

Bhabha Atomic Research Centre

Atomic Fuels Division

Technical Services Section

Ref.AFD/TSS/BP/19/ 18812

Date: 09/10/2019

Sub: Tender enquiry for fabrication, supply, wiring & installation, testing and commissioning of 350 kVAR plus 90 Amp Hybrid type Automatic power factor corrector (APFC) panel and power monitoring system at AFD.

Sealed offers are invited for and on behalf of the President of India, for fabrication, supply, wiring & installation, testing and commissioning of 350 kVAR plus 90 Amp hybrid APFC panel and power monitoring system. This work includes removal of existing APFC panel and fabrication, supply, installation and commissioning of 350 kVAR plus 90 Amp hybrid APFC panel along with incoming cabling and integration with existing system. This work also includes supply, installation and testing of power monitoring system for recording and analysis of all electrical parameters of two incoming feeders.

Scope of Work:

S.No.	Description	Specification and Qty.
1.	Fabrication, supply, wiring & installation, testing and commissioning of 350 kVAR plus 90 Amp hybrid APFC panel and power monitoring system at AFD	As per Annexure -A

Terms and conditions:

1. Offer should be valid for minimum 90 days otherwise it will be rejected.
2. Only Lumsum prices to be quoted.
3. The completion period of this job should be within 6 months from the date of issue of work order.
4. Persons having valid PVC will only be allowed to enter BARC to execute the job.
5. Warranty period should be 12 months (Minimum) after completion of work.
6. The payment will be made after the satisfactory completion of the work.
7. Income Tax and S.C. as applicable will be deducted from the bill.
8. Any delay which is attributed to the contractor is liable for penalty @0.5 % Per Week (Max 5%).

9. Quotations are to be printed on letter head / quotation format which should consist of GST registration number registered with local authority, PAN of the firm. Computer generated quotation shall be considered as invalid & rejected.
10. Sealed offer with tender no and due date legibly written on the sealed envelope should reach **through speed/registered post** on or before 22/10/19,

To,
Shri Bhupendra Patidar,
Scientific Officer (E)
Atomic Fuels Division
Bhabha Atomic Research Centre
Trombay, Mumbai 400 085.

- b) The contractor shall have to visit the site to comprehend the scope of work and equipment condition. The same will be arranged by the undersigned. The site can be visited between 15/10/19 to 18/10/19 on working days between 10:30am to 4:00 pm. however prior intimation of at least three working days is necessary.(Tel : 022 25594962, email: bpatidar@barc.gov.in)
- c) Supplier shall have valid electrical license and previous experience of installation & commissioning of hybrid APFC panel/similar work with documentary evidence. Without documents for above work execution, site visit shall not be considered.

The quotation submitted without site visit will not be considered.

Details and Confidentially & Publicity Clause

- I. No party shall disclose any information to any third party concerning the matters under this contract generally. In particular, any information identified as“proprietary” in nature by the disclosing party shall be kept strictly confidential by the receiving party and shall not be disclosed to any third party without the prior written consent of the original disclosing party.

This clause shall apply to the sub-contractor, consultant, adviser or employees engaged by a party with equal force

II. “Restricted information” categories under section 18n of the Atomic Energy Act, 1962 and “Official Secret under Section 5 of the Official Secret Act, 1923: -

Any contravention of the above-mentioned provisions by any contractor, sub-contractor, consultant, adviser or the employees of a contractor will invite penal consequence under the aforesaid legislation.

- III. Prohibition against use of BARC’s name without permission for the publicity purpose:

The contractor, sub-contractor, consultant, adviser or the employees engaged by the contractor, shall not use BARC’s name for any publicity purpose through any public

media like press, Radio, T.V. or Internet without the prior written of BARC. Contractor shall obtain Police verification certificate for all his employees including his supervisors and workers engaged in the work.

(B. Patidar)

SO/E, TSS, AFD

For & On behalf of President of India

Annexure-A

I. Fabrication, supply, wiring & installation, testing and commissioning of 350 kVAR plus 90 Amp hybrid APFC panel and power monitoring system at AFD.

