RFQ Number	**PlasGas-2023-001**
Request for Quotation Date	**2023/12/12**
RFQ Closing Date	**2024/01/15**
RFQ Closing Time	**10.00am**
Compulsory Site Briefing	**None**
Contact Person	Bheka.Khumalo@necsa.co.za
Quotation Validity	**90 Days from the closing date**
Submission Details	**RFQ Response must be sent to: Catherine.Matima@necsa.co.za**
RFQ Description	**D&D Process Engineering – NW PlasGas Detail Design**

Dear Service Provider

Kindly provide a quotation for goods and or services as outlined in section 2 of this document.

1. Introduction

The South African Nuclear Energy Corporation Limited (Necsa) is a state-owned public company (SOC), registered in terms of the Companies Act, (Act No. 61 of 1973), registration number 2000/003735/06.

The Necsa Group engages in commercial business mainly through its wholly-owned commercial subsidiaries: NTP Radioisotopes SOC Ltd (NTP), which is responsible for a range of radiation-based products and services for healthcare, life sciences and industry, and Pelchem SOC Ltd (Pelchem), which supplies fluorine and fluorine-based products. Both subsidiaries, together with their subsidiaries, supply local and global markets, earning valuable foreign exchange for South Africa and are among the best in their field in their respective world markets.

Necsa's safety, health, environment and quality policies provides for top management commitment to compliance with regulatory requirements of ISO 14001, OHSAS 18001 and RD 0034 (Quality and Safety Management Requirements for Nuclear Installations), ISO 9001 and ISO 17025.

Necsa promotes the science, technology and engineering expertise of South Africa and improves the public understanding of these through regular communications at various forums and outreach programmes to the community. We are a proudly South African company continuously striving, and succeeding in many respects, to be at the edge of science, technology and engineering related to the safe use of nuclear knowledge to improve our world.

For more information on Necsa, please visit: **www.necsa.co.za**

2. Scope of Work

Item Description	Quantity
Professional Engineering Services from an Engineering Consultant to perform specific process engineering activities in the Detail Design of the NW PlasGas Demonstration Plant. The Consultant is required to use process engineering judgement and experience to generate specific process engineering deliverables for the NW PlasGas demonstration facility. The SOW is limited to the following process engineering deliverables: 1) Mass balance 2) Energy balance 3) Pressure balance The work shall be based on an existing engineering design of the PlasGas Demonstration Plant to be provided by Necsa. Engineering design work not directly related to the above deliverables, as well as work for all other disciplines of engineering, are currently excluded from this SOW. See attached Document ENS-NWPVR-SOW-23001 Rev. 1.0 for further information on the Scope of Work.	1

3. Pricing

- All price quoted to include all applicable taxes.
- Price must be fixed and firm
- Price should include additional cost elements such as freight, insurance until acceptance, duty where applicable, disbursements etc.
- Quotation must be completed in full, incomplete quote could result in a quote being disqualified.
- Payment will be according to Necsa's General Conditions of Purchase.

4. Evaluation

4.1. Phase 1- Functionality Evaluation / Technical Evaluation

Where functional or technical evaluation criterion is applicable, assessment will be performed in terms of the criterion listed below and the criterion may include Technical, Performance, Quality and Risk.

If the Bidder's response does not indicate that the Bidder can support an acceptable technical solution, the Bidder's response will be rejected and not evaluated further.

Together the Technical, Performance & Quality and Risk criteria make up the functionality criterion and a Bidder's Proposal will be evaluated for functionality out of a possible 100 points. Only RFQ responses achieving an evaluation score of greater than the set threshold points of 80 out of the possible 100 points, will be selected to progress to the second stage.

