



INDIAN INSTITUTE OF TECHNOLOGY KANPUR
ELECTRICAL ENGINEERING DEPARTMENT

Tender Notice – Ref No: IIT/ EE/SMART CITY/SCADA/2015/03 DT. 31.12.2015

Project Investigator (PI) of Smart city pilot project, IIT Kanpur invites on behalf of the Director, item rate tenders in two envelope system (technical & financial) for the following work from eligible bidders.

Supply, Installation, Testing and Commissioning of SCADA and Energy Management System for Smart City Pilot Project at Substations of IIT Kanpur.

Estimated Cost: Rs 1.52 crore (approx.), Earnest Money: Rs. 3, 04,000/-, Period of completion 12 Months.

The Tender notice with all relevant information is available on www.tenderhome.com and institute (website <http://www.iitk.ac.in/infocell/tender/tendernotice.htm>).

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INDIAN INSTITUTE OF TECHNOLOGY KANPUR
ELECTRICAL ENGINEERING DEPARTMENT
ITEM RATE TENDER

Date:31.12.15

Tender Notice No.: **Ref No: IIT/ EE/SMART CITY/SCADA/2015/03**

Invitation of tenders for Supply, Installation, Testing and Commissioning of SCADA and Energy Management System for Smart City Pilot Project at Substations of IIT Kanpur under 2 bid system (Technical & Financial).

The tender's for the above work are invited on two bid system (technical & financial). The technical bid and financial bid will have to be submitted in separate envelopes. The financial bid of only technically qualified bidders will be opened in the presence of tenderers.

- i) To be submitted by 15:00 hours on 29.01.16 to the Central Stores, IIT Kanpur.
- ii) Technical bids will be opened in the presence of tenderers, who may be present, at 15:00 hrs. on 03.02.2016 in the office of Deputy Registrar, Stores and Purchase, IIT Kanpur.
- iii) Financial bids of only technically qualified bidders shall be opened in the presence of tenderers, who may be present, at 15:00 hrs. on 10.02.2016 in the office of Deputy Registrar, Stores and Purchase, IIT Kanpur.
- iv) The tendering schedule is given at NIT sr. no. 6.
- v) The details of the tender is available on the www.iitk.ac.in/centralstores/tenders & www.tenderhome.com site.

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**INDIAN INSTITUTE OF TECHNOLOGY, KANPUR
DEPARTMENT OF ELECTRICAL ENGINEERING**

NOTICE INVITING TENDER

1. Item rate tenders are invited on behalf of the Director, Indian Institute of Technology Kanpur from pre-qualified bidders for the following work **“Supply, Installation, Testing and Commissioning of SCADA and Energy Management System for Smart City Pilot Project at Substations of IIT Kanpur”**.
 2. The estimated cost of work is **Rs.1.52 Crore (Rupees One Crore Fifty-Two Lacs only)**. This estimate, however, is given merely as a rough guide.
 3. Criteria of eligibility
 1. The Tenderer should have completed satisfactorily at least *3 similar works each of value 40% of the estimated cost or *2 similar works of 50% of the estimated cost or *1 similar work of 80% of estimated cost during the last 5(five) years. (at least one work of them should be in Central Govt. /Central Autonomous bodies/ Central PSU/State PSU / State Govt.).
 2. Similar nature of work means execution of SCADA systems at 11/.433 KV or 33/11 KV Sub station levels.
 3. Details of average annual financial turnover on electrical works should be at least 100% of the estimated cost during the last 3 consecutive financial years.
 4. List of works completed of the requisite magnitude along with the attested copies of certificates of satisfactory completion. Having Service tax, ESI & EPF registration No. of government authorities.
 5. Having valid electrical license.
 4. Tenderer shall quote rates as per various terms and conditions of the said form which will form part of the agreement.
 5. The time allowed for carrying out the complete work shall be 12 (twelve) months, including rainy seasons, from the 10th day after the date of written orders to commence the work.
 6. The clear site of work is available.
 7. The tender proceedings shall be held as per the following schedule:

| | |
|---|--|
| i) Date of availability of tender | : 31.12.15 to 22.01.16 during working hours i.e. 9:00 AM to 5:00 PM |
| ii) Date of pre-bid meeting | : 22.01.16 |
| iii) Last date of receipt of tender | : 29.01.16 up to 1500 hrs |
| iv) Date of technical bid opening of tender | : 03.02.16 at 1530 hrs. |
| v) Date of financial bid opening of tender | : 10.02.16 at 15:30 hrs. |
- Note: In pre-bid conference, the doubts of the indenting bidders shall be clarified. Discussion on any additional technical/suggestion proposed by the bidders are also welcomed, which may be included by the committee in the tender.
7. Tender documents consisting of plans, specifications, the schedule of quantities of the various classes of work to be done and the set of terms and conditions of contract to be compiled with by the contractor whose tender may be accepted and other necessary documents can be seen in the office of DR, Stores and Purchase, IIT Kanpur between 1100 hrs. and 1700 hrs on all working days before the last date of receipt of the tender. Tender document, excluding standard form, will be issued from this office as per the schedule mentioned at Sl. no. 6 above.
 8. The tender shall be accompanied by earnest money of **Rs. 3, 04, 000/- (Rs. Three Lacs Four Thousand only)** in the form of Receipt Treasury Challan / Deposit at Call Receipt of a Scheduled / Public Sector / Multinational Bank in favour of Director, IIT Kanpur. The earnest money may also be furnished in the form of Term Deposit Receipt of the said Banks. The offers received without earnest

money or not in the prescribed form shall be rejected summarily. No interest shall be paid on the earnest money.

9. Tenderers are advised to inspect and examine the site and its surroundings and satisfy themselves before submitting their tenders as to the nature of the ground and sub-soil (so far as is practicable), the form and nature of the site, the means of access to the site. The accommodation they may require in general shall themselves obtain all necessary information as to risks, contingencies and other circumstances which may influence or affect their tender. A tenderer shall be deemed to have full knowledge of the site whether he inspects it or not and no extra charges consequent on any misunderstanding or otherwise shall be allowed. The tenderer shall be responsible for arranging and maintaining at his own cost of all materials, tools and plants, water, electricity, access facilities for workers and all services required for executing the work unless otherwise specifically provided for in the contract documents. Submission of a tender by a tenderer implies that he has read this notice and all other contract documents and has made himself aware of the scope and specifications of the work to be done and of conditions and rates at which stores, tools and plant, etc. will be issued to him by the Institute and local conditions and other factors having a bearing on the execution of the work.
10. The Director/DORD/PI, IIT Kanpur does not bind himself to accept the lowest or any other tender, and reserves to himself the authority to reject any or all of the tenders received without the assignment of a reason. All tenders in which any of the prescribed conditions are not fulfilled or are incomplete in any respect are liable to be rejected.
11. The Director/DORD/PI, IIT Kanpur reserves to himself the right of accepting the whole or any part of the tender and the tenderer shall be bound to perform the same at the rate quoted.
12. Tenders, which do not fulfill all or any of the conditions stipulated in the tender document or are incomplete in any respect, are liable for rejection. Tenderers shall sign the declaration in Appendix – B enclosed, and if the declaration is not found to represent a true statement of facts, the contract is liable to be cancelled, earnest money forfeited, and the contractor shall have no claim on the Institute.
13. The tenderers are not allowed to make additions and alterations in the tender document. Such additions and alterations shall be at tenderers' risk. Conditional / modified tenders are liable to be rejected.
14. The tender for the work shall remain open for acceptance for a period of 90 (ninety) days from the date of opening of tenders. If any tenderer withdraws his tender before the said period or makes any modifications in the terms and conditions of the tender which are not acceptable to the department, then the Institute shall, without prejudice to any other right or remedy, be at liberty to forfeit 50 (fifty) % of the said earnest money as aforesaid.
15. This notice inviting tender shall form a part of the contract document. The successful tenderer / contractor, on acceptance of his tender by the Accepting Authority, shall within 15 (fifteen) days from the stipulated date of start of the work sign the contract consisting of:
 - a) The notice inviting tender, all the documents including General Conditions of Contract, Special Conditions, specifications, Additional Specifications, Priced Schedule of Quantity, drawings, if any, forming the tender as issued at the time of invitation of tender, letter of negotiation and acceptance thereof together with any correspondence leading thereto.

