राजीव गाँधी पेट्रोलियम प्रौद्योगिकी संस्थान
(संसद के अधिनियम के अधीन स्थापित राष्ट्रीय महत्व का एक संस्थान)
जायस, अमेठी- 229304, उत्तर प्रदेश, भारत
RAJIV GANDHI INSTITUTE OF PETROLEUM TECHNOLOGY
(An Institution of National Importance Established under an Act of Parliament)
Jais, Amethi - 229304, Uttar Pradesh, India

Quotation Enquiry

Date: 19.12.2025

Ref: RGIPT/Jais/Quotation/2025-26/P-2402/01

To,

M/s .....

.....

.....

Subject: Request for Quotation of *Battery Charger for EV Based on Wide Band Gap (WBG) Devices: Grid to EV Battery (Charging)".*

Dear Vender,

We request you to kindly submit your quotation for the supply, installation, and demonstration of the below-mentioned equipment as per the format provided.

Sr. No.	Equipment / Accessories	Qty	Unit Price
1.	SiC MOSFET based Three Phase Inverter module	01 set	
2.	Lithium-Ferro Phosphate battery 48v/30AH with BMS and Closed Cabinet	01set	
3	SiC MOSFET Dual Active Bridge Based isolated DC-DC Converter Fed Charger	01set	
4.	FPGA Board- Real Time FPGA based PWM controller	01set	
5.	Control Panel	01set	
		Sub – total	
		GST 18%	
		Grand total	

Terms & Conditions:

1. The quoted price shall be inclusive of all applicable taxes, delivery, installation, and demonstration charges.
2. PAN and GST details are mandatory and must be provided along with the quotation.
3. The quotation, duly signed and stamped, must be submitted in a sealed envelope, either by hand or by post only.

Dr. Vijay Kumar Singh
Assistant Professor
Department of Electrical & Electronics Engg.
Rajiv Gandhi Institute of Petroleum Technology
Jais, Amethi-229304 U.P., India

4. The quotation must reach us **within 21 days** from the date of publication of this request.
5. Quotations received after the stipulated deadline shall **not be considered** for evaluation.
6. **Penalty/LD** shall be applicable for delay in supply, installation, or demonstration as per RGIPT procurement norms.
7. All necessary accessories, connectors, cables, manuals, and software/licenses required for complete installation and operations shall be supplied along with the equipment.
8. A complied document of technical specification (as per **Annexure-1**) must be sent along with the quotation.
9. The equipment, including accessories, shall carry a **minimum warranty of three (3) years**.
10. A **Performance Bank Guarantee (PBG) of 3%** of the total quoted amount shall be submitted in favor of **Rajiv Gandhi Institute of Petroleum Technology** for a period of **38 months** from the date of installation.
11. **Payment terms** shall be as per Institute norms and shall be released only after successful installation, testing, and demonstration.
12. The Institute reserves the **right to accept or reject any or all quotations**, wholly or partly, without assigning any reason.

Address:

Dr. Vijay Kumar Singh
Department of Electrical & Electronics Engineering
Rajiv Gandhi Institute of Petroleum Technology
Bahadurpur, Mukhetia More, Post-Harbanshganj
Jais, Amethi – 229304 (Uttar Pradesh)

Dr. Vijay Kumar Singh
Assistant Professor
Department of Electrical & Electronics Engg.
Rajiv Gandhi Institute of Petroleum Technology
Jais, Amethi-229304 U.P., India

Annexure-1

Technical Specifications

1. SiC MOSFET based Three Phase Inverter module

Specification: 2 kVA Peak Power

- 6 Nos. **SiC MOSFETs** (1200V / 50A peak rating or equivalent).
- 6 Nos. **HCPL-J316 based negative turn-off gate driver circuits** (-8V to +15V) with short-circuit protection.
- **Switching Frequency**: 0–85 kHz.
- All **collector and emitter terminals** must be accessible through proper connectors for power circuit connection.
- All **gate and emitter terminals** should be brought out and terminated on the front panel for observing driver output and fault status.
- **Indicator LEDs** must be provided for PWM input and power supply status.
- Proper **heatsinks with cooling fan provision** must be provided for all MOSFET's.
- **Temperature sensors** must be included for over-temperature protection.
- **PWM input connectors** must be available on the front panel for external controller interface.
- One **common +15V power supply** must be provided for all gate drivers with inbuilt isolated supply.
- **Over-current and short-circuit protection** must be provided for each individual MOSFET.
- **Reset circuit** must be provided and terminated externally to clear faults.
- **Snubber capacitors** must be provided for dv/dt protection for each MOSFET.
- 4 Nos. **Current sensors (55A)** for DC link current and output line current.
- **Input AC Voltage**: 0–440V (Phase-to-Phase).
- **Output DC Voltage**: 0–100V.
- **Rated Power**: 2 kVA.
- Ensures **<5% THD** and **unity power factor** on source side
- Maintains a **regulated DC link voltage**

