Global Energy Alliance
for people and planet

Expression of Interest (EOI) for Supply, Integration and Commissioning of Sodium-Ion Battery Energy Storage

Table of Contents

EOI Information

The Global Energy Alliance for People and Planet, in partnership with Leading Utility in north India,, invites Expressions of Interest (EOI) from qualified manufacturers, system integrators, and EPC contractors for the supply, integration, and commissioning of a Sodium-Ion Battery Energy Storage System (Na-Ion BESS) to be deployed at a selected Distribution Transformer (DT)..

The proposed project involves a ~200 - 300 kWh Sodium-Ion BESS, designed to operate at the distribution transformer level. The system shall be designed for up to two full charge-discharge cycles per day over a project life of 12 – 15 years and is expected to retain a State of Health (SoH) of not less than 70% at end of life.

The BESS deployment is intended to address key operational and reliability challenges faced by Utilities distribution network. The system is expected to deliver the following benefits:

- **Energy arbitrage and peak load shifting:** Reduction of peak demand stress and transformer overloading at the DT level through time-of-use energy management
- **AT&C loss reduction:** Improvement in Aggregate Technical and Commercial (AT&C) losses at the feeder and DT level through optimised energy dispatch
- **Voltage profile improvement:** Stabilisation of voltage on long rural and semi-urban feeders prone to voltage sag and fluctuation
- **Flexible integration of distributed renewables**: Enabling seamless integration of rooftop solar and other distributed renewable energy sources at the DT level
- **Deferral of network augmentation investments:** Reducing the need for near-term capital expenditure on DT upgrades and network reinforcement

Submission Timelines and Guidelines

#	Key Activity	Target Date
1	• EOI Release Date	5-Aug-26
2	• Submission of Proposer Questions	22-Aug-2026
3	• Response to Proposer Questions	26-Aug-2026
4	• Deadline for Submission of EOI Proposals	4-Sept-2026

- Response validity: 3 months from the submission deadline

All EOI communications and/or submissions (including with duly signed supporting documents where relevant) are required to be sent, in line with the timeline above, via email to:

Email: Sangeeta.Mathur@energyalliance.org **and** contractsgeappasia@energyalliance.org.

Please ensure you include the EOI title in the subject line of the email.

While the Global Energy Alliance (GEA) intends to adhere strictly to this schedule, GEA reserves the sole right, at its absolute discretion, to extend the submission deadline or modify the procurement timeline as necessary to ensure a competitive and compliant bidding process. Any such extensions or amendments will be communicated formally in writing to all confirmed respondents.

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1 Introduction

1.1 About the Global Energy Alliance for People and Planet

The Global Energy Alliance for People and Planet (GEAPP) is a collective movement for change, working to unlock renewable energy access in emerging economies. Clean energy is development; without it, every other form of progress is impacted. Today, half the world's population – 3.6 billion people – live in energy poverty.

Formed on a spirit of radical collaboration, Global Energy Alliance brings together philanthropy, including our founder partners the IKEA Foundation, The Rockefeller Foundation and the Bezos Earth Fund, governments, development partners, and the private sector. Together we seek to open up green energy access and a just transition, unlocking a new era of inclusive economic growth while enabling the global community to meet critical climate goals within the next decade. Our mission is to accelerate a renewable energy tipping point that powers progress for people and planet.

Central to our approach are two interconnected pillars:

- **Grids of the Future** harnesses AI and digital tools, battery storage and distributed renewable energy to prepare electricity grids for rising demand and clean energy. We are building partnerships with utilities in pivotal energy markets, strengthening the grids that serve more than 460 million people.
- **Powering Opportunity** supports the training, tools and markets that enable communities and countries to harness energy to power businesses, create jobs and drive growth. Our Powering Opportunity Coalition coordinates large-scale investments and shares best practices across eight countries, to create or improve 112 million jobs.

Together these two pillars create a mutually reinforcing cycle of abundant electricity and economic growth

Global Energy Alliance launched the **India Grids of the Future Accelerator** to support Indian DISCOMs in making the distribution network more efficient, cost-effective, renewable-friendly, and resilient. The support will range across rapidly advancing digitisation maturity, operational intelligence, grid reliability, peak management capabilities, asset performance, and scalable integration of Digital Twins, distributed energy resources, Battery Energy Storage Systems, and advanced demand-side solutions encompassing Demand Flexibility and Demand Side Management. The India Grids of the Future Accelerator intends to work with champion utilities to demonstrate tangible benefits that can be replicated and scaled across all DISCOMs in India.

1.2 About the customer

Leading public sector distribution company is responsible for distribution and retail supply of electricity across Jaipur and surrounding districts. Incorporated under the state Power Sector Reforms, operates under the regulatory oversight of the Electricity Regulatory Commission.

