

STANDARD BIDDING DOCUMENT

FOR

Full Turnkey Contract (Design Supply and Installation)

PVVNL

Part – 2

Scope of Work (Employer's Requirement)

FOR

IMPLEMENTATION OF MSCL PROJECT NETWORK , STRENGTHENING,
CAPACITY ENHANCEMENT,IMPLEMENTATION OF SCADA FOR POWER
SUPPLY UNDER SMART CITY MISSION (SCM) IN MORADABAD CITY.

Key Dates

Date of Release of RFB/ NIT	7 th November 2022
Date & Time of receiving Pre-bid queries via mail	19 th November 2022 till 16:00 Hrs E-mail Id: semmpvvnl@gmail.com
Deadline for Submission of Bid	29 th November 2022 upto 16:00 Hrs
Date & Time of Opening of Technical Part of Bid	30 th November 2022 at 16:00 Hrs

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PART - 2

EMPLOYER'S REQUIREMENT

Section - 6 : Employer's Requirements

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1. Overview of the Scope of Works

The work is to be executed on turnkey basis, the scope of which includes survey, network design, supply, manufacturer's quality assurance, testing (where specified/ required), transportation, storage, erection, including all civil/ structural works, site testing, commissioning of all items & materials including all associated activities defined in BOQ though not exclusively specified herein and are required for the completion and satisfactory performance of the entire works as intended.

This specification intends to cover but not limited to the following activities, services and works:

- ✓ Providing engineering data, and drawing for review, approval and records.
- ✓ Supply, testing, packing, transportation and insurance from the manufacturer's work to the site.
- ✓ Receipt, storage, insurance, preservation and conservation of equipments at the site.
- ✓ Fabrication, pre-assembly (if any), erection, testing and putting into satisfactory operation of all the equipments/ materials including successful commissioning.
- ✓ In addition to the requirements indicated in this section, all the requirements as stated in Technical specifications shall also be considered as a part of this specification as if completely bound herewith.
- ✓ Providing all materials, equipments and services specified or otherwise, including survey, which are required to fulfill the intent of ensuring operability, maintainability and the reliability of the complete works covered under this specification.
- ✓ During warranty period the bidder is required to provide all the services and activities mentioned in the contract.
- ✓ Preparation of project completion report/ closure proposal along with a report clearly indicating completion of any outstanding/ remedial work that needs to be carried out.
- ✓ Handing over the works to the employer for taking into commercial services.

It is not the intent to specify all aspects of design and construction of equipments mentioned herein. The systems, subsystems and equipments shall conform in all respect to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation. Accordingly, scope of works under this contract is as under:

- 1.1 Execution of all other works as per tender document. All Steel structure except STPs shall be hot dip galvanized as per relevant Indian Standard.
- 1.2 All the raw materials such as steel, zinc for galvanizing, reinforcement steel and cement for foundation, coke for earthing, bolts, nuts & washers, danger plates, phase plate, number plate etc. required for substations & its structures shall be included in the scope of supply. Bidders shall clearly indicate in their offer, the sources from where they propose to procure the key raw materials and the components.

- 1.3 All the Distribution Transformers procured with Standard ratings, meeting at least Energy Efficiency Level-1 as specified in IS 1180 (Part-1):2014 and its Amendment 1, 2, 3 & 4, should be manufactured by an authorised licensee and bear BIS certification standard mark.
- 1.4 A set of drawings are enclosed with this bid document. These are tender drawings and are to be approved by the Employer. These drawings are indicative in nature and therefore, must be referred while preparing drawings for approval.
- 1.5 All new assets created under the project to be properly GIS tagged.
- 1.6 The engraving of word “Developed under Smart City Mission ” in materials viz., Poles, Transformers (All types), Cables, etc is mandatory requirement. The Employer shall ensure strict compliance of this requirement. Also, while processing payments to the Contractor, suitable documentary evidence / photographs must be asked by the Employer in support of the compliance.
- 1.7 The Manufacturing Quality Plan (MQP) shall be finalized by the Employer in consultation with the contractor/manufacturer in line with the Technical Specifications and as per Employer’s practices

Supply of Plant and Services under this tender covers all interventions required for satisfactory operations of the facilities unless specifically excluded. Scope includes Design, Supply, survey, installation, erection testing and commissioning, on turnkey basis. The types of works are:

- 1) EHT/HT lines/Distribution Transformers/Substations
- 2) Undergrounding of 33kV, 11kV, Low Tention (LT) Lines
- 3) Cable laying works of HT & LT Cable through DWC duct / HDD / trenchless method.
- 4) SCADA works.
- 5) Installation of SCADA compatible RMU.
- 6) Installation of Feeder Pillars.
- 7) Replacement of Consumer Service Connections.

All items to be supplied and erected shall be strictly as per the specifications given in the Bid and should comply the relevant standards and any amendments thereof.

Any deviation taken by the bidder and not specifically / clearly brought out in the price schedule will not be considered as a valid deviation.

In addition to the works mentioned above the bidder is required to take care of the activities listed below:-

2. Survey

The Contractor shall carry out, and be responsible for, final design of the works, including any site surveys, subsoil investigations and all other things necessary for proper planning design and execution. The initial site surveys will be carried out for tentative freezing of the material requirement and the work content finalization, within one month of commencement of project, and sample check by the employer. The same shall be reviewed progressively on quarterly basis for freezing of the material requirement and work content. Design shall be prepared by qualified designers who are engineers and experienced in design of transmission and distribution systems. Employer shall provide all options proposed for Renovation & Modernization of Electrical Infrastructure to the contractor. Contractor, while surveying the execution of work, shall keep this requirement in view and suggest best Retrofitting & Renovation options in descending order. Means, Suitable Retrofitting of Electrical Infrastructure option shall be proposed on priority. Also, while executing the works, same priority of works must be followed.. The changes in design should be approved by Engineer-in-charge of Employer.

- ✓ Based on the finalized network design, the Bidder shall carry out the field survey for deciding location of poles, distribution transformers etc. Besides, field survey will also cover the following:
 - a. Proposed route of 33 KV, 11KV and LT Lines for underground cabling work.
 - b. Proposed location of 11/0.415 KV Distribution Transformers for installation of Compact Sub-Stations.
 - c. Proposed number of connections with all details of connected load requirements and cable size/length.
- ✓ Chowk/Crossing/Smart Road wise Bill of Quantity (BOQ), for each proposed work will be prepared by the Bidder and submitted to the Employer's Engineer-in-charge for his approval before commencement of actual work.

3. Project Management System

3.1. General

The Contractor shall assign a project manager with the authority to make commitments and decisions that are binding on the Contractor. Employer will designate an officer incharge to coordinate all employer project related activities. All communications between employer and the Contractor shall be coordinated through the project manager and officer incharge of Employer. The project managers shall also be assisting employer in communicating project related information to other stake holders.

Bidder shall submit the manpower deployment plan along with the bids, describing the key roles of each person.

The role and responsibilities of contractor shall be as follows:

- a) To prepare, maintain and update project detailed Work Execution Plan for successful implementation of project like approval of GTP, approval of sub-contractor, approval of drawings, supply of materials, mobilization of men, material and equipment etc. at site for successful completion of works, Compile and up-load physical as well as financial progresses, compile the progress of works at Employer level and to assist in forwarding it to all stake holders.
- b) To actively participate with employer in resolving all issues relating to project implementation including ROW, Forest Clearances and Railway Crossings.
- c) To actively participate in monitoring, reviewing and analysing the physical, financial and quality assurances works' progress of Project works and also to take suitable measures on compliance of observations being raised during monitoring/review meetings with employer.
- d) Physical as well as financial progresses shall be uploaded in standard Bill of Material format of the contract. Also, to submit invoices as per guidelines given by Employer for release of payments/funds.
- e) To oversee the progress and compliance of the Quality Assurance Mechanism as per -Employer guidelines.

3.2. Project Schedule

As per the schedule the bidder shall submit a preliminary implementation plan along with the bid. The detailed project implementation schedule shall be submitted by the contractor after the award of contract for employer's approval, which shall include at least the following activities:

- (a) Surveying of site.
- (b) Documents submission and approval schedule
- (c) Pre-Dispatch Inspection schedule
- (d) Dispatch Schedule
- (e) Installation & commissioning schedule
- (f) Training schedule, if any.

The project schedule shall include the estimated period for completion of project and its linkage with other activities etc. It is expected that the contractor should share updated project schedule based on the actual progress done at site, priorities of the employer, availability of material etc once per quarter along with the Progress report.

3.3. Progress Report

A progress report shall be prepared by the Contractor each month against the activities listed in the project schedule. The report shall be made available to employer on a monthly basis, e.g., the 10th of each month. The progress report shall include all the completed, ongoing and scheduled activities.

3.4. Transmittals

Every document, letter, progress report, change order, and any other written transmissions exchanged between the Contractor and employer shall be assigned a unique transmittal number. The Contractor shall maintain a correspondence index and assign transmittal numbers consecutively for all Contractor documents. Employer will maintain a similar correspondence numbering scheme identifying documents and correspondence that employer initiates.

3.5. Representation by Videography

Videography of all proposed smart roads to be made before start of work and after completion of work.

4. Quality Assurance and Evaluation Mechanism

The Quality Assurance (QA) will be carried out by Employer. The Employer may engage an Authorised representative of employer responsible & accountable for assuring quality in works. Key activities would include:

- Formulation of a detailed comprehensive Quality Assurance Mechanism (QAM) plan/Guaranteed Technical Particulars as the case may be in the State for the works to be carried out with an objective to create quality infrastructure works. The QAM and Inspection Plan shall be integral part of the contract agreement with turnkey contractor or equipment supplier and erection agency as the case may be in case of turnkey/ or departmental execution of works.
- Ensuring that the quality of materials/equipment supplied at site and execution of works carried out at field is in accordance to Manufacturing Quality Plan (MQP)/Guaranteed Technical Particulars (GTP) and Field Quality Plan (FQP)/Approved Drawings/Data Sheets respectively.