Sr.no.	Description	Quantity
1.	<p>De-commissioning, De-termination & Removal of existing skeletal APFC panel</p> <p>Job includes removal of the panels, D.B's and cables, cleaning and clearing the site</p>	1 set
2.	<p>Installation of Hybrid APFC panel having following details</p> <ul style="list-style-type: none"> • Rating of APFC Panel : 350 kVAR • Rated voltage of the Panel : 480 V • Frequency : 50 Hz • No of Phases : 3 phase, 4 wire • Ambient Temperature : 40⁰C • Enclosure Details: Free standing floor mounting • Material: CRCA • Thickness of Sheet Steel Used: Frame -2.0 mm Door – 2.0 mm Partition – 1.6 mm • Dimension (W x D x H) : 1700 mm x 800 mm x 1800 mm or small • Switching : Auto/manual • Protection : IP-42 or better • Application: Indoor • Cable Entry : Bottom/Top • Painting: Siemens gray/ RAL7032 <p>Bus bar Detail</p> <ul style="list-style-type: none"> • Material-Main & Earthing : Copper • Cross-section : Suitable • Bus bar Supports : SMC/DMC <p>Capacitors</p> <ul style="list-style-type: none"> • Type : Varplus Can Heavy Duty • Voltage rating: 480 V or Higher • No of Steps : 12 • Configuration : 12.5 kVAR x4+25 kVAR x4+50 kVAR x4 	

Switchgear details	
<ul style="list-style-type: none"> Incomer: MCCB, 3P, 36/50kA CVS TMD type with O/L & S/C protection 600 A 	1 no.
<ul style="list-style-type: none"> Phase indicating Lamps [R, Y, B] each 	1 no.
<ul style="list-style-type: none"> Step indicating lamps (on/off) 	24 nos.
<ul style="list-style-type: none"> ON/OFF push buttons 	24 nos.
<ul style="list-style-type: none"> Digital VAF meter (Multifunctional meter) 	1 no.
<ul style="list-style-type: none"> Auto/manual selectors switch 	1 no.
<ul style="list-style-type: none"> Timer 	1 no.
<ul style="list-style-type: none"> Microprocessor based relay displaying various parameters like voltage, current, KVA, KW, KVA_r, PF, THD V, THD I,: 12 stage 	1 no.
<ul style="list-style-type: none"> Current Transformer- 600/5A, CI- 1.0, 10VA 	3 nos
<ul style="list-style-type: none"> Fans 	1 Lot
Switching:	
<ul style="list-style-type: none"> For 12.5KVA_r – 4 STEPS 	
<ul style="list-style-type: none"> MCCB, 3P, 36kA, CVS TMD type -25A 	4 nos
<ul style="list-style-type: none"> TVS E type, TP, Power Contactor – 25A 	4 nos
<ul style="list-style-type: none"> 7% detuned reactor, 440V, Al wound type – 12.5kVA_r 	4 nos
<ul style="list-style-type: none"> For 25KVA_r – 4 STEP 	
<ul style="list-style-type: none"> MCCB, 3P, 36kA, CVS TMD type -50A 	4 nos
<ul style="list-style-type: none"> TVS E type, TP, Power Contactor – 50A 	4 nos
<ul style="list-style-type: none"> 7% detuned reactor, 440V, Al wound type – 25kVA_r 	4 nos
<ul style="list-style-type: none"> For 50KVA_r – 4 STEPS 	
<ul style="list-style-type: none"> MCCB, 3P, 36kA, CVS TMD type -100 A 	4 nos
<ul style="list-style-type: none"> TVS E type, TP, Power Contactor – 95A 	4 nos
<ul style="list-style-type: none"> 7% detuned reactor, 440V, Al wound type – 50kVA_r 	4 nos
<ul style="list-style-type: none"> For AHF (IGBT Based switching) – 90Amp 	1 no
<ul style="list-style-type: none"> MCCB, 3P, 36kA, CVS TMD type -100A 	
<ul style="list-style-type: none"> Power electronics: 3 Level inverter 	
<ul style="list-style-type: none"> Losses: At 480 VAC < 3% (60A<1300W and 120A<2800W) 	
<ul style="list-style-type: none"> Current transformers (CT) for Sensing harmonic current : 	
	Any ratio with 1or 5 ampere secondary
	Type 1 accuracy
	50/60Hz rated

