INDIAN INSTITUTE OF TECHNOLOGY KANPUR
ELECTRICAL ENGINEERING DEPARTMENT

Tender Notice – Ref No: IITK/ EE/SMART CITY/<u>AMI-SI-HA</u> /2016/01　　　　　**Date: 20 May 2016**

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) from eligible bidders for the following work:

SUPPLY, INSTALLATION, TESTING AND COMMISSIONING OF ADVANCED METERING INFRASTRUCTURE (AMI), SYSTEM INTEGRATION (SI) AND HOME AUTOMATION SYSTEMS FOR THE SMART GRID PILOT PROJECT AT IIT KANPUR

Estimated Cost: Rs.3 crores (approx.), Earnest Money: Rs.600000 /-, Period of completion 12 Months.

The Tender notice with all relevant information is available on <u>www.tenderhome.com</u> and institute (websitehttp://www.iitk.ac.in/infocell/tender/tendernotice.html.

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Saikat Chakrabarti
Project Investigator (PI)
Associate Professor
Department of Electrical Engineering
Indian Institute of Technology Kanpur 208016 India
Email: <u>smartcityiitk@yahoo.in</u>
Phone: +91-512-679-6936

DEPARTMENT OF ELECTRICAL ENGINEERING, INDIAN INSTITUTE OF TECHNOLOGY KANPUR, KANPUR-208016
Phones: 0512-679-6936............ (O)
e-mail: smartcityiitk@yahoo.com

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INDIAN INSTITUTE OF TECHNOLOGY KANPUR
ELECTRICAL ENGINEERING DEPARTMENT

Tender Notice No Ref No: IITK/ EE/SMART CITY/AMI-SI-HA /2016/01　　　　　**Date: 20 May 2016**

Invitation of tenders for Supply, Installation, Testing and Commissioning of Advanced Metering Infrastructure (AMI), System Integration (SI) And Home Automation System (HA) For the Smart City Pilot Project at IIT Kanpur.

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.

The details of the tender are available on the www.iitk.ac.in/centralstores/tenders & www.tenderhome.com site.

Time Schedules:

Sr No.	Description of Event	Date and Time
1	Pre-bid Meeting	6 June 2016 3:00 PM
2	Last Date & Time for receipt of tender papers	17 June 2016 3:00 PM
3	Date of technical bid opening of tender	21 June 2016 3:00 PM
4	Date of financial bid opening of tender	27 June 2016 3:00 PM
5	Venue	Department of Electrical Engineering

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.

Saikat Chakrabarti
Project Investigator (PI)
Associate Professor
Department of Electrical Engineering
Indian Institute of Technology Kanpur 208016 India
Email: smartcityiitk@yahoo.in
Phone: +91-512-679-6936

DEPARTMENT OF ELECTRICAL ENGINEERING, INDIAN INSTITUTE OF TECHNOLOGY KANPUR, KANPUR-208016
Phones: 0512-679-6936............ (O)
e-mail: smartcityiitk@yahoo.com

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DEPARTMENT OF ELECTRICAL ENGINEERING, INDIAN INSTITUTE OF TECHNOLOGY KANPUR, KANPUR-208016
Phones: 0512-679-6936............ (O)
e-mail: smartcityiitk@yahoo.com

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INDIAN INSTITUTE OF TECHNOLOGY KANPUR
ELECTRICAL ENGINEERING DEPARTMENT

I. 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 Advanced Metering Infrastructure (AMI), System Integration (SI) and Home Automation Systems for The Smart Grid Pilot Project At IIT Kanpur".**

2. The estimated cost of work is **Rs. 3.0 Crore (Rupees Three Crores only).** This estimate, however, is given merely as a rough guide.

List of Documents to be submitted with the tender :

- Required Experience / completion certificates of similar nature of works.
  The works certificates submitted by the bidder clearly indicate the details as mentioned in the eligibility criteria.

- The completion certificate cost of the similar work.
- Actual date of completion of the work.
- Copy of valid electrical licence.
- Copy of Service Tax Registration No.
- Details of turn over during the last three years.
- E.M.D. (Earnest Money Deposit).

3. Criteria of eligibility

   a) 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 % value of the estimated cost during last 7 (seven) years. (At least on work of them should be in Central Govt./Central autonomous bodies/Central PSU/State PSU/State Govt.).

   b) Similar nature of works mean, " The execution of complete solution for AMI (Advanced Metering Infrastructure) and its integration with SCADA/DMS/Smart Home".

   c) The supplier shall have turnover of 100% of the estimated value for the last 3 financial years.

   d) Joint venture is allowed but the main bidder should have at least experience of AMI solution execution, and shall qualify all the eligibility criteria required as above. If the main bidder sublets system integration (SI) and Smart home automation part, they shall submit work credentials for atleast two completed projects with cost in the field of SI and HA by the sublet party.

   e) Vendor (Main bidder) should be a CMMI level 5 company.

   f) **Authorization from manufacturer**: In the case of a bidder offering to supply goods under the contract which the bidder did not manufacture or otherwise produce, the bidder has been duly authorized by the goods manufacturer or producer to supply the goods in India. The manufacturer will have to endorse guarantee of the supplied goods in favor of IIT Kanpur.

   g) Having Service tax, ESI & EPF registration No. of government authorities.

   h) Having valid electrical license.

   i) Tenderer shall quote rates as per various terms and conditions of the said form which will form part of the agreement.

   j) 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.

DEPARTMENT OF ELECTRICAL ENGINEERING, INDIAN INSTITUTE OF TECHNOLOGY KANPUR, KANPUR-208016
Phones: 0512-679-6936............ (O)
e-mail: smartcityiitk@yahoo.com

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4. 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. The tender shall be accompanied by earnest money of **Rs. 600000/- (Rs. 6 lakhs only)** in the form of Receipt Treasury Challan / Bank Guarantee of Nationalized Bank / 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.

5. 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 an 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.

6. 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.

7. 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.

8. 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 Annexure – 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.

9. 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.

10. 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.

11. 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:

DEPARTMENT OF ELECTRICAL ENGINEERING, INDIAN INSTITUTE OF TECHNOLOGY KANPUR, KANPUR-208016
Phones: 0512-679-6936............ (O)
e-mail: smartcityiitk@yahoo.com

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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

DEPARTMENT OF ELECTRICAL ENGINEERING, INDIAN INSTITUTE OF TECHNOLOGY KANPUR, KANPUR-208016
Phones: 0512-679-6936............ (O)
e-mail: smartcityiitk@yahoo.com

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II. UNDERTAKING FROM THE TENDERER

(ANNEXURE – A)

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 here forwarded

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:

DEPARTMENT OF ELECTRICAL ENGINEERING, INDIAN INSTITUTE OF TECHNOLOGY KANPUR, KANPUR-208016
Phones: 0512-679-6936............ (O)
e-mail: smartcityiitk@yahoo.com

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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:

<div align="right">

For on the behalf of the Director

Signature _____

Designation _____

</div>

_____
DEPARTMENT OF ELECTRICAL ENGINEERING, INDIAN INSTITUTE OF TECHNOLOGY KANPUR, KANPUR-208016
Phones: 0512-679-6936........... (O)
e-mail: smartcityiitk@yahoo.com

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ELECTRICAL ENGINEERING DEPARTMENT

III. GENERAL DETAILS OF TENDER

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

Name of Work: **Supply, Installation, Testing, and Commissioning of Advanced Metering Infrastructure (AMI), System Integration (SI), and Home Automation Systems for Smart City Pilot Project at IIT Kanpur.**

i)	Estimated Cost of the work	:	**Rs 3 crore.**
ii)	Earnest Money	:	**Rs 6 lacs**
iii)	Performance Guarantee	:	5% of the Tendered Value.
iv)	Security Deposit	:	5% of the Tendered Value of the work.

Officer inviting tender   :   <u>PI, Dept. of EE, IIT Kanpur</u>

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   :   <u>22 Days</u>.
acceptance for reckoning date of start

Time allowed for execution of work   :   12 <u>(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   :   DORD

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Phones: 0512-679-6936........... (O)
e-mail: smartcityiitk@yahoo.com

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IV. GENERAL CONDITIONS OF CONTRACT

1. **The scope includes:**
   a) Supply, Installation, Testing and Commissioning of Advanced Metering Infrastructure (AMI), System Integration (SI), and smart home Systems under Smart City Pilot Project at IIT Kanpur.
   b) Open Source Code availability for future modification for R&D and installation support services.