Utility (referred as client in this document) serves a highly diverse consumer base across dense urban areas, semi-urban localities, and rural/agricultural zones presenting a wide range of load profiles and operational challenges suited to DT-level storage intervention.

Key Operational highlights:

- **Key Challenges:** Seasonal peak demand variability, overloaded distribution transformers in dense areas, long rural feeders with voltage regulation concerns, and high agricultural load with variable demand patterns
- **Renewable Integration:** Growing penetration of rooftop solar and distributed RE under PM Surya Ghar and state-level schemes creating bi-directional power flow challenges at DT level

Client is committed to leveraging emerging storage technologies to improve distribution system reliability, reduce losses, defer network augmentation, and support state to transition to a high-renewable electricity future.

1.3 Background

Load patterns in state have become increasingly variable, driven by sharp urban commercial peaks, heavy agricultural feeder demand in kharif and rabi seasons, and the growing penetration of rooftop solar creating reverse power flows at the distribution level. On the supply side, state's significant solar generation capacity introduces intermittency that propagates to the distribution level, creating voltage fluctuations and power quality issues at individual DTs.

Distribution Transformer-level BESS represents a direct intervention at the last-mile of the grid that can relieve overloaded DTs, improving feeder voltage profiles, absorbing excess rooftop solar generation, and reducing AT&C losses through better load management. Unlike substation-level BESS, DT-level systems provide benefits that are localized, measurable, and directly attributable to specific transformers and consumer clusters.

The State Integrated Clean Energy Policy targets the deployment of 125 GW of renewable energy by 2029-30. Storage technologies are highlighted as essential for grid flexibility and adequacy in a high renewable-penetration future. It anticipates 12 GW of Pumped-Storage Plant (PSP) capacity. State is establishing 1 GW / 2 GWh of BESS, backed by Viability Gap Funding from Ministry of Power. State's renewable energy targets make distribution-level storage a strategic priority.

Historically, high costs and modest round-trip efficiencies limited BESS deployment. However, rapid adoption of lithium-ion technology has scaled global manufacturing and reduced costs significantly. While lithium-ion has dominated early deployments, Sodium-Ion batteries are now emerging as competitive, sustainable alternatives — particularly suited to the Indian context due to the absence of lithium and cobalt dependency, and a supply chain with significant domestic potential.

In alignment with this national direction, The utility and the Global Energy Alliance is exploring the deployment of a 200 - 400 kWh Sodium-Ion BESS project to demonstrate the operational and commercial value of storage at the distribution transformer level. This pilot aims to create stacked revenue on Sodium-Ion technology performance under State's climatic and grid conditions — including high ambient temperatures (up to 48–50°C), dust storm exposure, and highly seasonal demand patterns.

The broader goal is to generate operational insights and share lessons that can inform regulatory and policy frameworks, thereby accelerating the adoption of storage technologies, including Sodium-Ion batteries, within India's evolving power system.

1.4 EOI Process

The responses received through this EOI will be used to:

1. Identify suitable Sodium-Ion BESS technologies and configurations appropriate for DT-level deployment that meet the intended use cases.
2. Develop technical specifications for the various systems and stages required for implementing the demonstration/commercial project.
3. Assess vendor capability to supply modular, scalable systems across multiple DT sites in a phased manner.
4. Shortlist qualified System Integrators for participation in the forthcoming Request for Proposal (RFP) process.

1.5 Miscellaneous

1.5.1 Right to accept or reject any Application

- Notwithstanding anything stated in this EOI, GEAPP and Client reserve the right to accept or reject any response, or to annul the EOI process and reject all responses at any time, without any liability or obligation, and without assigning any reasons. In such an event, GEAPP and Client may, at their discretion, invite eligible applicants to submit fresh responses.
- GEAPP and Client reserve the right to reject any applicant during or after the EOI process if it is found that the applicant made a material misrepresentation, or failed to provide, within the specified timeline, any supplemental information requested.
- GEAPP and Client reserve the right to verify all statements, information, and documents submitted by applicants in response to this EOI. Any such verification, or the absence thereof, shall not relieve the applicant of their obligations or liabilities, nor shall it affect any rights of GEAPP and Client.
- For clarity, this EOI does not constitute a procurement process. A formal procurement process, through a Request for Proposal (RFP), will be arranged separately at a future date. GEAPP and Client do not intend to participate in the project as EPC contractors, O&M service providers, or majority equity investors.

1.5.2 Compliance with GEAPP Policies

- The submission of Application under this EOI shall constitute the Applicant's agreement to comply with all applicable GEAPP policies, including the Profit Blocking Mechanism, as may be issued, amended, or communicated by GEAPP from time to time.
    - Profit Blocking Requirement: The Applicant acknowledges that any funding/ fees provided under this scope may be subject to profit-blocking requirements. The Applicant represents and warrants that any funds awarded under this scope shall be used solely for the approved project purposes and shall not, directly or indirectly, be used to finance, distribute, transfer, or otherwise provide a financial benefit to any shareholder, member, partner, owner, investor, or ultimate beneficial owner of the Applicant or any affiliated entity.
    - The Applicant further agrees to maintain appropriate records and supporting documentation to demonstrate compliance with this requirement and to provide such information to GEAPP upon request.