.....
**For and on behalf of
Director, IIT Kanpur**

UNDERTAKING FROM THE TENDERER

I / We have read and examined the notice inviting tender, schedule A. Specifications applicable, Drawings and Designs, General Rules and Directions, Conditions of Contract, clauses of contract, Special conditions, Schedule of Rate and other documents and Rules referred to in the conditions of contract and all other contents in the tender document for the work.

I / We hereby tender for the execution of the work specified for the Director of Institute within the time specified in Schedule 'F', viz., schedule of quantities and in accordance in all respects with the specifications, designs, drawings and instructions in writing with such materials as are provided for, by, and in respects in accordance with, such conditions so far as applicable.

We agree to keep the tender open for Ninety (90) days from the due date of its opening/ Ninety days from the date of opening of financial bid in case tenders are invited on 2/3 envelope system (strike out as the case may be) and not to make any modifications in its terms and conditions.

A sum of Rs. _____ (**Rupees** _____) is hereby forwarded in cash/receipt treasury challan/ deposit at call receipt of scheduled bank/ fixed Deposit receipt of a Scheduled bank/ demand draft of a scheduled bank/ bank guarantee issued by a scheduled bank as earnest money. If I / We fail to furnish that prescribed performance guarantee within prescribed period, I/We agree that the said Director / DORD / PI or his successors in office shall without prejudice to any other right or remedy, be at liberty to forfeit the said earnest money absolutely. Further If I / We fail to commence work as specified, I / We agree that Director of Institute or his successors in office shall without prejudice to any other right or remedy available in law, be at liberty to forfeit the said earnest money and the performance guarantee absolutely, otherwise the said earnest money shall be retained by him towards security deposit to execute all the works referred to in the tender documents upon the terms and conditions contained or referred to therein and to carry out such deviations as may be ordered.

Further, I/We agree that in case of forfeiture of earnest money or both Earnest Money and Performance Guarantee as aforesaid, I/We shall be debarred for participation in the re-tendering process of the work.

I / We hereby declare that I / We shall treat the tender documents, drawings and other records connected with the work as secret / confidential documents and shall not communicate information derived there from to any person other than a person to whom I / We am / are authorized to communicate the same or use information in any manner prejudicial to the safety of the state.

Dated

Signature of contractor:

Postal Address / Seal:

Witness:

Address/Occupation:

ACCEPTANCE

The above tender (as modified by you as provided in the letters mentioned hereunder) is accepted by me for and on behalf of the **Director of Institute** for a sum of Rs. _____ (**Rupees** _____ only),

The letter referred to below shall form part of this contact Agreement: -

- a)
- b)
- c)

Dated:

For on the behalf of the Director

Signature _____
Designation _____

III. GENERAL DETAILS OF TENDER

SCHEDULE 'A': Schedule of Quantities is enclosed separately.

Name of Work: Supply, Installation, Testing, and Commissioning of the SCADA and Energy Management System for Smart City Pilot Project at Substations of IIT Kanpur.

| | | | |
|------|----------------------------|---|---------------------------------------|
| i) | Estimated Cost of the work | : | Rs 1.52 crore. |
| ii) | Earnest Money | : | Rs 3.04 lacs |
| iii) | Performance Guarantee | : | 5% of the Tendered Value. |
| iv) | Security Deposit | : | 5% of the Tendered Value of the work. |

Officer inviting tender : PI, Dept. of EE, IIT Kanpur

Definitions:

| | | | |
|----|----------------------------|---|------------------------------|
| 1. | Engineer-in-charge | : | PI (Project Investigator) |
| 2. | Tender accepting authority | : | Director / DORD, IIT Kanpur. |
| 3. | Standard Schedule of Rates | : | Market Rate for all Items |
| 4. | Department | : | Dept. of EE, IIT Kanpur. |

| | | | |
|------|--|---|---------------------------|
| i) | Time allowed for submission of performance guarantee from the date of issue of letter of acceptance, in days. | : | <u>15 Days.</u> |
| ii) | Maximum allowable extension beyond the period provided in (i) above in days | : | <u>7 (seven) days.</u> |
| iii) | Authority for fixing compensation | : | PI |
| | Number of days from the date of issue of letter of acceptance for reckoning date of start | : | <u>22 Days.</u> |
| | Time allowed for execution of work | : | <u>12 (Twelve) Months</u> |

Authority to decide:

| | | | |
|------|---|---|------------------------------|
| (i) | Extension of time for completion of work. | : | <u>PI, Dept. of EE, IITK</u> |
| (ii) | Rescheduling of mile stones | : | <u>DORD</u> |

IV. GENERAL CONDITIONS OF CONTRACT

1. The contractor shall carry out and complete the said work in every respect in accordance with this contract and as per the directions and to the satisfaction of the Engineer-in-charge/user. Issue of further drawings and /or written instructions, detailed directions and explanations which are hereinafter collectively referred to as instructions of the engineer-in-charge/ user in regards to:-
 - (a) The variation or modification of the design, quality or quantity of works or the addition or omission or **substation** of any work.
 - (b) Any discrepancy in the drawings or between the schedule of quantities and /or drawings and/or specifications.
 - (c) The removal from the site of any materials brought thereon by the contractor and the substitution of any other material thereof.
 - (d) The dismissal from the works of any persons employed thereupon.
 - (e) The opening up for inspection of any work covered up.
 - (f) The amending /making good of any defects.

The contractor shall forthwith comply with and duly execute any instructions of work comprised in such engineers-in-charge instructions, provided always that the verbal instructions and explanations given to the contractor or his representative upon the works shall, if involving a variation , be confirmed in writing by the contractor within seven days and is not dissented in writing within a further seven days by the Engineer-In-Charge, such shall be deemed to be instructions of the Engineer-In-charge within the scope of the contract.

2. Contract Document

2.1 The several documents, forming the contract, are to be taken as mutually explanatory of one another and in case of ambiguities or discrepancies the same shall be explained and adjusted by the Engineer-In-Charge who shall thereupon issue to the contractor its interpretation directing in what manner the work is to be carried out. In case the contractor feels aggrieved by the interpretation of the Institute then the matter shall be referred to the DORD and his decision shall be final, conclusive and bind on both parties.

2.2 The drawings etc. shall remain in the custody of the Institute. Two complete sets of drawings, specification and bill of quantities shall be furnished by the Engineer-In-Charge to the contractor in such time which must not delay the progress of the construction and the Institute shall furnish copies of any additional drawings, which in their opinion may be necessary for the execution of any part of the work. One complete set shall be kept on the work site and the Engineer-In-Charge and his representatives shall be, at all reasonable times, have access to the same. The contractor shall study the drawings thoroughly before the commencement of work. In case of any discrepancy, the contractor shall seek clarification before proceeding with the works. Figured dimensions are in all case to be accepted in preference to the scaled sizes. Large scale details shall taken preference over small scale one.

The contractor shall give adequate notice in writing to the Engineer-in-charge/user of any further drawings or specification that may be required for the execution of the works or otherwise under the contract.

The Engineer-in-charge/user shall have full powers and authority to supply the contractor from time to time during the progress of the work such drawings and instructions as shall be necessary for proper execution and the contractor shall carry out and be bound by the same.

2.3 The successful tenderer shall be required to enter into an agreement with the Institute. The Bill of Quantities & rates filled by the successful tenderer in, the General Condition of the Contract, specifications for works, the special conditions, additional specifications, negotiation letter and the award letter etc. shall form part of the agreement to be signed by the successful tenderer. The cost of stamp paper and stamp duty, required for the agreement, shall be borne by the contractor.

3. Contract Agreement

The contractor shall, when called upon to do so, enter into and execute a contract agreement in the form annexed as annexure `A' with such modifications as may be necessary. The contract agreement, inclusive of its enclosures, shall remain in the custody of the PI, Depr. of EE, IIT Kanpur and the made available him as and when required contractor shall however be supplied, an attested copy there free of cost.

