Eskom	Strategy	Engineering

Title: **Tutuka Solar PV Plant Tender Technical Evaluation Strategy**

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[redacted]

CONTENTS

TABLES

1. INTRODUCTION

Eskom Holdings SOC Ltd desires to engage the services of an Engineering, Procurement and Construction (EPC) Contractor to undertake, on a lump-sum basis under a NEC ECC contract, all studies, permitting, design, engineering, procurement, manufacturing, deliveries to Site, execution, erection, commissioning, testing, completion, operation and maintenance (O&M) until taking Over, making good defects and warranty cover during the Defects Liability Period, and other works necessary to construct a Solar Photovoltaic (PV) Power Plant, the access road, the site facilities and any additional infrastructure at Tutuka Power Station.

2. SUPPORTING CLAUSES

2.1 SCOPE

This document contains the Tender Technical Evaluation Strategy and associated documents relating to a commercial enquiry for the design, manufacture, testing, supply, delivery, off-loading, construction, commissioning, development of user documentation, training, operating and maintenance of a Solar PV facility at Tutuka Power Station.

The Tender Technical Evaluation Strategy define the following technical evaluation criteria:

- Mandatory Evaluation Criteria
- Qualitative Evaluation Criteria
- Tender Returnable Technical Schedules
- TET Member Responsibilities
- Foreseen Acceptable / Unacceptable Qualifications

2.1.1 Purpose

The purpose of this tender technical evaluation strategy is to define the Mandatory Evaluation Criteria, Qualitative Evaluation Criteria, Tender Returnable Technical Schedules, TET Member Responsibilities, and Foreseen Acceptable / Unacceptable Qualifications for the installation of Solar PV Plant at Tutuka Power Station tender technical evaluation. The technical evaluation strategy serves as the basis for the tender technical evaluation process.

2.1.2 Applicability

The technical evaluation criteria stated in this document shall apply to all parties who submit a Tender Bid for the Project described herein and the TET members responsible for the tender technical evaluation.

It must be noted that the Tender Technical Evaluation Strategy Report, with the team members names and authorisation signatures, will not be included in the enquiry as a document, but only the content thereof.

2.2 NORMATIVE/INFORMATIVE REFERENCES

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

2.2.1 Normative

[1] 240-168966153: Generation Tender Technical Evaluation Procedure

[2] 240-48929482: Tender Technical Evaluation Procedure

[3] 559-189375010: Installation of Solar PV Plant at Tutuka Power Station Functional Specification

[4] 32-1033: Eskom Procurement and Supply Chain Management Policy

[5] 32-1034: Eskom Procurement and Supply Chain Management Procedure

2.2.2 Informative

[6] 240-53114190: Internal Audit Procedure

[7] ISO 9001 Quality Management Systems

[8] 240-141007195 Electronic Signature Usage Policy

[9] 240-156280553 Procedure for signing documentation electronically using the Eskom Electronic Signing System

2.3 DEFINITIONS

Definition	Description
Tender	A tender refers to an open or closed competitive request for quotations/prices against a clearly defined scope/specification.
(Tenders) Bid	The documentation submitted by a Bidder for consideration for the tender process concerning the Project at Tutuka Power Station.
Bidder	A third party who submits a Bid in response to the tender issued for the Project at Megawatt Park.
Contract	The NEC ECC Contract governing the engineering, procurement and construction work required for the Project.
Contractor	The primary Contractor who will be responsible for the entire Project Works, including all studies, permitting, design, engineering, procurement, manufacturing, deliveries to Site, execution, erection, commissioning, testing, completion, O&M until Taking Over, making good defects and warranty cover during the Defects Liability Period, and other works necessary to construct a solar PV power plant at Tutuka Power Station.
Defects Liability Period	A fixed period of time after the Taking Over Date (usually a twenty-four (24) month period) in which the Contractor shall remedy any outstanding defects and work required for the Project, and during which the Project is monitored to ensure it meets certain performance related thresholds as per the Contract.
Employer	Eskom Holdings SOC Ltd
Plant	All component and parts forming part of the Tutuka solar PV power plant which are necessary for the generation of electricity.
Project	The Plant and all access roads, site facilities and additional infrastructure located on Site.
Taking Over	The date on which the Project Works are determined to be complete in terms of the Contract (except for minor defects and outstanding work) and are taken over by the Employer.
Technical Evaluation Team	A team of individuals appointed by the Employer who are responsible for the review and evaluation of the Bids received in terms of the established technical evaluation criteria.
Site	The physical demarcated location on which the solar PV power plant is to be built.
Works	All studies, permitting, design, engineering, procurement, manufacturing, deliveries to Site, execution, erection, commissioning, testing, completion, O&M until Taking Over, making good defects and warranty cover during the Defects Liability Period,

Definition	Description
	and other works necessary to construct a solar PV power plant at Tutuka Power Station.

2.3.1 Classification

Controlled Disclosure: Controlled Disclosure to external parties (either enforced by law, or discretionary).

2.4 ABBREVIATIONS

Abbreviation	Description
AC	Alternating Current
AIS	Air Insulated Switchgear
BNEF	Bloomberg New Energy Finance
C&I	Control and Instrumentation
CEL	Cost Estimate Letter
CMS	Control and Monitoring System
CV	Curriculum Vitae
DC	Direct Current
ECSA	Engineering Council of South Africa
EDWL	Engineering Design Work Lead
EPC	Engineering, Procurement and Construction
EYA	Energy Yield Analysis
GIS	Gas Insulated Switchgear
HMI	Human Machine Interface
HV	High Voltage
HVAC	Heating, Ventilation and Air Conditioning (
LDE	Lead Discipline Engineer
LV	Low Voltage
MEC	Maximum Export Capacity
MV	Medium Voltage
MWac	MegaWatt alternating Current measured downstream of inverters
MWdc	MegaWatt direct Current measured at PV panel terminals
MWp	MegaWatt direct current measured at peak irradiance from PV arrays (i.e., plant nameplate capacity)
NLEPDS	Non-Lethal Energized Perimeter Detection System
O&M	Operation and Maintenance
OEM	Original Equipment Manufacturer
OHL	Overhead line
POC	Point of Connection

Abbreviation	Description
PR	Performance Ratio
PSiRA	Private Security Industry Regulatory Authority
PV	Photovoltaic
RMU	Ring Main Unit
SACPCMP	South African Council for the Project and Construction Management Professionals
SCADA	Supervisory, Control and Data Acquisition
SLD	Single Line Diagram
TET	Tender Evaluation Team
TES	Tender Evaluation Strategy

2.5 ROLES AND RESPONSIBILITIES

In accordance with [1] 240-168966153: Generation Tender Technical Evaluation Procedure.

2.6 PROCESS FOR MONITORING

N/A

2.7 RELATED/SUPPORTING DOCUMENTS

N/A

3. TENDER TECHNCIAL EVALAUTION STRATEGY

3.1 TECHNICAL EVALUATION THRESHOLD (TET)

The minimum weighted final score (threshold) required for a tender to be considered from a technical perspective is 70%.

3.2 TET MEMBERS

Table 3-1: TET Members

[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
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[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]

3.3 MANDATORY TECHNICAL EVALUATION CRITERIA

Mandatory Evaluation Criteria (gatekeepers) are 'must meet' criteria. These criteria are assessed on a Yes/No basis as to whether the criteria are met. An assessment of 'No' against any criterion shall technically disqualify the tender and shall not be further evaluated against Qualitative Criteria.

Refer to Appendix A for the defined Mandatory Criteria.

The Mandatory Criteria will be evaluated based on the information provided in accordance with Appendix C, which describes the specific tender returnable and technical schedules that the Bidder should complete and return during the Tender phase.

3.4 QUALITATIVE TECHNICAL EVALUATION CRITERIA

Tenders that have met all the Mandatory Evaluation Criteria will be evaluated against the Qualitative Evaluation Criteria. Qualitative Evaluation Criteria are weighted evaluation criteria used to identify the highest technically ranked tender.

The minimum weighted final score (threshold) required for a tender to be considered "Functionally Acceptable" from a technical perspective is 70%.

Refer to Appendix B for the defined Qualitative Criteria.

The Qualitative Criteria will be evaluated based on the information provided in accordance with Appendix C: Tender Returnable Technical Schedules, which describes the specific tender returnable and technical schedules that the Bidder should complete and return during the Tender phase.

3.5 TET MEMBER RESPONSIBILITIES

The TET members allocated to review/evaluate each Mandatory and Qualitative criterion is indicated in Table 3-2

Refer to Table 3-1 for identification of the TET members.

Refer to Appendix A,

Table A-1: for the Mandatory Criteria.

Refer to Appendix B, Table B-2 for the Qualitative Criteria.

Table 3-2: TET Member Responsibilities

[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]		[redacted]							
[redacted]	[redacted]	[redacted]	[redacted]		[redacted]							
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
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[redacted]							[redacted]				[redacted]	[redacted]
[redacted]	[redacted]			[redacted]					[redacted]		[redacted]	[redacted]

3.6 FORESEEN ACCEPTABLE / UNACCEPTABLE QUALIFICATIONS

3.6.1 Risks

Table 3-3: Acceptable Technical Risks

Risk	Description
	None

Table 3-4: Unacceptable Technical Risks

Risk	Description
1	Tier 1 Solar PV Modules not offered.

3.6.2 Exceptions / Conditions

Table 3-5: Acceptable Technical Exceptions / Conditions

Risk	Description
1	Not providing technical details deemed intellectual propriety.
2	Deviations issued with explanations or motivated alternative solutions.

Table 3-6: Unacceptable Technical Exceptions / Conditions

Risk	Description
1	Bidder's proposal does not cover entire scope of works.
2	Contractor or Subcontractor not registered with the specified professional bodies.

4. AUTHORISATION

This document has been seen and accepted by:

[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	
[redacted]	[redacted]	
[redacted]	[redacted]	
[redacted]	[redacted]	
[redacted]	[redacted]	
[redacted]	[redacted]	
[redacted]	[redacted]	
[redacted]	[redacted]	
[redacted]	[redacted]	

5. REVISIONS

Date	Rev.	Compiler	Remarks
[redacted]	[redacted]	[redacted]	[redacted]

6. DEVELOPMENT TEAM

The following people were involved in the development of this document:

[redacted]

7. ACKNOWLEDGEMENTS

None

APPENDIX A: MANDATORY TECHNICAL EVALUATION CRITERIA

A.1 MANDATORY TECHNICAL EVALUATION CRITERIA

Mandatory Evaluation Criteria (gatekeepers) are ‘must meet’ criteria. These criteria are assessed on a Yes/No basis as to whether the criteria are met. An assessment of ‘No’ against any criterion shall technically disqualify the tender and shall not be further evaluated against Qualitative Criteria.

The Mandatory Criteria is defined in Table A-1.

The Mandatory Criteria will be evaluated based on the information provided in accordance with Appendix C: Tender Returnable Technical Schedules, which describes the specific tender returnable and technical schedules that the Bidder must return during the Tender phase.

Table A-1: Mandatory Technical Evaluation Criteria

Criteria	Mandatory Technical Criteria Description	Reference to Technical Specification / Tender Returnable	Motivation for use of Criteria
1.	**Bidder's Experience**		
1.1	EPC capability Successful execution of at least one (1) completed commercial (not pilot or demonstration) ground mounted, grid connected, front-of-meter Solar PV project within the last seven (7) years, as the principal EPC Contractor. This single project (either axis tracking or fixed tilt) shall be ≥ 20 MWac. The Bidder must provide proof of the completed and operational solar PV project(s) in the form of a signed contract, completion certificate or a take-over certificate with references from solar PV plant Owner(s) / Developer(s). The bidder must have at least 5 years experience in the construction and commissioning of substations up to 132kV of 20MVA and above. Proof of completed projects, clients names and hand-over certificates to be submitted.	Appendix C: Tender Returnable Technical Schedules	The Bidder must exhibit the requisite capability and previous experience to provide assurance that the required works can be successfully executed.
1.2	O&M capability Successfully performed Operations and Maintenance (O&M) duties for at least two (2) years on at least one (1) ground mounted (either axis tracking or fixed tilt) PV plant with a minimum capacity of 20 MWac. The bidder must provide proof of EPC Contract(s) or O&M Contract(s) accordingly. Where the O&M duties are subcontracted, a signed letter of agreement between the two parties shall be submitted of the completed duties.	Appendix C: Tender Returnable Technical Schedules	The Bidder must exhibit the requisite capability and previous experience to provide assurance that the required O&M can be successfully performed.

Criteria	Mandatory Technical Criteria Description	Reference to Technical Specification / Tender Returnable	Motivation for use of Criteria
2.	**Solar PV Plant Capacity**		
2.1	<u>Required capacity</u> The AC capacity of the Solar PV plant shall be minimum capacity of 24 MWac and maximum export power evacuation of 36 MWac. The minimum DC capacity shall be ≥28 MWp with DC/AC ratio be ≥ 1.15. • The installed DC capacity shall be defined as the aggregate rated power of all PV modules under Standard Test Conditions (STC) • The installed AC capacity shall be defined as the aggregate rated power output of all inverters operating at unity power factor (pf = 1.0) at a temperature of 50 °C. • Using an estimate of usable land of 35.5ha The Bidder shall submit an Energy Yield Assessment report as evidence.	• 559-189375010, Installation of Solar PV Plant at Tutuka Power Station Functional Specification Section 1 and 4 • Appendix C: Tender Returnable Technical Schedules	The Project Maximum Export Capacity (MEC) to the grid is 36 MWac (measured at the PoC). Hence, the Solar PV plant AC capacity shall at least be ≥24 MWac. The DC capacity should be oversized in relation to the AC capacity (DC/AC ratio greater than 1), thereby allowing for greater energy harvest when the solar production is below the inverter's rating. A DC/AC ratio of at least 1.15 will require a DC capacity of at least 28 MWp.

