राजकीय इन्जीनियरिंग कालेज

कटरिया याकूबपुर, अम्बेडकर नगर (उ०प्र०) – 224122 भारत

Rajkiya Engineering College

Katariya Yakoobpur, Ambedkar Nagar, (U.P.) – 224122Cell Phone: 91-9454439590

AICTE APPROVED GOVERNMENT ENGINEERING COLLEGE Website:www.recabn.ac.in

VIDE APPROVAL LETTER No. F. No. Northern/1-3511948247/2018/EOA DATED: 30-Apr-2018 E-mail:director@recabn.ac.in

Affiliated to Dr. A.P.J. Abdul Kalam Technical University Lucknow, U.P., India

RECABN/TEQIP-III/2018/153 **Date: 09/03/2019**

INVITATION FOR QUOTATION FOR RENEWABLE ENERGY LAB COE (SETUP)

To,

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Dear Sir,

You are invited to submit your most competitive quotation for Renewable Energy Lab COE Setup for the Rajkiya Engineering College. In this connection, submit your financial offers/quotation as per the product in the given format in Annexure-II for Renewable Energy Lab COE setup. The details of specifications is given in Annexure-I

Sr. No	Name of Particular/ Product/Package Brief Description	Quantity	Place of Delivery	Installation Required
1	Renewable Energy (Center of Excellence)	As per specification (Attached in Annexure-I)	Rajkiya Engineering College, Ambedkar Nagar	**YES**

Government of India has received a credit from the International Development Association (IDA) in various towards the cost of the **Technical Education Quality Improvement Programme (TEQIP) Phase -III** Project and intends to apply part of the proceeds of this credit to eligible payments under the contract for which this invitation for quotations is issued.

ıctions:

The quantity of the particulars is as mentioned above.

2. The bidders should quote their offer/rates in package not individual items with clear terms without any ambiguity and shall be submitted individually for the above said Products.
3. The institute will select bidder who has offered the lowest aggregate cost for complete set of CoE package.
4. All duties, taxes and other levies payable by the bidder shall be included in the total price.
5. 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.
6. The cost should be quoted in Indian Rupees only.
7. Quotation/Offer shall remain valid for a period not less than 45 days after the last date of submission.
8. For the said product warranty should be at least two years/ onsite manufacture warranty.
9. The last date of submission of offer is ***28/03/2019*** by ***5:00 PM.***
10. The quotation will be open on **29/03/2019 at 12:00 PM**.
11. Sealed quotation to be submitted/ delivered at the address mentioned below:

Quotation (In the name of)	Delivery Address
TO DIRECTOR RAJKIYA ENGINEERING COLLEGE AMBEDKAR NAGAR PIN CODE-224122, UTTAR PRADESH	TEQIP-III OFFICE RAJKIYA ENGINEERING COLLEGE AMBEDKAR NAGAR PIN CODE-224122, UTTAR PRADESH

12. At the top of envelop should be mention **Quotation for Renewable Energy Lab (COE) Setup Under TEQIP-III** in bold.
13. The institute will select bidder who has offered the lowest cost.
14. Material should be standard make.
15. Submit a GSTIN registration and PAN copy of firm duly signed.
16. Delivery of the said items should be within 2-3 week from the date of P.O.
17. Payment shall be made in Indian Rupees as per P.O. no advance will be paid for the said.
18. Notwithstanding the above, the Purchaser reserves the right to accept or reject any quotations and to cancel the process and reject all quotations at any time prior to the P.O.
19. Postal or courier delay will not be considered and the bid received late will be rejected.

(TEQIP-III Coordinator)

TEQIP - III Co-ordinator
Rajkiya Engineering College
Ambedkar Nagar (U.P.) 224122

Annexure-I

Details Specification of Renewable Energy Lab Setup (COE)

