



**BHARAT HEAVY ELECTRICALS LIMITED
SOLAR BUSINESS DIVISION**

EOI Ref: EOIBOS2025-01

BHEL SBD Herewith Publishes

Expression of Interest

(EOI)

and

Invites Prospective vendors to partner with BHEL

for

**Entering into TC-MOU (Techno-commercial Memorandum of Understanding) and
Pre- bid tie up for BALANCE OF SYSTEM (BOS) VENDOR FOR 50 MW GROUND
MOUNTED SPV PROJECT AT OVERSEAS LOCATION**

Ref:EOIBOS2025-01 dtd 24-07-2025

Due Date of Receiving duly filled EOI: 04.08.2025 14:00 Hrs

About BHEL

BHEL is India's largest engineering and manufacturing enterprise, operating in the energy, industry and infrastructure sector. Company was established in the year 1964 and since then it has been "Making in India" offering comprehensive products, systems, and services in various areas including power generation (thermal, hydro, gas, nuclear, and solar PV), transmission, transportation, defence, aerospace, oil and gas, and emerging sectors like battery energy storage systems and electric vehicle chargers. BHEL has been instrumental in developing the country's power generation capacity, contributing to core industrial and strategic sectors since the time of its humble beginning. The company's commitment toward its customer is evident through wide range of product portfolio, development and absorption of new technologies, consistent investment of more than 2.5% of its revenue on R&D and innovation, establishment of world-class manufacturing facilities and offering sustainable business solutions. Apart from serving customers, BHEL has been supporting communities through programs like skill development, promoting health, hygiene, education, cleanliness and environmental protection, thus contributing to the society as a whole.

The purpose of publishing this EOI is to provide opportunities to probable vendors who can partner with BHEL for supplying Balance of system (BOS) at 50MW ground mounted SPV project at overseas location.

Note: BHEL reserves its right to independently verify the documents submitted and visit the vendor works for assessment. Necessary arrangements shall be made by the prospective vendors



**BHARAT HEAVY ELECTRICALS LIMITED
SOLAR BUSINESS DIVISION**

EOI Ref: EOIBOS2025-01

All corrigenda, addenda, amendments, time extensions, clarifications etc. to the Tender will be hosted on <https://bhel.com> only. Bidders should regularly visit this website to keep themselves updated.

Queries:

Bidders to note that any queries related with EOI are to be submitted online only at Email ID provided in Table A with CC to **k.manoj@bhel.in**. Queries/clarifications received in any other form are liable to be unanswered. A reply from the concerned will be given on the same Email ID.

Table A

Description	Email Id
For Technical Queries	muhammedshakir@bhel.in
For General & Commercial Queries	k.manoj@bhel.in
For submission of offers against EOI	technicalbid-epd@bhel.in

Submission of EOI

Offers against EOI to be submitted on Email address to **technicalbid-epd@bhel.in** with subject as Ref: **EOIBOS2025-01 dtd 24-07-2025 "BALANCE OF SYSTEM (BOS) VENDOR FOR 50 MW GROUND MOUNTED SPV PROJECT AT OVERSEAS LOCATION"** (Mail size should not be more than 20 MB. In case the size is larger, offer can be submitted partwise in multiple mails).

Following documents to be attached while submitting EOI:

1. Annexure I (Duly filled, signed, stamped on official letterhead)
2. Annexure II- Non-Disclosure Agreement (Duly filled, signed, stamped on official letterhead)
3. Documents in support of Pre-Qualification Requirements- Technical
4. Technical offer, comprising of technical specification/Product Catalogues/Datasheets/Drawings/ QAP/ Test report etc
5. Any other documents

Note: Bidders may adopt this mode at their own risk. BHEL does not own any responsibility /liability for delays in receipt / loss of secrecy of such offers.

No physical offers for EOI will be accepted.

Plant Location details:

**BHARAT HEAVY ELECTRICALS LTD
SOLAR BUSINESS DIVISION
Prof. CNR Rao Circle,
Opp. Indian Institute of Science,
Malleswaram Bangalore – 560012 India**



ANNEXURE – I

FORMAT FOR SUBMISSION OF EOI

(to be printed on the official letterhead of the APPLICANT)

To,

Mr. Vinay Kumar
AGM-Materials Management
BHEL SBD Bengaluru-560012

Dear Sir,

Subject: Submission of Expression of Interest Ref: EOIBOS2025-01 Dated 24.07.2024 "BALANCE OF SYSTEM (BOS) VENDOR FOR 50 MW GROUND MOUNTED SPV PROJECT AT OVERSEAS LOCATION"

With reference to your EOI inviting notice Ref: EOIBOS2025-01 Dated 24.07.2025 and after examining the detailed documents and other details mentioned in the EOI document, I/We hereby offer to submit my /our Expression of Interest.

