



**Basic Details**

Organisation Chain	ANERT		
Tender Reference Number	ANERT-TECH/41/2024-PE1(RTS)		
Tender ID	2024_ANERT_687282_1	Withdrawal Allowed	Yes
Tender Type	Open Tender	Form of contract	EPC Contract
Tender Category	Works	No. of Covers	2
General Technical Evaluation Allowed	No	ItemWise Technical Evaluation Allowed	No
Payment Mode	Online	Is Multi Currency Allowed For BOQ	No
Is Multi Currency Allowed For Fee	No	Allow Two Stage Bidding	No

**Payment Instruments**

Online Bankers	S.No	Bank Name
	1	SBI MOPS

**Cover Details, No. Of Covers - 2**

Cover No	Cover	Document Type	Description
1	Fee/PreQual/Technical	.pdf	PQ Documents
		.pdf	Technical Bid
2	Finance	.xls	Financial Bid
		.pdf	Financial Bid

**Tender Fee Details, [Total Fee in ₹ \* - 59,000]**

Tender Fee in ₹	59,000		
Fee Payable To	Nil	Fee Payable At	Nil
Tender Fee Exemption Allowed	Yes		

**EMD Fee Details**

EMD Amount in ₹	0.00	EMD Exemption Allowed	No
EMD Fee Type	fixed	EMD Percentage	NA
EMD Payable To	Nil	EMD Payable At	Nil

**Work / Item(s)**

Title	Invitation of Expression of Interest (EoI) for the Pilot Implementation of Battery Energy Storage System at Government Medical College Campus, Thiruvananthapuram (funded by Smart City Thiruvananthapuram Ltd)				
Work Description	Invitation of Expression of Interest (EoI) for the Pilot Implementation of Battery Energy Storage System at Government Medical College Campus, Thiruvananthapuram (funded by Smart City Thiruvananthapuram Ltd)				
Pre Qualification Details	Please refer Tender documents.				
Independent External Monitor/Remarks	NA				
Tender Value in ₹	NA	Product Category	Electrical Works	Sub category	NA
Contract Type	Tender	Bid Validity(Days)	180	Period Of Work(Days)	180
Location	Government Medical College Campus, Thiruvananthapu	Pincode	695015	Pre Bid Meeting Place	NA
Pre Bid Meeting Address	NA	Pre Bid Meeting Date	NA	Bid Opening Place	Online
Should Allow NDA Tender	No	Allow Preferential Bidder	No		

**Critical Dates**

Publish Date	22-Aug-2024 06:00 PM	Bid Opening Date	13-Sep-2024 04:00 PM
Document Download / Sale Start Date	22-Aug-2024 06:00 PM	Document Download / Sale End Date	13-Sep-2024 03:00 PM
Clarification Start Date	NA	Clarification End Date	NA
Bid Submission Start Date	22-Aug-2024 06:00 PM	Bid Submission End Date	13-Sep-2024 03:00 PM

**Tender Documents**

<b>NIT Document</b>	<b>S.No</b>	<b>Document Name</b>	<b>Description</b>	<b>Document Size (in KB)</b>
	1	Tendernotice_1.pdf	NIT and Abstract	272.69

  

<b>Work Item Documents</b>	<b>S.No</b>	<b>Document Type</b>	<b>Document Name</b>	<b>Description</b>	<b>Document Size (in KB)</b>
	1	Tender Documents	BESS.pdf	EoI Document	928.01
2	BOQ	BOQ_1069420.xls	Financial Bid	379.00	

**Tender Inviting Authority**

<b>Name</b>	CEO ANERT
<b>Address</b>	Office of CEO, ANERT Law College Road, Vikas Bhavan. PO, Thiruvananthapuram - 695 033



**AGENCY FOR NEW & RENEWABLE ENERGY  
RESEARCH AND TECHNOLOGY (ANERT)**

Department of Power, Government of Kerala  
Thiruvananthapuram, Kerala – 695 033;  
[www.anert.gov.in](http://www.anert.gov.in) , [projects@anert.in](mailto:projects@anert.in)

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## **E-EOI DOCUMENT**

*Invitation of Expression of Interest (EoI) for  
the Pilot Implementation of Battery Energy  
Storage System at Government Medical College  
Campus, Thiruvananthapuram (funded by  
Smart City Thiruvananthapuram Ltd)*

**Ref. No.: ANERT-TECH/84/2024-PE1(RTS)**

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### **PART – 1: GENERAL CONDITIONS**

**Date of Publishing of Bids** : - 22/08/2024

**Last Date of Submission of Bids** : - 13/09/2024

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## EOI NOTICE

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EoIs in two cover system with Earnest Money Deposit (EMD) are invited from reputed OEMs / EPCs, with relevant experience in Design and Installation in the relevant sector in the ***Invitation of Expression of Interest (EoI) for the Pilot Implementation of Battery Energy Storage System at Government Medical College Campus, Thiruvananthapuram (funded by Smart City Thiruvananthapuram Ltd)***. The e-EoI documents can be downloaded from the e-Tendering website of Govt. of Kerala – [www.etenders.kerala.gov.in](http://www.etenders.kerala.gov.in). The EoI form will not be available in any other form.

Thiruvananthapuram

CEO

22/08/2024

## ABSTRACT

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Ref. No.	<b>ANERT-TECH/41/2024-PE1(RTS)</b>
Name of Work	<b>Invitation of Expression of Interest (EoI) for the Pilot Implementation of Battery Energy Storage System at Government Medical College Campus, Thiruvananthapuram (funded by Smart City Thiruvananthapuram Ltd)</b>
Download of EoI Form	<a href="http://www.etenders.kerala.gov.in">http://www.etenders.kerala.gov.in</a>
Last date of submission of bids	13/09/2024 @ 1.00 PM
Date and Time of opening the bids	13/09/2024 @ 2.00 PM
Cost of EoI form	<b>Rs. 59,000/- (Including GST)</b>
Period of Warranty	10 Years from the date of Commercial operation
Availability of EoI Forms	Website <a href="http://www.etenders.kerala.gov.in">http://www.etenders.kerala.gov.in</a>
Place of opening of EoI	Office of CEO, ANERT Law College Road, Vikas Bhavan. PO, Thiruvananthapuram - 695 033, Kerala

Thiruvananthapuram  
22/08/2024

Sd/-  
CEO

# GENERAL TERMS AND CONDITIONS FOR E-PROCUREMENT

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This e-EoI is being published by ANERT inviting Invitation of Expression of Interest (EoI) for the Pilot Implementation of Battery Energy Storage System at Government Medical College Campus, Thiruvananthapuram (funded by Smart City Thiruvananthapuram Ltd). The EoI is invited in two cover system through e-procurement portal of Government of Kerala ([www.etenders.kerala.gov.in](http://www.etenders.kerala.gov.in)). The Prospective bidders willing to participate in this EoI shall necessarily register themselves with above mentioned e-procurement portal.

The EoI timeline is available in the critical date section of this EoI published in [www.etenders.kerala.gov.in](http://www.etenders.kerala.gov.in)

## 1. ONLINE BIDDER REGISTRATION PROCESS:

- 1.1 Bidders should have a Class III or above Digital Signature Certificate (DSC) to be procured from any Registration Authorities (RA) under the Certifying Agency of India. Details of RAs will be available on [www.cca.gov.in](http://www.cca.gov.in). Once, the DSC is obtained, bidders have to register on [www.etenders.kerala.gov.in](http://www.etenders.kerala.gov.in) website for participating in this EoI. Website registration is a one-time process without any registration fees. However, bidders have to procure DSC at their own cost.
- 1.2 Bidders may contact e-Procurement support desk of Kerala State IT Mission over telephone at 0471- 2577088, 2577188, 2577388 or 0484 – 2336006, 2332262 - through email: [helpeoI@gmail.com](mailto:helpeoI@gmail.com)/[eEoIshelp@kerala.gov.in](mailto:eEoIshelp@kerala.gov.in) for assistance in this regard

## 2. ONLINE PROCESS:

The EoI process shall consist of the following stages:

- i. Downloading of EoI document: The EoI document will be available for free download on [www.etenders.kerala.gov.in](http://www.etenders.kerala.gov.in). However, EoI document fees shall be payable at the time of bid submission as stipulated in this EoI document.



- ii. Pre-bid meeting: (will be updated in ANERT website – [www.anert.gov.in](http://www.anert.gov.in))
- iii. Publishing of Corrigendum: All corrigenda shall be published on [www.etenders.kerala.gov.in](http://www.etenders.kerala.gov.in) and shall not be available elsewhere.
- iv. Bid submission: Bidders have to submit their bids along with supporting documents to support their eligibility, as required in this EoI document on [www.etenders.kerala.gov.in](http://www.etenders.kerala.gov.in). No manual submission of bid is allowed and manual bids shall not be accepted under any circumstances.
- v. In case bidder encounters any technical issues pertaining to e-Procurement system while acting on the EoI, computer screen shot of the error message with date & time stamp on the web-browser along with the query shall be e-mailed by the bidder to the help desk (**[helpetenders@gmail.com](mailto:helpetenders@gmail.com)**/**[etendershelp@kerala.gov.in](mailto:etendershelp@kerala.gov.in)**), for resolution of the problem. At the same time, problem must be intimated to the concerned EoI Inviting Authority via email.
- vi. The time taken to ascertain, evaluate and suggest a solution for the problem reported by bidder may vary from case to case. Hence bidders are advised to submit the bid **at least 2 working days before the due date** and time of bid submission to avoid any last-minute issues that may come up.
- vii. Opening of Bid and Bidder short-listing: The single cover bids will be opened, evaluated and shortlisted as per the eligibility. Failure to submit the required documents online will attract disqualification. Price bids of the eligible bidder's will open the same day of opening and the work will be awarded.

### **3. DOCUMENTS COMPRISING BID:**

#### **3.1 (a) The First Stage - Pre- Qualification cum Technical Bid with Commercial terms**

Technical proposal shall contain the scanned copies of the following documents which every bidder has to upload:

**Cover 1** shall contain, Part-I (this document in PDF form)/scanned copies of:

- i. EoI documents downloaded (signed with office seal)
- ii. Summary of Bid qualification requirement (Annexure A)

- iii. Undertaking of the agency in the prescribed format (Annexure B) on Govt. of Kerala stamp paper worth Rs.200/-
- iv. Power of Attorney for the authorised signatory to sign the documents on behalf on the Consultancy firm.
- v. Copy of Registration Certificate of the bidder firm
- vi. Copy of GST Certificate
- vii. Copy of PAN card / TAN
- viii. Documents proving Previous Experience and Pre-Qualification
- ix. Declaration by the bidder (format as in Annexure – D)
- x. Declaration of relationship with ANERT employee (format as in Annexure - E)
- xi. Undertaking for No Blacklisting & No Banning (Annexure - F)

3.2 The department doesn't take any responsibility for any technical snag or failure that has taken place during document upload.

#### 4. DOCUMENT FEES

4.1 The Bidder shall pay a fee of Rs. 59,000/-. MSMEs, MSEs or NSIC registered agencies are exempted from payment of this fee.

4.2 Online Payment modes: The fees can be paid in through e-Payment facility provided by the e-Procurement system. Bidders can make payment only via Internet banking facility.

**State Bank of India Multi Option Payment System (SBI MOPS Gateway)**: Bidders are required to avail Internet Banking Facility in any of below banks for making EoI remittances in eProcurement System.

<b>A) Internet Banking Options (Retail)</b>			
1	Allahabad Bank	32	Kotak Mahindra Bank
2	Axis Bank	33	Lakshmi Vilas Bank
3	Andhra Bank	34	Mehsana Urban Co-op Bank
4	Bandan Bank	35	NKGSB Co-operative Bank
5	Bank of Bahrain and Kuwait	36	Oriental Bank of Commerce
6	Bank of Baroda	37	Punjab and Maharashtra Cooperative Bank

7	Bank of India	38	Punjab National Bank
8	Bank of Maharashtra	39	Punjab and Sind Bank
9	Bassein Catholic Co-operative Bank	40	RBL Bank
10	BNP Paribas	41	Saraswat Cooperative Bank
11	Canara Bank	42	ShamraoVithal Cooperative Bank
12	Catholic Syrian Bank	43	South Indian Bank
13	Central Bank of India	44	Standard Chartered Bank
14	City Union Bank	45	State Bank of India
15	Corporation Bank	46	Syndicate Bank
16	Cosmos Bank	47	Tamilnad Mercantile Bank
17	DCB Bank	48	Tamilnadu Cooperative Bank
18	Dena Bank	49	The Kalyan Janata Sahakari Bank
19	Deutsche Bank	50	TJSB Bank
20	Dhanalaxmi Bank	51	UCO Bank
21	Federal Bank	52	Union Bank of India
22	HDFC Bank	53	United Bank of India
23	ICICI Bank	54	Vijaya Bank
24	IDBI Bank	55	YES Bank
25	Indian Bank		
26	Indian Overseas Bank		
27	IndusInd Bank		
28	Jammu & Kashmir Bank		
29	Janata Sahakari Bank		
30	Karnataka Bank		
31	Karur Vysya Bank		
<b>B) Internet Banking Options (Corporate)</b>			
1	Bank of Baroda	21	Laxmi Vilas Bank
2	Bank of India	22	Oriental Bank of Commerce
3	Bank of Maharashtra	23	Punjab & Maharashtra Coop Bank
4	BNP Paribas	24	Punjab & Sind Bank

5	Canara Bank	25	Punjab National Bank
6	Catholic Syrian Bank	26	RBL Bank
7	City Union Bank	27	Shamrao Vitthal Co-operative Bank
8	Corporation Bank	28	South Indian Bank
9	Cosmos Bank	29	State Bank of India
10	Deutsche Bank	30	Syndicate Bank
11	Development Credit Bank	31	UCO Bank
12	Dhanalaxmi Bank	32	Union Bank of India
13	Federal Bank	33	UPPCL
14	HDFC Bank	34	Vijaya Bank
15	ICICI Bank	35	Axis Bank
16	Indian Overseas Bank		
17	Janta Sahakari Bank		
18	Jammu & Kashmir Bank		
19	Karur Vysya Bank		
20	Kotak Bank		

During the online bid submission process, bidder shall select **SBI MOPS** option and submit the page, to view the **Terms and Conditions** page. On further submitting the same, the e-Procurement system will re-direct the bidder to MOPS Gateway, where two options namely **SBI** and **Other Banks\*** will be shown. Here, Bidder may proceed as per below:

- a) **SBI Account Holders** shall click **SBI** option to with its Net Banking Facility, where bidder can enter their internet banking credentials and transfer the EoI Fee and EMD amount.
- b) **Other Bank Account Holders** may click **Other Banks** option to view the bank selection page. Here, bidders can select from any of the 54 Banks to proceed with its Net Banking Facility, for remitting EoI payments.