Sl. No.	Item	Specification
1	**Wind Energy Emulator Module:** Consisting of DC shunt motor 220 V DC, 2.5 K W, 1500rpm Three phase Slip Ring Induction motor 2.2 KW, 415 V AC,1000rpm, base plate for mounting machines with speed encoder 1024 ppr : 1 Nos **Three Phase Fully Controlled IGBT based Inverter : 2 Nos** **Three Phase Fully Controlled IGBT based converter : 1 Nos** **FPGA based controller with 8 voltage and 8 current sensors with 24 PWM : 1 Nos** **Software for Control and Monitoring : 1 User** **Grid Side Reactor, Contactors, Capacitor : 1 Set**	**Wind Emulator Machine Details** 220V, 2.5KW, 1500 rpm DC shunt Motor Coupled to 415V, 2.2 KW 1000 rpm 6 pole Three phase slip ring induction motor, 1024 ppr encoder included. Along with required power supplies for Sensors and shielded cables for motor WORD terminals **Three phase IGBT based Inverter details (Rectifier + Inverter + Brake Chopper)** **General Specifications** I/P AC Voltage: - 415 Volt DC Voltage: - 600 Volt O/P AC Voltage: - 415 Volt O/P AC Current 30 Amp Switching Frequency upto 20 kHz Fundamental Frequency 50 Hz Type of Cooling: - Forced Air Ambient Temp: - 40 Deg Duty Class: - Class I Cooling Method Forced Air Cooled. **IGBT Details** V-IGBT=6. Generation Trench V-IGBT CAL4= Soft switching 4 Generation CAL-diode. Isolated copper baseplate using DCB technology (Direct Copper Bonding). Increased power cycling capability. With integrated gate resistor. Low switching losses at high di/dt. **Bridge Module** Three phase bridge rectifier Blocking voltage of 1600 V High surge current carrying capability Large isolated base plate & Easy mounting **Gate Driver** It should interface and isolate the Control Unit/Primary Circuit from the secondary which is directly connected to the high power. Gate Driver controls the IGBT's dynamic behavior and its short circuit protection. Input signal level is 0/15V. Interlocking time between the input signals is 3µs. It monitors the errors: power supply under-voltage (below 13.3 V), short-circuit between Collector and Emitter. The error reset time is typically 9µs. On detection of error/fault, the Gate Driver switches off the IGBT. The IGBT switching speed may be adjusted by the resistors RGON and RGOFF. The two parameters (Rce, Cce) define the values and time delays for the comparison of an internal reference

		with the monitored value of Vce(sat). **Cooling** Teaching kit stack assembly is provided with forced air cooling. IGBT modules are mounted on 250 mm heat sink (extruded type). Forced air-cooling is provided by Hi Cool Fan. 230VAC 1ph. should be applied to the Fan input terminals provided on the unit. Flow of air is 3 m/s. Input to the fan is 1-Φ 230 V Supply
		Semikron IGBT based Converter
		Input AC Voltage (for rectifier) =415 V DC Voltage Vdc = 600 V Output AC Voltage Vac = 415 V 3-Φ Output Current Iac = 30 A Switching Frequency Fsw = 20 KHz Ambient Temperature Tamb = 40 deg C. Cooling Method Forced Air Cooled. **IGBT Details** V-IGBT=6. Generation Trench V-IGBT CAL4= Soft switching 4 Generation CAL-diode. Isolated copper baseplate using DCB technology (Direct Copper Bonding). Increased power cycling capability. With integrated gate resistor. Low switching losses at high di/dt. **Bridge Module** Three phase bridge rectifier Blocking voltage of 1600 V High surge current carrying capability Large isolated base plate & Easy mounting **Gate Driver** It should interface and isolate the Control Unit/Primary Circuit from the secondary which is directly connected to the high power. Gate Driver controls the IGBT's dynamic behavior and its short circuit protection. Input signal level is 0/15V. Interlocking time between the input signals is 3µs. It monitors the errors: power supply under-voltage (below 13.3 V), short-circuit between Collector and Emitter. The error reset time is typically 9µs. On detection of error/fault, the Gate Driver switches off the IGBT. The IGBT switching speed may be adjusted by the resistors RGON and RGOFF. The two parameters (Rce, Cce) define the values and time delays for the comparison of an internal reference with the monitored value of Vce(sat). **Cooling** Teaching kit stack assembly is provided with forced air cooling. IGBT modules are mounted on 250 mm heat sink