APPENDIX B: QUALITATIVE TECHNICAL EVALUATION CRITERIA

B.1 QUALITATIVE TECHNICAL EVALUATION CRITERIA

Tenders that have met all the Mandatory Evaluation Criteria will be evaluated against the Qualitative Evaluation Criteria. Qualitative Evaluation Criteria are weighted evaluation criteria used to identify the highest technically ranked tender.

The minimum weighted final score (threshold) required for a tender to be considered “Functionally Acceptable” from a technical perspective is 70%.

The scoring of qualitative criteria will be based on the degree of achievement of the tender to meet the technical requirements. A score will be allocated as per Table B-1: , for each technical qualitative criterion.

Table B-1: Scoring Guide for Qualitative Technical Evaluation Criteria

Score	Percentage	Description
5	100	Compliant • Meet technical requirement(s) AND • No foreseen technical risk(s) in meeting technical requirements
4	80	Compliant with associated qualifications • Meet technical requirement(s) with • Acceptable technical risk(s) AND/OR • Acceptable exceptions AND/OR • Acceptable conditions
2	40	Non-compliant • Does not meet technical requirement(s) AND/OR • Unacceptable technical risk(s) AND/OR • Unacceptable exceptions AND/OR • Unacceptable conditions
0	0	Totally deficient or non-responsive
Note: The scoring table does not allow for scoring of 1 and 3 as per procedure 240-168966153.		

The highest technically ranked tender will be based on the final scoring comparisons. The tender with the highest score will be recommended from a technical perspective, provided the minimum threshold is met or exceeded.

The Qualitative Criteria is defined in Table B-2. During the tender evaluations, Table B-1 will be used as a guide to score each criterion defined in Table B-2

Table B-2: . The Qualitative Criteria will be evaluated based on the information provided in accordance with Appendix C, which describes the specific tender returnable and technical schedules that the Bidder should complete and return during the Tender phase.

Table B-2: Qualitative Technical Evaluation Criteria

Criteria	Qualitative Technical Criteria Description	Reference to Technical Specification / Tender Returnable	Scoring Criteria	Criteria Weighting (%)	Criteria Sub Weighting (%)
1	**General**			**10%**	**100 %**
1.1	Project Schedule The Bidder provides a schedule/program showing the activities of all the project work to be done by the EPC Contractor and timelines, including the work which shall be done by subcontractors (i.e., the entire scope of the Project work represented).	• 559-189375010, Installation of Solar PV Plant at Tutuka Power Station Functional Specification • Appendix C: Tender Returnable Technical Schedules	As per Table B-1Table B-1:		40%
1.2	Project Organogram The Bidder provides a detailed organogram for the entire Project, including the design, construction, commissioning, operation, and maintenance phases. The organogram shall indicate the key personnel i.e., names, surnames and designations for the Project and their key skills/roles corresponding with CVs as returnable.	• 559-189375010, Installation of Solar PV Plant at Tutuka Power Station Functional Specification • Appendix C: Tender Returnable Technical Schedules	As per Table B-1		30%
1.3	Equipment warranty The Bidder provides warranty for the equipment offered.	• 559-189375010, Installation of Solar PV Plant at Tutuka Power Station Functional Specification • Appendix C: Tender Returnable Technical Schedules	As per Table B-1Table B-1:		30%

Criteria	Qualitative Technical Criteria Description	Reference to Technical Specification / Tender Returnable	Scoring Criteria	Criteria Weighting (%)	Criteria Sub Weighting (%)
2.	**Solar PV Plant Configuration and Performance Criteria**			**30%**	**100%**
2.1	<u>Bidders key personnel experience – Solar PV system</u> The Bidder provides detailed Curriculum Vitae (CV) of the key personnel, where the Solar PV System Designer is a registered professional member of the Engineering Council of South Africa (ECSA) or equivalent international acknowledgement and exhibits the required qualifications and experience.	• 559-189375010, Installation of Solar PV Plant at Tutuka Power Station Functional Specification • Appendix C: Tender Returnable Technical Schedules • Project Team organogram (key personnel)	5 - Registered, with more than 5 year's relevant experience 4 - Registered, with 4 to 5 years' relevant experience 2 - Registered, between 3 to 4 years relevant experience 0 - Registered with less than 3 years' relevant experience for resource or resource is not registered or no submission made.		10%
2.2	<u>PV system design</u> The Bidder provides a preliminary PV system design in accordance with the indicated requirements, including: • Solar PV System Design parameters • High level plant layout drawing including PV array layout and layout for civil infrastructure showing roads, fencing, buildings, laydown area, MV/LV inverters, substation buildings and yards. • Technical datasheet for PV modules, mounting structures axis trackers or fixed tilt, inverters, and MV/LV transformers.	• 559-189375010, Installation of Solar PV Plant at Tutuka Power Station Functional Specification • Appendix C: Tender Returnable Technical Schedules	As per Table B-1Table B-1:		30%

Criteria	Qualitative Technical Criteria Description	Reference to Technical Specification / Tender Returnable	Scoring Criteria	Criteria Weighting (%)	Criteria Sub Weighting (%)
2.3	Plant Annual Performance Ratio (PR) guarantee The Bidder provides a guarantee for the PR for each year of the 2-year Defects Liability Period until Final Acceptance is reached, including monthly breakdown of Guaranteed Performance Ratio for the first year and the corresponding estimated long-term solar irradiation on module plane.	• 559-189375010, Installation of Solar PV Plant at Tutuka Power Station Functional Specification • Appendix C: Tender Returnable Technical Schedules	5 - Performance Ratio ≥82% 4 - Performance Ratio ≥ 80% & < 82% 2 - Performance Ratio ≥ 78% & < 80% 0 - Performance Ratio < 78%		40%
2.4	Plant Annual Guaranteed Technical Availability The Bidder provides a guarantee for the Plant's Availability for each year of the 2-year Defects Liability Period until Final Acceptance is reached.	• 559-189375010, Installation of Solar PV Plant at Tutuka Power Station Functional Specification • Appendix C: Tender Returnable Technical Schedules	5 - Technical Availability ≥ 99% 4 - Technical Availability ≥ 97% & < 99% 2 - Technical Availability ≥ 95% & < 97% 0 - Technical Availability < 95%		20%

Criteria	Qualitative Technical Criteria Description	Reference to Technical Specification / Tender Returnable	Scoring Criteria	Criteria Weighting (%)	Criteria Sub Weighting (%)
3.	**Electrical System Criteria**			**10%**	**100%**
3.1	The Bidder submits a valid ECSA Certificate or equivalent international acknowledgement for the Electrical Engineer/Technologist including CV with minimum of 5 years work experience on the design, testing and commissioning of related electrical as specified on the Works Information.	• Appendix C: Tender Returnable Technical Schedules • Project Team organogram (key personnel)	5 – Valid ECSA Certificate or equivalent and CV submitted with more than 5 years' work experience for similar electrical scope of work. 4 – Valid ECSA Certificate or equivalent international acknowledgement and CV submitted with less than 5 years' work experience for similar or not similar electrical scope of work. 2 – Invalid/No ECSA Certificate or equivalent international acknowledgement and CV submitted with less than 5 years' work experience for similar or not similar electrical scope of work. 0 – No submission		15%

3.2	The Bidder submits a technical report confirming full compliance or any deviations if applicable for the electrical design, installation, commissioning, and handover requirements specified in the electrical scope. The technical report shall be in the form of a narrative and supportive documentation shall include the following as a minimum: • Compliance to electrical standards and requirements for PV Modules. • Compliance to electrical standards and requirements for Inverters. • Compliance to electrical standards and requirements for AC and DC cables. • Compliance to electrical standards and requirements for Ring Main Units (RMUs). • Compliance to electrical standards and requirements for Medium and Low Voltage Switchgear • Compliance to electrical standards and requirements for HV/MV Power Transformers, MV/LV Transformers, and MV/MV or LV/LV Transformers. • Compliance to electrical standards and requirements for 400-800/230VAC	• 559-189375010, Installation of Solar PV Plant at Tutuka Power Station Functional Specification • Appendix C: Tender Returnable Technical Schedules	5 – Comprehensive narrative provided which explicitly details the Bidder's technical report confirming full compliance to the electrical Works for all listed items without deviations. 4 – Narrative technical report contains ambiguity and deviations for not more than 3 items with acceptable risk, exceptions, and conditions. 2 – Narrative technical report where 3 or more than 3 items are incomplete, unclear and non-compliant with unacceptable risk, exceptions and conditions. 0 – No documentation provided		50%

Criteria	Qualitative Technical Criteria Description	Reference to Technical Specification / Tender Returnable	Scoring Criteria	Criteria Weighting (%)	Criteria Sub Weighting (%)
	and DC Distribution Boards • Compliance to electrical standards and requirements for Essential Power Systems (Batteries and Battery Chargers, Uninterruptable Power Supplies and Diesel Generators) • Compliance to electrical standards and requirements for Earthing System and Lightning Protection. • Compliance to electrical standards and requirements for Protection and Control. • Compliance to electrical standards and requirements for Grid Code.				
3.3	The Bidder provides the following information: • Medium Voltage Switchgear, and SF6 free Schedule as per Appendix C. • HV/MV Power Transformer Schedule as per Appendix C.	• 559-189375010Installation of Solar PV Plant at Tutuka Power Station Functional Specification • Appendix C: Tender Returnable Technical Schedules	5 – Schedule provided without any deviations. 4 – Schedule provided with acceptable risk, exceptions, and conditions. 2 – Schedule submitted with unacceptable risk, exceptions and conditions specified in any of the schedules submitted. 0 – No documentation provided		15%

Criteria	Qualitative Technical Criteria Description	Reference to Technical Specification / Tender Returnable	Scoring Criteria	Criteria Weighting (%)	Criteria Sub Weighting (%)
3.4	The Bidder submits the following: • High level Conceptual Electrical Reticulation or Single Line Drawing (SLD) for the required scope of work. • Power system study report previously done by the Contractor for similar scope of work.	• 559-189375010, Installation of Solar PV Plant at Tutuka Power Station Functional Specification • Appendix C: Tender Returnable Technical Schedules	5 – Conceptual Electrical Reticulation or SLD submitted including power system study. 4 – Conceptual Electrical Reticulation or SLD submitted excluding power system study. 0 – No documentation provided		20%
4.	**Control and Monitoring System (CMS) Criteria**			**10%**	**100%**
4.1	Bidders key personnel experience – C&I works • The Bidder provides detailed CVs of the key personnel, where the C&I works Designer exhibits the required qualifications and experience. • The detailed design in terms of this Contract is to be executed by a qualified professional who is a member of ECSA or equivalent international acknowledgement.	• Appendix C: Tender Returnable Technical Schedules • Project Team organogram (key personnel)	5 - Registered, with more than 5 year's relevant experience for resource 4 - Registered, with 5 years' relevant experience for resource 2 - Registered, between 3 to 4 years relevant experience for resource 0 - Registered with less than 3 years' relevant experience for resource or resource is not registered or no submission made		10%

Criteria	Qualitative Technical Criteria Description	Reference to Technical Specification / Tender Returnable	Scoring Criteria	Criteria Weighting (%)	Criteria Sub Weighting (%)
4.2	Plant Monitoring and Control System track record • The Bidder shall provide proof of successful installation of the proposed CMS/SCADA network on PV plants. • Proof shall be provided in a table of references with plant name, plant capacity, year commissioned, CMS system details.	• 559-189375010, Installation of Solar PV Plant at Tutuka Power Station Functional Specification Section 7.4 • Appendix C: Tender Returnable Technical Schedules	5 – Five (5) PV plants around the world, of ≥ 24 MWac each, during the past 7 years 4 – Less than five (5) PV plants around the world, of ≥ 24 MWac each, during the past 7 years 2 – Less than five (5) PV plants of any size 0 – No information provided		20%
4.3	Plant Monitoring and Control System experience • The Bidder provides proof of experience with the proposed software. • Proof shall be provided in a table of references with plant name, plant capacity, year commissioned, CMS system details, The CMS details shall include network layout, CMS overview report including Original Equipment Manufacturer (OEM) equipment information of all hardware and software, operator Human Machine Interface (HMI) screen dumps of the various display tabs.	• 559-189375010, Installation of Solar PV Plant at Tutuka Power Station Functional Specification • Appendix C: Tender Returnable Technical Schedules	5 – Two (2) PV plants ≥ 24 MWac each, during the past 5 years 4 – One (1) PV plant ≥ 24 MWac each, during the past 5 years 2 – One (1) PV plant 0 – No information provided		10%

