REQ 14] The installation should be designed to ensure 30 % spare capacity for future expansion upon finished. E.g. junction boxes, cable runs etc.

3.1.4.2 Electrical requirements

The Purchaser has good electrical capacity in the power distribution panel in the current installation. The AC power supply available is 230/400 Volt AC at 50 Hz. The distribution system is 3 phase, neutral + earth, according to IEC 364 3 TN-S system.

Uninterruptible power supply (UPS) will be provided at the main power switchboard inside the AFL substation. Maximum protection to be installed on the UPS is limited to circuit breaker B50/C25. The UPS short circuit delivery is 345A/400ms.

- [REQ 15] The Contractor shall take responsibility for all cabling from the power distribution panel and to his deliveries. The electrical installation includes but is not limited to:
- General installation work, numbering of cables etc.
 - Power switchboards, cabinets, etc.
 - Interfaces against networks, other systems, etc.
 - Earthing system
 - Cable runs, if needed
 - Documentation of completed work, selectivity calculation etc.
- [REQ 16] The Contractor should provide sufficient information, drawing and description with respect to electrical drawings and cabling, to enable the Purchaser to evaluate the Contractors compliance. All aspects regarding the electrical interface shall be further clarified during the design phase.

- [REQ 17] The delivery shall utilize the site-specific power distribution and UPS system provided by the Purchaser and the Contractor shall describe their electrical solution in his tender.
- [REQ 18] The equipment should be able to automatically handle voltage variations as seen in situations like UPS bypass operations without downtime, halting etc.
- [REQ 19] Based on past procurement experience we like to inform the Tenderer that Norwegian law of electricity NEK 400-6 2026 has special requirements that might not be commonly known. (NEK 400 is a Norwegian version of the IEC 60364 series, CENELEC HD 60364 series including some complementary national standards). Please describe how you intend to comply to this standard and the information and requirements below.
- All phase conductors and neutral conductor must be protected and break simultaneously. This is because in Norway the N-leader is seen as a live conductor.
 - All personnel that install or is working with the electrical system shall be certified electrician.
 - For the Purchaser to put voltage on the installation, the following shall be fulfilled, Verification according to NEK 400-6 2026:
 - Declaration of conformity
 - Final inspection:
 - Short-circuit current IK1-pol min (verifies automatic shutdown of the protection in distribution by a short circuit)
 - Earth continuity (verifies that the earth connection is complete)
 - Insulation measurement of the installation
 - Risk assessment
 - Documentation of the installation

3.1.4.3 IT infrastructure and requirements

The Purchaser will provide the physical network (Ethernet) equipment (switches, routers etc.) which is the common IT infrastructure for all systems at the airports. See Appendix F – The Purchaser's Contribution for more details.

- [REQ 20] The Delivery shall use the Purchasers' network infrastructure to exit the radar site and work in a routed environment.
- [REQ 21] The Contractor should in his tender describe their solution and clarify interface to the Purchasers IT network which shall be further evolved and detailed during the design phase.

3.2 Antenna System

This section and requirements within are intended to cover all parts and items needed for this Antenna System replacement. E.g. antenna, gear, motors, cables interlocks, switchboards, pedestal, ACU.

3.2.1 Airport Layout and Coverage Performance

The airport has a total of three SMR radars with overlapping coverage areas as far as physically possible. Please refer to drawings in Appendix E - Other specifications and drawings showing the airport layout.

- [REQ 22] The Contractor should provide theoretical coverage diagram for the true geographical SMR area.

[REQ 23] The Delivery should be fully compliant with the ED-116.

3.2.2 Antenna system

[REQ 24] The turning unit should be of a low noise type and ensure that audible noise and vibration are kept to acceptable levels with respect to the environment.

3.2.2.1 Safety

[REQ 25] The SMR shall be logically designed to prevent and reduce damage to people and equipment and provide protection in accordance with existing regulations and best safe practice.

