



**CEYLON PETROLEUM STORAGE TERMINALS LIMITED**

**BIDDING DOCUMENT**

**NATIONAL COMPETITIVE BIDDING**

FOR

**SUPPLY, INSTALLATION, TESTING, COMMISSIONING AND  
MAINTENANCE OF GRID-TIED ROOF MOUNTED SOLAR PV  
GENERATION SYSTEM AT MAIN GARAGE HANGER  
(187kWp) & NEW BUILDING (100 kWp) AT CPSTL, OIL  
INSTALLATION KOLONNAWA.**

**KPR/76/2024**

**Employer:**

Ceylon Petroleum Storage Terminals Limited,  
Oil Installation, Kolonnawa.  
Wellampitiya

**Engineer:**

Engineering Manager  
Ceylon Petroleum Storage Terminals Limited,  
Oil Installation, Kolonnawa.  
Wellampitiya

Issued to :.....

Issued by :.....

Date :.....

**October 2024**

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**VOLUME - 01**

- SECTION 01 : INSTRUCTIONS TO BIDDERS***  
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**SECTION – 1**

❖ ***INSTRUCTIONS TO BIDDERS***

DUPLICATE

## **INSTRUCTIONS TO BIDDERS**

Instructions to Bidders applicable to this contract are that given in Section-I of the Standard Bidding Document for Procurement of Works. CIDA Publication No.ICTAD/SBD/01, Second Edition ,January 2007, published by the Construction Industry Development Authority (CIDA), “Savsiripaya”, 123, Wijerama Mawatha, Colombo 07.

Instructions to Bidders shall be read in conjunction with the Bidding Data provided under section-5 of the Bidding Document (Volume 2)

Instructions to Bidders will not be a part of the contract.

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## **SECTION – 2**

### **STANDARD FORMS**

Form of letter of acceptance

Form of agreement

Form of performance security

Form of advance payment security

DUPLICATE

**FORM OF LETTER OF ACCEPTANCE**

*[LETTER HEADING PAPER OF THE PROCURING ENTITY]*

----- *[date]*

To: -----  
*[name and address of the Contractor]*

This is to notify you that your bid dated ----- *[insert date]* for the construction and remedying defects of the ----- *[name of the Contract and identification number]* for the Contract price of -----*[name of currency]* -----*[amount in figures and words]* as corrected in accordance with Instructions to Bidders and / or modified by a Memorandum of Understanding, is hereby accepted.

The adjudicator shall be ----- *[name and address of the Adjudicator, if agreed]* / shall be appointed by the Construction Industry Development Authority (CIDA).

You are hereby instructed to proceed with the execution of the said Works in accordance with the Contract documents.

The Start Date shall be: ----- *(fill the date as per Conditions of Contract).*

The amount of Performance Security is: ----- *(fill the date as per Conditions of Contract).*

The Performance Security shall be submitted on or before ----- *(fill the date as per Conditions of Contract).*

Authorized Signature : -----

Name and title of Signatory: -----

Name of Agency: -----

**STANDARD FORM: AGREEMENT**

*This AGREEMENT, made the -----[day] day of -----[month] 20----- [year] between -----[name and address of Employer] (hereinafter called “the Employer”) of the one part, and ----- [name and address of Contractor] (hereinafter called “the Contractor”) of the other part.*

WHEREAS the Employer desires that the Contractor execute -----  
*[name and identification number of Contract] (hereinafter called “the Works”) and the Employer has accepted the Bid by the Contractor for the execution and completion of such Works and the remedying of any defects therein.*

NOW THIS AGREEMENT WITNESSETH as follows:

1. In this Agreement, words and expressions shall have the same meanings as are respectively assigned to them in the Conditions of Contract hereinafter referred to, and they shall be deemed to form and be read and construed as part of this Agreement.
2. In consideration of the payments to be made by the Employer to the Contractor as hereinafter mentioned, the Contractor hereby covenants with the Employer to execute and complete the Works and remedy any defects therein in conformity in all respects with the provisions of the Contract.
3. The Employer hereby covenants to pay the Contractor in consideration of the execution and completion of the Works and the remedying of defects wherein the Contract Price or such other sum as may become payable under the provisions of the Contract at the times and in the manner prescribed by the Contract.

IN WITNESS whereof the parties thereto have caused this Agreement to be executed the day and year aforementioned in accordance with laws of Sri Lanka.

.....  
Authorized signature of Contractor

.....  
Authorized signature of Employer

COMMON SEAL

COMMON SEAL

In the presence of:

Witnesses:

- |    |                  |   |       |
|----|------------------|---|-------|
| 1. | Name and NIC No. | : | ..... |
|    | Signature        | : | ..... |
|    | Address          | : | ..... |
| 2. | Name and NIC No. | : | ..... |
|    | Signature        | : | ..... |
|    | Address          | : | ..... |



**FORM OF PERFORMANCE SECURITY  
(UNCONDITIONAL)**

.....  
(Issuing Agency's Name and Address of Issuing Branch or Office)

**Beneficiary:** Ceylon Petroleum Storage Terminals Limited,  
Oil Installation, Kolonnawa.  
Wellampitiya  
]

**Date:** .....

**PERFORMANCE GUARANTEE NO. :** .....

We have been informed that .....  
..... (Name of Contractor)  
(hereinafter called "the Contractor") has entered into Contract No.  
..... (Reference No. of the Contract) dated  
..... With you, for the  
..... [ name of the contract and brief description of  
works](hereinafter called "the Contract").

Furthermore, we understand that, according to the conditions of the Contract, a performance guarantee is required.

At the request of the Contractor, we .....  
..... (name of agency) hereby  
irrevocably undertake to pay you any sum or sums not exceeding in total an amount of  
..... (amount in figures)  
.....  
..... (amount in words) upon receipt by us of your first demand  
in writing accompanied by a written statement stating that the Contractor is in breach of its  
obligation(s) under the Contract, without your needing to prove or to show grounds for  
your demand or the sum specified therein.

This guarantee shall expire, no later than the ..... day of ..... 20..... (insert  
date, 28 days beyond the intended Completion Date) and any demand for payment under it  
must be received by us at this office on or before that date.

.....  
Signature(s)

## FORM OF ADVANCE PAYMENT SECURITY

.....  
.....  
(Name and Address of Agency, and Address of Issuing Branch or Office)

**Beneficiary Ceylon Petroleum Storage Terminals Limited,  
Oil Installation, Kolonnawa.  
Wellampitiya**

**Date:** .....

**ADVANCE PAYMENT GUARANTEE NO. :** .....

We have been informed that .....  
..... (Name of Contractor) (hereinafter called "the Contractor") has entered into Contract No. .... (Reference No. of the Contract) dated ..... With you, for the ..... [ name of contract & brief description] (hereinafter called "the Contract").

Furthermore, we understand that, according to the conditions of the Contract, an advance payment in the sum.....(amount in figures) ..... (amount in words) to be made against an advance payment guarantee.

At the request of the Contractor, we ..... (name of issuing agency) hereby irrevocably undertake to pay you any sum or sums not exceeding in total an amount of ..... (amount in figures) ..... (amount in words) upon receipt by us of your first demand in writing accompanied by a written statement stating that the Contractor is in breach of its obligation in repayment of the advance payment under the Contract.

The maximum amount of this guarantee shall be progressively reduced by the amount of the advance payment repaid by the Contractor.

This guarantee shall expire on ..... (insert date, 28 days beyond the expected expiration Date of the contract)

Consequently, any demand for payment under this guarantee must be received by us at this office on or before that date.

.....  
Signature(s)

**SECTION – 3**

❖ *CONDITIONS OF CONTRACT*

DUPLICATE

## **CONDITIONS OF CONTRACT**

Condition of Contract that will be applicable for this Contract is that given in Section 3 of the Standard Bidding Document for Procurement of Works “CIDA PUBLICATION NO. – ICTAD/SBD/01” Second Edition January 2007 published by the Construction Industry Development Authority (CIDA).

Conditions of Contract shall be read in conjunction with Contract data provided under Section-5 of the Bidding Document (Volume 2).

DUPLICATE

## **VOLUME - 02**

### **INVITATION FOR BIDS**

- SECTION 04 :**      **FORM OF BID AND QUALIFICATION INFORMATION**
- SECTION 05 :**      **SCHEDULE**
- SECTION 06 :**      **SPECIFICATIONS**
- SECTION 07 :**      **BILL OF QUANTITIES AND DAY WORK SCHEDULES**
- SECTION 08 :**      **STANDARD FORMS (BID)**

## Invitation for Bids (IFB)

### CEYLON PETROLEUM STORAGE TERMINALS LIMITED

#### **SUPPLY, INSTALLATION, TESTING, COMMISSIONING AND MAINTENANCE OF GRID-TIED ROOF MOUNTED SOLAR PV GENERATION SYSTEM AT MAIN GARAGE HANGER (187 kWp) & NEW BUILDING (100 kWp) AT CPSTL, OIL INSTALLATION KOLONNAWA.**

**TENDER REF : KPR/76/2024**

1. The Chairman, Departmental Procurement Committee (DPC), on behalf of the *Ceylon Petroleum Storage Terminals Limited, Oil Installation, Kolonnawa* now invites sealed bids from eligible and qualified Bidders for the above tender as described in the bidding document.

The work consists of Supply, Installation, Testing, and Commissioning of 187 kWp and 100 kWp Grid-Tied Roof Mounted Solar PV Generation System and integration of the new system into the LECO Grid through Transformer 01- Gajabapura (Account no. 0105383707) and Transformer 02- New Building (Account no.0105383608) respectively at CPSTL Kolonnawa Terminal.

The Construction period is **120 Calendar Days**.

2. Bidding will be conducted through **National Competitive Bidding (NCB)**.
3. To be eligible for contract award, the successful bidder shall not have been blacklisted and shall meet the following requirements
  - (a) Experience Required  
The bidder should have completed at least 03 projects as the main contractor with similar nature and complexity (Supply and installation of a Solar PV system with a minimum capacity of 100 kWp in industrial environment) during the last 05 years. The minimum value of a project should be **Rs. 20,000,000 (Rupees Twenty Million)**
  - (b) SLSEA Registration  
The bidder shall be a registered roof-top solar power service provider at Sri Lanka Sustainable Energy Authority (SLSEA).
4. Qualification requirements to qualify for contract award as prescribed in the bidding document.
5. Interested bidders may obtain further information from The **Manager (Procurement), Procurement Function, Ceylon Petroleum Storage Terminals Limited, 1<sup>st</sup> floor, New Administration Building, Oil Installation, Kolonnawa (Telephone 011-2572156, Fax 011-2074299)** and inspect the bidding documents at the above address from 0900 hrs to 1400 hrs.
6. A complete set of Bidding Documents in English language may be purchased by interested bidders on the submission of a written application to The **Manager (Procurement), Procurement Function, Ceylon Petroleum Storage Terminals Limited, 1<sup>st</sup> floor, New**

**Administration Building, Oil Installation, Kolonnawa** from **22.11.2024** until **16.12.2024** during office days from 0900 hrs to 1400 hrs. on the production of the receipt for the payment of Rs. 10,000.00 made as non-refundable fee made by cash to the CPSTL.

7. A pre-bid meeting will be held at **1000 hrs** on **28.11.2024** at Engineering Manager Office, Ceylon Petroleum Storage Terminals Limited, Oil Installation, Kolonnawa, Wellampitiya.
8. Bids shall be submitted on the bidding document obtainable from Procurement Function and duly filled bidding documents may be sent by post/courier under registered cover or sealed cover to reach the Chairman, Department Procurement Committee (Minor), C/o Manager Procurement, Ceylon Petroleum Storage Terminals Limited, Procurement Function, 01st Floor, New Building, Oil Installation, Kolonnawa, Wellampitiya or could be deposited in the tender box kept at the main entrance of CPSTL, on or before 1400 hrs. on 09.07.2024.
9. Bids will be closed at 1400 hrs. on **17.12.2024** and will be opened immediately thereafter at the office of Manager Procurement, in the presence of the authorized only one representative of the bidder who chose to attend.
10. In case the bidders are unable to submit the original bids as above, they could submit the scanned copy of the duly filled bidding documents in PDF format via email to **tenders@cpstl.lk** to reach on or before 1400 hrs. on **17.12.2024**, subject to following condition
  - i. Submission of the bid via email is at the bidder's own discretion.
  - ii. If the bidder intends to submit a bank guarantee or bank draft as the bid security (instead of a direct deposit to the CPSTL bank account), the **original bank guarantee/draft** must be sent or hand-delivered to the above address by 1400 hrs. on **17.12.2024**.
  - iii. The title and closing date of the tender must be indicated as the subject of the email.
  - iv. The size of an email (including attachments) must not exceed 20 MB. If the attachment exceeds 20 MB, the bidder must split the attachments and send them as separate emails (e.g., 01 of 03, 02 of 03, 03 of 03).
  - v. Direct links to external sites or shared folders (e.g., Google Drive) are strictly prohibited.
  - vi. Do not CC or BCC any other official or personal email IDs of CPSTL staff.
  - vii. Emails should be sent well in advance to allow CPSTL sufficient time to print and deliver the bids to the bid opening table on time.
  - viii. The original bid document must be securely kept and submitted to the Manager Procurement upon request. However, the original bid document will only be used for filing purposes and not for verification against the e-bid.
11. Bids shall be valid up to **18.03.2025**
12. All bids shall be accompanied by a Bid Security of **Rs. 450,000.00 (Rupees Four Hundred Fifty Thousand Only)**. Bid Security shall be valid up to **15.04.2025**.
13. Any of the following parties who wishes to submit a bid, shall register himself at the Department of Registrar of Companies [www.drc.gov.lk](http://www.drc.gov.lk) (e-ROC) as per the Public Contracts Act, No. 03 of 1987 for every public contract value exceeding Sri Lankan Rupees Five million (LKR 5,000,000).

