

Technical Specification for the replacement of a generator stator and inspection of the generator rotor.



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Reviewed and updated accordingly by Uniper Benelux N.V.



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1 INTRODUCTION

The installation of Uniper Benelux B.V in Leiden comprises a steam turbine generator and two gas turbine generators.

Uniper intends to keep the above-mentioned E-installations safe and operational in the coming years.

DNV Energy has carried out an inspection of the steam turbine generator (3MKA10) of the Leiden power plant.

After this inspection with on – and offline diagnose measurements carried out in September 2020 Uniper has concluded that the stator must be replaced. The stator will be replaced by an identical spare stator, separately rewound and available at Uniper. During the replacement of the stator, the generator. A major overhaul at the rotor is performed in 2017 and must be inspected during this overhaul.

This document describes the “Scope of Work” (SOW) for the replacement of the current for the rewound stator, and the inspection of the rotor. The replacement and overhaul are planned for 2023, during a plant shutdown.

2 PREAMBLE

This technical specification is applicable to the replacement of the stator, and the inspection of the rotor at the Uniper Leiden Power Plant.

As a responsible organisation Uniper strives to create a working environment that safeguards the health and safety of everyone connected with our business. We make safety an integral part of everything we do based upon the principle “We don’t hurt people”. (Citation: Uniper Generation Fleet Safety Management).

The CONTRACTOR is responsible for the complete and professional performance of the overhaul scope and for the proper disassembly and reassembly of the overhaul scope in accordance with the latest state-of-the-art / good engineering practice. It is the objective of the overhaul to provide a fully functional and operationally reliable generator.

The CLIENT requires the CONTRACTOR to provide, from the beginning of Contractor’s work technical specification, direct feedback of experience in order to enable the CLIENT to consider, already during the outage planning phase, options for technical, economic and process optimization of the generator and the overhaul process.

The CLIENT is entitled to have its interests represented by a third party, for instance DNV Energy.

3 PLANNING

The re-installation and the rotor inspection must be performed during the plant shutdown from week 35 up to and including 38 2023 (28-08-2023 up to 24-9-2023)

4 CONFIDENTIALY

The CONTRACTOR commits itself to keep all information contained in the Technical Specification strictly confidential. The CONTRACTOR is hereby instructed that any documents handed over or disclosed to the CONTRACTOR under this Technical Specification shall only be used for the performance of the scope of maintenance and overhaul work specified hereinafter.

5 ADDRESS OF THE PLANT LOCATION

Location of spare generator stator:

Uniper Benelux N.V.

De Constant Rebecqueplein nr 20

NL-2318 RC Den Hague

Location of the stator replacement + Rotor inspection:

Uniper Benelux N.V.

Maresingel 21e

NL-2316HB Leiden

An access protocol has been drawn up for people who wish to enter Uniper sites. Everyone must be able to identify themselves with a valid passport or ID.

Please note a driver's license is not accepted!

A contractor who comes to carry out work is also obliged to provide a valid VCA certificate. This must be shown on the first visit.

Please note that as a visitor or contractor, you must register 24 hours in advance at the relevant location via the hyperlink:

<https://uniper.work/>

It is mandatory to follow the gate instruction and then answer safety questions.

The obligation of personal protective equipment on the UNIPER sites is at least: **fire retardant** clothing with long sleeves, a helmet, safety goggles and safety shoes.

6 DATA OF THE GENERATORS

6.1 Data of the current generator in service (Leiden)

Manufacture	Smit Slikkerveer
Type / serial number	DTG / 37645
Year of manufacturing	1952
S_N [kVA] / Kw	37500 / 30.000
U_N [V]	10500
I_N [A]	2060
$\cos \phi$	0,80
f_N [Hz]	50
Total Mass / stator / rotor	54 T / 41 T / 13 T
Rated speed [rpm]	3000
Rotor voltage	220 V
Rotor current	680 A

6.2 Data of the rewound stator (To be stored after rewinding in The Hague)

Manufacture	Smit Slikkerveer
Type / serial number	DTG / 37640
Stator Core year of manufacturing	1953
Stator winding year of manufacturing	2022
S_N [kVA] / kW	37500 / 30.000
U_N [V]	10500
I_N [A]	2060
$\cos \phi$	0,80
f_N [Hz]	50
Stator mass / support frame	41 T / 6 T
Rated speed [rpm]	3000

7 ROLES AND STANDARDS

- IEC 60034 Rotating electrical machines – alle relevante delen, ten minste:
 - 1 rating and performance
 - 23 Specification for the refurbishing of rotating electrical machines
 - 27-1 off-line partial discharge measurements on the stator winding insulation of rotating electrical machines
 - 27-3 Dissipation Factor measurement.
 - 27-4 and IEEE43-2013 Measurement of Insulation Resistance and Polarization Index
- ISO 1940 mechanical vibration - balance quality requirements for rotors in a constant (rigid) state
- ISO 7919 Mechanical vibration of non-reciprocating machines – measurements on rotating shafts and evaluation criteria
 - 1 general guidelines
 - 3 coupled industrial machines
- ISO 10816 Mechanical vibration – Evaluation of machine vibration by measurements on non-rotating parts
 - 1 general guidelines
 - 3 Industrial machines with nominal power above 15 kW and nominal speeds between 120 r/min and 15 000 r/min when measured in situ
- ISO 4386 Metallic multilayer plain bearings
 - 1 Non-destructive ultrasonic testing of bond thickness greater than or equal to 0.5 mm
 - 2 destructive testing of bond for bearing metal layer
 - 3 non-destructive penetrant testing
- KEMA S13/14 KEMA specification for hydrogen, liquid and air-cooled synchronous a.c. generators with rated voltage 5 kV and above
- KEMA S22 DNV KEMA specification for diagnostic measurements on rotating electrical machines

8 OPERATING BEHAVIOUR OF THE STEAM TURBINE GENERATOR SET

Current operating behaviour

The generator cannot be operated across the entire load range, this is depending on the amount available steam. The nominal capacity is reached at around 20MW. The running behaviour of the steam turbine generator set according to NEN ISO 10816 and NEN ISO 7919 is classed in "Zone B" at nominal speed. During start-up there are critical points where it passes zone "D".