1.5.3 Governing Law and Jurisdiction

The EOI shall be governed by and construed in accordance with the laws of the State of New York, USA. The state and federal courts located in the State of New York shall have exclusive jurisdiction over any and all dispute, controversy, or claim arising out of or in connection with this EOI.

2 Indicative Roles and Responsibilities of the Bidder

- **Design and Engineering, with Supply, Installation and Commissioning:** End-to-end responsibility for the design, engineering, manufacture, supply, erection, commissioning, and testing of the Sodium-Ion BESS at identified DT locations. This includes all associated electrical, civil/structural, control, instrumentation, and power evacuation at 415V LT level required for project completion.
- **Thermal and Environmental Design:** Ensure the system is designed for reliable operation under state's climatic conditions, including ambient temperatures up to 50°C, dust storm exposure (IP-rated enclosures for eg- IP65), and monsoon conditions.
- **Protection Coordination:** Design and implement a protection scheme that is fully coordinated with the existing DT protection system, including overcurrent and earth fault protection, and obtain approval from Client prior to commissioning.
- **Advanced Energy Management & Data Storage:** Implement advanced energy management systems and ensure secure data storage on servers hosted in India.
- **Operations & Maintenance:** Carry out routine operations and maintenance of the Sodium-Ion BESS for the period in line with the agreed Service Level Agreements (SLA).
- **Performance Monitoring:** Collect, monitor, and analyses performance data during testing and subsequent operations to optimize system efficiency and value stacking.

3 Information about Applicants

a) Name of the Company
b) Legal status of the Company
c) Brief description of the Company including details of its business groups/subsidiaries/ affiliates:
d) Existing Manufacturing facilities – Locations, Capacity
e) Date of Incorporation
f) Date of Commencement of Business
g) Full address including Telephone nos. / Fax nos.:
    i. Registered Office:
    ii. Head Office:
    iii. Address for communication:
    iv. Contact Details:
    v. Office Address in India, if any:

h) Collaborations/tie-ups with technology providers/ developer (if applicable),
i) Details of Indian parties, if any, for installation, supply, services, and collaboration
j) Financial Data of Organization (Attach Relevant document in proof of same)

	FY 2025-26	FY 2024-25	FY 2023-24
Turnover			
Net worth			
Profit			

The proposer should demonstrate a sound financial situation and capacity by submitting financial audit reports

4 Techno-Commercial Information required from Applicants

4.1 Instructions for Applicants

The applicant shall submit a technical and commercial proposal for an outdoor sodium-ion BESS suitable for installation at the 415 V side of a distribution transformer.

The proposed installation is expected to have:

- Usable energy capacity in the range of approximately 200–400 kWh
- Power capacity to be proposed by the applicant based on a nominal duration of approximately two to four hours (bidders to suggest details and costing for various kW / kWh configurations)

- Capability to undertake up to two equivalent full cycles per day
- Indicative operating life of 12 – 15 years
- Outdoor installation under harsh climatic conditions, including ambient temperatures of up to 50°C, dust, humidity and monsoon exposure
- Integration with Client's electrical network, protection system and remote monitoring infrastructure

Applicants may propose more than one technically viable configuration. Any assumptions, deviations or qualifications shall be clearly identified.

The applicant shall distinguish between:

- Guaranteed values
- Typical or expected values
- Values supported by testing or certification
- Values that are subject to detailed engineering or site conditions

4.2 Proposed System Configuration

Provide an overview of the complete proposed BESS, covering:

a) Proposed rated power in kW and rated and usable energy capacity in kWh.
b) Nominal discharge duration at rated power.
c) Single-line diagram showing:
    i. Battery racks or cabinets
    ii. DC protection and isolation
    iii. PCS
    iv. AC switchgear and protection
    v. Auxiliary power system
    vi. EMS/controller
    vii. Metering and communication interfaces
    viii. Point of interconnection at 415 V
d) Physical arrangement and indicative general arrangement drawing, with the physical dimensions and space requirements, including:
    i. Length, width and height of each battery cabinet, PCS cabinet and auxiliary enclosure
    ii. Total installed footprint of the complete BESS
    iii. Total land or platform area required, including maintenance clearances
    iv. Minimum clearance required from the DT, buildings, boundary walls and other electrical equipment
    v. Access requirements for installation, module replacement and routine maintenance
    vi. Maximum equipment weight and loading on the foundation
    vii. Whether the system can be installed as a single integrated enclosure or requires multiple separate enclosures
e) Modular architecture, including:
    i. Minimum deployable unit
    ii. Battery module or cabinet size
    iii. PCS module size
    iv. Capacity increment for future expansion
f) Proposed operating modes and use cases supported by the system.
g) Clear identification of equipment that is:
    i. Manufactured by the applicant
    ii. Procured from third parties
    iii. Imported
    iv. Manufactured or assembled in India
h) This section should provide the system-level architecture. Component-level details requested in subsequent sections need not be repeated.