2. **Bid Price**

   a) The contract shall be for the full quantity as described above. Corrections, if any, shall be made by crossing out, initialing, dating and re writing. **The cost of the three phase Smart Meters is to be quoted including the cost of required CT's of ratio 100:5.**

   b) All duties, taxes and other levies payable on the raw materials and components shall be included in the total price. **Except Central Excise Duty & CDEC** (custom duty), as IIT Kanpur is exempted from these duty.

   c) Sales tax in connection with the sale shall be shown separately.

   d) The rates quoted by the bidder shall be fixed for the duration of the contract and shall not be subject to adjustment on any account.

   e) The Prices shall be quoted in Indian Rupees only.

   f) The service tax has not to be included into rate. It will be reimbursed by the institute as per reverse mechanism.

3. Each bidder shall submit only one quotation/tender.

4. **Validity of Quotation/Tender**

   Quotation shall remain valid for a period not less than 60 days after the deadline date specified for submission.

5. **Evaluation of Quotations/Tender**

Note: The bidder has to submit their quotation/offers in two envelopes. One envelope will contain Technical particulars/Technical bid. The second envelope will contain the Quoted offers/Financial bid.

Quotations/Tenders of only the following bidders will be evaluated:

(1) Which are properly signed and stamped.

(2) Conform to the terms and conditions, and specifications.

(3) The filled Technical particular/Technical bid will be evaluated as per the specifications and requirements in the Tender document and quotations of only the vendors meeting the Technical specifications will be shortlisted for opening of their Quoted offers/Financial bid.

DEPARTMENT OF ELECTRICAL ENGINEERING, INDIAN INSTITUTE OF TECHNOLOGY KANPUR, KANPUR-208016
Phones: 0512-679-6936............ (O)
e-mail: smartcityiitk@yahoo.com

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6. **Award of contract**

The Purchaser will award the contract to the bidder whose quotation has been determined to be substantially responsive (includes technically suitable) and who has offered the lowest evaluated quotation price.

   7.1   Notwithstanding the above, **the Purchaser reserves the right to accept or reject any quotations and to cancel the bidding process and reject all quotations at any time prior to the award of contract.**

   7.2   The bidder whose bid is accepted will be notified of the award of contract by the Purchaser prior to expiration of the quotation validity period. The terms of the accepted offer shall be incorporated in the purchase order.

7. Warranty/ guarantee shall be 36 months for the supplied goods.

8. Defect liability period for comprehensive maintenance of the AMI, System Integration and Home automation will be for 1(one) year from the date of completion of the project. After completion of defect liability period comprehensive maintenance of the entire system for the 2nd, 3rd and 4th year will be required from bidder, the charges for which is to be specified in the financial bid.

9. We look forward to receiving your quotations/tender and thank you for your interest in this project.

10. 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 PI 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.

DEPARTMENT OF ELECTRICAL ENGINEERING, INDIAN INSTITUTE OF TECHNOLOGY KANPUR, KANPUR-208016
Phones: 0512-679-6936............ (O)
e-mail: smartcityiitk@yahoo.com

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11. **Contract Document**

11.1 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.

11.2 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 contactor 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.

12. 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.

13. **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, Dept. 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.

14. 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.

15. Canvassing in connection with tenders is prohibited and the tenders, submitted by the tenderers who resort to canvassing, are liable for rejection.

DEPARTMENT OF ELECTRICAL ENGINEERING, INDIAN INSTITUTE OF TECHNOLOGY KANPUR, KANPUR-208016
Phones: 0512-679-6936............ (O)
e-mail: smartcityiitk@yahoo.com

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a. Tenderers shall have to sign the attached declaration (Annexure 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 contactor 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.

16. 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.

17. **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.

   a. 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.

   b. **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.

18. **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. 10 % will be released after acceptance of the system.

DEPARTMENT OF ELECTRICAL ENGINEERING, INDIAN INSTITUTE OF TECHNOLOGY KANPUR, KANPUR-208016
Phones: 0512-679-6936............ (O)
e-mail: smartcityiitk@yahoo.com

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19. **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.

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

      9.2.1   Shop Floor drawings/Detailed technical drawings/Technical particulars of the AMI, SI & Smart Home equipments.

20. **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 AMI, SI & Smart Home system of project.

   b.   Layout drawings showing details of size, type and mode of installation of above systems.

   c.   Technical literature, test certificates and operation and maintenance manuals required.

21. **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**.**

22. **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 contactor, 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.

DEPARTMENT OF ELECTRICAL ENGINEERING, INDIAN INSTITUTE OF TECHNOLOGY KANPUR, KANPUR-208016
Phones: 0512-679-6936............ (O)
e-mail: smartcityiitk@yahoo.com

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23. **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.

24. 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.

25. The tender document and drawings in respect of the work can be seen office of the DR, Stores and Purchase, IIT Kanpur.

26. The tender document contains **52** pages. No page of the tender document shall be removed, mutilated, detached or cancelled.

27. 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.

28. 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.

29. Delay penalty (as per the government rule or CPWD General Conditions of Contract 2014 relevant clause).

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

CONTRACTOR   **PI**

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Phones: 0512-679-6936............ (O)
e-mail: smartcityiitk@yahoo.com

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V.   DECLARATION OF BIDDER

(ANNEXURE B)

Indian Institute of Technology, Kanpur

Department of Electrical Engineering

Name of Work: **Supply, installation, testing and commissioning of the Advanced Metering Infrastructure (AMI), System Integration (SI) and Home Automation System for smart city pilot project at 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:

DEPARTMENT OF ELECTRICAL ENGINEERING, INDIAN INSTITUTE OF TECHNOLOGY KANPUR, KANPUR-208016
Phones: 0512-679-6936………… (O)
e-mail: smartcityiitk@yahoo.com

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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 Advanced Metering Infrastructure (AMI), System Integration (SI) And Home Automation System (HA) For the Smart City Pilot Project 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 PI / 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 PI / 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.

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Phones: 0512-679-6936............ (O)
e-mail: smartcityiitk@yahoo.com

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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 Advanced Metering Infrastructure (AMI), System Integration (SI) And Home Automation System (HA) For the Smart City Pilot Project system installation for 1 year from the date of final completion. The guarantee shall be submitted in the Performa given in Annexure-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

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Phones: 0512-679-6936............ (O)
e-mail: smartcityiitk@yahoo.com

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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. 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 confirming 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.

DEPARTMENT OF ELECTRICAL ENGINEERING, INDIAN INSTITUTE OF TECHNOLOGY KANPUR, KANPUR-208016
Phones: 0512-679-6936............ (O)
e-mail: smartcityiitk@yahoo.com

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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 **Advanced Metering Infrastructure (AMI), System Integration (SI) And Home Automation System (HA) For the Smart City Pilot Project** layout plans with sectional drawing.
- Detailed electrical and equipment layout with supports and principle supplier calculation sheets.
- Any other drawings / documents as required by Owner / PI necessary for the project.

DEPARTMENT OF ELECTRICAL ENGINEERING, INDIAN INSTITUTE OF TECHNOLOGY KANPUR, KANPUR-208016
Phones: 0512-679-6936............ (O)
e-mail: smartcityiitk@yahoo.com

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1.11. 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.

1.12. 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.

1.13. 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.

1.14. 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.

1.15. 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.

1.16. 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

DEPARTMENT OF ELECTRICAL ENGINEERING, INDIAN INSTITUTE OF TECHNOLOGY KANPUR, KANPUR-208016
Phones: 0512-679-6936............ (O)
e-mail: smartcityiitk@yahoo.com

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as required and approved by the PI. All the equipments shall be connected and tested in the presence of an authorized representativee of the PI.

1.17. 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.

1.18. 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

DEPARTMENT OF ELECTRICAL ENGINEERING, INDIAN INSTITUTE OF TECHNOLOGY KANPUR, KANPUR-208016
Phones: 0512-679-6936............ (O)
e-mail: smartcityiitk@yahoo.com

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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.