[REQ 26] All safety switches shall be self-controlling and if one switch fails to function it shall not be possible to operate the SMR system without special precautions until repair has been performed. The occurred fault must be indicated to the CMS.

[REQ 27] The Delivery should include a complete safety interlock function (disable antenna drive/ transmitter power) which should replacing the existing solution.

[REQ 28] It should be possible to perform controlled start and stop of the antenna locally inside the radome, for maintenance and test purposes, in a safe way.

[REQ 29] The system safety solution should include some form of manual lockable mechanical interlock that prevents movement of the antenna during maintenance.

[REQ 30] Safety devices should be incorporated to shut down the SMR antenna unit automatically under abnormal operating conditions such as may cause serious damage, e.g. bearing failure, low oil level, and drive motor overload.

[REQ 31] It should be possible to control and monitor the SMR antenna locally in the equipment room, preferable through the existing Terma RST software.

3.2.2.2 Start-up procedures

[REQ 32] The SMR antenna drive unit should be designed to minimise excessive torque during start up.

[REQ 33] The SMR should restart automatically following a disruption of service due to power transients or outages.

3.3 Control and Monitoring

For the Control and Monitoring System the Purchaser has Terma RST software in use and the intention is the reuse this and integrate the new Delivery through this interface. However, should this interface not be able to integrate parts of or all of the Delivery, the Purchaser still needs a working solution which must be delivered. The Terma RST further provides important information on to the Airport SADA system for APOC.

The Purchaser expects monitoring points from the Delivery, such as all essential critical system operation parameters as well as informational input (e.g. antenna speed, temperatures, oil level, noise, vibration, humidity etc.).

The Purchaser's strongly desires all the data to be easily available for integration to other internal platforms and application. E.g. Web-application in the SMR-LAN, Power BI, etc.

3.3.1 General

- [REQ 34] The Contractor should use Terma RST software as integration point as far as possible.
- [REQ 35] The delivery should include extensive monitoring data through the existing CMS system. Please provide an exhaustive list of all data that can be provided, also include any additional options that might be available (also options that might not be able to go through the existing CMS).
- [REQ 36] The Contractor should describe their output- and integration solution and other formats the data can be delivered on.
- [REQ 37] Failure to the CMS function should not cause failure to the SMR system.

3.4 Maintenance and maintainability

The Purchaser strongly desires a well-built system with a minimal need of maintenance with a foreseeably Maintenance Program that supports a reduction in corrective maintenance. Upon corrective maintenance, the replacement should be solved as smooth as possible. Low frequency of needed maintenance and inspections will be evaluated positive. Automated inspections or other aid (such as extensive monitoring capabilities) could also be evaluated positive.

3.4.1 General

- [REQ 38] The delivery should have great maintainability and need low amount of maintenance. Please provide detailed explanation of the maintenance.
- [REQ 39] The antenna motor should be quick to remove and install and should be able to be transported/lifted by use of a small standard hoisting system. E.g. have some sort of lifting lug or similar mounted onto the motor.
- [REQ 40] For test purposes ACP, north-pulse and all voltage outputs should be available on easily accessible sockets and/or test points.

3.4.2 Spare Parts

It's very important to the Purchaser that after a failure or break down of any part of the system through the systems lifetime, the Purchaser can order any part of the system, replace the part and thus restore the system to complete operation again. Parts should to the largest degree be possible to be shipped straight away.

The Purchaser's intention is to keep a small storage of spare parts locally. To which degree will be decided at later state, after award of Contract.