4.3 Sodium-Ion Battery Technology

4.3.1 Cell and Chemistry

a) Provide the following:
b) Cell manufacturer and manufacturing location.
c) Commercial name and model number of the cell.
d) Sodium-ion chemistry, including:
    i. Cathode chemistry
    ii. Anode chemistry
    iii. Electrolyte type
e) Cell format, such as cylindrical, prismatic or pouch.
f) Nominal cell voltage, operating voltage range, rated capacity in Ah and nominal energy in Wh.
g) Gravimetric and volumetric energy density at:
    i. Cell level

  ii. Module or pack level
  iii. Complete BESS level, where available

h) Maximum continuous and short-duration charge and discharge C-rates.
i) Operating and storage temperature ranges.
j) Cell self-discharge rate.
k) Current commercial availability and annual manufacturing capacity.
l) Key strengths and limitations of the proposed chemistry for stationary storage under Indian climatic and grid conditions.

A detailed description of the electrochemical working principle is not required. A concise chemistry description supported by the manufacturer's datasheet is sufficient.

4.3.2 Battery Module, Rack and Enclosure

Provide:

a) Module, rack and cabinet configuration.
b) Nominal DC voltage range of the battery system.
c) Number of cells, modules, racks and cabinets for the proposed configuration.
d) Electrical isolation, fuses, contactors and DC disconnect arrangements.
e) Cell-balancing approach.
f) Enclosure construction and IP rating.
g) Corrosion protection and suitability for outdoor installation.
h) Thermal management approach, including whether the system uses Natural convection, Forced-air cooling, Liquid cooling
i) Maximum internal battery temperature under 50°C ambient conditions at rated operation.
j) Noise level at the system boundary.
k) Footprint, dimensions and weight of the proposed system.
l) Foundation, access and maintenance-clearance requirements.

4.4 Performance and Degradation

Applicants shall provide guaranteed and expected performance under clearly stated operating conditions.

4.4.1 Battery Performance

Provide:

a) Rated energy capacity and usable energy capacity at beginning of life.
b) Recommended operating State of Charge range.
c) Recommended Depth of Discharge.
d) Maximum permissible Depth of Discharge.
e) DC round-trip efficiency at the battery terminals.
f) Calendar-life expectation.
g) Cycle-life expectations at the recommended operating condition.
h) Expected State of Health (considering 550 cycles annually) at the end of:
  i. 1 year
  ii. 3 years
  iii. 8 years
  iv. 12 years
i) Expected degradation profile over the project life.
j) Impact of the following on degradation:
  i. Ambient and cell temperature
  ii. Depth of Discharge
  iii. Charge and discharge C-rate
  iv. Average State of Charge
  v. Number of cycles per day

Cycle-life and degradation information shall specify the following test or modelling conditions:

- Depth of Discharge
- Charge and discharge C-rate
- Cell temperature
- Rest period, where applicable
- End-of-life criterion
- Whether the value is tested, modelled or estimated
- Relevant test standard or test report.

4.4.2 System Performance

Provide guaranteed or indicative values for:

a) AC-to-AC round-trip efficiency at rated power at the AC point of connection.

b) Usable energy delivered at the AC point of connection.
c) Maximum continuous active power.
d) Short-duration overload capability and duration.
e) Response time from receipt of command to commencement of power delivery.
f) Ramp rate.
g) Daily and annual auxiliary consumption.
h) Auxiliary load at ambient temperatures of:
    i. 25°C
    ii. 40°C
    iii. 50°C
i) Standby consumption.
j) Expected annual availability.
k) Planned maintenance downtime.
l) Minimum stable charging and discharging power.
m) Performance derating, if any, at high ambient temperature.

The applicant shall clearly state whether round-trip efficiency values include HVAC and other auxiliary consumption.

4.5 Battery Management System

Provide details of the proposed BMS covering:

a) BMS manufacturer and manufacturing location.
b) BMS architecture, including cell, modules, rack and system-level controllers.
c) Parameters monitored at each level.
d) Cell voltage and temperature measurement accuracy.
e) State of Charge estimation methodology and guaranteed accuracy.
f) State of Health estimation methodology and expected accuracy.
g) Cell-balancing method and balancing current.
h) Protection and trip thresholds for:
    i. Overvoltage
    ii. Undervoltage
    iii. Over-temperature
    iv. Under-temperature
    v. Overcurrent
    vi. Short circuit
    vii. Insulation fault
    viii. Communication failure
i) Event, alarm and fault logging.
j) Data sampling and logging frequency.
k) Local data-storage capacity and retrieval capability.
l) Firmware update and cybersecurity arrangements.
m) Communication interfaces and protocols.
n) Interface between BMS, PCS and EMS.
o) Fail-safe behavior in the event of loss of communication or control power.
p) BMS-related certifications and test reports.