4. All tenderers are required to deposit earnest money in the form of FDR/CDR duly endorsed in favour of Director, IIT Kanpur. Earnest money should be enclosed in a separate sealed envelope and tender documents should be enclosed in a another envelope superscribed “**EARNEST MONEY- NAME OF WORK “ ITEM RATE-TENDER-NAME OF WORK”**” on the top of envelope. At the time of opening of tender earnest money envelope will be opened first and in case earnest money is not found in the requisite form or amount envelope containing item rate tender of the party concerned shall be opened and will be summarily rejected and documents submitted will be confiscated by the Institute.
5. Canvassing in connection with tenders is prohibited and the tenders, submitted by the tenderers who resort to canvassing, are liable for rejection.

- a) Tenderers shall have to sign the attached declaration (Appendix B) and if the declaration is not found to represent a true statement of facts the contract is liable to be cancelled, earnest money forfeited and the contractor shall have no claim on the Institute.
- b) Tenderers are not allowed to make additions and alterations in the tender document. Any additions and alternations, if incorporated in the tender, shall be at the tenderer's risk since the modified tender is liable for rejection.

Conditional tenders violative of the spirit and the scope or the terms and conditions of the tender, are liable to be rejected without assigning any reasons. Tenders with any form of rebate shall be rejected summarily.

- c) Water and electricity required for electrical works shall be supplied free of charge.
 - d) Stamp duty on the security money shall also be the borne by contractor as per prevailing e notification of U.P Government.
6. Value Added Tax on work contract as per prevailing notification of U.P.Govt. shall be also be recovered from the contractor's bill. Income tax shall be deducted as per prevalent law.

7. **Conditions for Works**

- a) All chase cuttings in the wall, for recessed conduits and boxes and drilling the holes shall be done with power operated machines only. No chase shall be allowed to be cut manually with the use of hammer and chisel.
- b) All cuttings in cement plaster and brick shall be made good by using cement mortar 1:3 (1 part cement, 3 part coarse sand).
- c) The cut surfaces shall be repaired by an experienced mason only so as to match the repaired plaster with the original.
- d) All such repaired surfaces shall be cured for 3 to 4 days to keep the surfaces wet, using water spray machine (hand/motor operated) and avoid unnecessary flooding of the area.
- e) **Associated Civil works with smart home automation system are** included in the scope of this contract. These shall be executed by the Contractor in accordance with approved shop drawings by Owner /PI.

8. **Payment shall be regulated as under:**

- I For hardware component:
 - a) 75% of the tendered rate on receipt of materials at site.
 - b) 15% of the tendered rate on installation and connection.
 - c) 10% of the tendered rate on testing and commissioning.
- II For software component:
 - a) 90% of the payment shall be released only after installation and commissioning.

9. **Drawings/Data required prior to commencement of Smart home automation system works:**

9.1 The following drawings shall be provided by the PI of the work:-

- 9.1.1 Smart house Layout Drawing.
- 9.1.2 SLD of sub stations/SCADA Scheme
- 9.1.3 SLD of smart house

9.2 Following drawings shall be furnished by the contractor for the approval of the PI.

- 9.2.1 Shop Floor drawings/Detailed technical drawings.
- 9.2.2 SCADA drawings

- 10. Completion drawings:**
On completion of works and before issuance of completion certificate, the contractor should submit completion drawings in the form of four complete set of originals (reproducible) and two sets of CD's.
- a) As built G.A and schematic drawings of SCADA system of sub stations.
 - b) Layout drawings showing details of size, type and mode of installation of above systems. The contractor shall frame under glass, all control diagrams.
 - c) Technical literature, test certificates and operation and maintenance manuals required.
- 11. Works Inspection and Testing of Equipment:**
- a) Prior to dispatch of equipment the Institute reserves the right to inspect the same at the manufacturer's works and the contractor shall provide and secure every reasonable access and facility at the manufacturers works for inspection, for witness of all acceptance and routine tests as per relevant Indian Standards. Contractor shall give a reasonable notice of about 15 days for the purpose of test, and witness of all major equipments.
 - b) Pre-commissioning test: All routine tests shall be carried out as per the instructions of the PI.
- 12. Rates**
The work shall be treated as on works contract basis and the rates tendered shall be for complete item of work i.e. the supply, installation acceptance testing and commissioning, of all component, ancillary material and other items whatsoever required for carrying out the job to fulfil the intent and purposes as laid down in the specifications and / or the drawings, inclusive of taxes (including works contract tax, if any), duties and levies etc. and all charges for items contingent to the work, such as packing, forwarding, insurance, freight and delivery at site for the materials to be supplied by the contractor, watch and ward of all materials at the site, labour related expenses as per relevant labour laws, testing of materials/ samples etc. The tenderer's price shall be deemed to include all accessories and miscellaneous items, component panels, nuts, bolts, shims, clamps, supports etc. as required for proper fixing and / or grouting of equipments, ancillary items etc, except for the items where price is separately indicated. The quoted rate shall be exclusive of service tax, which will be reimbursed/paid extra as per rule.
- 13. Taxes & Duties**
- a) Being an indivisible works contract, VAT, excise duty, custom duty etc. are not payable separately except service tax, which shall be reimbursed as per the rule on reverse mechanism process.
 - b) The quoted rates shall be inclusive of Trade Tax on Works Contract. The works contract tax shall be deducted from the bills of the contractor payable to Govt. of Uttar Pradesh at the rates prescribed by the Govt.
- 14.** The earnest money of the unsuccessful tenderers shall be refunded on written request, within 1(one) month of the award of work. The earnest money of the successful tenderer shall however be adjusted towards the security deposit. The balance security deposit shall be recovered from each bills claimed by the contractor. The security will be released after successful completion of the defect liability period of one year.
- 15.** The tender document and drawings in respect of the work can be seen office of the DR, Stores and Purchase, IIT Kanpur.
- 16.** The tender document contains **30** pages. No page of the tender document shall be removed, mutilated, detached or cancelled.
- 17.** Rates for finished works shall be given for each items separately, both in words and figures. In the event of non compliance, the tender shall be deemed incomplete and liable for rejection.
- 18.** All entries by the tenderer should be made in one ink and one hand writing only. Tenders should be filled in legible hand writing and should not contain erasures, corrections and overwriting as far as possible. However if it becomes necessary, each correction etc. should be properly attested under dated signature.
- 19.** Delay penalty (as per the government rule or CPWD General Conditions of Contract 2014 relevant clause).

20. The work shall be executed on the basis of the technical **specifications:**

CONTRACTOR

PI

V
Appendix 'B'

**Indian Institute of Technology, Kanpur
Department of Electrical Engineering**

Name of Work: Supply, installation, testing and commissioning of the SCADA and energy management system for smart city pilot project at substations of IIT Kanpur".

D E C L A R A T I O N

1. (a) I/We hereby declare that I/We (name)
..... have no other business association with the Institute.

OR

(b) Have the following other business association with the Institute

4. (a) Have no relatives or connections by marriage with the staff of the Institute.

OR

(b) Have the following relatives or connections by marriage with the staff of the Institute.

Note: (i) Strike out (a) Or (b) of each of the above declaration which is not applicable.

(ii) There would generally not be any objections to any business association or relatives being in the Institute unless such business association or relatives are concerned with the operation of contract on official side.

CONTRACTOR

Address :

VI. Special conditions of contract

1.1. General

These special conditions are intended to amplify the general conditions and shall be read in conjunction with the same. For any discrepancies between the general conditions and these special conditions, the more stringent shall apply.

The specifications described in this tender for Grid Automation/Management, Safety and Security Systems is a guide to the type of systems and features that are to be taken as a minimum requirement. The features offered over and above those mentioned in the tender shall be given due weightage.

1.2. Scope of work

The general nature and the scope of work to be carried out under this contract are indicated in Drawings, input/output summary specifications and schedule of quantities. The contractor shall carry out and complete the said work under this contract in every respect in conformity with the contract documents and with the direction of and to the satisfaction of the Engineer In Charge / Owners site representative. The contractor shall furnish all labour, materials and equipment as listed under schedule of quantities and specified otherwise, transportation and incidentals necessary for supply, installation, testing, commissioning of hardware's & software's as described in the specifications and as shown on the drawings and as per site conditions.

