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1.0	**SCOPE**	This specification covers the technical requirements of design, manufacture, testing at manufacturer's works, packing, forwarding, supply and unloading of Ni-Cd Alkaline Battery with Battery Management System at site/ stores complete with all accessories for efficient and trouble free-operation. It is not the intent to specify completely herein all the details of tech design and construction of material. However, the material shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation in manner acceptable to TATA POWER - CODL, who will interpret the meanings of drawings and specification and shall have the power to reject any work or material which, in his judgment is not in accordance therewith. The offered material shall be complete with all components necessary for their effective and trouble free operation. Such components shall be deemed to be within the scope of Bidder's supply irrespective of whether those are specifically brought out in this specification and/or the commercial order or not.
2.0	**APPLICABLE STANDARDS**	The equipment covered by this specification shall unless otherwise stated, be designed, manufactured and tested in accordance with the latest editions of the following Indian/International standards and shall conform to the regulations of the local statutory authorities.

IEC 62281	Safety of primary and secondary Ni-Cd Alkaline cells and batteries during transport
IEC 62619	Safety requirements for secondary Ni-Cd Alkaline cells and batteries, for use in industrial applications
IEC 61000-4-2	Electromagnetic compatibility (EMC) - Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test
IEC 62133 II Edition	Rechargeable Cell/Battery Safety
UL 2054 II Edition	Household and Commercial Batteries
IEEE UL 1642	Standard for Ni-Cd Alkaline Batteries
IEEE UL 1973	Standard for Batteries for Use in Light Electric Rail (LER) Applications and Stationary Applications

3.0	**CLIMATIC CONDITIONS OF THE INSTALLATION**	The service conditions shall be as follows: 1. Maximum altitude above sea level 1,000m 2. Maximum ambient air temperature 50°C 3. Maximum daily average ambient air temperature 35°C 4. Minimum ambient air temperature 0°C 5. Maximum relative humidity 95% 6. Average number of thunderstorm days per annum (isokeraunic level) 70 7. Average number of rainy days per annum 120 8. Average annual rainfall 150cm 9. Earthquakes of an intensity in horizontal direction - equivalent to seismic acceleration of 0.3g 10. Earthquakes of an intensity in vertical direction - equivalent to seismic acceleration of 0.15g (g being acceleration due to gravity)

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11 .Wind velocity: 300 km/hr, 200 km/hr and 160 km/hr. environmentally, some of the regions, where the work will take place includes coastal areas, subject to high relative humidity, which can give rise to condensation. Onshore winds will frequently be salt laden. On occasions, the combination of salt and condensation may create pollution conditions for outdoor insulators. Some places are in heavily industrial polluted areas. Therefore, Outdoor material and equipment shall be designed and protected for use in exposed, heavily polluted, salty, corrosive and humid coastal atmosphere

The design of equipment and accessories shall be suitable to withstand seismic forces corresponding to an acceleration of 0.1 g.

4.0 GENERAL TECHNICAL REQUIREMENTS

S. No.	Particular	Requirement	
		48V, 100AH Battery	**24V, 100AH Battery**
1	Type of battery	Ni-Cd Alkaline battery	Ni-Cd Alkaline battery
2	Container	Transparent	Transparent
3	Nominal DC system voltage	48 V	24 V
4	Number of batteries	One set	One set
5	Number of cells	40	20
6	Cell type	Plante/tubular type	Plante/tubular type
7	Cell voltage		
	a) Nominal	1.2 V	1.2 V
	b) End cell voltage	1.14 V	1.14 V
8	Capacity of battery	100 AH	100 AH
	a) 10 hour rate of discharge		
9	Float charging voltage	1.42 V to 1.45 V	1.42 V to 1.45 V
10	Boost charging voltage	1.55 V to 1.69 V +/- 0.01 V	1.55 V to 1.69 V +/- 0.01 V
11	Mounting arrangement	Double row, single tier	Double row, single tier
12	Permissible D.C. System voltage variation	43.4 V to 54 V	21.7 V to 27 V

5.0 GENERAL CONSTRUCTIONS

5.1 General

The cells shall have prismatic, spill-proof type of construction with partial recombination feature. The cells shall be flooded type containing sufficient reserve electrolyte. Battery shall be equipped with nickel-plated inter-cell connectors and terminals. The cells shall be housed in high-strength impact resistant & alkali-resistant containers and should be transparent / translucent to facilitate checking of electrolyte level. Container and Lid should bewelded and should not cause leakage of electrolyte/gases during operation even in case of normal mechanical/electrical abuses. O-rings of nitrile rubber with Epoxy sealing shall be used to ensure proper sealing of bushings etc. Flip-top vent plugs/ valves with flame arrester feature shall be provided. The regulating valve type design shall be of self-resealing type. Construction of cells shall be so as to ensure