- [REQ 41] The Contractor shall provide a complete list of all spare parts, consumables etc. by filling in and completing Appendix B1 - Spare Parts - Cost Breakdown.
- [REQ 42] The Contractor should maintain a complete stock of spare parts for all equipment and systems delivered, for purchase by the Purchaser, throughout a period of at least fifteen (15) years after the date of the Performance Certificate. The purpose of this is to ensure the continuous operational throughout the designed lifetime period.
- [REQ 43] Contractor should provide a set of spare parts and consumables necessary for continuously operation and maintenance for the first 24 months.
- [REQ 44] The Contractor should maintain a complete stock of spare parts for the Delivery, for purchase by the Purchaser, throughout a period of at least fifteen (15) years after the date of the Performance Certificate. The purpose of this is to ensure the continuous operational throughout the designed lifetime period.

4 Training

The Purchaser's CNS unit has many systems to maintain and supervise. This leads to challenges when combining higher individual stability of each system and the reduced need for day-to-day interaction. Thus, an intuitive system design and manuals combined with well executed training is key for the Purchaser's CNS unit to perform their job when required.

It's the Purchaser's intention that the CNS unit's key personnel, as far as possible, take part in the design, installation, tests and formal training, to become as skilled as possible before system is put into operation. The Purchaser emphasizes practical approaches to increase the value of training. The Purchaser will ensure normal meeting room facilities when on-site.

- [REQ 45] The Contractor should provide OEM-delivered ATSEP System/Equipment Rating Training for the Delivery. The training must enable ATSEP personnel to operate, maintain, troubleshoot and restore the Delivery. The training should cover all parts of the Delivery and involve theoretical and practical (On Job) training, and as a minimum include:
- System overview
 - Operational instructions
 - Maintenance instructions
 - Error localization
 - Repair the system, within the frame of the maintenance concept
 - Upgrading and system improvement instructions, including adjustment of system parameters
 - Software settings (parameters) and to be introduced with their impact on the system.
- [REQ 46] The instructors shall be well skilled and master communication in either English or Norwegian.
- [REQ 47] The Contractor should propose a training program/plan that incorporates the required guidelines:
- Purchaser's maintenance staff shall participate in the installation and testing phases on site.
 - First training session should be held prior to and in connection with any FAT(s) in order to understand the system before the FAT is held.
 - Second training session is intended to be held at site, immediately prior to SAT and going into operation.
 - Number of participants would be less than 10 for any session
- [REQ 48] The Contractor should, no less than 2 months before the start of any training provide a training plan and content for review by the Purchaser. Suggestions and adjustments provided by the Purchaser should be incorporated and training documents must be approved by the Purchaser before any training starts.

5 Documentation

It's important for the Purchaser that when this project is completed, the Purchaser has a documentation package that is complete and as-built, and that it does not contain information that makes room for doubts or interpretation errors etc. The Contractors documentation obligation applies regardless of whether the documentation is expressly specified in the requirements specification or not. As long as the documentation is necessary or natural in order to understand, use, operate, maintain, control or further develop the delivery it must be delivered.

Detailed documentational requirements can be found in Appendix D - Administrative and ethical provision with sub-appendices and supporting documentation.

- [REQ 49] The Contractor shall produce a document register overview stating all documents and files intended to be delivered throughout the project. A template will be provided by the Client.
- [REQ 50] The Contractor should prepare, update and hand over all documentation necessary for the Purchaser to be able to fully own, manage, operate, maintain, modify, further develop, control, document and verify the delivery throughout its lifetime. The documentation must include all documentation related to the delivery, including but not limited to:
 - a. the design basis, calculations, technical descriptions, system descriptions and function descriptions, drawings, models, sketches, layouts, wiring diagrams, one-line diagrams, interface descriptions, configuration documentation and "as built"/"as built" documentation.
 - b. product data sheets, material documentation, declarations of conformity, certificates, approvals, test reports, inspection reports and balancing protocols.
 - c. operational, maintenance and management documentation, including maintenance documentation, spare parts lists, service intervals, troubleshooting procedures and recommended maintenance programmes.
 - d. training materials, user manuals, administrator guides and other documentation necessary for safe and prudent use.
 - e. regulatory documentation and other documentation necessary for approval, use permit, certification, audit, supervision, regulatory compliance or other documented conformity assessment.
- [REQ 51] The Contractor should update the existing documentation anywhere their Delivery supersedes the current, alternatively deliver their own documentation while integrating information from existing documentation to ensure completeness. It is the Purchaser's highest intention to find minimum-effort solutions to the existing documents that are interfacing to this Delivery without sacrificing completeness. The Purchaser has identified 14 documents (drawings, wiring diagram, description, manuals etc.) that is expected to be replaced or updated.
- [REQ 52] The documentation should be submitted in English, and in editable and generally usable digital formats. Drawings and models must be submitted both in relevant original editable format and in readable publication format, e.g. DWG/DXF/IFC/Revit/Visio where relevant, as well as PDF. The documentation must be structured, complete, searchable, version-controlled and unambiguously linked to the delivery.
- [REQ 53] All documentation Maintenance and technical documentation shall also exist in paper form.