4.6 Power Conversion System

Provide the following for the proposed PCS:

a) PCS manufacturer, model and manufacturing location.
b) Rated active power.
c) DC voltage operating range.
d) AC voltage and frequency range.
e) Conversion efficiency at 25%, 50%, 75% and 100% load.
f) Maximum continuous charge and discharge power.
g) Short-duration overload capability.
h) Ramp-rate capability.
i) Power-factor operating range.
j) Reactive-power capability curves across the active-power range.
k) Supported reactive-power control modes, including:
    a. Fixed power factor
    b. Fixed reactive power
    c. Volt-VAr
    d. Voltage control
l) Harmonic performance, including total harmonic distortion.

m) Phase-balancing capability. The applicant shall specifically clarify whether the proposed PCS can independently control power on each phase to mitigate phase-wise current imbalance at DT. Where this capability is available, the applicant shall provide:
   i. Maximum permissible phase imbalance
   ii. Per-phase power-control range
   iii. Whether the PCS uses a four-wire topology
   iv. Neutral-current handling capability
n) Supported active-power control modes, including:
   i. Scheduled charge and discharge
   ii. Peak shaving
   iii. Export limitation
   iv. Solar self-consumption or reverse-power-flow management
   v. Islanded operations during grid outage
o) Anti-islanding functionality.
p) Black-start or grid-forming capability, if available.
q) Transfer time between operating modes, where applicable.
r) Protection functions and coordination requirements.
s) AC and DC isolation arrangements.
t) Earthing requirements.
u) IP rating and cooling arrangement.
v) PCS-related standards, certifications and type-test reports.

4.7 Energy Management, Monitoring and System Integration

Provide the proposed EMS and integration architecture covering:

a) EMS manufacturer and manufacturing location.
b) Local BESS controller and EMS functionality.
c) Operating modes supported.
d) Dispatch hierarchy between the BMS, PCS, EMS and Client control systems.
e) Ability to receive:
   i. Manual dispatch commands
   ii. Time-based schedules
   iii. Active and reactive-power set points
   iv. Transformer loading signals
   v. Voltage signals
   vi. Rooftop-solar or reverse-power-flow signals
f) Ability to dynamically control charging and discharging based on:
   i. DT loading
   ii. Phase loading
   iii. Voltage
   iv. Time of day
   v. State of Charge
   vi. Solar generation or reverse flow
g) Integration with Client SCADA, DMS, data platform or other remote systems.
h) Supported protocols, including as applicable:
   i. Modbus TCP/IP
   ii. Modbus RTU
   iii. IEC 61850
   iv. IEC 60870-5-104
   v. DNP3
   vi. MQTT
   vii. REST API
i) List of all data points and commands that can be exchanged.
j) Data logging frequency and local storage period.
k) Historical data retrieval and export formats.
l) Remote monitoring and diagnostic capability.
m) User roles, authentication and access controls.
n) Cybersecurity architecture, including:
   i. Encryption
   ii. Network segregation
   iii. Secure remote access
   iv. Patch and vulnerability management
   v. Audit logs
o) Location of servers and cloud services.
p) Availability of open APIs and ownership of operational data.
q) Ability to operate locally and safely during loss of external communication.
r) Requirements from Client for communication, networking, servers and licenses.
s) Recurring software, cloud, SIM, communication or license fees.

A schematic illustrating the complete communication and control architecture shall be provided.

4.8 Electrical and Grid Integration

Provide:

a) Proposed point of connection and voltage level.
b) Required AC switchgear, breakers and isolators.
c) Metering arrangement.
d) Protection philosophy and indicative protection settings.
e) Coordination with:
   i. DT incomer and outgoing feeders
   ii. Existing overcurrent protection
   iii. Earth-fault protection
   iv. Reverse-power-flow conditions
f) Fault-current contribution of the PCS.
g) Short-circuit withstand requirements.
h) Islanding-detection method.
i) Earthing and lightning-protection arrangement.
j) Surge-protection arrangement.
k) Harmonic and power-quality compliance.
l) Whether an isolation transformer is required.
m) Ability to operate under:
   i. Voltage fluctuations
   ii. Frequency variations
   iii. Phase imbalance
   iv. Weak-grid conditions
n) Studies required before commissioning, including:
   i. Load-flow study
   ii. Short-circuit study
   iii. Protection-coordination study
   iv. Harmonic study
   v. Earthing study
o) Information and data required from Client for detailed engineering.

4.9 Safety and Compliance

The applicant shall submit a compliance matrix identifying whether each standard is:

- Complied with
- Under certification
- Not applicable
- Proposed as an equivalent standard

General statements such as "compliant with IEC/UL/BIS" without supporting details shall not be considered sufficient.