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		proper air circulation between the cells for heat dissipation/ ventilation (by providing either insulated button separators integral with the outer surface of the cell container or by suitably designing the inter cell connectors). The containers shall be strong enough, so that excessive bulging of container does not occur during service. Cells shall be supplied in filled & charged state or otherwise electrolyte in dry form & battery water separately or electrolyte in liquid form shall be shipped as desired by the owner. Battery shall have provision for water top up to ensure electrolyte level does not fall below recommended level.
5.2	**Terminals**	Separate terminals shall be provided on the end cell for connecting load through DC Distribution Box (DCDB) and for connecting charger leads. All terminals shall be of suitable size nickel plated steel. Suitable nickel plated copper lugs shall be provided by the supplier for the use of purchaser for connecting the load wiring. All connectors and leads shall be suitable for carrying discharge current for 30 min. continuously and rated for short-circuit duty of 4 kA for 1 second.
5.3	**Connectors**	Nickel plated copper inter-cell connectors shall be used for connecting adjacent cells and rows. Bolts, nuts and washers shall be nickel plated/ stainless steel. All terminals and cell interconnectors shall be fully insulated or shall have insulation shrouds.
5.4	**Cooling and ventilation**	Proper arrangement of natural air or forced air fan cooling (if required) to be provided for the battery bank, its charger and BMS to restrict the temperature rise beyond 40ºC
5.7	**Stand and battery racks**	Suitable corrosion resistant battery racks and cable supports shall be provided. Metallic racks shall be properly earthed. The bottom tier of stand shall have a ground clearance of 150 mm (minimum), above the floor. Racks shall be made of alkali resistant powder coated steel or stainless steel or FRP material to ensure corrosion resistance.
5.8	**Painting**	The racks shall be painted with anti-corrosive paint of 80 micron thickness (minimum) of Pantone 2727C color.
5.9	**Packing**	Bidder shall ensure that all the equipment covered by this specification shall be prepared for rail/ road transport (local equipment) and be packed in such a manner as to protect it from any damage in transit.
6.0	**NAME PLATE AND MARKINGS**	The unit shall be provided with a name plate clearly visible and effectively secured against removal. The name plate shall be indelibly and distinctly marked with all essential particulars as per relevant standards along with the following: i) Manufacturer's name ii) Month and Year of manufacture iii) Serial number and Type designation iv) Ni-Cd Alkaline chemistry type of the battery v) Nominal voltage of each cell vi) Ah capacity at 1C rate of the battery vii) Rated voltage viii) No. of cells in each module ix) No. of modules x) Installed battery capacity (kWh) xi) Input charge voltage

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		xii) Charge current xiii) Discharge current xiv) Guarantee period. xv) Reference standard xvi) Property of **TATA POWER - CODL** Also, the danger plate should be shown on the front of the enclosure/ cabinet/ racks housing the battery bank.
7.0	**TESTS**	All routine, acceptance & type tests shall be carried out in accordance with the relevant standards mentioned in clause 2.0. All routine & acceptance tests shall be witnessed by the purchaser/his authorized representative. All the components shall also be type tested as per the relevant standards. Following tests shall be necessarily conducted on the metering cubical in addition to others specified in IS/IEC/IEEE/UL standards.
7.1	**Type Test**	All the type tests should be conducted as per the relevant standards mentioned in clause 2.0
7.2	**Routine tests**	All the routine tests should be conducted as per the relevant standards mentioned in clause 2.0
7.3	**Acceptance Tests**	All the acceptance tests should be conducted as per the relevant standards mentioned in clause 2.0 and shall be witnessed by TPSODL officials.
8.0	**TYPE TEST CERTIFICATES**	The bidder shall furnish the type test certificates for the tests as mentioned above as per the corresponding standards. All the tests shall be conducted at CPRI/ERDA or any NABL accredited laboratory, as per the relevant standards mentioned in clause 2.0. Type tests should have been conducted in certified Test laboratories during the period not exceeding 5 years from the date of opening the bid. In the event of any discrepancy in the test reports, i.e. any test report not acceptable, same shall be carried out without any cost implication to the purchaser.
9.0	**PRE-DISPATCH INSPECTION**	The successful bidder shall submit one prototype samples for further testing and compliance as per specifications and getting approval before mass manufacturing. Equipment shall be subject to inspection by a duly authorized representative of the TATA POWER - CODL. Inspection may be made at any stage of manufacture at the option of the purchaser and the equipment if found unsatisfactory as to workmanship or material, the same is liable to rejection. Bidder shall grant free access to the places of manufacture to the TATA POWER SODL representatives at all times when the work is in progress. Inspection by the TPSODL or its authorized representatives shall not relieve the supplier of his obligation of furnishing equipment in accordance with the specifications. Material shall be dispatched after specific MDCC (Material Dispatch Clearance Certificate) is issued by the Purchaser. Following documents shall be sent along with material : a) Test reports b) MDCC issued by Purchaser c) Invoice in duplicate d) Packing list