This also includes any material, equipment, appliances and incidental work not specifically mentioned herein or noted on the drawings / documents as being furnished or installed, but which are necessary to be performed under this contract. Cutting holes, chases and the like through all types of walls / RCC and finishing's for all services crossings, including sealing, frame work, fire proofing, providing sleeves, and cover plates, making good structure and finishes to an approved standard. Sufficient quantity of supports for cable tray, cable saddles to be provided, as approved by Engineer in charge / Owner's as per site conditions and completion of following works:

- Testing and commissioning of the entire systems.
- Integration of all renewable energy system with smart home automation system
- Test reports, list of recommended spares, drawings, operation and maintenance manual for the entire works carried out. (4 sets and a soft copy in CD)
- Training of Owner's staff.

The bidder should visit the site and familiarize with site conditions. The work is required to be carried out phase-wise without causing any shut-down to the working facilities.

1.3. Project Execution and Management

The contractor shall ensure that senior planning and erection personnel from their organization are assigned exclusively for this project. They shall have around 10 years' experience in this type of installation and shall ensure at least one full time project manager and Two Project engineers who would be exclusively responsible for ensuring strict quality control, adherence to specifications and ensuring top class workmanship. The names and details of the engineers proposed to be deployed should be indicated along with their qualifications and experience.

The contractor shall arrange to have mechanized and modern facilities of transporting material to place of installation for speedy execution of work.

1.4. Imported Equipment

The successful tenderer shall submit upon award the following to facilitate the IIT Kanpur/Owner in their application for concessional duty for equipment / material proposed to be directly purchased and imported by them.

- a) Four copies of proforma invoice from Manufacturer / Supplier drawn in the name of Owner identifying FOB price from the country of origin and Freight cum Insurance up to site.
- b) Three sets of Technical Literature, high lighting model numbers and all technical details of the actual equipment/material offered by them.

Concessional custom duty `as applicable' only will be payable. Client will provide necessary documents as required, for the above, however all incidental and follow-up work etc. will be carried out by the contractor only. No delay / extra payment towards this will be payable by the client.

1.5. Performance Guarantee

The contractor shall carry out the work in accordance with the drawings, specifications, schedule of quantities and other documents forming part of the contract as well as site conditions.

The contractor shall be fully responsible for the performance of the selected equipment (installed by him) at the specified parameters and for the efficiency of the installation to deliver the required end result.

The contractor shall guarantee the SCADA system installation for 1 year from the date of final completion. The guarantee shall be submitted in the Performa given in Appendix-C

The contractor shall also guarantee the performance of various equipments individually, while handing over and during the guarantee period.

1.6. Bye – Laws and Regulations

The installation shall be in conformity with the bye-laws, regulations and standards of the local authorities concerned; in so far these become applicable to the installation. But if these specifications and drawings call for a higher standard of materials and / or workmanship than those required by any of the above regulations and standards, then these specifications and drawings shall take precedence over the said regulations and standards. However, if the drawings and specifications require something which violates the bye-laws and regulations, then the bye-laws and regulations shall govern the requirement of this installation.

1.7. Fees and Permits

The contractor shall obtain all permits / licenses and pay for any and all fees required for the inspection, approval and commissioning of their installation if required.

1.8. Drawings

System drawings, which shall be issued with the tenders, are diagrammatic only and indicate arrangement of various systems and the extent of work covered in the contract. These drawings indicate the points of supply and of termination of services and broadly suggest the feasible scheme and routes to be followed. The contractor may re-arrange the equipment for improving the layout and meeting the site conditions.

All such changes shall however be subjected to the PI approval. **These drawings are not meant to be working drawing which shall be prepared by the contractor as required.** The architectural / interior drawings and details shall be examined for exact location of equipment and, controls.

The contractor shall follow the tender drawings in preparation of their shop drawings, and for subsequent installation work. Contractor shall check the drawings of other trades to verify spaces in which his work will be installed.

Maximum headroom and space conditions shall be maintained at all points. Where headroom appears inadequate, the contractor shall notify the Owner's site representative any discrepancies and obtain clarification. Any changes found essential to coordinate installation of his work with other services and trades, shall be made with prior approval of the Owners site representative without additional cost to the Owner. The data given in the drawings and specifications is as exact as could be procured, but its accuracy is not guaranteed.

1.9. Technical Data

Each tenderer shall submit along with his tender, **the technical data, list of makes and data sheets** for all items / equipments offered by him. **Failure to furnish complete technical data with tenders may summarily result in rejection of the tender.**

1.10. Shop Drawings

All the shop drawings shall be prepared on computer through AutoCAD or similar system based on architectural drawings, site measurements and interior designer's drawings. All capacity calculations and shop drawings shall be done within two weeks of the award of the contract, contractor shall furnish, for the approval of the PI, three sets of detailed shop drawings of all equipments and materials including schematic & layouts for equipment and panel showing exact location with supports, cable / pipe routing, terminations, bends, detailed piping drawings for suppression system showing exact location and type of supports, valves, fittings etc. equipment panels inside / outside views, power and control wiring schematics, cable trays, supports and terminations. These shop drawings shall contain all information required to complete the project as per specifications and as required by the Consultants/Owner's site representative. These drawings shall contain details of construction, size, arrangement, operating clearances, performance characteristics and capacity of all items of equipment, also the details of all related items of work by other contractors.

Each shop drawing shall contain tabulation of all measurable items of equipment /materials/works and progressive cumulative totals from other related drawings to arrive at a variation – in – quantity statement at the completion of all shop drawings. Minimum 4 sets of drawings shall be submitted after final approval along with soft copy in compact disc.

Each item of equipment / material proposed shall be a standard catalogue product of an established manufacturer strictly from the manufacturers quoted by the tenderer in technical data part of given format.

When the Engineer-In charge/User makes any amendments in the above drawings, the contractor shall supply two fresh sets of drawings with the amendments duly incorporated along with check prints, for approval. The contractor shall submit further four sets of shop drawings to the PI for the exclusive use by the Owners site representative and all other agencies. No material or equipment may be delivered or installed at the job site until the contractor has in their possession, the approved shop drawings for the particular material / equipment / installation.

1.11. Assembly and Inspection

Shop assembly of all component parts shall be made to ensure that all parts are properly fitted to minimize installation problems.

The Engineer In Charge/owner reserves the right to inspect any machinery, material and component (herein after collectively called "Equipment") finished or used by the contractor under this contract and may reject which is defective in workmanship or design or otherwise unsuitable for the use and purpose intended or which is not in accordance with the intent of this contract.

The contractor shall on demand by the PI / owner, remedy / replace at their own expense any such defective or unsuitable equipment. The contractor shall advise the owners in advance when equipment is ready for inspection in the contractor's workshop and / or in his sub supplier's workshop.

The owner's Representative shall at all times have access to all parts of shops where equipment are being manufactured and also shall be provided with all reasonable facilities by the contractor and his sub supplier. None of the equipment to be furnished or used in connection with this contract will be supplied until shop inspection and performance testing, wherever possible, satisfactory to the owner's representative has been made.

Such shop inspection of the equipment shall not however, relieve the contractor from full responsibility for furnishing the equipment conforming to the requirements of this contract not prejudice any claim, right or privilege which the owners may have because of the supply of defective or unsatisfactory equipment. Should the owners waive the right to inspect any equipment, such waiver shall not relieve the contractor from his obligation under this contract.

Manufacturer's drawings, catalogues, pamphlets and other documents submitted for approval shall be in four sets. Each item in each set shall be properly labelled, indicating the specific services for which material or equipment is to be used, giving reference to the governing section and clause number and clearly identifying in link the items and the operating characteristics. Data of general nature shall not be accepted.

Samples of all materials like cables, backing boxes, conduits, and other equipments etc. as requested by PI Owner's representative shall be submitted to the owner's site representative prior to procurement. These will be submitted in two sets for approval and retention by owner's site representative and shall be kept in their site office for reference and verification till the completion of the project. Wherever directed a mock or sample installation shall be carried out for approval before proceeding for further installation.