Criteria	Qualitative Technical Criteria Description	Reference to Technical Specification / Tender Returnable	Scoring Criteria	Criteria Weighting (%)	Criteria Sub Weighting (%)
4.4	Plant Monitoring and Control System The Bidder confirms compliance or provides proof of compliance to the requirements in “Software Management” of the technical specification.	• 559-189375010, Installation of Solar PV Plant at Tutuka Power Station Functional Specification • Appendix C: Tender Returnable Technical Schedules	As per Table B-1		20%
4.5	C&I Design Criteria The Bidder confirms compliance or provides proof of compliance to the requirements in the technical specification.	• 559-189375010Installation of Solar PV Plant at Tutuka Power Station Functional Specification • Appendix C: Tender Returnable Technical Schedules	As per Table B-1		20%
4.6	High-level Plant Interface Architecture The Bidder will provide a High-level Plant Interface Architecture	• 559-189375010, Installation of Solar PV Plant at Tutuka Power Station Functional Specification • Appendix C: Tender Returnable Technical Schedules	As per Table B-1		20%

Criteria	Qualitative Technical Criteria Description	Reference to Technical Specification / Tender Returnable	Scoring Criteria	Criteria Weighting (%)	Criteria Sub Weighting (%)
5.	**Civil, Structural and Infrastructure Criteria**			**10%**	**100%**
5.1	Key Resource Requirements: ECSA Professionally Registered Civil/Structural Engineer or equivalent international acknowledgement. CV of the Professionally Registered Civil/Structural Engineer having a minimum of five (5) years' relevant experience. Letter of intent must be signed by both parties where a subcontractor is to be used for the resource.	• Appendix C: Tender Returnable Technical Schedules • Project Team organogram (key personnel)	5 - Registered, with more than 5 year's relevant experience for resource 4 - Registered, with 5 years' relevant experience for resource 2 - Registered, between 3 to 4 years relevant experience for resource 0 - Registered with less than 3 years' relevant experience for resource or resource is not registered or no submission made or signed letter of intent not submitted where a subcontractor is used for the resource		40%

Criteria	Qualitative Technical Criteria Description	Reference to Technical Specification / Tender Returnable	Scoring Criteria	Criteria Weighting (%)	Criteria Sub Weighting (%)
5.2	Previous similar work Tenderer's or tenderer's subcontracting relevant experience in the construction of similar civil engineering works (Steel Structures, Masonry/brick wall construction, concrete works). A list of at least three (3) verifiable references demonstrating previous similar works. Copies of completion certificates for each reference shall have the following: • Project name • Principal contractor • Client • Description of work performed (size of structures to be indicated) • Project cost (only for scope performed) • Project start and end date • Name, designation and contact number of reference person	Completion certificates/ completion letters/ reference letters – signed by the client	5 = Three (3) or more signed testimonial letters or copies of completion certificates for previous similar works has been submitted. 4 = Two (2) signed testimonial letters or copies of completion certificates for previous similar works has been submitted. 2 = One (1) signed testimonial letter or a copy of completion certificate for previous similar works has been submitted 0 = No proof previous similar work submitted as requested, submitted proof of similar works are not verifiable (no client contact details).		30%

Criteria	Qualitative Technical Criteria Description	Reference to Technical Specification / Tender Returnable	Scoring Criteria	Criteria Weighting (%)	Criteria Sub Weighting (%)
5.3	Technical proposal detailing the work methodology, which complies to the full scope and describes how the scope will be executed (both design and construction phases of the project). Technical proposal must demonstrate understanding of the scope and include the following as a minimum: • Proposed plant, equipment and tools • Methodology for the proposed works • Foreseen risks and concerns • Health and safety requirements • Quality management requirements • Required temporary works (if any)	• 559-189375010, Installation of Solar PV Plant at Tutuka Power Station Functional Specification • Appendix C: Tender Returnable Technical Schedules	5 - Technical proposal includes all minimum requirements 4 - Technical proposal includes four to five of the minimum requirements 2 - Technical proposal includes three or fewer of the minimum requirements 0 - No submission made		30%

Criteria	Qualitative Technical Criteria Description	Reference to Technical Specification / Tender Returnable	Scoring Criteria	Criteria Weighting (%)	Criteria Sub Weighting (%)
6	**Balance of Plant Criteria**			**10%**	**100%**
6.3	Fire protection The Bidder shall submit a Fire Protection Services design philosophy, covering aspects such as the fire protection/detection assessment, system and component description, system sizing approach, system design and construction codes, and system process (diagram).	• 559-189375010, Installation of Solar PV Plant at Tutuka Power Station Functional Specification • Appendix C: Tender Returnable Technical Schedules	As per Table B-1		30%
6.4	Water supply and reticulation The Bidder shall submit a water supply and reticulation design philosophy, covering aspects such as the water system, treatment of water for cleaning modules and monitoring mechanisms.	• 559-189375010, Installation of Solar PV Plant at Tutuka Power Station Functional Specification • Appendix C: Tender Returnable Technical Schedules	As per Table B-1		20%
6.5	Heating, Ventilation and Air Conditioning (HVAC) The Bidder shall submit a design philosophy for the HVAC system.	• 559-189375010, Installation of Solar PV Plant at Tutuka Power Station Functional Specification • Appendix C: Tender Returnable Technical Schedules	As per Table B-1		30%
6.6	Meteorological equipment and instrumentation schedule The Bidder shall submit datasheets for the Meteorological station and the pyranometer.	• 559-189375010, Installation of Solar PV Plant at Tutuka Power Station Functional Specification • Appendix C: Tender Returnable Technical Schedules	As per Table B-1		20%

Criteria	Qualitative Technical Criteria Description	Reference to Technical Specification / Tender Returnable	Scoring Criteria	Criteria Weighting (%)	Criteria Sub Weighting (%)
7.	**Operations and Maintenance Criteria**			**10%**	**100%**
7.1	Operations and Maintenance (O&M) Bidders key personnel experience – O&M Manager during O&M period The Bidder provides detailed CVs of the key personnel, where the Site O&M Manager exhibits the required qualifications and experience.	• Appendix C: Tender Returnable Technical Schedules • Project Team organogram (key personnel)	5 – More than 3 years relevant experience 4 – Three years relevant experience 2 – Less than 3 years relevant experience 0 – No submission		20%
7.2	Preliminary O&M Plan The Bidder shall provide a high-level O&M plan including preventative maintenance and corrective maintenance aspects.	• Appendix C: Tender Returnable Technical Schedules	As per Table B-1		50%
7.3	O&M training Experience Bidders key personnel experience – Trainers for O&M. The Bidder provides detailed CVs of the key personnel.	• Appendix C: Tender Returnable Technical Schedules • Project Team organogram (key personnel)	5 – More than 3 years relevant experience 4 – Three years relevant experience 2 – Less than 3 years relevant experience 0 – No submission		10%
7.4	O&M training Plan The Bidder submits a preliminary Training Plan. The plan shall describe the timing, type, and level of detail for the various training interventions, including O&M, Inverter, SCADA, CMS, etc.	• Appendix C: Tender Returnable Technical Schedules	As per Table B-1		10%

Criteria	Qualitative Technical Criteria Description	Reference to Technical Specification / Tender Returnable	Scoring Criteria	Criteria Weighting (%)	Criteria Sub Weighting (%)
7.5	Spare parts Letter confirming Bidder acceptance of spare parts minimum requirements as well as highlighting any proposed deviations.	• 559-189375010, Installation of Solar PV Plant at Tutuka Power Station Functional Specification • Appendix C: Tender Returnable Technical Schedules	As per Table B-1		10%

Criteria	Qualitative Technical Criteria Description	Reference to Technical Specification / Tender Returnable	Scoring Criteria	Criteria Weighting (%)	Criteria Sub Weighting (%)
8	**Grid Connection Works Criteria**			**10%**	**100%**
8.1	Eskom accredited Consulting Engineer must submit a valid ECSA Certificate for the Electrical Engineer/Technologist including CV with a minimum of 5 years Grid connection work experience on Substations, Control plant and HV lines. Signed letter of intent between Consulting Engineer and EPC Bidder to be provided.	• In line with Tutuka Cost Estimate Letter (CEL) • Appendix C: Tender Returnable Technical Schedules	5 – Valid ECSA Certificate and CV submitted with more than 5 years' Grid Connection work experience for similar Grid connection scope of work 4 – Valid ECSA Certificate or equivalent international acknowledgement and CV submitted with less than 3-5 years' Grid Connection work experience for similar Grid connection scope of work or not similar Grid connection scope of work 2 – Invalid/No ECSA Certificate or equivalent international acknowledgement and CV submitted with less than 5 years' Grid Connection work experience for similar Grid connection scope of work or not similar Grid connection scope of work 0 – No submission made		25%

Criteria	Qualitative Technical Criteria Description	Reference to Technical Specification / Tender Returnable	Scoring Criteria	Criteria Weighting (%)	Criteria Sub Weighting (%)
8.2	Approved Eskom HV Subcontractor Signed letter of intent between HV Subcontractor and EPC Bidder to be provided.	• In line with Tutuka CEL • Appendix C: Tender Returnable Technical Schedules	5 – Letter submitted and HV Subcontractor on Eskom's approved list of HV Subcontractors 0 - HV Subcontractor not on Eskom's approved list of HV Subcontractors or no submission made		20%
8.3	<u>HV/MV Transformer</u> The Bidder shall submit documented evidence (datasheet or other) confirming the following: • Power capacity: >35 MVA • Transformer step-up voltage from 22kV up to 132kV The preliminary high level SLD provided for the Plant shall contain the above details.	• 559-189375010, Installation of Solar PV Plant at Tutuka Power Station Functional • Appendix C: Tender Returnable Technical Schedules	As per Table B-1		20%
8.4	<u>Cables</u> The Bidder submits documented evidence (datasheet or other) confirming the following: • Line/cable type • Confirm the cable length • Connection point from the Solar PV facility to the Solar PV Switching Substation The preliminary high level SLD provided for the Plant shall contain the cable type, connection point and line voltage.	• 559-189375010, Installation of Solar PV Plant at Tutuka Power Station Functional Specification • Appendix C: Tender Returnable Technical Schedules	As per Table B-1		15%

Criteria	Qualitative Technical Criteria Description	Reference to Technical Specification / Tender Returnable	Scoring Criteria	Criteria Weighting (%)	Criteria Sub Weighting (%)
8.5	MV Switchgear The Bidder submits documented evidence (datasheet or other) confirming the following: • Withdrawal/fixed pattern, • Air insulation, • Confirm the manufacturing standards • Protection scheme	• 559-189375010, Installation of Solar PV Plant at Tutuka Power Station Functional Specification • Appendix C: Tender Returnable Technical Schedules	As per Table B-1		20%
			TOTAL	**100%**	

APPENDIX C: TENDER RETURNABLE TECHNICAL SCHEDULES

C.1 GENERAL

a. This document provides the specific technical requirements and schedules for the Bidder to complete and return during the Tender phase.

b. The Bidder completes this document with the clear understating and information presented in. The Bidder is free to deliver information in a free form outside the given tables, wherever this seems to be suitable. However, the Bidder shall abide by the topics and the numbering of the schedules and completely provide the requested information together with the respective schedule.

c. The column “Tendered” shall be filled in by the Bidder for all items. The given information and specification shall be part of the agreement and binding for all delivery and services.

d. The technical data sheets shall be supplemented by additional descriptions, explanations, drawings, and all other information necessary for a clear understanding of its application to enable the Employer to undertake the necessary assessment, evaluation, and verification of the technical and performance features of the Tender.

e. The Bidder ensures that wherever the information is required in respect to multiple units, the Bidder provides the required information on a unit-by-unit basis.

f. The Bidder provides all figures in this returnable to no more than two decimal places, unless required in specific section/s.

C.2 EXPERIENCE AND ELIGIBILITY

C.2.1 EPC Contractor Experience

Table C-1: General information about EPC Bidder

No.	Item	Details	
1	Name of EPC Bidder		
2	Home office address		
3	Regional office address		
4	Telephone / email address		
5	Name, Position and Title of contact person		
6	Legal form [1]		
7	Area of main business		
8	No. of staff in main business	Engineers:	Others:
9	Number of Solar PV power projects successfully completed		

[1] e.g., company, partnership, cooperation, consortium, joint venture, etc.

Table C-2: Specific EPC PV Project Experience

Item No.	Description	Unit	Required	Tendered
1	**Experience**			
1.1	Number of PV projects designed, constructed, and commissioned by EPC Bidder	Number	Successful execution of at least one (1) completed commercial ground mounted PV project within the last seven (7) years	
1.2	Capacity of Solar PV projects previously designed, constructed and commissioned by the EPC Bidder as principal EPC Contractor	MWac	At least one (1) project shall be ≥ 24 MWac	
2	**Project Details from experience presented above[2]**			
2.1	Name of Solar PV plant	-	To be provided by Bidder	
2.2	Location of Solar PV plant	-	To be provided by Bidder	
2.3	Name of Solar PV plant Owner(s) / Developer(s)	-	To be provided by Bidder	
2.4	Contact details of Solar PV plant Owner(s) / Developer(s)	-	To be provided by Bidder	
2.5	Type of PV module technology	-	To be provided by Bidder	
2.6	Type of PV mounting (fixed-tilt, tracking)	-	To be provided by Bidder	
2.7	Installation capacity	MWac	≥ 24	
2.8	Duration of construction	Months	To be provided by Bidder	
2.9	Commercial operation date	-	To be provided by Bidder	
2.10	Photographs if possible	-	To be provided by Bidder	
2.11	Proof verifying completed Solar PV plant in the form of contract, test on completion certificate, or take over certificate, with references from solar PV plant Owner(s) / Developer(s)	-	To be provided by Bidder	

[2] The Bidder provides the information requested in Item No. 2 for all the Solar PV projects indicated in Item No. 1 as the Bidder's claimed experience.