2. Lithium-Ferro Phosphate battery 48v/30AH with BMS and Closed Cabinet

- Battery Type : Lithium Iron Phosphate ($LiFePO_4$)
- Nominal Voltage : 48 V DC
- Rated Capacity : 30 Ah
- Energy Storage : 1.44 kWh
- Cell Configuration : 15S (3.2 V × 15 cells in series)
- Nominal Cell Voltage : 3.2 V
- Full Charge Voltage : 54.75 V (3.65 V × 15)
- Discharge Cut-off Voltage : 40.5 V (2.7 V × 15)
- Standard Charge Current : 10 A

- Maximum Charge Current : Up to 15–20 A
- Maximum Continuous Discharge :30–50 A
- Cycle Life : ≥ 3000 cycles @ 80% DOD
- Internal Resistance : ≤ 50 mΩ
- Self-Discharge Rate : ≤ 3% per month

Battery Management System (BMS)

- Type : Integrated Smart BMS
- Protections : Over/under-voltage, over-current, short-circuit, over-temp, balancing
- Communication Interface : Bluetooth (BLE 4.0 / 5.0)

Bluetooth Monitoring & Mobile App

- Real-Time Monitoring : Voltage, Current, SOC, Temperature, Remaining Capacity, Health
- Alerts/Warnings : Overcharge, Over discharge, Temperature faults, Connection issues
- Cycle Tracking : Shows current charge/discharge cycle and lifetime history
- Mobile App Compatibility : Android & iOS

Environmental Conditions

- Charge Temperature : 0°C to +55°C
- Discharge Temperature : -20°C to +60°C
- Storage Temperature : -10°C to +35°C
- Humidity : <85% RH, non-condensing

3. SiC MOSFET Dual Active Bridge Based isolated DC-DC Converter Fed Charger

Power Circuit

- 8 nos of **600 V / 75 A / 20 kHz SiC MOSFET** must be used to form the power circuit.
- **MOSFETs** need to be mounted on proper heatsinks with **cooling fans** provided.
- **Snubber capacitors** must be provided for **dv/dt protection** for each MOSFET module.
- **Overcurrent** and **short circuit protection** must be provided for each MOSFET module.
- **Temperature protection** must be included for thermal safety.

Driver Circuit

- 8 nos of **HCPL316J ICs based high-frequency PWM drivers** with built-in **opto-isolation**.
- Common **+15 V / 3 A isolated SMPS** power supply must be provided for all driver circuits.
- **PWM input terminals** must be provided on the **front panel** for external controller interface.
- **LED indicators** needed for:
  - PWM signal input
  - Power supply input

Dr. Vijay Kumar Singh
Assistant Professor
Department of Electrical & Electronics Engg.
Rajiv Gandhi Institute of Petroleum Technology
Jais, Amethi-229304 U.P., India

Vijay

- Fault status
- **Reset key** must be included to clear fault conditions.

Sensing and Measurement

- 4 nos of **55 A current sensors** to measure:
  - DC link current
  - Primary current
  - Secondary current
- Output load current
- 1 no of **IC-7840-based voltage sensor** to measure output voltage.

Metering Instruments

- **1 no. 72×72 mm Galvanized Voltmeter** (0–500 V) for general voltage monitoring.
- **1 no. 72×72 mm Voltmeter** (500 V) for **input voltage** display.
- **1 no. 72×72 mm Voltmeter** (300 V) for **output voltage** display.
- **1 no. 72×72 mm Ammeter** (20 A) for **output current** monitoring.

4. FPGA Board- Real Time FPGA based PWM controller

a) Core FPGA

- **Device:** must be a Xilinx Artix-7 XC7A200T or upper versions
- **Logic Resources:** 215,360 logic cells
- **Block RAM:** 13,455,360 bits
- **DSP Slices:** 740 × DSP48 for high-performance signal processing
- **Clock Management:** 10 Clock Management Tiles (PLLs & DCMs)

b) On-Board Interfaces & Power

- **USB 2.0 Hi-Speed** for host communication
- **On-board USB-JTAG** (ISE/Vivado compatible)
- **Isolated Power Input** (for noise-free operation)
- **Isolated USB-UART** for serial debug

c) Analog I/O

Bipolar SPI ADC

- 16 channels, 16-bit resolution
- 1 MSPS aggregate sampling
- ±10 V input range
- 20-pin header

Unipolar SPI ADC

- 8 channels, 12-bit resolution
- 1 MSPS aggregate sampling
- 0–3.3 V input range
- 10-pin PTB connector