Operational and maintenance abnormality / major concerns

- Balancing weights in rotor are made of tungsten and have been changed in 2020. Extra information about this is added as an attachment of this Scope.
- Some suspected movement/PD-markings at the generator Bushings. (To be newly manufactured in the rewinding scope)

Announced OEM recommendations and / or Customer Information Bulletin

- Not known

Oil leakages

- Not known

Information about the history of the generator

- In 2017 the stator was changed with a spare one from The Hague. This is the currently in use generator stator in Leiden. The to be rewound stator is the original one from Leiden.
- The rotor was completely sanitized from asbestos.
- Retaining rings were removed and inspected.
- Repaired cracks in the fanblades of the rotor.
- Rotor was newly balanced. (no overspeed-Test)

9 CONTRACTOR PERSONNEL

The CONTRACTOR shall have its own responsible supervisors and skilled qualified personnel for all phases of the works. All employees assigned by the CONTRACTOR must be technically and personally qualified for work at the plant sites of the CLIENT. On request of the CLIENT, personnel's qualification and compliance with the qualification requirements shall be evidenced by the CONTRACTOR.

The CONTRACTOR shall assign a Site Manager and a Project Manager responsible for coordinating all work carried out on the turbo-set. The CONTRACTOR is responsible to ensure the verbal communication on site in English.

All instructions, guidance and directions to be given by the CONTRACTOR to its employees with regard to their work and duties shall be given in a language understood by the employees and additionally be provided in writing. The names of the management and supervisory personnel and the responsible safety expert appointed by the CONTRACTOR shall be communicated to the CLIENT in the overhaul preparation meeting.

Note: The CONTRACTOR shall submit with its Bid a Project Organization Chart (identifying the functions) which shows the project and site organization.

9.1 Secured work area of the CONTRACTOR

Working time schedule Client:

Monday: 8 working hours daily	<i>(possible to extend to 12 hours with CLIENT Permission)</i>
Tuesday: 8 working hours daily	<i>(possible to extend to 12 hours with CLIENT Permission)</i>
Wednesday: 8 working hours daily	<i>(possible to extend to 12 hours with CLIENT Permission)</i>
Thursday: 8 working hours daily	<i>(possible to extend to 12 hours with CLIENT Permission)</i>
Friday: 8 working hours daily	<i>(possible to extend to 12 hours with CLIENT Permission)</i>
Saturday: 8 working hours daily	<i>(after permission from the client)</i>
Sunday: NO working hours on Sunday	

The CONTRACTOR may set up secured work areas in order to ensure quality of work and occupational safety and protect the progress of work against disturbances. Such secured work areas shall be visibly marked off by the CONTRACTOR in consultation with the responsible contact person of the CLIENT; consultation with the CLIENT shall be done prior to commencement of work.

Access to secured work areas is reserved to the CONTRACTOR's employees. The CLIENT shall be entitled to appoint persons that are also authorized to access such areas; such persons shall be instructed by the CONTRACTOR and have access to the secured work areas at any time. Persons authorized to access these areas are obligated to comply with the applicable rules of conduct. Other personnel of the CLIENT may access the secured areas only after application and in consultation with the CONTRACTOR; they have to comply with the applicable rules of conduct.

All persons present in the CONTRACTOR's secured work area shall follow the instructions of the site manager or his representative. In the case of threat to life or equipment and other abnormal conditions resulting from adjacent plants, the CLIENT's personnel shall decide on the measures to be taken and on the behaviour of all personnel in the power plant; such decisions and instructions shall also be applicable to the secured work areas.

The CONTRACTOR shall immediately notify the CLIENT of any contraventions of the above rules by personnel of the CLIENT or of other contractors that result in delays or other impairments, and shall state the potential consequences.

9.2 Work permit

9.2.1 Work permit

The work can only start after the CLIENT has issued a work permit and in particular after discussing the required management measures and the internal rules regarding the organization of the assignments and the tests. Work may only be carried out while the Site Manager of the CONTRACTOR is in possession of a valid work permit.

It is strictly prohibited to manipulate installation parts (valves, pumps, etc.), unless explicit permission has been given for this in the work permit. The permission to manipulate is cancelled once the work permit has been returned to the CLIENT.

The work permit is subject to a risk analysis consisting of two parts, which form the basis for the prevention measures. The first part is carried out by the CLIENT and the second part by the Site Manager of the Contractor covering the risks and hazards involved in its activities and those of any subcontractors it may have.

Work in confined spaces requires special attention and must be prepared in consultation with the CLIENT, in accordance with the procedures that are in effect.

9.2.2 Hot work permit

For the execution of all works in which heat, fire or sparks are produced an additional hot work permit is needed. Such work shall be completed in accordance with the current legal requirements. The Fire Permit is a document that has to be present, in addition to the work permit, at the work station during work with an increased risk of fire, such as welding, cutting, grinding and roofing works. The Fire Permit includes the results of a risk analysis and is only valid for one location and for one day at most.

9.2.3 Mobile cranes and self-unloading vehicles

The Site Manager of the CONTRACTOR shall apply for and obtain from the CLIENT a work permit for mobile cranes and self-unloading vehicles, prior to setting up such equipment at the site (instruction with regard to earthing and limitation of slewing range). In addition, the precise location shall be signed off by the CLIENT.

The Site Manager of the CONTRACTOR is also required to discuss in advance the needed hoisting plan for use of the mobile- or the hall crane.

10 PROJECT COMMUNICATION

10.1 Overhaul preparation meeting

At least one overhaul preparation meeting with the CONTRACTOR shall be held in order to prepare the overhaul work. This preparatory meeting shall take place not later than two months before the start of disassembly and reassembly work at the site. For the meeting, the CONTRACTOR shall prepare all relevant documents as identified in the Checklist "Preparation Meeting" in Section E of this SOW.

10.2 Findings follow-up matrix

All inspection findings and the resulting measures and costs shall be promptly listed in the findings follow-up matrix. The findings follow-up matrix will be initially defined and created by the CLIENT. The following information shall be recorded in the findings follow-up matrix.

- Identification and classification codes of the CONTRACTOR and the CLIENT for the components concerned;
- Description of the findings and CONTRACTOR's recommendations for repair;
- Cost incurred / amount of budget consumed by the measures resulting from the findings;
- Duration of work in days and impact on the end of disassembly/reassembly work date.

CONTRACTOR's Project Manager shall compile all information coming from the Site Manager and the workshops and record them in the findings follow-up matrix. The document shall be updated weekly and be filed with a revision index. Major abnormalities should be reported immediately. The form of the revision index will be discussed and agreed in the overhaul preparation meeting.

10.3 Control of component parts

If needed, the CLIENT shall be notified in writing of any generator components removed from the power plant site. Any such generator components must be clearly and durably marked as property of Uniper. The written notification shall include the following information:

- Component name and designation, including origin and sender;
- Destination address of the recipient;
- Forwarding company, including transport, shipping and package identification numbers.

10.4 Daily site reports

CONTRACTOR's site manager shall prepare daily site reports and forward them to the CLIENT every day. The daily site report documents the work performed on the generator components. At least the following information shall be documented in the records:

- Day, date, shift, time, name of the site manager on duty;
- Number of personnel present at the site and work performed;
- Any special occurrences at the site.

