RAJIV GANDHI INSTITUTE OF PETROLEUM TECHNOLOGY
JAIS, AMETHI

CORRIGENDUM -1

Date: 26.11.2024

Please refer to the E-tender No. TENDER REF. NO.: RGIPT/JAIS/BPCL-P-2402/MK/LAB/2024-25/01R in CPP portal & Institute Website for the for supply and installation of 01 nos. "Fabrication of plug and use VRFB-system of 5 kW/30kWh".

Corrections/Addendum to 1 nos. "Fabrication of plug and use VRFB-system of 5 kW/30kWh".

Technical Specification Corrigendum -1

Sr. No.	Particulars	Before Specifications
1.	One cell specifications	Cell should be able to incorporate electrodes of minimum area = 625 cm^2 (25x25 cm^2) Electrodes: Graphite felt of 6 – 6.5 mm mm thickness, which must be replaceable by in-house developed electrodes Minimum number of graphite felts = minimum 56, minimum area = 625 cm^2 (25 x 25 cm^2) Electrodes will be held inside the gaskets. Flow channels on bipolar plates (graphite): serpentine or interdigitated flow channel which will be later replaced by in-house developed design of flow channels. Area of flow channels = 25 x 25 cm^2 Thickness of bipolar plate = 10 - 12 mm. Minimum number of graphite plates = 29, minimum area = 900 cm^2 (30 x 30 cm^2) Inner plates will have channels on both side, whereas outer plates will have channels one side. Three different designs of in-house flow channels will be provided. These channels will be machined on graphite bipolar plates of thickness 10 - 12 mm. Minimum number of graphite plates for one design = 29, minimum area = 900 cm^2 (30 x 30 cm^2) Other details of graphite bipolar plates: Pyrolytic Sealed Bipolar Plates Corrosion and chemical resistant Grain size < 5 microns Apparent density = 1.78 g/c Flexural strength >= 85 MPa Compressive strength > 140 MPa Electrical resistivity <= 1470 μΩ-cm Coefficient of thermal expansion = 7.9 μm/m°C or better Shore hardness >= 74 Purity >= 99.99995% Current collectors: Copper plates with gold plating Membrane: proton conducting Nafion 117 or equivalent Minimum number of membrane pieces = 120, minimum area = 900 cm^2 (30 x 30 cm^2)

		Gaskets: silicon gaskets (minimum 60 pieces of minimum area of 30 x 30 cm2) Thickness of gaskets = 5 to 6 mm
2.	Battery stack	Number of cells = 28 Electrolye flow in series Electrolyte flow rate = 3-4 L/ min There should be provision of electrical connection leads from each cell
3.	Electrolyte tanks	Number of tanks = 2 Minimum capacity of one tank = 1000 L Concentration of vanadium = 1.0 – 1.5 M Purity of VOSO4.xH2O salt > 97% Concentration of sulphuric acid = 3.5 – 4.5 M Purity of Sulphuric acid > 99% Amount of electrolyte = appropriate for 6 h operation. Material of construction for tank: Plastic or metal suitable for acidic medium. Provision of nitrogen blanketing.
4.	Pumps	Number of pumps = 2 Peristaltic pumps of varying flow rate 0 to 5 L/min. If not peristaltic, similar pumps may be considered compatible for acidic environment of electrolyte
5.	Measurement and Control systems	Electrolyte flow measurement and control, flow rate: 0 -5 L/min Temperature measurement equipment, temperature: 10 - 55°C. Pressure measurement and control systems for tanks, pressure: 1.0 - 1.1 atm.
6.	Power electronics	It should work for charging and discharging mode Both voltage and current controlled Power rating: 12 kW Current range: 0 – 200 A Voltage range: 0 – 60 V Computer controlled or monitored
7.	Computer system	One with following minimum specifications. CPU: Intel Core i7 or equivalent AMD processor or better RAM: 16 GB or higher HDD: 1TB or higher GPU DirectX 9.0c compliant display adapter with 1GB RAM DVD combo drive TFT Monitor: 21" or higher Windows operating system
8.	Interface	The whole battery system must be controlled by computer using suitable software and hardware interface.
9.	Accessories	Above specifications are minimum. All other necessary accessories such as End plates, O-ring, swagelock fittings, pipings, electrical and mechanical fittings, etc must be provided for plug and use operation of the battery. There should not be any leakage during operation.
10	Spares	One set of spares for smooth operation of the battery set up.
11	Warranty	Comprehensive warranty (except electrolytes) of **minimum 2 years**.