Approval of shop drawings shall not be considered as a guarantee of measurement or of building dimensions. Where drawings are approved, said approval does not mean that the drawings supercede the contract requirements, nor does it in any way relieve the contractor of the responsibility or requirement to furnish material and perform work as required by the contract.

Where the contractor proposes to use an item of equipment, other than that specified or detailed on the drawings, which requires any redesign of the structure, partitions, foundation, piping, wiring or any part of the mechanical, electrical or architectural layouts; all such redesign and all new drawings and detailing required therefore, shall be prepared by the contractor at his own expense and gotten approved by the PI. Any delay on such account shall be at the cost of and consequence of the contractor.

Contractor shall prepare coordinated services shop drawings based on the drawings prepared by civil / interior, electrical, mechanical and other contractors to ensure adequate clearances are available for installation of services for each trade.

Where the work of the contractor has to be installed in close proximity to, or will interfere with work of other trades, he shall assist in working out space conditions to make a satisfactory adjustment. If so directed by the owner's site representative, the contractor shall prepare composite working drawings and sections at a suitable scale, not less than 1:50, clearly showing how his work is to be installed in relation to the work of other trades.

If the contractor installs his work before coordinating with other trades, or so as to cause any interference with work of other trades, he shall make all the necessary changes without extra cost to the owner.

Within two weeks of approval of all the relevant shop drawings, the contractor shall submit four copies of a comprehensive variation in quantity statement.

The following shop drawings shall be prepared and submitted for approval within **two weeks**.

- Cable routing, equipment / panel location, for all package of smart home automation system layout plans with sectional drawing.
- Detailed electrical and equipment layout with supports and principle supplier calculation sheets.
- PowerPoint location drawing along with IO summary detail excel sheet, schematic drawings, G.A. drawings, etc., for all panel, RTU panel, control panel, SCADA drawings schematics, power and control wiring, etc.
- Any other drawings / documents as required by Owner / PI necessary for the project.

1.12. Installation and Commissioning

The contractor shall carry out the complete installation and commissioning. All work shall commence on previously prepared foundation (if available). All the materials shall be moved from their place of storage into the location by the contractor. The contractor shall make his own arrangement to off load materials received at respective air / rail / road transport terminal points, dispatch to site and to store all material received at site. The owners shall provide clear storage and installation space only. All installation tools and tackles as and when required to suit the installation programme shall be provided by the contractor.

All consumables required for installation such as ladders, safety tools, bamboos and planks for scaffolding etc. as well as necessary welding rods, gases etc. shall be provided by the contractor. Protective and finish painting shall be carried out by the contractor. All steel surface shall be thoroughly cleaned before painting. The contractor shall indicate the electricity requirements during installation. The contractor shall remove all the waste material or rubbish from and about the work site and leave the job thoroughly cleaned up and ready for use.

1.13. Quiet Operation and Vibration Isolation

All equipment shall operate under all conditions of load without any sound or vibration which is objectionable in the opinion of the owner's site representative. In case of rotating machinery sound or vibration noticeable outside the room in which it is installed, or annoyingly noticeable inside its own room shall be considered objectionable. Such conditions shall be corrected by the contractor at his own expense. The contractor shall guarantee that the equipment installed shall maintain the specified noise levels.

1.14. Accessibility

The contractor shall verify the sufficiency of the size of the shaft opening, clearances in cavity walls, false floor and suspended ceilings for proper installation of their equipment and piping. His failure to communicate in sufficiency of any of the above shall constitute his acceptance of sufficiency of the

same. The contractor shall locate all equipment which must be serviced, operated or maintained in fully accessible positions shall be finalized and communicated in sufficient time, to be provided in the normal course of work. Failing this, the contractor shall make all the necessary repairs and changes at his own expense.

1.15. Materials and Equipment

All materials and equipment shall conform to the relevant Indian standards and shall be of the approved make and design. Makes shall be strictly in conformity with the list of approved manufacturers as per given in the tender document.

1.16. Manufacturer's Instructions

Where manufacturer has furnished specific instructions, relating to the material and equipment to be used in this project, not specifically mentioned in these documents, such instructions shall be followed in all cases.

1.17. Electrical Installation

The electrical work related to above works/ system services shall be carried out in full coordination and in total conformity with the control wiring drawings required for the SCADA / RTU wiring interconnection as required and approved by the PI. All the equipments shall be connected and tested in the presence of an authorized representative of the PI.

1.18. Testing and Commissioning

All tests as called for the specifications shall be carried out by the contractor through a specialist group, in accordance with the specifications and manufacturer, applicable standards and as approved by owner.

The testing and commissioning process will consist of component testing and integrated system testing. During the integrated system testing the system would be tested for its functionality, operation and performance at different load conditions. All the fault, alarm and changeover conditions shall be simulated during the integrated system test. The minimum duration of system integration test would be 72 hours. The contractor would have to perform these tests successfully for the system to be accepted.

A detailed testing and commissioning plan shall be prepared by the contractor on guidance from the owner within three weeks from receipt of the work order/LOI.

All types of routine and type tests as required shall be carried out at the works of the contractor or the manufacturers of the components as per owner's / Manufacturer's guidelines. The project managers / owners shall be free to witness any or all tests if they so desires.

On the completion of the installation, the contractor shall arrange to carry out various initial tests as per manufacture specification and best practice as instructed by owner's / PI, in the presence of and to the complete satisfaction of the PI / Owner, or their representatives. Any defects or shortcomings found during the tests shall be speedily rectified or made good by the contractor at his own expenses.

1.19. Control and monitoring system

- a) Physical checking of all components with respect to tender conditions and offer.
- b) Verification of Test Certificates.
- c) Verification of Operational logic and Software functioning.
- d) For every analog input point tested, the system shall be capable of simulating any value of input, independent of the actual field condition. This shall be accomplished either through

- software or a discrete field mounted potentiometer for each analog input.
- e) For every digital input point tested, the system shall be capable of simulating either an open or closed status, independent of the actual field, condition. This shall be accomplished either through software or a discrete field mounted input switch for each digital input.
 - f) Handover acceptance procedures shall include but not be restricted to the following:
 - Display and printout of all points
 - Verification for control for all output points.
 - Concurrent point history of all points.
 - Display of all graphic screens including historical and Real time graphs for all analog points.

The Control and monitoring systems shall be commissioned only after the contractor has certified in writing that the electrical installation work for automation services has been thoroughly checked, tested and found to be totally satisfactory and in full conformity with the approved shop drawings, specifications and manufacturer's instructions.

The above tests and procedures are mentioned herein, for general guidance and information only, but not by way of limitation to the provisions of tender conditions of contract and specifications. The date of commencement of all tests listed above shall be subjected to the approval of the PI /owner and in accordance with the requirements of these specifications.

The contractor shall supply the skilled staff and all necessary instruments and carry out any test of any kind on a piece of equipment, part of system or on a complete system, if the owner/PI requests such a test for determining specified or guaranteed data, as given in the specification or on the drawings.

Any damage resulting from the tests shall be repaired and / or damaged material replaced, to the satisfaction of the owner/PI. In the event of any repair or any adjustment having to be made, other than normal running adjustment, the tests shall be void and shall be recommended after the adjustment or repairs have been completed.

The contractor must inform the PI when such tests are to be made, giving sufficient notice, in order that the engineer-in charge/user/consultant or their nominated representative may be present. (All tests should be carried out in the presence of owners or /their representative). Complete records of all tests must be kept and 3 copies of these and location drawings must be furnished to owners.

Performance test shall consist of three days of 72 hour continuous operation of system for endurance testing. Testing of major equipment at factory in the presence of two personnel from engineer-in charge/user shall be included, if found necessary, and as required by engineer-in charge/user.

Four copies of the certified manufacturer's performance curves for each piece of equipment, high lighting operational parameters for the project, shall be submitted along with the test certificates. Contractor shall also provide four copies of record of all safety and automatic control settings for the entire installation.

The installation shall be tested again after removal of defects and shall be commissioned only after approval by the owner's site representative. All tests shall be carried out in the presence of the representatives of the engineer-in charge.