10.5 Detailed time schedule

After contract award, the CONTRACTOR shall prepare, on the basis of the contractual dates and deadlines, a detailed time schedule. In addition to all work to be performed by the CONTRACTOR, the detailed time schedule shall also cover all contributions needed from and interfaces with other contractors (e.g. scaffolding, thermal insulation, I&C, transports, etc.) and identify and duly consider any special operating conditions of the generator that are to be provided by the CLIENT (e.g. ensure operating weight, turbine oil system ready for operation, etc.). The detailed time schedule shall reflect the CONTRACTOR's planned sequence of work on the components (e.g. generator section, casing, rotor, valves, ancillary systems, etc.) of the turbo set.

The CONTRACTOR shall present and explain the detailed time schedule to the CLIENT during the overhaul preparation meeting. Interfaces with other works shall be discussed and complemented, if necessary. The detailed time schedule shall then be filed as a basic version.

The detailed time schedule shall reflect the following milestones:

- Setting up of site facilities;
- Start of disassembly/reassembly work at the site;
- Findings discussion meeting(s);
- CLIENT / THIRD PARTY witness points, as specified in the Inspection and Test Plan (ITP);
- Interfaces with rotor and ST (Steam turbine) casing parts transports;
- End of disassembly/reassembly work and readiness for turning gear operation.

The detailed time schedule shall show the following periods:

- Installation period for scaffolding, insulation and I & C equipment;
- Periods of disassembly/reassembly and repair work on the components, both on-site and off-site;
- Periods of use of the ST turbine overhead crane;
- Period of inspection and (Electrical) testing of the components and recording of findings;
- Periods requiring special operating conditions of the turbo set (e.g. operating weight, turbine oil system).

11 SCOPE OF WORK OF THE OVERHAUL OF THE GENERATOR

General: replacement of stator with the rewound spare stator, inspection of the rotor, overhaul of the exciter and other parts. The following scope of work for the generator and/or generator components does not absolve the CONTRACTOR from his responsibility to carry out all works required for the proper disassembly/reassembly of the scope according to the latest state-of-the-art/good engineering practice.

The CONTRACTOR shall translate the scope of services described in the present Technical Specification into a milestone-based time schedule. This time schedule is to show the sequence of work and consider all supporting work required from the scaffolding, insulation and I&C trades/contractors as well as use of the cranes in the turbine house and transports. The CLIENT expects the CONTRACTOR to comply in the timeline of his activities with all key dates specified above, irrespective of the nature and extent of the findings that are to be expected.

Note: The Bidder shall, jointly with the bid submit a time schedule with the following content,

- Start of disassembly/reassembly work at the site
- Duration of site work on scaffolding, thermal insulation and I&C equipment
- Duration of disassembly/reassembly work and repair work on site / off site
- In and External Transports
- Inspection and discussion of findings
- End of disassembly/reassembly work
- Commissioning/first synchronisation

Before starting work, it is to be assured that:

- The work permit is in place and the working conditions are well prepared.
- All method statements and risk assessments for all works are in place.
- All Maintenance/repair and test procedures are available for review (at least four weeks before commencement of the activities).
- All safety precautions have been carried out in accordance with the risk assessment.
- All affected electrical components are inactive and free from electric current.
- All pressures, temperatures and residual energies (e.g. position, tension, motion and energy storage) are reduced to safe levels.
- Before decommissioning the generator, the condition of the basement, piping system, and instruments etc. is to be monitored/ inspected.
- The vicinity of the generator and the supply systems is to be examined for oil leakages whilst a common inspection with the CLIENT. Potential additional works are to be recorded by the CONTRACTOR. All detected leaks should be marked and eliminated during the revision process.
- Before shutting down the generator, the Contractor documents the relevant operational data either on site or in the control centre with the assistance of the Client (warmed-up and under load operating conditions), prior to starting the revision process. After the commissioning these operational data is to be recorded again.
- All disassembled parts are to be marked clearly with their installation point and to be stored properly in a safe and dry location on site. They are further not to be exposed to a corrosive or aggressive ambient.
- For adjustable parts all according to data is to be recorded. When separating and loosening pipes and hoses, make sure that no particles/ items are taken in and pay attention to built-in orifices. Dismantled pipes, hoses and orifices are to be cleaned, inspected and closed in an appropriate manner immediately. With reassembly

all removed pipes are to be connected according to the guidelines / requirements of the generator manufacture.

- During works interruption opened components (e.g. stator housing, manholes, casings, pipes) are to be covered suitably (e.g. by sheets and boards). All non-accessible areas must be examined for dust and foreign particle/items immediately before reassembly. When necessary, the CONTRACTOR must have a suitable, endoscope available and must record the examination on a storage medium, in a universally readable format (jpeg, pdf etc.) for sharing with the CLIENT at request
- All measures that must be carried out either prior to or after the revision (e.g., alignment of the generator stator, the rotor, the exciter stator, opening pipe conduits and (electrical) isolators, and the reestablishment of pipeline connections, in-stalling closure disks, connection and disconnection of the generator leads) are included in the service package.
- Access to the generator stator is only permissible when wearing appropriate clean slip-on overshoes and work clothes without magnetic parts. It is extremely important to ensure that small parts are either not brought into the generator stator or are transported in such a way (contained) that they cannot get into or be left in the generator stator. All tools must be listed in a protocol before entering the generator.
- For the listed scope of work, it is to be assured that all gaskets, lock washers, bolts and screws are in proper condition. Damaged components must be replaced under consideration of material and design aspects. All materials subject to wear, such as flat seals, elastomers, sealing compounds, etc. are to be replaced as a rule. The CONTRACTOR has to provide and install these materials subject to wear.
- An immediate fact finding of all components in uncleaned and cleaned condition by visual inspection for damage, corrosion, deposits, stains, wear and broken-out areas is to be conducted. The evaluation of the components is to be conducted by the CONTRACTOR before the common fact finding together with the CLIENT. Within this evaluation all relevant data and tolerances are to be recorded. The desired condition and the tolerances are to be shown under specific consideration of the behaviour of these components in operation.
- After the complete disassembly of the components to be revised, a cooperative assessment is compiled on site by the CLIENT and the CONTRACTOR. Additional necessary repair procedures based on these findings, which are not included in this list of service specifications, will be ordered and settled separately upon mutual consent. The CONTRACTOR documents the findings and the resulting repair procedures.
- For the cleaning of parts, only clean and non-abrasive rags are to be used. Cleaning wool must NOT be used. For the cleaning of components in the oil system (e.g. bearing casings, oil tanks and pipes, filters and coolers) silicone-free tools must be used. Cleaning agents must NOT be used except fresh oil corresponding to the turbine oil.
- Clean all flanges, tapped holes, contact surfaces, seal faces, shims, bolts and nuts, pins and all disassembled body and machine parts (remove dirt/stains/deposits), recondition them (smoothing of defective spots) and check them for usability.
- Prepare the component surface for non-destructive testing (NDT). If necessary for the tests, the bodies shall be abrasive blasted dust-free (dust reduced). The testing points shall be agreed at the construction site between the CONTRACTOR, CLIENT and the NDT Personnel.
- All necessary spare parts from the fixed scope of works have to be delivered and installed by the CONTRACTOR. Before the overhaul the integrity and rightness of the spare parts delivered by the CLIENT has to be confirmed by the CONTRACTOR.
- Contractor must deliver an Project organisation plan with contact persons and contact data