- (a) An agent, sub-agent, representative, or nominee must be registered **prior to the closing of the Bid/Tender.**
- (b) If the tender applicant and tenderer is the same party he must be registered prior to **award of the tender.**

**The Chairman  
Departmental Procurement Committee (Major),  
C/O Manager Procurement,  
Ceylon Petroleum Storage Terminals Limited  
Procurement Function, 1st floor, New Building,  
Oil Installation, Kolonnawa,  
Wellampitiya.**

**Telephone: +94 11 2572156, +94 11 2572155  
Fax : +9411 2074299  
Email : procure@cpstl.lk**

DUPPLICATE



## **SECTION – 4**

- ❖ *FORM OF BID*
- ❖ *QUALIFICATION INFORMATION*

## FORM OF BID

**Name of Contract:** SUPPLY, INSTALLATION, TESTING, COMMISSIONING AND MAINTENANCE OF GRID-TIED ROOF MOUNTED SOLAR PV GENERATION SYSTEM AT MAIN GARAGE HANGER (187 kWp) & NEW BUILDING (100 kWp) AT CPSTL, OIL INSTALLATION KOLONNAWA.

To: **The Chairman,  
Department Procurement Committee (Major)  
C/O Manager Procurement,  
Ceylon Petroleum Storage Terminals Limited,  
Procurement Function, new Building,  
Oil Installation, Kolonnawa, Wellampitya.**

Gentleman,

1. Having examined the Standard Bidding Document – Procurement of Works (ICTAD/SBD/01 – Second Edition – January 2007), Specifications, Drawings and Bill of Quantities and addenda for the execution of the above – named Works, we/I the undersigned, offer to execute and complete such Works and remedy any defects therein in conformity with the aforesaid Conditions of Contract, Specification, Drawings, Bill of Quantities and addenda for the sum of Sri Lankan Rupees.....  
..... [in words]  
(LKR.....[in numbers].

or such other sums as may be ascertained in accordance with the said Conditions.

2. We/I acknowledge that the Contract Data forms part of our Bid.
3. We/I undertake, if our Bid is accepted, to commence the Works as stipulated in the Contract Data, and to complete the whole of the Works comprised in the contract within the time stated in the Contract Data.
4. We/I agree to abide by this bid for the period stated in the Sub-Clause 15.1 of Instructions to Bidders or any extended period and it shall remain binding upon us and may be accepted at any time before the expiration of that period.
5. Unless and until a formal agreement is prepared and executed this Bid, together with your written acceptance thereof, shall constitute a binding contract between us.
6. We accept/ we do not accept the Adjudicator.
7. We/I understand that you are not bound to accept the lowest or any Bid you may receive.

Dated this .....day of ..... 20.... in the capacity of .....  
..... duly authorized to sign tenders for and on  
behalf of .....

(IN BLOCK CAPITALS)

Signature :.....

Name :.....

Designation:.....

Address :.....

.....

Witness :.....

## Qualification Information

(To be completed and submitted by the bidder, with the Bid)

<b>SLSEA Registration</b>	
Registration number	(Attach copies of relevant certificates)
Expiry Date	
<b>Blacklisted Contractors</b>	
Have you been declared as a defaulted contractor by NPA or any other Agency?	
IF yes provide details	
<b>Business Registration No</b>	
<b>VAT Registration Number</b>	
<b>Work Program</b>	( attach as annex)
<b>Legal status</b>	(attach relevant status copies, as annex)
<b>Value of Construction works performed in last 5 years</b>	(attach copies of Certificate of Completion etc. and other documents such as profit-loss and income expenditure statement)
Year .....	
Year .....	
Year .....	
Year .....	
Year .....	
<b>Value of similar works completed in last 5 years (indicate only the three largest projects,)</b>	1. Value _____ Year ..... 2. Value _____ Year ..... 3. Value _____ Year .....  (attach copies of Certificate of Completion etc., as annex)
<b>Audited Financial reports for the last five financial years</b>	(attach as annex)
<b>Credit Facilities shall be at least Rs. 20 million specifically for the project</b>	(attach as annex)
<b>Qualification and experience of key staff – Site &amp; Head Office (Permanent, Contract basis &amp; Consultants)</b>	Technical: 1. 2. 3.
	Managerial: 1. 2. 3.
<b>Other information requested under ITB Clause 4.1</b>	

Signature of the Bidder : .....

## **SECTION 5**

### **❖ *BIDDING DATA AND CONTRACT DATA***

DUPLICATE

## **Bidding Data**

### **Instructions to Bidders** **Clause Reference**

**(1.1)** The Employer:

Name: Managing Director  
Address: Ceylon Petroleum Storage Terminals Limited,  
Oil Installation,  
Kolonnawa.

**Scope of Works**

**SUPPLY, INSTALLATION, TESTING, COMMISSIONING AND MAINTENANCE OF GRID-TIED ROOF MOUNTED SOLAR PV GENERATION SYSTEM AT MAIN GARAGE HANGER (187 kWp) & NEW BUILDING (100 kWp) AT CPSTL, OIL INSTALLATION KOLONNAWA.**

The scope of work of the contract is defined in general and shall include the following, but not limited to the same. The bidder shall also carry out all the related work that are not listed in this document, but required for completion of the entire work as specified in this Bidding Document.

- (i) The main objectives of this project are supply, installation, testing, and commissioning of 187 kWp and 100 kWp roof mounted Solar PV generation system to reduce the overall operational costs and carbon foot print of CPSTL.
- (ii) The Contractor shall procure and supply materials and all equipment, machinery, tools, consumables etc. necessary for completion of above works to be supplied by the contractor. Loading, handling and transportation of all materials from supply point / store at work site / Contractor's store as per the requirement of the job.
- (iii) The Contractor shall also carry out the jobs that are not specifically mentioned in this Bidding Document but required for successful completion of the job in all respects as per the standards, drawings and codes.
- (iv) Submission of soft copies and hard copies of as built drawings, reports and required documents in English language as directed by the Engineer. Drawings to be submitted in AutoCAD (dwg) format.
- (i) Constructions to be carried out without disturbing the CPSTL operations at the site. The construction site is a hazardous area containing highly inflammable petroleum products and the contractor shall execute the work with due care for the safety.

**(1.2)** Intended Completion Date is **120 Calendar Days** from the Start Date.

(1.3) The office for collection of bid forms is

Manager Procurement,  
Ceylon Petroleum Storage Terminals Limited,  
Procurement Function, New Building,  
Oil Installation, Kolonnawa, Wellampitiya,  
Sri Lanka.

The non-refundable fee is Rupees **10,000.00**

The Bid forms will be issued **from 22.11.2024 up to 16.12.2024** during office days from 0900 hrs. to 1400 hrs.

(2.1) The source of funds is Ceylon Petroleum Storage Terminals Limited

(4.2) The registration is not required

(4.3) The following information shall be provided in Section 4:

- VAT registration number (if applicable)
- Business Registration Certificate
- SLSEA Registration certificate and approvals of solar panels and Inverters.
- Form PCA 03
- Work program
- Attach legal status (Sole proprietor, Partnership, Company etc.)
- Attach authentication for signatory in the form of Power of Attorney
- Audited Financial reports for the last five financial years
- Total monetary value of work performed for each of the last five years
- Experience in works of a similar nature and size for each of the last five years
- Fabrication, installation and Construction Equipment
- Qualifications and experience of key site management and technical personnel proposed for the Contract
- Attach bidder's technical proposal with cable sizing calculation.
- Details of the suppliers and manufactures
- Manufacturer's Authorization Letters for Solar Panels and Inverters
- Dully filled and signed Technical Schedule
- All the technical literature, including catalogues, datasheets, layout drawings and manuals related to offered brands and models of equipment in English language.
- Any other

**(4.4)**

(a) Experience Required

The bidder should have completed at least 03 projects as the main contractor with similar nature and complexity (Supply and installation of a Solar PV system with a minimum capacity of 100 kWp in industrial environments) during last 05 years. Minimum value of a project should be **Rs. 20,000,000 (Rupees Twenty Million)**.

Documentary proof (Copy of PO, performance certificate, completion certificate, agreement etc.) shall be submitted.

(b) SLSEA Registration

The bidder shall be a registered roof-top solar power service provider at Sri Lanka Sustainable Energy Authority (SLSEA).

(c) Average annual volume of construction work performed in the last 5 years shall be at least Rs. 202.5 million.

(d) Required amount of Credit Facilities shall be at least Rs. 20 million specifically for the project.

(a) Following technical and managerial staff:

(i) A Site Engineer with BSc. (Electrical) or equivalent with minimum 02 years experience,

(ii) A Technical Officer with NDT (Electrical) or equivalent with minimum 05 years' experience should be assigned to the project full time basis.

This is the minimum requirement and the successful bidder shall assign all other necessary staff to enable compliance with all other contractual stipulations.

**(7.1)** Site visit

Prior to submitting a bid, bidders shall familiarize themselves and shall be deemed to have done so. The bidders shall inform Engineering Manager, Engineering Function, Oil Installation, CPSTL, Kolonnawa (Tel. 011-2572214, Fax No. 011-2531328) at least 02 days in advance with their names, NIC Numbers/Passport Numbers so that the CPSTL will arrange required permits for the site visit.

The bidders are advised to limit the number of persons, for the visit, due to the security reasons, at the Kolonnawa Installation area. Site visit will be permitted during 0830 – 1600 hrs. except Sundays and mercantile holidays. The cost of such visits shall be borne by the bidder.

(9.1) Employer's address for the purpose of clarification is;

Name: Manager Procurement

Address: Ceylon Petroleum Storage Terminals Limited,  
Procurement Function, New Building,  
Oil Installation, Kolonnawa,  
Wellampitiya.

Telephone: 0112572156

Fax: 0112074299

Email: procure@cpstl.lk

(11.1) The language of the bidding document shall be English.

(13.3) VAT component shall not be included in the rates. The amount written in the Form of Bid shall be without VAT. However, VAT component shall be shown separately at the end of the BOQ.

(13.4) The Contract is **not subjected** to price adjustment in accordance with Clause 47 of the Conditions of Contract.

(14.1) The Bid shall be quoted in Sri Lankan Rupees (LKR)

(15.1) The Bid shall be valid up to **18.03.2025**

(16.1) Bid shall include a Bid Security using the form included in Section 9.

(16.2) Bid Security shall be:

- For an amount **Rs. 450,000.00 (Rupees Four Hundred Fifty Thousand Only)**.
- Valid up to **15.04.2025**
- Securities and Guarantees shall be on demand guarantees issued by a commercial bank operating in Sri Lanka with the valid license issued by the monetary board of Sri Lanka-Central bank of Sri Lanka

(17.0) Pre-Bid meeting

Venue: Engineering Manager Office  
Ceylon Petroleum Storage Terminals Limited  
Oil Installation, Kolonnawa,  
Wellampitiya.

Date: **29.11.2024**

Time: **1000 a.m.**

(19.2) a The Employer's address for the purpose of Bid submission is



**The Chairman  
Departmental Procurement Committee (Major),  
C/O Manager Procurement,  
Ceylon Petroleum Storage Terminals Limited  
Procurement Function, 1st floor, New Building,  
Oil Installation, Kolonnawa,  
Wellampitiya.**

**Telephone: +94 11 2572156, +94 11 2572155**

**Fax : +9411 2074299**

**Email : procure@cpstl.lk**

- (19.2) b** Contract name: **SUPPLY, INSTALLATION, TESTING, COMMISSIONING AND MAINTENANCE OF GRID-TIED ROOF MOUNTED SOLAR PV GENERATION SYSTEM AT MAIN GARAGE HANGER (187 kWp) & NEW BUILDING (100 kWp) AT CPSTL, OIL INSTALLATION KOLONNAWA.**  
Contract no **KPR/76/2024**
- (20.1)** The deadline for submission of Bids shall be **1400 hrs. on 17.12.2024**
- (30.0)** Not Applicable
- (34.0)** The amount of Performance Security is 5% of the Initial Contract Price.
- (36.0)** The Adjudicator proposed by the Employer is an Adjudicator selected from the pool of Adjudicators of Construction Industry Development Authority (CIDA).  
Fees and types of reimbursable expenses to be paid to the Adjudicator shall be on a case-to-case basis and shall be equally shared by the Contractor and the Employer.

## Contract Data

*(Please note that the Clause nos. given hereunder are that of Conditions of Contract)*

### **(1.1) The Employer**

Name: Managing Director  
Address: Ceylon Petroleum Storage Terminals Limited,  
Oil Installation, Kolonnawa,  
Wellampitiya.

### **Employers Representative**

Name: Manager Procurement  
Address: Ceylon Petroleum Storage Terminals Limited,  
Procurement Function, New Building,  
Oil Installation, Kolonnawa,  
Wellampitiya.

### **(1.1) The Engineer**

Name: Engineering Manager  
Address: Ceylon Petroleum Storage Terminals Limited,  
Oil Installation, Kolonnawa,  
Wellampitiya.

**(1.1)** The scope of work of the contract is defined in general and shall include the following, but not limited to the same. The bidder shall also carry out all the related work that are not listed in this document, but required for completion of the entire work as specified in this Bidding Document.