Technical, Performance & Quality and Risk criteria

Item	Requirement	Weight	Points	Criteria
1	Evidence of experience in the review of mass, energy and pressure balances of chemical process facilities (i.e. individual resources).	20	20	Performed similar reviews > 5 times
			10	Performed similar reviews >2 times
			5	Performed similar reviews > 1 time
2	Experience of personnel reflected by CVs	40	40	Ecsa registration (Pr Eng) and > 8 years' experience as Chemical/process engineer
			20	Ecsa registration (Pr Eng) and > 5 years' experience as Chemical/process engineer
			10	Ecsa registration (Pr Eng) and > 3 years' experience as Chemical/process engineer
3	Delivery time	40	40	< 10 working days after receipt of order
			20	< 15 working days after receipt of order
Total			**100**	

4.2. **Phase 2 - Evaluation In Terms Of Preferential Procurement Policy Framework Act, 2022**

This bid will be evaluated and adjudicated according to the 80/20-point system, in terms of which a maximum of 80 points will be awarded for price and 20 points will be allocated based on the specific goals (B-BBE status level).

	POINTS
PRICE	**80**
SPECIFIC GOALS (B-BBEE status level)	**20**
Total points for Price and SPECIFIC GOALS	**100**

Preference goal
B-BBEE status level contributor

B-BBEE Status Level of Contributor	Number of points (80/20 system)
1	20
2	18
3	14
4	12
5	8
6	6
7	4
8	2
Non-compliant contributor	0

5. Required Documentation
   - Tax Clearance Certificate (Tax pin issued by SARS)
   - Declaration of interest (SBD 4)
   - BEE Certificate / Applicable Affidavit if classified as EME
   - Letter of Good Standing (COID) only if Applicable due to the nature of work required
   - Any other document or certification that might have been requested on this RFQ

6. Important

6.1. Quotation must be submitted on or before the RFQ closing date and time stated above.

6.2. Orders above R 30 000 will be evaluated according to the PPPFA 80/20-point system and a functionality scorecard where applicable and the ones above R 1 Million will be subjected to the tender process.

6.3. This RFQ is subjected to the Necsa's General Conditions of Purchase, Preferential Procurement Policy Framework Act 2000 and the Preferential Procurement Regulations, 2022, the General Conditions of Contract (GCC) and, if applicable, any other legislation or special conditions of contract

6.4. Failure on the part of a bidder to submit proof of B-BBEE Status level of contributor together with the bid, will be interpreted to mean that preference points for specific goals are not claimed.

6.5. The purchaser reserves the right to require of a bidder, either before a bid is adjudicated or at any time subsequently, to substantiate any claim in regard to specific goals, in any manner required by the purchaser.

6.6. For a Bidder to obtain clarity on any matter arising from or referred to in this document, please refer queries, in writing, to the contact details provided above. Under no circumstances may any other employee within Necsa be approached for any information. Any such action might result in a disqualification of a response submitted in competition to this RFQ.

6.7. No goods and/or services should be delivered to Necsa without an official Necsa Purchase order.

6.8. Necsa reserves the right to; cancel or reject any quote and not to award the RFQ to the lowest Bidder or award parts of the RFQ to different Bidders, or not to award the RFQ at all.

6.9. The supplier shall under no circumstances offer, promise or make any gift, payment, loan, reward, inducement, benefit or other advantage, which may be construed as being made to solicit any favour, to any Necsa employee or its representatives. Such an act shall constitute a material breach of the Agreement and the Necsa shall be entitled to terminate the Agreement forthwith, without prejudice to any of its rights

6.10. By responding to this request, it shall be construed that: the bidder, hereby acknowledge to be fully conversant with the details and conditions set out in the Necsa's General Conditions of Purchase, Preferential Procurement Policy Framework Act 2000 and the Preferential Procurement Regulations, 2022, the General Conditions of Contract (GCC), Technical Information and Specifications attached, and hereby agree to supply, render services or perform works in accordance therewith

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South African Nuclear Energy Corporation SOC Limited

Document Title	**SCOPE OF WORK: NW PLASGAS PROJECT MASS, ENERGY AND PRESSURE BALANCE REVIEW**
Number	**ENS-NWPVR-SOW-23001**
Date	**November 2023**

