

**E-5**

Electrical

**PROCUREMENT OF GOODS  
UNDER  
NATIONAL SHOPPING  
PROCEDURES**

**COEP/TEQIP-II/CoE-SRES/March2016/NS/16**

**For**

**Modular Power Converters**

**Bid Price: Nil/-**

**PACKET NO :COEP/TEQIP-II/ CoE-SRES/ March2016 /NS /16**

**INVITATION FOR QUOTATIONS FOR SUPPLY OF**

**Modular Power Converter**

1. You are invited to submit your most competitive quotation for the following goods: -

Sr. No	Title /Name of the equipment /System	Brief description [Attach separate annexure if necessary for detailed specifications	Quantity
1	<b>Modular Power Converter</b>	<b>Modular Power Converter</b> Please refer to the Annexure A	Refer Annexure A

The schedule is as follows

Date of inviting the quotations	23/03/2016
Last date of submitting the sealed quotation to TEQIP office, COEP	04/04/2016 [upto 3:00 pm]
Opening of the quotations	04/04/2016 [4:00 pm]
Validity of quotation	Min 45 days
Delivery Period	4 Months from the acceptance of PO

2. College of Engineering has received the grants for establishing Center of Excellence in Smart Renewable Energy System under MHRD's Technical Education Quality Improvement Program-Phase II. The said procurement is for this center. This project is World Bank sponsored project. This procurement is being carried out using the National Shopping Process, and will observe the guidelines of Shopping under TEQIP-II.

**3. Bid Price**

- The contract shall be for the full quantity as described above and in the annexure. Corrections, if any, shall be made by crossing out, initialing, dating and re-writing.
- All duties, taxes and other levies payable by the contractor under the contract shall be included in the total price. However, break- up of the basic price and taxes/duties shall be indicated clearly.
- The bidders will be evaluated on the basic price.

- d) The rates quoted by the bidder shall be fixed for the duration of the contract and shall not be subject to adjustment on any account.
  - e) The Prices should be quoted **in Indian Rupees** only.
4. Each bidder shall submit only one quotation.
5. **Validity of Quotation**
- Quotation shall remain valid for a period not less than 45 days after the deadline date specified for submission.
6. **Evaluation of Quotations**
- The purchaser shall evaluate and compare the quotations determined to be substantially responsive i.e. which
- (a) are properly signed ; and
  - (b) conform to the terms and conditions, and specifications.
- The Quotations would be evaluated considering all items together in this packet.**
7. **Award of contract**
- The Purchaser shall award the contract to the bidder whose quotation has been determined to be substantially responsive and who has offered the lowest evaluated quotation price.
- 7.1 Notwithstanding the above, the Purchaser reserves the right to accept or reject any quotations and to cancel the bidding process and reject all quotations at any time prior to the award of contract.
- 7.2 The bidder whose bid is accepted shall be notified of the award of contract by the Purchaser prior to expiration of the quotation validity period. The terms of the accepted offer shall be incorporated in the purchase order.
8. 80 % Payment shall be made immediately after delivery of the goods. Remaining 20 % payment will be made after successful commissioning and testing of the equipment/system.
9. Three years commercial warranty/ guarantee shall be applicable to the supplied goods.
10. You are requested to provide your offer in sealed envelope latest by **04<sup>th</sup> April 2016**. Please indicate ***“Quotation for Modular power converters. CoE-SRES/ March2016 /NS /16”*** at the right hand corner of the sealed envelope”

11. The bidder has to supply the material within the prescribed date. A penalty as per norms will be imposed for delayed supply upto 6 weeks. Any further delay will automatically terminate the purchase order/ contract.
12. The supplier requires supplying the store exactly as per the specifications and will be responsible to replace the defective supplies at his risk and cost.
13. The Supplier should submit deviation statement if any. The quotations simply mentioning “asper your specification and cost” shall be rejected.
14. The supplier should arrange for free demo / working trial of equipment (if required) at the Institute / Manufacturers place as the case may be at suppliers cost. The Purchase Order would be placed subject to satisfactory demonstration of the equipment.
15. Commissioning / Installation is at suppliers cost unless otherwise specified.
16. Conditional quotation will not be accepted.
17. We look forward to receiving your quotations and thank you for your interest in this project.