*\*Transaction Charges for Other Banks vide SBI Letter No. LHO/TVM/AC/2016-17/47 – 1% of transaction value subject to a minimum of Rs. 50/- and maximum of Rs. 150/-*

*\* Bidders who are using Other Banks option under SBI MOPS Payment Gateway, are advised by SBI to make online payment 72 hours in advance before EoI closing time.*

## **5. SUBMISSION PROCESS:**

- 5.1 For submission of bids, all interested bidders have to register online as explained above in this document. After registration, bidders shall submit their Technical bid online on [www.etenders.kerala.gov.in](http://www.etenders.kerala.gov.in) along with online payment of fees. They are also required to fill the form available in the ANERT website.
- 5.2 For page-by-page instructions on bid submission process, please visit [www.etenders.kerala.gov.in](http://www.etenders.kerala.gov.in) and click “Bidders Manual Kit” link on the home page.
- 5.3 It is necessary to click on “Freeze bid” link/ icon to complete the process of bid submission otherwise the bid will not get submitted online and the same shall not be available for viewing/ opening during bid opening process.

## **6. BID VALIDITY**

- 6.1 The bid will be valid for a period of 6 months from the date of opening of bids

## **7. DEVIATIONS**

- 7.1 The offers with Deviations in Commercial terms and Technical Terms of the EoI Document are liable for rejection.

## **8. BLACK LIST**

- 8.1 All the intending bidders shall agree that in the event of the documents furnished with the offer being found to be bogus or the documents contain false particulars, they shall be blacklisted for future EoIs/ association with ANERT

## **9. BIDDER'S LOCATION**

- 9.1 The bidders are requested to furnish the exact location of their registered office with detailed postal address and pin code, telephone and fax nos. etc. in their EoIs to arrange inspection by ANERT, if considered necessary.
- 9.2 All communication shall be made to the registered email of the bidder in the e-tender systems and ANERT shall not be responsible for non-receipt or delay of any such communication.

## **10. CORRUPT AND FRAUDULENT PRACTICES**

ANERT requires compliance with its policy in regard to corrupt and fraudulent/prohibited practices as set forth in this proposal. In further pursuance of this policy, the selected service Provider(s) shall permit ANERT or its representatives to inspect the accounts, records and other documents relating to the submission of the Proposal and execution of the contract, in case of award, and to have the records inspected by ANERT.

## **11. CONFLICT OF INTEREST**

- i. The service Provider(s) is required to provide professional, objective, and impartial services, at all times holding ANERT's interests paramount, strictly avoiding conflicts with other assignments or its own corporate interests, and acting without any consideration for future work. The consultant has an obligation to disclose to ANERT any situation of actual or potential conflict that impacts its capacity to serve the best interest of ANERT. Failure to disclose such situations may lead to the disqualification of the supplier or the termination of its Contract and/or sanctions by the Government.
- ii. Relationship with the ANERT staff: a service Provider (including its subsidiaries /partners) that has a close business or family relationship with a professional staff of the ANERT who are directly or indirectly involved in any part of the preparation of the Terms of Reference for the assignment, the selection process for the Contract, or the supervision of the Contract, may not be awarded a Contract, unless the conflict stemming from this relationship has been resolved in a manner acceptable to ANERT throughout the selection process and the execution of the Contract. Any other types of conflicting relationships as indicated in the EOI

## **12. CONFIDENTIALITY**

- i. From the time the Proposals are opened to the time the Contract is awarded, the agency (ies) should not contact any of the officials of ANERT on any matter related

to its Technical Proposal. Information relating to the evaluation of Proposals and award recommendations shall not be disclosed to the agency (ies) who submitted the Proposals or to any other party not officially concerned with the process, until the publication of the Contract award information.

- ii. Any attempt by the agency (ies) or anyone on behalf of the bidders to influence improperly ANERT in the evaluation of the Proposals or Contract award decisions may result in the rejection of its Proposal and may be subject to the application of prevailing Government sanctions procedures.
- iii. Notwithstanding the above provisions, from the time of the Proposals" opening to the time of Contract award publication, if a agency (ies) intends to contact ANERT on any matter related to the selection process, it should do so only in writing.
- iv. The Bids should be submitted only through the e-EoI portal [www.etenders.kerala.gov.in](http://www.etenders.kerala.gov.in). Agency (ies) shall upload all the necessary documents in the e EoI portal before the last date & time for online submission. Proposal received after the submission deadline will be treated as non-responsive and will be excluded from further evaluation process.
- v. Proposals must be direct, concise, and complete. ANERT will evaluate bidder's proposal based on its clarity and the directness of its response to the requirements of the project as outlined in this EoI document. Bidders shall furnish the required information on their technical and financial proposals in the enclosed formats only. Any deviations in format or if the proper information is not provided properly, the EoI will be liable for rejection. EoI Evaluation committee may seek clarification, if required, while evaluating the proposal.
- vi. The technical bid opening date, time and the address are as stated in the EoI document.

### **13. APPLICABLE LAW**

This EoI shall be governed by the laws and procedures established by Government of Kerala, within the frame work of applicable legislation and enactment made from time to time concerning such commercial dealings. Any default in the terms and conditions of the document by the service provider will lead to rejection of work order.

#### **14. AMENDMENT OF EOI DOCUMENT**

At any time prior to the deadline for submission of the EoI, ANERT may for any reason, modify the EoI document. The amendment document/ corrigendum shall be notified through the website [www.etenders.kerala.gov.in](http://www.etenders.kerala.gov.in) and such amendments shall be binding on all the bidders.

#### **15. GOVERNMENT OF KERALA – CORRUPT AND FRAUDULENT PRACTICES**

ANERT follows the policy of the Government of Kerala for anti-corruption and fraudulent practices to maintain sound procurement principles of open competition, economy and efficiency, transparency, and fairness. ANERT requires the agency (ies) to observe the following Government manuals (amended from time-to-time) during the selection process and in execution of such contracts The Kerala Financial Code (KFC), 2008 (7th Edition, 1st Edition was in 1963), The Stores Purchase Manual (SPM), 2013.





**AGENCY FOR NEW & RENEWABLE ENERGY  
RESEARCH AND TECHNOLOGY (ANERT)**

Department of Power, Government of Kerala  
Thiruvananthapuram, Kerala – 695 033;  
[www.anert.gov.in](http://www.anert.gov.in) , [projects@anert.in](mailto:projects@anert.in)

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## **E-EOI DOCUMENT**

***Invitation of Expression of Interest (EoI) for the  
Pilot Implementation of Battery Energy  
Storage System at Government Medical College  
Campus, Thiruvananthapuram (funded by  
Smart City Thiruvananthapuram Ltd)***

**Ref. No.: ANERT-TECH/41/2024-PE1(RTS)**

### **PART – 2: REGISTRATION PROCEDURE**

**Date of Publishing of Bids : - 22/08/2024**

**Last Date of Submission of Bids : - 13/09/2024**

## SELECTION OF AGENCY

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### 16. GENERAL

- 16.1 This Expression of Interest is being invited by ANERT from competent and eligible agencies/firms who fulfil the eligibility criteria prescribed in this document for the Pilot implementation of Battery Energy Storage System (ESS) with PCU for powering the load mentioned in this document.
- 16.2 The applicant should not have any pending litigation with ANERT or any other Government agency within the Country.
- 16.3 ANERT will not have any liability to any prospective Consultancy Company / Firm/ Consortium / Entity or person under any laws (including without limitation the law of contract, tort), the principles of equity, restitution or unjust enrichment or otherwise for any loss, expense or damage which may arise from or be incurred or suffered in connection with anything contained in this EoI document, any matter deemed to form part of this EoI document, the award of the Assignment, the information and any other information supplied by or on behalf of ANERT or its employees, any consultants or otherwise arising in any way from the selection process. ANERT will also not be liable in any manner whether resulting from negligence or otherwise however caused arising from reliance of any Applicant upon any statements contained in this RFP.

### 17. INTRODUCTION

ANERT is planning to implement a 250 kW Battery Energy Storage System (BESS) on pilot mode using the Financial Assistance from Smart City Thiruvananthapuram Ltd, which would function as a reference / demo installation for all the stakeholders in the State. INDIA is moving aggressively towards Renewable Energy and for enabling Round the Clock (RTC) from Renewables, some sort of Energy Storage System is necessary. The city of Thiruvananthapuram is being developed as Solar City, and mere Solarization through On Grid systems may help us in attaining the tag, for RTC to be ensured, BESS is an essential component.

In this context, a working Pilot installation in the Solar City is proposed at GMCT Campus, Thiruvananthapuram. The system must be capable of providing back up to the Main block of GMCT Thiruvananthapuram, and the electricity for charging the BESS can be taken from the existing Solar Power plant. The BESS must have the feature of exporting from the storage at Peak Hours if required, with prior permission from KSEBL or concerned authorities.

## **18. SCOPE OF WORK**

The Scope of Supply & Work includes all design & engineering, procurement & supply of equipment and materials, testing at manufacturers works, multi – level inspections, packing and forwarding, supply, receipt, unloading and storage at site, associated civil works, services, permits, licences, installation and incidentals, insurance at all stages, erection, testing and commissioning of containerised Battery Energy Storage System and performance demonstration with associated equipment and materials on turnkey basis at GMCT Main Block, Thiruvananthapuram, Kerala.

- i. The system proposed must have provision to include minimum three sources of power – Solar, Utility power & Backup DG. The BESS system must have provision to manage the input source based on availability and must also be able to schedule based on ToD and should have scheduling capabilities.
- ii. The system shall consist of a 250 kW Bi-Directional PCS + Provision for connecting existing Solar and 500 kWh Lithium Battery Storage System, which shall provide uninterrupted power to the output even at failure of 30% of the battery modules. The total system shall be designed for mobile or stationary use in a modular container divided into battery room and PCS room with all requisite fire protecting equipment and Air conditioner-based cooling. The proposed system must have a Power Monitoring System (PMS) with to monitor and control all the functions of BESS.
- iii. The system will power the building on black outs and Power cuts. The output of the PCU is to be connected to main LT panel, which will act as the primary source of powering the building.

- iv. The PCU part adopts advanced modular digital control technology, which optimizes the control performance, improves the reliability of the system, and realizes uninterrupted switching between modes such as grid-connected discharge, grid-connected charging, and system off-grid operation. The PCU system has a wide DC input range, which can better suit the charging and discharging requirements of different battery combinations. Under the same power output, the diversity of battery pack connections is increased, and the number of parallel battery packs is reduced. It can better manage the battery, improve the life of the battery and the economic benefits of the energy storage system.
- v. The requisite civil works for accommodating the system, at the site is under the scope of the bidder.
- vi. The bidder is required to take necessary approvals from the Electrical Inspectorate and KSEBL as per norms to commission the system.
- vii. All associated civil and electrical works are under the scope of the bidder.

## 19. QUALIFICATION CRITERIA

19.1.1 An undertaking in Rs.200/- Kerala stamp paper as per the format given in Annexure IC must be submitted along with e-EoI document.

19.1.2 Power of Attorney for signing the documents has to be provided by the bidder. The documents signed by this authority only will be accepted for Expression of Interest and other documents submitted under this project. If the agency desires to change this authority fresh PoA has to be submitted.

### 19.2 Eligibility Requirement

19.2.1 The detail of eligibility requirements is provided in the table below. The bidders are required to furnish the required supporting documents along with the Technical Bid.

S. No.	Criteria	Documents Required
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1.1	<p>The Applicant should be a Legal Entity continuously operational since last 10 Years.</p> <p>i.e., Legal Entity of the firm i.e.,</p> <ul style="list-style-type: none"> <li>• Sole Proprietorship Private Limited</li> <li>• Public Sector Undertaking</li> <li>• Limited Company</li> <li>• Partnership firm</li> <li>• LLP</li> </ul>	<p>a) In case of Company – Copy of Registration / Incorporation Certificate issued by MCA</p> <p>b) In case of LLP – Copy of Deed of Partnership along with registration certificate issued by MCA</p> <p>c) In case of Partnership – Copy of Deed of Partnership</p> <p>d) In case of Sole Proprietor – Duly notarized Undertaking from Sole proprietor</p>
1.2	Bidder must have GST Registration	Copy of GST registration certificate with GSTIN.
1.3	The Bidder must have valid PAN Number	Copy of Pan Card
1.4	The bidder should have undertaken and completed at least one installation of BESS system within the Country	Details of installation available in India along with photographs and event log / summary of monitoring details available for the system.
1.5	If the bidder is not an OEM of BESS, authorization certificate along with a copy of agreement between bidder and OEM regarding service and maintenance support must be submitted. Further, at least two service engineers of the bidder must have completed factory training to ensure timely rectification of complaints at the site.	Copy of MoU between OEM and bidder along with authorisation for bidding in the tender. Copy of successful training completion by service engineers along with their EPF / ESIC details.
1.6	<p>The bidder should have a dedicated office in Thiruvananthapuram and personnel with prior experience in Solar / BESS / UPS to attend any complaints.</p> <p>In case, the bidder is not having a dedicated office, an undertaking to open an office within 30 days of award of work to be submitted.</p>	Details of office in Thiruvananthapuram

1.5	The Applicant entity should have a Minimum Average Annual Turnover of Rs. 7.5 Crores in any of two out of the last five financial years	Audited Statements of the Last 5 Financial years and Certificate as per Format
1.6	The bidder should be having unblemished record and must not be blacklisted or declared ineligible for corrupt & fraudulent practices by “any state/ central government” department/ company / entity” as on date of bid opening.	The bidder shall provide an Undertaking as per the format provided as Format A.

## CONDITIONS OF CONTRACT

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### 20. GENERAL CONDITIONS

- 20.1 The bids should be submitted online at [www.etenders.kerala.gov.in](http://www.etenders.kerala.gov.in)
- 20.2 The EoI should be as per the prescribed form which should be downloaded from the e-tender website. The cost of EoI forms if any, should be paid online, and once paid will not be refunded. EoI forms are not transferable. EoIs that are not in the prescribed form are liable to be rejected.
- 20.3 Intending bidders should submit their EoIs on or before the due date and time mentioned in the document.
- 20.4 EoIs subject to conditions will not be considered. They are liable to be rejected on that sole ground.
- 20.5 The final acceptance/rejection of the bids rests entirely with CEO, ANERT who do not bind themselves to accept the lowest or any tenderer.
- 20.6 In case the contractor becomes insolvent or goes into liquidation, or makes or proposes to make any assignment for the benefit of his creditors or proposes any composition with his creditors for the settlement of his debts, carries on his business or the contract under inspection or behalf of or his creditors or in case any receiving order(s) for the administration of his estate are made against him or in case the contractor shall commit any act of insolvency or in case in which under any clause or clauses any act of insolvency or in case in which under any clause(s) of this contract the contractor shall have rendered himself liable to damages amounting to the whole of his security deposits, the contract shall, thereupon, after notice given by the Purchasing Officer to the contractor, be determined and ANERT may complete the contract in such time and manner and by such persons as ANERT shall think fit. But such determination of the contract shall be without any prejudice to any right or remedy of ANERT against the contractor or his sureties in respect of any breach of contract committed by the contractor. All expenses and damages caused to ANERT by any breach of contract by the contractor shall be paid by the contractor to ANERT and may be

recovered from him under the provisions of the Revenue Recovery Act in force in the State.