- (i) The main objectives of this project are supply, installation, testing, and commissioning of 187 kWp and 100 kWp roof mounted Solar PV generation system to reduce the overall operational costs and Carbon foot print of CPSTL.
- (ii) The Work also consists of integration the proposed Solar PV system with the LECO Grid through Transformer 01- Gjabapura (Account no. 0105383707.) and Transformer 02- New Building (Account no. 0105383608.....) under the Net Accounting.
- (iii) The Contractor shall procure and supply materials and all equipment, machinery, tools, consumables etc. necessary for completion of above works to be supplied by the contractor. Loading, handling and transportation of all materials from supply point / store at work site / Contractor's store as per the requirement of the job.
- (iv) The Contractor shall also carry out the jobs that are not specifically mentioned in this Bidding Document but required for successful completion of the job in all respects as per the standards, drawings and codes.
- (v) Submission of soft copies and hard copies of as built drawings, reports and required documents in English language as directed by the Engineer. Drawings to be submitted in AutoCAD (dwg) format.

(1.1) The Site is located at CPSTL, Oil Installation, Kolonnawa, Wallampitiya.

(1.1) The Start Date shall be 14 Days from the Letter of Acceptance.

(8.1) Schedule of other contractors: None

(9.1) Schedule of Key Personnel:

Minimum persons with qualifications and experience to be defined,

<b>Designation</b>	<b>Qualification</b>	<b>Experience</b>
Site Engineer	BSc. (Eng.)	02 years
Technical Officer (01nr)	NDT or equivalent	05 years

(13.1) The minimum insurance covers shall be:

(a) The minimum cover for insurance of the Works, Plants and Materials is 110% of Initial Contact Price

The maximum deductible for insurance of the Works and of Plant and Materials is 5% of initial Contract Price.

(b) The cover for loss or damage to Equipment is Contractor's responsibility.

(c) The minimum cover for insurance of other property (other than the Site) is Rs. 3,000,000.00.

(d) The minimum cover for personal injury or death,

for third party and employees of the Employer and other persons engaged by the Employer in the Works is Rs. 1,000,000.00 per person, per event.

(13.2) The minimum cover for personal injury or death of workmen or other employees of the contractor engaged in the works is Rs. 1,000,000.00 per person.

(17.1) The Intended Completion Date for the whole of Works shall be **120 Calendar Days** from the Date of Commencement of Works

Working Hours

- i. Normal working hours of CPSTL from Monday to Friday is from 0730 hrs. to 1645 hrs.
- ii. In the work program Saturday also can be considered as a working day and from Monday to Friday up to 1800 hrs. also can be considered as a working hour by the contractor. But to work on Saturday and up to 1800 hrs. the contractor is required to obtain prior permission since the offices are normally closed on Saturdays and after 1645 hrs.
- iii. However, working on statutory holidays, Sundays and after 1800 hrs. on working days will not be permitted.
- iv. Provided always that provision of above (iii) shall not be applicable in the cause of any work which it is customary to carry out, outside the normal working hours by rotary or double shifts.

**(19.1) Special Safety Conditions**

- i. Fire barriers to be erected and Fire blanket are to be laid before starting hot work at site where ever required.
- ii. The work/workers should conform to the Fire & Safety rules and regulations of CPSTL and they should wear safety belts when working at high elevations.
- iii. Before work of any nature is commenced in any area it is necessary to obtain excavation permits, safety certificates and if the work involves sparks or flames a hot work permit from the Fire & Safety Section of the CPSTL, Kolonnawa Installation depending on nature of work. All precautions stipulated in these documents must be adhered by the contractor and his employees. If the work cannot be completed in the period for which these documents are valid, the work shall be discontinued until the documents have been renewed.
- iv. The CPSTL Kolonnawa Installation is security-restricted area and all contractor's personnel shall abide by the security regulations prevailing and those which might be enforced as and when necessary due to changed circumstances.
- v. All contractor's personnel and their vehicles will be required to obtain gate passes before enter in to the CPSTL Kolonnawa Terminal. Safety clearances to be obtained before enter to the premises.
- vi. All contractor's personnel should possess valid police clearance certificate (Police Report) to obtain gate passes.
- vii. The contractor shall, except if and so far as the contract provides otherwise, indemnify the CPSTL against all losses and claims in respect of injuries or damage to any person or material or physical damage to any property whatsoever which may arise out of or in consequence of the execution of the works and against all claims, proceedings, damages, costs, charges and expenses whatsoever in respect of or in relation thereto except any compensation or damages for or with respect to:
  - a. the permanent use or occupation of land by the works or any part thereof;
  - b. the right of the CPSTL to execute the works or any part thereof on, over, under, in or through any land;
  - c. injuries or damage to persons or property resulting from any act or neglect of the CPSTL, his agent, servants or other Contractors, not being employed by the Contractor, or for or in respect of any claims proceedings, damages, costs, charges and expenses in respect thereof or in relation thereto or where the injury or damage was contributed to by the Contractor, his servants or agents such part of the compensation as may be just and equitable having regard to the extent of the responsibility of the Employer, his servants or agents or other contractors for the damage or injury.

- (21.1) The Site Possession Date shall be **14 Days** from Letter of Acceptance.
- (27.1) The Contractor shall submit a program for the Works within **14 Days** of delivery of the Letter of Acceptance.
- (27.3) The Program will be updated **Monthly**.  
If any time should it appear to the Engineer that the actual progress of the work does not conform to the approved program, the contractor shall produce, at the request of the Engineer a revised program showing the modifications to the previously approved program necessary to ensure completion of the work within the stipulated time of completion.
- (27.4) Withholding amount is 5% of the immediate claim.
- (35.1) The Defects Liability Period is **180 Calendar Days**.
- (39.2) Not applicable.
- (46.1) All payments will be made only in LKR.
- (47.1) The Contract Price is not subjected to price adjustment.
- (48.1) The retention from each payment shall be **10%** of the certified work done.  
The limit of retention shall be **5%** of the Initial Contract Price.
- (49.1) The liquidated damages for the whole of the Works shall be **0.05% of initial contract price per Day**.
- (50.1) The maximum amount of liquidated damages for the whole of the Works shall be **10%** of the Initial Contract Price.
- (51.1) Advance payment is 20% of the Initial Contract Price excluding provisional sums and contingencies.
- (52.1) The amount of Performance Security is **5 %** of the Initial Contract Price.  
The Performance Security shall be valid until 28 days beyond the completion date of Defects Notification Period.  
Performance Security acceptable to the Employer according to the given format in the bidding document shall be an unconditional on demand bank guarantee obtained from a commercial bank operating in Sri Lanka with the valid license issued by the monetary board of Sri Lanka - Central bank of Sri Lanka.
- (60.1) The percentage to apply to the value of the work not completed, representing the Employer's additional cost for completing the Works, is **25% of Initial Contract Price**.
- (63.7) The attendance fee payable to the Contractor on nominated sub-contract work shall not exceed 8%.

**SECTION 6**

❖ *SPECIFICATIONS*

DUPLICATE

## **SPECIFICATIONS, SCOPE OF SUPPLY AND SCOPE OF WORK**

### **6.1. Scope of Supply by CPSTL**

6.1.1 CPSTL shall assist the contractor in identifying existing power distribution system configuration, and appropriate locations to install solar panels, inverters, power distribution boards, and cables.

6.1.2 CPSTL shall release the power system for installation work in a manner such that minimum disturbance to the operational activities of CPSTL.

6.1.3 CPSTL shall assist the contractor in obtaining approval from the Lanka Electricity Company (Private) LTD (LECO) for a Solar Net Accounting Scheme. However, the Contractor shall arrange and obtain all the necessary approvals from the LECO for installation and operation of the Solar Net Accounting Scheme at CPSTL Kolonnawa Installation.

#### **6.1.4 Construction Utilities**

Electricity and drinking water that would be supplied to the contractor to undertake this work would be charged by the contractor per meter readings/ estimate.

Electrical power supply for construction work

- I. CPSTL shall provide only the power supply tapping point with a meter at the nearest distribution panel (approximately at a maximum distance of 150m).
- II. Contractor shall supply and install his own feeder cables and power distribution board required for the work site from the tapping point.
- III. The maximum power CPSTL shall supply is 63A, 400V, 50Hz, 3 Phase.
- IV. The electricity charge shall be deducted from the Final Bill of the Contractor.
- V. The electricity usage charge shall be deducted from the contractors bills as follows
  - a consumption charge of Rs. 44.00 per kWh for the concerned period and
  - b a one-time fixed charge of Rs. 4,000.00 if the duration is more than 01 month or at a rate of Rs. 133.34 per day if the duration is less than 01 month.
- VI. Engineer shall estimate the bill on above basis in occasions the power supply is provided without a meter.



## **6.2. Contractor's Scope of Supply**

Contractor shall supply construction equipment, materials, consumables and other requisites as follows for the supply, installation, testing and commissioning of Solar PV system with capacity of 187 kWp and 100 kWp along with the associated power evacuation system. The proposed solar panels shall be installed at the locations shown in the layout drawing. The Solar PV system shall be connected to the LECO grid of the installation as recommended by LECO, which operates at 400V, 50 Hz.

- 6.2.1. Supply of required number of 570Wp – 595Wp (Rated power range) solar panels including all necessary electrical accessories and mounting structures according to the specifications provided.
- 6.2.2. Supply of grid-tied multiple inverters having suitable capacities and combiner boxes including all necessary accessories for mounting, cable termination, and synchronization according to the specifications provided.
- 6.2.3. Supply of Cu cables with required sizes to interconnect DC power of the solar panels and the inverters according to the specifications provided.
- 6.2.4. Supply of AL or Cu/XLPE/SWA/PVC feeder cables with required sizes, according to the specifications provided.
- 6.2.5. Supply of cable ladders, cable trays, conduits, and any other required accessories where necessary.
- 6.2.6. Supply of isolation switches and surge protection devices as per the standards and specifications provided.
- 6.2.7. Supply of lightning protection system according to the standards and specifications provided.
- 6.2.8. Supply of suitable grounding system according to the standards and specifications provided.
- 6.2.9. Supply of control cables, Cat 6 and fibre optic communication cables for interconnection, synchronization and monitoring of the solar power system according to the standards.
- 6.2.10. Supply of necessary hardware & software including a tablet PC for monitoring the performance of the solar power system from a pre-defined remote location within the premises.
- 6.2.11. Supply of cable termination kits, cable lugs, colour boots, heat sleeves and all other accessories for cable termination work.
- 6.2.12. Supply of roofing materials for replacing any damage incurred to the existing roof during construction work.
- 6.2.13. Supply of all testing and installation equipment such as insulation testers, earth testers, cable tracers, power quality analysers, multi meters, clamp meters, and other instruments to perform necessary inspection and testing.
- 6.2.14. **Quality of Material and Equipment**  
The Contractor shall supply all equipment, material and accessories to be used under the scope of this contract with a proven quality.

All material and equipment to be supplied by the contractor are to be subjected to the approval of the Engineer.

The contractor shall maintain quality assurance records, and a copy of these records shall be given to Engineer upon completion of each job.

#### 6.2.15. Safeguarding the Materials and Equipment

CPSTL shall not be responsible for theft damage or loss of any of the materials and equipment during the installation. Equipment shall be covered and protected against dirt, water, and moisture, sand and chemical or mechanical injury. Upon completion of all works, the materials and equipment shall be thoroughly cleaned, adjusted and tested to demonstrate its proper operation to the Engineer. The contractor shall properly and adequately protect all materials and equipment before, during, and after installation. Material or Equipment damaged due to inadequate attention of the Contractor shall not be accepted and Engineer reserves the right to request replacements for such equipment at the handing over. It is the responsibility of the Contractor to clean the installation at close of work every day and to hand over a clean and neat installation at completion.

### **6.3. Contractor's Scope of Work and Specifications**

#### **6.3.1. Contractor's Superintendence**

This shall be read in conjunction with General Conditions of Contract. The contractor or his representative must be on the work site during the working hours. The instructions given by the Engineer's representative to the Contractor's representatives in the absence of the Contractor shall be considered as given to the Contractor himself.

#### **6.3.2. Preliminary Studies, Assessment and Preparation of Construction Drawings**

The contractor shall execute the following during the pre-mobilization stage.

- a. Inspection of premises.
- b. Assessment of identified roof structures for structural integrity and load bearing capacity.
- c. Assessment of surrounding area for system grounding.
- d. Site solar resource assessment.
- e. Prepare Construction Drawings for the solar PV system and obtain Engineer's Approval.

#### **6.3.3. Obtaining Approval for Solar Net Accounting Scheme from LECO**

- a. Contractor shall complete all the necessary documentation works and obtain approval for installation and operation of Solar Net Accounting Scheme at CPSTL, Kolonnawa Installation from LECO.
- b. Contractor shall obtain required technical specifications for designing the Solar PV system and integration with LECO grid, if required.

#### **6.3.4. Erection of Scaffolding**

Scaffolding should be erected to the approval of the safety department of CPSTL as follows:

- a) Should be of steel pipes and couplings, toe plates, platforms etc.
- b) 2” timber planks to be used for the platform and to be properly fastened at both ends.
- c) Ladders should be provided from the ground to the platform.
- d) After erecting the scaffolding, the contractor should obtain a written approval from the safety department of CPSTL before the commencement of work.

#### **6.3.5. Housekeeping and Site Cleaning**

The Contractor shall maintain good housekeeping in the site and vicinity of the site during construction and attend to cleaning of the site after completion of the work.