1. All the annexures and documents necessary in this connection are enclosed hereto. All the documents/ photocopies of the documents have been self-attested by me/us and BHEL is free to reject our offer if any of the documents/photocopies of the documents is/are found to be false or forged.
2. I/we, hereby also declare(s) that I/we have read all terms and conditions in the EOI and all terms and conditions mentioned in the EOI are acceptable. I herewith submit duly signed and accepted Non Disclosure Agreement as per Annexure II.
3. I/we, hereby also declare(s) that my/our organisation/firm is not debarred/ blacklisted by any Central/State Govt. department, agency, PSUs/ Institution/ Agencies/ Autonomous organization.
4. The information sought from me as per the EOI notice is enclosed to this letter.

Yours Faithfully,

(Signature & Stamp of Authorised Signatory)

Name

Designation:

Date:

Place:



ANNEXURE II

NON-DISCLOSURE AGREEMENT

I, _____, on behalf of the _____ (Name of Company),

acknowledge that the information received or generated, directly or indirectly, while working with BHEL on contract is confidential and that the nature of the business of the BHEL is such that the following conditions are reasonable, and therefore:

I warrant and agree as follows:

I, or any other personnel employed or engaged by our company, agree not to disclose, directly or indirectly, any information related to the BHEL Without restricting the generality of the foregoing, it is agreed that we will not disclose such information consisting but not necessarily limited to:

- Technical information: Methods, drawings, processes, formulae, compositions, systems, techniques, inventions, computer programs/data/configuration and research projects.
- Business information: Customer lists, project schedules, pricing data, estimates, financial or marketing data,

On conclusion of contract, I, or any other personnel employed or engaged by our company shall return to BHEL all documents and property of BHEL including: drawings, blueprints, reports, manuals, computer programs/data/configuration, and all other materials and all copies thereof relating in any way to BHEL, EPD's business, or in any way obtained by me during the course of contract. I further agree that I, or any others employed or engaged by our company shall not retain copies, notes or abstracts of the foregoing.

This obligation of confidence shall continue after the conclusion of the contract also.

I acknowledge that the aforesaid restrictions are necessary and fundamental to the business of the BHEL and are reasonable given the nature of the business carried on by the BHEL. I agree that this agreement shall be governed by and construed in accordance with the laws of country.

I enter into this agreement totally voluntarily, with full knowledge of its meaning, and without duress.

Place: - _____ Date: - _____

Name

Company

Signature



**EXPRESSION OF INTEREST (EOI) FOR
SHORTLISTING OF BALANCE OF SYSTEM (BOS)
VENDOR FOR 50 MW GROUND MOUNTED SPV
PROJECT IN SRI LANKA**

PS-439-1442

Rev No: 00

COPYRIGHT AND CONFIDENTIAL

*The information on this document is the property of Bharat Heavy
Electricals Limited. It must not be used directly or indirectly in
anyway detrimental to the interest to the company.*

**EXPRESSION OF INTEREST (EOI)
FOR
SHORTLISTING OF BALANCE OF
SYSTEM (BOS) VENDOR
FOR
50 MW GROUND MOUNTED SPV
PROJECT IN SRI LANKA**

Revision details: 00	Prepared VKC/VJ	by:	Checked by: PM	Approved by:	Date: 23/7/2025
----------------------------	--------------------	-----	----------------	--------------	--------------------



**EXPRESSION OF INTEREST (EOI) FOR
SHORTLISTING OF BALANCE OF SYSTEM (BOS)
VENDOR FOR 50 MW GROUND MOUNTED SPV
PROJECT IN SRI LANKA**

PS-439-1442

Rev No: 00

1.0 DISCLAIMER

- 1.1.** The information contained in this Expression of Interest (EOI) document provided to the Prospective bidder (s), by or on behalf of Bharat Heavy Electricals Limited (BHEL) or any of its employees or advisors, is provided to the Prospective bidders on the terms and conditions set out in this EOI document and all other terms and conditions subject to which such information is provided.
- 1.2.** BHEL may, in its absolute discretion, but without being under any obligation to do so, modify, amend or supplement the information in this EOI document.
- 1.3.** The issue of this EOI does not imply that BHEL is bound to select and shortlist any or all the Prospective bidder(s). Even after selection of suitable Prospective Bidder BHEL is not bound to proceed ahead with the Prospective Bidder and in no case be responsible or liable for any commercial and consequential liabilities in any manner whatsoever.
- 1.4.** The Prospective bidder shall bear all costs associated with the preparation, technical discussion/presentation and submission of response against this EOI. BHEL shall in no case be responsible or liable for these costs regardless of the conduct or outcome of the EOI process.
- 1.5.** Canvassing in any form by the Prospective bidder or by any other agency on their behalf shall lead to disqualification of their EOI.
- 1.6.** Notwithstanding anything contained in this EOI, BHEL reserves the right to accept or reject any application and to annul the EOI process and reject all applications, at any time without any liability or any obligation for such acceptance, rejection or annulment and without assigning any reasons, thereof. In the event that BHEL rejects or annuls all the applications, it may at its discretion, invite all eligible Prospective bidder(s) to submit fresh applications.
- 1.7.** BHEL reserves the right to disqualify any applicant during or after completion of EOI process, if it is found there was a material misrepresentation by any such applicant or the applicant fails to provide within the specified time, supplemental information sought by BHEL.