C.2.2 O&M Contractor Experience

a. The EPC Contractor will perform the role of O&M Contractor during the O&M period, defined as the first two (2) years of plant operations and maintenance during the Defects Liability Period. The EPC Contractor must have successfully performed or subcontracted the Operations and Maintenance (O&M) duties for at least two (2) years for at least one (1) commercial ground mounted PV plant with an installed capacity greater than 24 MWac.

b. The required operations and maintenance experience must be presented as indicated in Table C-4Table C-2: .

c. If the EPC Contractor is subcontracting the work for operations and maintenance of the Project for the O&M period, then the required Subcontractor's general information must be included as indicated in Table C-3: , and the Subcontractor's operations and maintenance experience must be presented as indicated in Table C-4:Table C-4. Furthermore, a signed letter of intent between the two parties shall be submitted during the tender stage.

Table C-3: General information about O&M Service Provider

No.	Item	Details	
1	Name of O&M Service Provider		
2	Home office address		
3	Regional office address		
4	Telephone / email address		
5	Name, Position and Title of contact person		
6	Legal form [3]		
7	Area of main business		
8	No. of staff in main business	Engineers:	Others:
9	Number of Solar PV power projects successfully operated and maintained		
10	Signed letter of intent between O&M Service Provider and EPC Bidder (if subcontracting O&M service)	To be provided by Bidder	

Table C-4: Specific O&M PV Project Experience

Item No.	Description	Unit	Required	Tendered
1	**Experience**			
1.1	Number of PV projects operated and maintained by O&M Contractor	Number	Successful O&M of at least one (1) commercial ground mounted PV plant	
1.2	Capacity of individual solar PV project(s) previously operated and maintained by the O&M Contractor	MWac	≥ 24	

[3] e.g., company, partnership, cooperation, consortium, joint venture, etc.

Item No.	Description	Unit	Required	Tendered
1.3	Period of operations and maintenance for each of the PV projects listed	Years	Successful O&M duties for at least two (2) years per PV project	
2	**Project Details from experience presented above[4]**			
2.1	Name of Solar PV plant	-	To be provided by Bidder	
2.2	Location of Solar PV plant	-	To be provided by Bidder	
2.3	Name of Solar PV plant Owner(s) / Developer(s)	-	To be provided by Bidder	
2.4	Contact details of Solar PV plant Owner(s) / Developer(s)	-	To be provided by Bidder	
2.5	Type of PV module technology	-	To be provided by Bidder	
2.6	Type of PV mounting (fixed-tilt, tracking)		To be provided by Bidder	
2.7	Installation capacity	MW	≥ 24	
2.8	Duration of operations and maintenance	Months	To be provided by Bidder	
2.9	Commercial operation date	-	To be provided by Bidder	
2.10	Photographs if possible	-	To be provided by Bidder	
2.11	Proof verifying Solar PV plant O&M duties in the form of EPC Contract(s) or O&M Contract(s) contract, test on completion certificate, take over certificate, or letter from Owner(s) / Developer(s)	-	To be provided by Bidder	

C.3 PROJECT IMPLEMENTATION SCHEDULE

The Bidder shall provide a Level II project implementation schedule showing all the Project activities to be performed, including activities that will be subcontracted. The entire scope of works of the Project shall be represented.

C.4 KEY PERSONNEL

a. The Bidder shall ensure that suitably qualified personnel are included in design, construction, commissioning, operation, and maintenance of the Project. The minimum requirements of key personnel for the Project are presented in Table C-5.

[4] The Bidder provides the information requested in Item No. 2 for all the Solar PV projects indicated in Item No. 1 as the Bidder's claimed experience.

b. The Bidder shall provide a detailed organogram for the entire project, including the design, construction, commissioning, operation, and maintenance phases. The organogram shall indicate the key personnel for the project

c. The Bidder shall provide the detailed CV of each key personnel responsible including ECSA or equivalent registration where applicable for the works mentioned in Table C-5Table C-5: and indicated on the detailed organogram.

d. If any replacement is required during the design, construction, commissioning, operation, and maintenance of the Project, the Bidder shall ensure that the replacement has equivalent or higher experience and qualifications than the one being replaced.

Table C-5: Experience of Key Personnel

Item No.	Description	Unit	Required	Tendered
1	**Designer**			
1.1	Solar PV system	Years	≥ 5	
1.2	Electrical works	Years	≥ 5	
1.3	C&I works	Years	≥ 5	
1.4	Civil / Structural works	Years	≥ 5	
1.5	Structural works	Years	≥ 5	
2	**Managers**			
2.1	Site Manager during construction	Years	≥ 5	
2.2	Site Manager during operation and maintenance	Years	≥ 3	
2.3	Project Manager	Years	≥ 3	
2.4	Commissioning Manager	Years	≥ 5	
2.5	Quality Manager	Years	≥ 5	
2.6	Health, Safety, and the Environment (HSE) Manager	Years	≥ 5	
3	**Trainers – Design, Construction, Commissioning, and O&M**			
3.1	Training Coordinator	Years	≥ 3	
4	Detailed CV of all personnel mentioned above	-	To be provided by Bidder	
5	Organogram for the entire project, including the design, construction, commissioning, operation, and maintenance phases	-	To be provided by Bidder	

C.5 EQUIPMENT WARRANTY

a. The Bidder provides equipment warranty according to minimum requirement set in Table C-6: below.

b. In addition (and without prejudice) to the defect's liability, the Bidder releases warranty on equipment (including not limited to strategic part warranty). No equipment warranty shall limit another warranty or otherwise.

c. The Bidder transfers the ownership of all manufacturer equipment warranties to the Employer during the Substantial Completion of the Project.

Table C-6: Equipment Warranty

Equipment		Minimum Warranty Period in Years	Warranty Period in Years provided by Bidder
PV Modules	Product Warranty against Manufacturing defects	12	
	Linear Power Performance	25	
Mounting structures	Steel structure components	10	
	Corrosion	20	
	Tracker motors and gear (if applicable)	5	
	Communication and Control system (if applicable)	2	
Inverters		5	
MV Transformers		5	
MV Switchgear (Primary and Secondary distribution)		5	
HV Transformers		5	
HV Switchgear		5	
Civil Works (latent defect warranty)		10	

C.6 SOLAR PV PLANT CONFIGURATION AND PERFORMANCE CRITERIA

a. The Bidder ensures the Solar PV system design is performed according to all relevant standards, permits, licenses, best industry practice, and according to the site conditions.

b. The Bidder designs a PV Plant with a minimum AC capacity of 24 MWac, complying with the requirements indicated below.

Table C-7: Solar PV System Design

Item No.	Description	Unit	Required	Tendered
1	**Basic Design Conditions**			
1.1	Design lifetime of the plant	Years	≥ 25	
1.2	Ambient Temperature	° C	-5 to 55	
1.3	Complying with site environmental conditions	Yes/No	Yes	
1.4	Complying with Environmental Permit and Water Use license permit	Yes/No	Yes	
2	**PV Capacity**			
2.1	Nominal AC capacity	MWac	≥ 24	
2.2	DC capacity	MWp	≥ 28	
2.3	Ratio of DC to AC capacity	-	≥ 1.15	
3	**Major Components – General Information**			
3.1	Total number of PV modules offered for the project	-	To be provided by Bidder	
3.2	Total number of inverters offered for the project	-	To be provided by Bidder	
3.3	Total number of Inverter Stations offered for the project (if applicable)	-	To be provided by Bidder	
3.4	Total number of MV/LV inverter transformers offered for the project	-	To be provided by Bidder	
4	**PV Module – Inverter Configuration**			
4.1	Number of PV modules per string	-	To be provided by Bidder	
4.2	String voltage (Vmpp) at maximum operating module temperature (at 85°C module temperature)	V	≥ 110% of minimum MPP input voltage of respective inverter	
4.3	String voltage (Vmpp) at minimum operating module temperature (at 0° C module temperature)	V	Below the maximum MPP input voltage of respective inverter	
4.4	String voltage (Voc) at minimum module temperature (at 0° C module temperature)	V	Below the maximum input voltage of respective inverter	
5	**Supportive Information**			
5.1	PV Array Layout	Yes/No	Yes	
5.2	String Voltage calculation	Yes/No	Yes	
5.3	Technical datasheet of PV module	Yes/No	Yes	
5.4	Technical datasheet of PV module mounting structure / tracker	Yes/No	Yes	

Item No.	Description	Unit	Required	Tendered
5.5	Technical datasheet of inverter	Yes/No	Yes	
5.6	Technical datasheet of Inverter Stations	Yes/No	Yes	
5.7	Technical datasheet of MV/LV inverter transformer	Yes/No	Yes	

C.7 GUARANTEE ON PERFORMANCE AND AVAILABILITY

a. The Bidder provides guarantee on the:
   i. Plant Performance Ratio (PR), and
   ii. Plant Availability

b. These Performance Guaranteed Values will be verified during the Provisional Acceptance Certificate (PAC) Test (PAT) and Final Acceptance Certificate (FAC) Tests.

c. The actual Performance Ratio (PR) shall be evaluated at 100% plant availability. The actual Plant Availability shall be evaluated separately.

d. The Bidder is required to provide Performance Guaranteed Values as indicated in **Error! Reference source not found.**

Table C-8 Plant Performance Guarantees

Year	Parameter	Minimum required by Employer	Guaranteed by Bidder
1	Guaranteed annual average Performance Ratio for year 1 of operation - Tests After Date of Completion (Year 1)	78 %	
	Guaranteed annual average Plant Availability for year 1 of operation - Tests After Date of Completion (Year 1)	98 %	
2	Guaranteed annual average Performance Ratio for year 2 of operation - Tests After Date of Completion (Year 2)	78 %	
	Guaranteed annual average Plant Availability for year 2 of operation - Tests After Date of Completion (Year 2)	98 %	

e. With regards to the “Guaranteed annual average Performance Ratio for year 1 of operation - Tests After Date of Completion (Year 1)” provided in **Error! Reference source not found.**, the Bidder is required to provide a monthly breakdown of this year 1 Performance Ratio (PR) guarantee, along with estimation of solar irradiation on module plane, in a tabular format as shown in Table C-9.

f. The Performance Ratio (PR) guaranteed for the Tests After Date of Completion (Year 1) will be the corresponding monthly average PR (shown in Table C-9) during which the test is performed. If the test duration covers period of two consecutive months, then the guaranteed PR during the Tests After Date of Completion (Year 1) is calculated based on weighted average PR of the two respective months.

Table C-9: Monthly breakdown of Guaranteed Performance Ratio for first year

Month	Breakdown of first year annual guaranteed PR (%)	Estimated Solar Irradiation on Module Plane (kWh/m2)
January		
February		
March		
April		
May		
June		
July		
August		
September		
October		
November		
December		
Annual Average		

g. The Bidder provides the following supportive information and documents (indicated in Table C-10Table C-10:) which shall verify the guaranteed level of Performance Ratio (PR).

Table C-10: Plant Performance Estimation

Item No.	Description	Unit	Required	Tendered
1	**Documents and Diagrams**			
1.1	Energy yield assessment report	Yes/No	Yes	
1.2	TMY datasets used by the Bidder for energy yield estimation report (P50, P90, and P99 for 1-year, 10-year and 25-year return periods)	Yes/No	Yes	
1.3	PV Module tilt angle (for fixed-tilt)	°	10 – 25 degrees	
1.4	Row to row distance	m	To be provided by Bidder	
2	**Losses Estimation**			
2.1	Near shading losses	%	≤ 2.5	
2.2	Reflection (IAM) losses	%	To be provided by Bidder	
2.3	Soiling losses	%	To be provided by Bidder	
2.4	Losses due to irradiance level	%	To be provided by Bidder	

Item No.	Description	Unit	Required	Tendered
2.5	Losses due to temperature	%	To be provided by Bidder	
2.6	Mismatch losses	%	To be provided by Bidder	
2.7	Module quality losses	%	To be provided by Bidder	
2.8	DC cabling losses	%	To be provided by Bidder	
2.9	AC cabling losses	%	To be provided by Bidder	
2.10	Losses in inverter	%	To be provided by Bidder	
2.11	Technical availability	%	To be provided by Bidder	
2.12	MV/LV Transformer losses	%	To be provided by Bidder	
2.13	Self-consumption losses	%	To be provided by Bidder	
2.14	Power evacuation losses	%	To be provided by Bidder	
2.15	Annual module degradation	%	To be provided by Bidder	
2.16	Others (specify)	%	To be provided by Bidder	

C.8 ELECTRICAL SYSTEM

C.8.1 Electrical System Criteria

Table C-11: Electrical Single Line Diagram and Reports

Item No.	Description	Unit	Required	Response from Bidder
1	**Full Compliance to Electrical Requirements**			
1.1	• The Bidder submits a technical report or methodology confirming full compliance or any deviations if applicable for the electrical design, installation, commissioning, and handover requirements specified in the electrical scope as stipulated 559-189375010, Installation of Solar PV Plant at Tutuka Power Station Functional Specification.	-	To be provided by Bidder	