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		e) Drawings & catalogue f) Guarantee / Warrantee card g) Delivery Challan h) Other Documents (as applicable)
10.0	**INSPECTION AFTER RECEIPT AT STORE**	The material received at Purchaser's store shall be inspected for acceptance and shall be liable for rejection, if found different from the reports of the pre-dispatch inspection and one copy of the report shall be sent to Engineering department.
11.0	**GUARANTEE**	Bidder shall stand guarantee towards design, materials, workmanship & quality of process/manufacturing of items under the contract for due and intended performance of the same, as an integrated product delivered under this contract. In the event any defect is found by the Purchaser up to a period of 60 months from the date of commissioning or 66 months from the date of last supplies made under the contract, whichever is earlier. Bidder shall be liable to undertake to replace/rectify such defects at his own costs, within mutually agreed timeframe, and to the entire satisfaction of the Purchaser, failing which the Purchaser will be at liberty to get it replaced/rectified at Bidder's risks and costs and recover all such expenses plus the Purchaser's own charges (@ 20% of expenses incurred), from the Bidder or from the "Security cum performance Deposit" as the case may be. In case the battery bank, battery charger or/ and the BMS fails within the guarantee period, the purchaser will immediately inform the bidder who shall take back the failed/ faulty part within 15 days from the date of intimation at his own cost and replace/repair it within forty five days of date of intimation with a roll over guarantee. Bidder shall further be responsible for 'free replacement' for another period of THREE years from the end of the guarantee period for any 'Latent Defects' if noticed and reported by the Purchaser.
12.0	**PACKING**	Bidder shall ensure that all the equipment covered under this specification shall be prepared for rail/road transport in a manner so as to protect the equipment from damage in transit. The material used for packing shall be environmentally friendly.
13.0	**TENDER SAMPLE**	Not Applicable.
14.0	**QUALITY CONTROL**	The bidder shall submit the offer Quality assurance plan indicating the various stages of inspection, the tests and checks which will be carried out on the material of construction, components during manufacture and bought out items and fully assembled component and equipment after finishing. As part of the plan, a schedule for stage and final inspection within the parameters of the delivery schedule shall be furnished. The Purchaser's engineer or its nominated representative shall have free access to the manufacturer's/sub-supplier's works to carry out inspections.
15.0	**MINIMUM TESTING FACILITIES**	Bidder shall have adequate in house testing facilities for carrying out all routine tests, acceptance tests as per Indian/International standards mentioned in clause 2.0.
16.0	**MANUFACTURING ACTIVITIES**	The successful bidder will have to submit the bar chart for various manufacturing activities clearly elaborating each stage, with quantity. This bar chart should be in line

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		with the Quality assurance plan submitted with the offer. This bar chart will have to be submitted within 15 days from the release of the order.
17.0	**SPARES, ACCESSORIES AND TOOLS**	Recommended and mandatory spares to be supplied by the bidder, without any cost implication to TATA POWER – CODL.
18.0	**DRAWING AND DOCUMENTS**	Following drawings and documents shall be prepared based on Purchaser specifications and statutory requirements and shall be submitted with the bid : a) Completely filled in General Technical Particulars b) General arrangement DRAWING for battery bank, battery charger (with detailed circuit diagram) and battery management system. c) Experience List d) Type test certificates After the award of the contract, four (4) copies of following drawings, drawn to scale, describing the equipment in detail shall be forwarded for approval.