APPROVAL & DISTRIBUTION

	NAME	SIGNATURE	DATE
Prepared By:	Mr. BM Khumalo Process Engineer: Engineering Services	17/11/2023 08:19:20(UTC+02:00) Signed by Bheka Khumalo, bheka.khumalo@necsa.co.za	
Checked By:	Mr. H Venter Chief Process Engineer Polaris Consulting	17/11/2023 08:48:27(UTC+02:00) Signed by Hennie.Venter@polariscm.co.za Venter, Hennie.Venter@polariscm.co.za	
Checked By:	Mr. F Erasmus Systems Engineer	18/11/2023 06:15:31(UTC+02:00) Signed by Frans Erasmus, frans.erasmus@necsa.co.za	
Accepted By:	Mr. L Mogotlhong Project Manager	21/11/2023 14:59:24(UTC+02:00) Signed by Leonard Mogotlhong, leonard.mogotlhong@necsa.co.za	
Approved By:	Mr. V Legoabe Head: Mechanical Engineering Services	04/12/2023 11:29:20(UTC+02:00) Signed by Vincent Legoabe, vincent.legoabe@necsa.co.za	
DISTRIBUTION	Engineering Services CMS (DG Ngwenya); All Persons Listed Above		

REVISION HISTORY

This document has been revised according to the following schedule:

Revision No.	Date Approved	Nature of Revision	Prepared by
1.0	See Title Page	First issue	BM Khumalo

1 INTRODUCTION

Low-level waste (LLW) was historically produced in some Necsa facilities because of the nature of their operations. Due to high volume and low nuclide concentration, it is not technically and economically viable to remove the radioactive material from LLW in order to decrease the liability. Historically, Plasma Gasification (PlasGas) has been successfully demonstrated at a laboratory scale, as a technique to treat non-radioactive waste by destroying all organic waste and melting the metallic and other inorganic compounds contained in the waste. Necsa intends to design and construct a demonstration Nuclear Waste PlasGas facility, which will use the existing LLW as feedstock. The proposed system will reduce the volume and weight of waste and destroy the non-contaminated matrix, thus rendering uranium recovery from the residue economically viable. Upon successful implementation and testing of the demonstration facility, a full-scale NW PlasGas facility will be established at Necsa to treat LLW that is not earmarked for Necsa's Volume Reduction Facility (VRF).

2 PURPOSE AND SCOPE

The purpose of this document is to give a high level Scope of Work (SOW) for the sourcing of Professional Engineering Services from an Engineering Consultant. The Consultant is required to use process engineering judgement and experience to generate specific process engineering deliverables for the NW PlasGas demonstration facility.

The SOW is limited to the following process engineering deliverables:

1) Mass balance
2) Energy balance
3) Pressure balance

The Consultant shall review the existing mass, energy and pressure balances produced by Necsa during Basic Design of the NW PlasGas demonstration facility. A document describing this review exercise and the outcome must be provided. If any errors, inconsistencies, gaps, etc. are identified, new calculations must be done for the affected Balance(s) and an updated revision provided in place of the current revision. Design changes are not permitted unless endorsed and authorized by Necsa.

3 OWNERSHIP

This SOW document belongs to Necsa's Engineering Services Department. The General Manager or as delegated is responsible for updating of the document and to ensure implementation thereof.