Sr. No.	Particulars	After Specifications
1.	One cell specifications	Cell should be able to incorporate electrodes of minimum area = 625 cm^2 (25x25 cm^2) Electrodes: Graphite felt of 6 – 6.5 mm mm thickness, which must be replaceable by in-house developed electrodes Minimum number of graphite felts = minimum 56, minimum area = 625 cm^2 (25 x 25 cm^2) Electrodes will be held inside the gaskets. Flow channels on bipolar plates (graphite): serpentine or interdigitated flow channel which will be later replaced by in-house developed design of flow channels. Flow channels on bipolar plates (graphite): serpentine or interdigitated flow channel Depth = ~3 mm, width = ~3 mm Flow channels on bipolar plates (graphite): designed flow channels Depth = ~3 mm, width = ~5 mm Testing of one cell with fabricated channels will be at the manufacture's site. Area of flow channels = 25 x 25 cm^2 Thickness of bipolar plate = 10 - 12 mm. Minimum number of graphite plates = 29, minimum area = 900 cm^2 (30 x 30 cm^2) Inner plates will have channels on both side, whereas outer plates will have channels one side. Three different designs of in-house flow channels will be provided. These channels will be machined on graphite bipolar plates of thickness 10 - 12 mm. Minimum number of graphite plates for one design = 29, minimum area = 900 cm^2 (30 x 30 cm^2) Other details of graphite bipolar plates: Pyrolytic Sealed Bipolar Plates Corrosion and chemical resistant Grain size < 5 microns Apparent density = 1.78 g/c Flexural strength >= 85 MPa Compressive strength > 140 MPa Electrical resistivity <= 1470 μΩ-cm Coefficient of thermal expansion = 7.9 μm/m°C or better Shore hardness >= 74 Purity >= 99.9% Current collectors: Copper plates with gold plating Thickness of current collector: 1.5 – 2.5 mm Plating thickness: 0.1 – 0.5 microns Membrane: proton conducting Nafion 117 or equivalent Minimum number of membrane pieces = 120, minimum area = 900 cm^2 (30 x 30 cm^2) Gaskets: silicon gaskets (minimum 60 pieces of minimum area of 30 x 30 cm2) Thickness of gaskets = 5 to 6 mm
2.	Battery stack	Number of cells = 28 Electrolye flow in series

		Electrolyte flow rate = 3-4 L/ min There should be provision of electrical connection leads from each cell
3.	Electrolyte tanks	Number of tanks = 2 Minimum capacity of one tank = 1000 L Concentration of vanadium = 1.0 – 1.5 M Purity of VOSO4.xH2O salt > 97% Concentration of sulphuric acid = 3.5 – 4.5 M Purity of Sulphuric acid > 99% Amount of electrolyte = appropriate for 6 h operation. Material of construction for tank: Plastic or metal suitable for acidic medium. Provision of nitrogen blanketing.
4.	Pumps	Number of pumps = 2 Peristaltic pumps of varying flow rate 0 to 5 L/min. If not peristaltic, similar pumps may be considered compatible for acidic environment of electrolyte
5.	Measurement and Control systems	Electrolyte flow measurement and control, flow rate: 0 -5 L/min Temperature measurement equipment, temperature: 10 - 55°C. Pressure measurement and control systems for tanks, pressure: 1.0 - 1.1 atm.
6.	Power electronics	It should work for charging and discharging mode Both voltage and current controlled Power rating: 12 kW Current range: 0 – 200 A Voltage range: 0 – 60 V Computer controlled or monitored
7.	Computer system	One with following minimum specifications. CPU: Intel Core i7 or equivalent AMD processor or better RAM: 16 GB or higher HDD: 1TB or higher GPU DirectX 9.0c compliant display adapter with 1GB RAM DVD combo drive TFT Monitor: 21" or higher Windows operating system
8.	Interface	The whole battery system must be controlled by computer using suitable software and hardware interface.
9.	Accessories	Above specifications are minimum. All other necessary accessories such as End plates, O-ring, swagelock/other suitable fittings, pipings, electrical and mechanical fittings, etc must be provided for plug and use operation of the battery. There should not be any leakage during operation.
10	Spares	One set of spares for smooth operation of the battery set up.
11	Warranty	Comprehensive warranty (except electrolytes) of **minimum 2 years**.

The last date to receive the bid is extended till **9th December 2024 (Monday)** 3 PM & the Opening of the Techno-commercial bid will be at 4 PM.

Milan Kumar 26/11/24

Dr. Milan Kumar
Chairman, Purchase Committee
Department of Chemical Engineering& Biochemical engineering