Sr. No.	Description	For Approval	For Review Information	Final Submission
1.	Technical Parameters	✓		✓
2.	GA Drawing	✓		✓
3.	Installation Instruction			✓
4.	Transport/ Shipping dimension drawing		✓	✓
5.	QA & QC Plan	✓	✓	✓
6.	Test Certificates	✓	✓	✓

Bidder shall subsequently provide Four (4) complete sets of final drawings, one of which shall be auto positive suitable for reproduction, before the dispatch of the equipment. Soft copy (Compact Disk CD) of all the drawing, GTP, Test certificates shall be submitted after the final approval of the same to purchaser.
All the documents & drawings shall be in English language.
Instruction Manual (in English language) covering erection and maintenance instructions and all relevant information and drawings pertaining to the main equipment as well as auxiliary devices.

19.0	**SERVICE LEVEL AGREEMENT**	**Services to be included during guarantee period:** 1. Guarantee shall be for 60 months from the date of commissioning or 66 months from the date of last supplies made under the contract, whichever is earlier.

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2. In case of any failure vendor shall report to site, within 24 hours of receipt of reporting of failure occurrence.

3. Vendor shall provide replacement of faulty part/ equipment within 4 days, after the confirmation of the fact that the part/ equipment cannot be repaired at site.

4. Vendor shall provide detailed root cause analysis of the fault within 15 days from the date of occurrence of the fault/ failure.

5. Any spare part replacement, testing and its commissioning to be done by the vendor only, without any price implication to the purchaser.

6. Any equipment, software or hardware to test the battery bank, BMS and battery charger to be borne by the vendor only.

Service to be included during tender:

1. Vendor needs to provide life-cycle support and supplies to ensure necessary support in terms of services and spares for 15 years from the date of PO.

2. Vendor needs to provide AMC for 10 years after guarantee period.

20.0 GUARANTEED TECHNICAL PARTICULARS

S. No.	Description	Units	
1	Rated DC system voltage	Volts/cell	24V/48V
2	Nominal cell voltage	Nos.	1.2
3	Number of cells		Vendor to provide the calculation
4	Cell designation		
5	Type of electrode		Ni Hydroxide (+ve) and Cd hydroxide (-ve)
6	Specific gravity of electrode		Vendor to provide
7	Cell float charge voltage	Volts	1.42 to 1.45
8	Cell boost charge voltage	Volts	1.55 to 1.69 +/- 0.01
9	End cell voltage	Volts	1.14
10	Nominal battery capacity at 5 AH hrs rate	Ah	Vendor to provide the calculation
11	Material of container		Tough polypropylene
12	Size of terminals		Vendor to provide
13	S/C rating of terminals/connectors/leads	kA	4kA for 1 sec
14	Current for charge to 90% Amps capacity in 7 hrs. from fully discharged state	Amps	Vendor to provide

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		15	Recombination efficiency	%	More than 95%
		16	Valve regulated or catalytic recombination type		Vendor to provide
		17	In case of catalytic recombination type, frequency of replacement of catalytic converter		Vendor to provide
		18	Release pressure for valve regulated type	Kg/M^2	Vendor to provide
		19	Volume of electrolyte per cell	Ml	Vendor to provide
		20	Volume of reserve electrolyte per cell	Ml	<6mL/AH
		21	No. of electrode plates per cell	Nos.	Vendor to provide
		22	Type of racks		Vendor to provide
		23	Cell dimensions: (a) Height (b) Width (c) Depth	 Mm Mm Mm	Vendor to provide
		24	Rack dimensions: (d) Height (e) Width (f) Depth	 Mm Mm Mm	Vendor to provide
		25	Operating temperature range	Deg C	
		26	Resistance to electrical abuse		
		27	Recycling facilities for unserviceable battieres available or not	Y/N	

21.0 SCHEDULE OF DEVIATION

The bidders shall set out all deviations from this specification, Clause by Clause in this schedule. Unless specifically mentioned in this schedule, the tender shall be deemed to confirm the purchaser's specifications.

(TO BE ENCLOSED WITH THE BID)

All deviations from this specification shall be set out by the bidders, clause by Clause in this schedule. Unless specifically mentioned in this Schedule, the tender shall be deemed to confirm the purchaser's specifications:

S.No.	Clause No.	Details of deviation with justifications

We confirm that there are no deviations apart from those detailed above.

Seal of the Company Signature :

Designation :

Initiator		Approver	

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Initiator		Approver	

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