4.1. Quality checks to be ensured by Turnkey Contractor:

Turnkey Contractor shall strictly ensure QAM checks during the day to day course of project execution, which are as follows:

- a. Pre-dispatch inspections of all materials viz. as per MQP/GTP, Approved Drawings, Technical Specifications, Datasheet, GTP, applicable national & international standards as per GCC Clause 23.
- b. 100% verification of all quality of material as per MQP/GTP, Approved Drawings, Technical Specifications, Datasheet and erection works in the field as per FQP/approved drawings.
- c. 100% verification of materials utilised under the scheme.

4.1.1. 100% verification of works done in Renovation and Modernization of Electrical Infrastructure.

4.1.2. Vendor approval: All the materials procured shall be purchased from the authorised vendors approved by the Quality Assurance Department of Employer. Preference to be given for procurement of material from already approved vendors of the Employer.

New vendors/suppliers may be approved by Employer, provided capability of manufacturer(s) is assessed suitably by visiting the factory premises and checking the testing facility available before accepting it as an approved vendor. If required, State Electricity Board/Power Department/ Distribution Companies may adopt vendors already approved by CPSEs.

4.1.3. FQP for Civil works: Contractor shall prepare a separate FQP/field execution drawings which shall be approved by their competent authority. The turnkey shall adhere to this FQP/drawings while carrying out physical works. Contractor

4.1.4. FQP for testing & commissioning: Contractor shall prepare a comprehensive Pre-commissioning test Check-list for testing & commissioning of, Distribution transformer

Substation and other major equipments to be installed as defined in BOQ . The electrical system shall be energized only after performing all tests as described in the pre-commissioning test checklist. and inspection from the electrical inspector of the state (or as the practice may be). Proper records in this regard, including tests on earth resistance, insulation resistance of 11 kV line & Distribution Transformer etc. shall be maintained, jointly signed by Employer and turnkey representatives.

4.1.5. Quality Assurance Mechanism (QAM) to be followed by the Contractor is as below:

- a. The Contractor shall be responsible and accountable for assuring quality in the scheme works. Accordingly, the Contractor shall formulate a comprehensive Quality Assurance mechanism (QAM) and Inspection Plan with an objective to build quality infrastructure under the project, which should be approved by the Employer. Alternately, the Employer may also provide its QAM which needs to be complied by the Contractor. The QAM and Inspection Plan shall be an integral Part of the contract agreement with turnkey Contractor or equipment supplier/vendor and erection agency as the case may be in case of partial turnkey and departmental execution of works. Documentation with regard to Quality Assurance and Inspection Plan shall be maintained by the Contractor and kept in proper order for scrutiny during the course of project execution and for future reference. The Contractor has to ensure that the quality of materials/equipment's supplied at site and execution of works carried out at field is in accordance to the Manufacturing Quality Plan (MQP)/Guaranteed Technical Particulars (GTP) and Field Quality Plan (FQP)/Approved Drawings/Data Sheets respectively.
- b. Some key indicative measures for effective implementation of the QAM by the Contractor are given below. However, these are for reference and need to be followed as per relevant provisions of the contract.
 - Supply:
 - Verification of qualifications of the subcontractor / manufacturer for supply of plant / equipment and materials. Factory inspections may be conducted if required.
 - Verification of material data, specifications, drawings and samples submitted by the subcontractor / manufacturer including GTPs.
 - Verification of type test reports including qualifications of the test laboratory, completeness and acceptance of the type test reports.
 - Witnessing acceptance tests carried out by the subcontractor/ manufacturer.
 - Carrying out pre-dispatch inspections as per relevant guidelines of this tender/ contract.
 - Inspection of storage facilities of the subcontractor/ manufacturer.

- Works:
 - Carry out field inspections on sample basis during implementation to verify works are carried out in compliance to technical specifications and acceptable quality of workmanship.
 - Issue Site Observation Reports (SOR) and follow-up with the subcontractor/ manufacturer for implementation of any remedial actions.
 - Upon completion, carry out joint inspections together with the Employer's staff and for final measurements and quality inspections.
 - Follow-up any on technical issues for corrective action during defects liability period with the subcontractor/ manufacturer.
 - c. It should be noted that no functional guarantees are applicable for equipment installed as a part of this contract hence Guarantee Tests are not applicable.
 - d. The Employer may identify any third party agency including PMA/ TPQMA etc. who would be responsible to monitor the QAM measures including verifications and inspections mentioned above. The project manager may also engage third party inspectors for this purpose in addition if required.
 - e. The Employer or its appointed third party shall design systems and procedures to implement QAM system including formats for submittals by the Contractor in line with the above requirements and provisions of the Contract.
 - f. The Contractor shall cooperate with and follow these QAM systems and procedures to ensure proper implementation of an effective quality assurance and evaluation mechanism.
- 4.1.6. Pre-commissioning test record: All pre-commissioning test check list shall be documented properly and signed by the quality engineer of the turnkey Contractor & countersigned by Employer's representative and shall be kept for future reference. These documents shall be maintained by turnkey Contractor in proper order and shall be made available at site for verification by Quality Monitors during inspection and finally be handed over to user department (O&M department) at the time of handing over of energized assets.
- 4.1.6. Roles and responsibility of Contractor in ensuring Quality of Plant and Facilities:
- 1) Turnkey contractor shall be primarily be responsible for supply of quality materials. Hence, turnkey contractor shall take all necessary actions including following:
 - a. To assess the capabilities and capacity of manufacturer to whom they intend to appoint as sub-vendor,

- b. To keep strict control over manufacturing of materials by controlling procurements of right raw materials, periodical stage inspections, to ensure process control and to get the materials invariably inspected in manufacturing stage as well as after manufacturing but before dispatch at the works of manufacturer to ensure quality of materials/equipment.
 - c. To ensure stage inspection and final dispatch inspection, turnkey contractor should deploy his/her quality assurance team to inspect the materials with Employer/third party inspector as well as independently as per requirements.
- 2) Receipt inspection: On receipt of materials at site, it would be the prime responsibility of turnkey contractor to verify materials physically in accordance to agreed technical specifications. Physical parameters like dimensions (length, width, height, area of conductor), weight per unit, Insulation Value, length of cable/conductor in sample drum(s), clear embossing on cables through sequential marking depicting name of manufacturer, size of cable and length in meter. Once the Contractor is satisfied, materials must be offered for joint inspection to Employer.
- 3) Earlier, on receipt of materials at site, dispatch documents shall be verified jointly by Employer, Employer's appointed Third Party, Turnkey Contractor and materials supplier (if representative is full time available at site. During inspection, quantities of items, sealing on the materials, serial numbers of the items, sequential embossing (proper visible/legible without any additional efforts) and name plates on the materials shall be checked. Dispatch challans shall be verified for details of consigner and consignee, materials descriptions, quantities transported, pre-dispatch clearance certificate/waiver of inspection. In case of high value equipment, capacity of equipment in terms of current carrying capacity, operating voltage and KVA ratings should be recorded.
- 4) Clearance for installation: Once, materials on receipt are accepted by turnkey contractor as well as Employer representative, they will be eligible for erection, testing and commissioning.
- 5) Sampling from field: Any material, including materials listed below, may be picked from site for testing at test laboratory chosen by inspecting official.
 - 1. Distribution Transformers
 - 2. Overhead Conductor, 3. Pole, 4. Insulators, 5. Cables, 6. RMUs or any other material defined in BOQ.
 - a. Inspecting official will have right to pick any of the supplied equipment whether it is lying in site stores, is under erection, is under local transportation from site stores to erection location or is already commissioned. The equipment shall be sealed jointly in presence of representatives of Employer, Employer's appointed Third Party, Contractor, and Supplier/manufacturer (if his representative is available at site). Employer at its discretion may invite manufacturer's representative to participate in sealing of materials.
 - b. Sealed equipment, on cost of turnkey contractor shall be sent to test laboratory for verification of routine/type test results. At the time of sealing, details of equipment available at site shall be recorded like cable/conductor drum number, power/distribution

transformer unique number, status of sequential legible embossing on cables, name of manufacturer etc.

- c. For testing of equipment, Employer/Nodal agency shall empanel test laboratories located in or nearer to the state wherefrom sample is picked up.
- d. Such picked up materials at a random shall be tested for all routine, acceptance and type tests feasible to conduct in the empaneled laboratory. The laboratory expenses including all other expenditures that shall incurred towards packing, transport, inspection, testing charges etc. are to be borne by the Employer. At least one sample from a lot may be subjected to inspection.
- e. In cases, where pre-dispatch and factory test results/NABL accredited lab test report are found mismatched with tests results on the sample picked from field; actions shall be taken against willful defaulted manufacturer and turnkey contractor both.
- f. Willful defaulter shall be those manufacturers and turnkey contractor whose material is found to be manufactured using inferior quality raw materials, second hand core materials, under-size/under-weight of cable/conductor in various parts of cable/conductor drum, not conforming to transformer load losses as defined in agreed technical specifications/contract conditions, improper or no sequential legible embossing on cable etc.
- g. This mismatch shall generally be, but not limited to the deviations in results from guaranteed technical specifications of materials in terms of capacity (KVA capacity, current carrying capacity, heating capacity, tensile strength, mechanical strength etc., operational efficiencies (errors in measurements of power, power/load losses, power consumption etc., weights of key component materials (aluminum, copper, insulation materials, steel components etc.), sub-standard specifications of key component (measured specifications are in deviation from guaranteed specifications as per technical specifications of the project and inferior/illegible embossing/sequential marking on cables are found, following two actions shall be taken:
 - i. Sub-vendors/vendor registration of the manufacturer shall be discontinued in all the power utilities of the country for a period of 5 years including in power utility concerned where this act is found,
 - ii. Entire lot of materials/equipment supplied by the defaulting manufacturer shall be rejected whether supplied materials/equipment is lying in site-stores, in transit, under erection, testing & commissioning or has already been commissioned. All costs related to removal of such rejected materials and reinstating fresh lot of materials shall be borne by turnkey contractor without any cost implication to power utility.
 - iii. Turnkey contractor shall be responsible for repetitive failures of materials in field testing in a turnkey-contract. In such situations, registration of turnkey contractor firm shall be discontinued in all the power utilities of the country for a period of 5 years including in power utility concerned where this act is found,