**Name: Prof. B. N. Chaudhari**  
Principal Investigator  
Center of Excellence-Smart Renewable Energy System

## Annexure A

### Detailed technical specifications for Modular Power Converter

#### [A] Modular Power Converter - IGBT AC – DC [06]

Sr. No.	Parameter	Specification required
1	Input	415 Volts +/- 10%, 3 phase 50 Hz
2	Output	DCV - 0 to 700 V
3	Power	3 kW continuous, extendable to 5 kW ( For 30 minutes )
4	Switching Frequency	Switching Frequency of the bridge to be up to 20 KHz
5	Devices	One bridge of 3 legs & additional leg for braking resistor at DC bus. Fast recovery diode rectifier for each device
6	Driver circuits	The driver circuits for all the legs individually modular for each leg
7	Signal Sensors	Hall effect type current and isolated voltage sensors at different points in the circuit.
8	Signal Conditioning	The Input signals for drivers as well as output signals from the sensors should be DSP (Texas / dsPIC compatible) / TTL compatible
		Signal conditioning cards for the following, 1) Voltage & Currents AC at input side 2) Voltage & Current for DC at output
9	Facilities	1) To configure either single phase or 3 phase circuit 2) Inductors to make UPF/Boost Converter at input end 3) Facility to bypass boost inductors 4) Capacitors for DC bus as well as for filters at input end with provision to connect or bypass in the ckt 5) Loading facility at dc link 6) Facility for connecting external braking resistance with necessary protection facility

<b>10</b>	<b>Protections</b>	1) Snubbers for all switching devices 2) 4 pole 10 Amp MCB/ELCB at input 3) Over voltage trip contactor at input and output 4) DC bus over voltage 5) MOV/ filter for input 6) Overload protection with gate drive disable signal 7) Input side HRC fuses 8) DC bus two HRC fuses 9) Single phasing prevention 10) Overvoltage protection with gate drive disable 11) Over temperature protection for the devices
<b>11</b>	<b>Indications</b>	1) Presence of input all phases 2) DC bus presence 3) Presence of each driving signal 4) Presence of control supply
<b>12</b>	<b>Size</b>	The Unit should be mountable on a table. The dimensions should be as per DIN standard. The Location of Connectors & components should be aesthetically selected
<b>Features and facilities of the set up</b>		
<b>13</b>	<b>Control Devices or Switches</b>	<ul style="list-style-type: none"> <li>The devices are in the single leg configuration. There are total 3 legs for bridge and one leg for braking.</li> <li>The IGBT's are of 75Amp / 1200 / 1600 volt rating. Power Devices should be of Semicron/EUPEC/ Mitsubishi)</li> <li>40 Amps/1200Volt fast recovery diodes need to be connected across each device.</li> </ul>
<b>14</b>	<b>Mounting of the Devices</b>	The devices should be mounted on a heat sink suitable to dissipate total 100 Watts of power from all the devices with a temperature rise of 25 degree above ambient without a fan operating on mains should be mounted on the heat sink. The devices are easily visible from the front and accessible for replacement in case of a fault. A PTC temperature sensor should be mounted on the heat sink.
<b>15</b>	<b>Mounting of the Device driver circuits</b>	The drive circuits should be mounted close to the device. Should be easily visible from front and accessible for replacement in case of a fault. The input signal connections are brought on the front panel with FRC connector. There should be LED's indicating the presence of drive signal.

16	<b>Inductors and capacitors</b>	<ul style="list-style-type: none"> <li>There are three inductors of 0.5mH / 12Amp at input of AC-DC converter. The inductors are mounted inside the cabinet. There should be provision to bypass the inductors when not required by operating a three pole 2 way 12-15 Amp rotary switch of a standard make.</li> <li>There should be provision to connect inductors externally in the DC bus circuit</li> <li>Two capacitors of 4700mfd/1000v, PG grade should be mounted internally and connected in series and the connections are brought on the panel.</li> <li>Three filter capacitors of 10mfd/440V connected as delta at input should be connected through a three pole two way switch. The capacitors can be bypassed when not required.</li> </ul>
17	<b>Signal Conditioning</b>	The outputs of the current & voltage sensors should be conditioned to be TTL and DSP compatible and brought on the front panel to a FRC connector.
18	<b>Terminations and connection links</b>	The terminals for high current and voltage should be of proper current and voltage rating and of shrouded type for safety. The connection links also should be of Shrouded type.