1.20. Rejection of Defective System

If on test any portion of the plant, equipment or components are found to be defective or not fulfilling

the intent or the meaning of the specifications, the same shall be replaced or repaired to the entire satisfaction of the PI.

In case the contractor fails to remove the defects, within a period considered reasonable, the owner reserves the right to take necessary remedial measures through other agencies and all expenses thus incurred would be recovered from the contractor.

The owner reserves the right to operate all the equipment and complete system whether or not the plant is taken over after the initial test and commissioning. Any defects found during the initial or running tests shall be removed at a suitable time as decided upon by the engineer-in charge/user/consultant.

1.21. Completeness of the project and completion certificate

The contractor shall provide all the required materials, equipment, ancillary items etc. to install a complete and satisfactory SCADA system capable of fulfilling the intent and purpose of the contract whether or not each and every item is mentioned in the specifications and / or drawings. Any shortcomings noticed at any stage shall be made good at no extra cost.

On completion of the work, a certificate shall be furnished by the contractor, counter signed by the licensed supervisor, under whose direct supervision the installation was carried out. This certificate shall be in the prescribed form as required by PI.

On satisfactory completion of all testing, commissioning and performance test, the system shall be considered to be virtually complete for the purpose of taking over by the owner.

The contractor shall be also responsible for getting the entire electrical installation of SCADA system duly approved by the local authorities concerned, if required and shall bear all expenses, if any, in connection with the same.

1.22. Completion drawings

Contractor shall periodically submit completion drawings as and when work in all respects is completed in a particular area. These drawings shall be submitted in the form of two sets of CDs and four portfolios (300 x 450mm) each containing complete set of drawings on approved scale indicating the work as built. These drawings shall clearly indicate complete system layouts, location of wiring and sequencing of automatic controls, locations of all concealed piping, cables, controls, wiring panels and other services. Each portfolio shall also contain consolidated control diagrams and technical literature on all controls. The contractor shall frame under glass, all control diagrams.

1.23. Operating instruction and maintenance manual

Upon completion and commissioning of SCADA system the contractor shall submit a draft copy of comprehensive operating instructions, maintenance schedule and log sheets for all systems and equipment included in this contract.

This shall be supplementary to manufacturers operating and maintenance manuals.

Upon approval of the draft, the contractor shall submit four (4) complete bound sets of typewritten operating instructions and maintenance manuals; one each for retention by PI owner's and owners site representative and two for owner's operating personnel. These manuals shall also include basis of design, detailed technical data for each piece of equipment as installed, spare parts manual and recommended spares for 5 years period of maintenance of each equipment.

1.24. On Site training

Upon completion of all work and all tests, the contractor shall furnish necessary operators, labour and helpers for operating the entire installation for a period of fifteen (15) working days of ten (10) hours each, to enable the owner's staff to get acquainted with the operation of the system.

1.25. Uptime guarantee

The contractor shall guarantee for the installed system an uptime of 99.998 %. In case of shortfall in any month during the defects liability period, the defects liability period shall be get extended by a month for every month having shortfall. In case of shortfall beyond the defects liability period, the contract for operation and maintenance shall get extended by a month for every month having shortfall and no reimbursement shall be made for the extended period.

The contractor shall provide log in the form of diskettes and bound printed comprehensive log book containing tables for daily record of all desired electrical parameters, power consumption, starting and stopping times for various equipment, daily services rendered for the system alarms, maintenance and record of unusual observations etc. contractor shall also submit preventive maintenance schedule.

Each tenderer shall submit along with the tender a detailed operation assistance proposal for the owners site representatives / owner's. This shall include the type of service planned to be offered during defects liability period and beyond.

The operation assistance proposal shall give the details of the proposed monthly reports to the management. The tenderer shall include a list of other projects where such an operation assistance has been provided.

1.26. Power requirement

The contractor shall submit with their tender, their requirements of power at each of their equipment/system.

1.27. Necessary Insurance Coverage

Necessary insurance cover for Worker Insurance, Provident Fund, ESI etc. should be taken up and included in the cost.

1.28. Safe custody and storage

Safe custody of all equipments supplied by the contractor shall be their own responsibility till the final taking over by the owner. Contractor should therefore, employ sufficient staff for watch and ward at their own expenses. The owner may however, allows the contractor to use the plant room / electrical rooms etc. for temporary storage of his equipment if such spaces are ready and available after approval of owner.

1.29. Variations in Quantities and Tender Drawings

The quantities for the item of works given in the schedule and / or in drawings are for the guidance of the tenderer. The contractor shall be paid on the basis of actual quantities of works carried out. However, the contractor shall check these quantities before quoting and will bring to the notice of PI for any major variation. Drawings issued with the tender are diagrammatic only and indicate the general arrangement only. The data given in the drawings and specifications is as exact as could be secured but, its accuracy is not guaranteed.

Contractor shall carry out their own computations and provide all such equipment, as required to achieve the specified conditions. The contract shall be on works contract basis and the owner reserves the right to add / delete any items of work during the currency of contract.

Guarantee Performa for SCADA System

We hereby guarantee the year round performance for SCADA System Installations (Hardware & software) which we have installed in the buildings described below:

BUILDING - Number of Substations: 10 (including control room installations)

LOCATION - IIT Kanpur

For a period of **1 year (One year)** from the date of acceptance of the total installation/commissioning & start of operation. We agree to repair or replace free of cost to the satisfaction of the owner / PI, any or all such work that may prove defective in workmanship, equipment / software or materials within that period, ordinary wear and tear and unusual abuse or neglect excluded, together with any other work, which may be damaged or displaced in so doing.

Signature of Contractor:

Date:

Seal:

VIII. SYSTEM DESCRIPTION TECHNICAL SPECIFICATIONS

2. SUBSTATION SCADA & ENERGY MANAGEMENT SYSTEM

2.1. Features and Specification of Substation SCADA

The SCADA system is intended for centralized monitoring and control of remote sub-station on computer screen installed in control room, including automatic acquisition of energy parameters and preparation of customized reports and monitoring / control of the Circuit Breakers / Switches / Isolator etc. The objective shall be achieved with the help of SCADA software and substation RTUs.

2.2. Communication Protocol

The communication protocol for SCADA system and RTUs must be open standard protocol and shall involve / support IEC 60870-5-104 and IEC 61850 for all levels of communication.

The SCADA system shall be designed, developed, tested, installed, and commissioned at the substation / plant as per IEC Standards for protective relays and energy meters.

The SCADA system shall contain the following main functional parts:

- SCADA application and station Human Machine Interface (HMI)
- Ethernet Local Area Network communication infrastructure for remote monitoring (to be supplied by the institute).
- Remote Terminal Unit (RTU)
 - Act as Gateway as each Meter / Transducer shall communicate data to the RTU through a serial or Ethernet network connection using a selected protocol.
 - Additionally, the RTU should have the capability to communicate with SCADA System over IEC 60870-5-104 & IEC 61850 Protocols.
 - RTU shall have hard wired interface with local control panels for status monitoring and control of the electrical switchgear.
- SCADA system shall be realized via a redundant set of servers and by means of human machine interface (HMI) and software package, which shall contain an extensive range of data acquisition and control functions.

2.3. Mandatory Scope of the work

- Supply, installation, testing and commissioning of RTU's at ten (10) substations of IIT Kanpur. One substation is 33 KV/11 KV substation and other nine (9) substations are 11KV/400 V substations.
- Wiring from RTU to relays / meters for monitoring and control including any associated hardware required for the communication between relays/meters to RTUs.
- Configuration of SCADA system software and connection with RTUs and other communication devices.
- Supply of SCADA system software as detailed in the following section.
- Supply of 2 hardware servers and 6 hardware workstations.
- Training on SCADA, RTU and associated communication network
- Support the System Integrator (SI) in integrating the SCADA system with the AMI and other associated parts of the smart city project.

2.4. Optional scope of work

Supply of DMS applications that includes, but not limited to the distribution system state estimation application, fault management, load-shed application, and feeder reconfiguration application.