- h. In cases, where field testing results are slightly mismatched with factory test results / pre-dispatch test reports/NABL accredited lab test report but are in permissible limits as per GTP/Data Sheet/Technical Specifications, no action shall be taken against the turnkey contractor/manufacturer.
 - i. In cases where turnkey contract is reluctant/not willing to support the Employer in selecting sample for testing by way of non-association in sampling, sampling and testing related activities of equipment, all actions related to sample selection, sealing and testing including dismantling, loading, unloading, transportation etc, will be taken by Employer on risk & cost of the turnkey contractor. The non-cooperative act on part of turnkey contractor shall be circulated amongst all power utilities in the country. In such situations, registration of turnkey contractor firm shall be discontinued in all the power utilities of the country for a period of 5 years including in power utility concerned where this act is found.
- 6) The Contractor should develop the quality assurance programme which shall generally cover the following:
- a. Organization structure for the management and implementation of the proposed quality assurance programme ;
 - b. Documentation control system;
 - c. Qualification data for bidder's key personnel;
 - d. Procedure for purchases of materials, parts, components and selection of sub-Contractor's services including vendor analysis, source inspection, incoming raw material inspection, verification of material purchases etc.
 - e. System for shop manufacturing and site erection controls including process controls and fabrication and assembly control;
 - f. Control of non-conforming items and system for corrective actions;
 - g. Inspection and test procedure both for manufacture and field activities.
 - h. Control of calibration and testing of measuring instruments and field activities;
 - i. System for indication and appraisal of inspection status;
 - j. System for quality audits;
 - k. System for authorizing release of manufactured product to the Employer.
 - l. System for maintenance of records;
 - m. System for handling storage and delivery; and
 - n. A manufacturing quality plan detailing out the specific quality control measures and procedures adopted for controlling the quality characteristics relevant to each item of equipment furnished and/or services rendered.
 - o. A Field quality Plan covering field activities

- 7) Electrical Inspector inspection: After successful completion of the work permission from State Electrical Inspectorate is required. Necessary fee etc. shall be paid by the Employer. However if Contractor pays such fee it shall be reimbursed on actual basis on documentary evidence. In case of defects / in-complete works notified by Electrical Inspectorate, these shall be completed by the agency at no extra cost implication to Employer.

5. Type and Acceptance test

The following type, acceptance and routine tests and tests during manufacture shall be carried-out on the material. For the purpose of this clause:

- 5.1. Contractor shall supply the materials of type & design which has already been Type Tested. Contractor shall provide copy of such tests at site in support of type-tested materials supplied under the contract. No extra payment or time shall be granted for type testing of materials. In exceptional case to case basis, employer will decide to permit type testing of material at Contractor's cost.
- 5.2. Acceptance Tests shall mean those tests which are to be carried out on samples taken from each lot offered for pre-dispatch inspection, for the purposes of acceptance of that lot.
- 5.3. Routine Tests shall mean those tests, which are to be carried out on the material/equipment to check requirements which are likely to vary during production.
- 5.4. Tests during Manufacture shall mean those tests, which are to be carried out during the process of manufacture and end inspection by the Contractor to ensure the desired quality of the end product to be supplied by him.
- 5.5. The norms and procedure of sampling for these tests will be as per the Quality Assurance Programme to be mutually agreed to by the Contractor and the Employer.
- 5.6. The standards and norms to which these tests will be carried out are listed against them. Where a particular test is a specific requirement of this Specification, the norms and procedure of the tests shall be as per IS/IEC Standard this specification or as mutually agreed to between the Contractor and the Employer in the Quality Assurance Programme.
- 5.7. For all type test and acceptance tests, the acceptance values shall be the values specified in this Specification, Approved Quality Plan or guaranteed by the Bidder, as applicable.

6. Type Testing, Inspection, Testing & Inspection Certificate

- 6.1 All equipment being supplied shall conform to type tests including additional type tests, if any as per technical specification and shall be subject to routine tests in accordance with requirements

stipulated under respective sections. The Contractor shall intimate the Employer the detailed program about the tests at least three (3) weeks in advance in case of domestic supplies & six (6) weeks in advance in case of foreign supplies.

- 6.2 The reports for all type tests and additional type tests as per technical specification shall be furnished by the Contractor alongwith equipment/material drawings. The type tests conducted earlier should have either been conducted in accredited laboratory (accredited based on ISO/IEC Guide 25/17025 or EN 45001 by the national accreditation body of the country where laboratory is located) or witnessed by the representative(s) of Employer or Utility. The test-reports submitted shall be of the tests conducted within last 5 (five) years prior to the date of bid opening. In case the test reports are of the test conducted earlier than 5 (five) years prior to the date of bid opening, the Contractor shall repeat these test(s) at no extra cost to the Employer, however the delay in supply due to type-test will not be acceptable during the project.
- 6.3 In the event of any discrepancy in the test reports i.e. any test report not acceptable due to any design/manufacturing changes (including substitution of components) or due to non-compliance with the requirement stipulated in the Technical Specification or any/all additional type tests not carried out, same shall be carried out without any additional cost implication to the Employer.
- 6.4 The Employer, his duly authorized representative and/or outside inspection agency acting on behalf of the Employer shall have at all reasonable times free access to the Contractor's/sub-vendors premises or Works and shall have the power at all reasonable times to inspect and examine the materials and workmanship of the Works during its manufacture or erection if part of the Works is being manufactured or assembled at other premises or works, the Contractor shall obtain for the Engineer and for his duly authorized representative permission to inspect as if the works were manufactured or assembled on the Contractor's own premises or works. Inspection may be made at any stage of manufacture, dispatch or at site at the option of the Employer and the equipment if found unsatisfactory due to bad workmanship or quality, material is liable to be rejected.
- 6.5 The Contractor shall give the Employer/Inspector ten (10) days written notice of any material being ready for joint testing including Contractor and Employer. Such tests shall be to the Contractor's account except for the expenses of the Inspector. The Employer/Inspector, unless witnessing of the tests is virtually waived, will attend such tests within thirty (30) days of the date of which the equipment is notified as being ready for test /inspection, failing which the Contractor may proceed alone with the test which shall be deemed to have been made in the Inspector's presence and he shall forthwith forward to the Inspector duly certified copies of tests in triplicate.
- 6.6 The Employer or Inspector shall, within seven (07) days from the date of inspection as defined herein give notice in writing to the Contractor, of any objection to any drawings and all or any equipment and workmanship which in his opinion is not in accordance with the Contract. The Contractor shall give due consideration to such objections and shall either make the modifications

that may be necessary to meet the said objections or shall confirm in writing to the Employer/Inspector giving reasons therein, that no modifications are necessary to comply with the Contract. If any modification is made on the equipment on the basis of test results not in conformity with the contract, the modified equipment shall be subject to same sequence of test again without any additional cost to Employer.

- 6.7 When the factory tests have been completed at the Contractor's or Sub-Contractor's works, the Employer/Inspector shall issue a certificate to this effect within seven (07) days after completion of tests but if the tests are not witnessed by the Employer/Inspector, the certificate shall be issued within seven (07) days of receipt of the Contractor's Test certificate by the Engineer/Inspector. Failure of the Employer/Inspector to issue such a certificate shall not prevent the Contractor from proceeding with the Works. The completion of these tests or the issue of the certificate shall not bind the Employer to accept the equipment should, it, on further tests after erection, be found not to comply with the Contract. The equipment shall be dispatched to site only after approval of test reports and issuance of dispatch instruction by the Employer.
- 6.8 In all cases where the Contract provides for tests whether at the premises or at the works of the Contractor or of any Sub-Contractor, the Contractor except where otherwise specified shall provide free of charge such items as labour, materials, electricity, fuel, water, stores, transport, loading & unloading, packing, apparatus and instruments as may be reasonably demanded by the Employer/Inspector or his authorized representative to carry out effectively such tests of the equipment in accordance with the Contract and shall give facilities to the Employer/Inspector or to his authorized representative to accomplish testing. Contractor Contractor Contractor
- 6.9 The inspection by Employer and issue of Inspection Certificate thereon shall in no way limit the liabilities and responsibilities of the Contractor in respect of the agreed quality assurance programme forming a part of the Contract.
- 6.10 The Employer will have the right of having at his own expenses any other test(s) of reasonable nature carried out at Contractor's premises or at site or in any other place in addition of aforesaid type and routine tests, to satisfy that the material comply with the specification.
- 6.11 The Employer reserves the right for getting any field tests not specified in respective sections of the technical specification conducted on the completely assembled equipment at site. The testing equipment for these tests shall be provided by the Employer.

7. Pre-Commissioning Tests

On completion of erection of the equipment and before charging, each item of the equipment shall be thoroughly cleaned and then inspected jointly by the Employer and the Contractor for correctness and completeness of installation and acceptability for charging, leading to initial pre-commissioning tests at Site. The list of pre-commissioning tests shall be provided by the

Employer as per its standard practices. or as included in the Contractor's quality assurance programme.

8. Commissioning Tests

All required instrumentation and control equipment will be used during such tests and the Contractor will use all such measuring equipment and devices duly calibrated as far as practicable. However, the Contractor, for the requirement of these tests, shall take immeasurable parameters into account in a reasonable manner. The tests will be conducted at the specified load points and as near the specified cycle condition as practicable. The Contractor will apply proper corrections in calculation, to take into account conditions, which do not correspond to the specified conditions.