1.19.   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.

DEPARTMENT OF ELECTRICAL ENGINEERING, INDIAN INSTITUTE OF TECHNOLOGY KANPUR, KANPUR-208016
Phones: 0512-679-6936............ (O)
e-mail: smartcityiitk@yahoo.com

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1.20. 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 **Advanced Metering Infrastructure (AMI), System Integration (SI) And Home Automation System (HA) For the Smart City Pilot Project** 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 AMI system duly approved by the local authorities concerned, if required and shall bear all expenses, if any, in connection with the same.

1.21 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.

1.22. Operating instruction and maintenance manual

Upon completion and commissioning of AMI, SI and Home Automation systems 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.

1.23. 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.

DEPARTMENT OF ELECTRICAL ENGINEERING, INDIAN INSTITUTE OF TECHNOLOGY KANPUR, KANPUR-208016
Phones: 0512-679-6936............ (O)
e-mail: smartcityiitk@yahoo.com

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1.24. 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.

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

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

1.27. 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.

1.28. 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.

DEPARTMENT OF ELECTRICAL ENGINEERING, INDIAN INSTITUTE OF TECHNOLOGY KANPUR, KANPUR-208016
Phones: 0512-679-6936............ (O)
e-mail: smartcityiitk@yahoo.com

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ELECTRICAL ENGINEERING DEPARTMENT

VII. GUARANTEE PERFORMA FOR ADVANCED METERING INFRASTRUCTURE (AMI), SYSTEM INTEGRATION (SI) AND HOME AUTOMATION SYSTEMS

(ANNEXURE – C)

Guarantee Performa for Advanced Metering Infrastructure (AMI), System Integration (SI) and Home Automation Systems for the Smart Grid Pilot Project at IIT Kanpur.

We hereby guarantee the year round performance for Advanced Metering Infrastructure (AMI), System Integration (SI) and Home Automation Systems Installations (Hardware & software) which we have installed in the buildings described below:

BUILDING   -   ....

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 SPECIFICATION FOR ADVANCED METERING INFRASTRUCTURE (AMI), SYSTEM INTEGRATION (SI) AND HOME AUTOMATION SYSTEMS FOR THE SMART GRID PILOT PROJECT AT IIT KANPUR.

ABBREVIATIONS USED

1. AMI — Advanced Metering Infrastructure
2. ODS — Operational Data Store
3. SI — System Integration
4. HAN — Home Area Network
5. MDAS — Meter Data Acquisition System
6. DLMS — Device Language Message Specifications
7. DMS — Data Management Systems
8. BMS — Building Management Systems
9. PV — Photovoltaic
10. NAN — Neighborhood Area Network
11. RF — Radio Frequency
12. SCADA — Supervisory control and Data Acquisition
13. CIM — Common information model
14. DCU — Data concentrator unit
15. DB — Distribution box
16. PLCC — Power line carrier communication
17. TOD — Time of day
18. ToU — Time of Use
19. HES — Head end system
20. IHD — Intelligent home devices
21. SIRIUS — Scalable Intelligent Robust Indigenous User-friendly Solution
22. OPC — Object Linking and Embedding for Process Control
23. ODBC — Open Database Connectivity
24. OLEDB — Object Linking and Embedding, Database
25. SNTP — Simple Network Time Protocol
26. NMEA — National Marine Electronics Association
27. MMI — Man Machine Interface
28. ESB — Enterprise Service Bus

DEPARTMENT OF ELECTRICAL ENGINEERING, INDIAN INSTITUTE OF TECHNOLOGY KANPUR, KANPUR-208016
Phones: 0512-679-6936............ (O)
e-mail: smartcityiitk@yahoo.com

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OVERALL ARCHITECTURE OF AMI, SYSTEM INTEGRATION AND HOME AUTOMATION

The overall architecture of the required AMI, system integration, and home automation solution is schematically shown in Figure 1.
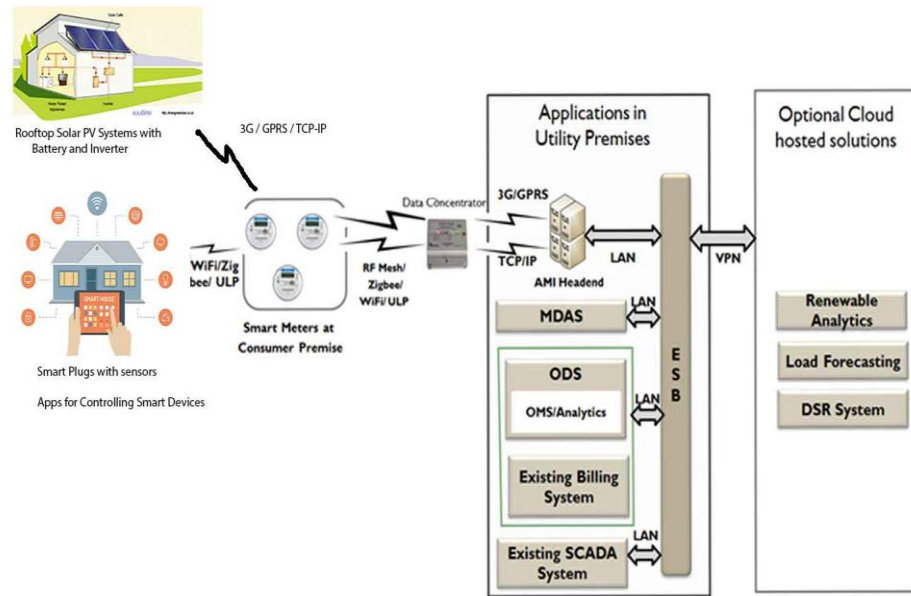
Figure 1: Overall architecture of AMI, system integration, and home automation

1   AMI OVERVIEW

1. The important tasks of AMI include acquisition and transmission of load information such as load profile, power quality etc., and receive data from the control center, such as dynamic pricing demand response information. The important components of the AMI are:
   - Smart meter at consumer end
   - Wireless Communication Network with setting up existing optical fiber network of identified IITK houses as backup
   - Head End System
   - IT Infrastructure for the Head End

2. AMI is to be integrated with the SCADA system which will be installed at the substations of IIT Kanpur. SCADA systems are the part of separate a tender, which has been already finalized.
3. The AMI needs to integrate twenty (20) smart homes (single phase) and five (5) hostel/lab/library premises (three phase) inside IIT Kanpur Campus. The smart homes will have smart meters, and participate in demand response program. The 20 houses are placed at discreet locations within the campus, for the details of which you can contact the undersigned or the team.

DEPARTMENT OF ELECTRICAL ENGINEERING, INDIAN INSTITUTE OF TECHNOLOGY KANPUR, KANPUR-208016
Phones: 0512-679-6936............ (O)
e-mail: smartcityiitk@yahoo.com

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1.1 MANDATORY SCOPE OF WORK

1. Supply, Installation, Testing and Commissioning of **Twenty (20) Single-Phase (10-60A)** and **Five (5) Three-Phase Smart Meters (100 A, CT operated)** as per the specifications mentioned in the tender document.
2. Supply, Installation, Testing and Commissioning of AMI basic and supporting components to integrate the information related to 25 new Smart Meters .The system should also have the capability to be able to handle 5000 Meter points in future. IIT KANPUR campus has one 33kV/11 kV Substation and nine (9) 11kV/440 V Substations.
3. Configuration of basic AMI components and supporting system hardware, software and other communication devices. IITK will provide associated part of existing optical fiber network to configure the AMI communication.
4. Supply of system hardware and software as detailed in the following section.
5. Training on smart meter configuration, Headend platform, and associated communication network.

1.2 OPTIONAL SCOPE OF WORK

1. For 300 homes in which the smart meters already exist, do a retrofit solution and include them into smart metering solution. These meters will be integrated with the newly installed smart meters.

1.3 FEATURES & SPECIFICATIONS OF AMI SYSTEMS

The following are the components required:

1. Smart Meters: Twenty (20) single-phase meters, and five (5) three-phase meters.
2. Wireless Communication infrastructure.
3. Data collectors and head end system.