20.7 In case the contractor fails to supply and deliver any of the said articles/services and things within the time provided for delivery of the same, or in case the contractor commits any breach of any of the covenants, stipulations and agreements herein contained, and on his part to be observed and performed, then and in any such case, it shall be lawful for ANERT (if they shall think fit to do so) to arrange for the purchase of the said articles and things from elsewhere or on behalf of ANERT by an order in writing under *the* hand of the CEO put an end to this contract and in case ANERT shall have incurred sustained or been put to any costs, damages or expenses by reason of such purchase or by reason of this contract having been so put an end to or in case any difference in price, compensation, loss, costs, damages, expenses or other moneys shall then or any time during the continuance of this contract be payable by the contractor to ANERT under and by virtue of this contract, it shall be lawful for ANERT from and out of any moneys for the time being payable or owing to the contractor from ANERT under or by virtue of this contract or otherwise to pay and reimburse to ANERT all such costs, damages and expenses they may have sustained, incurred or been put to by reason of the purchase made elsewhere or by reason of this contract having been so put an end to as aforesaid and also all such difference in price, compensation, loss, costs, damages, expenses and other moneys as shall for the time being payable by the contractor aforesaid.

20.8 Any sum of money due and payable to the contractor (including security deposit returnable to him) under this contract may be appropriated by the CEO or any other person authorised by ANERT and set off against any claim of ANERT for the payment of a sum of money arising out of or under any other contract made by the contractor with ANERT or any other person authorised by ANERT. Any sum of money due and payable to the successful tenderer from ANERT shall be adjusted against any sum of money due to ANERT from him under any other contracts.



- 20.9 Every notice hereby required or authorised to be given may be either given to the contractor personally or left at his residence or last known place of abode or business, or may be handed over to his agent personally, or may be addressed to the contractor by post at his usual or last known place of abode or business and if so addressed and posted, shall be deemed to have been served on the contractor on the date on which in the ordinary course of post, a letter so addressed and posted would reach his place of abode or business.
- 20.10 **Conditions in the technical document, technical specifications and special conditions of this EoI document would override these General Conditions, wherever applicable.**
- 20.11 **ANERT, by notice sent to the successful, may terminate the contract, in whole or in part, at any time for its convenience. The notice of termination shall specify that termination is for ANERT's convenience, the extent to which performance of the Supplier under the contract is terminated, and the date upon which such termination becomes effective.**
- 20.12 **The EoI shall be opened at the time and date announced in the Kerala Tenders portal, and the date for opening of price bid will be updated in the portal in due course after evaluation of the technical bids.**
- 20.13 **In case any difference or dispute arises in connection with the contract, all legal proceedings relating to the matter shall be instituted in the Court within whose jurisdiction the CEO, ANERT voluntarily resides.**
- 20.14 **The Courts situated at the place where the headquarters of ANERT is situated viz, Thiruvananthapuram alone will have jurisdiction to entertain civil suits and all other legal pertaining to this contract.**

## **21. SELECTION PROCESS FOR BIDDER**

There are two bid-opening events:

- a) Pre-Qualification cum Technical Bid
- b) Commercial Bid

The Commercial Bids of only those bidders will be opened who score equal to or more than qualifying marks in Technical Bid as decided by ANERT.

### 21.1 PRE-QUALIFICATION PROCESS

- a. The Bidders Pre-Qualification Proposal will be evaluated as per the requirements specified in the document and adopting the pre-qualification criteria spelt out. The Bidder is required to submit all required documentation in support of the pre-qualification criteria specified.
- b. The Bidder shall meet all the mandatory compliance requirements. Failure in meeting the mandatory compliance requirements will result in disqualification of the Bidder.
- c. An undertaking in Rs.200/- Kerala stamp paper as per the format given in Annexure B must be submitted online

### 21.2 Pre-Qualification Criteria

#	Criteria	Documents Required
1.1	The Applicant should be a Legal Entity continuously operational since last 10 Years. i.e., Legal Entity of the firm i.e., <ul style="list-style-type: none"> <li>• Sole Proprietorship Private Limited</li> <li>• Public Sector Undertaking</li> <li>• Limited Company</li> <li>• Partnership firm</li> <li>• LLP</li> </ul>	<ol style="list-style-type: none"> <li>a. In case of Company – Copy of Registration / Incorporation Certificate issued by MCA</li> <li>b. In case of LLP – Copy of Deed of Partnership along with registration certificate issued by MCA</li> <li>c. In case of Partnership – Copy of Deed of Partnership</li> <li>d. In case of Sole Proprietor – Duly notarized Undertaking from Sole proprietor</li> </ol>
1.2	Bidder must have GST Registration	Copy of GST registration certificate with GSTIN.
1.3	The Bidder must have valid PAN Number	Copy of PAN Card
1.4	The bidder should have undertaken and completed at least one installation of BESS system within the Country of minimum capacity of 150 kWh	Details of installation available in India along with photographs and event log / summary of monitoring details available for the system.

1.5	If the bidder is not an OEM of BESS, authorization certificate along with a copy of agreement between bidder and OEM regarding service and maintenance support must be submitted. Further, at least two service engineers of the bidder, must have completed factory training to ensure timely rectification of complaints at the site.	Copy of MoU between OEM and bidder along with authorisation for bidding in the tender. Copy of successful training completion by service engineers along with their EPF / ESIC details.
1.6	The bidder should have a dedicated office in Thiruvananthapuram and personnel with Graduate Engineering degree with prior experience in Solar / BESS / UPS to attend any complaints.  In case, the bidder is not having a dedicated office, an undertaking to open an office within 30 days of award of work to be submitted.	Details of office in Thiruvananthapuram and profile of Engineer available at office.
1.7	The bidder should be having unblemished record and must not be blacklisted or declared ineligible for corrupt & fraudulent practices by “any state/ central government” department/ company / entity” as on date of bid opening.	The bidder shall provide an Undertaking as per the format provided as Format A.

### 21.3 TECHNICAL QUALIFICATION

- a. ANERT will review the Technical bids to determine whether the technical bids are substantially responsive. Bids that are not substantially responsive are liable to be disqualified at ANERT’s discretion.
- b. The bidder’s technical solutions proposed in the bid document will be evaluated as per the requirements specified in this document.

### 21.4 Commercial Qualification

The Bidders shall quote for the entire scope of contract on an “overall responsibility” basis such that the total contract value covers all obligations of the Bidder mentioned in

or to be reasonably inferred from the Bidding documents in respect of providing the services. The Financial Bid shall be submitted in the format given as in the e-portal.

Prices quoted by the Bidder shall remain firm during the entire contract period and shall not be subject to variation on any account except change in applicable tax rates. A Bid submitted with an adjustable price quotation will be treated as non-responsive and rejected.

## **22. EVALUATION PROCESS**

ANERT shall evaluate the responses and scrutinize the supporting documentary evidence. Inability to submit the requisite supporting documents may lead to rejection. The decision of ANERT in the evaluation of proposals shall be final. No correspondence will be entertained outside the process of evaluation. Each of the responses/Proposals shall be evaluated as per the criteria and requirements specified in this tender document.

An Evaluation Committee will be constituted to evaluate the technical and financial proposals and recommend award of the works. The proposals will be evaluated in three stages.

### **22.1 Stage 1: - Pre-Qualification Cum Technical Bid**

- a. Each of the Pre-Qualification condition mentioned in Section 24.1 is MANDATORY. In case the Bidder does not meet any one of the conditions, the bidder will be disqualified.
- b. Response to the Pre-Qualification Requirements shall be evaluated in accordance with the requirements specified in this document; A checklist has to be created with proper page-wise indexing of all supporting documents
- c. ANERT will review the technical bids of the short-listed bidders to determine whether the technical bids are substantially responsive. Bids that are not substantially responsive are liable to be disqualified.

## 22.2 Stage 2: - Commercial Bid

- a. The bid should include all taxes, duties, fees, levies, works contract tax and other charges as may be applicable in relation to the activities proposed to be carried out.
- b. The taxes quoted in the offer should be as per the prevailing tax rates. Any subsequent increase in the tax rates or introduction of new tax will not be paid by ANERT. Similarly, if any benefits arising due to downward revision in tax rates, or any exemptions availed by the Bidders organization should be passed on to ANERT.

## 23 SPECIAL CONDITIONS

- 23.1 Each bidder should submit only one (1) bid. Any bidder who submits/participates in more than one bid for the work shall be disqualified.
- 23.2 If the due date for opening the EoI happens to be declared holiday, then the EoI will be received and opened on the very next day, for which no prior intimation will be given.
- 23.3 **During the EoI evaluation, ANERT may seek more clarifications/details from any or all of the bidders, if felt necessary.**
- 23.4 The ownership of all documents, reports, projects etc. being created as part of the assignment will vest with ANERT.
- 23.5 Any information furnished by the Bidder, if found to be incorrect at any stage, would render them being declared as ineligible.
- 23.6 Incomplete proposals may be summarily rejected. ANERT reserves the right to reject any or all the bid without assigning any reason thereof.

## 24. PAYMENT TERMS

24.1 No advance payment will be given. All the documents submitted should be certified by the concerned personnel of ANERT and will be released by Smart City Thiruvananthapuram Ltd upon recommendation of ANERT, which will be bound by a Tripartite agreement which will be executed between ANERT, SCTL & the selected vendor.

24.2 The terms of payment shall be:

- i. Upon delivery of materials at the site, 60 % of the contract value against that site will be released as first part payment. The supplier shall submit the invoice for the materials (including serial numbers and delivery chalan) duly certified by the concerned District Office along with a report regarding the supply of materials.
- ii. On completion of the installation of BESS system and filing application for connectivity, 20% of the contract value shall be released as second part payment. The supplier shall submit the invoice for the materials supplied and all documents related including the Project Completion Report to the completion of the work certified by the district office shall be submitted for the release of the amount. The PCR submitted will be used for conducting the pre-commissioning tests. Proof of the completion report submitted to the electrical inspectorate shall be submitted.
- iii. After the Inspection and Approval of the Electrical Inspectorate, date of Energisation to the Grid by the DISCOM will be considered as the official Date of Commissioning (CoD) of the project and this will be treated as the commissioning of the system.
- iv. On commissioning of the grid connected system, 10% of the remaining contract value will be released after proving the Key Performance Indexes. All documents related to the completion of the work including commissioning report shall be submitted for the release of the amount.
- v. The balance 10% shall be retained as performance security and will be released in equal parts of 2% after 2<sup>nd</sup>, 4<sup>th</sup>, 6<sup>th</sup>, 8<sup>th</sup> and 10<sup>th</sup> year of operation.
- vi. The security deposit of 5% furnished along with the contract agreement shall be released on successful completion of supply, installation, and commissioning.

## **25. RIGHTS TO ACCEPT/REJECT ANY OR ALL PROPOSALS**

ANERT reserves the right to accept or reject any proposal, and to annul the EoI process and reject all Bids at any time prior to award of Contract, without thereby incurring any liability to the affected Bidders or any obligation to inform the affected Bidders of the grounds for ANERT's action.

## **26. FAILURE TO AGREE WITH THE TERMS & CONDITIONS /CONTRACT**

Failure of the Bidder to agree with the Terms & Conditions of the EoI shall constitute sufficient grounds for the annulment of the award of contract. The contract may be awarded to the next most responsive bid among other bidders.

## **27. PERFORMANCE SECURITY**

The successful bidder has to remit an amount @ 5% of the total amount quoted by the bidder per annum as performance security deposit in terms of e-Bank Guarantee/Deposit having validity for 1 year from the date of agreement. The bank guarantee/deposit will be released/refunded to the successful bidder after completion of the contract period after deducting the penalties if any.

# TECHNICAL SPECIFICATIONS

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## GRID BASED BATTERY ENERGY STORAGE SYSTEM

The Scope of Work covered under this specification shall be but not limited to the following.

### 28. INITIAL DESIGN AND FABRICATION

For the initial design and fabrication of the equipment, the Contractor shall

- Design, fabricate, and assemble a fully functional, transportable BESS that meets the requirements delineated herein.
- Fully document the Design and expected performance of the BESS by means of documents, drawings, reports, data, and other submittals, as required herein.
- Perform Factory Acceptance Testing of the BESS.
- Conduct design review meetings during initial design and fabrication, in Consultation with the ANERT with special reference to the geographical/climatic conditions of the Project site.
- Obtain site-specific data in preparation for developing installation implementation plans.
- Develop site installation/construction drawings, specifications, and calculations.
- A control system that provides control actions for all required operational and protective features with event logging facility.
- Supply any special equipment and tools required for maintenance of the BESS.
- Supply an initial complement of spare parts (at a to-be-determined level).
- Provide warranty for the entire BESS and its constituent equipment.

### 29. TRANSPORTATION AND SITE SETUP

Interconnection of the BESS with the grid is at the point of common connection (PCC). The Contractor shall be responsible for all equipment and installation activities up to the system side of the PCC. The Contractor will be responsible for completing the necessary work for the interconnection point.



For installation/interconnection, the Contractor shall

- Develop drawings, specifications, and calculations for Contractor's scope of installation equipment and services (that is, up to the BESS side of the PCC).
- Obtain all permits necessary to transport the BESS to the site.
- Ship the BESS to the project site.
- Perform the Factory Acceptance Tests as mandated by MoP
- Assemble BESS components on site to produce a functional system (as required).
- Perform start-up testing and SAT of the BESS.
- Provide on-site Contractor representative during installation and/or interconnection activities by the ANERT and during start-up and SAT of the BESS by Contractor.
- Obtain permits necessary to prepare the site and to install and interconnect the BESS to the grid.
- Provide a complete set of as-built drawings.
- Provide a training class for ANERT's technicians and maintenance personnel.

### **30. OPERATION AND MAINTENANCE**

The operation and maintenance (O&M) of the BESS on comprehensive basis to the Contractor on turnkey for the 10 (Ten) years. The rates quoted by bidder for Comprehensive O&M of the Plant Facilities on yearly basis for 10 years shall be inclusive of the replacement costs if any.

### **31. DEFINITIONS**

- PCC - Point of common connection – MSB Panel at ANERT HQ
- Utility - Kerala State Electricity Board Limited (KSEBL)
- Unit battery - A unit battery is the minimum field-replaceable stored energy component or assembly. It may consist of one or more electrochemical cells, electrically interconnected in any series and/or series-parallel configuration. A unit battery has one (and not more than one) set of positive and negative terminals, by which it is interconnected with the rest of the storage system.
- BESS - Transportable, containerized energy storage system based on commercially available electrochemical storage solutions, capable of receiving,

it and / or balancing it.

### 32. BESS INTERCONNECTION

The BESS will be interconnected with the KSEBL grid at PCC. It is expected that the PCC will be at the MSB panel at ANERT HQ. However, the same must be finalized by the Contractor after consultation with the KSEBL.

