

	Project Name GE Frame 9/E RoCa 3	Document N°. WS764064879
Technical Specification for Replacement Combustion System Frame9/E gas turbine		

On our Uniper Benelux location RoCa3 at Rotterdam we have stationed a Frame9/E gas turbine with generator. In 2023 there is a change from Low Caloric Gas to High Caloric Gas planned for the unit. Instead of only changing the fuel nozzles we want to prepare the unit for the future with emission reduction and the possibility to run partly on Hydrogen. During the available time of a Combustion Inspection we want to have replaced the existing DLN-1 system with a new Combustion System together with fuel nozzles that are ready for High Caloric Gas, low emissions and the possibility to run at about 30 % Hydrogen. Hereby we request a lump sum quotation according this document specification.

A. Planning dates activities

The completions of all activities are according planning Uniper Benelux which will be finalized after awarding the order. Temporary planning dates are:

Start date exchange: Monday 08th May 2023

End Date exchange: Wednesday 17th May 2023

Commissioning end date: Friday 19th May 2023

The end date of the delivery time for the combustion system components is Week 16 2023 (Monday 17th April).

Your lump sum tender will include the design and presentation of a working plan and quality plan. During the combustion system exchange Uniper Benelux will have a representative to sign on a daily basis the quality assurance hold-, witness- and review points. The contractor must, after awarding of this contract, present and discuss for approval the following planning's:

- Overall planning based on the specified planning dates
- Manpower planning including subcontractors
- Organization plan
- Overall estimated progress curve of the work
- After approval of the overall planning
 - Detailed implementation schedule
 - Safety, health & quality plan

B. Scope of work to be carried out

1. The change from Low Caloric Gas to High Caloric gas on the GT3 RoCa, gas turbine Frame9/E included the hereunder mentioned innovations.

Replacement of existing DLN-1 Combustion System with a new system with the following requirements:

Suitable for High Caloric Gas	
Low Emission CO	< 20 mg/Nm3 at 15 % O2 at base load
	< 40 mg/Nm3 at 15 % O2 at minimum load
NOx	< 20 mg/Nm3 at 15 % O2 at 50 - 100% load
Suitable for Hydrogen	> 25 %
Minimum part Load in premix	< 50% of base load

With this change we want to bring the engine in such a condition that we can run for another 75.000 hours. The running regime has changed from continues running on base load into start/stop cycles with 5000 hours and 100 starts per year and part load conditions with a higher exhaust temperature.

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If the above option has a consequence of changing the control system then this must be stated in the offer with a complete price of changing and implementing the system. If the above option has a consequence of changing or add other systems (such as the gas system, autotune etc) then this must be stated in the offer with a complete price of changing and implementing the systems.

An exchange of the Combustion System on gas turbine GT3 RoCa as specified below. Maintenance and records are to be executed according to the latest standard protocols and technical information letters of manufacturers. After performing the Combustion Change the installation must be commissioned and ready for commercial operation.

Gas turbine type	:	PG9171E (with combustion extendor and uprates: High Pressure Brush Seal 2 nd Bearing Brush Seal Turbine Inter stage Brush Seal Haynes HR-120 One Piece Stage 1 Shroud) Bleed heat valve with 7 % passage instead of 5 %
Design memo no.	:	RA9006
Model list no.	:	9A1PE61
Manufacturer	:	Thomassen (license General Electric)
Year of built	:	1996
Number of running hours	:	ca. 180.000 OH
Control system	:	MarkV
Combustion system	:	DLN 1.0
Generator	:	ABB, WY21 Z-092
Power	:	168,75 MVA,
Reactive load	:	Cosφ 0,8
Rotational speed	:	3000 rpm
Voltage	:	15KV
Frequency	:	50Hz
Exciter	:	ABB, WTB95
Power	:	380 KW
Frequency	:	200 Hz

High Caloric Gas Specifications according:

<https://wetten.overheid.nl/BWBR0035367/2019-01-01>

Specifations in exhibit 1

2. Capital parts and consumables

Renew Combustor System with all necessary parts and consumables

3. Disassembly and assembly.

In general activities that are to be carried out:

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- 3.1. Disassemble gas flexible's to gas fuel nozzles, combustion system.
- 3.2. Change out combustion system
- 3.3. After replacement re-assemble items
- 3.4. Commissioning assistance re-assembled gas system (leak tests and repair leaks)
- 3.5. Tuning of combustion system

4. Instrumentation inspections

According to the latest standard inspection protocols the instrumentation has to be maintained. Scope of services to be performed is summarized in exhibit nr 1. Specification of the device list has to be revised before the start of the outage but after awarding this order.