1.3.1   SMART METER SPECIFICATIONS

A. MANDATORY FUNCTIONAL REQUIREMENTS

The mandatory functional requirements of the Smart Meter are provided below:
1. Should fit in the space of existing meters
2. Should support open protocol like DLMS, COSEM
3. Should provide remote switching from prepayment to credit mode and vice versa
4. should support two way communications
5. Should support internal communication interface for DCU / HES and HAN device.
6. Should avail port for local communication
7. Should be capable of storing 45 days of 15 minutes consumption data
8. Should support measurement of power quality parameters
9. Should support 4 quadrant measurement of power(Import/Export)
10. Should provide tamper detection and notifications
11. Should consume minimum power.
12. Should have security features incorporated
13. Should provide programmable setting with effective date and time
14. Should record billing, load survey, event & tampers, instantaneous and demand parameters
15. Should provide feature for local and remote configuration
16. Should support remote connect/ disconnect of power supply on both phase and neutral

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e-mail: smartcityiitk@yahoo.com

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17. Should provide feature for firmware upgrade, tariff configuration, load limit setting, tamper reset, MD(Maximum Demand) reset and time set transaction. These features should also be possible to realize remotely.
18. Should have load limiting provision with audible alarm
19. Should be able to notify power outage/restoration detection
20. Should have capability to communicate over either Zigbee/WiFi/PLCC in addition to TCP/IP.
21. The same meter will be utilized for roof top solar units by enabling Imp-Exp feature remotely.

B. THE GUARANTEED TECHNICAL SPECIFICATIONS OF AC SINGLE AND THREE-PHASE SMART METERS IS TABULATED AS BELOW

The Bureau of Indian Standard (BIS) has recently published a Standard on smart meters. This Standard, IS 16444:2015 "A.C static direct connected watthour smart meter class 1 and 2 - specification", is the first of its kind, specifies static watt-hour smart meters of accuracy class 1 and 2 for the measurement of a.c. electrical active energy of frequency 50 Hz for single phase and three phase balanced and unbalanced loads

Sr. No.	Technical Specifications	As per our Requirements	Details as per Offer
1	Name of Manufacturer		
2	Type of Meter (Model No.)		
3	Accuracy	Class 1.0	
4	Standard Applicable	IS-13779 with Latest revision, IS 16444:2015 IS15884:Alternating Current Direct Connected Static Prepayment Meters for Active Energy (Class 1 and 2) IS15959 : Data Exchange for Electricity Meter - Reading Tariff and Load Control IS 14434 (1998) Polycarbonate Moulding & Extrusion Materials. IS 14772:2000General Requirements For enclosures For Accessories Electrical Installations. IEC 61850 MMS protocol. COSEM for 3-phase meters as per IS 15959.	
5	Rated voltage a. Single phase b. Three Phase	a.240V b.415 V	
6	Operational Voltage (Single Phase/Three Phase)	240 Volts/415 Volts, Voltage Variation range: -30% to +20%. As per IS 13779	
7	Rated Current	10-60 Amps(Single- phase), 100 Amps (Three-phase), Imax = 120%Ib, Starting Current = 0.2%Ib	
8	Meter Constant	3200 Impulse / KWh	

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Phones: 0512-679-6936............ (O)
e-mail: smartcityiitk@yahoo.com

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9	Frequency	50 Hz (+/- 5%)	
10	Power Factor	Zero (lagging) through to Unity to zero (leading).	
11	Cut off voltage (at which meter stop working)	-50%	
12	Communication Options	RS232 Compatibility for SCADA,AMI integration Modems(PSTN/GPRS/GSM) Master/Slave Arrangement Wi-Fi, ZigBee, PLCC Internal Modem Power Supply ANSI type 2 optical port	
13	Remote Connect & Disconnect	Connection/Disconnection Through Latching Relay	
14	Stored Data	TOD (Time of day) data Two seasons & Two TOD tariff tables configuration in meter	
15	Load Survey Data parameters to be logged for each Survey integration period (SIP) Last 45 days load survey to be available in meter. SIP can be configured as 15/30/60 minutes.		
16	Peak load Management	Over Current Limit Upper limit 120% Over Load Limit Reduced Load Limit Duration for thresholds Max one Hour in resolution of 01 sec	
17	Communication setting	Two Way communication IP address Port Number APN name Allowed SMS sender Max. 2 Numbers	
18	Software	Software for programming and reading of meter compatible with windows, AMI system Allow offline configuration. Generate Reports.	
19	Temperature range of operation	As per IS 13779	

20	a. Continuous current rating (Amp.)
	   i) Single phase Meters
	   ii) Three Phase Meters
	b. Running with no load & at 115% voltage
		a.
		i) 60 Amps
		ii)100 Amps
		
		b. No creeping	

21	Short time over current for one half cycle at rated frequency. a. Single Phase Meters b.Three Phase Meters(CT operated)	a. 30 Imax. b. 20 Imax.	

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22	Starting current (min) at which meter shall run & continue to run.	0.2% of Ib.	
23	Power loss at rated frequency & reference temperature a) Current Circuit at rated current.(1ph/3ph) b) Voltage circuit at rated current. .(1ph/3ph)	As per IS-13779	
24	Performance of meter in tamper conditions		
	i)Phase-neutral interchanged /Phase to phase interchanged	Should work within specified accuracy and shall record correct energy	
	ii)Main & load wire are interchanged	Should work within specified accuracy and shall record correct energy	
	iii)Load is not terminated back to meter & current is drawn through local earth fully or partially	Should work within specified accuracy and shall record correct energy	
	iv)Indication on above tamper conditions	LCD/LED indication	
25	Suitability of meter to sustain over voltage i..e .phase to phase voltage injected between phase & neutral.	Should sustain	
26	LCD indicators for different tamper conditions	Reverse Current Earth tamper Neutral Missing Magnet tamper	
27	Meter constant(Impulse / kwh)	To be specified by supplier	
28	Electromagnetic compatibility (EMI/EMC severity level)	As per IS 13779/99	
29	Effect on accuracy of external magnetic field & harmonics	Should work within accuracy as per specification	
30	Effect of accuracy in tamper conditions	Should work within accuracy	
31	Approximate weight of meter	To be mentioned	
32	Type of body	To be specified	
33	Whether mounting of components on PCB shall be SMT type	SMT type and ASIC technology	
34	Whether quality assurance plan submitted	Required to be submitted.	
35	Testing certificates	As per specifications.	
36	Whether offered meter type tested as per IS: 13779/99 or IEC 62053 and as per the requirement of specification. (Indicate name of laboratory / Ref. of report no. and date).	Name of Laboratory to be specified. Page nos. of offer to be specified.	
37	Guarantee	5 year from the date of supply OR 5 years	

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Phones: 0512-679-6936............ (O)
e-mail: smartcityiitk@yahoo.com

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		from the date of commissioning of meter whichever is earlier.	
38	BIS license No.& date with its validity for ISI certification mark on meter	To be mentioned	
39	ISO accreditation no. & date with its validity	To be mentioned	
40	Past experience	Copies of orders to be enclosed	

C. OPTIONAL REQUIREMENTS FOR SMART METERS

The value adding/optional functional requirements of the smart meters are provided below:
1. Should provide auto registration.
2. Should have feature for randomization of data transfer on power restoration.
3. Should have feature for randomization in switching.
4. Meter operation should not be affected by any external interference.
5. Should have time synchronization feature.
6. Should display billing information.
7. Remote top up and local top up should be possible in prepaid option.
8. Should display prepaid or credit mode, connected or disconnected status, and identify the registers separately.
9. HAN interface should be open and non-proprietary.
10. Diagnostic parameters should be stored.

1.3.2 COMMUNICATION ARCHITECTURE SPECIFICATIONS

A. MANDATORY REQUIREMENTS

The mandatory functional requirements of the communication architecture (including DCU, repeaters and other associated components) are provided below:

1. Should enable multi point communication architecture.
2. Should be suitable to connect to either ZigBee/Wi-Fi/PLCC, in addition to GPRS and TCP/IP protocols.
3. Should have negligible power requirement.
4. Should support two way communications.
5. Should provide early 100% Geographic coverage.
6. Should scale up to 5000 meter points spread across the IITK campus.
7. Should have suitable bandwidth available.
8. Should be highly reliable.
9. Should have negligible operating cost.
10. Should have low latency.
11. Should have the same upload and download speed.
12. Should provide strong security features.
13. Should have low installation costs.