2.5. Typical substation architecture

The SCADA system shall have following minimum components:

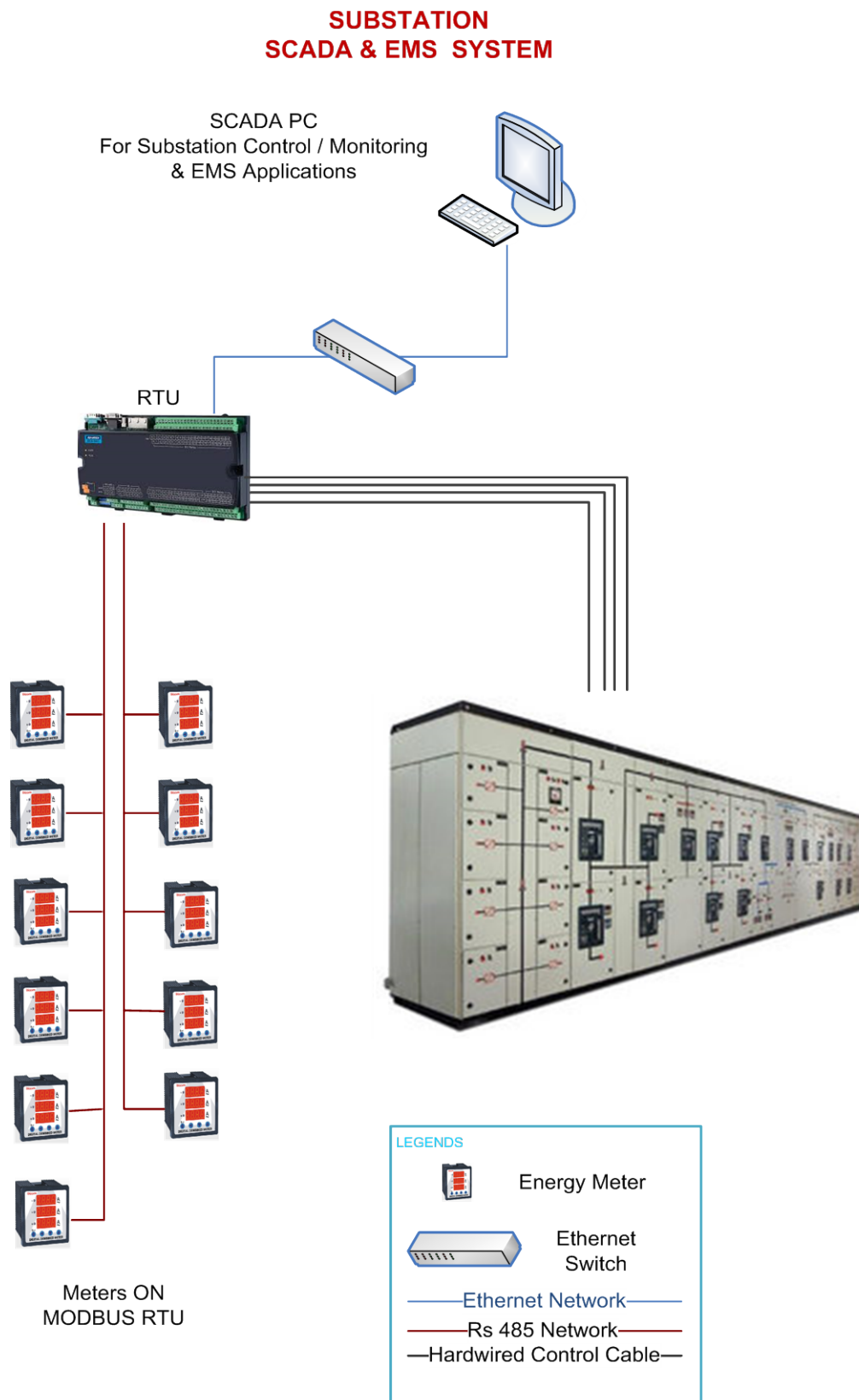
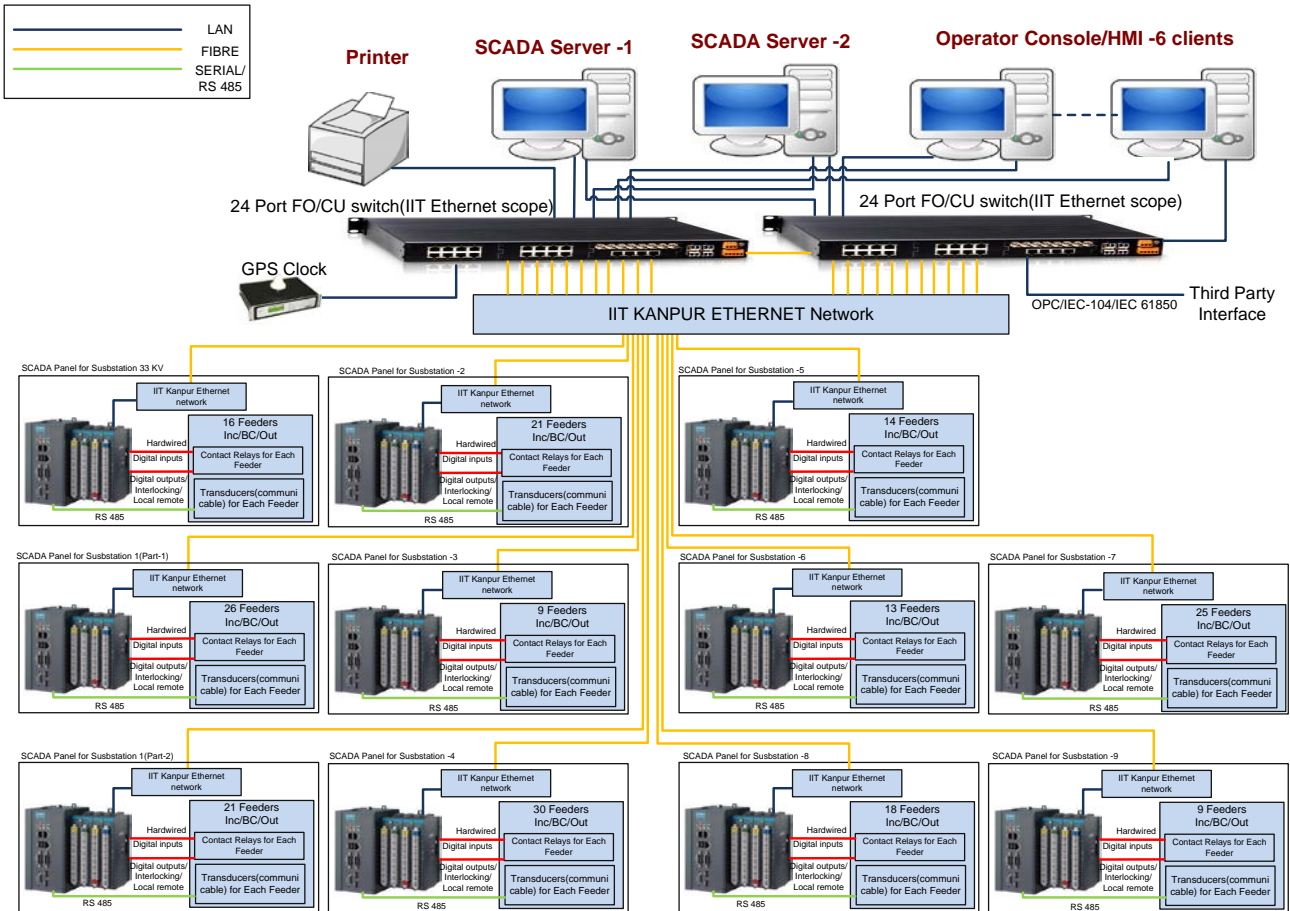


Figure 1: Substation SCADA and EMS System

2.6. Typical substation architecture

The SCADA system shall have following minimum components:



2.7. RTU – Hardware capability

It shall have a flexible high performance expandable disc less and fan less platform.