	<p style="text-align: center;">Grounded</p> <ul style="list-style-type: none"> • Topology : Digital harmonic topology • Control basis : Closed loop • Harmonics attenuation : < 3% THD(i) • Response time : 25 μs • Display : 144 mm QVGA TFT 64k-color touch screen • Operator interface: HMI touch panel screen • Display parameters: THDi, THDv, oscilloscope for viewing many selected parameters, phasor diagrams, load power, measured currents for Ih, Is, If, I neg seq, PF (Cos f), injected currents for Ih, I reactive, I neg seq, etc. • Noise level (ISO3746) : <70 db at one meter from unit surface • Operating Temperature: up to 50°C (Automatic switch off if ambient exceeds 50Deg C) • Mounting : Floor standing • Cable entry : Top or bottom • Standards compliance/certification : CE certified • Type Test compliance: As per IEC 62477-1: 2012. UL 508-17 standards. 	
3.	<p>Providing digital Power monitoring system in place of existing analog type as per following details</p> <p style="text-align: right;">2 Nos</p> <ul style="list-style-type: none"> • Model : PowerLogic PM8000 series • Make : Schneider electric • Size : 96 x 96 • Measurement parameters : Current, voltage, frequency <ul style="list-style-type: none"> Active, reactive, apparent power Power factor Current measurement range (autoranging) Active, reactive, apparent energy Settable accumulation modes Harmonics Distortion Individual Harmonics Waveform capture Detection of voltage swell and sag • Accuracy: IEC 62053-22 Class 0.2S, IEC 61557-12 PDM-S • Time synchronization 	

- WAGES metering support
- PQ compliance monitoring: IEC 61000-4-30 class S, IEC 62586, EN 50160, IEEE 519
- PQ analysis capabilities: Dip & swell detection, waveform capture, disturbance direction detection, trending & forecasting
- Protocols: Modbus, DNP3, IEC 61850
- Ports: RS-485, dual-port Ethernet, Ethernet-to-serial gateway
- Graphical, color display
- Anti-tamper protection seals
- Input voltage : 57 - 400 V L-N / 100 - 690 V L-L
- Input current : 1 A (0.2S), 5 A (0.2S) , 10 A (0.2 ANSI)
- IP: IP 54, UL type 12: Panel mount and Remote display, front.
IP 30: Panel mount rear, DIN rail mount, I/O modules

PQ compliance reporting and basic PQ analysis

- IEC 61000-4-30 Class S (test methods as per IEC 62586-2)

Harmonic analysis:

- THD on voltage and current, per phase, min/max, custom alarming
- Individual harmonic magnitudes and angles on voltage and current, up to the 63rd harmonic

Data and event logging:

- Onboard data and event logging
- 512 MB of standard non-volatile memory
- No data gaps due to network outages or server downtime.
- Min/Max log for standard values.
- 50 user-definable data logs, recording up to 16 parameters on a cycle-by-cycle or other user definable interval.
- Continuous logging or ‘snapshot’ triggered by setpoint and stopped after defined duration.
- Trend energy, demand and other measured parameters.
- Advanced time-of-use capability.
- Security / event log: alarm conditions, metering configuration changes, power outages, firmware download, and user login/logout all times tamped to ± 1 millisecond.

Alarming and control

	<ul style="list-style-type: none"> • 50+ definable alarms to log critical event data, trigger waveform recording, or perform control function. • Trigger on any condition, with 1/2-cycle and 1-second response time. • Combine alarms using Boolean logic and to create alarm levels. • In conjunction with Schneider Electric’s EcoStruxure software, alarms, software alarms, and alarm frequency are categorized and trended enabling sequence of events and root cause analyses. <p>Current transformer : 8 nos</p> <ul style="list-style-type: none"> • Ratio 2000/5 A • Applicable standard: IEC-61869-1&2 / IEC- 60044 -1, BS 3938, IS 2705 -1,2&3. • Case: -10% glass filled polycarbonate, flame retardant grades classified UL94V-0. • Insulation class: E (120°C max) • System voltage: 720V maximum • Operating frequency: 50Hz • Class of accuracy: 0.2S or better <p>Data monitoring software</p> <ul style="list-style-type: none"> • Struxure Ware Power Monitoring Expert v9.0 with 10 Device License • Make : Schneider electric 	
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II. General Condition