#### **6.3.6. Installation work**

- 6.3.6.1. Contractor shall design, procure, deliver to the site, install, test, commission, and carry out acceptance testing (including performance verification testing under site conditions) for 187 kWp and 100 kWp grid-tied, roof-mounted, Solar Photo Voltaic power generation system complete with solar panels, inverters, cables, cable management systems and grounding systems according to the specifications.
- 6.3.6.2. Contractor shall integrate the proposed solar PV system into the LECO grid as per the requirement of LECO.
- 6.3.6.3. Contractor shall prepare the roof structure in line with structural assessment and solar PV system design.
- 6.3.6.4. Contractor shall design, fabricate, install, test & commission main distribution panel and sub-distribution panels including cable termination, according to the specifications.
- 6.3.6.5. Contractor shall install panel-earthing systems at each of the distribution panels and properly earth the distribution panels and all exposed metallic parts.
- 6.3.6.6. All feeder cables must be laid within the existing cable trenches (overhead cabling is not allowed). The contractor is responsible for manually excavating the existing cable trenches, clearing cable sleeves across roads, and ensuring clear cable paths inside buildings.
- 6.3.6.7. Contractor shall install necessary suitable Cu or AL/XLPE/SWA/PVC – 4 Core cables buried underground by excavating the cable trench to a minimum of 600mm depth, laying cable in 50mm sand bedding and 50 mm sand overlay, laying cable tiles, laying cable warning tape, soil backfilling and compaction of trench, asphalt or concrete laying where necessary. Contractor may propose alternative cable types, laying and installation methods in his proposal.
- 6.3.6.8. Insulation and continuity testing of the cables shall be conducted in the presence of the Engineer or his representative, and the testing report shall be

- submitted to the Engineer.
- 6.3.6.9. Contractor shall terminate all the cables using appropriate cable lugs and glands. All the cables shall be labeled and numbered. The details shall be mentioned in the as built drawings and single line diagrams.
  - 6.3.6.10. All the string cables shall be properly tagged, identified and traceable at key locations (at array, junction box, inverter)
  - 6.3.6.11. The contractor shall connect the Solar power system to the LECO grid at the existing main substation through a master isolation switch to decouple the solar power system from the grid.
  - 6.3.6.12. The contractor shall install, program and commission a remote monitoring system to facilitate system performance monitoring and report generation using historical data.
  - 6.3.6.13. Emergency shutdown procedure and single line diagram should be displayed at the nearby inverter.
  - 6.3.6.14. The contractor shall submit essential documentation including Operation and Maintenance Manuals (including operational and maintenance procedures) and layout diagrams for troubleshooting.
  - 6.3.6.15. The contractor is required to provide certification confirming the system's compliance with LECO regulations in order to obtain the net accounting facility.
  - 6.3.6.16. The contractor shall deliver and hand over essential spare parts (*if any*) and tool kits for routine operation & maintenance work.
  - 6.3.6.17. Contractor shall carry out preventive maintenance of the solar PV system for a period of three years (03) to ensure that the plant is operated to deliver guaranteed energy output.

## **6.3.7. SPECIFICATIONS**

### **6.3.7.1. Standards Applicable**

#### **Code of Practice**

1. SLS 1522: 2016 Sri Lanka Standard Code of Practice for Grid Connected Photovoltaic Power Systems - Requirements for System Documentation, Installation, Testing & Commissioning

#### **Power Converters**

2. SLS 1543 Sri Lanka Standard Specification for Safety of Power Converters for use in Photovoltaic Power Systems –  
Part 1:2016 General Requirements (IEC 62109-1:2010)  
Part 2:2016 Particular Requirements for Inverters (IEC 62109-2:2011)
3. SLS 1547:2016 Sri Lanka Standard Specification for Photovoltaic (PV) Systems – Characteristics of the Utility Interface (IEC 61727:2004).

#### **Switchgear and Control gear**

4. SLS 1554 - Sri Lanka Standard Specification for Low-Voltage Switchgear and Control gear  
Part 1: 2017 General Rules (IEC 60947-1:2014)  
Part 2: 2017 Circuit-Breakers (IEC 60947-2:2016)  
Part 3: 2017 Switches, Disconnectors, Switch-Disconnectors and Fuse-Combination Units (IEC 60947-3:2015).

#### **DC Cable**

5. SLS 1542:2016 Sri Lanka Standard Specification for Electric Cable for Photovoltaic Systems (EN 50618:2014)

#### **Photovoltaic (PV) Modules**

6. SLS 1553 Sri Lanka Standard Specification for Photovoltaic (PV) Module Safety Qualification –  
Part 1: 2017 Requirements for Construction (IEC 61730-1:2016)  
Part 2: 2017 Requirements for Testing (IEC 61730-2:2016)
7. SLS 1544 Sri Lanka Standard Specification for Terrestrial Photovoltaic (PV) Modules – Design qualification and type approval –  
Part 1:2016 Test Requirements (IEC 61215-1:2016)  
Part 1-1:2016 Special Requirements for Testing of Crystalline Silicon Photovoltaic (PV) Modules (IEC 61215-1-1:2016)  
Part 2:2016 Test Procedures (IEC 61215-2:2016)
8. SLS 1546:2016 Sri Lanka Standard Specification for Photovoltaic Systems – Power Conditioners – Procedure for Measuring Efficiency (IEC 61683:1999)

## **Performance Testing and Energy Rating**

9. SLS 1545 Sri Lanka Standard Specification for Photovoltaic (PV) Module Performance Testing and Energy Rating –  
Part 1:2016 Irradiance and Temperature Performance Measurements and Power Rating (IEC 61853-1:2011)  
Part 2: 2017 Spectral Responsivity, Incidence Angle and Module Operating Temperature Measurements (IEC 61853-1:2017)
10. SLS 1637: 2019 Sri Lanka Standards Specification for Connectors for DC-application in photovoltaic systems – Safety requirements and tests
11. SLS IEC 62548: 2018 - Sri Lanka Standard Specification for Photovoltaic (PV) Arrays –Design Requirements (IEC 62548: 2016)
12. SLS IEC 62446:2017 - Sri Lanka Standard Specification for Photovoltaic (PV) Systems – Requirements for Testing, Documentation and Maintenance – Part 1: 2017 Grid Connected Systems – Documentation, Commissioning Tests and Inspection (IEC 62446-1:2016).
13. SLS IEC 60364: 2018 - Sri Lanka Standard Specification for Low Voltage Electrical Installation - Part 6: 2018 verification (IEC 60364-6: 2016)
14. SLS 1472 Sri Lanka Standard for Protection against Lightning
  - a) PART 1: 2013 // IEC 62305 - 1: 2010 – General Principles  
This part of IEC 62305 provides general principles to be followed for protection of structures against lightning, including their installations and contents, as well as persons.
  - b) PART 2: 2013 // IEC 62305 - 4: 2010 – Risk Management  
This part of IEC 62305 is applicable to risk assessment for a structure due to lightning flashes to earth. Its purpose is to provide a procedure for the evaluation of such a risk.
  - c) PART 3 // IEC 62305 - 4: 2010 – Physical Damage to Structures And Life Hazard  
This part of IEC 62305 provides the requirements for protection of a structure against physical damage by means of a lightning protection system (LPS), and for protection against injury to living beings due to touch and step voltages in the vicinity of an LPS.
  - d) PART 4 // IEC 62305 - 4: 2010 –\_Electrical and Electronic Systems within Structures  
This part of IEC 62305 provides information for the design, installation, inspection, maintenance and testing of electrical and electronic system protection (SPM) to reduce the risk of permanent failures due to lightning electromagnetic impulse (LEMP) within a structure. This standard does not cover protection against electromagnetic interference due to lightning, which may cause malfunctioning of internal systems.
15. SLS 1473 Sri Lanka Standard for Low Voltage Surge Protective Devices
  - a) PART 1: 2013// IEC 61643 - 11: 2011 – Surge Protective Devices Connected To Low-Voltage Power Systems - Requirements and Test Methods  
This part of IEC 61643 is applicable to devices for surge protection against indirect and direct effects of lightning or other transient over voltages.

b) PART 2: 2015 // IEC 61643 - 12: 2008 – Surge Protective Devices Connected To Low-Voltage Power Distribution Systems - Selection and Application Principles

This part of IEC 61643 describes the principles for selection, operation, location and coordination of SPDs to be connected to 50 Hz to 60 Hz A.C. and to D.C. power circuits and equipment rated up to 1 000 V r.m.s. or 1 500 V D.C.

C) PART 3: 2015 // IEC 61643 - 21: 2009 – Surge Protective Devices Connected to Telecommunications and Signaling Networks – Performance Requirements and Testing Methods

This International Standard is applicable to devices for surge protection of telecommunications and signaling networks against indirect and direct effects of lightning or other transient over voltages.

d) PART 4: 2015 // IEC 61643 - 22: 2004 – Surge Protective Devices Connected to Telecommunications and Signaling Networks – Selection and Application Principles

This part of IEC 61643 describes the principles for the selection, operation, location and coordination of SPDs connected to telecommunication and signaling networks with nominal system voltages up to 1 000 V r.m.s. A.C. and 1 500 V D.C.

e) PART 5: 2019 // IEC 61643-31: 2018 Requirements and Test Methods for SPDs for Photovoltaic Installations.

This part of IEC 61643 is applicable to Surge Protective Devices (SPDs), intended for surge protection against indirect and direct effects of lightning or other transient over voltages. These devices are designed to be connected to the DC side of photovoltaic installations rated up to 1 500 V DC.

f) PART 6: 2019 // IEC 61643-32 Surge Protective Devices Connected to the D.C. Side of Photovoltaic Installations – Selection and Application Principles.

This part of IEC 61643 describes the principles for selection, installation and coordination of SPDs intended for use in Photovoltaic (PV) systems up to 1 500 V DC and for the AC side of the PV system rated up to 1 000 V rms 50/60 Hz.

16. SLS 1496 Sri Lanka Standard for Lightning Protection System Components

A. PART 1: 2015 // IEC 62561 - 1: 2012 – Requirements for Connection Components

B. PART 2: 2015 // IEC 62561 - 2: 2012 – Requirements for Conductors and Earth Electrodes

C. PART 3: 2015 // IEC 62561 - 3: 2012 – Requirements for Isolating Spark Gaps (Isg)

D. PART 4: 2015 // IEC 62561 - 4: 2010 – Requirements for Conductor Fasteners

E. PART 5: 2015 // IEC 62561 - 5: 2011 – Requirements for Earth Electrode Inspection Housings and Earth Electrode Seals

F. PART 6: 2015 // IEC 62561 - 6: 2011 – Requirements for Lightning Strike Counters

G. PART 7: 2015 // IEC 62561 - 7: 2011 – Requirements for Earthing Enhancing Compounds

### 6.3.7.2. CEB/LECO requirement

The system shall fully compliance with the requirements specified by the CEB/ LECO Solar Net Accounting Scheme.

### 6.3.7.3. Operating Conditions

Design data:

Weather Condition	Humid Tropical Climate
Wind gusts speed	160 km/h
Min. Ambient Temperature	27°C
Max. Ambient Temperature	40°C
Max. Relative Humidity	95 %

- a. The solar PV array and mounting structure must be able to withstand wind gusts speed up to 100m/s without damage.
- b. All wiring, enclosures, and fixtures installed outdoors must be resistant to high humidity, corrosion, insect intrusion, and dust. The use of corrosion-resistant terminals is mandatory. Protecting electronic circuit boards from corrosion through potting or applying a conformal coating is strongly recommended.
- c. The design data specified herein are average values for the concerned location. It is bidder's responsibility to obtain precise data required to optimize the performance of system without compromising safety norms on his own.

### 6.3.7.4. Grid Parameters

Bidders shall consider grid parameters specified herein to integrate the solar PV system with the utility grid. In addition, Bidders shall obtain further data (if necessary) from relevant authorities to establish complete synchronization and protection. Costs associated with the integration of solar PV system and utility grid shall be included in the bid.

- Grid Nominal Voltage 400V
- No. of phases 3 phase and neutral
- System frequency 50 Hz
- Method of grounding Solidly Earthed

## 6.4.1 Specifications for System Accessories

### 6.4.1.1 Specifications/standards/requirements for Solar PV Modules

The solar PV modules intended for use in the proposed solar PV system should conform to the following standards and requirements.

- a. Should be made out of mono-crystalline silicon cells.
- b. Photo electrical conversion efficiency of Solar PV module shall be 20.0% or higher.
- c. Minimum Module rating shall be in the range of 570Wp to 595Wp.
- d. Rated output of module shall be positive tolerance only.



- e. Shall perform in an operating environment where, solar PV panel temperature ranging between 10°C to 85°C and relative humidity is 95%.
- f. Economic life should be more than 25 years.
- g. Module fill factor shall be 0.78 or higher.
- h. Modules shall be encapsulated and sealed to protect silicon cells from external environment and prevent ingress of moisture during its economic life.
- i. The PV modules must be tested & approved by one of the IEC authorized, test centers as per relevant and latest IEC standards.
- j. The modules should comply with SLS standards and Protection Class II and CE guidelines or latest for safety.
- k. Solar cell surface to be coated with anti-reflective coating.
- l. Module frame shall be made out of Aluminum only.
- m. Module shall be built to withstand against 100 m/s of wind speed.
- n. The bidder should be an Authorized Representative to market and service of this product in Sri Lanka (Attach a copy of the Authorization letter from the manufacture).
- o. Product warranty for the solar modules should be 10 years, and linear performance warranty should be indicated against 80-85% power output in 25th years. Warranty statement from the supplier should be attached. Contractor shall provide an international warranty from the principle for this purpose.
- p. Indicate the period of the insurance cover provided against the insolvency or bankruptcy of the manufacturer in case of a claim within the said warranty period. Contractor shall coordinate with the manufacturer and arrange this facility prior to handover the system.