Item No.	Description	Unit	Required	Response from Bidder
2	**Type Test Certificates and/or Datasheets**			
2.1	Submission of typical Type test certificate and/or datasheet for Primary and Secondary MV Switchgear	-	To be provided by Bidder	
2.2	Typical Type Test certificate and/or datasheet for HV/MV Power Transformer.	-	To be provided by Bidder	
3	**Plant Electrical Single Line Diagram**			
3.1	Submission of a high level Conceptual Electrical reticulation or Single Line Drawing containing the following as a minimum: - PV Modules - DC and AC Cabling - Combiner boxes - Inverter stations - Primary and secondary Switchgear - HV/MV Transformers - Power protection and surge devices - Overhead line - Indication of Point of Connection (POC)	-	To be provided by Bidder	
4	**Power System Study**			
4.1	Submission of Power System Study report previously done by the Contractor for similar scope of work	-	To be provided by Bidder	

C.8.2 Technical Schedules

C.8.2.1 PV Modules

Table C-12: PV Modules Schedules

Item No.	Description	Unit	Required	Response from Bidder
1	**Product information**			
1.1	PV Module manufacturer	Name	To be provided by Bidder	
1.2	Proof / supporting documentation that the offered PV module manufacturer is on the BNEF PV Module Tier 1 list	-	To be provided by Bidder	
1.3	Module Type	-	To be provided by Bidder	

Item No.	Description	Unit	Required	Response from Bidder
2	**Technical Characteristics**			
2.1	PV Module/Cell technology	-	To be provided by Bidder	
2.2	String maximum Voltage	VDC	1500	
2.3	Positive Power Tolerance	W	0 to +5 (or 0 to +3%)	
2.4	Module efficiency	%	≥ 20%	
2.5	Bifaciality factor for bifacial module, where applicable	%	≥ 70% ±5%	
2.6	Operating temperature	°C	between -40 °C and 85 °C	
2.7	Static mechanical load	Pa	≥ 2400	
2.8	Increased distributed mechanical load on the front glass surface	Pa	≥ 5400	
2.9	Temperature coefficient	%/°C	≥ -0.37	
2.10	Light induced degradation loss	%	≤ 2	
2.11	Nominal Module Operating Temperature (NMOT) lower than or equal to	°C	≤ 44 °C ±2 °C (NMOT @800 W/m2, 20 °C, AM 1.5, Wind speed 1 m/s)	
3	**Product Performance Guarantee**			
3.1	Power output guaranteed during the first year of operation	%	Minimum: 98%	
3.2	Linear power degradation coefficient from year 2 to year 25	%/year	Maximum degradation of -0.55%/year	
3.3	Guaranteed output of the nominal power after 10 years	%	Minimum 90%	
3.4	Guaranteed output of the nominal power after 25 years	%	Minimum 80%	
4	**Minimum Certificates and Standards**			
4.1	As per 559-189375010, Installation of Solar PV Plant at Tutuka Power Station Functional Specification, indicating required minimum certificates and standards.	Yes/No	Yes	
5	**Track Record**			
5.1	Manufacturer Production track record	year	≥ 5	
5.2	Minimum annual production capacity	MWp	≥ 500	
5.3	Capacity installed	MWp	≥ 1,000	

Item No.	Description	Unit	Required	Response from Bidder
5.4	A letter of confirmation certifying that the above requirements are met shall be issued by the module manufacturer and received by the Employer.	-	To be provided by Bidder	
5.5	Module type in operation in at least three (3) commercial plants of similar size (>24 MWac) that have been in successful operation for at least one (1) year.	Yes/No	Yes	
5.5.1	Location of each Project	-	To be provided by Bidder	
5.5.2	Capacity of each Project	MWp	To be provided by Bidder	
5.5.3	Commercial operation date of each project	-	To be provided by Bidder	
6	**Supportive Documents**			
6.1	Module Datasheet	-	To be provided by Bidder	
6.2	Brief description of the cleaning strategy instruction (from module manufacturer)	-	To be provided by Bidder	
6.3	A letter of confirmation certifying that module manufacturer track record is as per 5.1, 5.2, and 5.3 of this table.	-	To be provided by Bidder	
6	**Additional Information – To be listed by the Bidder**			
6.1	To be defined by the Bidder	-		

C.8.2.2 Inverters

Table C-13: Inverter Schedules

Item No.	Description	Unit	Required	Response from Bidder
1	**Product information**			
1.1	Inverter manufacturer	Name	To be provided by Bidder	
1.2	Inverter Type	-	To be provided by Bidder	
2	**Track Record**			
2.1	Manufacturer Production track record	year	≥ 5	
2.2	Minimum annual production capacity	MW	≥ 500	
2.3	Minimum capacity installed	MW	≥ 1,000	
2.4	A letter of confirmation certifying that the above requirements are met shall	-	To be provided by Bidder	

Item No.	Description	Unit	Required	Response from Bidder
	be issued by the inverter manufacturer and received by the Employer.			
2.5	Inverter type or series in operation in at least three (3) commercial plants totalling 200 MWac or higher nominal power (not demonstration projects), for at least twelve (12) months and have recorded a technical availability of at least 99% for twelve (12) consecutive months of operation.	Yes/No	Yes	
2.5.1	Location of each Project	-	To be provided by Bidder	
2.5.2	Capacity of each Project	MW	To be provided by Bidder	
2.5.3	Commercial operation date of each project	-	To be provided by Bidder	
2.6	Inverter type or series in operation in similar ambient conditions (up to ≥ 50°C)	months	≥ 12	
3	**Inverter Characteristics**			
3.1	Inverter technology/type	-	Central/String	
3.2	Inverter rated capacity per unit	MVA	To be provided by Bidder	
3.3	Nominal AC output Voltage	V	To be provided by Bidder	
3.4	Maximum conversion efficiency	%	≥ 98	
3.5	European efficiency	%	≥ 98	
3.6	Operating ambient temperature range	°C	-5 … +50	
3.7	Cooling method/mechanism	-	To be provided by Bidder. (The inverter cooling method shall be designed for installation and operating site conditions to ensure the inverter functions within its operating ambient temperature range)	
3.8	Inverter Maximum DC voltage	V	1,500	
3.9	Connection phases	-	Three-Phase	
3.10	Frequency	Hz	50	
3.11	Total harmonic distortion, Power Factor, Anti-islanding protection	-	According to South African	

Item No.	Description	Unit	Required	Response from Bidder
			Grid code compliance: Grid connection code for Renewable Power Plants (RPPs) connected to the electricity Transmission system (TS) or the Distribution system (DS) in South Africa	
3.14	Protection type IP rating	IP	Indoor ≥ IP54, Outdoor ≥ IP65	
3.15	Controllability of inverter output per remote control / energy management system, if possible.	Yes/No	Yes: Dynamic adjustable	
3.16	Earthing concept/philosophy	Yes/No	Yes Earthing according to installation requirements of PV module and inverter manufacturer.	
3.17	Input Failure detection	Yes/No	Yes	
3.18	Frequency protection	Yes/No	Yes	
3.19	DC overvoltage protection	Yes/No	Yes	
3.20	Surge protection	Yes/No	Yes	
4	**Minimum required standards**			
4.1	As per 559-189375010, Installation of Solar PV Plant at Tutuka Power Station Functional Specification indicating required minimum certificates and standards.	Yes/No	Yes	
5	**Monitoring system requirements**			
5.1	Continuous data logging to the CMS system for the defined technical plant performance parameters including events and status	Yes/No	Yes	
5.2	Connection interface to CMS	Yes/No	Yes	
6	**Product Warranty Extension**			
6.1	The Bidder shall indicate if the inverter manufacturer has an option for extension of product warranty. If yes, maximum duration of the warranty shall be indicated	years	To be provided by Bidder	

Item No.	Description	Unit	Required	Response from Bidder
7	**Supportive Documents**			
7.1	Inverter datasheet	-	To be provided by Bidder	
7.2	A letter of confirmation certifying that inverter manufacturer track record is as per 2.1, 2.2, and 2.3 of this table.	-	To be provided by Bidder	
8	**Additional Information – To be listed by the Bidder**			
8.1	To be defined by the Bidder	-		

C.8.2.3 Inverter Station

Table C-14: Inverter Station Schedules

Item No.	Description	Unit	Required	Response from Bidder
1	**Product information**			
1.1	Inverter Station manufacturer	Name	To be provided by Bidder	
2	**Track Record**			
2.1	Have been used in Projects of 24 MWac in capacity or more.	Yes/No	Yes	
2.1.1	Location of project	-	To be provided by Bidder	
2.1.2	Capacity of project	-	To be provided by Bidder	
2.1.3	Commercial operation date	-	To be provided by Bidder	
3	**Inverter Station Characteristics**			
3.1	For central inverter; shall at minimum house inverters and associated protection and control equipment and LV/LV auxiliary transformer.	Yes/No	Yes	
3.2	Ventilation system type	-	To be defined by the Bidder	
3.3	Degree of Protection (SANS 60529)	IP	≥ IP65	
3.4	Designed/protected to withstand outdoor conditions for at least 25 years	Yes/No	Yes	
3.5	Fire protection system	Yes/No	Yes	
3.6	Corrosion resistance	Yes/No	Yes	
4	**Product Warranty**			
4.1	Product warranty	Year	≥ 5	

Item No.	Description	Unit	Required	Response from Bidder
5	**Supportive Documents**			
5.1	Inverter Power Station datasheet	-	To be provided by Bidder	
6	**Additional Information – To be listed by the Bidder**			
6.1	To be defined by the Bidder	-		

C.8.2.4 MV/LV Inverter transformer

Table C-15: MV/LV Inverter transformer Schedules

Item No.	Description	Unit	Required	Response from Bidder
1	**Product information**			
1.1	MV/LV Inverter transformer manufacturer	Name	To be provided by Bidder	
2	**Transformer Characteristics**			
2.1	Transformer Type	-	To be provided by Bidder	
2.2	Rated Capacity	MVA	To be provided by Bidder	
2.3	Nominal Voltage (Low voltage side)	V	To be provided by Bidder	
2.4	Nominal Voltage (Medium voltage side)	kV	To be provided by Bidder	
2.5	Rated Frequency	Hz	50	
2.6	Tap-Changer Type	-	off-load	
2.7	Tap-changer - number of steps	No.	5	
2.8	Tap-changer –Ratio of each step	%	-5% to 5%	
2.9	Type of protection	-	To be provided by Bidder	
2.10	Transformer insulating medium	Type	Biodegradable oil or Dry-type	
2.11	Transformer Cooling method	-	To be provided by Bidder	

Item No.	Description	Unit	Required	Response from Bidder
2.12	IP Rating	IP	≥ IP55 for outdoor ≥IP4X for indoor	
2.13	No-load losses	W	To be provided by Bidder	
2.14	Load losses	W	To be provided by Bidder	
2.15	Climatic class (dry-type transformer only)	-	C2	
2.16	Environmental class (dry-type transformer only)	-	E2	
2.17	Fire class (dry-type transformer only)	-	F1	
2.18	Insulation Class (dry-type transformer only)	-	F	
3	**Minimum required standards (to be proven by respective Certificate or Conformity Declaration)**			
3.1	As per 559-189375010, Installation of Solar PV Plant at Tutuka Power Station Functional Specification indicating required minimum certificates and standards	Yes/No	Yes	
4	**Monitoring system requirements**			
4.1	Continuous data logging to the CMS system for the defined transformer performance parameters including events and status.	Yes/No	Yes	
4.2	Connection interface to CMS system using protocols.	Yes/No	Yes	
5	**Supportive Documents**			
5.1	Transformer Datasheet	-	To be provided by Bidder	
6	**Additional Information – To be listed by the Bidder**			
6.1	To be defined by the Bidder	-	To be provided by Bidder	

C.8.2.5 MV/LV Auxiliary transformer

Table C-16: MV/LV Auxiliary transformer Schedules

Item No.	Description	Unit	Required	Response from Bidder
1	**Product information**			
1.1	MV/LV Aux transformer manufacturer	Name	To be provided by Bidder	
2	**Transformer Characteristics**			
2.1	Transformer Type	-	To be provided by Bidder	
2.2	Rated Capacity	MVA	To be provided by Bidder	
2.3	Nominal Voltage (Low voltage side)	V	To be provided by Bidder	
2.4	Nominal Voltage (Medium voltage side)	kV	To be provided by Bidder	
2.5	Rated Frequency	Hz	50	
2.6	Tap-Changer Type	-	off-load	
2.7	Tap-changer - number of steps	No.	5	
2.8	Tap-changer –Ratio of each step	%	-5% to 5%	
2.9	Type of protection	-	To be provided by Bidder	
2.10	Transformer insulating medium	Type	Biodegradable oil or dry-type	
2.11	Transformer Cooling method	-	To be provided by Bidder	
2.12	IP Rating	IP	≥ IP55 for outdoor ≥IP4X for indoor	
2.13	No-load losses	W	To be provided by Bidder	No-load losses
2.14	Load losses	W	To be provided by Bidder	Load losses
2.15	Climatic class (dry-type transformer only)	-	C2	
2.16	Environmental class (dry-type transformer only)	-	E2	

Item No.	Description	Unit	Required	Response from Bidder
2.17	Fire class (dry-type transformer only)	-	F1	
2.18	Insulation Class (dry-type transformer only)	-	F	
3	**Minimum required standards (to be proven by respective Certificate or Conformity Declaration)**			
3.1	• As per 559-189375010, Installation of Solar PV Plant at Tutuka Power Station Functional Specification, indicating required minimum certificates and standards	Yes/No	Yes	
4	**Monitoring system requirements**			
4.1	Continuous data logging to the CMS system for the defined transformer performance parameters including events and status.	Yes/No	Yes	
4.2	Connection interface to CMS system using protocols.	Yes/No	Yes	
5	**Supportive Documents**			
5.1	Transformer Datasheet	-	To be provided by Bidder	
6	**Additional Information – To be listed by the Bidder**			
6.1	To be defined by the Bidder	-	To be provided by Bidder	