- 8.1 Any special equipment, tools and tackles required for the successful completion of the Commissioning tests shall be provided by the Contractor, free of cost.
- 8.2 The specific tests to be conducted on equipment have been brought out in the respective chapters of the technical specification. However where the pre-commissioning tests have not been specified specifically they shall be as per relevant IS code of practice or as mutually agreed.
- 8.3 The Contractor shall be responsible for obtaining statutory clearances from the concerned authorities for commissioning and operation of the equipment including the Electrical Inspector. Necessary fee to perform these works shall be paid by Employer.

9. GIS mapping & asset tagging

9.1 General Information

The State owned power distribution utilities have implemented GIS based asset tagging activities in the past and migrated asset information into GIS platform. Bidder should update various attributes of new / upgraded infrastructure created under RDSS over the same platform. Various electrical assets i.e , Distribution Transformer, HT & LT lines with over head conductor, poles, insulators, stay wire etc and Underground distribution system consists of Feeder pillar, UG cable etc; automation devises like RMU's FPI, Auto-reclosures etc needs to be updated in the existing GIS platform. The GIS platform and the associated mobile-app will be provided by the Employer. The scope of the bidder is limited to updating the GIS co-ordinates and the associated mapping information of the new assets created/upgraded on the platform provided by the Employer using the mobile app. However no additional payment shall be made to the Contractor for these works.

9.2 Key activities under the scope:

1. After successful award of the contract and finalization of Bill of Quantity (BoQ), the TKC should collect list of attributes (Data Model) for each of the assets purposed under the scheme from the project nodal / GIS incharge of the Utility.
2. The purposed methodology for delivery of these attributes as well as GPS coordinates of the assets up to the defined accuracy level to be decided mutually so that updating the same in existing GIS platform would not be a challenges at the later stage. A point of contact (PoC) is recommended at this stage to avoid any future complicity.
3. The vendor should create a physical marking procedure with consultation and approval of Employer and mark each assets and consumer that have been surveyed
4. Vendor will start collecting intended data from newly commissioned and / or upgraded infrastructure commissioned in this scheme and submit the same with the Employer nodal / team for approval.
5. The Employer's project in charge would get these data verified through their team, once completed they will get duly verified by Executive Engineer and circle SE and shall submit same to IT office for further review.
6. It is to be noted that updating of GIS asset information is mandatory requirement for the issuance of completion certificate by the employer.

10. Documentation

10.1. General

- 10.1.1. To ensure that the proposed systems conform to the specific provisions and general intent of the Specification, the Contractor shall submit documentation describing the systems to employer for review and approval. The Contractor shall obtain approval of employer for the relevant document at each stage before proceeding for manufacturing, system development, factory testing, site testing, training etc. The schedule for submission/approval of each document shall be finalised during the discussions before placement of the contract, this schedule shall be in line to overall project schedule.
- 10.1.2. Each document shall be identified by a Contractor document number, the employer document number, and the employer purchase order number. Where a document is revised for any reason, each revision shall be indicated by a number, date, and description in a revision block along with an indication of official approval by the Contractor's project manager. Each revision of a document shall highlight all changes made since the previous revision.
- 10.1.3. All technical description, specifications, literature, correspondence, prints, drawings, instruction manuals, test reports(both factory and at site), progress photographs, booklets, schedules and all supplementary data or documents furnished in compliance with the requirements of the Contract,

shall become the property of the Employer and the costs shall be considered as included in the Contract price.

- 10.1.4. The Contractor shall be responsible for any time delay, misinterpretation, error and conflict during design, manufacturing, testing and erection of the Works resulting from non-compliance with the requirements of this Specification.
- 10.1.5. The Employer shall have the right to make copies of any documents, data, reports, information etc. supplied by the Contractor in connection with the Works. The Employer shall not impart the information of these documents to any other manufacturer or competitor but he shall be free to use these for preparation of technical papers, reports etc.
- 10.1.6. All documentation shall be in English language.

10.2. Requirements for submission of documents, information and data by the Contractor

- 10.2.1. The Contractor shall submit to the Employer all documents in accordance with an approved schedule of submissions and shall submit any further information (in the form of drawings, documents, manuals, literature, reports etc.) when asked by the Employer while commenting/approving any drawings/documents etc.
- 10.2.2. The documents which are subject to the approval of the Employer shall be identified by the Contractor with the stamp "FOR APPROVAL". All other documents shall be submitted to the Employer for information and shall be identified by the Contractor with the stamp "FOR INFORMATION".
- 10.2.3. The sequence of submission of the documents shall be subject to the approval of the Employer. The sequence of submissions of all documents shall be such that the necessary information is available to enable the Employer to approve or comment the document.
- 10.2.4. The Contractor shall supply 4 hard copies of all drawings and documents.
- 10.2.5. In case a "SUBSEQUENT" revision of any document is made due to any reason whatsoever, a revision of the same, highlighting the changes shall be resubmitted for the Employer's specific approval/ information.

10.3. Documents for approval

- 10.3.1. The Employer shall be allowed fifteen (15) calendar days to approve the Contractor's submissions. The submissions for approval, shall be returned to the Contractor marked in one of

the following ways :

Category I:	Approved
Category II:	Approved with Comments.
Category III:	Returned for correction.
Category IV :	For information

- 10.3.2. The first notations "I" or "II" shall be deemed to permit the Contractor to proceed with the work shown on the document, except in the case of notation "III" the work shall be done subject to the corrections indicated thereon and/or described in the letter of transmittal. The Contractor shall bear the full responsibility for proceeding with the Works prior to receipt of the release in notation "I" from the Employer.
- 10.3.3. In case of notation "II", the Contractor shall include the alterations required & resubmit the document within fifteen (15) days from date of Employer's letter of transmittal.
- 10.3.4. In case of notation "III", the Contractor shall include the alterations required and resubmit the document to the Employer, within fifteen (15) days, from date of letter of transmittal, so that such document can be returned with the notation "I" or "II".
- 10.3.5. It may also be noted that the approval/commenting by the Employer does not relieve the Contractor of any of his contractual obligations and his responsibilities for correctness of dimensions, materials, weights quantities or any other information contained therein, as well as the conformity of designs with Indian Statutory Laws and the Technical Specifications as may be applicable. The approval also does not limit the Employer's rights under the Contract.
- 10.3.6. The approved documents shall be considered as the working documents. However the Technical Specification and connected documents shall prevail over these documents in case a decision is required on interpretation.

10.4. Documents for information

The Contractor shall not delay the Works pending the receipt by the Contractor of the comments on documents submitted to the Employer for information. However, the Employer shall have the right to comment on all the documents submitted by the Contractor, when, in the opinion of the Employer the document does not comply with the Contract or otherwise. The Contractor shall satisfactorily demonstrate that the information contained in the aforesaid document does meet the requirements of the Contract or revise the document in order that the information shall comply with the requirements of the Contract.

10.5. Basic reference drawings

- 10.5.1. The reference drawings are enclosed with the bid document, which forms a part of the specification. The Contractor shall develop a new layout in line with the specification and take the approval of the EMPLOYER.
- 10.5.2. All drawings submitted by the Contractor including those submitted at the time of bid shall be in sufficient detail to indicate the type, size, arrangement, material description, Bill of Materials, weight of each component, break-up for packing and shipment, dimensions, internal & the external connections, fixing arrangement required and any other information specifically requested in the specifications.
- 10.5.3. Each drawing submitted by the Contractor shall be clearly marked with the name of the Employer, the unit designation, the specifications title, the specification number and the name of the Project. If standard catalogue pages are submitted, the applicable items shall be indicated therein. All titles, noting, markings and writings on the drawing shall be in English. All the dimensions should be in metric units.
- 10.5.4. Further work by the Contractor shall be in strict accordance with these drawings and no deviation shall be permitted without the written approval of the Employer, if so required.
- 10.5.5. The review of these data by the Employer will cover only general conformance of the data to the specifications and documents interfaces with the equipment provided under the specifications. This review by the Employer may not indicate a thorough review of all dimensions, quantities and details of the equipment, materials, any devices or items indicated or the accuracy of the information submitted. This review and/or approval by the Employer shall not be considered by the Contractor, as limiting any of his responsibilities and liabilities for mistakes and deviations from the requirements, specified under these specifications and documents.
- 10.5.6. All manufacturing and fabrication work in connection with the equipment prior to the approval of the drawings shall be at the Contractor's risk. The Contractor may make any changes in the design which are necessary to make the equipment conform to the provisions and intent of the Contract and such changes will again be subject to approval by the Employer. Approval of Contractor's drawing or work by the Employer shall not relieve the Contractor of any of his responsibilities and liabilities under the Contract.
- 10.5.7. All engineering data submitted by the Contractor after final process including review and approval by the Employer shall form part of the Contract Document and the entire works performed under these specifications shall be performed in strict conformity, unless otherwise expressly requested by the Employer in Writing.

