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RFQ Number	RFQ-Non-Fer-2024
Request for Quotation Date	2024-10-28
RFQ Closing Date	2024-11-08
RFQ Closing Time	10:00am
Compulsory Site Briefing	None
Contact Person	Catherine.Matima@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	Non-ferrous material M&E Balances – Smelter

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 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 mass and energy balance calculations and review of a report in support of the preparation for the operational use of an induction furnace for the volume reduction of contaminated non-ferrous scrap material.	1

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Necsa will make a dongle for the FactSage Nuclear Database available to the successful bidder with the explicit requirement that this software will exclusively be used for the calculations required by Necsa and that it will not be used for any other purpose.

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 to the Technical templates 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 out of the possible 100 points and which score a number of points for functionality that is greater than or equal to the set threshold points of the number of points achieved by the highest scoring Bid for functionality will be selected to progress to the second stage.

Technical, Performance & Quality and Risk Criteria

Item	Requirement	Weight	Points	Criteria
1	Evidence of experience of performing of Mass, energy and pressure balances by using FactSage software	60	60	Performance of similar studies by current employees using the Factsage software.
				No evidence of experience using Factsage.
2	Delivery time	30	30	< 30 working days after receipt of order

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			20	< 60 working days after receipt of order
3	Possession of FactSage software for M&E balance calculations	10	10	Software license
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)

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- 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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APPROVAL & DISTRIBUTION

	NAME	SIGNATURE & DATE
PREPARED	FJ Erasmus Pr. Eng. (740304) Systems Engineer	 Signed by: FJ Erasmus, f.j.erasmus@necsa.co.za 15/05/2024 10:36:15 (UTC+02:00)
Checked	Dr K Moodley Chief Engineer: Process Engineering	 Signed by: Keesie Moodley, k.moodley@necsa.co.za 15/05/2024 15:42:30 (UTC+02:00)
Checked	LG Mogotlhong Process Engineer: Project Management	 Signed by: Lesetsoe Mogotlhong, l.mogotlhong@necsa.co.za 15/05/2024 09:45:30 (UTC+02:00)
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Approved	S Mosinki Executive Manager: Engineering Services	 Signed by: Stephen Mosinki, s.mosinki@necsa.co.za 15/05/2024 11:10:30 (UTC+02:00)
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1 PURPOSE AND SCOPE

1.1 Purpose

The purpose of this document is to facilitate the development of feed recipes for the envisaged decontamination of the non-ferrous scrap materials through e-melting the contaminated scarp materials in an induction furnace. The targeted effectiveness of this envisaged process is ninety eight percent ((98%)) as expressed by the ratio of the uranium contained in the slag material to the uranium in the feed material.

1.2 Scope

To simulate the melting process for various specified non-ferrous scrap material categories. These simulations will provide mass & energy balances based on assumptions regarding the composition of the input materials, the range of fluxes used, as well as the compositions of alternative refractory materials. It is also required to assess the impact of the various fluxes and other inputs on the refractory materials used during the process.

The optimality of the feed material recipes will be based on several parameters including slag basicity, tapping/casting temperature, off-gas temperatures, densities, viscosities, and the compositions of both product and by-product streams. Appendix A outlines the user requirements for modelling the operating process parameters.

The results from these simulations will be constraint by the fact that the exact specifications of the feed materials (scrap material) are not known and variable from batch to batch. This contributed to the fact that the categorisation of the feed material (scrap material) is based on appearance. The specifications of the various categories are thus approximations of the actual composition of the feed materials and the assumption is that the results will be compatible.

2 REFERENCES AND ABBREVIATIONS

2.1 References

This document refers to:	
[1]	NLM-SAR-08/001: SMELTER SAFETY ASSESSMENT REPORT
[2]	ENS-SMELT-ABS-24001: REVIEW OF THE SMELTER MASS & ENERGY BALANCE

2.2 Abbreviations

Abbreviation	Description
BaCl ₂	Barium chloride
Bq	Becquerel
Bq/gU	Becquerel per gram uranium
CaF ₂	Calcium fluoride
CaO	Calcium oxide

Abbreviation	Description
cp	centipoise
°C	Degree Celsius
kg	kilogram
Kg/hr	Kilogram per hour
kW	kilowatt
kWh/t	Kilowatt-hour per ton
LiF	Lithium fluoride
M/A	MgO/Al ₂ O ₃
Mg	Magnesium oxide
mm	millimetre
Nm ³ /h	Normal Meter Cubed per Hour.
%	Percentage
SEC	Specific Energy Consumption
S/M	SiO ₂ /MgO
S/M +C	SiO ₂ /MgO +CaO
SiO ₂	Silicon oxide
t/t	Ton per ton
UO ₂ F ₂	Uranyl fluoride
Vol%	Volume percentage

3 BACKGROUND

Necsa possesses approximately 14,000 tons of scrap metal contaminated with uranium material, primarily comprising 93% ferrous alloys and 7% non-ferrous alloys. This scrap metal is categorized based on appearance into steel, stainless steel, aluminium, cast iron, and other non-ferrous metals. The uranium content in the scrap metal is quantified in the form of UO₂F₂. The objective of the project is to decontaminate the material through re-melting in an induction furnace. The rationale behind re-melting is to extract most of the uranium from the alloy phases and concentrate it in a slag phase, thus facilitating a reduction of the volume of contaminated materials. The target is the retention of 98% of the uranium contaminant in the slag material.