**[B] Modular Power Converter - SCR AC – DC [04]**

Sr. No.	Parameter	Specification required
1	<b>Input</b>	415 Volts +/- 10%, 3 phase 50 Hz
2	<b>Output</b>	DCV - 0 to 700 V
3	<b>Power</b>	3 kW continuous, extendable to 5 kW ( For 30 minutes )
4	<b>Switching Frequency</b>	Switching Frequency of the bridge to be up to 500 Hz
5	<b>Devices</b>	One bridge of 3 legs & additional leg for braking resistor at DC bus. Fast recovery diode rectifier for each device
6	<b>Driver circuits</b>	The driver circuits for all the legs individually modular for each leg
7	<b>Signal Sensors</b>	Hall effect type current and isolated voltage sensors at different points in the circuit.
8	<b>Signal Conditioning</b>	The Input signals for drivers as well as output signals from the sensors should be DSP (Texas / dsPIC compatible) / TTL compatible
		Signal conditioning cards for the following, 1) Voltage & Currents AC at input side 2) Voltage & Current for DC at output

<b>9</b>	<b>Facilities</b>	1) To configure either single phase or 3 phase circuit 2) Inductors to make UPF/Boost Converter at input end 3) Facility to bypass boost inductors 4) Capacitors for DC bus as well as for filters at input end with provision to connect or by pass in the ckt 5) Loading facility at dc link 6) Facility for connecting external braking resistance with necessary protection facility
<b>10</b>	<b>Protections</b>	1) Snubbers for all switching devices 2) 4 pole 10 Amp MCB/ELCB at input 3) Over voltage trip contactor at input and output 4) DC bus over voltage 5) MOV/ filter for input 6) Overload protection with gate drive disable signal 7) Input side HRC fuses 8) DC bus two HRC fuses 9) Single phasing prevention 10) Overvoltage protection with gate drive disable 11) Over temperature protection for the devices
<b>11</b>	<b>Indications</b>	1) Presence of input all phases 2) DC bus presence 3) Presence of each driving signal 4) Presence of control supply
<b>12</b>	<b>Size</b>	The Unit should be mountable on a table. The dimensions should be as per DIN standard. The Location of Connectors & components should be aesthetically selected
	<b>Features and facilities of the set up</b>	
<b>13</b>	<b>Control Devices or Switches</b>	<ul style="list-style-type: none"> <li>The devices are in the single leg configuration. There are total 3 legs for bridge and one leg for braking.</li> <li>The SCRs are of 40 Amp / 1600 volt rating. Power Devices should be of Semicron/EUPEC/ Mitsubishi)</li> <li>40 Amps / 1600 Volt fast recovery diodes need to be connected across each device.</li> </ul>



<b>14</b>	<b>Mounting of the Devices</b>	The devices should be mounted on a heat sink suitable to dissipate total 100 Watts of power from all the devices with a temperature rise of 25 degree above ambient without a fan operating on mains should be mounted on the heat sink. The devices are easily visible from the front and accessible for replacement in case of a fault. A PTC temperature sensor should be mounted on the heat sink.
<b>15</b>	<b>Mounting of the Device driver circuits</b>	The drive circuits should be mounted close to the device. Should be easily visible from front and accessible for replacement in case of a fault. The input signal connections are brought on the front panel with FRC connector. There should be LED's indicating the presence of drive signal.
<b>16</b>	<b>Inductors and capacitors</b>	<ul style="list-style-type: none"> <li>• There are three inductors of 0.5mH / 12Amp at input of AC-DC converter. The inductors are mounted inside the cabinet. There should be provision to bypass the inductors when not required by operating a three pole 2 way 12-15 Amp rotary switch of a standard make.</li> <li>• There should be provision to connect inductors externally in the DC bus circuit</li> <li>• Two capacitors of 4700 mfd / 1000 V, PG grade should be mounted internally and connected in series and the connections are brought on the panel.</li> <li>• Three filter capacitors of 10 mfd / 440 V connected as delta at input should be connected through a three pole two way switch. The capacitors can be bypassed when not required.</li> </ul>
<b>17</b>	<b>Signal Conditioning</b>	The outputs of the current & voltage sensors should be conditioned to be TTL and DSP compatible and brought on the front panel to a FRC connector.
<b>18</b>	<b>Terminations and connection links</b>	The terminals for high current and voltage should be of proper current and voltage rating and of shrouded type for safety. The connection links also should be of Shrouded type.