5. Specification Quotation

The quotation must be specified in lump sum and duration of the following items:

1. Delivery time new combustion system
2. Removing existing combustion system
3. Assembling the new combustion system
4. Tuning the new combustion system
5. Instrumentation and Speedtronic

Lump sum prices are including necessary tools, rental of tools, lifting tools (hoist and slings), air hoses/tools with matching connectors Uniper Benelux, workshop containers, cranes, transport, housekeeping and cleaning. Well before the overhaul but after possible awarding of this contract the contractor must list and check all the necessary tools to be present on site. Your lump sum must also include all necessary specialists and professionals that you will deploy, gate access, safety instructions, any other day/week/travel and hotel allowances. Contractor shall provide a separate quotation for each extra activity that is not a part of this specification. Extra activities are to be approved in writing by a representative of Uniper Benelux. Contractor must provide a separate hourly rates list for subsequent calculation of the extra activities.

Your lump sum quotation is in compliance with this document specification. Any deviation has to be mentioned in a separate deviations list. Awarding the quotation will be based on the conditions as mentioned in the Tender Document.

6. General activities

1. One week before the start of the Combustion change all preliminary activities have to be finished.
2. All equipment and piping which are to be disassembled in- and outside the casing in order to make your overhaul activities and working site accessible must be preformed by contractor and forms a part of your lump sum. Temporary sealing of all flanges to be disconnected are provided by contractor and forms a part of your lump sum.
3. During the commissioning sufficient personal must be on site to repair any failure of installation parts where contractor have worked on during the overhaul.
4. The commissioning end date will be provided 1 day in advance at the latest 1 week after completing the activities.
5. All cleaning activities and housekeeping of working space has to be arranged by contractor.
6. Uniper Benelux will provide for:
 - Electric power supply
 - Air supply (6bar)

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- Accommodations such as office-, lunch- and changing room-shower-toilet facilities.

B. Reports after awarding of contract

Your lump sum includes all standard required verbal and written preliminary, interim and final reports in accordance with the guidelines given in the Inspection & Maintenance manual of the manufacturer. In advance, but after awarding of this contract, you must prepare and provide an action plan concerning reports. As part of your lump sum, you must prepare, present and discuss for approval a complete quality plan in accordance with the current gas turbine guidelines. A complete commissioning and inspection & test plan must be part of this. The quality plan must be approved well before the start of the Major combustion change but after awarding of this contract to you. Rights are reserved to add additional reports, hold points and witness points.

☐ Reports during work

- Daily, progress of work
- Weekly a specification of manpower for the next week and the progress in relation to the overall estimated progress curve

C. General preconditions

Contractor must include any missing, incomplete or incorrect description of the scope with the tender, including financial and completion time consequences. Contractor must include a Commissioning and Inspection & Test Plan from a previous project for review. Contractor's specified tender is an all-in lump sum. If items which are relevant to you are missing, please specify them separately in your tender. Changing and replacing employees must be kept to a minimum. Replacement may only occur after consultation and approval. All manpower must have the necessary gas turbine knowledge and experience. Sub-contracting of the work, or part of it, shall only be permitted if prior consent thereto has given in writing. If work is sub-contracted, vendor shall remain fully responsible for the coordination and execution of the work outsourced to sub-contractor(s). For sub-contracting purposes, Vendor shall make use of approved contractors. Uniper statement: **We work safely...or not at all!!** Safety records on Lost Time Injury Frequency Rate (LTIFR) must be accompanied with your quotation.

