






# TRANSMISSION

## TENDER TECHNICAL EVALUATION STRATEGY FOR PROFESSIONAL SERVICES

### ZEUS – PERSEUS 765 kV LINE SERIES COMPENSATION

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**Rev. 2**

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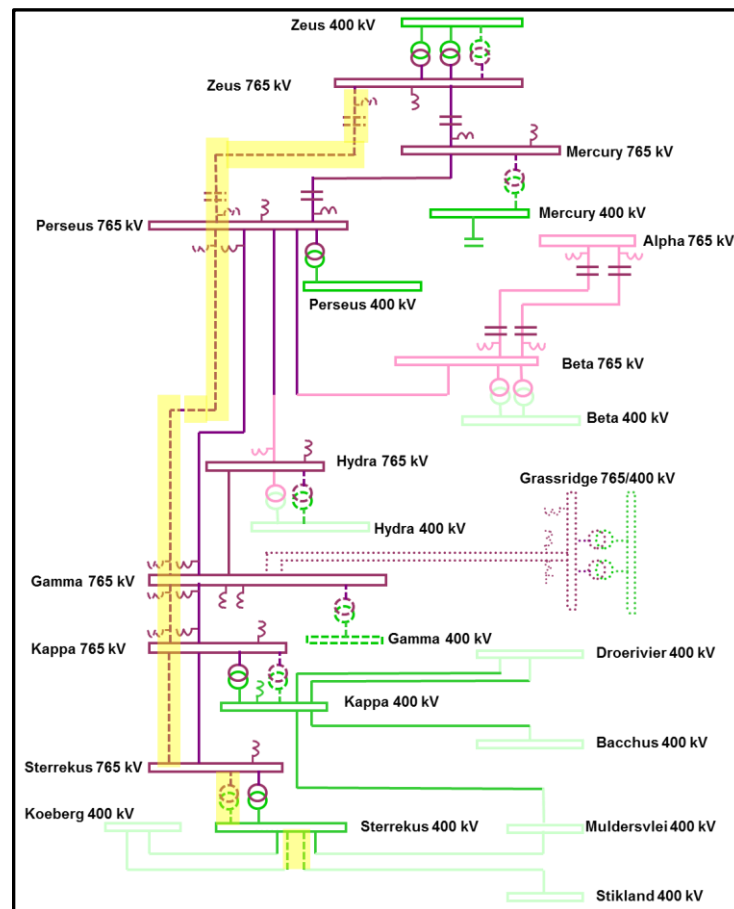
## 1 PURPOSE

The purpose of this document is to define the requirements and evaluation criteria to be used in contracting and assessing the capabilities for series compensation study professional services required on the Zeus-Perseus 765 kV transmission line.

## 2 INTRODUCTION

Strengthening of the Cape Corridor 765 kV network is required in the near future to provide increased transfer capacity to and from the Greater Cape area (Eastern Cape, Northern Cape and Western Cape). The 2<sup>nd</sup> 765 kV transmission line (Cape Corridor Phase 4) will increase the power transfer capacity of the existing Cape Corridor to supply the forecasted loads and also to evacuate excess generation out of the Greater Cape area due to the integration of the large-scale renewable generation in the three Cape provinces.

The pre-engineering studies have been completed and the proposed expansion to the network is detailed below. The expansion includes overhead lines, transformers, series capacitor banks, shunt reactors and line reactors as shown in Figure 1.



**Figure 1: Planned expansion of the Cape Corridor**

## Document Classification: Controlled Disclosure

The high level scope of work is as follows:

### Zeus to Perseus 1<sup>st</sup> 765 kV line

- Build a ±430 km, 765 kV line from Zeus to Perseus with line reactors at both ends.
- \*Install series capacitors at Zeus and Perseus

### Perseus to Gamma 2<sup>nd</sup> 765 kV line

- Build the 2<sup>nd</sup> ±420 km, 765 kV line from Perseus to Gamma with line reactors at both ends.

### Gamma to Kappa 2<sup>nd</sup> 765 kV line

- Build the 2<sup>nd</sup> ±400 km, 765 kV line from Gamma to Kappa with line reactors at both ends.