11. Return of replaced old materials to the area stores of Employer

- Old PVC wire will be rolled into bundles. The bundles should be tightened firmly and properly with PVC sticker strip or string. A tag should be attached with each bundle to indicate the weight of the bundle. As far as possible, bundle should consist of wire of the same size and same metal. Similar action is required to be taken in case of GI wire.
- Old conductor of same size shall be rolled into bundles. Bundles should be tightened firmly and PVC sticker strip or string regarding size of conductor shall be mentioned. Size, type & Weight of each bundle shall also be indicated on the sticker strip.
- Materials released due to bay capacity augmentation and/or due to replacement like power transformers, distribution transformers, insulator, meter board, cut outs etc are also required to be returned to Employer's stores through proper documentation.
- All other line materials released like, conductors, poles, cross arms; fabricated material, etc. shall be properly accounted for and returned to Employers store after recording all necessary details including weight, length etc. wherever necessary.
- In respect of accountal of devolution of released material, the process as formulated by Employer time to time shall be followed by the Contractor

12. Miscellaneous activities

- Commencement of Supply & Works: The Contractor shall ensure that the supply and installation of material and service under the contract is as per approved PERT / completion schedule of works. The Contractor is to commence supply with the type tested materials with necessary routine test/ acceptance test certificates for a particular lot duly approved by EMPLOYER or the EMPLOYER's authorized agencies.
- The Contractor shall submit Type test and routine test certificates as applicable, issued by NABL accredited / third party independent standard laboratories like CPRI, NPL etc.
- Unit rates: The unit rates quoted shall include details which are obviously and fairly intended, and which may not have been included in these documents but are essential for the satisfactory completion of work. The unit rate quoted shall be inclusive of deployment of all plants, equipments, men, materials, skilled & unskilled labour etc. essential for satisfactory completion of work.
- The prices for fabricated materials shall include all works relating to fabrication, galvanizing, insurance, storage and delivery ex-Contractors stores, unloading and loading. The quoted prices shall also include the cost of necessary quantity of steel and zinc, freight charges up to site store and other indirect charges incurred in connection with supply of finished materials.
- Quantities/ length of 33 KV, 11 KV line and LT line, distribution transformers sub stations, etc. indicated in the price schedules are provisional. Any quantity variation in individual item and in contract value shall be governed as per GCC clause 39. The Contractor shall execute the work based on the actual survey and as approved by the Engineer-in-charge or person authorized by him.

- The scope of work also covers supply of other items, not specifically mentioned in this specification and/or bill of materials but are required for the successful installation, testing, commissioning and satisfactory performance of the 33 KV & 11 KV lines, , distribution transformer sub stations, LT lines, service lines etc.

The following works & services shall also be provided by the Contractor.

- a) Unloading the equipments from the rail or road transport and moving those to storage area. Demurrage/ wharf age charge, if any incurred, shall be paid by the Contractor
- b) Opening of packing cases, inspection and checking of materials for any damage or loss in transit shall be the responsibility of the Contractor. All claims with the concerned authorities e.g. rail, transport, insurance etc. shall be lodged by the Contractor.
- c) Complete erection of equipments, etc covered under the contract, final preparation for testing, commissioning, final run and acceptance tests and putting the sub-station/ plant/line etc. into operation.
- d) All consumable, stores required for the above erection and commissioning works.
- e) All erection tools, lifting tackles, and all equipments, tools & tackles for transportation at site.
- f) Workshop, as required within the work area.
- g) Third party insurance at site and insurance of personnel employed at site as required under Workman's Compensation Act. Security arrangement for watch and guard as required shall be made by Bidder at his own cost.
- h) All the technical/ skilled staff deployed for the job must possess the required qualifications and necessary licenses and permits.
- i) Contractor shall take all safety precautions during work and the workmen must use safety belts, hand gloves, masks and other safety devices as may be necessary for safety of the personnel.
- j) The Contractor shall provide operating personnel during trial tests and till the PSS, DSS, lines and equipments etc. are taken over by EMPLOYER as specified in taking over Clause, defined later.
- k) Any other work not covered above but required for successful completion of the project has to be carried out by the Contractor at his own cost.
- l) Quantity Scope will change to any extent. However, project cost will remain same

Note: Before receipt of equipment at site but without limiting his obligations and responsibilities under this clause hereof, the Contractor shall insure against his liability for any equipment, material or physical damage, loss or injury which may occur to any property, including that of EMPLOYER and project management agency, or to any person including employee of the EMPLOYER, by or arising out of the execution of the contract or in the carrying out of contract. The third party insurance cover shall be provided for the period from date of Ex-factory dispatch till taking over of the entire equipment after testing, commissioning and trial operation, if any.

Third party insurance shall be affected for an adequate amount to cover for all marine, transportation, field transportation, erection, testing and commissioning till handing over to Employer,. Terms shall include a provision whereby, in the event of any claim being brought or made against EMPLOYER in respect of which the Contractor would be entitled to receive indemnity under the policy, the insurer will indemnify EMPLOYER and project management agency against such claims and any costs, charges and expenses in respect hereof. Contractor shall lodge the claim if need so arise, the employer shall be the Employer of the equipment/materials and the claims shall be settled in the name of Employer.

13.0 Augmentation/Renovation

13.1 Renovation/Augmentation of 33 kV line

- 1.00 Renovation/Augmentation of 3 phase 33 kV line using replacement of existing support matching with length and type of existing support is envisaged of following type:
- i. 11 M long steel Tubular poles with welded steel base plate of Designation 540 SP 52 (IS 2713, Pt I, II, III 1980)
 - ii. 13 M long steel Tubular poles with welded steel base plate of Designation 540 SP 72 (IS 2713, Pt I, II, III 1980)
- 2.00 Renovation/Augmentation of existing conductor with following type of new ACSR conductor including jointing sleeves, binding materials and helical formed fittings etc as required are envisaged under this work-
- i. 6/4.72 mm+7/1.57 mm (100 mm² Al. Area) - Dog replacing existing Dog/weasel conductor
- 3.00 While executing this work, mid span pole with all fittings may be provided matching with existing poles of the line.
- 4.00 Following works shall also be executed by Contractor under this head –
- a. Replacement of damaged insulators
 - b. Straightening of tilted supports by providing additional foundation or by providing boulders etc as required.
 - c. Revamping of pole earthing and replacement of GI earth wire.
 - d. Labelling, providing danger board, providing anti climbing device and painting of all the poles shall be in the scope of work
 - e. Replacement of damaged/bent V-cross arms & top clamps with new ones
 - f. Providing of stay set wherever required
 - g. Providing of guarding wherever required
 - h. Removal of old conductor in coil form, removal of old steel structure, removal of old conductor fittings, removal of any other worn out/defective material and deposit them in Employer's store within a reasonable time as decided by Project Manager

5.0 33 kV line for underground Road crossing –

A separate composite item of Road crossing is kept in BoQ. 2 Nos. separate cables shall be laid in separate HDPE pipe enclosures. At a time, one shall be used and another shall be kept

idle as spare in ready to join condition. Cable termination, cable identification, protective covering, laying of jumpering cable etc shall all be completed in this head. This composite item shall contain following key items:

- a. 3Cx300 Sqmm XLPE armored cable (approx. length is 0.3 km each) – 2 sets
- b. 160mm dia HDPE pipe of PE – 80 grade for cable protection in underground laying – 2 sets
- c. 160mm dia HDPE pipe of PE-80 grade for cable support at DP/lattice structure – 2/2 sets
- d. Outdoor heat shrinkable cable jointing kits for main cable and jumpering cable – 4 Nos for main cable, 8 Nos for jumpering cables.
- e. 33 kV lightening arrestor station class 10kA (6 nos.),
- f. 4 Nos GI 3-meters long pipe earthing/chemical earthing,
- g. 6 SWG GI wires with GI nuts, bolts & washers,
- h. Cable markers,
- i. Bi-metallic clamps,
- j. Jumpering with 33 kV Aerial Bunched Cables 200 Sqmm dia (10 mtr) etc – 4 sets

Detail survey of location of Road crossing be performed by Contractor to avoid multi-crossing at nearby location. Prior permission for execution of this work shall be obtained by Project Manager for which necessary technical support shall be provided by Contractor. Line crossing shall be performed using underground cabling.. Contractor should ensure timely completion of work during block period by mobilizing requisite man, materials and machine at crossing locations.

Horizontal drilling machine shall be used for horizontal bore below Roads..

6.0 Quality & Quantity inspection and compliance to the observation:

The line works, before or after commissioning/energisation, shall be inspected by Quality Inspectors and State Inspection Inspectorate. Contractor shall provide all requisite details of line like approved survey report, as built drawings and joint measurement sheet etc to the inspector. Contractor shall rectify defects/deficiencies and submit compliance to the observations with supporting photographs in digital form within one month from receipt of observations.

7.0 Statutory clearances

During execution of 33 KV Line work, all statutory clearances shall be ensured for ground clearance, line-to-line clearance, road crossing clearance, horizontal and vertical clearances from buildings/objects etc. All road crossings and line crossings shall be guarded as per specifications. Conductor joint should not be provided in mid span length. Instead, it should be nearer to the support.

13.2 Renovation/Augmentation of 11 kV line

- 1.00 Renovation/Augmentation of 3 phase 11 kV line using replacement of existing support matching with length and type of existing support is envisaged on following type :
- a. 11 M long steel Tubular poles with welded steel base plate of Designation 540 SP 52 (IS 2713, Pt I, II, III 1980)
 - b. 13 M long steel Tubular poles with welded steel base plate of Designation 540 SP 72 (IS 2713, Pt I, II, III 1980)
- 2.00 Renovation/Augmentation of existing conductor with following type of new ACSR conductor including jointing sleeves, binding materials and helical formed fittings etc as required are envisaged under this work-
- a. 6/4.72 mm+7/1.57 mm (100 mm² Al. Area) - Dog by replacing existing Dog/weasel conductor
- 3.00 While executing this work, mid span pole with all fittings may be provided matching with existing poles of the line.
- 4.00 Following works shall also be executed by Contractor under this head –
- a. Replacement of damaged insulators
 - b. Straightening of tilted supports by providing additional foundation or by providing boulders etc as required.
 - c. Revamping of pole earthing and replacement of GI earth wire.
 - d. Labelling, providing danger board, providing anti climbing device and painting of all the poles shall be in the scope of work
 - e. Replacement of damaged/bent V-cross arms & top clamps with new ones
 - f. Providing of stay set wherever required
 - g. Providing of guarding wherever required
 - h. Removal of old conductor in coil form, removal of old steel structure, removal of old conductor fittings, removal of any other worn out/defective material and deposit them in Employer's store within a reasonable time as decided by Project Manager
5. 11 kV line for underground road crossing –

A separate composite items of 11 kV line Road crossing is kept in BoQ.