Vendor needs to compare and justify about choosing a particular protocol for communication in smart home and AMI solutions in his response.

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Phones: 0512-679-6936............ (O)
e-mail: smartcityiitk@yahoo.com

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B. OPTIONAL REQUIREMENTS

The value adding/optional functional requirements of the communication architecture are provided below:
1. Should have low fixed and running costs.
2. Should have reduced infrastructure for managing IP.

1.3.3 TECHNICAL SPECIFICATIONS FOR DATA CONCENTRATOR UNITS

S.No	Characteristic	Details as per offer
1	Maker's Name & Country.	
2	Total Power Consumption of DCU	
3	Minimum starting current of the DCU	
4	Display	
5	Type of material of DCU Base & Cover	
6	EEPROM / SD card	
7	Seal	
8	Guarantee for satisfactory operation of DC.	
9	Standards to which the meter conforms.	
10	Overload capacity or Max Input D.C. Supply	

1.3.4 HEADEND SYSTEM

A. MANDATORY REQUIREMENTS

The mandatory functional requirements of headend system are provided below:
1. Should support domestic and feeder meters (single as well as three phase).
2. Should support multiple communication options.
3. Should be highly scalable.
4. Should support scheduled and on demand reads.
5. Should collect all data available in meter including logs. This should extend to but is not limited to the following:
   - Half hourly or lesser duration data for multiple channels such as kWh, kW, kVA, kVAR, Current, Voltage, Frequency.
   - Above data by phase, import/export.
   - Daily reads.
   - Monthly reads.
   - Alerts and alarms.
6. Should support transactions with meter and communication devices.
7. Should integrate with communication network management system.
8. Should support inbound and outbound communication.
9. Should support system security.
10. Should have a provision of alerts and alarms based on at least the following events:

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Phones: 0512-679-6936............ (O)
e-mail: smartcityiitk@yahoo.com

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Outage, Magnetic Tamper, Cover Opening, Phase Jamming/Jump/Imbalance/Closure, Communication Failure, Radio Jamming, and SIM/Card removed.

B. OPTIONAL REQUIREMENTS

The Value adding/Optional functional requirements of Headend System are provided below:
1. Should support standard and custom reports.
2. Should have Service Oriented architecture.

1.4   AMI SYSTEM – NON FUNCTIONAL REQUIREMENTS

The table below provides a detail on the general and non-functional requirements:

S.No.	Area	Category	Sub Category	Technical Compliance Requirement Description	Details as per offer
1	Non Functional	Security and Access Control	User Roles	The solutions shall support multiple user roles with varying levels of privileges for data access and data modification. At a minimum, these should include: - Administrator - Read Only Access - Update Access	
2	Non Functional	Security and Access Control	Audit and Logging	The solution shall support the logging of user access and sessions and retain these logs for a specified period of time	
3	Non Functional	Security and Access Control	Integrated Security	The solution shall not permit the use of any master roles or super user roles in integrated processes	
4	General	Hardware and DC	Environments	The following environments will be required to be setup: -Development (2% volume) -Test (2% volume) -QA/Training (50% volume) -Production (100% volume)	
5	General	Hardware and DC	Sizing and Specifications	The supplier must provide the hardware specifications and sizing to cover all environments and expected data growth	
6	Non Functional	Hardware and DC	Client Operating	The solution must be compatible for installation in environment with Windows 7	

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			System	and above operating system	
7	Non Functional	Hardware and DC	Client Browsers	The solution must be compatible for installation in environment with Internet Explorer and Chrome	
8	Non Functional	Hardware and DC	Tablets (Future)	The solution shall support Android based tablets	
9	Non Functional	Disaster Recovery and Backups	Setup	Supplier shall provide a detailed deployment plan that shows an integrated Active-Passive disaster recovery setup. The plan shall define recovery point objective (RPO) and the recovery time objective (RTO) details as well	
10	General	Testing and QC	Phases	The following test phases should be covered during this project: - Unit Test - System Integration Test - User Acceptance Test - Performance Test (supplier to recommend)	
11	General	Testing and QC	End-to-End Testing	Supplier shall conduct end to end testing involving actual meters	
12	General	Testing and QC	Tools	The supplier shall recommend the tool for performance/load testing	
13	General	Testing and QC	Tools	Test case definitions shall be done in Excel and the versioning shall be managed via SharePoint or any equivalent tool	
14	General	Project Management	Phases	The solution shall be delivered using the standard phases of the waterfall model: - Requirements - Design - Development	

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				- Testing - Deployment (Cutover/GoLive)	
15	General	Project Management	Planning	The suppler shall provide a detailed plan of activities for this project and shall appoint a project manager to execute the plan. The plan shall also include the list of deliverables produced in each phase	
16	General	Project Management	Compliance	The supplier shall comply with any project management processes that IITK requires them to follow.	
17	General	Software Licensing	Supply	The supplier shall provide complete details of the software required for this project and the list of software licenses that will be supplied by them	
18	General	Software Licensing	Non-Supply	The supplier shall provide complete details of software for the successful implementation of this project	
19	Non Functional	Training	Content and Language	The supplier shall provide all the training materials in English language for proper operation of the solution	
20	Non Functional	Training	Delivery	The supplier shall conduct the training for a fixed number of users. The details of the training shall be proposed by the supplier	
21	Non Functional	Documentation	Language	All the necessary documentation, including the deliverables shall be in English	
22	General	Warranty	Scope	Supplier shall provide dedicated resources on site to	

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Phones: 0512-679-6936............ (O)
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				immediately address and resolve issues during the warranty period.	
23	Non Functional	Ongoing Support	Period	Supplier shall offer ongoing support for the solution on an annual basis, initially for a period of 2 years	
24	Non Functional	Ongoing Support	Scope	Ongoing support shall include: - monitoring the solution - resolution of minor issues - applying patches as released by software vendor	
25	Non Functional	Ongoing Support	SLA Reporting	Suppler shall define and agree an SLA reporting mechanism with IITK based on the SLA model finalized	
26	Non Functional	Ongoing Support	Location	Supplier shall recommend a cost optimized model for onsite and offshore support for the solution	
27	Non Functional	Ongoing Support	Tools	Supplier shall provide a ticketing tool and call number for IITK to raise and record support tickets	
28	Non Functional	Ongoing Support	Access to Support	Supplier shall provide access to support via email, web login to ticketing tool and phone calls	

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Phones: 0512-679-6936............ (O)
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2. SYSTEM INTEGRATION
2.1 MANDATORY SCOPE OF WORK

1. Supply, Installation, Testing and Commissioning of **MDAS, Operational Data Store (ODS), Analytics platform, and customer portal** as per the specifications mentioned in the tender document.
2. Supply, Installation, Testing and Commissioning of SI basic and supporting components to integrate the head end system, existing SCADA system, MDAS, ODS, Analytics platform, and customer portal.
3. Configuration of SI components and supporting system hardware, software and other communication devices.
4. Supply of system hardware and software as detailed in the following section.
5. Training on MDAS, ODS, Analytics, Customer platforms and associated SI infrastructure configuration.

2.2 OPTIONAL SCOPE OF WORK

1. Supply of cloud based applications that includes, but not limited to the renewable analytics, demand response, and load forecasting solutions.
2. Supply of billing solutions that includes billing for Time of Use (ToU), max. demand pricing, in addition to basic billing options.