### Kappa to Sterrekus 2<sup>nd</sup> 765 kV line

- Build the 2<sup>nd</sup> ±150 km, 765 kV line from Kappa to Sterrekus.

### Sterrekus Ext 2<sup>nd</sup> 2000 MVA, 765/400 kV transformer

- Install 2<sup>nd</sup> 765/400 kV 2000 MVA transformer at Sterrekus Substation.

### Loop-in Koeberg-Stikland 400 kV line into Sterrekus Substation

- Loop-in Koeberg-Stikland 400 kV line into Sterrekus Substation.

### \*Note:

The Zeus – Perseus 765 kV line must be compensated such that its loading is similar or equal to that of the Mercury – Perseus 765 kV line. Compensation is assumed to be distributed with 35% at the Zeus end and 65% at the Perseus end. Estimated compensation values are provided below. **However, % distribution and values of compensation to be determined through these specialised studies.**

Line Name	Bank Name	Location	Line Length	Voltage	Line Inductive Reactance $X_L = 2\pi fL$		Bank Capacitive Reactance $X_c = 1 / (2\pi fC)$		Compen- sation	Bank Size (Mvar)
			(km)	kV	$X_L$ ( $\Omega$ )	$X_L$ (p.u.)	$X_c$ ( $\Omega$ )	$X_c$ (p.u.)	%	$= 3I^2 X_c$
Mercury-Perseus No1 765 kV	Perseus 1	Remote	235	765	65	0.0109	30	0.0051	46%	893
Zeus-Perseus No1 765 kV	Zeus 2	Remote	430	765	118	0.0202	29	0.0050	70%	863
Zeus-Perseus No1 765 kV	Perseus 2	Remote					53	0.0091		1578

## Document Classification: Controlled Disclosure

Over and above this, the following additional 765/400 kV transformers have been identified (and must be considered) for the Cape Corridor:

- Install 1<sup>st</sup> 765/400 kV 2000 MVA transformer at Mercury Substation.
- Install 2<sup>nd</sup> 765/400 kV 2000 MVA transformer at Kappa Substation.
- Install 1<sup>st</sup> 765/400 kV 2000 MVA transformer at Gamma Substation.
- Install 3<sup>rd</sup> 765/400 kV 2000 MVA transformer at Zeus Substation.
- Install 2<sup>nd</sup> 765/400 kV 2000 MVA transformer at Hydra Substation.

### 3 REFERENCES

Parties using this document shall apply the most recent edition of the documents listed in the following paragraphs.

#### 3.1.1 NORMATIVE

1. IEC 60143 – Series capacitors for power systems
2. IEC/SANS 62271-100 – High-voltage switchgear and controlgear Part 100: Alternating-current circuit-breakers
3. IEC 60071 – Insulation Co-ordination
4. Transmission System Planning Guideline (TSPG)
5. Grid Code – Network Code

#### 3.1.2 INFORMATIVE

1. Cape Corridor Strengthening Phase 4: URS Rev 2, September 2021
2. Cape Corridor Strengthening Phase 4: Zeus-Sterrekus 765 kV Line, GP Report\_13/23, L Mashego, March 2013
3. Transmission Development Plan 2022-2031, October 2021

### 4 DEFINITIONS

Definition	Description
<b>The Contractor</b>	The successful engineering firm/consultancy and staff being appointed to deliver scope of work as specified
<b>The Employer</b>	Eskom Holdings SOC LTD or designated representative

## **5 STUDY SCOPE OF WORK**

Studies are to be conducted for the last year of the current TDP cycle i.e. year 2031 (which is at the time of compiling this document). The high level scope of work for the specialised studies of the series compensation is as follows:

- Sizing (impedance), % distribution at remote ends and optimisation of the series capacitors (taking into consideration but not limited to load flows and fault levels);
- Thermal rating and overload requirements as stipulated in the applicable references.
- End-to-end voltage profiles of the series compensated line and existing Zeus-Mercury-Perseus 765 kV line and maximum voltage at the series capacitors on these lines.
- Investigation and identification of possible sub-synchronous resonance (SSR) node problem areas in the Eskom network before and after the series compensation (including but not limited to Koeberg, Ankerlig and Gourikwa, Tutuka and Majuba i.e. generation closely linked / coupled to the Cape Corridor). In the event of a substantial change in the frequency scan results, additional sites over and above those listed above must be identified and included.
- Transient Recovery Voltage (TRV) and Initial Transient Recovery Voltage (ITRV) [both the peak and Rate of Rise of Recovery Voltage (RRRV)] to determine the worst voltage rating on both sides of the series capacitor and at the remote substations for fault conditions and by-pass switching operations.