C.8.2.6 MV Secondary Switchgear (RMU)

Table C-17: MV Switchgear (RMU) Schedules

Item No.	Description	Unit	Required	Response from Bidder
1	**Product information**			
1.1	Switchgear manufacturer	Name	To be provided by Bidder	
1.2	RMU Type/Model	Type	To be provided by Bidder	
2	**Ratings**			
2.1	Nominal voltage	kVrms	To be provided by Bidder	
2.2	Rated voltage	kVrms	To be provided by Bidder	
2.3	System frequency	Hz	50	
3	**Design**			
3.1	Indoor/Outdoor application	-	To be provided by Bidder	
3.2	Insulating medium	-	SF6-free GIS	
3.3	Interrupting technology (switch dis-connectors)	-	Vacuum	
3.4	Interrupting technology (circuit breaker)	-	Vacuum	
4	**Supportive Documentation**			
4.1	RMU datasheet/Catalogue	-	To be provided by Bidder	
5	**Minimum required standards**			
5.1	As per 559-189375010, Installation of Solar PV Plant at Tutuka Power Station Functional Specification, indicating required minimum certificates and standards	Yes/No	Yes	
6	**Additional Information – To be listed by the Bidder**			
6.1	To be defined by the Bidder	-		

C.8.2.7 MV Primary Switchgear

Table C-18: MV Primary Switchgear Schedules

Item No.	Description	Unit	Required	Response from Bidder
1	**Product information**			
1.1	Switchgear manufacturer	Name	To be provided by Bidder	
1.2	Type/Model	Type	To be provided by Bidder	
2	**Ratings**			
2.1	Nominal voltage	kVrms	To be provided by Bidder	
2.2	Rated voltage	kVrms	To be provided by Bidder	
2.3	System frequency	Hz	50	
3	**Design**			
3.1	Indoor/Outdoor application	-	Indoor	
3.2	Insulating medium	-	AIS	
3.3	Type	Withdrawable or Fixed-patten	Withdrawable	
3.4	Interrupting technology	-	Vacuum	
4	**Supportive Documentation**			
4.1	Switchgear datasheet/Catalogue	-	To be provided by Bidder	
5	**Minimum required standards**			
5.1	As per 559-189375010, Installation of Solar PV Plant at Tutuka Power Station Functional Specification, indicating required minimum certificates and standards	Yes/No	Yes	
6	**Additional Information – To be listed by the Bidder**			
6.1	To be defined by the Bidder	-		

C.8.2.8 Grid Code Compliance

Table C-19: Grid Code Compliance

Item No.	Description	Unit	Required	Response from Bidder
1	**Minimum Plant Technical Grid Code Requirements for category C Plant**			
1.1	Voltage range as per Category C in the renewable Grid Code of South Africa	Yes/No	Yes	
1.2	Frequency as per Category C in the renewable Grid Code of South Africa	Yes/No	Yes	
1.3	Voltage ride through as per Category C in the renewable Grid Code of South Africa	Yes/No	Yes	
1.4	Power Quality as per Category C in the renewable Grid Code of South Africa	Yes/No	Yes	
1.5	Power Frequency response as per Category C in the renewable Grid Code of South Africa	Yes/No	Yes	
1.6	Reactive Power Capabilities as per Category C in the renewable Grid Code of South Africa	Yes/No	Yes	
1.7	Protection and fault levels as per Category C in the renewable Grid Code of South Africa	Yes/No	Yes	
2	**Plant Required Control Functions**			
2.1	Voltage Control	Yes/No	Yes	
2.2	Power Factor Control	Yes/No	Yes	
2.3	Reactive Power Control	Yes/No	Yes	
3	**Minimum required standards**			
3.1	Grid Connection Code for Renewable Power Plants (RPPs) Connected to the Electricity Transmission system (TS) or the Distribution System (DS) in South Africa	Yes/No	Yes	

Item No.	Description	Unit	Required	Response from Bidder
4	**Additional Information – To be listed by the Bidder**			
4.1	To be defined by the Bidder	-	-	

C.9 CONTROL AND MONITORING SYSTEM (CMS)

C.9.1 CMS Criteria

Table C-20: CMS CRITERIA

Item No.	Description	Unit	Required	Response from Bidder
1	**Experience in CMS or SCADA systems for Utility scale PV plant applications**			
1.1	The Bidder shall provide proof of successful installation of the proposed CMS/SCADA network on PV plants. Proof shall be provided in a table of references with plant name, plant capacity, year commissioned, CMS system details.	-	Five (5) PV plants around the world, of ≥ 24 MWac each, during the past 7 years	
1.2	The Bidder provides proof of experience with the proposed software. Proof shall be provided in a table of references with plant name, plant capacity, year commissioned, CMS system details, The CMS details shall include network layout, CMS overview report including Original Equipment Manufacturer (OEM) equipment information of all hardware and software, operator Human Machine Interface (HMI) screen dumps of the various display tabs.	-	Two (2) PV plants ≥ 24 MWac each, during the past 5 years	
2	**CMS Compliance**			

Item No.	Description	Unit	Required	Response from Bidder
2.1	CMS network single line diagram showing Plant Interface architecture (high level)	Yes/No	Yes	
2.2	CMS equipment and cable list in tabular format (basic)	Yes/No	Yes	
2.3	Field wiring philosophy (basic)	Yes/No	Yes	
2.4	CMS power supply and power distribution diagram, showing UPS and battery bank sizing (high level)	Yes/No	Yes	
2.5	19" network cabinet specifications and general arrangement drawing (basic)	Yes/No	Yes	
2.6	CMS equipment panel specifications and general arrangement drawings (basic)	Yes/No	Yes	
2.7	CMS design report describing the hardware and software, the operating philosophy, information servers and data analysis tools (basic philosophy)	Yes/No	Yes	
2.8	Control and server room layout drawing (high-level)	Yes/No	Yes	
3	**C&I Design Criteria**			
3.1	The system shall be designed to ensure high availability, i.e., greater than 99.9%.	Yes/No	Yes	
3.2	Data shall be stored locally and externally, with periodic backups performed with external hard drives which are to be kept in a secure location.	Yes/No	Yes	
3.3	Compliance with Eskom's Standard for Demilitarised Zone (DMZ) Designs for Operational Technology (240-79669677), Information Security – IT/OT and Third Party Remote Access Standard (32-373), Eskom Cyber Security Standard for Operation Technology (240-55410927), and Human Machine Interface Design Requirements Standard (240-56355728)	Yes/No	Yes	
3.4	Open data exchange: data exchange interface must make it possible for the Employer's centralized control	Yes/No	Yes	

Item No.	Description	Unit	Required	Response from Bidder
	and monitoring system to exchange data with the SCADA system for both real time and historical data.			
3.5	The Plant SCADA system and field control system shall allow for automatic start-up and shut down of the Plant.	Yes/No	Yes	
3.6	The field control system shall be designed to ensure normal operation even in the event of loss of software communication link.	Yes/No	Yes	
3.7	The Contractor shall ensure that the SCADA system has an operational life span of 25 years from the Plant's Commercial Operations Date (COD), which involves being capable of adapting to software updates. The Contract shall provide a lifecycle management plan for the SCADA system hardware and the OS and APP software.	Yes/No	Yes	
3.8	A minimum of ten (10) user licenses shall be provided to the Employer, and it shall be possible to restrict user-access to rational levels to protect the integrity of the system and prevent unwanted, unwarranted, and/or unsafe Project configuration changes	Yes/No	Yes	
3.9	The SCADA system vendor must be able to offer technical support for the operational life of the system. The Contractor shall provide a lifecycle management plan for the SCADA hardware and OS and APP software	Yes/No	Yes	
3.10	The Employer will require licenses and access to make changes to the SCADA system/PLC system and all programmable devices as and when required.	Yes/No	Yes	
4	**High-level plant interface Architecture**			
4.1	The Bidder will provide a High-level Plant Interface Architecture	-	To be provided by Bidder	

C.9.2 Technical Schedules

Table C-21: Control and Monitoring Systems Schedules

Item No.	Description	Unit	Required	Tendered
1	**Data Sheets and Manuals**			
1.1	CMS Servers	Yes/No	Yes	
1.2	Network Switches	Yes/No	Yes	
1.3	GPS time server	Yes/No	Yes	
1.4	Thin clients (CPU, monitors, keyboard, mouse)	Yes/No	Yes	
1.5	KVM extenders	Yes/No	Yes	
1.6	Firewall gateway	Yes/No	Yes	
1.7	Web server	Yes/No	Yes	
1.8	Fire panels	Yes/No	Yes	
1.9	Fire sensors and alarm equipment	Yes/No	Yes	
1.10	Programmable logic controllers	Yes/No	Yes	
1.11	IO cards / RTUs	Yes/No	Yes	
1.12	UPS and battery banks	Yes/No	Yes	
1.13	DC power supplies	Yes/No	Yes	
1.14	CMS application software for operating, monitoring and configuration (i.e., SCADA software manual)	Yes/No	Yes	
1.15	Antivirus software	Yes/No	Yes	
1.16	OPC server software	Yes/No	Yes	
1.17	BMS server/workstation	Yes/No	Yes	
1.18	BMS application software	Yes/No	Yes	

Item No.	Description	Unit	Required	Tendered
2	**CMS Servers**			
2.1	No of units	pcs	2 (dual redundant configuration)	
2.2	Manufacturer	-	To be provided by Bidder	
2.3	Product/Model/Type	Yes/No	Yes	
2.4	Communication capabilities Ethernet, Serial RS485, Optical fibre	Yes/No	Yes	
2.5	Redundant array of independent disks (RAID) configuration	Yes/No	Yes	
2.6	Redundant power supplies with dual power input ports	Yes/No	Yes	
2.7	Redundant case fans,	Yes/No	Yes	
2.8	19” (inch.) rack-mountable type enclosure for the servers and power supplies installed in the plant server room	Yes/No	Yes	
2.9	On-board database to continuously process and store all real time plant data for the lifespan of the plant,	Yes/No	Yes	
2.10	Tront accessible universal serial bus (USB) ports.	Yes/No	Yes	
3	**SCADA/CMS Software**			
3.1	Microsoft Windows 11 Operating system	Yes/No	Yes	
3.2	Only industry recognised software shall be used.	Yes/No	Yes	
3.3	Licences for the software systems will be purchased by the Contractor and made available with step-in rights for the future purchasers and operators of the Plant.	Yes/No	Yes	

Item No.	Description	Unit	Required	Tendered
3.4	The Contractor shall provide all project specific software, firmware, and operating system developed for, and applicable to, the control and monitoring systems being provided. The SCADA system shall include novel modelling approaches and techno-financial indicators allowing the operators to predict failures, detect root causes of errors, and optimise the Plant operation in a cost-effective manner.	Yes/No	Yes	
3.5	The software shall be completely documented by the Contractor and be provided on a non-proprietary basis. The Contractor shall provide a remote monitoring system and software with a supervisory role and access to historic values.	Yes/No	Yes	
3.6	Custom software required to adapt or customise the control and monitoring systems shall be provided by the Contractor.	Yes/No	Yes	
3.7	CMS application software for comprehensive operating, monitoring and configuration of all plant equipment and sub-systems	pcs	≥ 2	
3.8	Web-server application software for remote clients	Yes/No	Yes	
3.9	Information server application software	pcs	≥ 2	
3.10	Hosting the anti-virus software	pcs	≥ 2	
3.11	Firewall software	Yes/No	Yes	
3.12	OPC server software	Yes/No	Yes	
3.13	Other 3rd party system software	-	To be provided by Bidder	
4	**Operator Thin Clients**			
4.1	No of CPU units	pcs	≥ 2	
4.2	Manufacturer	-	To be provided by Bidder	
4.3	Product/Model/Type	Yes/No	Yes	

Item No.	Description	Unit	Required	Tendered
4.4	Communication capabilities - Ethernet	Yes/No	Yes	
4.5	19-inch rack type	Yes/No	Yes	
4.6	100% operational availability per thin client	Yes/No	Yes	
4.7	19-inch (minimum)TFT LCD monitors	Pcs	6 (3 per thin client)	
4.8	40-inch (minimum)TFT LCD monitors	Pcs	2 (1 per thin client)	
4.9	Monitor Manufacturer	-	To be provided by Bidder	
4.10	Monitor Product/Model/Type	Yes/No	Yes	
4.11	Monitor Communication capabilities, HDMI, DisplayPort, VGA	Yes/No	Yes	
4.12	Number of keyboards and mouse sets	pcs	2	
4.13	Keyboard and mouse Manufacturer	-	To be provided by Bidder	
4.14	Keyboard and mouse Product/Model/Type	Yes/No	Yes	
4.15	Keyboard and mouse product data sheet and manual	Yes/No	Yes	
4.16	Keyboard video and mouse (KVM) extenders per thin client	pcs	4 (2 per thin client)	
5	**CMS Web Server**			
5.1	On-site web-server for access to remote web-clients	Yes/No	Yes	
5.2	Number of web-client licences for remote monitoring (concurrent access)	-	20	
6	**Ethernet Network switches**			
6.1	No. in Server room (installed in 19” cabinet, rack mount)	pcs	2 (dual redundant)	
6.2	No. in Inverter Stations and switchgear rooms (installed in CMS panels, DIN mount)	pcs	10 (1 per location)	
6.3	Switch Manufacturer	-	To be provided by Bidder	