4 LIST OF ABBREVIATIONS

Compressible LLW	Compressible Low Level Waste
HAZOP	Hazard and Operability (Safety Study)
HEPA	High Efficiency Particle Air
LLW	Low-level Waste
NW	Nuclear Waste
PlasGas	Plasma Gasification
P&ID	Piping and Instrumentation Diagram
PFD	Process Flow Diagram
etc.	And so forth
QMS	Quality Management System
SOW	Scope of Work
SQEP	Suitably Qualified and Experienced Person
SSC	Structures, Systems and Components
$T_{1/2}$	Half-life
WAC	Waste Acceptance Criteria

5 DEFINITIONS

Term	Definition
LLW	Waste complying with: • Contamination from un-irradiated uranium • Long-lived radionuclides ($T_{1/2}$ > 31 years). • Concentrations are limited to 400 Bq/g for alpha and 4 000 Bq/g for beta and gamma emitters

	• Vaalputs WAC [20]
Plasma Gasification	Plasma gasification is an extreme thermal process using a plasma under partial oxidation conditions to convert organic matter (in this case contained in Compressible LLW) into process gas consisting primarily of water and carbon dioxide.
Concept Design	All the design and testing activities and supporting documents necessary to confirm the feasibility of the elected waste disposal process. It provides inputs to the HSE Design Basis for the Basic Design and typically includes HAZOP 1 and 2 Reports, as well as a Design Base Accident Analysis.
Basic Design	All the design and testing activities and supporting documents necessary to confirm that the facility specification can be met. It typically includes the HAZOP 3 safety study, an SSC Safety Classification Report and Equipment Technical Specifications as inputs to the Detail Design of the equipment.
Detail Design	All the design documentation necessary to manufacture individual items of equipment, to construct the plant, and to meet all design and regulatory requirements. The documentation also describes all the necessary functional and physical characteristics of each item; the characteristics selected for product acceptance testing; and the tests necessary for installation, operation, support, training, and disposal of each item.
Consultant	A consultant specializing in process engineering design and providing technical solutions to the sizing and specification of process equipment.
Professional Engineering Services	A service that requires or is based on the application of process engineering principles and data to a design relating to engineering.

Professionally Registered Chemical Engineer	A chemical engineer who is registered professionally as a Professional Engineer (Pr Eng) with the Engineering Council of South Africa.
Review	A detailed check of an engineering design deliverable to determine if the information presented is correct.
Suitably Qualified and Experienced Person (SQEP)	An individual holding a chemical engineering degree equivalent to NQF Level 8 or higher.

6 REFERENCES

The list of references below is divided into two sections. These are Basic Design and Supporting Information. Only documents relevant to this SOW (not the entire Basic Design Package) are included in the list.

6.1 BASIC DESIGN

[1] AC-NWPVR-DES-20001 Process Description for the NW PlasGas System (B-609), Rev, 03

[2] AC-NWPVR-PFD-21002 Process Flow Diagram, Rev 2.

[3] AC-NWPVR-REP-22002 Mass Energy & Pressure Balance for the Low-Level Waste Plasma Gasification (NW PlasGas) Demonstration System (B303), Rev 2.

[4] AC-NWPVR-PID-21004 Glovebox P&ID, Rev 3.

[5] AC-NWPVR-PID-21005 Feed system P&ID, Rev 3.

[6] AC-NWPVR-PID-21006 Gas Cylinders P&ID, Rev 3.

[7] AC-NWPVR-PID-21007 Reactor P&ID, Rev 3.

[8] AC-NWPVR-PID-21008 Scrubber P&ID, Rev 3.

[9]	AC-NWPVR-PID-21009	Cooling system P&ID, Rev 3.
[10]	AC-NWPVR-REP-21011	Scrubber design report, Rev 1.

6.2 SUPPORTING INFORMATION

[11]	SHEQ-INS-0189	Overview of Necsa's Security Processes
[12]	SHEQ-INS-8920	Access Control to Necsa Sites and its Facilities
[13]	SHEQ-INS-8921	Necsa's requirements for the Security Clearance of Items (Deliverables and Removals)
[14]	SHEQ-INS-8923	Requirements for the searching of Persons, Vehicles and Items Accessing and Egressing Necsa Sites.
[15]	SHEQ-INS-0113	Overview of Necsa's Information Security Processes
[16]	SHEQ-INS-0310	Information Security: Acceptable Use Procedure
[17]	SHEQ-INS-0320	Information Security: Requirements for Third Party Access
[18]	SHEQ-INS-8930	Security Requirements for the Control of Classified Information
[19]	SHEQ-INS-0234	Necsa QMS Requirements for External Design Organisations
[20]	NL28NLP-WAC-01	Waste acceptance criteria for Vaalputs, J.F. Beylefeld, August 2000.