1. The capacitors shall have low-loss, units tested in accordance with IS 13340-1993/IS 13341-1992, IEC 60831 part 1&2. Each element is of a self-healing type and manufactured using metalized polypropylene film.
2. Power factor controller shall complied IEC 60664-1 / IEC 61326.
3. Low voltage switch gear shall complied IEC 60947.
4. A protection system shall be provided to each capacitor which shall comprise, integral discharge resistor and overpressure disconnecter device (PSD). The discharge resistor provided, ensure that the capacitor is discharged to a voltage not exceeding 50 V measured at the capacitors terminals, one minute after disconnection from the power supply.
5. All wire and cable used in electric panel shall be FRLS type.
6. All wires and cables used in panels shall be of suitable colour code.

7. After completing the job detailed wiring diagram as per ferrule to be provided.
8. Supply, laying and termination of incoming cable to APFC panel will be in scope of supplier.
9. Integration of APFC panel with existing power distribution panel will be in scope of supplier.
10. Stranded copper wire of at least 1.5 sqmm size shall be used for control wiring.
11. Spacing between electrical components in panel shall be as per the IEC standard (60439).
12. Two earthing points shall be provided on electrical panel.
13. Electrical components used in the panel shall be of reputed make.
14. Panel shall be coated in Siemens gray/ standard with seven tank processing.
15. Panel Internal Light: CFL bulbs/LED light or equivalent complete with switch. Illumination of minimum 300 lux inside panel is required, interlocked with door limit switch.
16. Proper cooling arrangement shall be made inside the panel to limit temperature within 40⁰C.
17. The panel shall be designed for continuous operation (24 hrs X 7 Days).
18. All unwanted, removed fittings, parts, panels are to be disposed as per the instruction of departmental engineer.
19. All panelling and other installation works include earthing as per I.S standard with bare copper conductor.
20. Submit all catalogues, brochures and datasheet of the offered products along with offer.
21. The Software Platform shall have specialized data acquisition, visualization, analysis and reporting tools specifically designed for Power Management Applications such as:
 - 21.1. Electrical Distribution System Monitoring and Alarming.
 - 21.2. Electrical System Capacity Management.
 - 21.3. Power Quality Monitoring and Compliance.
 - 21.4. Multi Source Management.
 - 21.5. Continuous Electrical Thermal Monitoring.
 - 21.6. Breaker Setting Monitoring.
 - 21.7. Backup Power Testing
 - 21.8. Power Events Analysis.
 - 21.9. Energy Usage Analysis and Energy Benchmarking.
 - 21.10. Energy Performance Analysis and Verification.

22. The Software Platform shall natively support (no additional installation or configuration of the software required) at least 112 devices specifically designed for power distribution and power quality monitoring including: programmable power analyzers, power meters, branch and multi-circuit meters, smart panels with communicating circuit breakers, protection relays, uninterruptable power supplies, active harmonic filters, capacitor bank controllers, electrical distribution thermal sensors.
23. The functionality of the Software Platform shall be extensible whereby additional capabilities may be added via software license activation codes without the need to install additional software modules or add-ons.
24. The Software Platform shall be certified for use as a part of an ISO50001/50002 program and verifiably support compliance. In addition, the functionality shall support ongoing ISO50001 programs per the following areas of Section 4 of the ISO standard:
 - 24.1. Energy review.
 - 24.2. Energy baseline.
 - 24.3. Energy performance indicators.
 - 24.4. Monitoring, measurement, and analysis.
 - 24.5. Input to management review.
25. The Software Platform shall be designed to comply with cybersecurity standard IEC62443 at the component level: IEC62443-4-1 and IEC62443-4-2 (SL1).
26. The Software Platform shall be designed to streamline the process of checking and maintaining EN50160 and IEEE 519 Power Quality compliance.
27. The Software Platform shall natively support the vendor's continuous electrical thermal monitoring system with the ability to detect abnormal bus bar or cable temperatures due to loose or faulty connections and to prevent equipment damage and fire.
28. The Software Platform shall be designed to integrate and embed within the vendor's Building Management System (BMS) software platform to provide Energy and Power Management applications within the context of the BMS environment.
29. Software shall be capable to monitor all the parameters of power meters in real time.
30. The Software Platform shall be able to be installed on a physical computer or virtual machine and shall support a variety of Windows operating systems including Server and non-Server class Windows operating systems.