Where a cited standard was originally developed for lithium-ion or another battery chemistry, the applicant shall demonstrate its applicability to the proposed sodium-ion product.

The response should cover, as applicable:

a) Cell-level standards and test reports.
b) Battery module and stationary battery standards.
c) PCS and power-electronics standards.
d) Grid-interconnection requirements.
e) Electrical-safety standards.
f) Fire detection and suppression standards.
g) Enclosure and environmental standards.
h) Transportation requirements.
i) Applicable Indian standards, CEA regulations and BIS requirements.

The applicant shall separately describe:

a) Cell and module test results in extreme operating conditions (at least 2x-5x of normal operating range).
b) Thermal-runaway behavior of sodium-ion chemistry.
c) Propagation between cells, modules and racks.
d) Off-gas generation and venting arrangements.
e) Gas-detection requirements.
f) Fire-detection system.
g) Fire-suppression system.
h) Emergency Shut-off and Containment Measure

i) Emergency response procedure.
j) Safe separation distances.

The applicant shall not simply list certifications. Copies of valid certificates or test reports should be attached where available.

4.10 Environmental Conditions and End-of-Life Management

Provide:

a) Maximum and minimum operating ambient temperature.
b) Maximum relative humidity.
c) Altitude limit without derating.
d) Dust, water-ingress and corrosion resistance.
e) Performance under monsoon and dust-storm conditions.
f) Noise and heat rejection.
g) Any liquid, gas or other effluent generated during normal or abnormal operation.
h) Hazardous or regulated materials are present in the system.
i) Expected recyclability by weight.
j) Proposed take-back, recycling and disposal arrangement in India.
k) Identity and location of authorized recycling partners, if available.
l) Applicant's responsibilities and indicative cost for end-of-life removal and disposal.

4.11 Warranty, Guarantees and Augmentation

Provide the proposed warranty and performance-guarantee framework covering:

a) Product warranty for:
    i. Cells
    ii. Modules
    iii. Battery cabinets
    iv. BMS
    v. PCS
    vi. EMS
    vii. HVAC and auxiliaries
b) Performance warranty period.
c) Guaranteed usable energy at the AC point of connection over 12 years.
d) Guaranteed State of Health or retained capacity at defined milestones.
e) Guaranteed round-trip efficiency.
f) Guaranteed availability.
g) Conditions and exclusions are applicable to each guarantee.
h) Permitted operating envelope required to retain the warranty.
i) Methodology for measuring:
    i. Usable capacity
    ii. State of Health
    iii. Round-trip efficiency
    iv. Availability
j) Capacity-test frequency and procedure.
k) Proposed augmentation requirement, including:
    i. Timing
    ii. Additional capacity
    iii. Indicative cost
    iv. Space provision
    v. Responsibility for supply and installation
l) Treatment of failure to meet guaranteed parameters.
m) Availability of spare parts and technical support for at least 12 years.

4.12 Project Execution and Operations

Provide:

a) Scope of supply and services and scope exclusions.
b) Indicative implementation schedule covering:
    a. Site survey
    b. Detailed engineering
    c. Manufacturing
    d. Factory acceptance testing
    e. Delivery
    f. Civil works
    g. Installation
    h. Commissioning
    i. Performance testing

c) Total period from notice to proceed to commercial operation
d) Site facilities and inputs required from Client.
e) Proposed O&M model for 12 years.
f) Recommended critical and operational spares.
g) Replacement lead times for cells, modules, BMS, PCS and HVAC components.

4.13 Budgetary Commercial Proposal

Applicants shall provide a non-binding budgetary price for at least one configuration between 200 kWh and 400 kWh.

4.13.1 Capital Cost

Provide the price in both absolute terms and where applicable:

- ₹/kW
- ₹/kWh of rated capacity
- ₹/kWh of usable beginning-of-life capacity

The capital-cost breakdown shall cover:

a) Cells, modules and racks.
b) Battery cabinets or enclosure.
c) BMS.
d) PCS.
e) EMS, controller and monitoring system.
f) HVAC and auxiliary systems.
g) Fire-detection and suppression system.
h) AC and DC switchgear.
i) Cable and earthing.
j) Metering and communication equipment.
k) Civil and structural works.
l) Transportation and insurance.
m) Installation.
n) Testing (FAT, SAT and Performance Guarantee Test) and commissioning.
o) Engineering and project management.
p) Initial spare parts.
q) Training programme for Client personnel.
r) Taxes and duties.
s) Any other material cost item.

The applicant shall clearly state inclusions, exclusions and price-validity period.