		(extruded type). Forced air-cooling is provided by Hi Cool Fan. 230VAC 1ph. should be applied to the Fan input terminals provided on the unit. Flow of air is 3 m/s. Input to the fan is 1-Φ 230 V Supply **Thermal Protection** Normally Closed Thermal contact switch is used for protection against thermal runaway. The position of the thermal switch normally closed when its temperature is below the threshold temperature (80 deg C) & it changes to normally open above 80 deg C. After cooling down, it again retains it normally closed position. Thermal switch is placed at the warmest point on the heat sink.
		FPGA Based Controller Details
		It is having a Xilinx FPGA Zynq™-7000 SoC XC7Z020-CLG484-1with Dual ARM® Cortex™-A9 MPCore™ Which have capability Up to 667 MHz operation along with NEON™ Processing / FPU Engines. Memory allocation in the board is given by 512 MB DDR3 and 256 Mb Quad-SPI Flash with Full size Isolated Voltage (8) and current (8) sensors for feedback Voltage +/- 0-1000V AC/DC measurement and output is instantaneous. Current Sensor 0-25 AC/DC measurement and output is instantaneous. Dual, 200KSPS-1MSPS 16 bit 4x2 channel Simultaneous sampling for ADC for sensors alone. PWM Card 3.3/5 to 15 V Level Shifting of 12x2 PWM Out with optical isolation. Dedicated I/O with for encoder and Hall sensors with 5V supply and Differential noise reduction. 4 Digital Input which can take 3.3V/5V input to FPGA. 230V, 5A, 4 numbers of NO-NC Contactor Relay for HV Driving purpose.
		Library Blocks
		Building blocks for the wind energy system like the GSC (grid side converter), RSC (Rotor side converter), PLL (Phased locked loop) etc will be provided with the module. These blocks are open and editable.
		L & C Filters, Switches, Relays
		Required Numbers of L, C filters for designed ratting. Switches and relays along with relay drives for the protection is also provided with system
2		**Three phase IGBT based Inverter details** I/P AC Voltage: - 415 Volt DC Voltage: - 600 Volt

	Virtual Grid tied Solar Module **3-phase** **IGBT based** **Inverter Stack + boost converter** **(1 Nos)** **Grid Emulator, (5-Level)** **(1 Nos)** **FPGA based controller with 8 voltage and 8 current sensors** **(1 Nos)** **Software for Control and Monitoring** **(1 Nos)** **Solar Panel along with junction box, 30m cable and mounting arrangement 2500 W** **Grid side reactor and capacitor, Boost Converter Reactor, Grid side capacitor.**	O/P AC Voltage: - 415 Volt O/P AC Current 30 Amp Switching Frequency 20 kHz Fundamental Frequency 50 Hz Type of Cooling: - Forced Air Ambient Temp: - 40 Deg Duty Class: - Class I Cooling Method Forced Air Cooled. **Boost Converter Specifications** I/P DC Voltage: - 200 Volt O/P DC Voltage: - 600 Volt O/P DC Current upto 10 Amps Switching Frequency upto 20 kHz Fundamental Frequency 50 Hz Type of Cooling: - Forced Air Ambient Temp: - 40 Deg Duty Class: - Class I Cooling Method Forced Air Cooled. **Common Specification for Inverter and Boost Converter** **IGBT Details** V-IGBT=6. Generation Trench V-IGBT CAL4= Soft switching 4 Generation CAL-diode. Isolated copper baseplate using DCB technology (Direct Copper Bonding). Increased power cycling capability. With integrated gate resistor. Low switching losses at high di/dt. **Gate Driver** It should interface and isolate the Control Unit/Primary Circuit from the secondary which is directly connected to the high power. Gate Driver controls the IGBT's dynamic behaviour and its short circuit protection. Input signal level is 0/15V. Interlocking time between the input signals is 3µs. It monitors the errors: power supply under-voltage (below 13.3 V), short-circuit between Collector and Emitter. The error reset time is typically 9µs. On detection of error/fault, the Gate Driver switches off the IGBT. The IGBT switching speed may be adjusted by the resistors RGON and RGOFF. The two parameters (Rce, Cce) define the values and time delays for the comparison of an internal reference with the monitored value of Vce(sat). **Thermal Protection** Normally Closed Thermal contact switch is used for protection against thermal runaway. The position of the thermal switch normally closed when its temperature is below the threshold temperature (80 deg C) & it changes to normally open