**EXPRESSION OF INTEREST (EOI) FOR
SHORTLISTING OF BALANCE OF SYSTEM (BOS)
VENDOR FOR 50 MW GROUND MOUNTED SPV
PROJECT IN SRI LANKA**

PS-439-1442

Rev No: 00

1.8. BHEL reserves the right to verify all statements, information and documents submitted by the applicant in response to the EOI. Any such verification or lack of such verification by BHEL shall not relieve the applicant of his obligations or liabilities hereunder nor will it affects any rights of BHEL.

2.0 DETAILS OF EXPRESSION OF INTEREST (EOI)

2.1. INTRODUCTION:

Trincomalee Power Company Limited (a JV of CEB, Sri Lanka and NTPC India) is planning to setup a 50 MW SPV project at Sampur, Sri Lanka. Tender is expected to be floated in month of Aug'25. BHEL seeks Expression of Interest from Prospective bidder(s) of Balance of System works for 50 MW Ground Mounted solar power plant at Srilanka, who are meeting the requirements of this EOI and are willing to be associated with BHEL through a pre-bid tie-up to enable BHEL to quote as EPC contractor for the project.

2.2. ABOUT BHEL:

BHEL is a leading state-owned company and one of the largest engineering and manufacturing enterprise in India, catering to the core infrastructure sectors of Indian economy viz. energy, transportation, and heavy engineering industry, defence, renewable and non-conventional energy. The energy sector covers generation, transmission and distribution of equipments for thermal, gas, hydro, nuclear and solar photo voltaic power plant. BHEL has been in this business for more than 50 years and BHEL supplied equipment account for approx. 180 GW of the total thermal generating capacity in India. BHEL is also listed in Indian stock exchanges. BHEL has 16 manufacturing units, 4 power sector regions, 8 service centres and 15 regional offices besides host of project sites spread all over India and abroad. BHEL has its footprint in all the inhabited continents with references in 88 countries including Malaysia, Oman, Iraq, Syria Sudan, Libya, Cyprus, Malta, Afghanistan, Bangladesh, Bhutan, New Zealand, Mauritius etc. The cumulative overseas installed capacity of BHEL manufactured power plants nearing 10,000 MW. To position leading state-owned companies as Global Industrial giant and as a recognition for their exemplary performance, Government of India categorized BHEL as “Maharatna Company” in 2013. More details about the entire range of BHEL’s products and operations can be viewed by visiting our web site www.bhel.com



**EXPRESSION OF INTEREST (EOI) FOR
SHORTLISTING OF BALANCE OF SYSTEM (BOS)
VENDOR FOR 50 MW GROUND MOUNTED SPV
PROJECT IN SRI LANKA**

PS-439-1442

Rev No: 00

2.3.ABOUT SBD, BANGALORE

Solar Business Division (SBD), one of the manufacturing units of BHEL in Bengaluru (Karnataka). Solar Business Division is a new name to Electric & Photovoltaic Division (EPD) since Oct 2020 with a long-term objective of BHEL to give unified thrust to solar business segment. SBD is operating independently as the primary solar business centre to ensure responsiveness to the changing business environment and long-term sustenance of the product. BHEL-SBD has been continuously developing its solar portfolio and today, is one of the few companies in India which provides end-to-end in-house solutions for all solar power needs - including conceptualisation, design, engineering, manufacturing, erection, testing, commissioning and O&M - with proven expertise of over three decades with more than 1.2 GW portfolio. BHEL has commissioned India's largest floating solar power plant of 100 MW Capacity for NTPC at Ramagundam (Telangana).

2.4. BRIEF SCOPE OF COOPERATION:

2.4.1. BHEL SCOPE:

1. Supply of PV Modules
2. Supply and Installation of Complete BESS System.

2.4.2. PRE QUALIFICATION CRITERIA (PQR):

The Prospective bidder(s) shall meet the following qualification requirements as on the date of submission of EOI:

“Vendor should have executed minimum 1 no of SPV project as EPC or BOS contract of capacity minimum 10 MW. Such plant shall be in operation for minimum 1 year. As an evidence to this vendor shall submit the completion certificate from the customer.”

2.4.3. BOS VENDOR SCOPE:

The scope of Project shall be to design, engineering, construction, commissioning, of a 50 MW (AC capacity) Solar PV (Photovoltaic) power plant at Sampoor in the Trincomale District, Eastern Province, Sri Lanka and the operation and maintenance of the Solar Park Facility.