4.13.2 Lifecycle Costs

Provide:

a) Annual fixed O&M cost for each year of the 12-year period.
b) Variable O&M charges, if any.
c) Software and communication charges.
d) Insurance assumptions, if included.
e) Cost of planned battery augmentation.
f) Cost of major component replacement.
g) End-of-life removal and disposal cost.
h) Indicative lifecycles cost over 12 years.
i) Payment terms.
j) Incoterms (If any)
k) Applicable escalation assumptions.

4.13.3 Cost Outlook

Provide an indicative cost outlook for similar systems at:

a) Pilot scale (DT configuration)
b) 1 MWh cumulative procurement
c) MWh cumulative procurement
d) 10 MWh or higher cumulative procurement

The applicant shall identify the principal drivers of cost reduction, such as local manufacturing, higher procurement volume, cell-cost reduction or design standardisation.

4.14 Any Additional Information

The applicant shall provide:

a) Key technical risks associated with the proposed solution.
b) Aspects requiring further validation or site testing.
c) Any limitations on the stated operating use cases.
d) Any special operating, safety or maintenance requirements.
e) Recommendations for structuring the subsequent pilot RFP.

5 Indicative Technical Datasheet

The applicant shall complete the table for each proposed system configuration. Where a parameter varies with ambient temperature, State of Charge, C-rate or other operating condition, the applicable conditions shall be stated.

Sl. No.	Parameter	Unit	Guaranteed Value	Expected / Typical Value	Applicable Conditions / Remarks
A. System Configuration					
1	Proposed system configuration	—			Brief description
2	Rated AC power	kW			
3	Maximum continuous charge power	kW			
4	Maximum continuous discharge power	kW			
5	Rated DC energy capacity at beginning of life	kWh			
6	Usable AC energy at beginning of life	kWh			Measured at point of connection
7	Nominal discharge duration at rated power	hours			
8	Minimum deployable system size	kW / kWh			
9	Incremental module size for capacity expansion	kW / kWh			
10	Number of battery cabinets / enclosures	No.			
11	Number of PCS cabinets / modules	No.			
B. Battery Characteristics					
12	Cell chemistry	—			Cathode, anode and electrolyte
13	Cell format	—			Prismatic, pouch, cylindrical, etc.
14	Nominal cell voltage	V			
15	Cell rated capacity	Ah			
16	Nominal battery DC voltage	V			
17	Battery DC operating voltage range	V			
18	Recommended State of Charge operating range	%			
19	Recommended Depth of Discharge	%			
20	Maximum permissible Depth of Discharge	%			
21	Maximum continuous charge rate	C-rate			
22	Maximum continuous discharge rate	C-rate			
23	Cell-level gravimetric energy density	Wh/kg			
24	Cell-level volumetric energy density	Wh/L			
25	Module or pack-level gravimetric energy density	Wh/kg			
26	Module or pack-level volumetric energy density	Wh/L			
27	Daily self-discharge	%/day			At stated temperature and SoC
C. Efficiency and Auxiliary Consumption					
28	Battery DC round-trip efficiency	%			State DoD, C-rate and temperature
29	PCS conversion efficiency at 25% load	%			
30	PCS conversion efficiency at 50% load	%			
31	PCS conversion efficiency at 75% load	%			
32	PCS conversion efficiency at 100% load	%			
33	AC-to-AC round-trip efficiency at rated power	%			Including auxiliaries
34	AC-to-AC round-trip efficiency at 50% rated power	%			Including auxiliaries
35	Standby consumption	kW			

36	Auxiliary consumption at 25°C ambient	kW and %			
37	Auxiliary consumption at 40°C ambient	kW and %			
38	Auxiliary consumption at 50°C ambient	kW and %			
39	Annual auxiliary energy consumption	kWh/year			State operating assumptions
D. Operating Performance					
40	Response time	ms			From command receipt to power response
41	Time to reach rated power	seconds			
42	Active-power ramp rate	kW/s			
43	Minimum stable charging power	kW			
44	Minimum stable discharging power	kW			
45	Short-duration overload capability	% of rated power			State allowable duration
46	Power-factor operating range	—			
47	Maximum reactive-power capability	kVAr			At zero and rated active power
48	Total harmonic distortion	%			At rated operation
49	Independent phase-wise power control capability	Yes / No			
50	Maximum active-power control per phase	kW/phase			If applicable
51	Neutral-current handling capability	A			If four-wire PCS is proposed
52	Grid-forming capability	Yes / No			Optional capability
53	Black-start capability	Yes / No			Optional capability
54	Anti-islanding capability	Yes / No			
E. Temperature and Environmental Performance					
55	Minimum operating ambient temperature	°C			
56	Maximum operating ambient temperature	°C			
57	Maximum operating temperature without derating	°C			
58	Power derating at 50°C ambient	%			
59	Energy derating at 50°C ambient	%			
60	Storage-temperature range	°C			
61	Maximum relative humidity	%			
62	Maximum altitude without derating	m above MSL			
63	Battery enclosure IP rating	IP class			
64	PCS enclosure IP rating	IP class			
65	Corrosion-protection class	—			
66	Maximum noise level	dBA			State measurement distance
67	Maximum heat rejection	kW			At rated operation and 50°C ambient
F. Life, Degradation and Availability					
68	Design life	years			
69	Design equivalent full cycles	cycles			
70	Cycle life at recommended operating conditions	cycles			State DoD, C-rate, temperature and EOL criterion
71	Expected equivalent full cycles per day	cycles/day			
72	Guaranteed retained usable capacity after 5 years	%			At AC point of connection
73	Guaranteed retained usable capacity after 10 years	%			
74	Guaranteed retained usable capacity after 12 years	%			
75	Expected calendar degradation	%/year			State assumptions
76	Guaranteed annual availability	%			State exclusions
77	Planned annual maintenance downtime	hours/year			
78	Augmentation required during project life	Yes / No			
79	Indicative augmentation capacity	kWh			
80	Indicative augmentation year	Year			
G. Dimensions and Space Requirements					
81	Dimensions of each battery cabinet, L × W × H	m			