2 Nos. separate cables shall be laid in separate HDPE pipe enclosures. At a time, one shall be used and another shall be kept idle as spare in ready to connect condition. Cable termination,

cable identification, protective covering, laying of jumpering cable etc shall all be completed in this head. These composite items shall contain following sub-items:

- a) 3Cx185 sqmm XLPE armored cable (approx. length is 0.3 km each) – 2 sets
- b) 160mm dia HDPE pipe of PE-80 Grade for cable protection in underground laying – 2 sets
- c) 160mm dia HDPE pipe of PE-80 Grade for cable support at DP structure/lattice structure – 2 sets/2 sets
- d) Outdoor heat shrinkable cable jointing kits for main cable and jumpering cable – 4 Nos for main cable and 8 Nos for jumpering cables.
- e) 11 kV lightening arrestor station class 10kA (6 nos.),
- f) 4 Nos GI 3-meters long pipe earthing,
- g) 6 SWG GI wires with GI nuts, bolts & washers,
- h) Cable markers,
- i) Bi-metallic clamps,
- j) Jumpering with 11 kV Arial Bunched Cables 200 Sqmm dia (10 mtr) etc – 4 sets
- k) Maintenance free type earthing

Detail survey of location of road crossing be performed by Contractor to avoid multi-crossing at nearby location. Prior railway permission for execution of this work shall be obtained by Project Manager for which necessary technical support shall be provided by Contractor. Line crossing shall be performed using underground cabling. Block on railway traffic shall be arranged by Project Manager. Contractor should ensure timely completion of work during block period by mobilizing requisite man, materials and machine at crossing locations.

Horizontal drilling machine shall be used for horizontal bore below railway tracks.

6. Quality & Quantity inspection and compliance to the observation:

The line works, before or after commissioning/energisation, shall be inspected by Quality Inspectors and State Inspection Inspectorate. Contractor shall provide all requisite details of line like approved survey report, as built drawings and joint measurement sheet to the inspector to conduct. Contractor shall rectify defects/deficiencies and submit compliance to the observations with supporting photographs in digital form within one month from receipt of observations.

7. Statutory clearances:

During execution of 11 KV Line work, all statutory clearances shall be ensured for ground clearance, line-to-line clearance, road crossing clearance, horizontal and vertical clearances

from buildings/objects etc. All road crossings and line crossings shall be guarded as per specifications. Conductor joint should not be provided in mid span length. Instead, it should be nearer to the support.

13.3 R & M and augmentation of Distribution Transformer Substations

1. Survey of Distribution Transformer Substations:

A detailed survey of overloaded Distribution Transformer substation shall be performed. Existing electrical connected loading and habitation shall be surveyed and a presentable document showing population residing in the un-electrified area/existing electrified area of habitation shall be performed. Based on survey, best option for augmentation of distribution transformer substation and the capacity of new transformer shall be decided. The capacity of augmented DTR shall be governed by following technical aspects:

- a) Optimistic lengths of LT lines needed to feed the existing consumers, existing un-connected consumers and future growth in electrical loading,
- b) Space available for installation of support/transformers,
- c) Probable load expected to come on the transformer due to existing BPL beneficiaries /others connected /un-connected probable beneficiaries in the locality taking care of their expected load growth in next 5 years.
- d) Distribution Transformers of capacity 16 KVA to 630 KVA (single phase as well as three phase) shall be decided as per standard rating of distribution transformer as depicted in IS specifications. Nonstandard ratings of DTR shall not be installed.
- e) Distribution Transformers of capacity 16 KVA to 630 KVA (single phase as well as three phase) shall be installed on existing structures/plinth.

Based on survey report, Project Manager shall decide type, capacity and location of Distribution Transformer sub-station for augmentation/R&M works.

2. Following types of works are envisaged for Distribution Transformer sub-station for augmentation/R&M works:
 - a. Replacement of defective materials of DTR substations
 - b. Re-erection/re-concreting of substation supports
 - c. Dismantling of defective/worn-out steel structure materials, 11 kV/LT equipment like Lightning Arrester, DO Fuse, Distribution Box/SMC Distribution Box, LT cable, jumpering conductor, terminal clamps, insulators etc as required. Shifting of dismantled material to Employer's store within reasonable period of time.
 - d. Installation of stay set for strengthening of DTR substation structure.
 - e. Topping up of new and filtered transformer oil wherever required.

- f. De-moisturizing of silica gel, filling of transformer oil in silica gel breather.
- g. Providing new DTR substation equipment like steel structure materials, 11 kV/LT equipment like Lightning Arrester, DO Fuse, Distribution Box/SMC Distribution Box, LT cable, jumpering conductor, terminal clamps, insulators etc
- h. Renovation of DTR substation earthing by providing new earth pits, inter connection of earth pits and their connection to various equipment
- i. Cleaning of metallic structure items by rubbing through emery paper and re-painting using two coats of red oxide paint and two coats of aluminium oxide paints of reputed type and make as approved by Project Manager using painting brush.

13.4 Renovation of LT line

- 1.00 Conversion of LT line using replacement of existing supports with all fittings matching with length and type of existing support is envisaged of following type:
 - a) 11 M long Steel Tubular poles with welded steel base plate of Designation 540 SP 52 (IS 2713, Pt I, II, III 1980)
 - b) 9 M long pSteel Tubular poles with welded steel base plate of Designation 540 SP 28 (IS 2713, Pt I, II, III 1980)
- 2.00 Conversion of existing LT line of bare conductor with following type of new ABC cable LT line as required are envisaged under this work-

2.01	1X16 (Ph) + 1X25 (bare messenger cum neutral) SQ. MM.
2.02	1X16 (Ph) + 1X25 (bare messenger cum neutral) + 1x16 (insulated Street lighting)SQ. MM.
2.03	3X16(Ph)+1X25 (bare messenger cum neutral) SQ. MM.
2.04	3 X 16(Ph) +1x25 (bare messenger cum neutral) + 1x16 (insulated Street lighting) SQ. MM.
2.05	1X25(Ph)+1x25 (bare messenger cum neutral) SQ. MM.
2.06	1X25(Ph) + 1X25 (bare messenger cum neutral) + 1x16 (insulated Street lighting) SQ. MM.
2.07	3X25(Ph)+1X25 (bare messenger cum neutral) SQ. MM.
2.08	3 X 25(Ph) +1x25 (bare messenger cum neutral) + 1x16 (insulated Street lighting) SQ. MM.
2.09	1X35(Ph)+1X25 (bare messenger cum neutral) SQ. MM.
2.10	1x35(Ph) + 1X25 (bare messenger cum neutral) + 1x16 (insulated Street lighting) SQ. MM.
2.11	3X35(Ph)+1X25 (bare messenger cum neutral) SQ. MM.
2.12	3X35 (Ph) + 1x25 (bare messenger cum neutral)+ 1x16 (insulated Street lighting)

	SQ. MM.
2.13	3X50(Ph)+1X35 (bare messenger cum neutral) SQ. MM.
2.14	3X50 (Ph)+1x35 (bare messenger cum neutral) +1x16 (insulated Street lighting) SQ. MM.
2.15	3X95(Ph)+1X70 (bare messenger cum neutral) SQ. MM.
2.16	3X95(Ph)+1X70 (bare messenger cum neutral) +1x16 (insulated Street lighting) SQ. MM.
2.17	3X120(Ph)+1X70 (bare messenger cum neutral) +1x16 (insulated Street lighting) SQ. MM.

3.00 While executing this work, mid span pole with all fittings may be provided matching with existing poles of the line or wherever the sag is high and need so arise.

4.00 Following works shall also be executed by Contractor under this head –

- a) Straightening of tilted supports by providing additional foundation or by providing boulders etc as required.
- b) Revamping of pole earthings and replacement of GI earth wire.
- c) Labelling, providing danger board, providing anti climbing device and painting of all the poles shall be in the scope of work
- d) Providing of stay set wherever required
- e) Removal of old bare conductor and depositing in Employer's store.

13.5 LT AB Cable Reconductoring Work

1. Survey

1.1. Survey

The Contractor shall carry out a GPS based survey of existing bare conductor LT distribution lines in the habitation. The Survey should cover Pole by pole survey of all the bare conductor lines to identify the location of poles and phase configuration, pole condition, Existing stays / struts, Existing street lamp connections, Location and capacity of the connected distribution transformer (DTR) to each LT line, Connection points of any existing ABC lines connected to the bare conductor lines should be identified. The length of such ABC lines and total service connections provided through this line should be indicated on the map at this point, Load readings for each LT feeder. Upon completion of the survey the Contractor is required to develop the Single Line Diagram (SLD-A) indicating the survey Information and Schedule of network survey information (Schedule – A).

1.2 Load Readings

Load readings of each LT feeder shall be taken before and after proposed ABC conversions. This is required to monitor actual demand reductions achieved following ABC conversions.

Load currents on each phase and the neutral in respective LT feeder shall be taken on four different occasions per day before and after completion of ABC conversion work. The load current measurements shall be decided by Engineer in Charge. Load reading before ABC conversions shall be taken when carrying out the survey and recorded in Schedule-A. Load readings after ABC conversions shall be provided to the Project Manager/Engineer in charge within one week from completion of works.

1.3 Network Design for ABC Conversions

Contractor should prepare details of proposed ABC conversions for respective habitation in accordance with these guidelines and prepare Single line diagram indicating proposed ABC conversions (SLD-B) and Schedule of proposed ABC conversions (Schedule -B). while preparing SLD, loading in distribution transformer must be examined. On completion of work, average day-loading in distribution transformer should limit 80-85% only. Contractor

1.4 Load Balancing

When preparing ABC conversion schedule (Schedule-B), phase connections for single phase Distribution Box/SMC Distribution Boxes shall be determined so that total number of single phase consumers are balanced across the three phases of a given feeder.