### 33. GRID CHARACTERISTICS

The BESS shall be capable of continuous operation under variable voltage, frequency and phase imbalance conditions at the PCC, as described in the Table below. Information on available fault current and other characteristics of the KSEBL grid will be provided by the KSEBL. The Contractor shall confirm, for each KSEBL site, that this information has been received and understood during the site-specific engineering phase.

#### Codes and Standards

IEC 62477	Secondary cells and batteries for renewable energy storage for On-grid applications: Non-chemistry Specific (applicable to all secondary battery types)   Safety requirements for power electronic converter systems and equipment
IEC 61000	Electro Magnetic Compatibility of Lithium-Ion Battery Energy Storage System.
IEC 62116	Utility-interconnected photovoltaic inverters - Test procedure of islanding prevention measures
IEC 61727	Photovoltaic (PV) systems - Characteristics of the utility interface
UL 9540 or (IEC TS 629335-1 + IEC 62933-5-2)	Electrical energy storage (EES) systems -Part 5-1: Safety considerations for grid-integrated EES systems - General specification / Standard for Energy Storage Systems and Equipment
IEC 62485-2	Safety requirements for secondary batteries and battery installations – to meet requirements on safety aspects associated with the erection, use, inspection, maintenance, and disposal: Non-chemistry Specific (applicable to all secondary battery types)
IEC 61508	Functional Safety of Electrical/Electronic/Programmable Electronic Safety- related Systems: Applicable for all Battery Energy Storage Systems OR
IEC 62620 / IEC 62619	Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for secondary lithium cells and batteries, for use in industrial applications

Any other Standards that are mandatory as per Ministry of Power guidelines and not mentioned here, need to comply.

### 34. TECHNICAL SPECIFICATION OF BATTERY ENERGY STORAGE SYSTEM

#### 34.1 Procurement-Specific Ratings and Requirements

Item Description	Requirement
Battery Technology	Any battery technology with totally Maintenance Free suitable for operation in site-specific climatic conditions can be used with sufficient HVAC system in place and accessible from outside.
Rated No of Cycles (Minimum)	4000 cycles at rated energy capacity at 80%; Depth of Discharge (DoD) at 25°C and C/1 Rate of Discharge
Nameplate watt rating*, AC (A)	250 kW, continuous. The same shall comprise of a single unit or multiple units, for N+1 redundancy, with capability of extending up to 500kW in the future.
Nameplate watt-hour rating, ac (B)	500 kWh at 250 kW net ac output at the beginning of life and not less than 80% of this capacity at any point of time up to End of Battery Life. (The vendors are required to meet this criteria and battery capacity must be finalised taking into account this aspect.)  The battery Ah shall be 51.2V, 100 AH capacity and shall have provision to expand up to 750 kWhr, without any major hardware changes in the future. The provision
System AC-DC-AC efficiency*:	> 90%
Use case requirements	Peak Management Voltage Support Frequency Regulation (demonstration only) Intermittent Resource Support
Peak Management	Yes  Morning and evening (preference to evening) No. of days per year: up to 365

Item Description	Requirement
	<p>In the Peak Management Use Case scenario, power generated during the early and midday periods shall be stored in the BESS and released later in the day, during peak demand.</p> <p>In this case, the BESS shall be discharged in the Peak Limiting profile in the late afternoon. To the extent that the total energy dispatched does not exceed the nameplate watt-hour rating, the BESS may be further discharged in Constant Power Mode after Part 01 (Solar PV Plant) is no more generating.</p> <p>One discharge cycle per day is envisaged in this use case.</p>
VAR compensation /voltage support (VC/VS)	Yes
Intermittent resource support (IRS)	<p>Yes</p> <p>This use case is envisaged to be employed during the day, primarily to support variations in Solar PV generation.</p> <p>The days for operation in this use case shall be determined in consultation with the ANERT/KSEBL.</p>
Black Start Capability	Yes
Ventilation System inside the Container	Should be such as to maintain minimum and maximum Temperature as recommended by the manufacturer for optimum performance of the batteries on continuous basis.
Grid Charging	Allowed with the discretion of grid operator. If the BESS is charged through the grid, the energy consumed shall be considered part of the Auxiliary power and shall be metered.
Over Loading Capacity	<p>(105%) : continuous operation</p> <p>(105%~120%) : 10min</p> <p>(120%) : stop operation</p>

### 34.2 Additional Information and Requirements for Frequency Regulation Use Case

This Clause provides information regarding the anticipated energy dispatch under the frequency regulation use case, as described in Clause 35.4. However, the same may be altered as per Control Strategy proposed so as to allow minimum Energy Imbalances.

Table 3: Additional Information and Requirements for Frequency Regulation Use Case	
Item Description: Frequency Regulation Use Case	Requirement
Maximum BESS power level for frequency regulation	Discharging: 50% of nameplate watt rating Charging: 50% of nameplate watt rating

### 34.3 Additional Information and Requirements for Intermittent Resource Support Use Case

This section provides information regarding the anticipated energy dispatch under the intermittent resource support use case, as described in Clause 35.5.

Table 4: Additional Information and Requirements for Intermittent Resource Support Use Case	
Item Description: Intermittent Resource Support Use Case	Requirement
Voltage flicker compensation:	Yes Compensate for all changes in intermittent resource output power level that exceed 10% per second and in which the new power level remains for at least 5 seconds. The Maximum system Power level for Voltage flicker compensation during discharging and discharging to be determined during detailed system design in terms of % of nameplate watt and VAR rating.
Ramp rate control: period of operation	To be specified in design
Ramp rate control (Power level of the BESS shall decrease at a linear rate)	100 kW/min Maximum BESS power level for charging and discharging to be determined at the time of detailed system design in terms of % of nameplate watt and VAR rating.
Intermittent resource generation following daily schedule and combined power output.	Suggested Scheme (to be finalized during detailed design stage):

Intermittent resource generation following: period of operation	Charging during morning up to noon and other off-peak periods Begin discharging in load following mode in the afternoon (coinciding with Peak Demand in the evening) Conclude discharging at 08:00 PM Combined Power output of Intermittent resources (Part 01 and Part 02) and BESS to be at unity power factor. Maximum BESS power level for charging and discharging to be determined at the time of detailed system design in terms of % of nameplate watt and VAR rating
Warranties	10-year for parts and labour warranty for the entire BESS and its constituent equipment and works done by the contractor.

#### 34.4 Frequency Regulation

The BESS shall be capable of both charging and discharging, at the power level or levels specified in Table above, in response to an external signal (such as an automatic generation control signal). FR may occur for as much as 24 hours per day and for as much as 365 days per year. FR operation would not be simultaneous with any other real power discharge or charge, but it may occur simultaneously with supply of reactive power.

#### 34.5 Intermittent Resource Support

The BESS will support the integration of solar PV plant into the grid by either eliminating or reducing undesirable voltage and power fluctuations on the KSEBL line or by firming the power delivered by the resource (that is, augmenting the power produced so that an expected output may reliably be achieved).

#### 34.6 Nameplate Ratings

##### 34.6.1 Overall System Real Power and Energy Ratings

During discharge, the BESS shall be rated to supply at the PCC the continuous net ac real power and ac energy output specified in *Table 2: Supply-Specific Ratings and Requirements* above. These ratings shall be referred to in all project documentation, including this specification, as the nameplate watt rating and the nameplate watt-hour

rating. All nameplate ratings shall be achievable over the End of Battery life, as specified in this tender document. The nameplate watt rating and nameplate watt-hour rating shall be achievable during discharge for the full range of stated environmental conditions, provided that the battery is fully charged and the HVAC system (if incorporated in the BESS) has stabilized. In any case, the BESS shall be capable of being discharged at reduced power levels from that specified above. However, in no case will the energy discharged from the battery be greater than the nameplate watt-hour rating.

The Contractor shall clearly state in its O&M manual as well as during design review the expected efficiencies of the major subsystems (battery, PCS) as well as the expected losses from auxiliaries.

**Note:** There may be specific requirements regarding the attainable power level during charging, which the Contractor may need to identify in co-ordination with the grid operator/ANERT. However, unless otherwise specified in those sections, the real power level attainable during charging shall be at the Contractor's discretion, so long as the other charging requirements in this specification are met.

#### 34.2.1 Overall System Reactive Power Rating

In accordance with the VAR-related control modes identified in Clause 23, the BESS shall be capable of dispatching both leading and lagging reactive power at the PCC, up to the rated VAR capacity specified in Table-2, regardless of whether the battery is being simultaneously discharged or charged. This rating shall be referred to in all project documentation, including this specification, as the nameplate VAR rating. The BESS shall be capable of simultaneously producing real and reactive power as long as no nameplate rating is exceeded. That is, the combination of operation at full nameplate watt rating and full nameplate VAR rating shall not exceed the nameplate VA rating.

### 35 BESS Use Cases

The BESS shall be capable of operating over its entire life in one or more of the use cases described in this section to meet the system requirements specified in Table-2, and further detailed in the tender document.

The possible use cases supported by this technical specification include the following:

- Peak management (PM)
- VAR compensation /voltage support (VC/VS)
- Frequency regulation (FR)
- Intermittent resource support (IRS)

The use cases should not be interpreted as either operating modes or control functions. The requirements for the BESS control functions that are required to operate the BESS in a manner that supports these use cases as mentioned in this document. While Use cases describe what the BESS will be used for, whereas control functions describe how the equipment will be operated to achieve those uses. Mapping of the control functions to the use cases is provided in Clause 38.

The purpose for defining and describing the use cases is to provide the Contractor with essential information needed to ensure that the BESS will have the desired life and performance characteristics. In particular, the requirements listed in this section should support Contractor's efforts to accomplish the following:

- Determine other BESS subsystem performance capabilities
- Understand the various combinations of uses that the KSEBL may exercise

The operation of the BESS at the KSEBL site may also include some combination of the above use cases. The possible (or required) combinations are described in Clause 37.

Each use case description in the following subsections includes a capability requirement for a number of cycles and days per year of operation in that use case. On days of the year in which a particular use case is not being used, the BESS shall be considered available for operation in some other use case, so long as the nameplate ratings specified elsewhere are not exceeded. Simultaneous operation in two or more of the real power use cases (PM, FR, IRS) is not required, but it may be optionally provided at the discretion of the Contractor, so long as no nameplate rating is exceeded. In accordance with Clause 37, simultaneous operation in the VC/VS use case together with one of the other use cases is a required capability.

**Important Note:** The various use cases described below represent a wide range of battery and PCS capabilities. The BESS shall be designed to accommodate the most



stringent of the intended operation scenarios so that any of the scenarios can be exercised without exception. The use cases described in this Clause 37 presuppose the provision of a suitably designed control system, as outlined in Clause 40 of this specification. Accordingly, the descriptions of the use cases must be read and understood in conjunction with the description of the control functions specified in Clause 40.

### **35.1 Peak Management (PM)**

In the PM use case, the BESS is controlled to reduce peak power demand on the KSEBL feeder to which the BESS is connected. The BESS would be discharged at any power level up to the maximum power level specified as the nameplate watt rating. The BESS shall support operation in this application for up to the number of times per year specified, if any, in Table-2. In this Use case, each daily operation is expected to consist of one discharge and charge cycle, in either a variable or a constant power output, as described below.

In that event that two discharges are required in a day, the maximum number of days per year that the system would operate with two daily discharges is one-half the number of days in single-daily-discharge mode. In the case of two discharges in a single day, it may be desirable for the KSEBL to charge the battery between the two discharges (opportunity charging) and the BESS shall permit such operation. For example, a morning and afternoon peak may be shaved, with a partial (or complete) recharge taking place during the day between the morning and evening peaks.

**Note:** Specification of the number of days per year for the two-daily-discharges scenario at half those for the single-daily-discharge mode assumes that opportunity charging between daily cycles would fully restore battery capacity, so that each of the two discharges in the day would take place at the full nameplate watt-hour rating. If each discharge were less than the nameplate watt-hour rating, the PM operation in a two-daily-discharges scenario could potentially occur on more days per year.

Two different power dispatch profiles during discharge are specified, as described in the following two subsections.

#### **i. Constant Power**

The BESS is discharged at a single, constant power level for a specified duration. The dispatch power level may be any value less than or equal to the nameplate watt rating. The duration of the constant power discharge may be any period of time (up to six hours), so long as the total energy dispatched to the load does not exceed the nameplate energy rating of the BESS or exceed any other operational or safety limits.

#### **ii. Peak Limiting**

The BESS is discharged at a varying power level proportional to the amount by which the actual load on the KSEBL feeder or substation transformer exceeds a desired value. The dispatch of power from the BESS in this case would mirror the shape of the KSEBL load (which may be, generally, sinusoidal in shape). The duration of this discharge may be several hours, so long as the total energy dispatched to the load does not exceed the nameplate energy rating of the BESS or any other operational or safety limits. As an example, with the BESS installed at a distribution substation, the load on the secondary winding of the substation transformer would be monitored and sent to the control system. The KSEBL operator would enter a set point, and the BESS would operate so as to prevent or reduce overloading of the transformer by serving some (or all) of its entire peak load.

Actual discharge profiles may vary with respect to overall shape, number of peaks and valleys per day, ramp rate, and overall duration of discharge, including possible standby time between successive peaks. The Contractor shall specify all operational and warranty-specific limitations on the use of the battery for the two different power dispatch profiles.

### **35.2 VAR Compensation/Voltage Support (VC/VS)**

The BESS shall be capable of supporting voltage on the KSEBL feeder to which it is connected by the injection or absorption of both real and reactive power (VARs). This operation shall be possible during real power discharge or charge and during standby. The operation may be dynamic (continuously varying reactive/real power output) or static (operation at a fixed power factor).

In this use, it shall be possible for the KSEBL to determine the priority of operation and/or the level of reactive power support desired, including different levels for leading and lagging VARs, as well as precedence of reactive power over real power or real power over reactive power. Specifically, it shall be possible to give either real power or reactive

power the higher priority, so long as the nameplate VA rating (see Clause 71.6.271.6.2) is not exceeded. In this use, the BESS shall be capable of responding to both real-time and pre-programmed control signals (see Clause 74).

i. VAR Compensation Option

The intent of VAR Compensation is that the BESS be capable of carrying out the basic functions of a synchronous generator having the option to include injection voltage control/reactive power consumption and limitation of active power when the effect of the reactive power is not sufficient. It uses a progressive curve, whereby the higher the deviation is from the target voltage, the greater is the effort to correct the deviation. It may be necessary to automatically disable over frequency or under frequency protection during operation in VC/VS mode. The Contractor shall coordinate this with the KSEBL.

### **35.3 Frequency Regulation (FR)**

The BESS shall be capable of both charging and discharging, at the power level or levels specified in Table-2, in response to an external signal (such as an automatic generation control signal). FR may occur for as much as 24 hours per day and for as much as 365 days per year. FR operation would not be simultaneous with any other real power discharge or charge, but it may occur simultaneously with supply of reactive power.

### **35.4 Intermittent Resource Support**

The BESS will support the integration of solar PV plant into the grid by either eliminating or reducing undesirable voltage and power fluctuations on the KSEBL feeder or by firming the power delivered by the resource (that is, augmenting the power produced so that an expected output may reliably be achieved).