6 Engineering, Manufacturing and Installation

This chapter provide some requirements but is mostly intended to give an abstract to the process. See *Appendix D - Administrative and ethical provision* with sub-appendices for more details.

All engineering to be performed by the Contractor under this contract must be implemented through a Design Phase where the Purchaser actively will participate in the system design and development throughout all phases of the project.

All work, materials, components, etc. must be carried out to a first-class standard within the requirements stated in the Contract as well as any contemporary “state of the art” standard currently present at the completion of the work/hand-over.

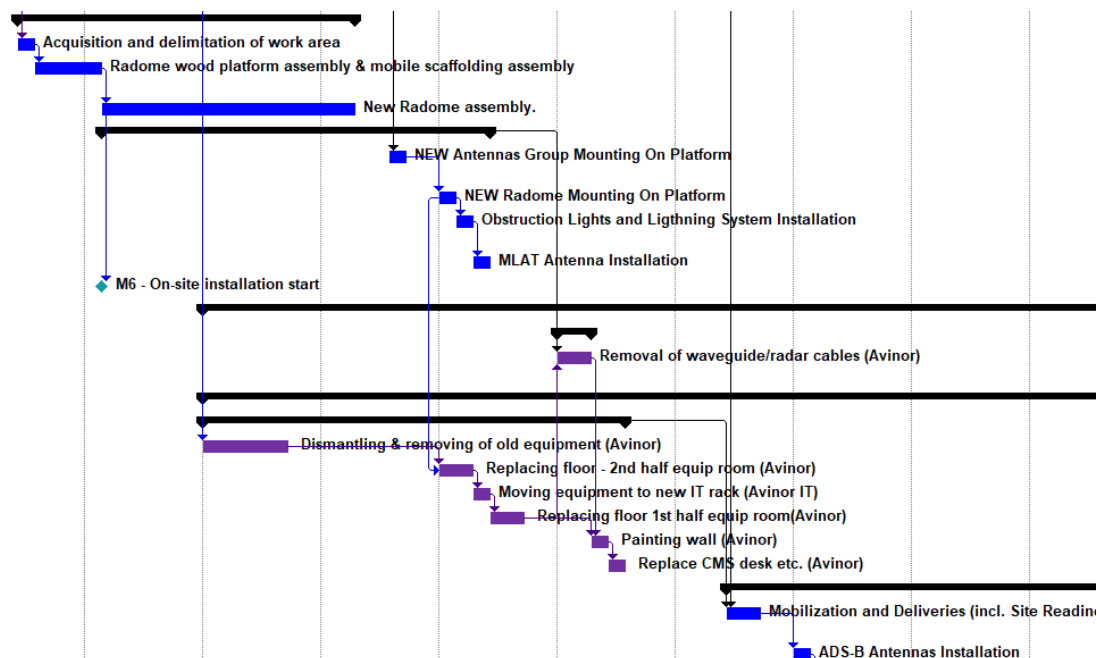
6.1 General

- [REQ 54] It is the intention of the Purchaser to use the Purchasers framework agreement to remove the existing radome's. The remaining equipment to be replaced through this Delivery should be decommissioned by the Contractor.
- [REQ 55] All equipment and cables should be physically labelled according to the Purchaser's specification, see Appendix D - Administrative and ethical provision. The Contractor can use their own in parallel.
- [REQ 56] Finishing should be selected to prevent damage from all possible combinations of atmospheric deterioration, corrosion, mould and pollution, and shall in no way be a potential health hazard to manufacturers, installers, operators, users or environment. Please clearly state finishing for the different component.

6.2 Installation plan/schedule

The project in total consists of several different contracts and contractors/sub-contractors, and it is critical for the quality and progress that all the contractors co-operate both in the planning and executing phase to optimize the total project plan.

As this Delivery is the most complexed contract, the Purchaser intention is to let this contract be the backbone of the schedule and the other work/contracts would add to and adapt onto this delivery schedule. Such a merge has been done with great success on prior projects and radar replacement as can be seen below:



Below is a list of other known Contractors:

- Radome
- Radome mounting Contractor
- Crane company
- Electrical Company

- Avinor work

- [REQ 57] The Contractor should produce a detailed MS project Gant chart (similar format could be agreed) for their entire Contract delivery. The purchaser will add all known other Contractors/work etc. to this chart to make one shared schedule. This would then be updated throughout the project in cooperation with the Purchaser.
- [REQ 58] The Contractor should review Appendix C which outlines the desired progress and provide a proposal.