Due to the fact that the scrap materials are categorized and grouped based on appearance, no definitive specification for the input materials exist. As input specifications the most common specification for the category specified will be used for the simulations which at best will be an approximation of the composition of the input materials.

4 INPUT FOR THE SIMULATIONS

4.1 Furnace

An induction furnaces, with a capacity of 1000 kW, will be utilized. The specification of the Non- Ferrous Alloy furnace is:

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- Capacity approximately 1500 kg (Aluminium)/4000 kg steel
- Melting rate 400 kg/hr
- Inside diameter 850 mm
- Depth approximately 1200 mm

4.2 Feed Materials per Melting Batch¹

- Aluminium Grade 6082 – 1500 kg
- Copper – 4300 kg
- Brass – 4500 kg
- Bronze – 4500 kg
- Nickel – 4500 kg

4.3 Flux Materials

- Calcium fluoride (CaF_2)
- Potassium chloride (KCl)
- Barium chloride (BaCl_2)
- Lithium fluoride (LiF)

4.4 Level of Contamination

4.4.1 Aluminium for 1500kg feed material

- < 75 g UO_2F_2 per batch to be melted [2].
- Enrichment grade < 5% enriched U [2].

4.4.2 Other non-ferrous materials

- < 200 g UO_2F_2 per batch to be melted [2].
- Enrichment grade < 5% enriched U [2].

4.5 Simulation Outputs Report

4.5.1 A detailed simulation report for per Feed Material per fluxes used.

4.5.2 Feed recipes for the feed material evaluated

4.5.3 Estimated uranium recovery to the slag for each recipe

4.5.4 Estimated process energy requirement for each recipe

4.5.5 Slag phase behaviour as a function of temperature

4.5.6 Slag liquid and apparent viscosity as a function of temperature

4.5.7 Slag-Refractory interaction and recommendations regarding the most suitable refractory material for the application

Notes:

¹ Adjusted based on densities of input materials

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4.6 Recommendations with respect to the suitability of the process

4.6.1 Suitability of the intended process with specific reference to Aluminium.

4.7 Review of the review-report on Ferrous Materials

4.7.1 The analysis work performed on the ferrous materials has been reviewed [2] in the context of the requirements of the safety case for the project, as well as the effectiveness of the decontamination process based on a brief literature review. A brief assessment of the conclusions reached in this report is required.

5 REVISION HISTORY

This document has been revised in accordance with the following schedule:

Rev. No.	Date approved	Nature of Revision	Prepared
1.0	See title page	First issue.	F Erasmus

APPENDIX A

FURNACE				
Specific Energy	SEC, kWh/t feed			
Requirement(SER)	kWh/t furnace feed			
	kWh/t scrap			
	kWh/t slag			
	kWh/t alloy			
Consumption (SEC)	kWh/t furnace feed			
	kWh/t scrap			
	kWh/t slag			
	kWh/t alloy			
Furnace Slag	ton/melt			
Furnace Alloy	ton/melt			
Process gas	Nm3/h			
Process Gas Composition	Vol%			
	Vol%			
	Vol%			
	Vol%			
	Vol%			
	Vol%			
Final Gas	Nm3/h			
Final Gas Composition	Vol%			
	Vol%			
	Vol%			
	Vol%			
	Vol%			
	Vol%			
Scrap-to-alloy-ratio	t/t tapped alloy			
Scrap-to-slag-ratio	t/t tapped slag			
Scrap-to-scrap-ratio	t/t scrap			
Alloy-to-scrap-ratio	t/t alloy			
Slag-to-alloy-ratio	t/t tapped alloy			
Alloy-to-slag-ratio	t/t tapped slag			
Basicity	ratio			
MgO/Al ₂ O ₃	M/A ratio			
SiO ₂ /MgO	S/M ratio			
SiO ₂ /MgO+CaO	S/M+C ratio			

Furnace heat losses		%		
Temperatures			Design	Operating
Feed	Calcine	°C		
	Reductant	°C		
	Flux	°C		
Product	Alloy	°C		
	Slag	°C		
	Slag-alloy superheat	°C		
	Liquid's temperature	°C		
	Solidus temperature	°C		
Gas	Process gas temp	°C		
	final gas temp	°C		
Viscosity	Alloy	cp		
	Slag	cp		
Raw materials				
Scrap batched	ton			
	t/t tapped alloy			
	t/t tapped slag			
Flux batched	ton			
	t/t tapped alloy			
	t/t tapped slag			

Feed scrap	<u>Al</u>	% of feed				
	<u>Cu</u>	% of feed				
	<u>Brass</u>	% of feed				
	<u>Bronze</u>	% of feed				
	<u>Nickel</u>	% of feed				
Flux	<u>Flux 1</u>	% of feed				
	<u>Flux 2</u>	% of feed				
	<u>Flux 3</u>	% of feed				
	<u>Flux 4</u>	% of feed				

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	%	Flux 1	Flux 2	Flux 3	Flux 4
Flux Composition	CaF₂				
	KCl				
	BaCl₂				
	LiF				