82	Dimensions of each PCS cabinet, L × W × H	m			
83	Dimensions of auxiliary / EMS / fire-system enclosure	m			
84	Equipment-only footprint	m^2			Sum of physical equipment footprint
85	Maintenance-clearance area	m^2			
86	Ventilation-clearance area	m^2			
87	Fire-safety separation area	m^2			Based on test results / applicable code
88	Cable-routing and termination area	m^2			
89	Total installed site area required	m^2			Including all equipment and clearances
90	Space intensity	m^2/kWh			Based on total installed site area
91	Minimum clearance from DT	m			
92	Minimum clearance from buildings or boundary walls	m			
93	Minimum spacing between battery cabinets	m			
94	Minimum front maintenance clearance	m			
95	Minimum rear and side maintenance clearance	m			
96	Maximum installed system height	m			
97	Total installed system weight	tonnes			
98	Maximum weight of a single transportable unit	tonnes			
99	Maximum foundation loading	kN/m^2			
100	Foundation dimensions and depth	m			Indicative
101	Crane or lifting access required	Yes / No			State capacity and access width
102	Minimum access-road width	m			
103	Single integrated enclosure available	Yes / No			
H. BMS, EMS and Communication					
104	State of Charge estimation accuracy	%			
105	State of Health estimation accuracy	%			
106	Data sampling frequency	seconds			
107	Local data-storage duration	months			
108	Remote monitoring capability	Yes / No			
109	Supported communication protocols	—			Modbus, IEC 61850, IEC 104, DNP3, etc.
110	Open API availability	Yes / No			
111	Local autonomous operation during communication loss	Yes / No			
112	Server / cloud hosting location	—			
113	Recurring software or communication licence required	Yes / No			State annual cost separately
I. Safety and Certifications					
114	Cell-level UL 9540A or equivalent testing	Available / Pending / Not available			
115	Module-level UL 9540A or equivalent testing	Available / Pending / Not available			
116	Unit or rack-level UL 9540A testing	Available / Pending / Not available			Desirable
117	UL 9540 integrated-system certification	Available / Pending / Not available			Desirable
118	Stationary battery safety certification	Standard / status			UL 1973 or equivalent
119	Applicable IEC battery safety standard	Standard / status			
120	PCS safety certification	Standard / status			
121	PCS EMC certification	Standard / status			
122	Environmental testing certification	Standard / status			IEC 60068 or equivalent
123	IP-rating test certificate	Standard / status			IEC 60529 or equivalent
124	Transportation test compliance	Standard / status			Applicable UN requirements
125	Fire-detection system	Type			
126	Fire-suppression system	Type			
127	Off-gas detection	Yes / No			
128	Emergency ventilation	Yes / No			

129	Cell-to-cell propagation demonstrated	Yes / No			State test reference
130	Module-to-module propagation demonstrated	Yes / No			State test reference
J. Project Delivery and Support					
131	Manufacturing lead time	weeks			
132	Delivery period from order	weeks			
133	Installation period	weeks			
134	Testing and commissioning period	weeks			
135	Total period from award to commissioning	weeks			
136	Product warranty	years			
137	Performance warranty	years			
138	O&M support period offered	years			
139	Nearest service centre	Location			
140	Breakdown-response time	hours			
141	Critical-spares availability period	years			
K. Commercial Summary					
142	Total budgetary capital cost	₹ lakh / crore			Excluding and including taxes
143	Installed cost per rated power	₹/kW			
144	Installed cost per rated energy	₹/kWh			
145	Installed cost per usable BOL AC energy	₹/kWh			
146	Annual fixed O&M cost	₹/year			
147	Indicative 12-year O&M cost	₹			
148	Indicative augmentation cost	₹			
149	Indicative 12-year lifecycle cost	₹			
150	Domestic value addition	%			
151	Price-validity period	days			