The Project shall have a capacity to provide up to 50 MW (AC) of electric power at the Interconnection Point at Commissioning,



**EXPRESSION OF INTEREST (EOI) FOR
SHORTLISTING OF BALANCE OF SYSTEM (BOS)
VENDOR FOR 50 MW GROUND MOUNTED SPV
PROJECT IN SRI LANKA**

PS-439-1442

Rev No: 00

The design and specifications of the Project shall be in accordance with internationally accepted engineering standards and practice. The type of equipment proposed for the Project shall be proven technology. Brief scope of supplies & services are listed as below:

Sr. No.	Item Description	Qty.	Unit
1	Module Mounting Structures	1	Set
2	Module cleaning system	1	Set
3	SCB	1	Set
4	PV Cable String to SCB	1	Set
5	SC Cable SCBs to PCU	1	Set
6	PCU/Inverter with ACB	1	Set
7	SVGs/ Reactive Power compensators, Harmonic Power Filters	1	Set
8	Inverter Transformer	1	Set
9	Fire Protection System of Inverter Transformer	1	Set
10	AC Cable PCU to Transformer	1	Set
11	HT Cable - Transformer to Incomer HT Panel and HT Panel to Pooling station and u/g evacuation	1	Set
12	HT Cable - Main PS to substation ganty	1	Set
13	HT Switchgear ICOG Panel	1	Set
14	BOS (other than Specified Above)	1	Set
15	Fire Detection and Protection System	1	Set
	WMS	1	
	Safety equipment, Tools and Tackels	1	
	Lightning Protection System	1	
	Earthing System	1	
	Illumination System	1	
	LT, control/Instrumentation Cables, Cable termination Kits, Lugs, Glads, Jointing Kits	1	
	UPS and Chargers with Battery	1	
	Auxiliary transformer	1	
	IR & CMCS switchyard equipment - SY fencing & gate, misc h/w	1	
	Signage-Marking plates & name plates, cheq plates, computer, AC, furniture, etc	1	
	Aux power cables	1	
	MC4 Quick Connects, Cable tie and HDPE pipes	1	



**EXPRESSION OF INTEREST (EOI) FOR
SHORTLISTING OF BALANCE OF SYSTEM (BOS)
VENDOR FOR 50 MW GROUND MOUNTED SPV
PROJECT IN SRI LANKA**

PS-439-1442

Rev No: 00

	I&C of BOS components	1	
16	SCADA SYSTEM	1	Set
17	Mandatory Spares	1	Set
18	Civil Work	1	Set
19	Site establishment (Site office, Accommodation, Vehicle facilities, Temporary power supply, etc)	1	Set
20	O&M of the plant for 5 years	1	Set
21	O&M Spares for 5 years	1	Set

2.4.4. TECHNICAL REQUIREMENTS - SOLAR PARK FACILITY

2.4.4.1. Description of the Project

The Solar Park Facility will be located at the Project Site. The main components of the Project are the Solar Park Facility. The Solar Park Facility comprises:

- Solar PV array: modules mounted on single axis tracker / fix tilt structures
- Power conversion units (inverters)
- Power transformers to connect at 33 kV
- LV and MV switchgear and wiring
- Control, monitoring and Instrumentation (SCADA)
- Forecasting system
- Communication system
- Ancillary systems
- O&M facilities

2.4.4.2. Basic Requirement

i) Solar PV Module Array

- a. Annual performance ratio : 80% or more



**EXPRESSION OF INTEREST (EOI) FOR
SHORTLISTING OF BALANCE OF SYSTEM (BOS)
VENDOR FOR 50 MW GROUND MOUNTED SPV
PROJECT IN SRI LANKA**

PS-439-1442

Rev No: 00

- b. Technology : Proven technology
- c. Generating Voltage : at the option of developer
- d. Voltage at Interconnection Point : 33 kV
- e. Minimum design life : 25 years
- f. Solar PV modules shall be a commercial, off-the-shelf product, UL listed, meeting IEC standards of IEC 61215, IEC 61730, IEC 60364, IEC 61701, IEC 61853, IEC 62804 or higher, shall be properly installed according to manufacturer's instructions.
- g. System wiring shall be installed in accordance with the applicable international standards.
- h. All modules installed in a series string shall be installed in the same plane/orientation.
- i. Panel installation design shall allow for the best ventilation possible of panels to avoid adverse performance impacts.

ii) Inverters and Controls

- a) Inverters shall be a commercial off-the-shelf product, meeting IEEE 1547 or IEEE2800, or local guidelines
- b) Each inverter and associated controls shall be properly installed according to the manufacturer's instructions.
- c) The inverters shall have at a minimum the following features:
 - Peak efficiency of 96% (European efficiency).
 - Operational indicators of performance and built-in data acquisition and remote monitoring.
 - Capable of parallel operation with the existing AC power and the ability to automatically synchronize its output waveform with that of the CEB System upon restoration.