#### **6.4.1.2 Specifications/standards/requirements for Inverter**

- a. The Inverter operation shall be based on Maximum Power Point Tracking (MPPT) principle.
- b. The grid interconnection protection scheme required (shall be as per the standards and requirement specified by LECO) at the grid interface may be built in to inverter or separately provided. The Bidders are expected to study and understand the protection scheme required at the grid interface prior to selection of the Inverter.
- c. Inverter shall be protected against incorrect polarity of DC input.
- d. The power quality of the Inverter output shall be as specified by the CEB/LECO (as per the standard and specifications of Net Accounting Scheme stipulated by CEB/LECO).

- e. The operating range of the Inverter shall be +/- 10% nominal voltage and -6% / +4% of power frequency. These settings should be adjustable to set the Inverter operating range.
- f. Provide multiple 3-ph inverters, to match the required AC capacity of each system.
- g. The Inverter efficiency shall be 98% or more.
- h. The applicable IP class shall be IP 65 or higher as per IEC 62208 specifications.
- i. Shall be built with capability to synchronize with low voltage grid.
- j. Shall be built with capability to log data, remote monitoring and data transferring to remote computer.
- k. Product warranty shall be a minimum of ten (10) years.
- l. The Inverters should be grid interactive and DG set interactive if necessary. Inverter output should be compatible with the grid frequency. Typical technical features of the inverter in addition to the above shall be as follows:
  - Grid Frequency Synchronization range: +/- 3Hz
  - Maximum Input DC Voltage: Depending on the inverter used. (Shall not exceed overloading limits as specified by manufacturer)
  - No-load losses: Less than 1% of rated power.
  - THD: < 3%
- m. Inverters shall be capable of complete automatic operation including wake-up, synchronization & shutdown.
- n. Inverters should comply with SLS standards.
- o. Inverters should comply with IEEE 1547 (and IEC 62116) for islanding protection and interconnecting with grid as required by CEB/LECO.
- p. Inverters should be tested and approved by internationally recognized test houses.
- q. Should be capable of generating 3-phase AC power, which suits the local grid code.
- r. The bidder should be an Authorized Representative to market and service this product in Sri Lanka or should be purchased from authorized dealer (Attach a copy of the Authorization letter).

#### **6.4.1.3 Specifications/standards/requirements for Array Structure**

- a. The structures provided shall be of flat-plate design with combination of I, C and L sections as per structure design requirement to withstand 160 km/h wind speed. Suitable fastening arrangement such as grouting and clamping should be provided to secure the installation against the specified wind speed. The solar PV panel mounting structure shall be firmly secured onto the roof structure without affecting the structural integrity. This shall be performed in consultation with a qualified structural engineer.

- b. Structural material shall be Aluminum and electrolytic alloy compatible with the materials used in the module frame, its fasteners, nut and bolts.
- c. The fasteners used should be made up of stainless steel. Proper sealing materials are to be employed for roof penetrations.
- d. The structures shall be designed to allow easy replacement of any module. Panel array to be oriented towards East-West direction wherever possible.
- e. Each structure should have an angle of inclination as per the site conditions to take maximum irradiance. However, to accommodate more capacity the angle inclination may be reduced until the plant meets the specified performance ratio requirements.
- f. The mounting structure could be removed easily on a major roof repair and reinstall using the same materials.
- g. The module alignment and tilt angle shall be calculated to provide maximum annual energy output wherever possible. The existing roof alignment may be followed if the difference in energy yield (energy maximum tilt angle Vs roof angle) found to be insignificant. The panel-mounting angle shall be as much as closed to the optimum value.
- h. Free space to be provided between panel rows for ease of maintenance, which include replacement, inspection and cleaning of panels.
- i. Panels to be separated from the roof surface using a suitable space (as per the installations guide of SLSI- SLS 1522) to prevent the generation of excessive heat under the panels.
- j. Appearance of the roof, if visible at a distance, also to be considered for deciding mounting angle.
- k. Materials shall be UV resistant and shall be designed to withstand the temperatures to which they are exposed.
- l. Dissimilar metals, if used, shall be isolated from one another using non-conductive materials.

#### **6.4.1.4 Specifications/standards/requirements for Combiner Boxes**

- a. Shall be suitably rated (box bus bar) to handle the expected current flow at the combiner box.
- b. The array combiner boxes shall be sealed to prevent ingress of dust, vermin and moisture
- c. The IP rating shall be minimum IP 65.
- d. Shall be provided with test point for fault detection.
- e. Shall be equipped with suitable arrangement to disconnect and isolate arrays.
- f. Shall be fitted with cable glands for both incoming and outgoing cables.

- g. DC negative and positive cables put in to the separate conduit pipe/cable trays
- h. Cables to be properly terminated at the combiner box.
- i. Protective devices to be installed at combiner boxes to protect against over voltages and lightning conditions.
- j. Cables shall be properly tagged for identification.
- k. Ground fault protection to be provided either at combiner boxes or at inverters.

#### **6.4.1.5 Distribution boards/ DC and AC Cable network**

- a. DC Distribution panel is needed to receive the DC output from the array field, with analog measurement panel for voltage, current from different MCBs to check any failure in the array field.
- b. It shall have MCCBs of suitable rating for connection and disconnection of array sections. DCDB shall be fabricated by CRC Sheet to comply with IP65 protection.
- c. Cross section area of the conductors shall be selected such that voltages are managed at stipulated limits to facilitate trouble free operation of the equipment and PV system. Over current protection shall be provided at appropriate levels of the network.
- d. The DC cable network shall be designed such that energy losses are kept below 2% when transferring the rated power. Similarly, energy losses at AC side shall be kept below 2.5%.
- e. Copper or Aluminum Cables of appropriate sizes and of reputed-made shall be provided from Inverter onwards in AC side. Only copper cables of appropriate sizes and of reputed-made shall have to be used for DC cable network. The permissible voltage drop from the solar modules to inverter shall not be more than 2% of peak power voltage of the power source (solar panel).
- f. All connections should be properly terminated, soldered and/or sealed from outdoor and indoor elements. Cables shall be terminated using proper tools.
- g. All cables used outdoor shall comply with latest standards. In general, relevant IEC standards should be adopted in calculation of current rating, voltage drops and cable de-rating factors.
- h. Cabling and other accessories should be warranted, and indicate the warranty period including for the workmanship.
- i. Cables to be taken through either conduits or cable trays and the same shall be firmly secured.
- j. All exposed cables, conduits and cable trays shall be resistance to UV radiation, heat and abrasion.

#### **6.4.2 Data monitoring equipment:**

- a. Each inverter shall be included LCD display or latest method for monitoring the energy production and essential parameters.
- b. An external Digital Energy Meter shall be provided to log the actual value of energy generated, voltage and current by the solar system. Technical data sheet of the digital meter should be provided.
- c. Remote monitoring system (In addition to Local Monitoring system) is required and please indicate the existing feature of monitoring system along with inverter/ of proposed Solar Net –Accounting System for monitoring and checking the performance.
- d. Data shall be uploaded to the cloud through a dedicated internet connection provided by the contractor. Contractor shall provide a separate tablet PC to monitor the system via web application. The cost of the internet connection (Including 4G or above SIM cards and related fees) and maintenance of the tablet PC shall be covered by the contractor during the 03-year maintenance period. Cost of the data monitoring system shall be included in the under the inverter related communications. The cost shall be covered under Comprehensive Annual Maintenance Contract Agreement after the 03-year maintenance period. If internet facility is provided through data cable, the data line circuit protector shall be included. The remote monitoring system shall provide following features.

No	Required Feature
01	Real Time data
02	Past Data
03	Peak Power
04	Cumulating Power
05	CO2 Emission
06	Power & Energy Graphs
07	Cloud Conditions
08	Fault & Safety Event
09	Module Performance
10	Ambient temperature

#### **6.4.3 Protection**

The system should be provided with all necessary protections like grounding, lightening/ surge, and grid islanding as follows:

##### **6.4.4.1 Grounding protection**

- a. All components and exposed metal parts in the system shall be properly grounded. Solar panels shall include both equipment and system grounding. In addition, the lightning arrester/masts should also be provided inside the array field.
- b. Provision should be kept for shorting and grounding of the PV array at the

time of maintenance work. AC Distribution Board and DC Distribution Board should also be earthed properly. It shall be ensured that all the grounding points are bonded together to make them at the same potential.

- c. Grounding shall meet such norms as specified in the electrical code of practice in use and as specified by utilities. Cost of necessary grounding shall be included in the bid.

**6.4.4.2 Grid Islanding & Surge Protection**

- a. Solar system shall be equipped with islanding protection. In addition to disconnection from the grid (islanding protection i.e. on no supply), under and over voltage conditions shall be provided.
- b. Solar system shall be provided with adequate rating fuses, fuses on inverter input side (DC) as well as output side (AC) for overload and short circuit protection and disconnecting switches to isolate the DC and AC system for maintenances as needed.
- c. Fuses of adequate rating shall also be provided in each solar array module to protect them against short circuit.

**6.4.4 Earthing**

- a. All non-current carrying metal objects such as solar PV panel frames, mounting structures, enclosures etc shall be grounded using unbroken earth wire. Earth wire shall be neither disconnected nor connected via fuse or any other link which has the tendency for physical opening or separation.
- b. Earthing system shall be electrically connected to provide return to earth path from all equipment irrespective of their mechanical connection.
- c. Earth pit should be constructed and earth resistance shall be less than five (5) Ohm.
- d. Test point shall be provided for earth electrode for inspection and testing.
- e. The earth wire shall be made out of copper and shall be designed to withstand expected highest current.
- f. All earth rods should be connected to the single point to make the earthing system is equipotential.

**6.5 TECHNICAL SPECIFICATIONS**

**6.5.1 Solar PV Panels**

<b>Description</b>	<b>CPSTL Requirement</b>
Type of cells	Mono Crystalline
Rated Maximum Power (Pmax) range	Between 570 Wp to 595 Wp
Open Circuit Voltage (Voc)	<i>(Please Mention)</i>
Maximum Power Voltage (Vmp)	<i>(Please Mention)</i>
Short Circuit Current (Isc)	<i>(Please Mention)</i>
Maximum Power Current (Imp)	<i>(Please Mention)</i>
Power Tolerance	Positive Only
Module Efficiency	≥20%

Description	CPSTL Requirement
Construction Material	Aluminum and Glass( $t \geq 2\text{mm}$ )
Ingress Protection level	IP66
Junction box	IP68
Connectors	MC4-EV02 QC 4.10-35/45
Operating Temperature	0°C to +85°C
Temperature Coefficient of Pmax( $\gamma \Delta P_{\text{max}}$ )	-0.37%/C <sup>0</sup>
Fill Factor	Minimum 0.78
Product Warranty	10 Years or more
Linear Performance	Minimum 80% Provide linear performance warranty certificate for 25 years indicating 80%-85% output in the 25 <sup>th</sup> year.
Expected Life time	25 Years
Quality Management	ISO 9001: 2008, ISO 14001:2004 or Equivalent
Catalogues and Test certificates	Please Attach

### 6.5.2 Inverters

Description	CPSTL Requirement
Inverter Type	String Inverter
Rated capacity	<i>(Bidder to propose as appropriate)</i>
Inverter Technology	Transformer less
Rated DC Input power	<i>(Bidder to propose as appropriate)</i>
Rated / Max Input Voltage	<i>(Please Mention)</i>
Min / Start Input Voltage	<i>(Please Mention)</i>
MPP Voltage Range	<i>(Please Mention)</i>
Independent MPP Input	<i>(Please Mention)</i>
Strings per MPP Input	<i>(Please Mention)</i>
Rated AC Power Output	<i>(Bidder to propose as appropriate)</i>
AC Nominal Voltage	3Ph+N+PE ; 230V / 400V
Rated Grid Voltage	400V
Rated Grid Frequency Range	50Hz
Rated Output Current	<i>(Please Mention)</i>
Feed In / Connection Phases	3/3
Grid Connection	3 Phase
Grid Code	IEEE 1547 or Equivalent
Max THD	<3%
Efficiency	>98%
Protection	DC side disconnection, Ground Fault Monitoring, Grid voltage Monitoring, DC reverse polarity protection, AC short circuit protection, Residual current monitoring and protection

Description	CPSTL Requirement
	DC Surge Arrestor Type II for all Inputs
Operating Temperature Range	10°C to +60°C
Ingress Protection level	IP65
Max Operating humidity	0% - 100%
Display	LCD or the latest technology
Communication interface	RS 485
Product Warranty	10 Years

### 6.5.3 Enclosures

Description	CPSTL Requirement
Type	Indoor floor standing
Material	Electro galvanized sheet steel
Thickness of the sheet	Frame-2.0mm, Door-1.5mm Covers-1.5mm
Protection	IP65
Cable Entry	Bottom
Painting	Powder-coated, Beige

### 6.5.4 Other Accessories

Item	Description	CPSTL Requirement
<b>Indicators</b>	Type of indicator	LED
<b>Selector Switch</b>	Required Positions	3 Positions
<b>Push button</b>	Type	Momentary
<b>Emergency Stop Button</b>	Type	Turn to Release
<b>Cooling Fan</b>	Size	Min. 100 mm diameter
	Operation	Operated by thermostat
<b>Panel door Lights</b>	Wattage	5W
	Switching	By limit switch on door
<b>Busbar</b>	Tinned copper flat	
<b>Earth Bar</b>	25x3 mm Tinned Copper flat	

### 6.5.5 Cables

Description	CPSTL Requirement
Type	Cu or AL/XLPE/SWA/PVC
Standard	BS 1186, BS 5467, BS 6346, SLS 1542
Conductor	Class 2 Annealed Cu / AL
Insulation Material	XLPE for above 25mm <sup>2</sup> / PVC for 1.5mm <sup>2</sup> , 4mm <sup>2</sup>
Nominal Voltage	600/1000V
Core Colours	Brown, Black, Grey, Blue
Sheathing Material / Color	PVC Type 9 / Black



## **6.6 Testing and Commissioning**

- a. The contractor is responsible for conducting a final inspection and pre-testing all equipment and system features required for the project. Any deficiencies discovered during the inspection and pre-test must be promptly corrected by the contractor.
- b. The contractor shall submit a written request for the Acceptance Test to the Engineer at least fourteen days before the requested test date. This request must include a certification from the contractor confirming the completion of all work and pre-testing of all components.
- c. During Acceptance Test, Contractor shall demonstrate all equipment and system features to the Engineer. Contractor shall remove covers, open wiring connections, operate equipment, and perform other reasonable work as requested by the Engineer.
- d. Any portions of the work found to be deficient or not in compliance with the drawings and specifications will be rejected. The Engineer will prepare a list of any such deficiencies observed during the Acceptance Test. Contractor shall promptly correct all deficiencies. Upon correction of deficiencies, Contractor shall submit a request in writing to Engineer for another Acceptance Test.