Note: Due to the LVP-season and the risk and implications to operation without function SMR, the work on the second site (M13) cannot be started if there is issues or insecurity related to the status of the first deliver/site or there is an overhanging risk that the site would be restored too close or into the LVP-season. Should this be the case, replacement of second site would most likely be moved to the next summer window.

7 Inspections and Testing

As part of the projects planning activities, the Contractor must in cooperation with the Purchaser and his interface partners, agree on a detailed test and verification plan. This must be done in due time, but no later than before the installation phase commences. Inspection and testing do not relieve the Contractor of any obligation.

The Purchaser has good experience with testing numerous deliveries, many within this field and thus intends to continue our verification and testing through these steps. The steps are further described below.

7.1 General

- [REQ 59] Through the inspections and testing it should be verified that the Delivery is in accordance with the requirements of the Contract, this includes Compliance verification and operational acceptance for the SMR system as a whole, but limited to where the Delivery has impacted the SMR system.
- [REQ 60] The delivery should as a minimum be inspected, tested and verified according to the following principal steps:
- a) Pre-FAT
 - b) Factory Acceptance Test (FAT)
 - c) Compliance verification
 - d) Mechanical and electrical inspections
 - e) Site Integration Test (SIT)
 - f) Site Acceptance Test (SAT)
 - g) Stability Test Period
 - h) Delivery/Handover inspection
- [REQ 61] The Contractor should demonstrate all parts of the Delivery. Any part that is not intended to be demonstrated, must be stated and explained. Contractors' proposal for when all requirements is intended to be tested must be clearly stated.
- [REQ 62] The Contractor should make a test plan/program that verifies all parts of the Contract work and submission of the specific test specification should be no less than 2 months prior to the start of each test to ensure agreement on test scope, level and details.

- [REQ 63] A team from the Purchaser's side shall be allowed to attend and participate in all tests and verifications of the Delivery. The Purchaser does not intend to attend conduction of the Pre-FAT.

7.2 Pre-Factory Acceptance Test

To ensure that the deliveries are ready for FAT inspection the deliveries must be tested before Purchasers arrival.

- [REQ 64] The Contractor shall conduct necessary Pre-Factory Acceptance Test(s) (Pre-FAT) in accordance with the agreed FAT specification and records of the tested objects(s) shall be forwarded to the Purchaser no less than 14 days prior to the upcoming FAT.