2.3 SUPPORTING COMPONENTS OF THE AMI FOR SYSTEM INTEGRATION (SI)

The following are the components required:

1. Meter Data Acquisition System
2. Operational Data Store (ODS)
   - Analytics
   - Customer Portal

2.4 METER DATA ACQUISITION SYSTEM (MDAS)

The functional requirements of MDAS including theft detection and analytics features are provided below:

1. Should serve as the master data repository for meter data
2. Should be seamlessly integrated with the AMI system components
3. Should provide multi-channel support
4. Should support different interval lengths
5. Should be able to manage meter reading schedules
6. Should be integrated to the headend for billing read
7. Should be integrated to the headend for interval reads and alarm data. This shall include:
   a) half hourly or lesser duration data for multiple channels such as kWh, kW, kVA, kVAR, Current, Voltage, Frequency
   b) above data by phase, import/export
   c) daily reads
   d) monthly reads
   e) alerts and alarms

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8. Should be integrated with the headend of different vendors in near real time to obtain an 'On Demand' read or meter snapshot

9. Should be integrated with the headend in near real time to perform a 'Meter Ping' function

10. Should be integrated with the headend in near real time to perform the 'Remote Cut/Reconnect' function.

11. The following alarm data should be collected from the headend: Outage, Magnetic Tamper, Cover Opening, Phase Jamming/Jump/Imbalance/Closure, Communication Failure, Radio Jamming, SIM removed

12. Integration with headend systems should use web services or other standard integration so that the same may be easily expanded to newer headends.

13. Should support the CUT and RECONNECT functionality where the headend and meters have this feature.

14. Should collect data from the headends at least once in 24 hours automatically. Frequent data collection of less than 24 hour cycle will be preferred.

15. Should be automatically updated with meter information when new meters are added to the network.

16. Should maintain the passwords for each meter so that the same can be constant even when the headend changes due to any change in communication module.

17. Should remain integrated with headend independent of the telecom provider that is being used.

18. Should be integrated with the Billing system to provide the aggregated consumption and billing read to be used to perform the billing.

19. Should provide the aggregated consumption and billing read as per the customer billing cycle to the billing system.

20. Should have the feature to provide an aggregated consumption and billing read for any data as requested by the billing system

21. Should be updated with the customer properties such as postcode, customer type, connection type etc. from the billing system or portal so that these may be used by the MDAS in processing rules

22. Should provide interval data for a required period for a given customer site for review and analysis.

23. Should provide the details of meter events and alarms in the form of a timeline for the customer to portal for review and analysis.

24. Interval and event data sent by the MDAS should be able to be presented on the customer portal over the internet website.

25. Should be able to send aggregated consumption and demand data to ODS.

26. Should send outage and alarms to the Outage Management System in near real time.

27. Should have the feature to send an SMS alert on the basis of alert or exception received from the meter.

28. Should be integrated with the web service/service to send the SMS alerts

29. Should be able to send SMS alerts to business user or supervisor. These should be configurable

30. Should be able to send SMS alerts to end consumers, and should use the contact number provided in the customer contact details in Portal. The alerts should be configurable

31. Should be integrated with the SMTP server to send email alerts

32. Should be able to send email alerts to business user or supervisor. These should be configurable

33. Should be able to send email alerts to end consumers, and should use the email id provided in the customer contact details in Portal. The alerts should be configurable

34. Should have the feature to manually upload interval data and meter reads using files provided in the specific format

35. Should have the feature to manually enter the interval data and meter reads using forms and applications screens

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36. Should have the feature to view the installation data, customer and site properties, interval data, billing reads, alerts and alarms for a given customer and allow drill down where necessary
37. Should provide graphical view of interval data for a customer
38. The validation rules should be configurable in the MDAS and should be able to use historical values, reference values, averages etc.
39. Validation rules in the MDAS should allow configurable tolerance levels that can be changed from time to time
40. Validation rules in the MDAS should be able apply to particular sets of customers based on customer properties or site or installation properties
41. Validation rules should have sequence of operation and criticality defined and configurable
42. Validation rules in MDAS should all an aggregation of consumption at various levels of hierarchy to account for energy losses in the network as compared to the consumption at the end points
43. Should provide a high-low validation check
44. Should provide a missing values validation check
45. Should provide a consumption spike check
46. Should provide a check to compare master meter consumption against the aggregate consumption of sub meters
47. Should provide a class average check. In this check the customer's consumption profile is compared against the average profile for the customer class. There are 6 classes in total
48. Should have a check to detect abnormal usage that can be reasonably suspected to be theft of energy.
49. Should have a check to compart the present consumption with previous month, previous year and previous similar season
50. Should store a record of all validations performed on the particular set of data and whether that validation passed or failed
51. Should be configurable to determine which validation should create an exception and which validation should create an informational log entry
52. Where the set of data failed validation in the MDAS, a user should be able to manually edit and correct the data as per their expert decision
53. While editing data in the MDAS, the user should be able to edit multiple data items that form part of the data set in order to fix multiple issues in one go
54. When data is edited in the MDAS the user details and time shall be captured for record
55. On completion of the editing activity, it should be possible to revalidate the data using the validation rules
56. User should be able to override the validation rules as per their expert decision
57. Where there is missing values in interval data the MDAS should be able to estimate the missing values
58. Estimation should be based on industry standards for interpolation or extrapolation of available data
59. Should be configurable to complete an automatic estimation
60. Should be able to create an estimate for billing read as per the IITK rules in scenario where the required data is missing
61. Estimated data shall be tagged or recorded as such so that is it easily identified as estimated. The estimation process used shall also be recorded
62. Should have the capability to handle different types of alarms differently based on the severity and criticality classifications
63. Should be able to generate exceptions when certain alarms are raised based on a set of configurable rules

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e-mail: smartcityiitk@yahoo.com

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64. Should be able to correlate alarms with other activities such as work order on the same date to eliminate false alarms

65. All exceptions generated should be available in a work queue.

66. Exceptions in the MDAS work queue should be auto assigned to specific users for their resolution. The MDAS should also allow for reassignment of exceptions

67. Should record the user details and time when an exception is resolved

68. Certain exception types should be automatically resolved based on a set of configurable rules

69. Should be able to aggregate interval data to provide the total consumption for a particular period

70. Should be able to provide as many aggregate values as the number of consumption channels on the meter including import, export, reactive etc.

71. Should be able aggregate consumption on the basis of a meter hierarchy, and also provide a virtual aggregate of multiple meters for single customer with multiple sites

72. Should be able to aggregate consumption at customer class level for the purpose of reporting

73. Should be able to net out import and export consumption at interval level with matching time

74. Should be able to net out import and export consumption at aggregate level

75. Should be able to aggregate consumption data at network node level for the purpose of energy accounting

76. Should store the data for the past 5 years

77. Data beyond 5 years should be archived in a form such that it can be extracted for examination if so required, using standard data tools

78. Should store raw data as well as processed data for all meters. Versions of interval data shall be maintained along with a record of the source of the data and who updated it

79. Should provide a standard dashboard with the following details:
    a) Meters read in previous period
    b) Meter failed to read in previous period
    c) Exceptions Generated by type/region
    d) Exceptions Auto Resolved by type/region
    e) Estimates Created by customer class/region
    f) Billing Data sent to Billing System
    g) Alarms Generated by type/region
    h) Work Order Requests by region
    i) Cut/Reconnect Processed by customer class/region

80. Should generate a report on suspected theft cases on the basis of the validations done on the meter data and two levels of aggregation in the network hierarchy

81. Should generate a daily report of total number of meters read and total number of meters failed to read as a measure of the efficiency of the meter reading system. The report will provide breakup by region and customer class or similar parameters

82. Should generate a daily report of validations performed and validations that failed by validation type, customer class and region

83. Should generate a daily report of meter reads estimated by customer class and region

84. Should generate a daily report of exceptions that were auto resolved by the system by exception/validation type, customer class and region

85. Should provide a summary report of meters not read due to communications failure

86. Should provide a summary report of meters and associated with communications modules, that were newly added or underwent a change of association

87. Should provide a summary report of anomalies such as:
a) negative consumption
b) negative energy accounting

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e-mail: smartcityiitk@yahoo.com

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   c)   wide frequency fluctuation

   d)   duplicate records (meter number at multiple sites)

   e)   meter associated with multiple headends/communication modules

88. The MDAS must have an user friendly interface with easy to use information and functions

89. The MDAS should have a browser based interface on the client side or an extremely lightweight client application

90. The users should be able to import and export data in standard formats such as text, csv, xml, MS Excel etc.

91. Users should be able to perform batch functions of the type listed below:

   a)   Resolve multiple exceptions

   b)   Generate multiple billing determinants

   c)   Reassign multiple work queue items

   d)   Upload interval data for multiple meters

   e)   Upload alarm data for multiple meters

   f)   Create estimates for multiple meters

92. Existing solar installations and consumption data collected should be integrated with the headend

93. Should be compliant with SOA and use Web Services for integration with other applications

2.5 OPERATIONAL DATA STORE (ODS)

The functional requirements of Operational Data Store are provided below:

1. Should provide single view of network operational data

2. Should be able to hold historic data pertaining to but not limited to the following:

   a)   Communications events and alarms

   b)   Meter Reads

   c)   Meter exceptions and alarms

   d)   Network data

   e)   Device alerts

3. Should function as a central repository: a high performance database capable of holding Data Lake for at least 5000 meter points (including time-series), Relevant SCADA data, and other data related to meter alarms, customer data, faults etc.