## **6.7 Handing Over**

### **a. As Built Drawings**

After completion of the project the contractor shall handover three sets of A1 size hard copies & 3 sets of soft copies in a CD (consisting of PDF version) of As Built drawings to cover the entire installation incorporating all the changes / revisions.

### **b. System Information**

Contractor shall handover all licenses purchased, software configurations, usernames and passwords (with full rights) of all the Systems to the authorized person nominated by the Employer.

### **c. Manuals and Technical Catalogues.**

Operation and maintenance manuals and relevant technical catalogues of equipment used in the system shall be handed over in triplicate.

Provide three (3) complete printed operational manuals in a format as provided by the equipment manufacturer. Instructions shall be simplified to permit operation of the system by non-technical personnel.

## **6.8 Training**

- a. Prior to the commissioning of the systems, the Contractor shall arrange suitable technology transfer programmes for the Employer's technical staff to ensure that they are fully able and qualified to execute all functions

related to the operations, trouble shooting and perform a minor maintenance of all the equipment and Systems provided under the Contract. The Works shall not be considered complete for the purposes of Taking Over until such Technology transfer programmes have been completed.

- b. Technology transfer programmes shall cover the following:
  - i. Systems operation and control.
  - ii. System and plant maintenance and repair, replacement and configurations.
  - iii. Recording and reporting.
  - iv. Emergency operation procedure.
  - v. Maintenance management procedures.
  - vi. Safety.

All training sessions shall be completed within the initial project implementation period.

## **6.9 Warranty**

1. Manufacturer's Comprehensive warranty including the workmanship shall be provided for a period of Three (03) years from the date of handing over in general for the entire system (The warranty periods specifically requested for the components such as Solar PV panels and Inverters for specific periods mentioned in the technical specifications/schedule shall prevail). It shall include free maintenance service, free provision of spare parts, tools, etc. This condition shall also apply towards the software delivered by successful Contractor along with the system.
2. Any unit of goods supplied which fails beyond repair within the warranty period shall be replaced with a new unit free of charge (either an identical or a latest model with same/advanced features & functionality of the faulty unit) by the supplier, and the warranty applicable to that unit shall continue for the balance period of the warranty period.
3. Warranty Period of the hardware items will commence from the date of delivery to the purchaser. Meanwhile, software license/subscription will commence once the UAT test is completed successfully (Use trial licenses during the implementation period).
4. Minimum 10 years warranty is required for the inverters and Solar PV modules in accordance with industrial standard warranty conditions.
5. Solar PV modules supplied with an additional linear performance warranty for 25 years indicating against 80-85% power output in 25<sup>th</sup> years. Warranty statement from the supplier should be submitted.

## **6.10 Maintenance and support**

The Contractor shall provide Three (03) years free onsite maintenance service from the date of handing over as described below.

- a. The operation & maintenance of solar PV system would include wear, tear, overhauling, machine breakdown, insurance, and replacement of defective

modules, invertors, spares, consumables & other parts until the end of warranty period.

- b. Before expiration of the Three-year free onsite maintenance period, contractor shall enter into Comprehensive Annual Maintenance Contract (CAMC) with the employer including free maintenance service, free provision of spare parts, tools, etc. This condition shall also apply towards the software delivered by successful Contractor along with the system. Contractor shall upgrade the software, pay the relevant subscription fees, licence fees etc., at his cost and handover all licenses purchased, software configurations, usernames and passwords (with full rights) of all the systems to the authorized person nominated by the Employer at the end of the initial commissioning period and/or the beginning of each CAMC period.
- c. The service provided during the 03-year free maintenance period and under the CAMCs shall include troubleshooting, repair and replacement of all equipment, parts and spares as and when required within 04 Hours (Resolution time) of official notice from the employer.
- d. The Contractor shall be responsible for providing full operation, maintenance and repair services for all Systems and Works, for the duration of the Contract Period.
- e. The provision of all consumables, spare parts, and replacement parts shall be maintained as required.
- f. The Contractor shall remain responsible for the effective and efficient performance of the systems with all equipment for the maintenance and repair thereof throughout the Contract Period.
- g. The Contractor shall provide telephone hotline support for the Employer throughout the maintenance period and Contractor shall undertake to answer all questions on all technical and non-technical matters of the Systems informed by nominated persons of the employer.
- h. The Contractor shall undertake to install new releases of all software packages installed under the Contract within maintenance period at no extra cost. Every installation shall be preceded by installation on a test site. The Employer shall validate the new functions over a period and after receiving approval, the Contractor shall install and test.
- i. The Contractor shall properly maintain the maintenance register up-to-date, which shall be used to log all adjustments and any repair works with all maintenance information, during maintenance period.

During Comprehensive Annual Maintenance Contract, Contractor shall provide maintenance visit every 4 months by at least three maintenance visits per year at regular intervals for usual maintenance and supervision.

**SECTION 7**

❖ ***BILL OF QUANTITIES***

DUPLICATE

## **PREAMBLE TO THE BILL OF QUANTITIES**

It is the Bidder's responsibility to see that the prices include for complying with all the requirements of the other documents whether specifically referred to in Bill of Quantities.

The Bidder is advised to visit the site of the proposed work and it is the responsibility of the Bidder to ascertain the conditions governing access to the site, the extent of working space storage area etc.

1. This Bill of Quantities contains pages numbered from 56 to 61. Bidders are requested to see that no page is missing, no duplicate and that all TRADES are carried to SUMMARY at the end of the Bill of Quantities.
2. The Conditions of Contract, the Specifications and the Drawings are to be read in conjunction with the Bill of Quantities.
3. The cost of complying with all conditions, obligations and liabilities described in the Conditions of Contract, Specifications and the Bill of Quantities including all overhead charges and profit in carrying out the work as shown on the Drawings shall be deemed to be spread over and included in the prices of sums stated by the Bidder in the Bill of Quantities unless separately measured.
4. If the Bidder fails to price any items in the Bill of Quantities then the cost of the work under such items shall be held to be spread over and included in the prices given against other items of work.
5. The quantities set out in the Bill of Quantities are provisional and cover the approximate scope of the work anticipated to be performed by the Contractor. The actual quantities used for final measurement purposes will be determined by the Engineer by measurement of the work completed by the Contractor.
6. Where trade names, brands and or Catalogue Numbers are referred to, sole preference to any material or equipment is not intended. Any other material or equipment may be used, provided that the characteristics of type, quality, appearance, finish, method of construction and / or performance is superior to the specified.
7. Whenever the method of measurement is not clear from the documents available, the principles as given in the Sri Lanka Standard 573: 1999 UDC 69(08374) shall be applicable.
8. Selected Bidder shall comply with the arrangement of work and be ready to work part by part as required by the Authorities of the Employer if applicable.
9. The unit and lump sum prices of the Bill of Quantities (referred to as the Contract Rates) shall, except in so far as is otherwise provided for under the Contract, be deemed to cover all obligations set out in the Contract, and all matters or things necessary for the proper completion and maintenance of the Works, and shall be fixed and binding upon the Contractor.
10. Unit prices when applied to the quantity of work performed under the Contract shall, and other sums specifically determined under the provisions of the Contract,

constitute full remuneration to the Contractor under the Contract.

11. Each item shall be priced by the Bidder in Sri Lanka Rupees or Foreign Currency.
12. Rates for items in this Bill of Quantities shall be inclusive for hauling, transporting, loading, unloading, spreading, heaping, supporting, scaffolding, welding, and for laps, unless otherwise specifically stated.
13. Unless otherwise specifically stated in Bill of Quantities or herein, the following shall be deemed to be included with all items: -
  - i. Labour and all costs in connection therewith.
  - ii. Materials, goods and all costs in connection therewith.
  - iii. Tools, plants, equipment, machinery and all costs in connection therewith.
  - iv. Waste of materials.
  - v. Protecting and clearing.
  - vi. Square cutting.
  - vii. Establishment charges, overhead charges and profit.
  - viii. All setting out works.
  - ix. For providing of method statements, calculations, proposals by Contractor, shop drawings and as built drawings.
  - x. The rate for each item shall also include for all the following.
    - a. Complying with regulations of the Municipal Council and/or any other relevant authority under which particular item of work is to be executed unless otherwise included in the preliminaries.
    - b. Plant and equipment unless and otherwise included in preliminaries.
14. If Bidders are anticipating to give any discount, it shall be marked separately in the space allocated in the summary of Bill of Quantities. Provisional Sums shall not be considered when calculating discount.
15. All materials, equipment supplied shall be new, unused without any defects.
16. All materials used in the Works shall be of the best quality of their respective kinds as specified and shall be obtained from sources and suppliers approved by the Engineer and shall comply strictly with the tests prescribed or, Where tests are not laid down in this Specification, with the requirements of the latest issue of the relevant British Standards or other Standards approved by the Engineer.
17. Metric units are used throughout the Bill of Quantities for measurement purposes unless otherwise indicated. Abbreviations used in the Contract are as follows:-

L.S.	-	Lump Sum
P.S.	-	Provisional Sum
m	-	Metre
m <sup>2</sup>	-	Square metre
m <sup>3</sup>	-	Cubic metre
kg	-	kilograms
nr	-	Numbers
LKR	-	Sri Lankan Rupees
USD	-	US Dollars

**BILL OF QUANTITIES****CEYLON PETROLEUM STORAGE TERMINALS LIMITED****JOB : SUPPLY, INSTALLATION, TESTING, COMMISSIONING AND MAINTENANCE OF GRID-TIED ROOF MOUNTED SOLAR PV GENERATION SYSTEM AT MAIN GARAGE HANGER (187kWp) & NEW BUILDING (100 kWp) AT CPSTL, OIL INSTALLATION KOLONNAWA****BOQ No: KI/02/2024**

ITEM	DESCRIPTION	UNIT	QTY	LKR COMPONENT	
				RATE LKR	AMOUNT LKR
	<b>Contractors are strictly advised to visit the site &amp; follow the given details, sketch drawings, and specifications before commencing the works. Any discrepancy should be forwarded to the Engineer before the commencement of such works.</b>				
<b>1</b>	<b>PRELIMINARIES</b>				
1.1	Mobilization and demobilization, site office, temporary facilities for storage materials, site clearing, removal of all temporary facilities after the completion of works and keeping the site clean and tidy during construction and for all required safety precautions to personnel who are within work site and warning sign-board, tags, locks, barriers etc.	Item	01		
	<b>The total amount carried to summary</b>				

ITEM	DESCRIPTION	UNIT	QTY	LKR COMPONENT	
				RATE LKR	AMOUNT LKR
<b>2</b>	<b>SOLAR PV SYSTEM – 187 kWp (Garage main hanger roof)</b>				
2.1	Supply of 570Wp-595Wp Monocrystalline Solar Panels (Contractor shall supply appropriate number of panels required based on the rated power of the panel supplied and the areas of the potential roofs).	kWp	187		
2.2	Supply of grid-tied multiple inverters with all related communication and integration hardware (Contractor shall supply appropriate number of inverters required based on the total rated power of the panels. The AC to DC ratio shall be no less than 1:1.2 )	kWp	187		
2.3	Supply of Aluminium Railings with required Accessories (including Bases, Clamps, Fixing kits No-leak tape, Tar Tape etc.)	Item	01		
2.4	Supply of all DC cables and suitable industrial connectors (Cable sizing shall be carried out in accordance with the bidder's proposal)	Item	01		
2.5	Supply of all armoured AC power cables (Cable sizing for each segment shall be carried out in accordance with the bidder's proposal).	Item	01		
2.6	Supply of main AC power distribution board, sub distribution boards, metering unit, protection devices, circuit breakers, grounding accessories, isolation switches, roofing materials for replacing any damage incurred to the existing roof during construction etc.	Item	01		



ITEM	DESCRIPTION	UNIT	QTY	LKR COMPONENT	
				RATE LKR	AMOUNT LKR
2.7	Supply of cable termination kits, cable lugs, colour boots, heat sleeves cable trays, ladders, conduits, casings, sleeves for crossing the roads and required materials for restoring the roads (if required) for routing and termination of cables.	Item	01		
2.8	Supply of necessary hardware & software including a tablet PC for monitoring.	Item	01		
2.9	Installation of Solar Panels, Inverters, Power Distribution Boards, All cables, Cable Management systems and all other accessories required to complete the solar system installation including integration of the proposed Solar PV system with the LECO grid, and obtaining relevant approval from LECO.	Item	01		
2.10	Testing, Commissioning and Maintenance of the System for period of 03 years. System detailed designing and engineering involvement, documentation, and project management with all other miscellaneous.	Item	01		
2.11	Supply fabrication and fixing of canopy to cover the wall mounted inverters etc. as per the Drawing	Item	01		
2.12	Supply and installation of lightning protection system according to the standards and specifications provided	Item	01		
2.13	Any other items ( <i>Please specify</i> )	Item	01		
	<b>The total amount carried to summary</b>				