Item No.	Description	Unit	Required	Tendered
6.4	Product/Model/Type	-	To be provided by Bidder	
6.5	Product data sheet and manual	-	To be provided by Bidder	
6.6	Optical fibre and Ethernet ports	Yes/No	Yes	
6.7	Managed type with online management and configuration via the thin clients using a network management software installed on the CMS servers.	Yes/No	Yes	
6.8	Compatibility with Simple network management protocol version 3 (SNMP v3) and Internet protocol version 6 (IPv6).	Yes/No	Yes	
6.9	Online monitoring of the port connections, communication link status, bandwidth, and device heath status indicating alarms and faults to the server and remote users.	Yes/No	Yes	
6.10	Power supply from dual redundant power sources (230 Vac or 24 Vdc)	Yes/No	Yes	
6.11	Dual power input ports	Yes/No	Yes	
6.12	Optical fibre and Ethernet ports	Yes/No	Yes	
6.13	10% unused ports (rounded up)	Yes/No	Yes	
6.14	Wide operating temperature range (typically between -40C to +75C)	Yes/No	Yes	
6.15	Auto negotiation capability	Yes/No	Yes	
6.16	Auto crossover (MDIX) capability	Yes/No	Yes	
6.17	Full duplex communication capability	Yes/No	Yes	
6.18	Single fault tolerant, backbone CMS network	Yes/No	Yes	
6.19	Network topology (Ring, Star) with single fault tolerance	-	Ring with Redundancy Manager	

Item No.	Description	Unit	Required	Tendered
7	**Network Time Synchronisation**			
7.1	19” time server unit installed in server room	Yes/No	Yes	
7.2	GPS antenna	Yes/No	Yes	
7.3	NTP synchronisation via Ethernet	Yes/No	Yes	
7.4	Time stamping accuracy (UTC+2)	ms	10	
7.5	Automatic self-calibrating function	Yes/No	Yes	
7.6	Power source (UPS)	V	230	
7.7	On-board display and function keys	Yes/No	Yes	
8	**CMS Field Equipment Panels**			
8.1	Wall mounted	Yes/No	Yes	
8.2	Protection class (indoor)	IP	54	
8.3	Protection class for string combiner boxes and weather stations (outdoor)	IP	65	
8.4	Open/Close door sensor	Yes/No	Yes	
8.5	Internal ambient temperature sensor	Yes/No	Yes	
8.6	Power source (100% availability)	V	230	
9	**Server Room Network cabinets**			
9.1	19” rack type, 42U height	Yes/No	Yes	
9.2	Network and power cabling, bottom entry	Yes/No	Yes	
9.3	Use of grommets at cable entries	Yes/No	Yes	
9.4	Internal cable channels for routing of cables	Yes/No	Yes	
9.5	Removable blanking panels	Yes/No	Yes	
9.6	Perforated front and rear panels	Yes/No	Yes	

Item No.	Description	Unit	Required	Tendered
9.7	Perforated side panels	Yes/No	Yes	
9.8	Removable front and rear doors	Yes/No	Yes	
9.9	Open/close door sensors	Yes/No	Yes	
9.10	Internal lighting	Yes/No	Yes	
9.11	Internal ambient temperature sensor	Yes/No	Yes	
9.12	Supplied general arrangement (GA) drawings of server room network panels	Yes/No	Yes	
10	**Fire Detection System**			
10.1	No. of fire panels (depending on communication medium limits per zone)	pcs	To be provided by Bidder	
10.2	Protection class (indoor installation)	IP	54	
10.3	SANS 10139 compliance	Yes/No	Yes	
10.4	Product datasheet of fire panels	Yes/No	Yes	
10.5	Smoke/Heat sensors make and model	-	To be provided by Bidder	
10.6	Sensor and alarming products datasheet	Yes/No	Yes	
10.7	Real time monitoring at PV control room via operator HMI	Yes/No	Yes	
11	**CMS Power Supply**			
11.1	Dual- redundantly configured, online UPS system with seal-type battery backup, and back-up time of 1 hour per UPS unit	Yes/No	Yes	
11.2	Sealed type nickel cadmium or lithium-ion batteries	Yes/No	Yes	
11.3	CMS field panels to be supplied from 230V AC supply.	Yes/No	Yes	
12	**CMS Interfaces**			
12.1	Meteorological systems (weather station, instruments), Modbus RS485	Yes/No	Yes	

Item No.	Description	Unit	Required	Tendered
12.2	String combiner boxes, Modbus RS485	Yes/No	Yes	
12.3	Central inverters, Modbus RS485 or TCP	Yes/No	Yes	
12.4	Switchgear MCCBs, Modbus RS485 or TCP, 24V potential free	Yes/No	Yes	
12.5	MV and LV Transformers, Modbus RS485, 4-20mA.	Yes/No	Yes	
12.6	Energy meters, Modbus RS485 or TCP	Yes/No	Yes	
12.7	Switchgear electrical protection relays, Modbus RS485 or TCP	Yes/No	Yes	
12.8	Electrical battery tripping units (BTU)	Yes/No	Yes	
12.9	CMS uninterruptable power supply (UPS) units	Yes/No	Yes	
12.10	Internal environmental sensors of equipment panels, network cabinets, Inverter Power Stations,	Yes/No	Yes	
12.11	Balance of plant (BoP) potable water and sewage tank levels	Yes/No	Yes	
12.12	Fire detection system	Yes/No	Yes	
12.13	Heating, ventilation and air-conditioning (HVAC) system	Yes/No	Yes	
12.14	Interface to Eskom IT network. OPC DA	Yes/No	Yes	
12.15	Firewalled connectivity to internet for full remote monitoring functionality of the PV plant	Yes/No	Yes	
12.16	The Bidder to provide internet service provider (ISP) via ADSL or 3G for use on the plant during the installation and O&M period.	Yes/No	Yes	
12.17	Provision of an Eskom approved gateway for future interface to the NSP using the DNP3 protocol.	Yes/No	Yes	
12.18	CMS MODBUS interface to Power station EOD control system	Yes/No	Yes	

Item No.	Description	Unit	Required	Tendered
12.19	A3 colour printer connected to CMS network	Yes/No	Yes	
13	**Data Communication Medium**			
13.1	Cat6 shielded twisted pair (STP)	Yes/No	Yes	
13.2	Single mode optical fibre > 2kM	Yes/No	Yes	
13.3	Multi-mode optical fibre < 2kM	Yes/No	Yes	
13.4	Wireless / Bluetooth communication	Yes/No	No	

C.10 CIVIL, STRUCTURAL AND INFRASTRUCTURE WORKS

C.10.1 Civil, Structural and Infrastructure Criteria

Table C-22: Civil, structural and infrastructure criteria

Item No.	Description	Unit	Required	Response from Bidder
1	**Work Methodology**			
1.1	Technical proposal detailing the work methodology, which complies to the full scope and describes how the scope will be executed (both design and construction phases of the project). Technical proposal must demonstrate understanding of the scope and include the following as a minimum: • Proposed plant, equipment and tools • Methodology for the proposed works • Foreseen risks and concerns • Health and safety requirements • Quality management requirements • Required temporary works (if any)	-	To be provided by Bidder	

C.10.2 Technical Schedules

Table C-23: Civil & Structural Compliance to Functional Specification

Item No.	Description	Unit	Required	Response from Bidder
1	**Geotechnical Investigation**			
1.1	Detailed geotechnical investigation to be carried out by the Bidder	Yes/No	Yes	
2	**Foundation for Mounting Structure**			
2.1	Foundation type	-	To be provided by Bidder	
2.2	Foundation design applicable to Environmental Permit and Water Use license permit	Yes/ No	Yes	
3	**Hydrological Impact Assessment**			
3.1	Detailed hydrological impact assessment to be carried out by the Bidder	Yes/ No	Yes	
4	**Topographical survey**			
4.1	Detailed topographical survey to be carried out by the Bidder	Yes/No	Yes	
5	**Supportive Documents**			
5.1	Indicative Plant Layout drawing, including roads, fence, O&M building, Laydown area, MV/LV inverters, substation buildings and yards.	Yes/No	Yes	
6	**Coal ash waste resource**			
6.1	Ash waste resource to be incorporated into the civil and structural designs as per 10.11.3 of the Employer's Requirements [375-172742]	Yes/No	Bidder to specify	
6.2	Additional information to be provided in relation to 6.1	Yes	Yes	

C.11 BALANCE OF PLANT

Table C-24: General information about the Subcontractor (if applicable)

No.	Item	Details	
1	Name of subcontractor		
2	Home office address		
3	Regional office address		
4	Telephone / email address		
5	Name, Position and Title of contact person		
6	Legal form [5]		
7	Area of main business		
8	No. of staff in main business	Technical:	Others:
9	PSiRA registration number		

C.11.1 Fire Protection

Table C-25: Fire protection Schedule

Item No.	Description	Unit	Required	Response from Bidder
1	**Fire protection system design**			
1.1	The Bidder shall submit a Fire Protection Services design philosophy, covering aspects such as the fire protection/detection assessment, system and component description, system sizing approach, system design and construction codes, and system process (diagram).	Yes/no	Yes	

[5] e.g., company, partnership, cooperation, consortium, joint venture, etc.

C.11.2 Water Supply and Reticulation

Table C-26: Water Supply and Reticulation Schedule

Item No.	Description	Unit	Required	Response from Bidder
1	**Potable and Process Water Supply and Reticulation System**			
1.1	The Bidder submits a Potable and Process Water Supply and Reticulation Design Philosophy Report. The report shall include system and component descriptions, system sizing approach, applicable system design and construction codes, treatment of water for cleaning PV modules, monitoring mechanisms, etc.	Yes/No	Yes	

C.11.3 Heating, Ventilation and Air Conditioning (HVAC)

Table C-27: HVAC Schedule

Item No.	Description	Unit	Required	Response from Bidder
1	**HVAC system design**			
1.1	The Bidder submits a HVAC Services Design Philosophy Report. The report shall include system and component descriptions, system sizing approach, applicable system design and construction codes, etc., thereby documenting the design philosophy for: - O&M Control room - O&M Server Room - Offices - O&M Spare Parts Workshop - O&M Ablutions and locker rooms - Inverter stations	Yes/No	Yes	

Item No.	Description	Unit	Required	Response from Bidder
	- Substations			

C.11.4 Monitoring And Meteorological Equipment and Instrumentation

Table C-28: Monitoring and Meteorological Equipment and Instrumentation Schedule

Item No.	Description	Unit	Required	Response from Bidder
1	**General**			
1.1	No. of meteorological stations	-	≥ 4	
2	**Meteorological Station Equipment and Instrumentation**			
2.1	**Irradiance**			
2.1.1	No. of Pyranometer installed at Horizontal plane to measure GHI	pcs	≥ 2	
2.1.2	No. of Pyranometer installed at POA to measure POA irradiance	pcs	≥ 2	
2.1.3	No. of albedometers for bifacial modules: No. horizontally mounted albedometer installed away from the solar array in an unobstructed area OR No. of in-plane rear-side irradiance albedometers	pcs	≥ 2 ≥ 6	
2.1.4	Product type	-	To be provided by Bidder	
2.1.5	Class (according to ISO 9060)	-	Second	

Item No.	Description	Unit	Required	Response from Bidder
2.1.6	Measurement uncertainty	%	≤ 2%	
2.1.7	Product data sheet	Yes/No	Yes	
2.1.8	Calibration certificate	Yes/No	Yes	
2.2	**PV Array Temperature Measurement**			
2.2.1	No. of temperature sensors	pcs	≥ 6	
2.2.2	Manufacturer	-	To be provided by Bidder	
2.2.3	Product/Model/Type	Yes/No	Yes	
2.2.4	Product data sheet	Yes/No	Yes	
2.2.5	Measurement accuracy	°C	±1	
2.2.6	According to IEC 61724-1 or equivalent	Yes/No	Yes	
2.2.7	Temperature range	°C	-40 to 100°C	
2.3	**Ambient temperature measurement**			
2.3.1	No. of temperature sensors	pcs	≥ 2	
2.3.2	Manufacturer	-	To be provided by Bidder	
2.3.3	Product/Model/Type	Yes/No	Yes	
2.3.4	Product data sheet	Yes/No	Yes	
2.3.5	Measurement accuracy	±°C	1	
2.3.6	According to IEC 62724-1 or equivalent	Yes/No	Yes	
2.4	**Soiling**			
2.4.1	No. of soiling measurement instruments	pcs	≥ 2	
2.4.2	Manufacturer	-	To be provided by Bidder	
2.4.3	Product/Model/Type	Yes/No	Yes	
2.4.4	Product data sheet	Yes/No	Yes	