**EXPRESSION OF INTEREST (EOI) FOR
SHORTLISTING OF BALANCE OF SYSTEM (BOS)
VENDOR FOR 50 MW GROUND MOUNTED SPV
PROJECT IN SRI LANKA**

PS-439-1442

Rev No: 00

- A minimum 5 - year manufacturer's warranty shall be provided.
- Manufacturer to warrant the availability of spares for 10 – years.

iii) Mounting Structures

- a) All structures, including array structures, shall be designed in accordance with all applicable local codes.
- b) All structural components and hardware shall be noncorrosive (eg. - galvanized steel, stainless steel, or aluminium).
- c) All civil structures shall be designed to obtain a minimum 30-year design life.
- d) The array structure shall be equipped with either single axis tracking according to the orientation or fixed tilt.
- e) A minimum 10-year manufacturer's warranty shall be provided for mounting structures.

iv) Lightning Protection

Lightening and surge protection shall be provided on building / structures / equipment.

2.4.4.3. Specifications for Grid Interconnection

1. General

Solar Plant Facility shall be connected to Sampoor CSS.

Interconnection Point of the Solar Park Facility will be at the 33kV outdoor gantry of Sampoor CSS.

Utilization of the feeder bays and 33 kV distribution routing shall be subject to instructions and approval by the CEB to prevent obstructions.

The Project Company shall propose the optimum electrical connection arrangement of the Solar Park Facility using Prudent Utilities Practice, subject to the specifications provided in this Schedule 5.



**EXPRESSION OF INTEREST (EOI) FOR
SHORTLISTING OF BALANCE OF SYSTEM (BOS)
VENDOR FOR 50 MW GROUND MOUNTED SPV
PROJECT IN SRI LANKA**

PS-439-1442

Rev No: 00

Notwithstanding the specifications provided in this document, the Project Company shall ensure the adequacy of the short circuit ratings of the equipment proposed for the Interconnection Facilities.

1. The CEB System Technical Limits:

• Nominal rated voltage:	33kV
• Normal operating voltage range:	33 ± 10% kV
• Power frequency withstand:	70 kV (rms)
• Impulse withstand voltage:	170 kV (peak)
• Maximum short-circuit current:	25 kA for 1 second
Frequency (Hz)	System Conditions
50.5 - 52.0	Emergency
49.5 - 50.5	Normal
47.0 - 49.5	Emergency

2. Grid Requirements

Solar Park Facility and their accessories shall be ensured to be capable of operating safely and reliably within the grid conditions specified as below. These requirements are mainly based on the specific grid connection requirements for interconnecting the proposed Solar Park Facility.

3. Solar PV Power Plant Control and Monitoring Capability

The Solar Park Facility shall be equipped with a plant control and monitoring system:

- i. With permanently installed and operational disturbance monitoring facilities for key variables including each input and output, and
 - ii. Facilities for testing the control system sufficient to establish its dynamic operational characteristics
- iii. Having the following control options:



**EXPRESSION OF INTEREST (EOI) FOR
SHORTLISTING OF BALANCE OF SYSTEM (BOS)
VENDOR FOR 50 MW GROUND MOUNTED SPV
PROJECT IN SRI LANKA**

PS-439-1442

Rev No: 00

i. Voltage control as set out in this Schedule, including;

- Option to include voltage droop characteristic
- Has limiting devices to ensure that a voltage disturbance does not cause Solar Park Facility to trip at the limits of its operating capability
- Allow the voltage set point to be continuously controllable in the range of at least 95% to 105% of normal voltage
- Regulates voltage within 0.5% of its set point
- Regulate voltage in a manner to support network voltages during faults in the manner set out in Grid Code.

iii. Power factor control in the manner set out in this Schedule iii. Reactive power control in the manner set out in this Schedule iv. With the Solar Park Facility connected to the CEB System, the settling times of voltage, active and reactive power measured at the targeting point, shall be less than 5 seconds for a 5% voltage disturbance.

4. Voltage Variation Capability

- i) Phase rotation is R-Y-B counter-clockwise.
- ii) Solar Park Facility shall be capable of delivering the active and reactive power outputs within the voltage variations specified in clause 3.17.1.3 of the Grid Code.

5. Frequency Variation Capability

The nominal frequency of the CEB System is 50 Hz and is controlled within the limits of 49.5 Hz and 50.5 Hz unless abnormal conditions prevail. Under abnormal CEB System conditions such as during faults and system disturbances, the system frequency could fall or rise beyond the normal frequency band. Solar Park Facility shall be capable of sustaining in continuous and uninterrupted operation during the manifestation of frequency events indicated in clause 3.17.1.1 of the Grid Code.