7 ROLES AND RESPONSIBILITES

7.1 NECSA

Necsa is required to:

1) Provide access to the Necsa site for physical meetings.
2) Provide the relevant information to the Consultant for completion of the engineering work.
3) Timeously respond to queries from the Consultant to avoid project delays.
4) Organise regular meetings with Consultant making sure Necsa requirements are met.
5) Review and/or comment on the work provided by the Consultant, and eventually accept the work once all issues have been satisfactorily resolved.

7.2 CONSULTANT

The appointed Consultant is required to:

1) Adhere to Necsa's security requirements in terms of access to the Necsa site and the handling of Necsa's information, as defined in [11] to [18].
2) Ensure that its quality management system complies with the requirements of Necsa, as defined in [19].
3) Perform a comprehensive review of all existing documents pertaining mass, energy and pressure balances for the NW PlasGas project provided by Necsa.
4) Ensure that all engineering work is undertaken by a suitably qualified and experienced person (SQEP).
5) Ensure that the scope of each task is carried out in full.
6) Provide regular feedback on the status of the work.
7) Comply with all Necsa specific policies, procedures and guidelines.
8) Ensure compliance with the relevant design codes and standards.
9) Produce all deliverables for the SOW, with complete traceability through all work presented.
10) Ensure that each deliverable is reviewed internally by a Professionally Registered Chemical Engineer and approved, thereafter, before submission to Necsa for consideration.
11) Take accountability and provide assurance for the quality of the work.

8 SCOPE OF WORK

8.1 PROCESS OVERVIEW

The Block Flow Diagram (BFD) of the system is shown in Figure 1 below. The objective of the radioactive waste plasma gasification (NW PlasGas) system is to reduce the volume of low-level waste (LLW) through plasma gasification (PlasGas). The LLW generated at Necsa will be used as feedstock for a radioactive waste plasma gasification (NW PlasGas) system. The waste will be shredded, blended and gasified in order to reduce its volume significantly (> 95 percent volume reduction). The two main outputs of the plant will be combustion gas (CO_2, and H_2O) and contaminated unburnt residue.
The process commences by preparation of the feed. The feed is sorted in a glove box, shredded and fed to the gasification reactor by the screw feeder at a constant rate. The shredder and screw-feeder work as an integrated unit.

The combustible content is converted into CO_2 and H_2O predominantly in the reactor and the non-combustible material is collected at the bottom of the reactor in an ingot mould. The non-combustible material, including uranium will be removed at regular intervals from the bottom of the reactor and packaged into drums and stored.

O_2 (Oxygen) will be fed to the reactor to facilitate the combustion. N_2 (Nitrogen) will also be fed into the hopper to flush the gases and particulates to the reactor. The N_2 is also fed to the plasma power supply to ionize the torch and passes through to the reactor. The process gas product (predominantly CO_2 and H_2O) exiting the reactor is quenched to reduce the temperature, scrubbed to remove toxic gases, filtered and passed through a flare (to destroy possible remaining CO, NOx or H_2). The gas from the flare is discharged to the atmosphere via the process ventilation stack.