In IRS use, the BESS shall respond to one of two classes of controlling signals: (1) the voltage at the electrical connection point or PCC and (2) the output power level of the intermittent resource (or some other power level signal). Several scenarios are possible, as described in the following paragraphs.

i. Voltage Flicker

In a voltage flicker control scenario, the BESS shall be dispatched to control rapid but small (such as 2% to 5%), potentially frequent changes in voltage on the utility feeder that produce voltage flicker at other customer loads on the feeder. The flicker standard to

be implemented shall be determined during detailed design stage in consonance with the regulation of the jurisdiction having authority.

The control signal is the power output level of the solar PV plant. Drops in power shall be compensated by a discharge of the BESS, whereas increases in power shall be compensated by a charge of the BESS in accordance with a specified scheme (to be finalized during detailed design stage). The BESS shall respond instantaneously for each qualifying power level change and then immediately begin a ramp to zero power with a specific ramp rate.

Depending on a number of factors—including the size of the intermittent resource compared to the native feeder load, the impedance of the feeder, and the location of the BESS and the intermittent resource relative to one another—voltage flicker may be improved by the BESS providing either real or reactive power or both in response to either variations in the voltage at the electrical connection point or variations in the output power level of an intermittent resource. The output of the BESS (either discharge or charge) shall be instantaneous in response to a change in the monitored quantity, followed by a ramp to zero over a settable period of time.

ii. Ramp Rate Control

In a ramp-rate-control scenario, the BESS shall be dispatched to limit the rate of power change up or down (ramp rate) from the intermittent resource so that large step changes in power output are smoothed over time to produce a controlled ramp (up or down). Ramp rate control is effectively the same as voltage flicker control from the point of view of power in or out of the storage system except that the goal, for example, is to limit the operation of automatic voltage regulators and tap changers on the feeder or at the substation that are caused by relatively larger changes in output of the intermittent resource.

The control signal is the power output level of solar PV plant. Drops in power shall be compensated by a discharge of the BESS, whereas increases in power shall be compensated by a charge of the BESS in accordance with a specified scheme (to be finalized during detailed design stage). The BESS shall respond instantaneously for each qualifying power level change and then immediately begin a ramp to zero power with a specific ramp rate.

The BESS shall be dispatched in response to variations in power at the point of concern, whether it is the feeder at the electrical connection point or the output terminals of the intermittent resource. The output of the BESS (either discharge or charge) shall be instantaneous in response to a change in the monitored quantity, followed by a ramp to zero over a settable period of time. The maximum output (either discharge or charge) of the BESS shall be specified in the detail design Scheme.

iii. Generation-Following

In the generation-following scenario, the BESS shall be dispatched to follow the output power from the intermittent resource(s) part of the Plant Facilities to compensate for its variability. The output from the BESS shall be controlled to produce a resultant power output level from the same. The desired level of the resultant power shall be settable. The BESS shall charge the battery with energy from the renewable sources, as determined in consultation with the Owner. The BESS shall discharge the battery so that the output of solar PV plant plus battery is a constant (see Table -2). During the recharge operation, the charging power level should be such that the net output of the array is kept more or less constant (that is, array power momentary dropouts should be compensated to the extent possible during recharge).

In the most general case, both discharge and charge operations will occur depending on the maximum power output capability of the solar PV plant relative to the battery storage system capability, the desired power set point, the window of operation of the storage, and the variations in output of the resource. Actual discharge profiles in the IRS use case may vary with respect to overall shape, number of peaks and valleys per day, ramp rate, and overall duration of discharge, including possible standby time between successive discharges or charges. The Contractor should specify all operational and warranty-specific limitations on the use of the battery for different dispatch profiles.

### **35.5 Combination Use Case Requirements**

On days of the year in which a particular use is not active, the BESS shall be considered available for other uses, so long as the nameplate ratings specified elsewhere (see Clauses 37) are not exceeded. Simultaneous operation in two or more of the real power use cases (PM, FR, IRS) is not required but may be optionally provided at the discretion of the Contractor, so long as no nameplate rating is exceeded. In accordance

with Section simultaneous provision of VAR support (VC/VS) with other use cases is a required capability. The BESS shall be capable of operating in several combinations of use cases, like Peak Limiting plus Frequency Regulation, Peak Limiting plus Voltage Flicker, Peak Limiting plus Ramp Rate Control. On any given day of the year, only one of these two dispatch profiles would be executed.

### **35.6 Charging Requirements**

The control system shall allow the KSEBL to initiate a specified or programmed charge cycle. The Contractor shall work with each KSEBL to ensure that the KSEBL's requirements are met to the full capability of the BESS and that the battery is properly charged manner describe all charging requirements and shall guide the user in ensuring that charging of the battery is properly carried out.

## **36 DESIGN, FABRICATION, AND CONSTRUCTION REQUIREMENTS OF BESS**

### **36.1 General**

The methods and materials specified in this technical specification are intended to represent minimum requirements. Reliance thereon shall not diminish the responsibility for meeting performance and other requirements stated in this technical specification.

The design of the BESS shall incorporate the principle of modularity, with a view to reducing life-cycle costs and ease of replenishment of storage capacity while facilitating ease of maintenance, space requirements, and reliability. The design should also facilitate rapid and easy replacement of the unit batteries without significant downtime. Overall, the design philosophy shall be to minimize and optimize all costs to the ANERT, not simply initial capital costs or low maintenance costs.

*Life-cycle costs include the following: initial system cost, unit battery replacement cost, periodic equipment upgrades, maintenance costs, auxiliary system energy consumption, charging energy costs (that is, costs due to overall battery and PCS losses), and any other contributors to life-cycle energy cost.*

### **36.2 System-Level Design and Performance Requirements**

36.2.1 The major equipment items shall include a battery, battery management system (BMS), PCS, output/isolation transformer, and SCADA which is to be integrated with the solar plant SCADA system defined elsewhere in this document.

Additional equipment shall include HVAC, wiring, connectors, protective devices, grounding, junction boxes and enclosures, instrumentation, enclosures, and all other items needed for a fully functional, grid-interactive BESS to meet the requirements set forth in this specification. All systems and components of systems—including electrical storage unit, switching devices in the PCS, components of monitoring and control systems, and components of auxiliary systems— must use proven and previously demonstrated technology. Electrochemical cells, PCS switching devices, and control system hardware and software must be commercially available and in use for other markets. Electrochemical cells must be replaceable (in small orders) with a maximum six-week lead time under normal business conditions. Designs using experimental or otherwise undocumented components are not permitted.

36.2.2 The BESS shall be characterized using language and methods consistent with IEEE 1679, “Recommended Practice for the Characterization and Evaluation of Emerging Energy Storage Technologies in Stationary Applications.”

36.2.3 The BESS shall be IEEE 1547 (Standard for Interconnecting Distributed Resources with Electric Power Systems)-compliant, where possible.

36.2.4 The prudent design of the BESS should include careful consideration of resonance and Ferro-resonance.

### **36.3 Containerization and Transportability**

36.3.1 The BESS shall be containerized, using either standard International Organization for Standardization (ISO) 668 shipping containers or custom-designed power equipment centres. The container or containers shall be designed to be drop-shipped onto a properly prepared pad or foundation (such as compacted soil, concrete pad or platform, and so on). When fully installed, all BESS components—including battery racks all auxiliaries, such as HVAC and fire suppression systems, (preferably Heptafluoropropane), step-up transformers to match grid, ac switchgear, and so on—and tools shall be enclosed in (or on) the containers, even if certain components must be separately shipped and installed at the site.

36.3.2 Containers shall be designed and constructed to meet IP54 and NEMA 3R requirements, which protect the equipment inside from harmful effects resulting

from the ingress of water, dirt, dust, and wind. The design and installation of Containers shall meet relevant regulatory requirements for occupational safety and health under national and state legislations.

36.3.3 All containers and packaging of separately shipped components shall be suitable for land or sea transport, including offering suitable protection of the equipment inside against damage from weather and vibration or shock from transportation.

36.3.4 The containers and their contents shall be designed to be easily prepared for transport, shipped, connected and operated at site. The Contractor shall ensure that all required bracing and shipping stabilization equipment to enable transport is either kept at hand or brought to the site in a timely manner before transport.

#### **36.4 Additional transportability requirements and/or clarifications**

36.4.1 In designing for transportability of the lithium-ion batteries, the Contractor shall follow the relevant guidelines (Sub-section 38.3) set forth in the United Nations document “Recommendations on the Transport of Dangerous Goods—Manual of Tests and Criteria” (ST/SG/AC.10/11/Rev.5), with specific reference to obtaining UN38.3 and UN3480 certifications at the battery module and/or container level.

36.4.2 The BESS container or containers shall be of a size and weight to be capable of being transported to project sites with due consideration for the load bearing restrictions imposed by bridges, if any, and rarefied atmospheric conditions in the region. 36.4.3 Containers shall incorporate standard lugs or other means for lifting by crane or shall be properly palletized for movement with forklift trucks, or both.

#### **36.5 Design Life and Life-Cycle Costs**

36.5.1 End of battery life - End of battery life is that point in time when the BESS can no longer meet the power and/or energy discharge requirements of this Specification due to age or non-repairable malfunction of the battery subsystem, and/or non-replaceable components. When the system is no longer able to provide these requirements, the system has reached its end of life. Battery End of life shall be not less than 10 years from the date of Commissioning.



36.5.2 It shall be the responsibility of the Contractor to make periodic replacements/replenishments of unit batteries, if and when required, up to the End of Battery Life as described above. Outage time as a result of replacement will also be counted as an “Accountable BESS Outage” for the purpose of computing BESS Availability.

### **36.6 Reliability, Availability, and Operability of the BESS**

The BESS shall be designed for high reliability, defined in the following terms:

**Starting reliability:** (99% starting reliability means that the unit shall start in 99 of 100 attempts)

**Mean-time-to-repair-** The time taken from the time of notification of a need for repair to the time of completion of repairs (that is, inclusive of time for arrival of spare parts and repair personnel at the location of the BESS)

Availability

Availability is the percentage of hours that the BESS is available during the year. The availability guarantee shall begin upon facility commissioning. Annual availability shall be calculated as follows:

$$\left[ 1 - \left( \frac{\sum \text{Accountable BESS Outage duration in hours}}{8760} \right) \right] \times 100$$

Where:

*Accountable BESS outages* are outages caused or necessitated by the BESS equipment that result in reduced capacity or loss of essential function of the BESS. These outages may be initiated by failure of components, loss of battery capacity (to the extent that End of Battery Life is not reached), operation of protective devices, alarms, or manual action. Such outages include both forced outages due to equipment problems and scheduled outages for BESS maintenance.

*Accountable BESS outage duration* is the elapsed time of accountable BESS outages from the instant the BESS experiences reduced capacity or is out of service to the instant it is returned to service or full capacity. If the BESS experiences reduced capacity but is determined by the ANERT to be available for service even if the ANERT elects not to

immediately return the equipment to full capacity, such time will be discounted from the outage duration.

- The Procurement specific nameplate ratings shall be as defined in Clause 37 above. The BESS shall be considered to be under an accountable outage if any of those ratings cannot be met. The BESS shall also be considered to be under an accountable outage if a scheduled (or required) charge cycle cannot be completed.
- The data required for assessment of the availability of the BESS shall be collected through the Plant's integrated SCADA system.

36.6.1 It shall be possible to fully remove, repair, and replace in the field any failed or poorly performing component within a day, assuming that spare parts, test equipment, and maintenance personnel are on the site. This capability shall be demonstrated in the factory acceptance test (FAT) for unit batteries and other key components.

36.6.2 The BESS shall be capable of unattended operation, with provision of remote monitoring and control.

#### 36.7 Planned Maintenance Outage

Up to 5 weeks each year will be permitted for a planned outage to perform any required maintenance. The Contractor shall provide a guarantee for the maximum length of time required for this type of maintenance operation.

### **36.8 Battery Subsystem Design Requirements**

#### 36.8.1 Electrochemical Cells

Only cells that are commercially available or for which suitable (not necessarily identical) replacement cells can be supplied on short notice will be allowed. *For both premature cell failures and end-of-battery-life replacement, the Contractor shall guarantee cell availability and the length of down time (hours or days) required to replace cells.* The cells may be supplied as separate, individual units or as group of cells combined into modules. The cells shall meet the seismic requirements for the planned location of the BESS. Cell and module design shall accommodate the anticipated vibrations and shocks associated with the transportation of the BESS and shall resist deterioration due to vibrations resulting from the same. Associated hardware and paraphernalia should also be able to withstand the

rigors of transportation. The transport plan shall be shared with the ANERT and approved prior to dispatch.

36.8.2 Labelling of the cells or unit batteries shall include manufacturer's name, cell type, nameplate rating, and date of manufacture, in fully legible characters. All cells shall be traceable to the point of origin for purpose of addressing safety issues.

### 36.8.3 Electrochemical Storage System

36.8.3.1 The storage system may consist of one or more-unit batteries. If the storage system consists of more than one unit battery, these may be electrically interconnected in any desirable series and parallel configuration to achieve the overall system storage and power rating requirements.

36.8.3.2 Each electrically series-connected string of unit batteries shall include a means of disconnecting the string from the rest of the system and of providing over-current protection (during a fault). The means of disconnect shall provide for a physical interruption of the string electrical circuit, which shall be visible to anyone servicing the individual unit batteries in the string and shall be capable of being locked or secured in an open position.

36.8.3.3 If the disconnect means consists of removal of a unit battery, the storage system shall be designed to allow maintenance personnel to determine that there is no current flowing in the string and provisions to ensure that the PCS is off before the unit battery is removed. Procedures for maintenance and/or field replacement of unit batteries shall neither require nor recommend removal of the unit battery without first ensuring that no current is flowing in the string circuit.

36.8.3.4 Over-current protection, whether on the ac or dc side, in paralleled unit battery strings shall be sized and coordinated so that currents from other strings do not contribute to a fault in any unit battery string.

36.8.3.5 Where appropriate, dc wiring shall be braced for available fault currents. Protection shall include a dc breaker, fuse, or other current-limiting device on the battery bus. This protection shall be coordinated with the PCS capabilities and battery string protection and shall take into account switching or other transients and the inductance/resistance (L/R) ratio at

the relevant areas of the dc system. The Contractor shall produce a fault analysis and protection coordination study for the battery dc subsystem during final design. *The ANERT reserves the right to withhold permission to ship the BESS until the fault analysis has been satisfactorily completed.*

36.8.3.6 Cells, wiring, switch gear, and all dc electrical components shall be insulated for the maximum expected voltages plus a suitable factor of safety.

36.8.3.7 The battery system shall include a system to detect and alarm excessive ground leakage current levels. Ground fault detection shall be enabled for the container or, if more than one electrical series string is installed in the container, for each series string. The detection/trip level shall be field adjustable. The Contractor shall have overall responsibility for the safety of the electrical design and installation of the battery, as well as all aspects of the BESS.