**EXPRESSION OF INTEREST (EOI) FOR
SHORTLISTING OF BALANCE OF SYSTEM (BOS)
VENDOR FOR 50 MW GROUND MOUNTED SPV
PROJECT IN SRI LANKA**

PS-439-1442

Rev No: 00

6. Voltage Waveform Distortion

- i) Allowed waveform distortion at the Interconnection Point, shall be limited to indicative planning levels given in Table 2 of Clause 4.1.1 of IEC 61000 -3-6 (Harmonics)
- ii) Accordingly, the Project Company shall ensure that level of Total Harmonics Distortion (THD) generated by Solar Park Facility at the Interconnection Point must be lower than 50% of the limits indicated in the following table.
- iii) Harmonic analysis for the Solar Park Facility shall be conducted by the Project Company and the study reports shall be submitted to the CEB during design stage.
- iv) It is the responsibility of the Project Company to conduct background harmonic measurements at least for 2 weeks as per TR IEC 61000-3-6: 2012 for the harmonic analysis. If the Project Company fails to conduct adequate background harmonic measurements, then the post commissioning harmonic measurements must be below the harmonic levels in the below table.
- v) Once the Solar Park Facility is connected to the system (post commissioning), the distortions shall be measured to ensure that they do not exceed the allowable limits as given in the table. The analysis shall be conducted as per TR IEC 61000.3.6:2012.

Odd harmonics Non-multiple of 3		Odd harmonics multiple of 3		Even harmonics	
Harmonic order H	Harmonic voltage %	Harmonic order H	Harmonic voltage %	Harmonic order H	Harmonic voltage %
5	6	3	5	2	2
7	5	9	1.5	4	1
11	3.5	15	0.4	6	0.5



**EXPRESSION OF INTEREST (EOI) FOR
SHORTLISTING OF BALANCE OF SYSTEM (BOS)
VENDOR FOR 50 MW GROUND MOUNTED SPV
PROJECT IN SRI LANKA**

PS-439-1442

Rev No: 00

13	3	21	0.3	8	0.5
$17 \leq h \leq 49$	$227 \cdot 17/h - 0.27$	$21 < h \leq 45$	0.2	$10 \leq h \leq 50$	$0.25 \cdot 10/h + 0.25$
Note: The compatibility level for the total harmonic distortion is THD = 8%					

7. Voltage Fluctuations

7.1 Flicker

- i) The Project Company must ensure that, irrespective of the operating status of the Solar Park Facility, it does not contribute to the flicker at the PoC above the limits indicated in the following table.

(Allowed voltage fluctuations are limited to indicative values of planning levels given in Table 2 of Clause 4.2.1 of IEC 61000-3-7 -Voltage fluctuation).

Description	Limit
Pst	0.45
Plt	0.35

- ii) Project Company shall evaluate short term and long-term flicker contribution of the Solar Park Facility to the CEB System and design Solar Park Facility such that fluctuations do not exceed the allowed limits.
- iii) Flicker analysis for the Solar Park Facility shall be conducted by the Project Company study reports shall be submitted to the CEB during the design stage of the Project.
- iv) It is the responsibility of the Project Company to conduct at least 2 weeks of background flicker measurements as per TR IEC 61000-3-7: 2012 for flicker analysis. If the Project Company fails to conduct adequate background flicker measurements, then the post commissioning flicker measurements must be below the flicker levels in the above table.



**EXPRESSION OF INTEREST (EOI) FOR
SHORTLISTING OF BALANCE OF SYSTEM (BOS)
VENDOR FOR 50 MW GROUND MOUNTED SPV
PROJECT IN SRI LANKA**

PS-439-1442

Rev No: 00

- v) The Project Company shall measure and ensure that fluctuations do not exceed the allowed limits after the connection of the Solar Park Facility to the CEB System.
- vi) The flicker assessment procedure shall be accordance with TR IEC 61000.3.7: 2012 clause 4.2.2 “Assessment procedure for evaluation against planning levels”.

7.2 Rapid Voltage Fluctuation

The Project Company must ensure that, irrespective of the operating status of the Solar Park Facility, it does not produce rapid voltage fluctuations above the limits given in the following table. The guidelines relating to rapid voltage fluctuations are given in TR IEC 61000-3-7: 2012.

Number of changes (n)	$\Delta U/UN$ % MV
$n \leq 4$ per day	5-6
$n \leq 2$ per hour and > 4 per day	4
$2 < n \leq 10$ per hour	3

8. Unbalanced Loading Capability

Design of the Solar Park Facility shall enable it to remain synchronized in the CEB System under voltage unbalance as specified in IEC 60034-1 or Clause 6.5 of IEC 61400-1, whichever is the highest.

In addition, under unbalanced fault conditions in the CEB System, Solar Park Facility shall be capable of withstanding the resulting negative sequence loading and also remain connected to the CEB System, until the fault is cleared.

9. Power Factor Variation/ Reactive Power Capability

The Solar Park Facility shall be capable of continuously delivering reactive power to the CEB System at the Interconnection Point in accordance with clause 3.17.1.3 of the Grid Code.