4. Should support a desirable data model at least of the likes of Snowflake or Star, for ad hoc and periodic reporting

5. Should interface (via Service Bus) with other components (Head End, MDAS, ODS, SCADA, and other optional components such as billing system etc.) to capture data and trigger action on detected problems

6. Should function as a platform for predictive trend analysis, events and leakage management

7. Should have data export features with the capability to export data sets in various formats

8. Should capture real-time (semi real-time) high-frequency data (1 minute to 30 minute intervals)

9. Should have capability to develop custom analytics, required for research purpose, on the data available.

10. Scenario Development and Execution: an analytics engine capable of developing and executing scenarios, specific to power distribution system, efficiently for large data sets.

11. Should provide business operational insights leading to faster and more accurate decisions.

12. Should provide visual operations management portal (control centre) with the following:

   a)   A dashboard to manage the overall operations of SCADA as well as MDAS.

   b)   Views to allow users to monitor information and events

DEPARTMENT OF ELECTRICAL ENGINEERING, INDIAN INSTITUTE OF TECHNOLOGY KANPUR, KANPUR-208016
Phones: 0512-679-6936............ (O)
e-mail: smartcityiitk@yahoo.com

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c) Real-time \ semi real-time analysis and processing of events information
d) Send commands/requests/signals to MDAS and SCADA for the management of events and alerts based on the result of a certain scenario analysis.
e) Access on both desktop and mobile devices.

2.6 ANALYTICS

The Analytics will be part of the ODS platform. The system should have the capability to allow the development of customer analytics/algorithms to carry out the research work on the available data.

2.7 CUSTOMER PORTAL

The user, through customer portal, will have the functionality to view the dashboard containing information including but not limited to his energy consumption, such as load profile, power consumption, alerts, alarms, peak load over a customized period.

System Integration work is needed to integrate the ODS, AMI, SCADA data and other associated application data of the Smart City Project at IIT Kanpur. Therefore, associated SI infrastructure should be scalable and flexible in integrating the data exchange of various future applications also.

2.8 SYSTEM INTEGRATION OF EXISTING SCADA SYSTEM

The data available by the existing SCADA system is to be integrated to the ODS at the control Centre by the System Integrator. The details of SCADA system and its protocols are given below for integration support.

2.8.1 Communication Protocol

The communication protocol for SCADA system and RTUs is open standard protocol and involves / support IEC 60870-5-104 and IEC 61850 for all levels of communication.

The SCADA system contains the following main functional parts:

- SCADA application and station Human Machine Interface (HMI)
- Ethernet Local Area Network communication infrastructure for remote monitoring supplied by the institute.
- Remote Terminal Unit (RTU)
  - It is Gateway as each Meter / Transducer communicates data to the RTU through a serial or Ethernet network connection using a selected protocol.
  - Additionally, the RTU have the capability to communicate with SCADA System over IEC 60870-5-104 & IEC 61850 Protocols.
  - RTU have hard wired interface with local control panels for status monitoring and control of the electrical switchgear.

2.8.2 SCADA system

SCADA system is realized via a redundant set of servers and by means of human machine interface (HMI) and software package, which contain an extensive range of data acquisition and control functions.

- The support for SCADA is given by Synergy systems and solutions with the aid of SIRIUS and HUSKY software and hardware platforms, respectively.
- SIRIUS supports OPC based communications that can be used to connect to any third party OPC server. SIRIUS provides tag browsing feature that is used for importing tags from OPC server. In

DEPARTMENT OF ELECTRICAL ENGINEERING, INDIAN INSTITUTE OF TECHNOLOGY KANPUR, KANPUR-208016
Phones: 0512-679-6936............ (O)
e-mail: smartcityiitk@yahoo.com

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addition, it provides DDE support through which it can acquire as well as provide data to third party applications.

- SIRIUS also provides ODBC, OLEDB connectivity to its databases. This helps in accessing a plant's real-time or historical data for reporting, analysis and presentation purposes.
- SIRIUS supports time synchronization through GPS receivers over SNTP, NMEA, and other ASCII protocols.
- Based on the real-time or historical database, reports can be created using Crystal Reports, MS Excel, or any other third-party reporting engine. A Crystal Reports viewer is integrated in the MMI module.

Communication Protocols Supported by SIRIUS	
IEC 60870-5-101	Pro Control P13
IEC 60870-5-103	Indactic33
IEC 60870-5-104	SPORT
DNP 3.0 (Serial & TCP/IP)	SNP (GE-Fanuc)
MODBUS RTU	IEC 1107 (Energy Meters)
MODBUS TCP/IP	ICC (over IEC60870-5-101/104)
Bitbus	AB DF1
RP570	SPA
Sinaut ST1	UNITELWAY
Proteus 2000	MODBUS PLUS
Equinode	FIP(Sycoway)

3   SMART HOME

3.1   Smart Home Features and Specifications

Few (around 20) of the existing hostel rooms/residential flats or houses of the IIT Kanpur will be converted to smart homes. The power for smart homes will be supplied by the IITK substation.

- Smart homes will have smart lighting, fridge, washer, heating and cooling systems which will be controlled through a smart home solution installed in the central controller logically. For that, each power point will be equipped with the remote monitoring and control facility (e.g. Smart Plug) to accept command from central controller using home area network (HAN).
- The smart home solution will integrate existing PV+inverter and existing Battery+inverter systems. The integrated solution will have the capability to realize various demand response and ToU pricing scenarios. Smart home will be divided into essential and non-essential loads. Non-essential loads will be used to participate in the demand response and ToU pricing scenarios. An indicative smart home architecture in shown in the figure below.
- Smart home solution will interact with the smart meter of the house to receive the various price and load signals.
- Smart home solution should have the facility to run various functions in auto as well manual mode.
- In the absence of grid supply non-essential loads will be turned off and only essential loads will be fed by PV system or Battery Inverter.
- Four or more technologies among GPRS (3G), WiFi, Zigbee, Ethernet and PLC must be implemented in the project as part of communication between smart devices and data center.

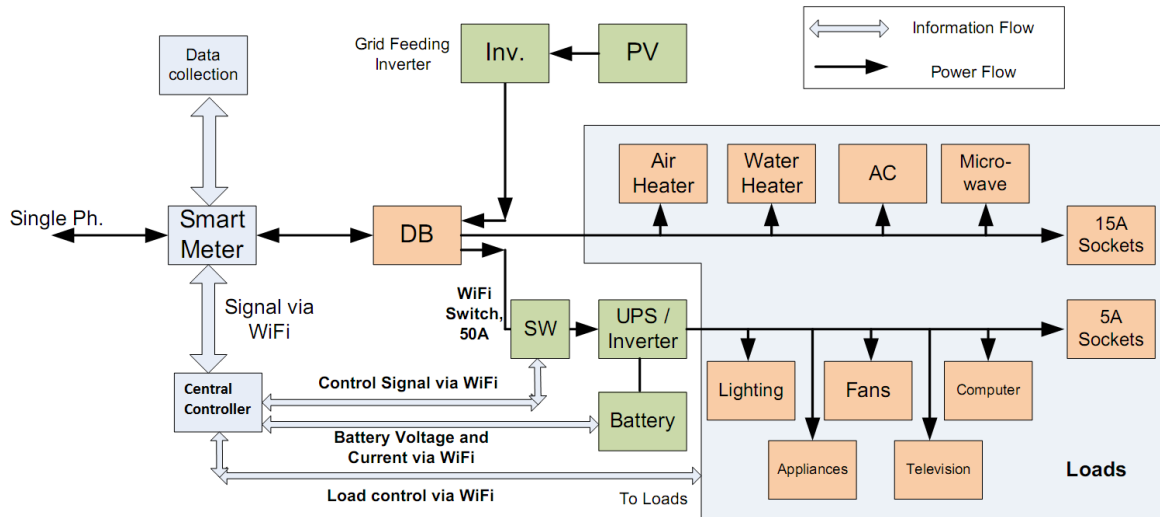The architecture of the proposed smart home solution is shown in the Figure 1 below.