ITEM	DESCRIPTION	UNIT	QTY	LKR COMPONENT	
				RATE LKR	AMOUNT LKR
<b>3</b>	<b>SOLAR PV SYSTEM – 100 kWp ( New building roof)</b>				
3.1	Supply of 570Wp-595Wp Monocrystalline Solar Panels (Contractor shall supply appropriate number of panels required based on the rated power of the panel supplied and the areas of the potential roofs).	kWp	100		
3.2	Supply of grid-tied multiple inverters with all related communication and integration hardware (Contractor shall supply appropriate number of inverters required based on the total rated power of the panels. The AC to DC ratio shall be no less than 1:1.2)	kWp	100		
3.3	Supply of Aluminium Railings with required Accessories (including Bases, Clamps, Fixing kits No-leak tape, Tar Tape etc.)	item	01		
3.4	Supply of all DC cables and suitable industrial connectors (Cable sizing shall be carried out in accordance with the bidder's proposal)	Item	01		
3.5	Supply of all armoured AC power cables (Cable sizing for each segment shall be carried out in accordance with the bidder's proposal).	Item	01		
3.6	Supply of main AC power distribution board, sub distribution boards, metering unit, protection devices, circuit breakers, grounding accessories, isolation switches, roofing materials for replacing any damage incurred to the existing roof during construction etc.	Item	01		

ITEM	DESCRIPTION	UNIT	QTY	LKR COMPONENT	
				RATE LKR	AMOUNT LKR
3.7	Supply of cable termination kits, cable lugs, colour boots, heat sleeves cable trays, ladders, conduits, casings, sleeves for crossing the roads and required materials for restoring the roads (if required) for routing and termination of cables.	Item	01		
3.8	Installation of Solar Panels, Inverters, Power Distribution Boards, All cables, Cable Management systems and all other accessories required to complete the solar system installation including integration of the proposed Solar PV system with the LECO grid, and obtaining relevant approval from LECO.	Item	01		
3.9	Testing, Commissioning and Maintenance of the System for period of 03 years. System detailed designing and engineering involvement, documentation, and project management with all other miscellaneous.	Item	01		
3.10	Supply fabrication and fixing of canopy to cover the wall mounted inverters etc. as per the Drawing	Item	01		
3.11	Supply and installation of lightning protection system according to the standards and specifications provided	Item	01		
3.12	Any other items <i>(Please specify)</i>	Item	01		
	<b>The total amount carried to summary</b>				

<b>SUMMARY</b>			
<b>ITEM</b>	<b>DESCRIPTION</b>	<b>CURRENCY</b>	<b>LKR AMOUNT</b>
1	PRELIMINARIES	= LKR	
2	SOLAR PV SYSTEM 187 kWp- (Main Garage Hanger )	= LKR	
3	SOLAR PV SYSTEM 100 Kwp- (New Building )	= LKR	
	<b>Sub Total I</b>	(a) = LKR	
	Less discount if any	(b) = LKR	
	<b>Sub Total II</b>	(c) = (a) - (b) = LKR	
	SSCL (If applicable)	(d).....% = LKR	
	<b>Total sum with SSCL carried to Form of Bid</b>	(e) = (c)+(d) = LKR	

Total amount in words (LKR):-.....

VAT registered no :-.....

SSCL registered no :-.....

[ Please Attached Copy of the SSCL Registration & Copy of the VAT Registration (if applicable) ]

Name of Bidder :-.....

Address :-.....  
.....

Telephone No:.....

Email Address:.....

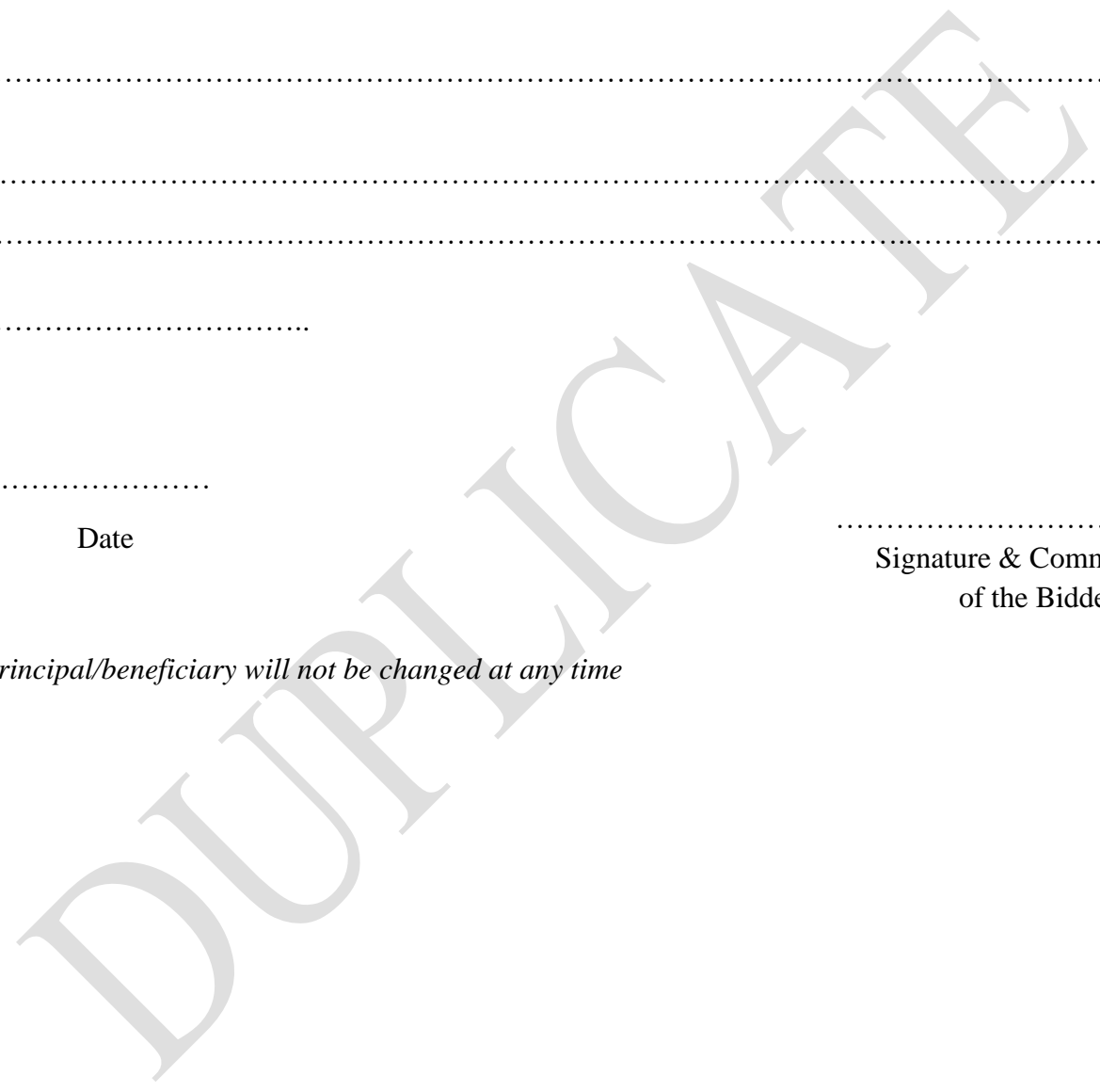
.....

Date

.....

Signature & Common Seal  
of the Bidder

**Note:** Name of the declared principal/beneficiary will not be changed at any time



## **SCHEDULE FOR DAY WORKS**

### **SCHEDULE A- LABOUR**

Any labour engaged on Day work shall be paid at the rates given below. Contractor's profit and overheads should not be included in the rates.

<b>No.</b>	<b>Category</b>	<b>Gross Daily Wages LKR</b>
1	Skilled labour	
2	Semi-skilled labour	
3	Unskilled labour	
4	Electrician	

### **SCHEDULE B-MATERIAL**

The Bidder shall give in this schedule the basic price of the following material

<b>No.</b>	<b>Category</b>	<b>Unit</b>	<b>Gross Rate LKR</b>
1	Solar PV Panel	01 No	
2	Invertor (for each capacity)	01 No	
3	Cable (Specify size and type)	01 m	
4	Aluminium Railing	01 No	

### **SCHEDULE C – PLANT**

Any Plant engaged on Day works shall be paid at the rates given below. The rates are for wet hire. These rates shall include for all inputs for running of the plant, transport to site, operators, attendants, insurance and other overheads associated with such plant.

<b>No.</b>	<b>Description of Plant</b>	<b>Hourly Rate LKR</b>
1	Fork lift	
2	Welding Plant	

**Schedule D–Details of Suppliers & Manufactures**

No	Item	Manufacture	Supplier	Country of Origin	Country of manufacturer
1.	Solar Panels				
2.	Invertors				
3.	Aluminium Railings				
4.	AC Cables				
5.	DC Cables				
6.	Switchgears				
7.	Enclosures				

DUPLICATED

**SECTION - 8**

❖ ***DRAWINGS***

DUPPLICATE



### LIST OF DRAWINGS

<b>NO.</b>	<b>DRAWING TITLE</b>	<b>DRG. NO.</b>
01	Detail of Canopy at Main Garage	1945
02	Cable layout plan Main Garage	1945-1
03	Invertor Panel Room at Zone 09	1945-2
04	Cable layout plan – New Building	1946-1
05	Layout Plan (solar panel) – Main Garage	1947
06	Layout Plan (solar panel) – New building	1947-1

### LIST OF ANNEXURES

<b>NO.</b>	<b>ANNEXURE TITLE</b>	<b>ANNEXURE. NO.</b>
01	Manufacturer's Authorization	Annexure - 01
02	Technical Schedule	Annexure - 02

**DUPLICATE**

**SECTION – 9**

❖ ***STANDARD FORMS (BID)***

**FORM OF BID SECURITY**

*[this Guarantee form shall be filled in accordance with the instructions indicated in brackets]*  
----- *[insert issuing agency’s name, and address of issuing branch or office]*

**Beneficiary: Ceylon Petroleum Storage Terminals Limited,  
Oil Installation, Kolonnawa,  
Wellampitiya**

*Date:* ----- *[insert (by issuing agency) date]*

**BID GUARANTEE No.:** ----- *[insert (by issuing agency) number]*

We have been informed that -----  
- *[insert (by issuing agency) name of the Bidder]* (hereinafter called "the Bidder") has submitted to you its bid dated -----*[insert (by issuing agency) date]* (hereinafter called "the Bid") for the ..... of *[insert name of Contract]* under Invitation for Bids No. ----- *[insert IFB number]* ("the IFB").

Furthermore, we understand that, according to your conditions, Bids must be supported by a Bid Guarantee.

At the request of the Bidder, we ----- *[insert name of issuing agency]* hereby irrevocably undertake to pay you any sum or sums not exceeding in total an amount of ----- *[insert amount in figures]* ----- *[insert amount in words]* upon receipt by us of your first demand in writing accompanied by a written statement stating that the Bidder is in breach of its obligation(s) under the bid conditions, because the Bidder:

- (a) has withdrawn its Bid during the period of bid validity specified; or
- (b) does not accept the correction of errors in accordance with the Instructions to Bidders (hereinafter "the ITB"); or
- (c) having been notified of the acceptance of its Bid by the Employer during the period of bid validity, (i) fails or refuses to execute the Contract Form, if required, or (ii) fails or refuses to furnish the Performance Security, in accordance with the ITB.

This Guarantee shall expire: (a) if the Bidder is the successful bidder, upon our receipt of copies of the Contract signed by the Bidder and of the Performance Security issued to you by the Bidder; or (b) if the Bidder is not the successful bidder, upon the earlier of the successful bidder furnishing the performance security, otherwise it will remain in force up to -----  
--- *(insert date)*

Consequently, any demand for payment under this Guarantee must be received by us at the office on or before that date.

\_\_\_\_\_  
*[signature(s) of authorized representative(s)]*

**CHECK LIST FOR BIDDERS**

DUPLICATE

## CHECK LIST FOR BIDDERS

Bidders are advised to fill the following table.

ITEM	ITB Clause	YES (tick)	REFERENCE
Form of Bid			
Addressed to the <b>Employer</b> ?	18		
Completed?	18		
Signed?	18		
<b>Bid Securing Declaration Form (if required)</b>			
Properly filled and signed	16		
<b>Bid Security (if required)</b>			
Address to the <b>Employer</b> ?	16		
Format as required?	16		
Issuing Agency as specified?	16		
Amount as requested?	16		
Validity <b>28 days beyond</b> the validity of Bid?	16		
<b>Qualification Information</b>			
All relevant information completed?	4		
Signed?	4		
<b>Addendum</b>			
Contents of the addendum (if any) taken in to account?	10		
Bid package			
All the documents given in ITB Clause 12 enclosed in the original and copy?	12		
ITB Clause 19 followed before sealing the Bid package?	19		

Signature of the Bidder: ..... Date:.....

**(Common Company Seal)**

### **Manufacturer's Authorization**

[The Bidder shall require the Manufacturer to fill in this Form in accordance with the instructions indicated. This letter of authorization should be on the letterhead of the Manufacturer and should be signed by a person with the proper authority to sign documents that are binding on the Manufacturer. The Bidder shall include it in its Bid, if so indicated in the ITB.]