SPI DAC

- 8 outputs, 12-bit resolution
- 10-pin PTB connector

d) Memory & Wireless

- **Flash:** 64 Mb SPI-Flash for bitstream or data storage
- **Wireless:** Wi-Fi and Bluetooth modules

e) User I/O & Display

- 8 × Slide switches (user inputs)
- 8 × LEDs (user outputs)
- 4 × Push-buttons
- 50 MHz system clock
- 20 × 4 LCD interface

f) General-Purpose I/O

- **5 V-tolerant PWM/Capture Pins:**
- 2 × 40-pin headers (64 I/O)
- **3.3 V GPIO:**
- 40-pin header (36 I/O)

g) Programming & Toolchain

- The Xilinx® Vivado® High-Level Synthesis (HLS) tool access must be provided that transforms a C specification into a register transfer level (RTL) implementation that we can synthesize into a Xilinx field programmable gate array (FPGA).
- **ISE & Vivado Examples:** Pre-built reference designs for microgrid systems and motor control (PMSM, BLDC, SynRM, BDFRM) is highly required.

Note:

- **VHDL based Re-programmable facility highly needed for Constant Current (CC), Constant Voltage (CV),** and **State of Charge (SOC)** charging schemes can be implemented.

h) Operating System Support

- Compatible with Ubuntu/Linux and Windows
- Full driver support for JTAG, UART, and peripheral interfaces

5. Control Panel

General

- **Type:** Floor-standing
- **Enclosure:** Powder-coated CRCA steel / SS304
- **Protection Class:** IP52 / IP55 (Indoor)
- **Form Factor:** Form 2 (as per IEC 61439)

Electrical Ratings

- **Rated Voltage:** 415V AC, 3-Phase, 50Hz
- **Rated Current:** 10A
- **Short Circuit Rating:** 2kA for 1 sec

Panel Construction

- **Material:** 14/16 SWG CRCA Sheet
- **Finish:** Powder coated RAL 7035 (Light Gray/cyan)
- **Cooling:** Natural air ventilation
- **Cable Entry:** Bottom / Top

Components

- **Terminal Blocks:** BTI/Phoenix / Wago / Elmex
- **Wiring:** Flexible copper

Meters and sensor: -

3-Phase Source Impedance with Measurement Unit

- **Three (3) variable tapping inductors** rated for **0–5 mH / 25A** must be provided.
- **Three (3) PT-based voltage sensing circuits** with signal conditioning must be provided to measure the **3-phase mains voltage**.
- **Three (3) Hall-effect current sensors** with integrated signal conditioning must be provided to measure the **3-phase mains current**.
- 1 No. **3-phase Multifunction Meter (MFM)** with Modbus protocol must be provided to display grid parameters such as:
  - Active Power
  - Reactive Power
  - Power Factor (PF)
  - Total Harmonic Distortion (THD)
  - Voltage
  - Current
  - Apparent Power
- 3 Nos. **Current Transformers (CT)** with 30:5A ratio must be provided for MFM connections

High-Frequency Ferrite Core Transformer

- **Type** : High-frequency transformers (Ferrite Core)
- **Operating Frequency** : 18 kHz
- **Power Rating** : 1.5 kW
- **Input Voltage** : 400 V DC
- **Output Voltage** : 54 V DC
- **Output Power** : 1.5 kW
- **Necessary LC filters** : needed for smoothing output ripple.

Three Phase Variac: 1no.

- No. of phases : 3 Phase
- Type : Portable / Enclosure type
- Operating : Manual
- Frequency : 50Hz
- Voltage rating Input : 415 V AC, 3 Phase
- Output : 0-470 V AC Variable
- Current rating per coil : 5A Maximum
- Dimension in mm (Approx.) : (L*W*H)250 * 300 * 550mm
- Type of Cooling : Natural Air cooled

- Core Material : CRGO Silicon Steel
- Coil Material : 99% Pure Copper
- Termination : Input & Output terminals must be brought out on top for easy connections.
- Insulation Resistance Test : Over 5 M Ohms (500V DC Megger)
- Operating Temperature : 0-45oC
- HV Test : 2.5KV for 1 min.
- Construction : Round Construction
- Load Rating : Continuously Rated
- Insulation Material : Class 'H' To Withstand 180 Deg C Temperature
- Thermal Withstand : 120 Deg Continuous
- Operating Humidity : 0-90% Non-Condensing
- Electrostatic Shield : Nil
- Linear Harmonics Attenuation : 100%
- Non-Linear Harmonics Attenuation : More Than 75%
- Degree of Ip : Ip-21 Or as Per Customer Specification
- Impedance : 3 To 4%

vijay 19/12/2025

Dr. Vijay Kumar Singh
Assistant Professor
Department of Electrical & Electronics Engg.
Rajiv Gandhi Institute of Petroleum Technology
Jais, Amethi-229304 U.P., India

Dr. Vijay Kumar Singh
Assistant Professor & PI (SG-2402)
Electrical & Electronics Engineering Department
RGIPT, Jais