2. Conversion of bare conductor lines to ABC

2.1 AB Cable types and Sizes

1.1 kV voltage grade XLPE insulated aluminum conductor and aluminum alloy bare neutral messenger type cables shall be used for proposed ABC conversions. The AB cables provided shall fully comply with technical specifications provided in this tender document.

The following standard sizes of AB cables shall be used:

- ✓ ABC16-SP : 1X16 mm² (ph)+1X25 mm² (bare messenger cum neutral) +1x16 mm² (insulated street lighting cable)
- ✓ ABC50 : 3X50 mm² (ph)+1x35 mm² (bare messenger cum neutral) +1x16 mm² (insulated street lighting)
- ✓ ABC95 : 3X95 mm² (ph)+1x70 mm² (bare messenger cum neutral) +1x16 mm² (insulated street lighting)
- ✓ ABC120: 3X120 mm²(ph)+1x70 mm² (bare messenger cum neutral)+1x16 mm² (insulated street lighting)

2.2 Vertical and Horizontal Clearances

All statutory clearances shall be ensured for ground clearance, line-to-line clearance, road crossing clearance, horizontal and vertical clearances from buildings/objects etc. All road

crossings and line crossings shall be guarded as per specifications. Conductor joint should not be provided in mid span length. Instead, it should be nearer to the support.

As per ISS 162-1961 minimum electrical clearance from live part to earth and safety clearance in case of different voltage must be kept as follows:			
Voltage	Electrical Clearance (mm)		Safety Clearance in SIS (mm)
	Phase - Earth	Phase - Phase	
33kV	381	432	2740
66kV	658	786	3050

Minimum Clearance Between Power Lines (mtr.) :			
kV	11	33	66
11	2.44	2.44	2.44
33		2.44	2.44
66			2.44

2.3 Installation of AB Cables

3. Prior to installation of AB cables, all pole works including stay/struts works should be completed as per scope of works provided in proceeding sections. (i.e installation of new poles, pole replacements, pole re-alignment, installation of pole supports).

All ABC accessories used for installation works shall conform to technical specification provided in this document.

3..1. Installation of clamp assemblies

AB cable should be installed on poles using anchoring and suspension clamps according to the approved drawings by the Project Manager. Samples of complete clamp assemblies shall be approved by the Project Manager prior to use.

Anchoring clamps shall be used at the beginning and end of each cable run, at a major change in direction, terminal poles and at T-off points. Suspension clamps shall be used at other intermediate points.

It should be noted that different clamps are specified for cable ranges 25-50 sqmm and 70-95 sqmm. These have different dimensional and maximum load specifications. If ABC manufacturer recommends any alternate clamps it should be approved by the Project Manager prior to use.

Stainless steel straps and buckles shall be used for fixing pole brackets to the pole as shown in drawings. Strap binding tool shall be used for tensioning and cutting the straps.

Separation of neutral messenger for tensioning and fixing to the clamp should be done using plastic phase separators. Weather resistant black nylon ties should be used for typing insulated

conductors to the neutral messenger at either side of suspension clamps, to prevent the phase conductors from chatting against suspension clamp.

3..2. Stringing of AB cable

Stringing of AB cables shall be done in a proper manner ensuring insulated conductors do not get damaged during installation. Dragging the ABC on the ground is not permitted. Pulleys installed on poles shall be used to pull AB cables.

Minimum clearance above ground to line shall be maintained. Sag tension charts for installing AB cables shall be developed by the Contractor taking into consideration of cable characteristics, maximum / minimum temperatures and maximum wind pressure as per service conditions provided by Employer. Based on this clear guidelines shall be provided to linesmen to ensure bare neutral messenger is pulled at appropriate tension so that;

- (a) Required ground clearances are maintained, and
- (b) Messenger conductor tension is maintained well below its breaking load at all temperatures.

Dynamometer method or sag method may be used to ensure appropriate tension of neutral messenger during installation. Over tensioning of neutral messenger should be avoided to ensure its tension does not exceed permissible loading limits at low temperatures. Loose spans of AB cable should be avoided to maintain permissible maximum sag at high temperatures. Loose spans may only be allowed for short spans in special cases. This applies when there are practical difficulties to install necessary stays or struts as required at a t-off point. A short loose span of AB cable may be used in this case to transfer the stay / strut support point upstream or downstream of the line.

Stringing of AB cable shall be done using proper equipment such as stringing blocks with plastic coated pulleys, pulling (come along) clamp, cable hoist and pulling tool, dynamometer etc. Proper equipment recommended by the ABC manufacturer shall be used to avoid any damage to the cable during installation. Temporary stays or strut poles shall be employed as necessary during stringing operation to ensure safety of personnel and equipment.

Phasing of insulated conductors shall be identified by one, two and three ridges on the XLPE insulation. Same phasing shall be maintained accordingly through the line. Interchanging of phasing at any connection point is not permitted.

In order to ensure durability of AB cables and to prevent possibility of failures due to effects of water treeing, any exposed parts of phase conductors or open cuts of insulation are strictly not permitted. Hence all connectors to be used in ABC line shall be pre-insulated type or bare connectors covered by heat shrinkable tubing or GelWrap sleeves. For installing connectors proper equipment such as insulation stripping tool, ratchet cable cutter, hydraulic compression tool with compression dies shall be used.

All cable ends shall be properly sealed by pre-moulded or heat-shrinkable type end caps. Samples of all ABC accessories including connectors shall be approved by the Project Manager prior to use.

Mid-span joints shall be generally avoided by properly planning stringing work. In exceptional cases where mid span joint is required, pre-insulated compression connectors shall be used. The joints for each phase shall be staggered along the cable. No mid-span joints are allowed for AB cable sections running across a street.

Insulated piercing connectors or non-tension mechanical connectors with heat shrinkable tubing shall be used for non-tension inline connections at anchoring points where necessary.

3..3. AB cable connections to Distribution Transformers

AB cables shall be connected to bus-bars or protection equipment terminals of the LT feeder Distribution Boards by means of pre-insulated compression lugs and aluminium / bi-metallic strips.

Where no Distribution Board is available AB cable shall be directly connected to the distribution transformer bushing terminals using insulated compression lugs. In this case additional length of AB cable shall be provided by means of a loop to facilitate future connection to the Distribution Board or fuses.

3..4. Earthing of Poles / ABC neutral messenger conductor

Earthing shall generally be carried out in accordance with the requirements of latest CEA regulations (as amended from time to time) and the relevant regulations of the Electricity Supply Authority

The Contractor shall ensure every 6th pole of ABC line including neutral messenger and any metallic hardware is earthed with spike earth (20x2500 mm) as per existing practice of Employer. (for normal soil).

Poles shall be earthed using 8 SWG (7/4.0 mm) GI wire with 1 No. Coil/Spike/Pipe earth.

3..5. Pole Numbering

Each pole of the existing line shall be uniquely numbered as per pole numbering scheme followed by the Employer. Pole number and other information as required by the Employer should be painted on the pole.

- 3..6. Dismantling existing bare conductors and line hardware
Dismantling existing bare conductors and line hardware. Conductors and other line hardware including insulators, brackets, cross arms and bolts and nuts shall be carefully removed without causing damage to the existing poles. Bare conductors shall be removed in the longest length practicable for future re-use with a metal tag of description/ tag # of conductor, the said conductor shall be wound on empty conductor reels or made up in rolls.
Following dismantling works affected areas shall be cleaned and reinstated. All dismantled items shall remain the property of Employer and Contractor shall deliver all salvaged materials to the designated Employer warehouse as directed by the Project Manager.
- 3..7. Parallel AB Cable lines
Parallel AB cable lines refers to installation of second ABC cable line on the existing poles as per design requirements approved by Employer.
The scope of work for this item shall exclude (a) existing bare conductor line dismantling and (b) pole numbering requirements applicable for the scope of works specified above for 'conversion of bare conductor lines to ABC'.
- 3..8. Rates for Conversion of bare conductor lines to ABC
It should be noted that scope of work for this item relates to AB cable installation on existing poles. It excludes any additional works required on the existing poles or installation of new poles, installation of Distribution Box/SMC Distribution Boxes, stays etc. Separate BOQ items are provided for work associated with installation of new poles and replacement, re-alignment or relocation of existing poles, installation of stays and struts and installation of Distribution Box/SMC Distribution Boxes for AB cables.
4. Installation of LT Distribution Box/SMC Distribution Boxes for ABC
- 4..1. Types of LT Distribution Box/SMC Distribution Boxes
The following types of LT Distribution Box/SMC Distribution Boxes (according to number of consumers to be connected) shall be selected:
- ✓ Type A : Single Phase, 1 Incoming (25 mm²)/ 6 outgoing (upto 10 mm²)
 - ✓ Type B : Three Phase, 1 Incoming (35 mm²)/ 4 outgoing (upto 16 mm²)
- 4..2. Mounting Arrangement
Distribution Box/SMC Distribution Box (DB) shall be mounted on LT pole with galvanized MS clamp of 40x3 mm size.
- 4..3. Connection to AB Cable
2Cx25 sqmm or 4Cx35 sqmm Stranded cables shall be used to connect AB cable with single phase and three phase Distribution Box/SMC Distribution Box respectively. For connection to ABC, insulation piercing connectors (IPC) and PG clamps of appropriate size shall be used.

Single phase Distribution Box/SMC Distribution Boxes shall be connected to specified phase as per Schedule-B in order to ensure load balancing in ABC line.

4.4. Connection of Consumer Service Cables

All existing consumer service cables shall be re-connected to the Distribution Box/SMC Distribution Box by the Contractor. In case existing consumer service connections are to be replaced with armoured service cables in a given habitation as determined by the Project Manager, new armoured cable shall be connected to the Distribution Box/SMC Distribution Box.

