

ANNEXURE A

Qualifying requirement for procurement of High frequency high voltage transformer rectifier set -

1. Vendor shall be OEM manufacturer of the equipment.
2. The vendor must possess experience of successful operation of HFTR set for ESP application in a coal fired <sup>power</sup> plant of minimum two years on bid opening date. Necessary proof of same shall be submitted along with the bid.
3. The vendor should have executed minimum five projects of similar nature on bid opening date. Necessary proof of same shall be submitted along with the bid.

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**Tentative Specification for IGBT based High Power, High Frequency switched mode power supply for Electrostatic Precipitator**

**1. Environment Conditions:**

**Ambient Temperature:** 1 deg. C to 50 deg. C

**Humidity:** upto 100%

**Location:**

Outdoor. On ESP roof top

**Environment:**

The atmosphere will be very dusty, corrosive & abrasive. The equipment shall be suitable designed and manufactured for such environment.

**2. Applicable Standards:**

The equipment shall be designed, manufactured and tested (including type test) as per applicable standards

**3. Terminal Conditions:**

**Power Supply Available:** 415 volt (line to line), 3phase, 50Hz AC

**Power Supply Variation:** voltage +/- 10%, frequency +/- 5%, Combined V & F: 10%

**Capacitance of Precipitator (PF) :** 200 X rated output current (mA)

**Form Factor to be considered for High Power High Frequency TR:** 1.4 (max.) for input current and 1.15(max.) for input voltage.

**4. IGBT based, High Power, High Frequency Switched Mode power supply:-HFHVTR**

The HFHVTR shall house (a) power supply module (b) Transformer module and (c) DSP Controller module.

The power supply module consists of 3ph diode converter, DC filter, DC Bus, IGBT bank, L + C bank. The Transformer module consist of Line reactor, Step up transformer, full wave diode rectifier, HF choke and the DSP Controller module consist of Controller with its accessories.

All sections of HFHVTR like input rectification section, capacitor bank section, inverter section, controller section, transformer section and high voltage rectification section etc., shall be integrated to single module of enclosure. The HFHVTR is required to operate continuously throughout the year in all climatic condition in ESP application.

Supplier may propose their own module arrangement meeting the above requirement.

**5. The tentative details of individual sections are as follows.**

**I. Input Rectifier: Three phase diode bridge rectifier**

- a. I/P AC Voltage: - 415V +/-10%
- b. I/P Frequency: - 50Hz
- c. O/P DC Voltage: - 600 V or suitable to overall configuration
- d. O/P DC Current: - 400 A (As per the inverter losses requirement)
- e. O/P Power: - 120 KW + total inverter losses
- f. Ambient Temperature: - 50 Deg.
- g. Type of cooling: - Natural air cooling
- h. Power Overload: - 150 % of rated kW for 60 sec for every 10 minutes

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- II. **Capacitor Bank:** Equivalent Inductor & capacitance value, Harmonics current rating shall be suitable for 120 kW inverter, operating at switching frequency of 10 kHz to 25 kHz. The LC bank to be connected to DC bus.

### III. Inverter:

- a. Configuration: - 1-PH IGBT Based PWM Inverter
- b. I/P DC Voltage: - 550V +/-10% or suitable
- c. O/P AC Voltage: - 1-PH,0 - 400 V
- d. O/P AC Current: - 300A or as required.
- e. O/P Frequency: - maximum 10 kHz to 25 kHz ( 10 kHz preferred)
- f. O/P Power: - 120 KW
- g. O/P Power factor: - 0.9 (minimum)
- h. Switching frequency :- 10 kHz to 25 kHz
- i. Ambient Temperature: - 50 Deg.
- j. Type of cooling: - Natural/Forced air-cooling (preferred.)
- i. Power Overload: - 150 % of rated kW for 60 sec for every 10 minutes

- IV. **Switching:** The switching topology shall be of **soft-switching type** and suitable inductor and capacitor value shall be considered to enable soft-switching at operating frequency. The switching frequency shall be in the range of 10kHz to 25 kHz. (The preferred frequency is 10 kHz).

### V. High Power High frequency High voltage Transformer Rectifier:

- a. Phase : single phase
- b. KVA Rating : 95
- c. Input Power Supply : 415 +/- 10 % Volts AC, 1 Phase, 10-25 kHz
- d. DC Output Voltage : 95kV (full wave rectified)
- e. DC Output current : 1000mA
- f. Power Factor : > 0.9
- g. Core Material : Nano crystalline / Amorphous silicon or Equivalent
- h. Losses : < 5.5 KW
- i. Ripple : < 5 KVp-p
- j. Frequency: The operating frequency shall be in the range of 10kHz to 25 kHz.
- k. Type of cooling : Oil / air.

### VI. Spark:

The HFHVTR shall supply DC power to ESP round the clock (24 hrs. aday) and shall withstand the spark/arc/short circuits occurred at field. Occasionally the spark count may reach 200 sparks per minute. The HFHVTR shall be suitable for such operating conditions.

- VII. **Testing :** The functional testing, acceptance and type testing of the HFHVTR shall be as per applicable documents/standards.

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