36.8.3.8 The battery system shall include a monitoring/alarm system and/or prescribed maintenance procedures to detect abnormal unit battery conditions and notify proper personnel of their occurrence.

36.8.3.9 Abnormal conditions shall include but not be limited to (1) weak unit batteries that could reasonably be expected to fail to provide rated capacity upon full discharge, (2) high- resistance or open-unit batteries, (3) high-resistance or open external unit battery connections, (4) unit batteries with temperatures exceeding operating thresholds, and (5) internally shorted unit batteries. Unit battery monitoring, whether automatic or manual, should be specified to alert the proper personnel in a timely manner that an abnormal unit battery condition exists or may exist. All alarms shall be part of the control system and shall include remote display or annunciation capability.

36.8.3.10 The unit batteries shall be racked or shall be housed in stackable modules. The unit batteries or cells shall be arranged and installed to permit easy access for equipment and personnel. The moveable units shall be arranged and installed to permit easy access for equipment and personnel to carry out unit removal and replacement activities. For all systems, it shall be

possible to remove and replace a prematurely failed unit battery or cell (as appropriate), when system performance specifications cannot be met. The lengths and widths of all aisles and spaces into which personnel may enter in the field for operations and/or routine or unscheduled maintenance purposes, as well as egress routes from these aisles and spaces, shall conform to applicable codes and standards. All racks and metallic conductive members of stackable modules shall be grounded to earth. Racks shall meet the seismic load and road vibration requirements and shall include means to restrain cell movement during seismic events and transport. The Contractor shall furnish analyses and/or other data that show that the rack and cell designs are designed to meet all potential seismic and transport vibration requirements.

36.8.3.11 The design of all modules and racks shall specifically account for the anticipated vibrations and shocks associated with the periodic transportation of the BESS.

#### 36.8.3.12 Cell/Battery Auxiliary Systems

The cells and battery system shall be supplied with all required and/or recommended accessories. This includes inter-cell connectors and monitoring devices for cell temperature and cell voltage, if required.

### **36.9 Power Conditioning System Design Requirements**

#### 36.9.1 General

36.9.1.1 The PCS is the interface between the DC battery system and the AC system and provides for charging and discharging of the battery. The PCS may consist of one or more parallel units. Paralleling may be at the DC or AC terminals. Line-commutated systems or systems that require the presence of utility voltage or current to develop an AC output are not acceptable. The PCS circuit topology shall be voltage source (that is, the PCS at its AC terminals shall appear to the grid as a voltage source rather than as a current source and, at its DC terminals, shall be capable of reversing current flow in the battery without reversing the polarity of the DC bus).

36.9.1.2 All load-carrying cables within the PCS subsystem shall have a suitable load

factor of safety. The PCS shall preferably be air-cooled suitable for the site climatic conditions, with final rejection of waste heat to the ambient air. The air-handling systems shall include filtering that is adequate to keep dust from the interior of the PCS system.

36.9.1.3 The PCS modules shall be housed inside the containerised solution, with provisions to prevent moisture condensation and to prevent the entrance of water, airborne salt or dust, rodents, insects, and/or similar materials or pests into air intake/exhaust ports.

### **36.9.2 Power Conditioning System Rating**

The PCS shall be capable of delivering Real power as specified in Table-2. This rating shall be referred to in all project documentation, including this specification, as the nameplate VA rating. To account for losses in the PCS, the DC input power to the PCS will be higher than the rated PCS output power. The available DC input power will be the BESS nameplate watt rating divided by the PCS full load efficiency (as specified in the datasheet) during discharge. The PCS shall be directly accessible and modular type with multiple number of 250 kW capacity each and the system shall have provision to enhance capacity up to 500 kW, without making any major modifications.

### **36.9.3 Power Conditioning System Protection and Control**

The PCS, in conjunction with the control system, shall be capable of completely automatic, unattended operation, including self-protection, synchronizing and paralleling with the grid, and disconnect. The control of the PCS shall be integrated with the overall BESS controls. The PCS shall include all necessary self-protective and self-diagnostic features to protect itself from damage in the event of component failure or the excursion of operating parameters beyond a safe or expected range. This includes excursions due to internal or external causes. The self-protective features shall prevent the PCS from being operated in a manner that may be unsafe or damaging. Faults due to malfunctions within the PCS, including commutation failures, shall be cleared by the PCS over-current protection device(s).

## **36.10 Power Conditioning System AC Interface with AC bus**

36.10.1 The BESS must meet applicable harmonic current and voltage specifications in accordance with applicable standards. Harmonic suppression may be included with the PCS or at the BESS AC system level. However, the Contractor shall design the BESS electrical system to preclude unacceptable harmonic levels in the BESS auxiliary power system.

36.10.2 In addition to interconnection standards specified in this document, there may be specific requirements for interconnection, which need to be ascertained by the Contractor in coordination with the distribution utility at each site. The PCS transformer may be used to aid in harmonic cancellation and may include tertiary windings to supply BESS auxiliary power requirements. The transformer must be dry type. The PCS shall include provisions for disconnect on both its AC and DC terminals for maintenance work. Conductor separation must be clearly visible. The detailed maintenance procedure shall be addressed in the O&M manual.

#### 36.10.3 Electromagnetic Interference

The PCS shall not produce electromagnetic interference (EMI) that will cause mis-operation of instrumentation, communications, or similar electronic equipment within the BESS.

#### 36.10.4 Islanding

The PCS design shall include provisions to limit run-on and islanding as per applicable standards upon the loss of grid. This capability shall be demonstrated to the ANERT's satisfaction during the FAT.

### **36.11 AC System**

The BESS AC system includes all switch gear, bus work, cable, connectors, transformers, and protective relaying required for connecting the BESS at the PCC. The Contractor shall design, procure, ship, and assemble on-site all ac interconnection equipment on the BESS side of the PCC. On-site assembly of Contractor supplied equipment shall be coordinated with the utility. The Contractor shall design, fabricate, ship and install all cabling required for connecting the BESS to the PCC. The BESS AC system shall include potential transformers, current transformers, and any other metering

equipment so that the performance monitoring and documentation requirements of this specification can be met. Metering accuracy shall meet applicable standards.

### **36.12 Protection and Control**

- 36.12.1 The power system (PCS), AC and DC switchgear/protective devices) shall be designed to provide safe, reliable operation with minimum interruption. Reliable operation shall be supported by a sensitive and properly coordinated protection system. The protection system shall be capable of monitoring significant operating parameters and sensing all abnormal operations or fault conditions. It shall isolate the faulted circuits or components without causing damage to other circuits and components of the system. The protection system shall also provide adequate indications and/or alarms for identification of the faulted circuits, components, and abnormal conditions, allowing preventive action and rapid restoration of service.
- 36.12.2 The grid may have its own protective schemes at the point of common connection (PCC) that will be the responsibility of the Contractor to be fulfilled.
- 36.12.3 Integration of the protective relaying and metering into the BESS controls shall not circumvent normal protective relaying. Protection shall not be interlocked with the position of any isolating/interrupting devices.
- 36.12.4 The BESS shall provide breaker failure protection for the primary interrupting device (that is, breaker, high-voltage interconnect, low-voltage interconnect) that is responsible for disconnecting the BESS and/or high-voltage ground sources from the distribution system.
- 36.12.5 The BESS shall be capable of interrupting line-to-line fault currents and line-to-ground fault currents available at the PCC and flowing in the Contractor's equipment in either direction for faults on either side of the PCC. Faults due to malfunctions within the BESS shall be cleared by the BESS protective devices.
- 36.12.6 The BESS must have low-voltage ride-through capabilities according to extant technical guidelines on connectivity.
- 36.12.7 BESS and high-voltage ground sources should be disconnected from the distribution system and the system operators must be notified if any of the



following occur:

- The BESS local interconnection protection system fails
- The interrupting device fails.
- The dc supply is lost
- The signal channel fails

The BESS interconnection protection must be capable of distinguishing between external faults on the distribution system and internal faults within the facility. The automatic reconnection scheme must be disabled for faults occurring within the facility.

The BESS shall include provisions to protect against transient voltage surges from switching, lightning, and similar causes, in accordance with applicable standards. The overall PCS design shall also limit surges on the dc bus to twice the normal maximum DC bus voltage.

### **36.13 Auxiliary Power**

The BESS shall include an auxiliary power system (separate or same as the Solar Plant auxiliary system) derived from the utility AC bus, the PCS transformer low-side bus, PCS transformer tertiary winding, or similar means with metering. The auxiliary power system shall include all step-down transformers, breakers, fuses, motor starters, relaying, panels, enclosures, junction boxes, conduits, raceways, wiring, and similar equipment, as required for the BESS operation. The auxiliary power system shall include separate potential transformers and current transformers, so that auxiliary power consumption can be measured and electronically recorded in real time, independently of operation of the PCS or of net power flows to and from the battery. The auxiliary power system and/or control system design shall provide for whatever emergency power is necessary for an orderly system shutdown during abnormal conditions such as a loss of grid power. The auxiliary power system and/or control system design shall also provide for the capability to restart automatically after BESS shutdowns of several days.

## **37 CONTROL AND COMMUNICATION**

### **37.1 Control System General Requirements**

The control system shall be designed to provide for automatic, unattended operation. The control system design shall provide for local manual operation and remote

operation or dispatch from a remotely located computer. The control system shall be programmable for establishing or adjusting all parameters, set points, algorithms, limits, and so on that are required for effective operation as described in this specification. The control system shall be designed to prevent externally supplied, control panel or local signals from causing the BESS to operate in an unsafe manner or in a manner that may damage the BESS.

## **37.2 Control Functions and Protocols**

37.2.1 To the extent possible, all BESS control functions, and operating modes shall be in accordance with standard functionalities for smart distributed resources, as documented in the IEC 61850-90-7.

37.2.2 The communication protocol for the BESS shall be according to IEEE 1815-2010, Standard for Electric Power Communications—Distributed Network Protocol (DNP3), as further developed in DNP3 Application Note AN2011-001, DNP3 Profile for Basic Photovoltaic Generation and Storage or IEC 61850.

37.2.3 If data points and/or control functions outside the standard point definitions in DNP3 AN2011- 001/IEC 61850 are created by the Contractor, the Contractor shall maintain a systematic log of the same for the purpose of maintaining/facilitating interoperability with future standards/protocols for distributed energy resources

## **37.3 Additional Control System Functions**

### **37.3.1 Shutdown/Startup/Standby**

The start and stop controls shall be as per DNP3 AN2011-001 standard specifications or IEC 61850. The control system shall use these controls for an orderly and safe shutdown, even in the absence of grid power. The control system shall also use these controls for an orderly startup sequence, which shall provide for a safe system reset from any standby or operating condition so that the unit goes through a normal startup sequence in the same way it would when being powered up after loss of power or being in a shutdown state. The control system shall include provisions for a standby state (that is, BESS but not charging or discharging), which shall be the end result of a normal startup

sequence. It shall also be possible to enter the standby state from any of the other operating states except connect/disconnect.

#### 37.3.2 Initiation of Shutdown

The control system shall initiate shutdown under the following conditions and shall remain in the shutdown state until a reset signal, either local or remote, is initiated. An appropriate alarm shall be set.

- Emergency trip switch.
- Loss of the low-voltage AC or utility grid voltage.
- An AC circuit breaker trip (either side of transformer).
- Door interlock: Initiate shutdown when the door is opened (with appropriate provision for maintenance work). Interlocks shall be self-resetting.
- Smoke/fire alarm.
- Control logic trouble.
- A DC ground fault (field-adjustable setting).
- Remote disable (no reset required).
- grid system faults (balanced and unbalanced; line-to-ground, line-to-line, and three- phase).
- Abnormal frequency
- Abnormal voltage
- Islanding condition.
- Protection or control scheme failures, including the following:
  - Failure of local interconnection protection system
  - Failure of critical breaker trip coil or interrupting device
  - Loss of DC supply

#### 37.3.3 Reset Alarms

For all system-generated alarms, the control system shall provide for the resetting of those alarms. This function is intended for alarms that, after they are set (for example, by a fault condition, as listed above and elsewhere in this specification), must be cleared by operator intervention to allow normal operation to be restored.

#### 37.3.4 Modify Storage Settings

The control system shall provide for modification of various set points and fixed operation/control settings associated with the various control functions.

#### 37.3.5 Event/History Logging

The control system shall provide for the automatic logging of the following information:

- All errors or failures
- All startup and shutdown actions
- All control actions
- All responses to control actions
- All limit violations, including returns within limits

#### 37.3.6 Status Reporting

The control system shall provide for reading and reporting of various BESS-supplied status information in accordance with the data collection and reporting requirements specified in this technical specification.

#### 37.3.7 Time Synchronization

The control system shall provide for synchronization of its real-time clock with a standard time source.

#### 37.3.8 Change Operational Mode

The control system shall support the mechanisms inherent in DNP3 AN2011-001 for activating/deactivating control functions. The control functions are expected to be executed by command from a remote host but may also be scheduled according to the DNP3 standard.

#### 37.3.9 Perform Self Diagnostics

The control system shall provide for self-diagnostic functions.

### **37.4 Control System Hardware Requirements**

All local control and monitoring system components shall be housed in appropriate controlled environment enclosures at a visible position of the container and shall be in conjunction with Solar Plant SCADA system.

### **37.5 Control System Self-Protection and Self-Diagnostic Features**

37.5.1 The BESS shall include appropriate self-protective and self-diagnostic features to protect itself and the battery from damage in the event of BESS component failure or from parameters beyond the BESS's safe operating range due to internal or external causes. The self-protective features shall not allow local or remote signals to cause the BESS to be operated in a manner that may be unsafe

or damaging to the BESS. All protective operations resulting in a shutdown shall be carried out in an orderly and safe manner, even in the absence of utility power.

37.5.2 Temperature sensors shall be incorporated in critical components within the BESS. The BESS shall alarm and go to standby/fault mode when an over-temperature condition is detected.

37.5.3 The BESS shall alarm upon detection of a DC ground fault. The alarm trip level shall be field adjustable.

37.5.4 Door interlock switches shall be provided for all BESS container doors. The BESS shall alarm and go to shutdown mode when an BESS door is opened. Doors shall be fitted with provisions for external locks.

37.5.5 The BESS shall alarm and go to shutdown mode upon detection of smoke.

37.5.6 Surge-protection devices shall be provided at the input and output terminals of the BESS.

### **37.6 Control Panel**

- The BESS shall include an LCD touch display of Minimum10', which is easily accessible, on or within the BESS container. As a minimum, the following operator controls shall be located on the control panel:
  - Trip/reset for the BESS AC circuit breaker or contactor.
  - Trip/reset for DC circuit breaker(s)/contactor(s).
  - PCS on/off.
  - Reset toggle or push button. When reset is initiated, the control system shall resume control and proceed to the appropriate operating mode.
  - Reset cut-out selector switch to disable remote or local reset signals.
  - A selector switch to manually set the operating state (that is, the shutdown, disconnect, or operate state) and to have the control system set the operating state automatically.
  - A selector switch to manually set the operating mode and to have the control system set the operating mode automatically.
- The control panel or console shall also include meters, indicators, and displays.