7.3 Factory Acceptance Test

- [REQ 65] The Contractor shall conduct a Factory Acceptance Test (FAT) in accordance with the agreed FAT specification, the Purchaser plan to attend.

7.4 Compliance verification

With the new EU regulation, the purchaser cannot put the new system into operation before we can demonstrate Compliance. As the SMR capacity is critical for the airport during low visibility this puts this replacement project at a high risk for the airport. It is therefore a goal that Conformity Assessment is completed before the existing SMR is shut down for replacement.

As per time-of-writing Avinor must receive sufficient evidence that the delivery is compliant and the Contractor should expect active focus on this subject already from Contract signature.

- [REQ 66] The Contractor shall aid and support the Purchaser in Conformity Assessment and deliver all requested Supporting Documentation required so that the Purchaser can demonstrate Compliance.
- [REQ 67] Conformity assessment should be able to be demonstrated before on-site work starts.

7.5 Mechanical and Electrical Inspections

Several non-formal mechanical and electrical inspection must be conducted throughout the installation phase (e.g. by Purchaser's Trade foreman) and should be fitted into the schedule in appropriate time in cooperation with the Contractor.

These inspections must be made prior to the commissioning of the system as for example the electrical engineer requires electrical documentation to approve the installation in order to provide voltage to the system. Another example would be a thorough mechanical inspection of the antenna system is carried out before disassembly of the crane.

- [REQ 68] When the installation work has been completed by the Contractor, a formal verification that the Contract work has been completed should be carried out. The inspection should comprise of both mechanical and electrical inspection and must be conducted together with the Purchaser.
- [REQ 69] The Contractor should plan the inspection and produce the relevant inspection protocols/documents. The Contractor should divide the inspections as needed to ensure optimal progress.

7.6 Site Integration Test (SIT)

The purpose of the SIT is to ensure connection can be establish between this Delivery and interfacing systems, and that data format are exchanged as intended. The Purchaser considers the

practical execution of the SIT to be more informal and conducted in parallel and fitted in between other work in the time frame between Compliance verification

With the new EU regulation, the purchaser cannot put the new system into operation before we can demonstrate Compliance. As the SMR capacity is critical for the airport during low visibility this puts this replacement project at a high risk for the airport. It is therefore a goal that Conformity Assessment is completed before the existing SMR is shut down for replacement.

As per time-of-writing Avinor must receive sufficient evidence that the delivery is compliant and the Contractor should expect active focus on this subject already from Contract signature.

- [REQ 70] The Contractor shall aid and support the Purchaser in Conformity Assessment and deliver all requested Supporting Documentation required so that the Purchaser can demonstrate Compliance.
- [REQ 71] Conformity assessment should be able to be demonstrated before on-site work starts.

Mechanical and Electrical Inspections and Site Acceptance Test (SAT).

Practical examples of SIT could be establishing connection to web—interface for delivering data or confirmation on connection to Scanner. To clarify, the SIT does not intend to verify the correctness of all data delivered at this stage, it is to ensure progress.

- [REQ 72] During the SIT the Contractor shall be available to assist with clarification and troubleshooting on their side should issues/questions occur.
- [REQ 73] All interfacing parts of the Delivery should include an SIT, unless otherwise agreed.

7.7 Site Acceptance Test (SAT)

The intention of the SAT is that at the point of completion and approval, the delivery meets all technical- and performance requirements to go-live, and all interfaces are up and running.

The Purchaser expects the SAT to comprise of several sub-tests to ensure completeness. This would include the Contractors SAT test, Integration and tuning on SCANTER system, ED-116 and A-SMGCS verification to name the most obvious.

The Purchaser presumes that A-SMGCS needs to adapt to the new antenna/sensor. The impact could result in the need to conduct an additional ED-87 verification (regression or partial) before the SMR again can be put back into operation. The Purchaser will be responsible for the A-SMGCS integration and conducting the ED-87, but the Contractor must assist with clarification, information and tuning on their side to ensure this can be resolved with a minimal effort.