11.1 Decommissioning and re-commissioning of the turbo set

The CONTRACTOR shall promptly report to the CLIENT the completion of his reassembly work ready for operation in an end-of-work meeting to be held at the site. Such end-of-work meeting shall be attended by:

- CONTRACTOR's Site Manager, and
- CLIENT's Maintenance Engineers and Project Leader Revision.

During start-up of the generator set by the CLIENT, the CONTRACTOR must be present at the power plant in order to carry out or arrange for tests, optimization or trouble shooting/repair work as may be necessary within his scope of services.

11.2 Generator I&C equipment (Including Enclosure)

To the extent necessary for the revision process, the control equipment will be disassembled and reassembled by the CLIENT. The control connections for the instruments will be disconnected and reconnected by the CLIENT. To this end, the CONTRACTOR will provide the CLIENT with a list of the relevant instruments, including information regarding the target date for disassembly and reassembly. After disassembly visual inspection has to be performed by the CONTRACTOR. The CLIENT is to be promptly informed by the CONTRACTOR about findings.

After the reassembly, all necessary mechanical and control configuration processes will be carried out by the CLIENT in accordance to the input requirements provided by the CONTRACTOR.

Available protocols with configurations data can be provided by the CLIENT and have to be updated by the contractor after finishing the work. With the assistance of the CONTRACTOR, the control-related signal chains up to the existing substation control room will be tested for their functionality by the CLIENT.

11.3 Scaffolding and Thermal insulation

The CLIENT will award a separate contract for the scaffolding and insulation work required for implementation of the inspection work; the scope of work required in this regard shall be discussed and agreed between the CONTRACTOR and the CLIENT.

Scaffolding

The CONTRACTOR shall submit to the CLIENT a list of scaffolds to be set up; the list shall state the place/plant section, the work to be done/loading/design of the scaffolds and the target dates on which the CONTRACTOR will assume responsibility for the scaffolds as well as the target dates on which the scaffolds will be returned to the scaffolding contractor. Prior to commencing work, the CONTRACTOR shall have all scaffolds provided by the CLIENT inspected by a competent person and accept them for use, and return them upon completion of the work. Such competent person

shall be responsible for the scaffolds for the period between acceptance and returning of the scaffolds. Any modifications to the scaffolds shall be subject to CLIENT's approval. A standard form provided by the CLIENT shall be used for approval and acceptance of the scaffold.

It is to be noted that at the start of the revision process, several days will be needed for scaffolding assembly. The same applies at the completion of revision for insulation and equipment removal.

11.4 Generator auxiliary tools check

Immediately upon contract award, the CONTRACTOR shall inspect the auxiliary tools (tools, gear and equipment) available at the power plant for completeness and proper function. The CLIENT will support the CONTRACTOR in doing such inspection. The results shall be recorded in a deviation report, stating:

- any missing auxiliary tools (spreader bars, auxiliary bearings etc.),
- auxiliary tools that were not tested (in particular load handling attachments, hydraulic tools).

Together with the deviation report and not later than two weeks from the inspection of the auxiliary tools, the CONTRACTOR shall compile and submit to the CLIENT a spare parts offer covering "Auxiliary Tools" and "Tests".

Upon completion of the overhaul, the CONTRACTOR shall return the auxiliary tools to the CLIENT in a functional condition. Any damaged or missing auxiliary tools shall be identified to the CLIENT.

11.5 Cutting and welding work solely valid for pipework smaller DN 80

Cutting and welding work on pipes (drain, vent, instrumentation piping) for making the necessary adjustments / modifications to pipework and / or pipe routing shall be done by the CONTRACTOR, including all work for weld seam preparation, provision of welding equipment, heat treatment, testing and documentation. The CONTRACTOR shall be responsible for identifying the base material on the basis of his design and workshop drawings.

12 CHECKLISTS AND TESTS

Clarification

X	-	To do
P	-	Protocol
VI	-	Visual Inspection
W	-	Witness Point

Who provides What:

12.1 Site facilities

Description	CLIENT	CONTRACTOR	Comments
Office container with Uniper guest Wi-Fi	X		CONTRACTOR names demand
Break and breakfast container	X		CONTRACTOR names demand
Locker / sanitary facilities container - Water / wastewater connection - Electrical connection	X		CONTRACTOR names demand
Sanitary facilities at site - Toilets - Hand washbasins	X		
Use of canteen	X		CONTRACTOR names demand
A conditioned tent indoor the plant to install and cover the rotor during the inspection.	X		
Scaffolding	X		
Dismounting and re-installation of: -the sound enclosure -instrumentation -fire protection -lighting inside the sound enclosure	X		
Tool container		X	CLIENT allocates position
Storage and surveillance of tools, materials, site facilities		X	
Workbenches		X	
Sandblasting cabin for small parts, including abrasives / disposal		X	
Cleaning and washing box for small, soiled components		X	

12.2 Occupational health and safety

Description	CLIENT	CONTRACTOR	Comments
First aiders	X	X	In control room
First aid equipment		X	
Emergency plan	X		
List of emergency phone numbers			
Personal protective equipment, Minimum standard is: - protective clothing - protective boots - hard hats - ear protectors - safety glasses		X	Protective work equipment according to task assigned
Safety disconnection of components - Disconnection - Connection	X		
Demand for barriers, fall protection, covers, scaffolding		X	
Installation of barriers, fall protection, covers	X		
Supplying and erection of scaffolding	X		
Risk assessment according to labour protection law		X	Available on site
Manuals - Hazardous material according to authority regulation - Work equipment according to Industrial Health and Safety Regulations		X	Available on site
Chrome 6 contamination	X	As of now Uniper has no information that there are installation parts in this SOW/ to be worked on, that are Chrome 6 suspicious *	
Asbestos contamination	X	As of now Uniper has no information that there are installation parts in this SOW/ to be worked on, that are asbestos suspicious *	

* If any suspicious parts are found during the overhaul period, UNIPER will take responsibility for testing and remediation of the suspicious parts.