### **37.7 Performance Monitoring and Data Acquisition**

37.7.1 The BESS shall include a (Data Acquisition System) DAS to provide continuous monitoring and display of key operational parameters, as well as permanent archival of all measured parameters. The DAS shall include sensors, transducers, wiring, signal isolation and conditioning circuitry, and data acquisition and analysis hardware and software as required to perform the functions described in this section. The DAS shall be of standard commercial manufacture and shall use hardened components suitable for operation in the climatic conditions prevailing at site.

37.7.2 The DAS shall measure operational data, as described in this Clause, and shall record all data points to fixed and removable non-volatile memory. The DAS shall be capable of making all monitored data and events available through the DNP3 / IEC 61850 communication interface and shall permit display of current values and recent historical trends on a local screen for all recorded points. In addition, the DAS shall provide panel meter displays of certain operational parameters, as prescribed below.

37.7.3 Provision of monitoring and event data via the communication interface shall adhere to DNP3 AN2011-001 / IEC 61850 to the extent possible and capture at least the following data points:

- Frequency at the AC bus
- AC real power
- Power factor
- Real energy delivered
- Real energy received
- Auxiliary power
- Auxiliary energy
- DC power
- DC voltage
- DC current
- Phase A voltage
- Phase A angle
- Phase B voltage
- Phase B angle
- Phase C voltage

- Phase C angle
- Battery state of charge
- Battery string currents
- Battery temperature

37.7.4 Digital displays, on each battery bank, shall be no less than 1 in. (2.54 cm) high and shall update at least once per second. The DAS shall be integrated with the Solar PV SCADA described elsewhere in this Technical Specification either as addendum or within an overall Energy Management System Interface. The DAS shall, at a minimum, provide remote data inquiry from personal computer- based platforms and data file export capabilities in ASCII format on independent media (such as a universal serial bus drive) that are readable on personal computer- based systems.

37.7.5 The DAS shall continuously measure or calculate the data points and shall make them available via the communication network as specified. All measured parameters shall also be permanently archived in all modes of operation. For continuously varying quantities, the Contractor shall propose for ANERT's review and approval an approach to data archiving that is suitable for each quantity measured. The final approach will be decided during product design.

37.7.6 The DAS shall provide unsolicited message capability for reporting critical alarms. The Contractor and the ANERT will agree on a list of alarms that are reported the instant they are detected. However, a minimum of following parameters shall be displayed on BESS local control panel, console, or SCADA computer:

- Main temperature Alarm (on system temperature exceeding a predetermined threshold)
- Smoke/fire Alarm (on system detection of smoke/fire)
- DC leakage current (battery leakage current to ground exceeding a predetermined threshold)
- Breaker status (connect/disconnect switch)
- AC voltage OK (system ac voltage exceeding a predetermined threshold)
- Battery temperature alarm (battery temperature exceeding a predetermined threshold)
- Synchronization error shutdown
- PCS fault
- Weak Unit Battery Alarm

- AC system fault
- Control logic problem (problem with the BESS control logic)
- DC fuse blown
- Container door open (BESS container door opening)

37.7.7 The BESS shall include provisions for determining and storing in non-volatile memory the sequence of abnormal events, trips, and/or alarms that cause the BESS to go the disconnect or shutdown state. It is preferable that this function be implemented separately from the normal operations data acquisition function of the DAS so that failures in the latter (hardware/software failures or power interruptions) will not prevent the permanent logging of abnormal event sequences. The BESS shall include provisions to transmit, at a minimum, the data displayed on the panel meters and the alarm/status indicators to the remote computer.

## **38 GROUNDING**

A suitable equipment grounding system shall be designed and installed for the BESS. This system shall be designed to be tied to an existing site grounding system. The system also shall be adequate for the detection and clearing of ground faults. All exposed non-current-carrying metal parts shall be solidly grounded. Particular attention shall be given to prevention of corrosion at the connection of dissimilar materials such as aluminium and steel.

## **39 WIRING**

39.1 All wiring shall be continuous for each wiring run; splices are not acceptable.

39.2 Wiring that may be exposed to mechanical damage shall be placed in conduit or armoured.

39.3 Wires shall have identifying labels or markings on both ends. The labels or markings shall be permanent and durable. Stick-on labels will not be allowed. All field wiring between separate equipment items supplied by the Contractor shall be color-coded according to appropriate standards.

39.4 In general, and where practicable, control and instrumentation wiring shall be



separated from power and high voltage wiring by use of separate compartments or enclosures or by use of separate wireways and appropriate barrier strips within a common enclosure.

39.5 BESS and PCS control and instrumentation system wiring shall be bundled, laced, and otherwise laid in an orderly manner. Wires shall be of sufficient length to preclude mechanical stress on terminals. Wiring around hinged panels or doors shall be extra flexible and shall include loops to prevent mechanical stress or fatigue on the wires.

39.6 Insulation and jackets shall be flame retardant and self-extinguishing.

39.7 Wiring to terminal blocks shall be arranged as marked on wiring diagrams. Terminal groupings shall be in accordance with external circuit requirements.

39.8 Raceway and cable systems shall not block access to equipment by personnel. There shall be no exposed current-carrying or voltage-bearing parts.

## **40 CIVIL/STRUCTURAL**

### **40.1 General Requirements**

40.1.1 Soil bearing stresses shall not exceed the allowable stresses for the soil parameters, as determined by the Contractor. A minimum safety factor of 1.5 shall be provided against uplift, sliding, and overturning loads. Soil stresses shall be calculated using unfactored loads.

40.1.2 All structures and foundation designs must include suitable evidence to show that their design is commensurate with a minimum of 25-year life.

40.1.3 Unless specifically stated otherwise, the design of all structures, equipment, and foundations shall be based on applicable portions of IS codes, these specifications, and industry standards.

40.1.4 All components shall be painted, coated, or otherwise protected in a manner commensurate with at least 25-year design life. Particular attention shall be given to prevention of corrosion at the connections between dissimilar materials such as aluminium and steel, and steel and concrete.

40.1.5 All structures and foundations shall be designed to resist dead, live, wind, and seismic loads.

## 40.2 Requirements for Contractor Installation

40.2.1 The Contractor shall be responsible for obtaining all required permits and ensuring that all inspections by local authorities are completed as required.

40.2.2 Calculations based on applicable standards shall be supplied to show that the design of the entire BESS will withstand wind speed and/or gusts and other loads specific to the site and that the design meets all applicable structural and transportation codes.

40.2.3 Excavation spoils shall be disposed of as directed by the ANERT.

40.2.4 All reinforced concrete work shall be in accordance with relevant Indian Standards. All other materials and installation requirements shall be subject to ANERT approval.

## 41 MECHANICAL

41.1 All exposed surfaces of ferrous parts shall be thoroughly cleaned, primed, and painted or otherwise suitably protected to survive outdoor conditions for at least 25-year design life of the system.

41.2 Outdoor enclosures shall be weatherproof and capable of surviving intact under the site environmental conditions specified. Outdoor enclosures shall be equipped to prevent condensation.

41.3 Components mounted inside enclosures shall be clearly identified with suitable permanent designations that also shall serve to identify the items on drawings provided.

41.4 The site temperatures and the effect of temperature on component life shall be considered in developing the thermal design for all components, including the battery and PCS. Irrespective of the heat-removal system design the final rejection of all waste heat from the BESS shall be to the ambient air. Air-handling systems shall include filters to prevent dust intrusion into the BESS.

41.5 The BESS shall include an HVAC or ventilation system designed to maintain battery temperatures at levels acceptable to the Contractor's normal battery warranty conditions, conducive to acceptable battery life, and as required to maintain battery capacity for all seasons/climatic conditions at the site. The air

handling/distribution system shall be designed to promote temperature uniformity within the battery.

## **42 OTHER DESIGN REQUIREMENTS**

### **42.1 Noise Levels**

The Contractor shall provide for and maintain noise mitigation devices like Noise mufflers at site, if required.

### **42.2 Fire Protection**

The Contractor shall design and install a fire protection system that conforms to good engineering practice. The fire protection system design and associated alarms shall take into account that the BESS will be unattended. If required by the type of fire protection system provided, the Contractor shall calculate and take into account the heat content of the battery cell materials in designing an appropriate fire protection system. Separate fire protection systems may be used in the battery, PCS, and control areas.

### **42.3 Toxic Materials**

If any toxic substance can be emitted from the equipment during a failure, fire, or emergency or protective operation, description of the toxic nature of the substances as well as treatment for exposure to it shall be included in the O&M manual. Their treatment and disposal shall be in accordance with the New Hazardous Waste Management Rules 2016 notified by the Government of India.

### **42.4 Spare Parts and Equipment**

The Contractor shall evaluate the design with regard to expected failure rates, modes, and effects; overall BESS reliability; and planned mode of servicing. Based on this evaluation, the Contractor shall recommend and furnish an initial complement of spare parts that are not readily available. For example, these spare parts may include spare unit batteries and a small rectifier to maintain the unit batteries, as well as fuses, printed circuit boards, and switching devices (gate turnoff thyristors [GTOs], silicon-controlled rectifiers [SCRs], insulated gate bipolar transistors [IGBTs], and so on).

## **43 MAINTENANCE AND REPAIR**

- 43.1 The Contractor shall supply all labour, equipment, and materials needed to maintain the BESS performance and safe operation, including all maintenance required to satisfy the warranty terms and conditions.
- 43.2 The Contractor shall list all maintenance activities to be carried out under the maintenance contract. For each maintenance item, the list shall include a description of the item, the expected frequency (maintenance interval), the time required to perform the maintenance, any anticipated parts replacement, and any potential problems in carrying out the maintenance.

## **44 FACTORY ACCEPTANCE TESTING OF BESS**

- 44.1 The Contractor shall develop and submit to the ANERT for its review and approval a comprehensive FAT plan that shall demonstrate that the BESS will meet the requirements of the specification. The ANERT shall have the right to request reasonable changes to the test plan.
- 44.2 Where full-scale testing of larger systems at the factory may be difficult or impossible due to the large system, the FAT shall be carried out at a subsystem or module level and shall consist of tests of 100% of the subsystems or modules that comprise the complete BESS, to the extent possible. In the FAT plan, the Contractor shall clearly state what is being tested and shall fully explain any features or functions of the fully assembled BESS that would not be fully tested in the reduced-scale testing proposed. In such a case, the SAT plan shall further describe how the tests that could not be carried out in the factory will instead be carried out at the site.
- 44.3 After the Contractor determines that the BESS is fully operational, the Contractor shall conduct a FAT, witnessed by the ANERT and/or the ANERT's representative. The FAT shall consist of the Contractor demonstrating to the ANERT that the BESS is fully operational and performs as specified. This includes but is not limited to the following:
- Visual inspection of all provided equipment, including dimensions and overall design.

- Verification of proper mechanical construction such as electrical connection torques.
- Verification of sensors, metering, and alarms.
- Verification of all control functions, including remote control and monitoring, and communications interfaces.
- Verification of BESS performance at full and partial power and energy ratings.
- Verification of maintenance and replacement features for unit batteries and other key components.
- Verification of compliance with specifications.

44.4 During the FAT, the BESS shall meet the following:

- Be operated and function as specified and designed in all the operating states, use cases, and duty cycles specified herein
- Meet the power and energy requirements specified herein
- Be demonstrated to meet the safety and response to catastrophic failure requirements specified herein
- Have the efficiencies, response capabilities, and other features specified herein and/or proposed by the Contractor

44.5 Operation of all control, protective relaying, and instrumentation circuits shall be demonstrated by direct test, if feasible, or by simulating operating states for all parameters that cannot be directly tested. Automatic, local (control console), and remote operation of the controls shall be demonstrated. ANERT's site. If this is not possible for the full BESS at the manufacturing facility, independent laboratory certification of operation of critical components and subsystems in the battery, PCS, and control systems shall be submitted at the time of the FAT. The Contractor shall submit to the ANERT for approval, 90 days before the FAT, a list of components and subsystems for which independent lab testing certification will be sought.

44.6 The Contractor shall perform any and all system modifications required during start-up and testing. The testing may be suspended as a result of a BESS malfunction and resumed only on rectification of problem items. Such suspension and resumption will occur at the sole discretion of the ANERT.

44.7 The BESS will not be accepted for shipment until all FATs have been successfully completed. In addition, the ANERT will verify that all provisions of the contract have been met, including verification of all required submittals, any spare parts delivery, and any required system modifications.

## **45 COMMISSIONING AND FUNCTIONAL GUARANTEE TEST PROCEDURE**

45.1 The Contractor shall develop and submit to the ANERT for its review and approval a comprehensive SAT plan that shall demonstrate to the ANERT that the BESS will perform as specified at the ANERT's site. The ANERT shall have the right to request reasonable changes to the test plan.

45.2 The Contractor shall develop and perform SAT procedures to ensure that the BESS will perform as designed and that the system meets the performance criteria specified elsewhere in these specifications. The SAT plan shall include procedures to test operating scenarios described in the specification. These procedures may involve special requirements and/or witnessing by the local independent system operator. To the extent achievable, all use cases and operating modes described in the specification shall be tested.

45.3 After the Contractor has determined that the BESS is fully operational, the Contractor shall conduct the SAT, witnessed by the ANERT and/or the ANERT's representative. The tests shall include, as a minimum, the following:

- Verification of sensors, metering, and alarms
- Verification of all control functions, including automatic, local, and remote control
- Verification that the performance criteria in the specification can be met or exceeded
- Demonstration of all of the intended uses
- Demonstration of interface protection circuits and functions and control interfaces

45.4 Tests shall demonstrate that the BESS capabilities, efficiencies, response, and features are as proposed by the Contractor.

45.5 Testing shall include, as a minimum, measurement of harmonic content and power factor at full and partial power levels for both charge and discharge.

- 45.6 Operation of all control, protective relaying, and instrumentation circuits shall be demonstrated by direct test, if feasible, or by simulating operating states for all parameters that cannot be directly tested. Automatic, local, and remote operation shall be demonstrated.
- 45.7 The SAT shall also specifically address discovery of problems or failures that may have occurred during or as a result of shipment.
- 45.8 The Contractor shall perform any required modifications and repairs identified by the testing, before acceptance by the ANERT.
- 45.9 The ANERT will not accept the BESS for commissioning until all acceptance tests have been successfully completed and all provisions of the contract have been met.
- 45.10 Functional Guarantee - Actual Operating Experience

Since it may not be possible, due to system constraints, to test all facets of the BESS function as part of the performance verification tests specified in the preceding sections the actual operating experience of the BESS during the performance guarantee period after initial startup shall be deemed an extension of the performance verification tests. The performance guarantee period shall not be construed as a substitute for the warranty requirements, as specified in the subsequent Clause. Actual operating experience will be documented through Contractor-furnished records, and other system monitoring equipment and associated BESS performance. Documented failure or malfunctions of any BESS component during the performance guarantee period shall be deemed a failure of the system commissioning test. The Contractor shall, at no cost to the ANERT, make the necessary repairs, replacements, modifications, or adjustments to prevent the same failure or malfunction from occurring again. The replacement of certain BESS components in response to a system failure may necessitate, at the discretion of the ANERT, the duplication of certain performance verification tests, which shall be performed at the Contractor's expense.