**[c] Modular Power Converter - MOSFET DC – AC [12]**

<b>Sr. No.</b>	<b>Parameter</b>	<b>Specification required</b>
<b>1</b>	<b>Input</b>	48 VDC +/- 10%
<b>2</b>	<b>Output</b>	ACV 3 phase, 32 V
<b>3</b>	<b>Power</b>	300 W continuous

<b>4</b>	<b>Switching Frequency</b>	Switching Frequency of the bridge to be up to 100 KHz
<b>5</b>	<b>Devices</b>	One bridge of 3 legs & additional leg for braking resistor at DC bus. Fast recovery diode rectifier for each device
<b>6</b>	<b>Driver circuits</b>	The driver circuits for all the legs individually for each leg
<b>7</b>	<b>Signal Sensors</b>	Hall effect type current and isolated voltage sensors at different points in the circuit.
<b>8</b>	<b>Signal Conditioning</b>	The Input signals for drivers as well as output signals from the sensors should be DSP (Texas / dsPIC compatible) / TTL compatible
		Signal conditioning ckts for the following, 1) Voltage & Currents at AC side 2) Voltage & Current at DC side
<b>9</b>	<b>Facilities</b>	1) To configure either single phase or 3 phase circuit 2) Provision to connect Inductors for grid connections 3) Facility to bypass boost inductors 4) Capacitors for DC bus as well as for filters at output end with provision to connect or bypass in the ckt 5) Facility for connecting external braking resistance with necessary protection facility
<b>10</b>	<b>Protections</b>	1) Snubbers for all switching devices 2) 4 pole 10 Amp Relay at output 3) Over voltage trip relay at input and output 4) DC bus over voltage 5) MOV/ filter for output 6) Overload protection with gate drive disable signal 7) AC side glass fuses 8) DC bus glass fuse 9) Overvoltage protection with gate drive disable
<b>11</b>	<b>Indications</b>	1) Presence of output all phases 2) DC bus presence
<b>12</b>	<b>Size</b>	The Unit should be mountable on a table. The dimensions should be as per DIN standard. The Location of Connectors & components should be aesthetically selected

	<b>Features and facilities of the set up</b>	
<b>13</b>	<b>Control Devices or Switches</b>	<ul style="list-style-type: none"> <li>The devices are in the single leg configuration. There are total 3 legs for bridge and one leg for braking.</li> <li>Suitable MOSFETs</li> </ul>
<b>14</b>	<b>Mounting of the Devices</b>	Provision to be made for heat sink for each MOSFET Ease in replacement of MOSFETs
<b>15</b>	<b>Inductors and capacitors</b>	There should be provision to connect inductors externally in the circuit
<b>16</b>	<b>Signal Conditioning</b>	The outputs of the current & voltage sensors should be conditioned to be TTL and DSP compatible and brought on the front panel to a FRC connector.
<b>17</b>	<b>Terminations and connection links</b>	The terminals for high current and voltage should be of proper current and voltage rating and of shrouded type for safety. The connection links also should be of Shrouded type.
<b>18</b>	<b>Overall Dimensions &amp; weight</b>	380 x 240 x 80 mm ( L x B x H ) Approx weight should be 3 Kg
<b>19</b>	<b>Overall Aesthetics</b>	Compact, Easily portable, All circuits visible from TOP