12.3 Supply and disposal services / consumables

Description	CLIENT	CONTRACTOR	Comments
Plant service water (not drinkable)	X		
Plant compressed air (3 x 5 bar)	X		
Electricity (plug in units) 50Hz / 230V 50Hz / 400V, 63A	X		CONTRACTOR names the electricity capacity needed
Standard cleaning agents, lubricants and any other chemical products including working instructions for hazardous substances		X	
Consumables - cleaning cloth (lint-free) - protective sheet, adhesive tape (striking colours) - abrasives / grinding and cutting materials		X	
Technical gases		X	
Media (e.g. oil, grease) fillings for operation	X		
Disposal/recycling of - residual waste - paper / cardboard - wood - metal - cable, electrical and electronic scrap - sealing material - Wastewater - NDT material - insulation - hazardous materials packages with remainders - empty hazardous materials packages	X		Transport to assembly point and waste separation by CONTRACTOR

12.4 Tools

Description	CLIENT	CONTRACTOR	Comments
Specific and standard tools for generator replacement	X	X	The Contractor must evaluate and ensure the completeness and functionality of the tools.
Mobile Crane		X	
Stationary Crane	X		
<i>Turbine hall crane Den Haag: Max 75 Ton</i> <i>Turbine hall crane Leiden: Max 60 Ton</i>			
Shaft lift-out device for extracting rotor	X		The Contractor must evaluate and ensure the completeness and functionality
Ropes for shaft lift-out device		X	
Steel cable / rope for lifting of generator components		X	
Short steel cables, shackles etc. for material transport		X	
Plant-specific special tools - hydraulic tools - auxiliary bearings - transport safeguards (colour-marked) - guide rods		X	
Tools for coupling bolts		X	
Tools for foundation bolts		X	
Industry-type vacuum cleaner		X	
Rotating and static rotor support		X	
Completeness and functionality of the special-purpose tools and auxiliary tools		X	Before/ after overhaul (CE-Certified)
Pallets		X	
Material boxes for small parts		X	

12.5 Transport of components (lifting, hoisting, shipment)

Description	CLIENT	CONTRACTOR	Comments
Material, spares and component shipment (e.g. unloading, uploading, craning) on site between warehouse, workshop and turbine hall		X	Contractor has to be announce the date of the transport one week before
Loading operation of CONTRACTOR site equipment prior to commencement and after completion of inspection activities.		X	Contractor has to be announce the date of the transport one week before
Turbine hall crane operation by skilled and certified personnel (hoist plan and/or rotor pull-out procedure should be delivered in advance, for review)		X	Use of the turbine hall crane is not solely for CONTRACTOR and needs to be synchronised with other works during outage time. The CONTRACTOR is obliged to be able and with according to documented qualification to operate the turbine hall crane in every shift.
Material, spares and component shipment (e.g. unloading, uploading, craning) off site between plant and workshop		X	
Transport packaging / preservation inside and outside the site		X	
Lift truck 3.5T		X	
Driving licence for lift truck		X	
Pallet truck		X	
All lifting plans must be made by Contractor and delivered in advance for review by Client		X	

12.6 Replacement + Rotor inspection preparation meeting

Description	CLIENT	CONTRACTOR	Comments
- Project Manager - Project Leader Revision - Maintenance Engineer(s) Uniper	X		Nomination of acting persons
CONTRACTOR contact persons, - Site Manager - Project Manager		X	Nomination of acting persons
Health, Safety, Environment and Quality on site - Plant organisation in practise - Work coordination / Coordinator - Work responsibility	X		The CLIENT explains the site-specific organisation and requirements
Work permit act on site	X		The CLIENT explains the work permit procedure
Health, Safety, Environment and quality of the CONTRACTOR - Site organisation in practise - Work coordination - Work responsibility - Transfer of the risk assessment for each job		X	The CONTRACTOR explains his scope of work specific HSE measures on site
Detailed time schedule for the scope of service, - Assembling time spam scaffolding and I&C equipment - Overhaul work time spam on site / off site - Milestones component fact finding and check activities - Transport time spam and interfaces - Specified activities on the turbo set like operating weight, oil system operable ASO - Turbine hall crane occupancy		X	The CONTRACTOR explains the scope of service based on the timeline.
Inspection and Test Plan (ITP) for the scope of service, - Checks and tests of parts (T) - Work records (P) - CLIENT witness points (W) - CLIENT hold points (H)		X	The CONTRACTOR explains the scope of service based on the ITP. The CLIENT checks the interfaces on his side
Generator specific auxiliary tools check - Check for completeness - Check of functionality - List of deviations		X	CONTRACTOR has to submit a deviation report and proposal for tools/tests
Generator I&C equipment list, - Scope of disassembling / reassembling work for measurements and cables - Target dates		X	

Site organisation of the Turbine hall, • Turbine hall space arrangement (size and loading data needed!) • Storage and assembly areas • Secured work area • Office container areas	X	X	Alignment between the CLIENT and CONTRACTOR to optimize the workflow within the turbine hall
Site organisation in general, Number of staff as basis for sizing of staff accommodation (Contractor's and sup contractor employees)		X	
Discussion of checklists, Who provides what	X		The checklists forms are part of the agreed scope
Procedures for repair generator rotor for associated installations and references from other clients.		X	

12.7 De- and recommissioning checklist

Description	CLIENT	CONTRACTOR	Comments
Before shutting down the turbo generator, the CONTRACTOR documents the relevant operational data either on site or in the control centre with the assistance of the CLIENT, prior to starting the revision process.	X	X, P	
After completing the revision process, the operational data are to be recorded again by the CONTRACTOR. The CLIENT will evaluate this operational documentation.			
The following operational data is to be recorded in warmed-up condition and under 25%, 50% 75% and full-load operation:			
- Active power - Power factor	X	X, P	
Air coolant - cold air temperature - warm air temperature	X	X, P	
Lubricating oil - pressure - flow - temperatures	X	X, P	
Bearing temperature	X	X, P	
Vibration - bearing case - shaft vibration	X	X, P	Uniper-DCS
Shaft voltage	X	X, P	
Temperatures of all machine RTD's	X	X, P	
The CONTRACTOR has to inform the CLIENT contemporary about the systems which are ready for operation.		X	
The recommissioning has to be performed by the CONTRACTOR in close collaboration with the CLIENT.	X	W	
The first starts after the overhaul will be supervised by the commissioning engineer of the CONTRACTOR.		X	

13 REPLACEMENT OF THE GENERATOR STATOR AND INSPECTION OF THE ROTOR

The Contractor is responsible for the complete and professional performance of the overhaul of the listed generator components.