This must be carried out for six scenarios (i.e. one and two generation units in operation at Koeberg for peak load, midday load, and light load) under system healthy and N-1 contingency conditions (including loss of a Koeberg unit). Where specified or where deemed necessary, N-2 contingency conditions must also be evaluated.

The following internal Eskom information required to perform the studies will be supplied by Eskom Grid Planning for the purpose of conducting the studies:

- 6 x steady state load flow case files (.sav) and associated slider binary file/s (.sld) for the 6 scenarios for year 2031 in PSS®E format (V33.5 and/or V34.4);
- Description / summary of the Transmission network changes leading up to those years;
- Additional details of equipment beyond what is contained in the load flow case files where available, such as generator mechanical information and existing ratings and future ratings of standard switchgear.

## **6 EXPECTED OUTCOME**

- a) Detailed separate technical reports that document the studies undertaken and the findings and recommendations thereof for e.g. steady state studies report, SSR report and TRV report, in electronic format;
- b) PSS®E / PowerFactory / PSCAD / EMTDC (or any other power systems simulation tool) files used in electronic and editable/unlocked/unprotected format; where possible converted into working and solving PSS®E files as well.
- c) Presentation of study assumptions and study results to an Eskom technical review committee.

## **7 TRAINING**

Eskom staff will be identified to work closely with the consultant during the studies. The intention is that the Eskom staff will gain experience and knowledge in undertaking the work together with the consultant. Skills and knowledge transfer must be provided to at least 2 Eskom planners (grid planners and/or operations planners). The above will be included in the offer and contract to be signed with the consultant.

## **8 TIME FRAME**

The duration for the completion of these studies is 8 months.

## **9 LEGISLATION**

In all matters on which this specification is silent, a ruling shall be sought from The Employer and such ruling shall then form part of this specification. Whilst every attempt has been made to ensure that this specification is complete, any errors and/or omissions and items not clearly defined or requiring clarity shall be brought to The Employer's notice.

All staff of The Contractor will be required to comply with and complete a non-conflict of interest declaration and a non-disclosure agreement (NDA).

In undertaking the Study Scope of Work, The Contractor shall comply with the Occupational Health and Safety Act and Regulations, Act 85 of 1993 of the Republic of South Africa, and the amendments. When undertaking work in foreign territories, The Contractor shall comply with applicable local legislation. The Contractor shall strictly comply with all applicable provisions of The Employer's Accident Prevention Manual, ORHVS, SHEQ and Construction Safety Manual.

The Contractor shall observe working clearances when working near or about energized lines or equipment as per The Employer's Accident Prevention Manual and ORHVS. The Contractor shall provide necessary personal protective clothing and equipment for their staff and implement their correct use as required.

## **10 EVALUATION OF PROPOSALS**

All required documentation requested in this specification as well as indicated below shall be included in the tender package and shall form part of the evaluation unless specifically indicated otherwise.

The required information shall be in the form of compliance statements, staff resumes, project reference lists and reference letters as applicable in demonstrating compliance to the requirements stipulated.

### **10.1 PROCEDURE**

Bidders who are unable to demonstrate compliance to all applicable requirements and/or scoring thresholds at the required stages in the procurement process will be rejected.

Information submitted with the tender at the bid stage must adequately address all items listed under the functionality Criteria in Table 1 in Annex A. The submitted information must be of sufficient detail to allow the evaluating team to make a confident evaluation of the offer against the requirements stipulated.