## **46 WARRANTY**

- 46.1 The Contractor shall provide a warranty for the entire BESS and its constituent equipment.

46.2 At a minimum, the Contractor shall provide an unconditional, 10 (Ten) -year parts and labour warranty on all BESS equipment including battery (unit or racks). For the battery storage, 10-year warranty is to provided and the warranty shall cover parts warranty including battery nominal capacity ratings in order to meet the End of battery Life condition described in this specification.

46.3 Warranty replacement shall be required for individual unit batteries that degrade in performance to the point at which the BESS cannot meet the requirements specified in this specification up to the End of Battery Life and/or for unit batteries that materially degrade the availability, reliability, safety, or functionality of the BESS.

46.4 The warranty shall guarantee the availability of battery replacements delivered to the site within 2 weeks of notification during the battery warranty period. This period, shall, however, not be considered part of the Accountable Outage period for assessing BESS availability.

46.5 Additional warranty requirements are as follows:

- The warranty shall specify the terms and conditions of the warranty, including operating conditions requirements, procedures that must be followed, and all maintenance requirements. The warranty terms shall be easy to understand and shall be clearly stated.
- The warranty shall provide an explicit statement as to the warranted cycle life and the warranted calendar life of the battery.
- The warranty shall include a simple and easy to understand proration formula, if any, to be used in crediting the ANERT for unused life or capacity of equipment replaced or repaired.
- The warranty shall specify guaranteed battery replacement costs. The ANERT shall be provided the option to secure the guaranteed replacement cost at the time of the initial supply agreement.
- The warranty shall specify the scope of service associated with software updates.
- The warranty shall specify the scope of service included in replacement or repair of the equipment.
- The warranty shall specify all labour, materials, shipping charges, and other



ANERT expenses not included in the warranty.

- The warranty shall specify the estimated time to complete the repairs/replacement required to restore the BESS to the warranted performance level. The time shall be given as the number of working days from the time of ANERT's notice to the Contractor that the BESS has failed to meet the performance requirements.

#### **47 DOCUMENTATION AND SUBMITTALS**

- a. The Contractor shall furnish complete documentation that will be used for determination of contract compliance, as well as O&M of the BESS.
- b. Review and acceptance of submittals shall not encumber the ANERT or the KSEBL with responsibility for the adequacy or safety of the Contractor's design.
- c. Titles shall clearly indicate the function of the document, the ANERT and location of the facility.
- d. At a minimum, Contractor's documentation shall consist of the following:
  - Construction and installation drawings
  - Construction materials submittal
  - Equipment drawings and specifications
  - Operation and maintenance manual
  - Maintenance schedule
  - Critical path method project schedule
  - Master test plan and procedures
  - Quality assurance manual
  - Software documentation
  - Study reports
  - Test reports
  - Training manual

## FORMAT FOR COVERING LETTER

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*(This letter to be submitted on the official letter head of the bidder, signed by the authorised signatory.)*

Sir,

I/We hereby e-tender to render the services under annexed terms and conditions of contract, the whole of the articles referred to and described in the attached specification and quantity decided by the Agency for New & Renewable Energy Research and Technology (ANERT), at the rates quoted against each item.

I am/We are remitting herewith the required amount of Rs. .... towards the registration Fee by electronic payment vide transaction No .....  
dtd.....

Yours faithfully,

Place:

Signature

Date:

Name

Designation

(Office Seal)

## ANNEXURE A – SUMMARY OF BID QUALIFICATION REQUIREMENTS

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(To be filled in by the bidder in Letter Head)

1.	Name of the applicant and address with email, phone etc.	
2.	Main area of Business	
3.	Registered Office in Kerala	
4.	Details of Power of Attorney	
5.	Proof for Experience	

Documentary evidence for the bid qualification requirements are submitted along with this document and the details furnished above are true and correct.

Signature  
of authorised signatory

Name  
Designation

Date:

(Office seal)

## **ANNEXURE B – AGREEMENT**

*(To be provided on Rs.200 Non-Judicial Kerala Stamp paper)*

**Subject: Invitation of Expression of Interest (EoI) for the Pilot Implementation of  
Battery Energy Storage System at Government Medical College Campus,  
Thiruvananthapuram (funded by Smart City Thiruvananthapuram Ltd)**

With reference to the RFP Document for the captioned Project, I/we, I ..... (Name, Designation) authorised signatory of ..... (Name and full address of the bidder) having examined all relevant documents and understood their contents hereby undertake that the Proposal is unconditional and unqualified.

1. I/We confirm that I/we have examined the terms and conditions published in the EOI and accordingly submitting the Application. The proposal is unconditional and unqualified.
2. All information provided in the Proposal is true and correct and all documents accompanying such Proposal are true copies of their respective originals.
3. This statement is made for the express purpose of appointment Providing PMU services in terms of providing Consultancy and Technical Services
4. I/We shall make available to ANERT any additional information it may deem necessary or require for supplementing or authenticating the Proposal.
5. I/We acknowledge the right of the ANERT to reject our application without assigning any reason or otherwise and hereby waive our right to challenge the same on any account whatsoever.
6. I/We certify that in the last three years, I/we have neither failed to perform on any contract, as evidenced by imposition of a penalty by an arbitral or judicial Court or a judicial pronouncement or arbitration award against us, nor have been expelled from any project or contract nor have had any contract terminated for breach on our part.

7. I/We declare that:
1. I/We have examined and have no reservations to the EOI Documents, including any Addendum thereto, issued by the ANERT;
  2. I/We do not have any conflict of interest in accordance with provisions of the EOI Document;
  3. I/We have not directly or indirectly or through an agent engaged or indulged in any corrupt practice, fraudulent practice, coercive practice, undesirable practice or restrictive practice, as defined in the EOI document, in respect of any tender or request for proposal issued by or any agreement entered into with the ANERT or any other public sector enterprise or any Government, Central or State; and
  4. I/We hereby certify that we have taken steps to ensure that in conformity with the provisions of this EOI, no person acting for us or on our behalf will engage in any corrupt practice, fraudulent practice, coercive practice, undesirable practice or restrictive practice.
8. I / We understand that you may cancel the Selection Process at any time and that ANERT is neither bound to accept any Proposal that you may receive nor to select the Consultant, without incurring any liability to the Applicants in accordance with the EOI document.
9. I / We certify that in regard to matters other than security and integrity of the country, we or any of our Associates have not been convicted by a Court of Law or indicted or adverse orders passed by a regulatory authority which would cast a doubt on our ability to undertake the Consultancy for the Project or which relates to a grave offence that outrages the moral sense of the community.
10. I / We further certify that in regard to matters relating to security and integrity of the country, we have not been charge-sheeted by any agency of the Government or convicted by a Court of Law for any offence committed by us or by any of our Associates.
11. I / We hereby irrevocably waive any right or remedy which we may have at any stage at law or howsoever otherwise arising to challenge or question any decision taken by the ANERT (and/ or the Government of Kerala / India) in connection

with the selection of Consultant or in connection with the Selection Process itself in respect of the above mentioned Project.

12. I / We agree and understand that the proposal is subject to the provisions of the EOI document. In no case, shall I/we have any claim or right of whatsoever nature if the Consultancy for the Project is not awarded to me/us or our proposal is not opened or rejected.
13. I / We agree to keep this offer valid for (120) days from the date of opening of technical bid.
14. I/We have studied EOI and all other documents carefully. We understand that we shall have no claim, right or title arising out of any documents or information provided to us by the ANERT or in respect of any matter arising out of or concerning or relating to the Selection Process including the award of Consultancy.
15. The Technical Proposals and Financial Proposals are being submitted in separate Covers available in the etenders portal.
16. I/We agree and undertake to abide by all the terms and conditions of the EOI Document. In witness thereof, I/we submit this Proposal under and in accordance with the terms of the EOI Document.

Signed by Sri ..... Signed by Sri .....

(Date) .....

(Date) .....

in the presence of witnesses

in the presence of witnesses

1.

1.

2.

2.

## ANNEXURE C – POWER OF ATTORNEY

*(On Stamp Paper of requisite Stamp value)*

Know all men by these presents, we, ..... (name of Firm and address of the registered office) do hereby constitute,.....nominate, appoint and authorise Mr / Ms..... son/daughter/wife and presently residing at ....., who is presently employed with us and holding the position of.....as our true and lawful attorney (Hereinafter referred to as the —Authorized Representative) to do in our name and on our behalf, all such acts, deeds and things as are necessary or required in connection with or incidental to submission of our Proposal for and selection as the Consultant for

including but not limited to signing and submission of all applications, proposals and other documents and writings, participating in pre-bid and other conferences and providing information/ responses to the ANERT, representing us in all matters before the ANERT, signing and execution of all contracts and undertakings consequent to acceptance of our proposal and generally dealing with the Authority in all matters in connection with or relating to or arising out of our Proposal for the said Project and/or upon award thereof to us till the entering into of the Agreement with the ANERT.

AND, we do hereby agree to ratify and confirm all acts, deeds and things lawfully done or caused to be done by our said Authorised Representative pursuant to and in exercise of the powers conferred by this Power of Attorney and that all acts, deeds and things done by our said Authorised Representative in exercise of the powers hereby conferred shall and shall always be deemed to have been done by us.

IN WITNESS WHEREOF WE, ..... THE ABOVE - NAMED AUTHORISED REPRESENTATIVE HAVE EXECUTED THIS POWER OF ATTORNEY ON THIS DAY OF ....., 2024

For

(Signature, name, designation and address)

Witnesses:

- 1.
- 2.

Notarized

Accepted (Signature, name, designation and address of the Attorney)



## **ANNEXURE D – DECLARATION BY THE BIDDER**

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e-EoI Notification No: ....., dtd ..... for  
Invitation of Expression of Interest (EoI) for the Pilot Implementation of Battery Energy  
Storage System at Government Medical College Campus, Thiruvananthapuram (funded by  
Smart City Thiruvananthapuram Ltd)

To

The CEO  
ANERT

We, the undersigned, declare that:

1. We have examined and have no reservations to the Bidding Document, including Addenda No.: ..... (if any)
2. We offer to supply in conformity with the Bidding Document and in accordance with the delivery schedule
3. Our Bid shall be valid for a period of 6 months from the date fixed as deadline for the submission of EoIs in accordance with the Bidding Document, and it shall remain binding upon us and may be accepted at any time before the expiration of that period;
4. If our Bid is accepted, we commit to submit a Security Deposit in the amount of 5 percent of the Contract Price for the due performance of the Contract;
5. We are not participating, as Bidders, in more than one Bid in this bidding process;
6. Our firm, its affiliates or subsidiaries, including any subcontractors or suppliers for any part of the Contract, has not been declared ineligible by the ANERT or Government of Kerala;
7. We understand that this Bid, together with your written acceptance thereof included in your notification of award, shall constitute a binding contract between us, until a formal Contract is prepared and executed.

8. Our firm has obtained the certifications from MNRE or NABL approved Test laboratories that the goods and services are satisfying the technical criteria specified in the bid.

Date

Signature

Name

## **ANNEXURE E – DECLARATION OF RELATIONSHIP WITH ANERT EMPLOYEE**

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(to be signed and submitted by the bidder along with the bid)

EoI Notification No.: .....

Invitation of Expression of Interest (EoI) for the Pilot Implementation of Battery Energy Storage System at Government Medical College Campus, Thiruvananthapuram (funded by Smart City Thiruvananthapuram Ltd)

To

The CEO  
ANERT

Name of the ANERT employee with Designation:

Name of the bidder related to the employee:

This is to put on record that Shri/Smt .....  
currently working as ..... in ANERT is related  
to ....., who is the bidder in the bid. We are aware of  
the Anti-corruption policy of ANERT and will observe the highest standards during the  
execution of contract and shall refrain from corrupt, fraudulent, collusive or coercive  
practices on competing for the contract.

Signature

Name

Date

## **ANNEXURE F – UNDERTAKING FOR NO BLACKLISTING & NO BANNING**

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*(To be provided on Rs.200 Non-Judicial Stamp paper. In Case of JV the following format is to be provided by Each Member of the Joint Venture on their respective letterhead, signed by respective authorized Signatory along with Authorized Signatory for which POA is attached with Bid))*

### **Undertaking for No Blacklisting & No Banning**

To

The CEO  
ANERT

**Sub:** Invitation of Expression of Interest (EoI) for the Pilot Implementation of Battery Energy Storage System at Government Medical College Campus, Thiruvananthapuram (funded by Smart City Thiruvananthapuram Ltd)

I / We hereby declare that presently our Company/Limited Liability Partnership/ Partnership Firm/ Sole Proprietorship is having unblemished record and is not declared ineligible for corrupt/fraudulent practices by any State/Central Government/PSU on the date of Bid Submission.

I / We further declare that presently our Company/Limited Liability Partnership/ Partnership Firm/ Sole Proprietorship is not blacklisted and not declared ineligible for reasons other than corrupt/fraudulent practices by any State/Central Government/PSU on the date of Bid Submission.

If this declaration is found to be incorrect then without prejudice to any other action that may be taken, our security may be forfeited in full and the EoI if any to the extent accepted may be cancelled.

**(Signature & Seal of Authorized Signatory for which POA attached)**

**Name of Authorized Signatory:**

**Designation:**

**Date:**

**Place:**

## ANNEXURE G – CERTIFICATE OF FINANCIAL QUALIFICATION

(On Letterhead of the respective entity for which the below details are provided.)

### Financial Qualification Certificate

(Rupees in Crores)

S/N	Financial parameters	FY 18-19	FY 19-20	FY 20-21	FY 21-22	FY 22-23
1.	<b>Net Worth</b>					
a)	Paid up Capital					
b)	Free Reserves and Surplus*					
c)	Misc expenses to the extent not written off					
	<b>Net Worth (a+b-c)</b>					
2.	<b>Annual Turnover **</b>					

\* Free Reserve and Surplus shall be Exclusive of Revaluation Reserve, written back of Depreciation Provision and Amalgamation.

\*\* Annual total Income/ turnover as incorporated in the Profit and Loss Account excluding non-recurring income, i.e., sale of fixed asset etc.

It is certified that all the figures are based on audited accounts read with auditors report and Notes to Accounts etc.

#### (Signature & Seal of Authorized Signatory

Name of Authorized Signatory:

Certifying Chartered Accountant:

Designation:

Name of Firm:

Date:

UDIN No:

Place:

Date:

Place:

#### Note:

1. In addition to above certificate from Chartered Accountant, Bidder is required to submit Firm's Annual Audit Report, Balance sheet, Profit & Loss and Income Tax Returns / CA certificate for last Five years i.e., F.Y: 2018-19, 2019-20, 2020-21, 2021-22 & 2022-23.