Item No.	Description	Unit	Required	Response from Bidder
2.4.5	Calibration according to IEC 61724-1 Photovoltaic system performance.	Yes/No	Yes	
2.4.7	Uncertainty of measurement	%	≤ 3%	
2.4.8	Calibration certificate	Yes/No	Yes	
2.5	**Wind speed and Wind direction measurement**			
2.5.1	No of Anemometer	pcs	≥ 2	
2.5.2	Manufacturer/Product type	-	To be provided by Bidder	
2.5.3	Product data sheet	Yes/No	Yes	
2.5.4	Anemometer suitable of wind energy applications	Yes/No	Yes	
2.5.5	Operational Temperature	°C	-20 to 70	
2.5.6	Speed Range	m/s	0 to 70	
2.5.7	Wind direction accuracy	°	± 5°	
2.6	**Rainfall gauge**			
2.6.1	No. of rain gauge	pcs	≥ 2	
2.6.2	Manufacturer/Product type	-	To be provided by Bidder	
2.6.3	Product data sheet	Yes/No	Yes	
2.7	**Moisture Meter – Relative Humidity Measurement**			
2.7.1	No. of moisture meter	pcs	≥1	
2.7.2	Manufacturer/Product type	-	To be provided by Bidder	
2.7.3	Product data sheet	Yes/No	Yes	
2.7.4	Range	% RH	0 - 100	
2.7.5	Overall Accuracy	%	± 2 %	
2.7.6	Response Time	s	20 s (T90) or less	

C.11.5 Sewage and Waste Disposal Services

Table C-29: Sewage and Waste Disposal Services Schedule

Item No.	Description	Unit	Required	Response from Bidder
1	**Sewage and Waste Disposal System**			
1.1	The Bidder submits a Sewage and Waste Disposal Design Philosophy Report. The report shall include system and component descriptions, system sizing approach, applicable system design and construction codes, monitoring mechanisms, etc.	Yes/No	Yes	

C.12 OPERATION AND MAINTENANCE

C.12.1 Operation And Maintenance Plan

Table C-30: Operations and Maintenance Schedule

Item No.	Description	Unit	Required	Response from Bidder
1	**Operations and Maintenance Plan**			
1.1	The Bidder shall submit a preliminary (high-level) operations and maintenance plan/approach, providing a general overview for operations and preventative maintenance of the main components.	Yes/No	Yes	
1.2	The Bidder shall submit a preliminary corrective maintenance approach, including envisaged response and repair times for the main components.	Yes/No	Yes	

C.12.2 Operation And Maintenance Training

Table C-31: Training Schedule

Item No.	Description	Unit	Required	Response from Bidder
1	**Training Plan**			
1.1	The Bidder shall submit a preliminary training plan. The plan shall describe the timing, type, and level of detail for the various training interventions, including O&M, Inverter, SCADA/CMS, etc.	Yes/No	Yes	

C.12.3 Spare Parts

Table C-32: Spare parts Schedule

Item No.	Description	Unit	Required	Response from Bidder
1	**Spare parts**			
1.1	The Bidder submits a letter confirming Bidder acceptance of spare parts minimum requirements as per 559-189375010, Installation of Solar PV Plant at Tutuka Power Station Functional Specification. The Bidder highlights any proposed deviations and additions.	Yes/No	Yes	

C.13 GRID CONNECTION WORKS

a. It is a requirement that the Engineering Design be performed under the self-build agreement by the Contractor, be performed by a consulting engineer accredited by Eskom for Substations, Control Plant and HV lines. The same consultant shall also design the Solar Substation as both the Solar Substation and the Eskom Switching Station will share a common platform and adjacent earth mats. Details of the Consulting Engineer to be provided in Table C-33.
b. It is a requirement that the construction works performed under the self-build agreement be performed by a contractor accredited by Eskom for Substations, Control Plant, and HV lines. Details of the HV Subcontractor to be provided in Table C-34.

Table C-33: General information about the Consulting Engineer

No.	Item	Details	
1	Name of Consulting Engineer		
2	Home office address		
3	Regional office address		
4	Telephone / email address		
5	Name, Position and Title of contact person		
6	Legal form [6]		
7	Area of main business		
8	Signed letter of intent between Consulting Engineer and EPC Bidder	To be provided by Bidder	
9	Proof that the Consulting Engineer is accredited by Eskom	To be provided by Bidder	

[6] e.g., company, partnership, cooperation, consortium, joint venture, etc.

Table C-34: General information about the HV Subcontractor

No.	Item	Details	
1	Name of HV Subcontractor		
2	Home office address		
3	Regional office address		
4	Telephone / email address		
5	Name, Position and Title of contact person		
6	Legal form [7]		
7	Area of main business		
10	Signed letter of intent between HV Subcontractor and EPC Bidder	To be provided by Bidder	
11	Proof that the HV Subcontractor is Eskom approved	To be provided by Bidder	

C.13.1 Grid connection schedules

C.13.1.1 MV Cables

Table C-35: MV Cable Schedule

Item No.	Description	Unit	Required	Response from Bidder
1	**Cables**			
1.1	Cable type		Yes	
1.2	Cable length	m	Yes	

[7] e.g., company, partnership, cooperation, consortium, joint venture, etc.

C.13.1.2 Grid Connection and HV/MV Transformer Schedule

Table C-36: Grid connection Schedules

Item No.	Description	Unit	Required	Response from Bidder
1	**Overhead line (OHL)**			
1.1	Provide documented evidence (data sheet or other) for the OHL phase conductor	Yes/No	Yes	
2	**HV/MV Transformer**			
2.1	**Product Information**			
2.1.1	Transformer manufacturer	Specify	To be provided by Bidder	
2.2	**General Requirements**			
2.2.1	No of Transformers	No.	≥2	
2.2.2	Nominal rating	MVA	To be provided by Bidder	
2.2.3	Primary Voltage	kV	33	
2.2.4	Secondary Voltage	kV	132	
2.2.5	Rated Frequency	Hz	50	
2.2.6	Maximum Flux density	T	1.7	
2.2.7	Tap-Changer Type	Specify	On-load	
2.2.8	Diverter Type	Specify	Vacuum	
2.2.9	Transformer insulating medium	Type	Biodegradable oil	
2.2.10	No-load Losses	W	To be provided by Bidder	
2.2.11	Load losses	W	To be provided by Bidder	
2.3	**General Design Conditions**			
2.3.1	Altitude above sea-level	m	1800	

Item No.	Description	Unit	Required	Response from Bidder
2.3.2	Ambient air temperatures: Maximum Monthly Average Yearly Average Minimum	ºC	 38 31 25 -8	
2.3.3	Amount by which the temperature rise limits are reduced according to IEC60076-2	ºC	5	
2.3.4	Additional amount by which the temperature rise limit is reduced above the values stipulated in IEC60076-2, as per additional safety margin	ºC	5	
2.3.5	Total amount by which the temperature rise limit is reduced	ºC	5 + 5 = 10	
2.3.6	Humidity	%	61.5	
2.3.7	Solar radiation	kW/m2	2.5	
2.3.8	Atmospheric UV radiation	High/Low	High	
2.3.9	Pollution (Insulators)	IEC 60815 Table 1	IV- Very Heavy	
2.3.10	Seismic	IEC60068-3-3	Yes, Mining activity, according to IEC 60076 requirements	
2.4	**Transformer Design Review**			
2.4.1	The bidder shall make commercial allowance for appointment of a 3rd party power transformer specialist to form part of the technical design reviews and factory acceptance tests.	Yes/No	Yes	

Item No.	Description	Unit	Required	Response from Bidder
2.5	**Minimum required specifications**			
2.5.1	As per Eskom Specification 240-68973110 – *Specification for Power Transformers rated for 1.25 MVA and above and highest voltage of 2.2 kV or above and Eskom Standard 240-56227520 Large Power Generator Transformers in Power Stations for transformers rating above 2.5 MVA and winding operating at or above 11kV.*	Yes/No	Yes	
2.6	**Monitoring system requirements**			
2.6.1	Continuous data logging to the CMS system for the transformer performance parameters including events and status.	Yes/No	Yes	
2.6.2	On-line gas analyser with alarming and status monitoring in the Control Room	Yes/No	Yes	
2.6.3	On-line Tap-changer monitoring	Yes/No	Yes	
2.7	**Supportive Documents**			
2.7.1	Transformer Datasheet	-	To be provided by Bidder	
2.8	**Additional Information – To be listed by the Bidder**			
2.8.1	To be defined by the Bidder	-	To be provided by Bidder	

C.13.1.3 MV Primary Switchgear

Table C-37: MV Primary Switchgear Schedule

Item No.	Description	Unit	Required	Response from Bidder
1	**Product Information**			
1.1	Switchgear manufacturer	Name	To be provided by Bidder	
1.2	Type/Model	Type	To be provided by Bidder	

Item No.	Description	Unit	Required	Response from Bidder
2	**Ratings**			
2.1	Nominal voltage	kVrms	To be provided by the Bidder	
2.2	Rated voltage	kVrms	To be provided by the Bidder	
2.3	System frequency	Hz	50	
3	**Design**			
3.1	Indoor/Outdoor application	-	Indoor	
3.2	Insulating medium	-	AIS	
3.3	Type	Withdrawable or Fixed patter	To be provided by the Bidder	
3.4	Interrupting technology	-	Vacuum	
4	**Supportive Documentation**			
4.1	Switchgear data sheet / catalogue	-	To be provided by the Bidder	
5	**Minimum required standards**			
5.1	• 559-189375010 Installation of Solar PV Plant at Tutuka Power Station Functional Specification • Appendix C: Tender Returnable Technical Schedules	Yes/No	Yes	
6	**Additional Information – To be listed by the Bidder**			
6.1	To be defined by the Bidder	Yes/No	Yes	

C.13.1.4 HV Primary Switchgear

Table C-38: HV Primary Switchgear Schedule

Item No.	Description	Unit	Required	Response from Bidder
1	**Product Information**			
1.1	Switchgear manufacturer	Name	To be provided by the Bidder	
1.2	Type/Model	Type	To be provided by the Bidder	
2	**Ratings**			
2.1	Nominal voltage	kVrms	132	
2.2	Rated voltage	kVrms	To be provided by the Bidder	
2.3	System frequency	Hz	50	
3	**Design**			
3.1	Indoor/Outdoor application	-	Outdoor	
3.2	Insulating medium	-	To be provided by the Bidder	
3.3	Type	-	To be provided by the Bidder	
3.4	Interrupting technology		To be provided by the Bidder	
4	**Supportive Documentation**			
4.1	Switchgear data sheet / catalogue	-	To be provided by the Bidder	
5	**Minimum required standards**			
5.1	• 559-189375010 Installation of Solar PV Plant at Tutuka Power Station Functional Specification • Appendix C: Tender Returnable Technical Schedules	-	Yes	

Item No.	Description	Unit	Required	Response from Bidder
6	**Additional Information – To be listed by the Bidder**			
6.1	To be defined by the Bidder	Yes/No	Yes	

C.13.1.5 MV Primary Switchgear Protection

Table C-39: MV Primary Switchgear Protection Schedule

Item No.	Description	Unit	Required	Response from Bidder
1	**Product Information**			
1.1	Protection relay manufacturers	Name	To be provided by the Bidder	
1.2	Type/Models/Scheme Designation	Type	To be provided by the Bidder	
2	**Ratings**			
2.1	Scheme voltage	kVrms	To be provided by the Bidder	
3	**Design**			
3.1	Provide interlocking methodologies	-	To be provided by the Bidder	
3.2	Provide proposed protection block diagram MV feeders, transformer bay	-	To be provided by the Bidder	
3.3	Description of MV protection and control IED's	-	To be provided by the Bidder	
3.4	Details of MV protection schemes for incoming circuits and transformer feeders	-	To be provided by the Bidder	
3.5	Software communication to remote engineering device	-	Yes	
3.6	Disturbance recording ability	-	Yes	

Item No.	Description	Unit	Required	Response from Bidder
4	**Supportive Documentation**			
4.1	Protection Systems data sheets, catalogues, product brochures, background literature	-	To be provided by the Bidder	
5	**Minimum required standards**			
5.1	• 559-189375010 Installation of Solar PV Plant at Tutuka Power Station Functional Specification • Appendix C: Tender Returnable Technical Schedules		Yes	
6	**Additional Information – To be listed by the Bidder**			
6.1	To be defined by the Bidder	Yes/No	Yes	

C.13.1.6 HV Primary Switchgear Protection

Table C-40: HV Primary Switchgear Protection Schedule

Item No.	Description	Unit	Required	Response from Bidder
1	**Product Information**			
1.1	Protection relay manufacturers	Name	To be provided by the Bidder	
1.2	Type/Models/Scheme Designation	Type	To be provided by the Bidder	
2	**Ratings**			
2.1	Scheme voltage	kVrms	To be provided by the Bidder	
3	**Design**			
3.1	Provide interlocking methodologies applied	-	To be provided by the Bidder	

Item No.	Description	Unit	Required	Response from Bidder
3.2	Provide proposed protection block diagram HV feeders, transformer bay	-	To be provided by the Bidder	
3.3	Description of HV protection and control IED's	-	To be provided by the Bidder	
3.4	Details of HV protection schemes for incoming circuits and transformer feeders including details of interfacing to existing systems	-	To be provided by the Bidder	
3.5	Description of overall HV switchboard control systems and interfacing to existing systems	-	To be provided by the Bidder	
3.6	Details of power supply for control voltages and protection systems supplies	-	To be provided by the Bidder	
3.7	Software communication to remote engineering device	-	Yes	
3.8	Disturbance recording ability	-	Yes	
4	**Supportive Documentation**			
4.1	Protection Systems data sheets, catalogues, product brochures, background literature	-	To be provided by the Bidder	
5	**Minimum required standards**			
5.1	• 559-189375010 Installation of Solar PV Plant at Tutuka Power Station Functional Specification • Appendix C: Tender Returnable Technical Schedules	Yes/No	Yes	
6	**Additional Information – To be listed by the Bidder**			

Item No.	Description	Unit	Required	Response from Bidder
6.1	To be defined by the Bidder	Yes/No	Yes	

-End-