The plant has the following subsystem functions:

1) Feed storage
2) Feed preparation
3) Reactor system
4) Gas treatment
5) Waste streams
6) Analytical measuring

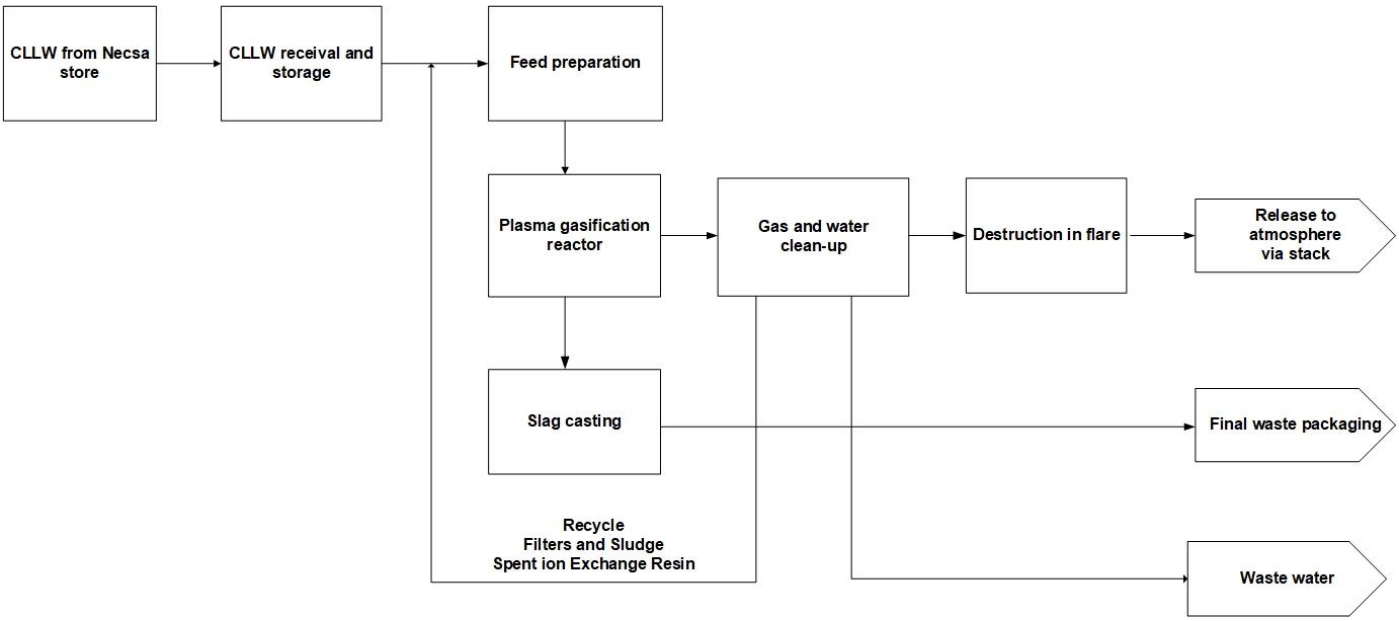

Figure 1: Block Flow Diagram of the NW PlasGas System

8.2 SPECIFICATION AND DESCRIPTION OF THE SERVICES AND DELIVERABLES

A Report for the Mass, Energy and Pressure Balance in the NW PlasGas plant are currently available in [3]. The Consultant is required to review this report and verify if the results presented are correct. A document describing this exercise and the outcome thereof must be provided. If any errors, inconsistencies, gaps, etc. are identified during this process, then new calculations must be undertaken for the affected Balance(s) and an update (new revision) provided in place of [3].

The above Balances are supplemented by the stream table that is attached to the PFD in [2]. The stream table summarizes the results of the Balances and provides the temperature, pressure, phase, mass flow rate and composition of each stream identified in the PFD. Therefore, if the values of any of the operating parameters are revised during this exercise, then the stream table must be updated accordingly.

An electronic copy of the Microsoft Excel spreadsheet containing the calculations should be presented, together with newly revised [2] and [3] above (See 8.3 below).

8.3 USE OF SOFTWARE

HSC Chemistry software package was used to determine the species present in the reactor at different temperatures. The rest of the calculations presented in [2] and [3] where done on Microsoft Excel. The Consultant shall obtain access to HSC Chemistry on their own in order to verify the species present in the reactor at different temperatures and provide to Necsa a copy of the electronic HSC files. The rest of the calculations can be done on Microsoft Excel.