		above 80 deg C. After cooling down, it again retains it normally closed position. Thermal switch is placed at the warmest point on the heat sink. **Grid Emulator :- Three phase IGBT based Five Level Inverter** Input DC Voltage: 0 to 200V DC link Voltage: - 200 Volt O/P AC Current: - 14 Amp Switching Frequency: - upto 20 kHz Fundamental Frequency: - 50 Hz Type of Cooling: - Forced Air Ambient Temp: - 40 Deg Duty Class: - Class I Cooling Method Forced Air Cooled. Consisting of 3 sets of stacks of 2 independent, H bridge inverters. Each H bridge inverter is completely independent and isolated.All the input and output terminals are brought out. Note: Isolated DC supply has to be provided for each H bridge externally. Diode Bridge Rectifier will be provided inside the stack. Isolation transformer of 500 mA should be provided for testing. **IGBT Details** V-IGBT=6. Generation Trench V-IGBT CAL4= Soft switching 4 Generation CAL-diode. Isolated copper baseplate using DCB technology (Direct Copper Bonding). Increased power cycling capability. With integrated gate resistor. Low switching losses at high di/dt. **Diode Bridge Rectifier** Three phase bridge rectifier Blocking voltage of 1600 V High surge current carrying capability Large isolated base plate & Easy mounting **Gate Driver** It should interface and isolate the Control Unit/Primary Circuit from the secondary which is directly connected to the high power. Gate Driver controls the IGBT's dynamic behaviour and its short circuit protection. Input signal level is 0/15V. Interlocking time between the input signals is 3µs. It monitors the errors: power supply under-voltage (below 13.3 V), short-circuit between Collector and Emitter. The error reset time is typically 9µs. On detection of error/fault, the Gate Driver switches off the IGBT. The IGBT switching speed may be adjusted by the resistors RGON and RGOFF.

		The two parameters (Rce, Cce) define the values and time delays for the comparison of an internal reference with the monitored value of Vce(sat).
		Thermal Protection Normally Closed Thermal contact switch is used for protection against thermal runaway. The position of the thermal switch normally closed when its temperature is below the threshold temperature (70 deg C) & it changes to normally open above 70 deg C. After cooling down, it again retains it normally closed position. Thermal switch is placed at the warmest point on the heat sink. Isolation transformers 500mA, 6 Nos for testing purpose will be provided along with virtual grid **Solar Panel:-** The panel will be provided with suitable mounting arrangement along with 30m of cabling. The power rating of the panel is 2500W. **FPGA Based Controller Details:** It is having a Xilinx FPGA Zynq™-7000 SoC XC7Z020-CLG484-1with Dual ARM® Cortex™-A9 MPCore™ Which have capability Up to 667 MHz operation along with NEON™ Processing / FPU Engines. Memory allocation in the board is given by 512 MB DDR3 and 256 Mb Quad-SPI Flash with Full size Isolated Voltage (8) and current (8) sensors for feedback Voltage +/- 0-1000V AC/DC measurement and output is instantaneous Current Sensor 0-25 AC/DC measurement and output is instantaneous Dual, 200 KSPS-1MSPS 16 bit 4x2 channel Simultaneous sampling for ADC 15 V, 36 PWM Out **Software Details:-**
		Real time capturing Real time capturing and plot up to 32 Channels in 200 ksps rate with buffering option up to 60sec, that includes voltage (8) & current (8) analogue signals and additional add-on card's data along with viewing probes for application algorithm using which logic can be probed. Direct link to Matlab Simulink software. Capability to make the algorithm schematically in Simulink environment using the System generator tool box in Simulink and transfer the code to the controller for

		hardware implementation. Sensor outputs are available as schematic blocks making ADC and sensor interfacing simplified. MPPT, Islanding, Grid emulator, Sag and Swell algorithms will be provided. Also general program Building blocks like PI controller, Carrier wave, Sinusoidal wave, programed signals, transformation blocks etc. will be provided with the module. These blocks are open and editable. **Contactors and LC filters:** Required numbers of LC filter and contactors along with relay switching module will be provided