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Exhibit 1

Bijlage III, bedoeld in artikel I, onderdeel A

Bijlage 3, bedoeld in artikel 1 en artikel 2 , derde lid, van de Regeling gaskwaliteit

H-gas bij aflevering op een aansluiting

Gaskwaliteit		Waarde	Eenheid
<u>Wobbe-index</u>			
Standaardbandbreedte		47 – 55,7	MJ/m ³ (n)
<i>Afwijkende ondergrens (Wobbe-index)</i>			
Gassysteem Delfzijl, bedoeld in bijlage 6		48,6	MJ/m ³ (n)
Gassysteem Eemshaven, bedoeld in bijlage 6		47,2	MJ/m ³ (n)
Gassysteem ZO Drenthe, bedoeld in bijlage 7		49	MJ/m ³ (n)
Gassysteem GZI, bedoeld in bijlage 7		43,46	MJ/m ³ (n)
Gassysteem IJmond, bedoeld in bijlage 9		49,3	MJ/m ³ (n)
De provincie Limburg		49	MJ/m ³ (n)
De provincies Noord-Holland, Zuid-Holland en Groningen		48,3	MJ/m ³ (n)
<i>Afwijkende bovengrens (Wobbe-index)</i>			
Gassysteem Westgas/Waalhaven, bedoeld in bijlage 8		57,5	MJ/m ³ (n)
Gassysteem Maasmond, bedoeld in bijlage 8		56	MJ/m ³ (n)
Gassysteem LNG, bedoeld in bijlage 8		57,2	MJ/m ³ (n)
Waterdauwpunt ¹	Raffinaderijgas-systeem, bedoeld in bijlage 8	≤ -8	°C (bij 25 bar(a))
	Rest Nederland	≤ -8	°C (bij 70 bar(a))
Gascondensaat ¹		≤ 5	mg/m ³ (n) bij -3 °C bij elke druk
Temperatuur	Raffinaderijgas-systeem, bedoeld in bijlage 8	0 - 40	°C
	Rest Nederland	0 - 35	°C
Zuurstofgehalte	Bij een gasopslaginstallatie in Grijpskerk in de gemeente Zuidhorn	≤ 0,0005	mol% daggemiddeld

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	Bij andere gasopslaginstallaties	$\leq 0,0010$	mol% daggemiddeld
	Rest Nederland	$\leq 0,5$	mol% daggemiddeld
Koolstofmonoxide	Raffinaderijgas-systeem, bedoeld in bijlage 8	$\leq 1,5$	mol%
	Rest Nederland	≤ 2.900	mg/m ³ (n)
Koolstofdioxidegehalte		$\leq 2,5$	mol%
Waterstofgehalte	Raffinaderijgas-systeem, bedoeld in bijlage 8	≤ 40	mol%
	Rest Nederland	$\leq 0,02$	mol%
Chloor op basis van organochloorverbindingen		≤ 5	mg Cl/m ³ (n)
Fluor op basis van organofluorverbindingen		≤ 5	mg F/m ³ (n)
Pathogene microben ¹		≤ 500	aantal/m ³ (n)
Stofdeeltjes ¹ met een grootte boven de 5 μm		≤ 100	mg/m ³ (n)
Zwavelgehalte op basis van anorganisch gebonden zwavel (H ₂ S en COS)	Raffinaderijgas-systeem, bedoeld in bijlage 8	≤ 10	mg S/m ³ (n)
	Rest Nederland	≤ 5	mg S/m ³ (n)
Zwavelgehalte op basis van alkylthiolen	Raffinaderijgas-systeem, bedoeld in bijlage 8	≤ 10	mg S/m ³ (n)
	Rest Nederland	≤ 6	mg S/m ³ (n)
Totaal zwavelgehalte vóór odorisatie		≤ 30	mg S/m ³ (n)
Totaal zwavelgehalte na odorisatie		≤ 41	mg S/m ³ (n)
THT-gehalte (odorant)	in HTL: reukloos gas	0	mg THT/m ³ (n)
	in RTL: reukloos / ruikbaar gas	0 / 10-40	mg THT/m ³ (n)
	in RNB: ruikbaar gas	10 - 40	mg THT/m ³ (n)
Siliciumgehalte op basis van siliciumhoudende verbindingen		$\leq 0,1$	mg Si/m ³ (n)