Specifications for 500 kWh Lithium Iron Phosphate battery

1. Introduction:

BHEL is one of the leading engineering organisations in the world, contributing to society in the diversified fields in design, engineering, manufacturing and erection & commissioning of power generation equipment, power transmission system, transportation and industrial automation.

BHEL is considering development of energy storage systems and hence it is inviting the Battery manufactures to quote for supply of 500 kWh Lithium Iron Phosphate battery for the following one or multiple applications.

1) Output smoothening of SPV power output
2) Frequency regulation
3) Time shifting of energy generation and consumption
4) Peak load saving

Specification for battery & BMS are as given below

2. Specification of the Battery:

SNo	Parameter	Rating	Remarks
1	Cell Chemistry	LiFePO4	
2	Energy	500kWh	250 kW for 2 hours
3	Minimum Cycle Life at 80% DoD	2000 cycles	
4	Internal Resistance	<6mΩ	
5	Charge Cut-off Voltage	< 960V	
6	Discharge Cut-off Voltage	>620V	
7	Nominal Charge Current	Min 0.2C	
8	Nominal Discharge Current	Min 0.5C	
9	Monthly Self-discharge	<3%	
10	Response time	<75ms	
11	Cycle Efficiency	>90%	DC - DC
12	Atmospheric Temperature Range	0^{o}C to 50^{o}C	
13	Relative Humidity Range	95 %	
14	Dimensions of battery cabinet	2750mmx600mmx1200mm (with a tolerance of +/- 20%)	

In addition to the above, data of the following parameters are to be furnished by the supplier for further design of the system.

S.No	Parameter
1	Maximum charge rate
2	Maximum discharge rate
3	Service Life
4	Tables of data or graphs a) Maximum charge power as a function of charge level b) Maximum discharge power as a function of charge level c) Charge capacity as a function of charge power d) Discharge capacity as a function of discharge power e) Charge energy as a function of charge power f) Discharge energy as a function of discharge power g) Energy efficiency as a function of power
5	Physical dimensions
6	Enclosure
7	Auxiliary Power Supply requirement
8	External Interfaces
9	Safety Precautions
10	Operating instructions and maintenance manual

3. <u>Specifications for the Battery Management System (BMS):</u>

Suitable battery management system (BMS) should be offered reliable functioning of the offered flow battery under normal and abnormal operation. The offered BMS must provide display, data logging, protection, diagnostic, and communication with SCADA or PCS etc. features for reliable operation of the battery.

The offered Control Hardware and Software for BMS should perform the above functions. Please provide response (Yes/No) to the following features of the offered BMS along with necessary technical details.

SNo	Operations of BMS	Yes/No	Remarks
1	Protection and Control i. Thermal management ii. Operating between safe current and voltage limits iii. Communication/Shutdown on detection faults iv. Protecting cells from the internal degradation and capacity fade v. Providing optimal charging patterns vi. Balancing cells throughout the stack vii. Protection alarms/indications		

2	Measurement i. Measurement of SOC		
3	Monitoring i. Battery bank Current, Voltage and SOH monitoring ii. 1000VDC isolation working voltage iii. 24x7 remote monitoring of battery performance		
4	Data recording i. Event recording and storage features ii. Display of important parameters like voltage, current, SOC and healthiness of the battery		
5	Any other parameter which is not specified, but required for the safe operation of battery		
6	Hardware and software details		

4. <u>General Conditions:</u>

i. Offers for Battery & BMS are solicited from reputed OEMs for integrating with Power conditioning system.

ii. The prospective supplier should have supplied / commissioned Lithium iron phosphate battery of rating at least 250 kWh with BMS in the last two years and should have been in operational for the last one year. Documentary evidence against the same shall be submitted by the supplier. Offers not meeting the above criteria will not be considered.

iii. The Battery and BMS should be erected and commissioned by the supplier at BHEL site, Hyderabad. As the PCS and other switch gear is under the scope of the BHEL, the prospective supplier should support BHEL in commissioning total ESS system. Supplier should complete erection and commissioning within 45 days of receipt of Intimation from BHEL.

iv. The prospective supplier shall submit offer for erection & commissioning charges separately along with the taxes applicable, which include erection, commissioning, performance tests at site, on-site training to operators etc.

v. The warranty for Batteries & Battery Management System should be for at least 5 years from the date of commissioning. The prospective supplier shall submit Performance Bank Guarantee (PBG) for 10 % of the order value towards warranty for 5 years plus 2 months claim period.

vi. The vendor shall develop and submit a comprehensive Factory Acceptance Test (FAT) plan for Battery and BMS together, to BHEL for its review and approval. FAT shall be demonstrated to BHEL representative for compliance of specification, inclusive but not limited to following:

A. Visual inspection of equipment including dimensions and overall design

B. Testing of sensors, metering and alarms

C. Testing of all control functions including remote control, monitoring and communication interfaces

D. Testing of system performance at rated energy, charging and discharging rates for the following:

    a. Atleast three cycles of charging and discharging of the rated capacity at rated charging and discharging rates within the permissible voltage limits

    b. DC-DC cycle efficiency

    c. Self-discharge

E. Safety features

F. Demonstration of maintenance and replacement features of the offered battery

Supplier should give minimum of 45 days' notice to BHEL about readiness of system for testing. Travel and Hospitality for BHEL Inspectors will be to BHEL Account.

vii. The battery container should be self-sufficient with all safety and thermal management equipment and all required sensors for safer and proper operation of the battery. The supplier should mention these equipment details in his offer.

viii. Battery offered should comply to the following standards:

i. IEC 62133 - Safe operation of portable sealed secondary cells and battery
ii. IEC 62281 - Safety during transportation
iii. IEC 61959 - Mechanical tests
iv. IEC 61960 - Performance tests
v. IEC 61427-2 - General requirements

ix. Vendor shall provide a list of mandatory spares for the offered system. The prices of these spares shall be quoted separately as optional which may be considered during evaluation of bid. It shall not be binding on BHEL to procure all of these mandatory spares.