**EXPRESSION OF INTEREST (EOI) FOR
SHORTLISTING OF BALANCE OF SYSTEM (BOS)
VENDOR FOR 50 MW GROUND MOUNTED SPV
PROJECT IN SRI LANKA**

PS-439-1442

Rev No: 00

10. Load Following Capability / Dispatchability

- i) Solar Park Facility shall have the capability of providing frequency control ancillary service (i.e. load following capability) in accordance with clause 3.17.1.6 & 3.17.1.7 of the Grid Code.
- ii) The Solar Park Facility shall be capable of reducing the active power output with adjustable Speed Drop settings in the range of 3% to 10%.
- iii) Solar Park Facility must be controllable in terms of active power output according to the requirements of the CEB System Control Centre with a view to counteracting a risk or disturbance of the system imbalance. It must then be possible to reduce the power output under any operating condition and from any working point to a target value defined by the CEB System Control Centre. This target value will be given by the CEB System Control Centre at the Interconnection Point. The reduction of the power output of the Solar Park Facility to the target value must take place with at least 10% of the power output per minute without disconnection of the plant from the CEB System.

11. Allowable Rate of Change of Active Power Output Due to Resource Side Variation

Change to active power output due to change in resource side (such as passing cloud) must not exceed the following values.

- (a) Upward – Maximum 3% per minute
- (b) Downward – Maximum 3% per minute

The Project Company undertakes to include a sufficient battery energy storage system to realize the above.

12. Fault Ride-through Capability

Solar Park Facility shall be capable of remaining synchronized with the CEB System during and following any symmetrical or asymmetrical fault/disturbance in the CEB System or the Solar Park



**EXPRESSION OF INTEREST (EOI) FOR
SHORTLISTING OF BALANCE OF SYSTEM (BOS)
VENDOR FOR 50 MW GROUND MOUNTED SPV
PROJECT IN SRI LANKA**

PS-439-1442

Rev No: 00

Facility's internal network resulting in voltage dips or rises at the Interconnection Point in accordance with clause 3.17.3 of the Grid Code.

13. Current Distortion Limits

Allowed current distortion is limited to the current distortion limits described in clause 6, 7, 8 and 9 of IEC 61000-3-6 (Harmonics).

Measurement and evaluation and preparation of reports of the current harmonic distortion shall be carried out as per IEC 61000-3-6.

14. Emission Limits of Fluctuating Loads

Allowed emission is limited to the emission limits described in clause 6, 7, 8 and 9 of IEC 61000-3-7 (Voltage fluctuation).

Measurement and evaluation of the emissions shall be carried out as per IEC 61000-3-6.

Measurement and evaluation reports shall be prepared as per IEC 61000-3-7.

15. Protection Arrangements and Fault Level Considerations

- i) Protection schemes of the Solar Park Facility should be properly coordinated with the protection systems of the CEB System.
- ii) Solar Park Facility shall be provided with protection against grid disturbances/ abnormalities and against internal faults within the Solar Park Facility.
- iii) At the request of the Project Company, the CEB will provide all necessary information including maximum and minimum fault levels, maximum clearance times, autoreclosing or sequential switching features iv) Project Company shall obtain the CEB's approval for the protection systems employed. Relay setting calculations and the proposed system related settings shall be submitted to the CEB for approval.
- v) Protection schemes employed in the Solar Park Facility shall have appropriate backup protection schemes and breaker fail schemes.



**EXPRESSION OF INTEREST (EOI) FOR
SHORTLISTING OF BALANCE OF SYSTEM (BOS)
VENDOR FOR 50 MW GROUND MOUNTED SPV
PROJECT IN SRI LANKA**

PS-439-1442

Rev No: 00

16. Equipment Standards

All equipment used up to the Interconnection Point shall conform to applicable statutory obligations and comply with the Minimum Functional Specifications and relevant IEC standards of latest editions.

17. Neutral Grounding

The Project Company shall submit a design proposal for the review of the CEB ensuring that the neutral grounding of the Solar Park Facility is compatible with that of the CEB System.

Any instructions provided by the CEB on this regard shall be duly incorporated in to the design.

18. Metering

Metering and associated equipment of the Solar Park Facility shall be supplied and installed at the Interconnection Point by the Project Company.

Meters shall comply with the Applicable Codes and Standards.

It is necessary to install power quality meters, which are capable of recording 1024 samples per cycle for one (1) year, at two 33 kV feeders to monitor post commissioning power quality.

19. Synchronizing

Solar Park Facility shall be capable of automatic, unattended operation unless manual overriding is enabled for local manual controlling. The Solar Park Facility shall be automatically synchronized to the CEB System without exceeding the generating current 1.5 times of full load current.

20. Technical Data and Dynamic Model Requirements

During the Preliminary Period, the Project Company shall supply to CEB the technical and dynamic model data for a system study for the impact of the Solar Park Facility connection to the CEB System.