- Specifications
 - 64 bit processor.
 - 2 or more LAN ports
 - 4 or more serial ports / usb
 - Digital inputs as per requirements (minimum support for 100 DIs)
 - Digital outputs as per requirements (minimum support for 100 DOs)
 - Analog inputs as per requirements (minimum support for 24 AIs)
- It shall have network time protocol (NTP) format time protocol support.
- The communication protocol for RTU must support IEC 60870-5-104 and IEC 61850 and all other standard protocols required (MODBUS and IEC 60870-5-103) for all levels of communication such energy metering, relays, etc.
- The primary function of the RTU shall be to concentrate metering data by polling and receiving information from connected meter / transducer. Each meter / transducer shall communicate data to the RTU through a serial or ethernet network connection using a selected protocol.
- The RTU shall be hard wired to Local Control Panel (LCP) for Monitoring and Control of the Circuit Breakers / Switches / Isolators etc. and other available signals at LCP.
- The RTU shall be able to accomplish these tasks through the use of embedded software applications.

- RTU source code and complete development environment shall be provided including training also.
- These software applications shall be configurable to set up the RTU to operate as per the requirement of the system.

2.8. Salient features of RTU

- Data concentration for all types of Meters
- Hard wired interface with local control panel for monitoring and control
- Ease of use /configuration
- Support for network time protocol (NTP)
- Support for multiple SCADA protocols for communication to multiple masters

2.9. SCADA Server: Hardware (2 Nos.)

Computer System Configuration

- Industrial Grade
- 64 Bit Architecture
- Xeon Processor 4 Core or Higher
- SDRAM- 16 GB or Higher
- HDD-500 GB X 3 or higher
- Raid 5 or Higher
- Drive-52X
- Ethernet Card x 2
- USB port- min 2 nos
- Color 24" LCD Monitor
- Operating System — Windows 2012 Server or equivalent / latest one

2.10. SCADA Workstation / operator console: Hardware (6 Nos.)

Computer System Configuration:

- Industrial Grade
- 64 Bit Architecture
- Intel i5 5th Generation or Higher
- SDRAM- 4 GB or Higher
- HDD-500 GB or higher
- Drive-52X
- Ethernet Card x 2
- USB port- min 2 nos
- Color 24" LED Monitor
- Operating System — Windows 7 Professional or equivalent

2.11. Objectives of SCADA system

For Energy Metering

- It shall have Graphical User Interface (GUI) based software on Windows platform.
- Online views
 - Tabular and Graphical
 - The Substation SLD mimic shall be realized on computer screen.
 - One screen of SLD mimic shall be populated by data from energy meter.
- Meter Support
 - The software shall acquire data from the any make of meters / transducers over standard protocol.

- Viewing Online Data
 - The software shall provide facility to monitor instantaneous electrical parameters on real time basis.
 - Online data can be viewed in graphical /tabular formats/substation SLD mimic.
- Viewing Historical Data
 - The software shall provide historical data views for analysis purpose.
- Group Definition
 - The software shall provide facility for grouping of meters to define virtual meters.
 - This feature shall be used for calculation of total energy loss and consumption of a location.
- Alarm Management
 - It shall provide user definable alarms for different parameters.
 - These alarms shall be available for system monitoring on real time basis.
- Reports
 - The software shall provide various types of reports like min-max, energy consumption data, alarm data, interruption data, meter replacement, demand data, energy loss data etc.
 - The reports shall provide time-related follow-ups of measured and calculated values. The data displayed shall comprise:
 - Trend reports:
 - ✓ Day (mean, peak)
 - ✓ Month (mean, peak)
 - ✓ Year (mean, peak)
 - Historical reports of selected analog values:
 - ✓ Day (at 15 minutes' interval)
 - ✓ Week
 - ✓ Month
 - ✓ Year
- There shall be a facility to develop new reports for the analysis of any electrical parameter/s or trends.
- It shall be possible to select displayed values from the database in the process display on-line. Scrolling between days shall be possible. It shall be possible to select the time period for which the specific data are kept in the memory.
- Following printouts shall be available from the printer and shall be printed on demand:
 - Daily voltage, load and frequency curves depicting time on X-axis and the appropriate parameters on the Y-axis. The time duration of the curve is 24 hours.
 - Weekly trend curves for real and derived analog values.
 - Printouts of the maximum and minimum values and frequency of occurrence and duration of maximum and minimum values for each analog parameter for each circuit in 24 hr period.
 - Printout on adjustable time period as well as on demand for MW, MVAR, Current, Voltage on each feeder and transformer
 - Printout on adjustable time period as well as on demand system frequency and average frequency.
 - Reports in specified formats which shall be handed over to contractor.
- Trend display (historical data)
 - It shall be possible to illustrate all types of process data as trends — input and output data, binary and analog data. The trends shall be displayed in graphical form as column or curve diagrams. Adjustable time span and scaling ranges must be provided.
 - It shall be possible to change the type of value logging (direct, mean, sum, or difference) on-line in the window. It shall also be possible to change the update intervals on-line in the picture as well as the selection of threshold values for alarming purposes.
 - There shall be an export facility to export required reporting data to the excel sheet.
- Data Import and Export - The software shall have facility to import CSV files from a third party application. User should export the meter data to CSV format.

- SCADA Source code and Development Environment shall be provided. Vendor will also provide training to work on SCADA Source code and Development Environment.

2.12. For RTUs

- Graphical user interface (GUI) based software on Windows platform.
- Online views
 - Tabular and Graphical.
 - The Substation SLD mimic shall be realized on computer screen.
 - One screen of SLD mimic shall be populated by data from RTU.
- RTU Communication Support
 - The software shall acquire data from IEC Protocols such as IEC 60870-5-104 / IEC 61850 compliant RTUs.
- Viewing Online Data
 - The software shall provide facility to monitor instantaneous electrical parameters on real time basis.
 - Online data can be viewed in graphical /tabular formats/substation SLD mimic.
- Control of the Circuit Breakers
 - The software shall provide facility to control Circuit Breakers as per user requirements.
 - Commands shall be performed from SLD / Detail views mimics and shall be user configurable.
 - System should support direct and select before execute commands as per IEC standards.
 - Commands shall be linked with the Input Status of the breaker so that Alarms / Events can be managed for Operator Actions and differentiated from tripping signals.

2.13. User-authority levels

- It shall be possible to restrict activation of the process within a certain user authorization group. Each user shall then be given access rights to each group of process, e.g.:
 - Display only
 - Operator
 - System administrator
 - Developer
- The access rights shall be defined by passwords assigned during the log-in procedure.
- Only the system administrator shall be able to add/remove users and change access rights.
- Role based user authentication is possible. New roles and their assignments can be configured for access control.

2.14. For monitoring and control

- SCADA system shall be able to monitor critical electrical parameters based on certain rules and shall be able to take actions automatically in case of rule violations.
- SCADA display shall allow operator to control the substation devices remotely on click of button.
- The SCADA system shall have the option to operate it in an auto or manual mode with manual over-ride facility.

2.15. Alarms and events

- System shall allow user defined alarms and events for both analog and digital values
- User shall be able to define the severity level of alarms and associated color codes for easy identification of the alarms.
- User shall be able to send alerts for the alarms / events through SMS / EMAIL.

2.16. For research activity

- The SCADA system application shall be based on open source / developed source codes. The source code of SCADA system shall be provided along with the development environment for the future research activities at IIT Kanpur. Alternately, the SCADA application software, including its development environment, shall have the facility to seamlessly host / integrate to any custom developed software / algorithm on top of it. The SCADA software should be flexible enough to support any future enhancements in the application. It should also have flexibility to add/delete/modify data points, connections of communicable devices such as RTUs, PMUs etc. The SCADA database should be accessible and customizable to support and configure data exchange between core SCADA and the custom build applications. The training for development environment shall be provided to the research scholars / Engineers of IIT Kanpur.

2.17. Applications of SCADA system

- The following applications / features shall be provided in the SCADA system.
- SLD with paging and zooming facility.
- Remote monitoring and control.
- Data acquisition and management.
- Device configuration for data acquisition.
- Alarm and event management.
- Bad data detection and its replacement with the calculated / manually entered value.
- 2D/3D Graphical and tabular display.
- Reporting