Date:..... [Date of Bid Submission]

No.:.....

**To: Ceylon Petroleum Storage Terminals limited.  
Oil Installation,  
Kolonnawa, Wellampitya,  
Sri Lanka**

WHEREAS

We [insert complete name of Manufacturer], who are official manufacturers of [insert type of goods manufactured], having factories at [insert full address of Manufacturer's factories], do hereby authorize [insert complete name of Tenderer] to submit a bid the purpose of which is to provide the following Goods, manufactured by us [insert name and or brief description of the Goods], and to subsequently negotiate and sign the Contract.

Whereby extend our full guarantee and warranty in accordance with Content 6.3 in Specification, with respect to the Goods offered by the above firm.

Signed: [insert signature(s) of authorized representative(s) of the Manufacturer]

Name: [insert complete name(s) of authorized representative(s) of the Manufacturer]

Title: [insert title]

Duly authorized to sign this Authorization on behalf of: [insert complete name of Tenderer]

Dated on \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_ [insert date of signing]

## TECHNICAL SCHEDULE

**Bidder Shall Fill in This Schedule and Initial Each Page**

### S-1: Solar PV Panels

Item	Description	Compliance (Yes/No)	Proof Document Pg. Nr.	Remarks
Make	<i>(Please Mention)</i>			
Model	<i>(Please Mention)</i>			
Country of Origin	<i>(Please Mention)</i>			
Country of Manufacture	<i>(Please Mention)</i>			
SLSEA Approval for the model	<i>(Please attach a copy)</i>			
Certificate for Testing and Approval	<i>(Please attach a copy)</i>			
Certificate Issued by an accredited Agency Authorized and approved by IEC	<i>(Please attach a copy)</i>			
Output Cables mm2	<i>(Please Mention)</i>			
Type of cells	Mono Crystalline			
Rated Maximum Power (Pmax)	Range 570Wp – 580Wp			
Open Circuit Voltage (Voc)	<i>(Please Mention)</i>			
Maximum Power Voltage (Vmp)	<i>(Please Mention)</i>			
Short Circuit Current (Isc)	<i>(Please Mention)</i>			
Maximum Power Current (Imp)	<i>(Please Mention)</i>			
Power Tolerance	Positive Only			
Module Efficiency	≥20%			
Number of bypass diodes	<i>(Please Mention)</i>			
Construction Material	Aluminum and Glass(t≥2mm)			
Weight	<i>(Please Mention)</i>			
Ingress Protection level	IP66			
Solar Cell Coating	Anti-reflective coating			
Module encapsulation	Modules shall be encapsulated and sealed to protect silicon cells from ingress			

Junction box	IP68			
Connectors	MC4-EV02 QC 4.10-35/45			
Operating Temperature	10°C to +85°C			
Relative Humidity	95%			
Temperature Coefficient of Pmax ( $\gamma\Delta P_{max}$ )	-0.37%/C <sup>0</sup>			
Fill Factor	Minimum 0.78			
Wind Speed Withstand	100 m/s			
Product Warranty	10 Years or more Attach certificate			
Expected Economic Life time	25 Years Attach linear performance warranty Certificate			
Quality Management	ISO 9001: 2008, ISO 14001:2004 or Equivalent			
Safety Compliance	SLS standards Protection class II and CE conformity			
Bankrupt warranty supplied by the manufacturer	Mention the time period Attach a copy			
Manufacturer Authorization Letter (MAL)	MAL shall be submitted			



**S-2: Inverters (Fill separate tables for each capacity)**

<b>Item</b>	<b>Description</b>	<b>Compliance (Yes/No)</b>	<b>Proof Document Pg. Nr.</b>	<b>Remarks</b>
Make	<i>(Please Mention)</i>			
Model	<i>(Please Mention)</i>			
Country of Origin	<i>(Please Mention)</i>			
Country of Manufacture	<i>(Please Mention)</i>			
SLSEA Approval for the model	<i>(Please attach a copy)</i>			
Certificate for Testing and Approval	<i>(Please attach a copy)</i>			
Certificate Issued by an accredited Agency	<i>(Please attach a copy)</i>			
Inverter Type	String Inverter			
Inverter Technology	Transformer less			
Rated DC Input power	<i>(Please Mention)</i>			
Rated / Max Input Voltage	<i>(Please Mention)</i>			
Min / Start Input Voltage	<i>(Please Mention)</i>			
MPPT Technology	Compulsory			
MPP Voltage Range	<i>(Please Mention)</i>			
Independent MPP Input	<i>(Please Mention)</i>			
Strings per MPP Input	<i>(Please Mention)</i>			
Rated AC Power Output	<i>(Please Mention)</i>			
AC Nominal Voltage	3Ph+N+PE; 230V / 400V			
Rated Grid Voltage	<i>(Please Mention)</i>			
Nominal Voltage range	+/- 10%			
Rated Grid Frequency	50Hz			
Frequency range	-6%/+4%			
Rated Output Current	<i>(Please Mention)</i>			
Feed In / Connection Phases	3/3			
Grid Connection	3 Phase			
Max THD	<3%			
Grid Synchronization function	Built-in grid synchronization			

Grid Frequency Synchronization Range	+/- 3Hz			
Efficiency	>98%			
Protection	DC side disconnection, Ground Fault Monitoring, Grid voltage Monitoring, DC reverse polarity protection, AC short circuit protection, Residual current monitoring and protection DC Surge Arrestor Type II for all Inputs			
Grid and DG set interactive capability	Compulsory			
No Load Losses	< 1%			
Operating Temperature Range	0°C to +60°C			
Ingress Protection level	IP65			
Max Operating humidity	0% - 100%			
Display	<i>(Please Mention)</i>			
Communication interface	<i>(Please Mention)</i>			
Data Logging Capability	Compulsory			
Remote Monitoring Capability	Compulsory			
Data Transferring to remote Computer	Compulsory			
Automatic Operation Capabilities	Wake-up, Synchronization & Shutdown			
Maximum AC Output Apparent Power	<i>(Please Mention)</i>			
Power Factor	<i>(Please Mention)</i>			
Short Circuit Proof	<i>(Please Mention)</i>			
Grid Code and Islanding Protection	IEEE 1547 or Equivalent And as per CEB/LECO requirements			
Guarantee	10 Years			
Manufacturer Authorization Letter (MAL)	MAL shall be submitted			

**S-3: Enclosures**

Item	Description	Compliance (Yes/No)	Proof Document Pg. Nr.	Remarks
Make	<i>(Please Mention)</i>			
Model	<i>(Please Mention)</i>			
Country of Origin	<i>(Please Mention)</i>			
Country of Manufacture	<i>(Please Mention)</i>			
Type	Indoor floor standing			
Material	Electro galvanized sheet steel			
Thickness of the sheet	Frame-2.0mm, Door-1.5mm Covers-1.5mm			
Protection	IP65			
Cable Entry	Bottom			
Painting	Power coated, Beige			

**S-4: Other Accessories**

Item	Description	Compliance (Yes/No)	Proof Document Pg. Nr.	Remarks
<b>Indicators</b>				
Type of indicator	LED			
<b>Selector Switch</b>				
Required Positions	3 Positions			
<b>Push Buttons</b>				
Type	Momentary			
<b>Emergency Stop Buttons</b>				
Type	Turn to Release			
<b>Cooling Fan</b>				
Size	Min. 100 mm diameter			
Operation	Operated by thermostat			
<b>Panel Door Lights</b>				
Wattage	5W			
Switching	By limit switch on door			
<b>Bus bar</b>				
Type	Tinned copper flat			
<b>Earth bar</b>				
Type	Tinned Copper flat			

**S-5: Cables****Note : Calculations for cable sizes shall be submitted with the bid.****Fill separate tables for each type of cable**

Item	Description	Compliance (Yes/No)	Proof Document Pg. Nr.	Remarks
Make	<i>(Please Mention)</i>			
Model	<i>(Please Mention)</i>			
Country of Origin	<i>(Please Mention)</i>			
Country of Manufacture	<i>(Please Mention)</i>			
Type	Cu or AL/XLPE/SWA/PVC			
Size	<i>(Please Mention)</i>			
Voltage drop	<i>(Please Mention)</i>			
Standard	BS 1186, BS 5467, BS 6346, SLS 1542			
Conductor	Class 2 Annealed Cu / AL			
Insulation Material	XLPE for above 25mm <sup>2</sup> / PVC for 1.5mm <sup>2</sup> , 4mm <sup>2</sup>			
Nominal Voltage	600/1000V			
Service Voltage Type	AC/DC			
Core Colours	Brown, Black, Grey, Blue			
Sheathing Material / Color	PVC Type 9 / Black			

**S-6: Array Structure**

Item	Description	Compliance (Yes/No)	Proof Document Pg. Nr.	Remarks
Design	Flat-plate Design allowing easy replacement of any module Entire structure shall be easily removable in an event of roof replacement.			
Withstand Wind Speed	160 km/h			
Structure Fixing	Firmly secured to the roof without affecting the structural integrity			
Structural Material	Aluminium and electrolytic alloy compatible with the materials used in the module frame, its fasteners, nut and bolts			
Fasteners	Stainless Steel			
Sealing materials	Provide sealing materials for roof penetrations			

Inclination	Angle inclination as per site condition to obtain maximum irradiance			
Orientation	East-West Direction wherever possible			
UV resistance	Materials shall be UV resistant and shall be designed to withstand the temperatures to which they are exposed			
Dissimilar metals	shall be isolated from one another using non-conductive materials			
Installation Standards	SLSI- SLS 1522			

#### S-7: Combiner Boxes

Item	Description	Compliance (Yes/No)	Proof Document Pg. Nr.	Remarks
Bus bar	suitably rated (box bus bar) to handle the expected current flow			
IP Rating	IP 65			
Test Point	Provide test point for fault detection			
Disconnection Facility	suitable arrangement to disconnect and isolate arrays			
Cable Entry and Glanding	fitted with cable glands for both incoming and outgoing cables			

#### S-8: DC Distribution Boards

Item	Description	Compliance (Yes/No)	Proof Document Pg. Nr.	Remarks
Measurement Panel	Provide Measurement panel for voltage, current from different MCBs to check any failure in the array field			
MCCBs	suitably rated for connection and disconnection of array sections			
Material	CRC sheet			
IP Rating	IP65			

### S-9: DC Cable Network

Item	Description	Compliance (Yes/No)	Proof Document Pg. Nr.	Remarks
Sizing	Sizes as per load requirement for connecting all the modules/arrays to Junction Boxes, Junction Boxes to DC distribution box and DC distribution box to inverter. The cables shall be able to handle maximum expected current in case of a short circuit condition Energy Loss requirements shall be met			
Energy Loss	DC Side: <2% AC Side: <2.5%			
Voltage Drop	Shall facilitate trouble free operation of the equipment and PV system			
Overcurrent Protection	Shall be provided at appropriate levels of the network			
DC Cable Separation	negative and positive cables put into the separate conduit pipe/cable trays, firmly secured properly tagged and terminated			
UV resistance	All exposed cables, conduits and cable trays shall be UV resistant and shall be designed to withstand the temperatures to which they are exposed			
Guarantee	Comprehensive warranty including the workmanship shall be provided for a period of Five (05) years			

### S-10: Data Monitoring Equipment

Item	Description	Compliance (Yes/No)	Proof Document Pg. Nr.	Remarks
External Digital Energy Meter	To log the actual value of energy generated, voltage and current by the solar system			
Remote Monitoring System	To monitor the performance and health of the system with a facility to upload the data to the cloud through an internet connection. System shall			

	include a tablet PC			
Features provided by Remote Monitoring System	Real Time data			
	Past Data			
	Peak Power			
	Cumulating Power			
	CO2 Emission			
	Power & Energy Graphs			
	Cloud Conditions			
	Fault & Safety Event			
	Module Performance			
	Ambient temperature			

### S-11: Protection

Item	Description	Compliance (Yes/No)	Proof Document Pg. Nr.	Remarks
<b>Grounding Protection</b>				
Exposed Metal Parts	All parts shall be properly grounded			
Maintenance Grounding	Provision should be kept for shorting and grounding of the PV array at the time of maintenance work			
AC and DC Earthing	AC Distribution Board and DC Distribution Board should also be earthed properly and bonded together			
<b>Lightning Protection</b>				
Requirement	Direct lightning protection for the array field			
Technical details and drawings	To be submitted with the offer			
<b>Grid Islanding and Surge Protection</b>				
Islanding Protection	disconnection from the grid on no supply, under and over voltage conditions shall be provided			
DC side and AC side Fuses and surge protection requirement	For Overload, Short Circuit and Surge protection and Maintenance disconnections			
Solar Array Disconnection	Fuses of adequate rating shall also be provided in each solar array module to protect them			

	against short circuit			
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**S-12: Earthing**

<b>Item</b>	<b>Description</b>	<b>Compliance (Yes/No)</b>	<b>Proof Document Pg. Nr.</b>	<b>Remarks</b>
Component Earthing	All non-current carrying metal objects such as solar PV panel frames, mounting structures, enclosures etc shall be grounded using unbroken earth wire. Earth wire shall be neither disconnected nor connected via fuse or any other link which has the tendency for physical opening or separation			
Electrical Continuity	Earthing system shall be electrically connected to provide return to earth path from all equipment irrespective of their mechanical connection			
Earth Pit	Provide with lid having earthing symbol			
Earth Resistance	Shall be less than 05 ohms			
Test Link	Provide			
Common Earth	All earth rods should be connected to the single point to make the earthing system is equipotential			

Signature of the Bidder: ..... Date:.....

**(Common Company Seal)**