The technical evaluation begins after the tender closing date and once all submissions are received by the technical cross-functional team evaluating the offers. An outline of the process is provided below:

- 1) The evaluation and scoring will be conducted on each submission in accordance with the Criteria and Scoring Allocation defined in Table 1 in Annex A.
- 2) Items requiring clarifications (if any) will be communicated to The Contractor for official response. The Contractor will be given a period of 5 working days to respond on issued clarification requests.
- 3) Only submissions that score above the stipulated threshold will then be allowed to progress further in the procurement process. The stipulated threshold is 60 %.
- 4) If there are any deficiencies in the submissions that score above the stipulated threshold, the Contractor may be required to submit outstanding information and correct any deficiencies to the satisfaction of Eskom prior to contract award.



## **10.2 DEVIATIONS**

The supplier shall notify Eskom of any deviations from this specification and listed normative references in the submission at tender stage. This shall be clearly labelled and included in the technical files.

## **11 AUTHORISATION**

This document has been seen and accepted by:

<b>Name and surname</b>	<b>Designation</b>
Kevin Kleinhans	Chief Engineer – Insulation Coordination
Sphiwe Nkosi	Chief Technologist – Substation Equipment & Diagnostics
Ronald Marais	Senior Manager – Strategic Grid Planning
Neels van Staden	Senior Consultant – Substation Equipment & Diagnostics
Paul Davel	Chief Engineer – System Operator
Krishna Naidoo	Project Manager – PDD
Alwyn Marais	Chief Engineer – PDD
Leslie Naidoo	Senior Manager – Grid Planning

## **12 REVISION HISTORY**

<b>Date</b>	<b>Rev</b>	<b>Compiler</b>	<b>Remarks</b>
June 2022	1	Ahmed Hansa	First issue.
Nov 2022	2	Ahmed Hansa	Removed “Cost for Task Order” from Functionality Criteria and Scoring Matrix (Annex A) and increased weighting of “Delivery Time for Task Order” from 10% to 20%.

## Annex A – : Functionality Criteria and Scoring Matrix

Table A.1: Functionality Criteria and Scoring Matrix

Technical (Scope Match) Evaluation Template				COMMENTS / SOURCE / REFERENCE (see examples below)	
Task Reference:					
Task Description:	Specialised Studies for Series Compensation of the Zeus-Perseus 765 kV Line				
Discipline:	Electrical				
Task Duration:	Eight (8) months				
Requestor:	Ahmed Hansa				
Tenderer:					
	100%	Evaluator:			
		Date:			
	Criteria Weight (must total 100)	Score	Total Weighted Score		
<b>RESOURCE PLAN</b>					
Qualifications of key personnel	20%		0.2	Includes personnel ranging from 4 years experience to >30 years. Has a PhD, Masters etc.	
Proposal meeting scope requirements	30%		0.3	As per submitted Vol 1. - Technical Proposal	
<b>PREVIOUS ASSIGNMENTS</b>					
Previous relevant assignments of personnel	20%		0.2	Studies mainly focused on steady state. No evidence of TRV.	
Reference list of company and personnel	10%		0.1	Detailed references provided but previous studies not very relevant.	
<b>DELIVERY TIME</b>					
Delivery time for task order	20%		0.2	Duration indicated as 25 to 30 weeks	
<b>Total Weight</b>	100%		1.0		
<b>Overall Score</b>			0%		
Qualifications of key personnel	PhD - Expert	Masters Degree (M.Sc/M-Tech)	Honours Degree (B tech, Bsc hons.)	Degree/ Higher Diploma	National Diploma
	10	8	6	4	2
Proposal meeting scope requirement	Excellent response which demonstrates the ability to deliver the service far in excess of minimum requirements	Good response detailing clearly how the service will be delivered above and beyond the minimum requirements	Acceptable response detailing how the service will fully meet the requirements	Barely adequate levels of required scope proposal	Less than minimum level of required scope proposal or irrelevant
	10	8	6	4	2
Previous relevant assignments	> 5 assignments	3-4 assignments	2-3 assignment	1-2 assignment	0 assignments
	10	8	6	4	2
Reference list	>8 References	6- 7 References	4-5 References	2-3 References	1 Reference
	10	8	6	4	2
Delivery time for task order	Within 10%	20% earlier or later	30% earlier or later	40% earlier or later	50% earlier or later
	10	8	6	4	2
Signed by: _____					
Date: _____					