**[d] Modular Power Converter – Universal AC - DC – DC [10]**

<b>Sr. No.</b>	<b>Parameter</b>	<b>Specification required</b>
<b>1</b>	<b>Input</b>	90 to 265 VAC, 1 Phase 50 Hz / DC input 5 V to 60 V
<b>2</b>	<b>Output</b>	DC 1.8 V to 350 V
<b>3</b>	<b>Power</b>	300 W Maximum, 20 Amp max Current
<b>4</b>	<b>Switching Frequency</b>	Switching Frequency to be up to 100 KHz
<b>5</b>	<b>Devices</b>	Suitable MOSFETs
<b>6</b>	<b>Driver circuits</b>	The driver circuits for all devices
<b>7</b>	<b>Signal Sensors</b>	Hall effect type current and isolated voltage sensors at different points in the circuit.
<b>8</b>	<b>Signal Conditioning</b>	The Input signals for drivers as well as output signals from the sensors should be DSP (Texas / dsPIC compatible) / TTL compatible

		Signal conditioning circuit for the following, 1) Voltages & Current at AC side 2) Voltages & Currents at DC sides
<b>9</b>	<b>Facilities</b>	<ol style="list-style-type: none"> <li>1. Unity power factor control circuit at input / 1 Ph Grid interface circuit</li> <li>2. Following DC-DC converter topologies can be configured <ol style="list-style-type: none"> <li>a) Step Down converter</li> <li>b) Step up converter</li> <li>c) Fly back converter</li> <li>d) Forward converter</li> <li>e) Half bridge converter</li> <li>f) Full bridge converter</li> </ol> </li> <li>3. MOSFET as switching device</li> <li>4. TTL/DSP/d-Space compatible isolated switch driving circuits</li> <li>5. Output voltage and output current feedback</li> <li>6. Output inductor current sensing</li> <li>7. Bridge output voltage sensing</li> <li>8. DC Bus current sensing</li> <li>9. DC Bus voltage sensing</li> <li>10. Rectifier output current sensing</li> <li>11. Input voltage and current sensing</li> <li>12. Inductor output voltage sensing for UPF control</li> <li>13. Facility to change inductors</li> <li>14. Facility to connect capacitors in series or parallel</li> </ol>
<b>10</b>	<b>Protections</b>	<ol style="list-style-type: none"> <li>1. Input over voltage : Disconnect input supply Electromechanical breaking</li> <li>2. DC over voltage : Disconnect Output bridge driving pulses</li> <li>3. DC over current :Disconnect Output bridge driving pulses</li> <li>4. Output Over voltage: Disconnect Load Electromechanical breaking</li> <li>5. Output over current :Disconnect Output bridge driving pulses, Fault Latched and manually reset</li> <li>6. Over temperature for switching devices :Disconnect Output bridge driving pulses</li> </ol>
<b>11</b>	<b>Indications</b>	<ul style="list-style-type: none"> <li>• Supply voltage</li> <li>• Supply current</li> <li>• Input power factor</li> <li>• DC bus voltage</li> <li>• DC input current</li> <li>• Output Voltage</li> <li>• Output current</li> </ul>
<b>12</b>	<b>Size</b>	The Unit should be mountable on a table. The dimensions should be as per DIN standard. The Location of Connectors & components should be aesthetically selected
	<b>Features and facilities of the set up</b>	
<b>13</b>	<b>Mounting of the Devices</b>	Provision to be made for heat sink for each MOSFET Ease in replacement of MOSFETs

<b>14</b>	<b>Inductors and capacitors</b>	There should be provision to connect inductors externally in the circuit
<b>15</b>	<b>Signal Conditioning</b>	The outputs of the current & voltage sensors should be conditioned to be TTL and DSP compatible and brought on the front panel to a FRC connector.
<b>16</b>	<b>Terminations and connection links</b>	The terminals for high current and voltage should be of proper current and voltage rating and of shrouded type for safety. The connection links also should be of Shrouded type.
<b>17</b>	<b>Overall Aesthetics</b>	Compact, Easily portable, All circuits visible from TOP