The technical data requirements are as specified in CEB's Data and Model Requirements to be

Complied by Inverter Based Renewable Energy Plants (March 2023 Version)



**EXPRESSION OF INTEREST (EOI) FOR
SHORTLISTING OF BALANCE OF SYSTEM (BOS)
VENDOR FOR 50 MW GROUND MOUNTED SPV
PROJECT IN SRI LANKA**

PS-439-1442

Rev No: 00

21. Required SCADA & Telecommunications for Solar Park Facility

All the signals related to Solar Park Facility and its controllers shall be configured as per the IEC 60870 – 5 – 104 protocol with typical signal list given in Attachment 2 of Schedule 5. Gateway configuration parameters are given in Attachment 3 of Schedule 5. The communication interfaces shall be configured as in Attachment 4 of Schedule 5. Finalized Signal List shall be submitted at least 02 weeks prior to the Commissioning. Configuration of CEB System Control Center SCADA master station for integration of the signals shall be done by the CEB. The integrated signals shall be tested up to the NSCC by the Project Company. The separate remote control level for CEB System Control Center operations and interlocking operations shall be activated for the v CEB System Control Center operations. Simulations of any signals shall not be accepted.

Final configuration of database, project file and gateway image (Acronis true image) and backup files shall be submitted in the form of Portable external hard disk.

The telecommunications facility shall be compatible with the international standard system and common practices of a solar power plant development and shall be equipped with, fixed-line telecommunications with PABX facility; Wireless communications; Fiber optic line from the Solar Park Facility up to the Interconnection Point; Direct link communications with the CEB System Control Centre.

Project Company is required to install a separate fiber optic communication link from Solar Park Facility Gateway to the Collector substation using a fiber optic cable containing 24 number of single mode fiber cores suitable for transmission of 1310nm and 1520nm optical wavelength and shall in conformity with ITU-T recommendations G.652.D.

Suitable distribution frame / patch panels with single mode pig tail (FC) terminations shall be installed at two ends of FO cable and FO cable to be terminated at the patch panel.



**EXPRESSION OF INTEREST (EOI) FOR
SHORTLISTING OF BALANCE OF SYSTEM (BOS)
VENDOR FOR 50 MW GROUND MOUNTED SPV
PROJECT IN SRI LANKA**

PS-439-1442

Rev No: 00

The communication link shall be interfaced to the FO multiplexer at collector substation using fiber patch cord through a suitable DC powered firewall.

An IP phone shall be made available at solar park facility to provide voice communication facilities with National System Control Center (NSCC).

Specifications of the IP phone and firewall shall be subjected to the reviewing and approval of CEB.

Project Company shall use only the space allocated for energy meter panel inside the Collector Substation for installing the Energy Meters as well as installing the necessary SCADA and Communications equipment.

2.5. INSTRUCTIONS

- **Language:** All correspondences and documents related to the EOI response shall be in English language, provided that any printed literature furnished by the prospective bidder may be written in another language, as long as such literature is accompanied by a translation of its pertinent passages in English language in which case, for purposes of interpretation of the bid, the English translation shall govern.
- The response shall necessarily be accompanied with following details:
 1. Company Background
 2. Mandatory documents as per clause 2.6 above.
 3. Reference list of Customers
 4. Audited Annual Accounts along with Statutory Auditor's report for last 3 (three) years
- The prospective Bidder shall abide by the terms & conditions, as applicable, of the EOI.
- All pages of the response against this EOI shall be duly signed by the authorised signatory.
- BHEL at its discretion shall inspect the prospective bidder's works/office/reference site premises for the purpose of evaluation, as deemed necessary before selection of bidder. BHEL decision in this regard shall be final.
- Any prospective Bidder which has been debarred/blacklisted by Central/State Governments or by any entity controlled by Central/State Governments from participating in any of their project, as on date of submission of EOI, shall not be eligible to submit the EOI.
- The Bidder response shall necessarily be accompanied with details on company background, product profile, and relevant certificates and documents.



**EXPRESSION OF INTEREST (EOI) FOR
SHORTLISTING OF BALANCE OF SYSTEM (BOS)
VENDOR FOR 50 MW GROUND MOUNTED SPV
PROJECT IN SRI LANKA**

PS-439-1442

Rev No: 00

2.6. CONFLICT OF INTEREST

Bidder shall not have a conflict of interest that affects the final Market tender bidding process. Any/all Bidders found to have a conflict of interest shall be disqualified. A Bidder may be considered to have a conflict of interest, if

- (a) Prospective Bidder is also engaged by other potential competitor.
- (b) Prospective Bidder lends, or temporarily seconds its personnel to other potential competitor organizations.
- (c) Any other conflict of interest criteria specified in the RFP.

2.7. PROCESS TO BE CONFIDENTIAL:

Information relating to the examination, clarification, evaluation and comparison of EOI and recommendations shall not be disclosed. Any effort by Prospective Bidder to influence BHEL in processing of EOI or selection decisions may result in the rejection of the response against EOI.

In case any amendment/corrigendum to this EOI is issued, it shall be notified only at www.bhel.com .

2.8 GOVERNING LAWS & JURISDICTION:

The EOI process shall be governed by, and construed in accordance with the laws of India and the Courts at New Delhi (India) shall have exclusive jurisdiction over all disputes arising under, pursuant to and/or in connection with the EOI process.