DEPARTMENT OF ELECTRICAL ENGINEERING, INDIAN INSTITUTE OF TECHNOLOGY KANPUR, KANPUR-208016
Phones: 0512-679-6936............ (O)
e-mail: smartcityiitk@yahoo.com

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Figure 1: Approximate Smart Home Switching Scheme (Actual scheme may differ)
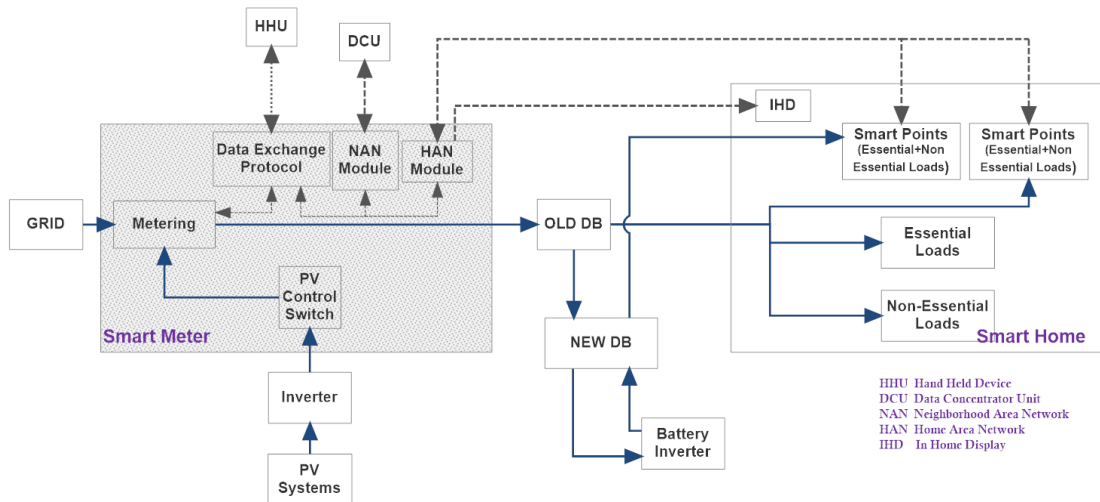

Figure 2: Block schematic of Home Network for a typical house (Actual scheme may differ)

3.2   Smart Home Central Controllers

Following are the requirements of Smart Home Central Controller:

- Central controller must have the ability to control the switching ON/OFF of different loads by sending command signals to remotely located smart devices.
- The central controller will have the facility to feed part of the house load from PV system or battery system to limit the peak current drawn from the grid under peak load conditions.
- The central controller functions will be automatic as well as manual.
- The central controller of the smart home will have the facility to provide real time energy usage details in tabular as well as graphical format to increase customer participation in energy efficiency.
- The central controller of the smart home will have the facility to communicate with external world through smart metering system installed in smart homes or through internet. So that in case of load shed (full or partial) it can respond accordingly.

DEPARTMENT OF ELECTRICAL ENGINEERING, INDIAN INSTITUTE OF TECHNOLOGY KANPUR, KANPUR-208016
Phones: 0512-679-6936............ (O)
e-mail: smartcityiitk@yahoo.com

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- Central controller should notify the user that how much power is available and how many non-essential loads are ON and need to be switched OFF.
- The central controller of the home automation system should support GPRS (3G), PLC, Zigbee and WiFi, which allows us to monitor and control home equipments and even program them to work in conjunction with one another.
- The central controller must provide feature to manage home through online account and mobile apps using Android/iOS device or tablet. The central controller App will be configured in a tablet PC of not less than 8 inch in size. This tablet PC should be of minimum 2 GB RAM, 1.5 GHz quad core processor, 720p resolution. It should have Wi-Fi as well as GPRS connections. Higher configuration Tablet PC, suitable for the smart home solution is suggested.
- The central controller should have capacity to hold and control more than 50 smart devices.
- The average communication range for central controller with smart devices and with the DCU is around 60-Feet to 100-Feet.
- During technical pre-bid clarification meeting the software features of central controller must be demonstrated and discussed. The central controller must have provision for modifications in the software at project execution stage.

3.3   Technical Specification of HAN Coordinator Unit

Sl. No.	Characteristics	Details as per offer
1.	Purpose of Remote Control	
2.	Components	
3.	Power Board Input Supply (AC)	
4.	RC Board Input Supply (DC)	
5.	Battery Charger Specification	
6.	No of Switching Controls	
7.	Range	
8.	Electronic Board consumption	
9.	Expandability	
10.	Operating Temperature Range	
11.	Accuracy	

3.4   Technical Specification of Switch Control Unit

Sl. No.	Features	Details as per offer
1.	Purpose of Control Card	
2.	Board Input Supply	
3.	AC Electrical Input	
4.	No of load channels	
5.	Electronic Board consumption	
6.	Expandability	

DEPARTMENT OF ELECTRICAL ENGINEERING, INDIAN INSTITUTE OF TECHNOLOGY KANPUR, KANPUR-208016
Phones: 0512-679-6936............ (O)
e-mail: smartcityiitk@yahoo.com

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4. FORMAT OF QUOTATION/TENDER

Sl. No.	Description Goods	Specifications	Qty.	Unit	Quoted Unit Rate in Rs.	Total Amount	
						In Figures	In Words
	TOTAL						
	Sales Tax						

Gross Total Cost: Rs. ....

We agree to supply the above goods in accordance with the technical specifications for a total contract price of Rs.................. (Amount in figures) (Rs. .... amount in words) within the period specified in the Invitation for Quotations.

We also confirm that the normal commercial warranty/guarantee of 60 months shall apply to the offered goods.

Signature of Bidder

Name:

Designation:

5. SPECIAL CONDITIONS

1.) Authorization from Manufacturer
In the case of a Bidder offering to supply goods under the contract which the Bidder did not manufacture or otherwise produce, the Bidder has been duly authorized by the goods' Manufacturer or producer to supply the   goods in India.

2.) Proof of Manufacturing and past performance.
Details of experience and past performance of the bidder on works of similar nature within the past two years and details of current contracts in hand and other commitments.

3.) Details of last 3 years turnover of the bidder.

Saikat Chakrabarti

Associate Professor
Department of Electrical Engineering
Indian Institute of Technology
Kanpur 208016 India
Office: 105D ACES
Email: saikatc@iitk.ac.in saikat.chakrabarti@gmail.com
Phone: +91-512-2596598 Fax: +91-512-2590063 / 2590260
Homepage: http://home.iitk.ac.in/~saikatc/

DEPARTMENT OF ELECTRICAL ENGINEERING, INDIAN INSTITUTE OF TECHNOLOGY KANPUR, KANPUR-208016
Phones: 0512-679-6936............ (O)
e-mail: smartcityiitk@yahoo.com

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IX.   TECHNICAL DEVIATION FORMAT

(ANNEXURE – D)

Clause No.	Prescribed as per Tender Specification	Deviation in the bidder's Offer

Bidder's Signature with Seal

N.B.:
The bidder has to mention all technical deviations in his offer which differs from the Technical Requirement if this Tender in above format. Deviation not mentioned in above format but mentioned in any other format or in any other part of the offer document shall not be considered as deviation and the bidder shall be deemed to have accepted our technical requirement without deviation.

DEPARTMENT OF ELECTRICAL ENGINEERING, INDIAN INSTITUTE OF TECHNOLOGY KANPUR, KANPUR-208016
Phones: 0512-679-6936............ (O)
e-mail: smartcityiitk@yahoo.com

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