31. The Software Platform shall support a variety of SQL Server Editions including Enterprise, Standard and Express Editions.
32. The Software Platform shall provide a graphical timeline view of alarms and events that constitute an “incident” in the electrical distribution network.
33. The Software Platform shall be able to acquire specialized, high speed power disturbance data directly from onboard advanced power quality meters for the purpose of Power Events Analysis.
34. The Software Platform shall provide an interactive, web-enabled Reports application that allows users to generate, modify, save and manage reports based on pre-formatted report templates (up to 64 templates) that are designed to support the following:
 - 34.1. Energy Usage, Modeling and Performance Verification
 - 34.2. Power Quality Performance and Compliance (EN50160 and IEEE 519)
 - 34.3. Electrical Equipment Operation and Performance (Breakers, UPSs, Generators).
35. The reporting tool shall support automatic distribution (via email or shared folder) on a schedule basis or based on event or manual export using the following output formats: .csv, .xlsx, .pdf, .tiff, .html, .xml.

III. Inspection and test

1. Before starting of fabrication, the contractor shall prepare system layout drawing along with wiring diagram and get approved from purchaser.
2. Before leaving the manufacturing work, all equipments shall have been inspected and tested and the results recorded in test report.
3. The manufacturer shall provide test report of each and every electrical components of power panel and submit at the time of inspection / execution.

IV. Following test shall be carried out,

1. Visual and functional check.
2. Continuity test
3. Insulation test
4. High voltage test
5. Auto/manual testing of hybrid APFC panel.
6. All capacitor shall be tested as per IS 13340-1 (2012).
7. All power contactor shall be tested as per IS 13947.

The On-Site acceptance test (On-SAT) will be conducted after system installation on site and is intended to assure that no damage occurred to the system during shipment, that the system is correctly installed and that the system requirements are satisfied when connected

to “live” field inputs/outputs. Actual testing of the complete system with actual load or equivalent operation/function must be done to validate the system at the purchaser’s site.

V. Documentation and training

1. The manufacturer shall supply at least following drawing /documents in the quantities indicated.
 - 1.1. Bill of material
 - 1.2. Transport, installation, commissioning, operation, maintenance instruction and fault finding procedure.
 - 1.3. Single line diagram
 - 1.4. As built control and power wiring diagram
 - 1.5. Manual of each components used in hybrid APFC panel and power monitoring system
 - 1.6. List of recommended spare parts
 - 1.7. Test certificate of each components
 - 1.8. Maintenance and operation manual of APFC panel
2. Supplier shall provide to training to three persons that will covers all aspect of hybrid APFC panel and power monitoring system such as system feature, operation & maintenance procedures and safety criteria.

VI. Warranty and support services

1. Supplier shall provide minimum one year of warranty of Hybrid APFC panel and power monitoring system.
2. The supplier shall indicate the organization, manpower and other resources of customer support division.
3. The supplier shall have support from the principal for a period of 5 years. The address of the principal may also be mentioned.
4. Supplier shall provide list of customers along with the name, address and contact details to whom similar or higher capacity system supplied.
5. The supplier shall further ensure the availability of all spares for at least 5 years from the date of acceptance of the system.

VII.Services available

1. Electrical: 415V, 3-phase, 50Hz & 230V,1-phase, 50Hz are available.
2. Compressed air at 6 kg/cm² is available.
3. Cooling water at 2 kg/cm² is available.
4. Vendor shall mention the Electrical power requirement, voltage, current, connection method, line size etc.

5. Vendor shall also mention the other services required for the operation of press like compressed air requirement, cooling water requirement etc.
6. Vendor shall inform the services requirements in advanced for appropriate arrangement to be made by purchaser.

VIII. Packing and forwarding

All the items shall be divided into several shipping sections for protection and ease of handling during transportation. The equipment shall be properly packed for transportation by ship or rail or trailer. Electrical items shall be wrapped in polyethylene sheet before being placed in the wooden crates or cases to prevent damage to the finish. This side up, centre of gravity, weight, owner particulars, purchase number, shall be clearly marked on the package together with other detail as per purchase order.