- [REQ 74] The Contractor should together with the Purchaser conduct SAT in accordance with the agreed SAT specification and intention as stated above.
- [REQ 75] The Contractor should correct errors as quick as possible.
Errors leading to an unsuccessful SAT must be corrected within 14 days.
Minor defects of no influence of the operation of the system and/or the stability Test Period must be corrected within 30 days.

7.8 Stability Test Period

After the system has been put into operation the Stability Test Period of 90 days shall commence. During this period, the delivery must be monitored carefully to verify stable operation and performance. However, if there are other circumstances triggering a longer Stability Test Period, the longest Stability Test Period shall prevail.

The Purchaser will let the system run without interfering with it, but should an issue occur that results in operational issues or risk of operational issues for the airport, the Purchaser's ATSEP personnel will have to interfere in an attempt to clarify or resolve the issue to get the system back into operation again. Such interference is on behalf of the Contactor and on the Contractors responsibility.

After the Stability Test Period is completed without significant defects, the Stability Certificate will be signed.

- [REQ 76] The Stability Test Period shall and can be started only after the SAT is approved and the Delivery is in a fault-free stable condition. The Purchaser could accept to start even with minor defects of no influence of the system, but this would have to be assessed based on the nature of the defect and at the discretion of the Purchaser.
- [REQ 77] The Contractor shall be responsible for maintenance of the system during the Stability Test Period. Any work on the system executed by the Purchaser's personnel shall be on behalf of the Contractor and on the Contractor's responsibility.
- [REQ 78] From the start of installation/decommissioning through the Stability Test Period the Contractor should have a high response for rectifying/preventing errors or irregularity that creates a risk of damage or adversely affect airport operations. For such events and when not on site, the Contractor should guarantee a maximum response time of 2 hours for remote support and where a site intervention would be needed, they should guarantee intervention within 24 hours.
- [REQ 79] If the Delivery has a malfunction, not caused by external factor (e.g. power outage, lightning strike) during the Stability Test Period, the Contractor should correct the malfunction, and the Stability Test Period should be restarted.
- [REQ 80] The Contractor should ensure good parts availability in case of issues with the installed equipment occurs. The Purchaser expects the parts for the second Delivery to be available on-site during the replacement of the first site. This would ensure minimal MTTR time. The Contractor should further clarify their parts availability during the second replacement.
- [REQ 81] After the final day of the Stability Test Period has been completed there shall be conducted a thorough inspection to ensure no undetected issues

7.9 Delivery/Handover inspection

- [REQ 82] Handover shall be executed according to the Contract after the Stability Test Period is completed and all the defects from previous tests and inspections has been corrected and validated as durable. Ownership is transferred to the Purchaser, and the guarantee period commences.

8 Optional Items

8.1 Buy-back of the decommissioned equipment

Although the equipment is old, it might still be useful parts for others (e.g. refurbish and resell). Actions to reduce the impact on the environment are important to the Purchaser and we would like to understand more of what the Contractor does to minimize such waste.

- [REQ 83] The Contractor should propose a buy-back option of the parts replaced by this Delivery, it could be either the whole lot or selected parts.

8.2 Reuse of the ACU

The Purchaser installed the existing Scanner ACU in 2019 and it could be an option to reuse it.

- [REQ 84] Please provide insight to what such a reuse could imply, both upsides and downsides. Reuse would presumably push an ACU replacement sooner in time and the Purchaser would like to know what work/cost would lie in just an ACU replacement as a stand-alone replacement.

8.3 Alternative options

The purchaser might be unaware of options or features that would be beneficial to the Purchaser, and which would have been required if known. The Contractor can propose to deliver relevant alternative options should they choose to.

- [REQ 85] The Contractor should deliver alternative options related to this delivery if such options are available.