ITP Clarification

X	–	To do	PT	–	Dye Penetrant Test
P	–	Protocol	UT	–	Ultrasonic Test
VI	–	Visual Inspection	W	–	Witness point with CLIENT
E	–	Electrical Test			

13.1 Disassembly and re-assembly of the generator

SOW: Disassembly	ITP	Client point	Remarks
Remove of the top and sidewall NDE side of the enclosure		X	
Opening the generator bearing housing	VI,X		
Removal of residual oil of bearing housing	X		
Measurement of the electrical insulation between foundation and the bearing houses	P	W	
Measurement the airgap of the exciter stator	P	W	
Measurement the shaft alignment of the main rotor <> steam turbine rotor	p	W	
Dismounting and removal of the coupling bolts	p		
Removal bearings and seals	P		
Removal end covers	VI,X	W	
Dismounting the exciter stator	X		
Pulling out the main rotor with exciter rotor	X	w	
Internal transport to warehouse by using the hall into indoor tent	X		
Rotor transport and inspection frame delivered by contractor	X		
Install into the conditioned indoor tent	X		Tent delivered by Uniper
Disconnection of flexible connection between stator, bushings and busbar	X		
Check the flexible copper expansion strips between bushings and generator leads	VI,X		
Disconnection of RTD and space heaters	X		
Dismounting and lifting of the stator	X	W	
Disassemble stator and internal transport to warehouse by using the hall crane	X		
Stator transport frame for current stator must delivered by contractor	X		
The bolts / tread ends from the generator covers and the inspection hatches with English thread must be replaced with metric thread.	X	W	

SOW: Reassembly	ITP	Client point	Remarks
Cleaning the components to be installed	X	W	
Visual inspection of the new stator before installation.	X	W	
Internal transport of the stator from warehouse to the ST turbine floor	X		Possibly stored in EDH (The Hague), transport to ELD (Leiden)
Install the rewound stator	X	W	
Mounting foundation bolts and end covers etc	X		
Reconnection RTD's	X		
Reconnection space heaters.	X		
Check inside generator regarding remaining particles, tools and loose parts	X	W	
Pulling in the main rotor	X		
Installation the bearings and seals	X		
Re-alignment the stator after pulling in the rotor	P		
After installation of the sleeve bearing, measuring of the airgap between main rotor and stator	P		
Check torque of relevant bolts (foundation, couplings etc.)	P		
Re- alignment of the main rotor <> steam turbine rotor	P	W	
Re- alignment of the main stator	P	W	
Re- alignment of the exciter stator	P	W	
After the final alignment the stator it must be fixed with four dowel pins	X		
Remounting of the coupling bolts	P		
Remounting the flexible connection with new bolts and nuts. The replace bolts, washer, rings of the flexible copper expansion strips to state of art material.	P		New bolts, washers and nuts delivered by contactor
Final check inside generator regarding remaining particles, tools and loose parts			
Installation the end covers and replace all seals	X		
Measurement of electrical insulation between foundation and the bearing house	E,P	W	
Closing of bearing housings	X		
All parts (like the end covers) repainted at RAL 5007	X	W	
The following documentation has to be delivered two weeks after finalizing the overhaul to the client * • Dimensional records for de- and reassembly • *Fact finding reports has to be delivered two working days after the finding • Repair reports and used materials datasheets, certificates etc. • All work items which are marked above by a 'E and P' • All electrical and mechanical measurements as noticed			

13.2 Busbar

SOW: Busbar	ITP	Client point	Remarks
Visual inspection and cleaning	X	W	
Following documentation has to be delivered:			
Fact finding reports			

13.3 Generator bushings

The current six bushing will be replaced by new bushings, manufactured during the rewinding of the stator.

Also, a new mounting plate and new locking devices will be delivered.

Probably there is a little difference in position after the alignment of the stator.

Because of this issue drilling of the holes at the stator side and the flexibles site of the bushings must performed after the mounting and final aliment of the new bushings (on-site).

Note: the bar position at the spare bushing is rotated 90 degrees from existing bushings*.

The new delivers bushings will have the same position as the current ones.

SOW: Bushings	ITP	Client point	Remarks
New bushing must be installed at new mounting plate with the new locking devices. Re-alignment of the new bushings. Drilling holes drilling into the copper bars	X	X	*Image of a spare bushing, see enclosure.
Visual inspection and cleaning	X	W	
Insulation resistance and polarization index measurement, after installation– 10000 V _{DC} recommended – (5000V _{DC} allowed)	E,P	W	
After installation the bushings must be PD free till 2 x Un. <10 pC	E,P	W	
Following documentation has to be delivered two weeks after delivery of the stator to the client *			
- All work items which are marked above by a 'E and P' - Dimension records for reassembly * Fact finding reports within 2 working days - Repair reports			

13.4 Generator rotor

Upon Contractor's decision and agreement with the client the rotor's overhaul could be performed either on-site or in a dedicated workshop, regardless the location of the overhaul, the contractor shall prove in advance that the overhaul location is suitable with the state-of-the-art for generator's rotor maintenance.

The following works shall be carried out but not limited to:

SOW: Generator Rotor	ITP	Client point	Remarks
Visual check regarding oil, dust, corrosion, damages, Hot Spots, loose elements	VI	W	
Visual check of rotor wedges, ventilation ducts	VI	W	
Rotor end winding - Check of rotor end-winding regarding abrasion dust, particles, cracks, loose surface coating, damages, Hot Spots, loose blockings, etc. (boroscope) - Check of the rotor pole connections (boroscope)	VI,P VI,P	W W	
Check tight seat and lock of balancing weights	VI		
Cleaning by dry method	X		
Check rotor fan blades regarding mechanical impacts and NDT on root of the blades, only applicable when NOT painted	VI, PT, P	W	
Cleaning of retaining ring surfaces and removing loose paint	X		
Ultrasonic / NDT inspection of both retaining rings	US,VI,P	W	
Check coupling flanges - Clearance - Corrosion - NDT (if necessary)	VI, PT, P		
Clean coupling flange	VI		
Clean, check and overhaul shaft grounding	VI,P		
Clean and check bearing surface area	VI,P	W	
Electrical measurements on the rotor winding - Insulation resistance of the rotor winding, 500 V, DC, 1 min - Ohmic resistance of the rotor winding - Pole comparison test (Impedance test for each pole) - RSO interturn test with >1000 V pulse measurement	E,P E,P E,P E,P	W W W W	
Following documentation has to be delivered two weeks after delivery of the stator to the client * - All work items which are marked above by a 'E and P' - Dimension records for de- and reassembly * Fact finding reports has to be delivered two working days after the finding - Repair reports			

13.5 Sleeve Bearings Generator

The following works shall be carried out but not limited to:

SOW: sleeve bearings	ITP	Client point	Remarks
Checking oil system: oil pressure, pipes, hoses and seals	X		
Check bearing insulation Option: replace if required Option: recast bearing	E,VI,P P	W	
Check bearing surfaces and babbitt bonding	PT, UT	W	
Check bearing clearances and adjust it (if necessary)	P		
Check seating of bearing sleeves on bearing saddles	VI,P		
Check labyrinth rings and, Option: replace seal strips	VI,X		
Check position of the housing / bolts	P		
Check and measure clearance of labyrinth rings	P		
Check condition instrument wires	VI,X		
Check and measurement of the RTD's	P		
All parts painted at RAL 5007	X	W	
Following documentation has to be delivered: - Results and raw data (files) delivered within 2 working days from the execution of the activity - All work items which are marked above by a 'E and P' - Dimension records for de- and reassembly - Fact finding reports - Repair reports			

13.6 Generator monitoring

The following works shall be carried out from the CONTRACTOR

SOW: Generator monitoring	ITP	Client point	Remarks
Check the condition and functionality of the grounding brushes for good movement, correct positioning and signs of wear, replace, if necessary, clean (until grease-free), polish shaft at brush contact points, check ground cable for good connection to the bearing block.	VI,P	W	
Check the condition and functionality of the rotor earth fault brush.	P		
Following documentation has to be delivered two weeks after delivery of the stator to the client * - Results and raw data (files) delivered within 2 working days from the execution of the activity - All work items which are marked above by a 'P' - Dimension records for de- and reassembly * Fact finding reports be delivered two working days after the finding - Repair reports			

13.7 Exciter unit

The brushless exciter consisting of the rectifier wheel, stator winding, rotor winding

The following works shall be carried out but not limited to:

SOW: Exciter Unit	ITP	Client point	Remarks
Dismounting of stator	X		
Clean all accessible parts of the exciter and rectifier wheel	VI,X		
Clean leakage air filter, replace if necessary	X		
Clean rotating rectifier exciter rotor	VI,X		
All parts painted at RAL 5007	X	W	
Remounting stator	X		
Check airgap stator <> rotor	X	W	
Electrical measurements on the rotor winding before and after cleaning:	E,P	W	
- Insulation resistance and polarization index, 500VDC - Windings resistance	E,P	W	
Electrical measurements on the stator winding exciter before and after cleaning:	E,P	W	
- Insulation resistance and polarization index, 500VDC - Windings resistance	E,P	W	
Electrical measurements on the rectifier wheel:			
Characteristics and insulation resistances of each diode	E,P	W	
Characteristic of each RC-block (if present)	E,P	W	
Overvoltage protection (if present)	E,P	W	
Insulation resistance after rectifier's re-assembly 500VDC	E,P	W	
Following documentation has to be delivered two weeks after delivery of the stator to the client * - All work items which are marked above by a 'E and P' - Dimension records for de- and reassembly * Fact finding reports to be delivered two working days after the finding - Repair reports			

14 SAT SITE ACCEPTANCE TESTS

14.1 Measurements before starting up / ramping up

SAT	ITP	Client point	Remarks
Electrical measurements of the stator winding:			
Measurement point at generator leads before connection to the busbar:			
Measure insulation resistance and polarization index of each phase of the stator winding, 5000V, DC. Before installation and before commissioning.	E,P	W	IEEE43
Measure winding resistance (individual phases)			
RTD insulation test, 500 V, DC, 1 minute	E,P	W	
RTD resistance test and testing with DSC system	E,P	W	
Functional testing of the space heaters	E,P	W	
Space heater Insulation test, 500 V, DC, 1 minute	E,P	W	
Following documentation has to be delivered two week after delivery of the stator to the client * - Results and raw data (files) delivered within 2 working days from the completion of the activity - All work items which are marked above by a 'E and P' - Dimension records for de- and reassembly * Fact finding reports delivered two working days after the finding			

14.2 Measurements during commissioning / running

The Contractor is in the lead to draw up the ITP (Inspection and Test Protocol) for the SAT

- Routine SAT tests according to state of the art:
 - Direction of rotation, checking of phase sequence
 - $\cos \phi = 0$ - point measurement
 - No load points
 - Voltage balances
 - Current balances
 - Vibrations measurements (0 - 1/4 - 2/4 - 3/4 and maximum load)
- No-load load characteristics / curve
- Short circuit characteristics / curve
- Protection setting check
- AVR settings check
- Temperature rise test; short circuit heat run test at rated current (no stator voltage)
- Temperature rise test: heat run test with Power factor 0,8 with rated Voltage

15 QA /QC DURING THE RE INSTALLATION AND OVERHAULD

Quality Assurance (QA) shall be based on the CONTRACTOR's Quality Management (QM) system. The QM system shall at least comply with the requirements of NEN-EN-ISO 9001:2015. CONTRACTOR's QA shall also cover all the CONTRACTOR's suppliers and subcontractors. The CONTRACTOR shall be responsible for planning, implementation, monitoring and documentation of the QA for its entire scope of supply and services. The CONTRACTOR shall have in place its own responsible QA supervisory and technical personnel, duly qualified for the scope of supply and services. Even if the CLIENT puts into place its own quality supervision, the CONTRACTOR shall remain fully responsible for quality assurance.

The CONTRACTOR shall prepare a non-conformance report for each quality defect and inform the CLIENT immediately. The non-conformance report shall contain the following information:

- Description of the non-conformity/quality defect;
- Classification of the quality defect, including reasons for the classification made;
- Description of the impact on the generator functional unit;
- Description of the corrective action to be taken, including reasons;
- Impact on dates and deadlines.

Each and any deviation from the specified quality shall be classified by the CONTRACTOR as follows:

- Class 1: The non-conformance of the Scope of Work (SOW) will be corrected by the CONTRACTOR on the CONTRACTOR's own responsibility; the CLIENT will be informed.
- Class 2: Non-conformances that may result in additional work and expense will be corrected by the CONTRACTOR on the CONTRACTOR's own responsibility; consultation and coordination with the CLIENT is mandatory.

The CLIENT reserves the right to inspect the presented documents related to the Scope of Work or have them inspected by a skilful and independent THIRD PARTY, and to expand the Scope of Work in consultation with the CONTRACTOR.

The CONTRACTOR shall submit with its Bid a description of the main elements of its project-specific quality assurance programme (organization, responsible/contact persons).

15.1 Inspection and Test Protocol (ITP) and fact finding

The CLIENT's Inspection and Test Protocol (ITP) covers the scope of fact finding, measurements, inspections and tests to be performed by the CONTRACTOR, the CLIENT and the Third-party witness points to be considered by the CONTRACTOR.

On the basis of its technical expertise and experience, the CONTRACTOR shall prepare a project-specific Inspection and Test Protocol (ITP) which must duly reflect the scope specified by the CLIENT in the present Technical Specification.

The CONTRACTOR shall update the ITP to reflect any subsequent technical changes /additions to the ITP that become necessary as a result of inspection findings. The CONTRACTOR shall inform all parties involved (e.g., subcontractors) of any changes or additions made to the ITP.

The CONTRACTOR is required to submit the project-specific ITP together with its Bid. It shall at least contain the following information:

- Time and location of fact-finding measurements and tests/inspections.
- Reporting points and CLIENT / Third-party witness points;
- Testing centre, testing methods and procedures, main focus(es) of the inspection/test;
- Document numbers of the applicable testing procedures and test specifications;
- Recording.

CONTRACTOR's testing procedures and test specifications must be available before commencement of the activity and the CLIENT shall have the right to inspect such procedures and specifications. The procedures and specifications must cover the following testing and inspection requirements:

- Scope of application;
- Applicable standards and codes (standards, directives and codes of practice);
- Qualification of testing/inspection personnel;
- Preconditions for safe and reliable testing;
- Acceptance levels;
- Testing and procedural instructions.

The CONTRACTOR is responsible for performing all fact-finding work, fact finding, measurements, inspections and tests, for prompt recording and evaluation of results, and for preparing the reports. The records and reports shall be prepared at the construction site as inspection work proceeds and shall be kept available for inspection by the CLIENT at the site at any time; on request, copies of all records and reports shall be supplied to the CLIENT during the overhaul project. The CLIENT / Third-party shall have the right to inspect (in advance) at its discretion the testing procedures/test specifications and manufacturing documents for the component parts and subassemblies of the CONTRACTOR.

The CONTRACTOR shall derive, from the findings and test results, the measures required and present them to the CLIENT in writing within 1 workday. The CONTRACTOR shall document the findings, tests/inspections and the measures agreed in the findings follow-up matrix. The CLIENT / Third-party and the CONTRACTOR shall aim at carrying out a joint fact-finding effort upon complete disassembly of the components to be overhauled.

The records and reports compiled by the CONTRACTOR shall contain all information necessary for evaluation. The location and sizes of the findings/flaws shall be identified by stating the precise position in the form of quadrants (e.g. 03:00 hrs) and the size. In case of photographic documentation, a clear allocation of the photo shall be ensured, and a scale shall be included in the photo. Existing component part identification codes shall also be recorded.

The CONTRACTOR commits itself to notify the CLIENT in writing of any findings necessitating additional supplies and/or services within 1 workday from their identification at the latest, and to submit to the CLIENT within 3 days an offer covering the additional supplies and/or services (including optional variants, if any).

15.2 Warranty, new material and new components

The warranty at the performed work, overhauled components and material shall be at least two years after commissioning.

All new components and materials must be suitable for 60.000 running hours under operating conditions.

Design changes/adjustments made to component parts and/or subassemblies must not cause any additional operational restrictions. Any design changes/adjustments made to component parts and/or subassemblies shall be documented in the final documentation.

15.3 Documentation

The CONTRACTOR shall compile the complete final documentation and present it and hand it over to the CLIENT by the agreed date after completion of the rewinding; one electronic copy of the complete final documentation on a data carrier shall be handed over to the CLIENT.

The documentation shall reflect the "as-built" status. Any documents reflecting merely the planning/engineering status shall be explicitly identified as such. The documentation shall include, but is not limited to:

- Documentation of the dimensions measured and recorded during the overhaul.
- Documentation of findings, records of tests and inspections carried out.
- Documentation of welded joints (including welding procedure specifications)
- Documentation of design changes made to the component parts
- Documentation of risk assessments within the meaning of the Machinery Directive 2006/42/EC;
- Material certificates for installed new parts;
- Qualification test certificates and calibration certificates of used instruments and test equipment.

15.4 Detailed time schedule

After contract award, the CONTRACTOR shall prepare, on the basis of the contractual dates and deadlines, a detailed time schedule. The detailed time schedule shall reflect the CONTRACTOR's planned sequence of the rewinding of the stator.

The CONTRACTOR shall present and explain the detailed time schedule to the CLIENT in advance.

The detailed time schedule shall reflect at least the following milestones:

- | | |
|---|---|
| - the reference measurements during running | - NDT measurements at the retaining rings |
| - measurements before starting the overhaul | - Stator inspection before pulling in the rotor |
| - starting the prework on site | - pulling in the rotor |
| - disassembly of the exciter | - re- alignment of the stator housing |
| - pulling out the rotor | - re- alignment of the rotor |
| - dismantling of the stator | - re-alignment of the exciter |
| - the electrical measurements at the rewound stator | - final inspection before closing the generator covers |
| - reinstallation of the rewound stator | - end of assembly. |
| - overhaul of the rotor | - SAT |
| - electrical measurement at the rotor | - Client / third party witness points, as specified in the Inspection and Test Plan (ITP) |
| - NDT measurements at the vanes | |

The detailed time schedule filed as a basic version shall be constantly followed up by the CONTRACTOR and promptly updated as necessary (e.g., to reflect changes in milestone dates, dates changed due to findings or optional work ordered) and the updated version shall be marked with a new revision index and forwarded to the CLIENT. The detailed time schedule shall at least be updated after new findings.

16 MACHINERY DIRECTIVE

The CONTRACTOR shall carry out a risk assessment for each and any change made to the generator, in order to analyse whether such changes are expected to result in significant additional risks or changes in existing risks and thus whether such change will result in a significant modification to the stator winding.

In the event, that the CONTRACTOR within the scope of its work makes a significant modification to the stator winding within the meaning of the Machinery Directive (2006/42/EC), the Contractor shall proceed as described hereinafter

The CONTRACTOR shall document the results of all risk assessments in writing and submit and explain them to the CLIENT prior to making the relevant modification.

17 TRANSPORTS

In and external transports must be performed by the contractor.

Total weight of the generator 54 Ton

Stator is 41 ton and the rotor weight 13 Ton

The weight of the Uniper support frame is 6 Ton

A transport insurance for the replacement of the generator must be included during the project.

The Uniper support frame, used under the rewind stator, can be re-use during the transport and storage in the warehouse.

All necessary covering must be delivered by the contractor to protect the stator, rotor and other parts against transport damage and contamination.

18 ENCLOSURES

- Images of the generator in The Hague and in Leiden
- Image of exciter unit
- Image of the spare stator (not rewind)
- Image of a spare bushing with mounting plate and locking support
- Info balancing weights rotor body
- Rotor pull out tools
- Old Inspection reports and data

The General Conditions of Purchase Uniper Benelux (Uniper-EN/2018-01) and the General Safety Regulations of Uniper Benelux (Uniper-EN/2018-02) apply to this inquiry and all related written and oral expressions and subsequent agreement(s). We will send these terms to you free of costs upon your request and/or they are available at <https://www.uniper.energy/benelux/>