5. Replacement of Existing Consumer Service Connections

5.1. Service Connection Types

The applicable service connection types are as follows;

SC Type	Connected Load No of Phases / Contract Dmd	Service Cable Size (cores / sqmm)
SP-1	Single Phase / upto 4 kW	2 x 4 mm ²
TP-1	Three Phase / upto 4 kW	4 x 4 mm ²
TP-2	Three Phase / above 4 kW	4 x 4 mm ²

5.2. Service Cable Types

The service cable shall be 1.1 KV grade PVC insulated, PVC sheathed, armoured multicore stranded aluminium cable as per sizes indicated in above table

5.3. Service Cable Span

Permissible maximum span for service cable shall be 30 m. In isolated cases this limit may be extended with the approval of Project Manager provided that required ground clearance is maintained with additional supports where necessary.

Existing service cables shall be replaced with armored service cables only in certain specified areas which are high theft prone areas. This will be specified by the Project Manager during execution. No service cable replacements shall be carried out without the approval of Project Manager.

In this case existing service cables shall be replaced with new armoured cables. Existing un-armoured service cables shall be removed and returned to Employer warehouse. Any non-standard supports used as supports for existing service cables shall also be removed.

New armoured service cables shall be drawn from the LT Distribution Box/SMC Distribution Box upto the meter board as shown in drawings. The service wire is to be hanged on supportive GI wire between pole support and the house. 7/3.15 mm (10 SWG) & 7/4.00 mm (8 SWG) GI wires shall be used for single phase and three phase services respectively.

Before installing service wires and GI wire, GI pipe / MS Angle on the consumer premises is to be erected using clamps/ nails/proper binding etc. In case of hut or poor structure at consumer premises, GI pipe is to clamp on wooden planks/wooden structure existing in the house. The GI pipe should be supported for neutralizing tension by means of GI tie wire support. In pukka/brickwork/cement concrete foundations, house, GI support pipe is to be clamped by means of MS clips.

New service cable shall be connected to existing consumer meter terminals or incoming fuse / MCB / MCCB terminals. Care should be taken not to damage the existing meters in the process. 20mm dia PVC conduit pipes shall be used to take down service cable from the roof to the meter box along the walls. The service cable shall be drawn inside PVC pipes from roof upto the meter board.

Terminal cover of the meter or fuses shall be sealed upon connection of new service cable as arranged with the Employer.

Earth terminal point shall be provided at meter board via bearer GI wire. This point shall be connected with the proper earthing system through GI wire. 10mm diameter earth knob in form of bolt and nut is to be installed on energy meter board.

All work required to install service cable from LT Distribution Box/SMC Distribution Box upto the meter board shall be carried out as per drawings. This includes GI wire for supporting service cables from LT Distribution Box/SMC Distribution Box upto the consumer premises, MS angle fixed at roof, clamp with bolts nuts and flat iron for fixing GI wire on pole, clamps for fixing cable to GI wire, PVC conduit pipes and accessories to draw the service cable from roof upto the meter board.

6. Installation of Poles

6..1. Types of pole installation works for ABC conversions

The following types of pole installation works applicable for ABC conversions as per site requirements specified in the table below;

#	Type	Site Requirements
1	Installation of new poles	<ul style="list-style-type: none"> · New pole to be used as an intermediate pole in the existing line to address excessive spans or other requirements. · When there is a need to do minor extensions to the existing line in order to minimize excessive service cable lengths to

		existing consumers. · To shift existing lines due to safety/ clearance issues.
2	Replacement of existing (unusable) poles	· To replace existing poles which are damaged / corroded and cannot be re-used. · To replace of existing non-standard line supports such as temporary structures including supports embedded in buildings.
3	Re-location of existing poles	· To shift existing poles · To shift existing lines due to safety/ clearance issues
4	Re-alignment of existing poles	· To straighten the poles that are inclined in a particular direction but in re-usable condition

6..2. Types of poles

For works relating to new poles and replacement of poles, poles according to Employer specification shall be used.

For works relating to re-location or realignment of existing poles the available existing pole (any type) may be re-used provided that it is in re-usable condition.

7. Erection of Poles

7..1. Removal of existing poles for re-use or disposal

All unusable poles or non-standard line supports in the existing LT lines shall be removed and disposed. If the existing pole is removed for re-use adequate measures should be taken not to damage the pole during removal.

Existing poles shall be removed by pulling the complete pole from the ground; poles shall not be cut off at the ground line. Pole shall be cleaned and any material attached with the pole (including concrete) shall be removed. The RCC base plate may be removed and re-used if it is in re-usable condition.

Pits shall be backfilled and compacted completely with sufficient added backfill piled above grade to prevent depressions being created by natural compaction.

Contractor shall be responsible for disposal of unusable poles or non-standard line support structures after taking approval of the Project Manager/ Engineer In- Charge of the Employer.

7..2. Erection of new or existing poles

Pole pit shall be excavated as per details provided in drawing.

- 7.3.3. Erection of poles with concrete foundation
Concrete foundations shall be used to erect terminal / tension poles and poles in water logged areas or for all locations as instructed by the Project Manager.
- 7.3.4. Re-alignment of existing pole
Existing poles that are inclined in a particular direction shall be re-aligned / straightened by pulling, providing additional bouldering, concreting and re-compacting as necessary. Upon re-alignment pole shall be erected fully vertical and firmly fixed to ground and shall not wobble. If necessary pole may be completely removed and re-installed.
- 7.3.5. Earthing of poles
Earthing of poles shall be carried out as per CEA regulations and existing practice of Employer.
- 7.3.6. Pole Numbering
Requirements specified in section 3.9 with respect pole numbering shall also be applicable for new poles or pole replacements indicated in this section.
8. Installation of Stays and Struts
- 8.1. Installation of Stays (Guys)
Stays shall be installed to nullify tension on poles due to tension of AB cable at terminal, angle, cut-point and T-off positions. Stays may also be installed at steep gradient locations as required. Along the straight run stays shall be installed at minimum two locations in 1 km.
- If there are no existing stays installed at such locations in the existing line, such poles shall be identified and included in Schedule-B for installation of new stays. In addition required stays for proposed new and relocated poles shall also be included.
- 10 SWG stay wire (7/ 3.15 mm) with 16 mm stay rod shall be used for 11 kV / LT lines. Stay shall be installed in the opposite direction of resultant force due to AB cable tension in order to nullify the same.
- If the stay wire proves to be hazardous, it should be protected with suitable asbestos pipe filled with concrete of about 2 m length above the ground level, painted with white and black strips so that, it may be visible at night.
- 8.2. Installation of Struts
The struts may be used only in case where stays cannot be installed due to physical obstacles or limitations. Strut shall be applied in the same direction of resultant force due to AB cable tension in order to nullify the same.

8..3. Installation of Stays

Stay assembly comprising of turn buckle assembly, anchor rod and plate, stay insulator, thimble and GI stay wire shall be supplied and installed .

In general, the stay should be applied on the pole as close as possible to the load center. The angle between stay wire and pole shall be between 45° – 60°. Where there are issues obtaining specified angle due to physical obstacles, bow (outrigger) stay arrangement may be considered with the approval of the Project Manager. In case of critical space issues, fly stays may also be considered subject to approval of the Project Manager.

Concreting of stay pit shall be done as shown in drawings except for firm soil where compacting with necessary aggregates shall be done.

Stay wire shall be properly tightened after installation and allowing sufficient time for setting concrete. Contractor shall ensure all stays in the existing line are properly tightened including new and existing stays.

8..4. Installation of Strut pole

Installation of strut pole shall be carried out using 8 m PCC pole and pole brackets. Strut pole shall be installed with the RCC base plate. Angle between the line and strut pole shall be 45 degree.

9. Re-Connecting Existing Street Lamps to ABC

If there are existing street lamps connected to the bare conductor line, these street lamps shall be re-connected to ABC line through the street lighting conductor using IPC (for insulated conductor) and PG clamps (for bare neutral messenger). This work scope is limited to providing connection to existing street lamps only.

10. Shutdown during execution of works :

The Contractor is required to take shutdown to execute reconductering and all other works wherever needed. During shut down, safety of system and operating manpower shall be ensured by Contractor.

Shut down shall be planned with concerned substation incharge well in advance. This may subject to exigencies leading to cancellation of requisition if situation so desire. Contractor shall be responsible to take advance action on resource mobilization (men, materials and machine) well in advance to perform shut down works. Adequate manpower shall be mobilise so as to take-up the works in parallel at ll supports on given shut-down area. Contractor shall deploy well educated and experience engineer to take care of shut down, eand earthing of lines, check clearances on completion of works, return shut down and ensure re-energisation of section/part

of line. He shall be available at site for taking shut-down, during execution of works, return of shut down and re-energisation of line. Safety of working crew shall be looked after by him. He must be a trained person having requisite experience of shut-down works. He must be well aware of LT/HT networks and their supply sources.

On completion of work, Contractor shall provide as built GA drawings GPS making of connected consumers and their type of connection (single/three phase), domestic/commercial/agriculture etc. and connected loads.

14.0 Underground Cabling

14.1 Underground Cabling

1. Survey

The detailed survey shall be carried out for the approved feeders/spur lines by the Contractor and submitted for Employer's approval. The Successful Tenderer shall carry out radar survey of the route using Ground penetrating Radar and determine route profile of any other utility cables, pipes etc along the route. The route survey and drilling profile shall be got approved and finalized by the Engineer-in-Charge prior to commencement of the drilling, HDPE pipe insertion and cable insertion.

2. The scope includes :

- ✓ Laying of underground 33 KV, XLPE HT Cable (3Cx400 sqmm.,)
- ✓ Laying of underground 11KV, XLPE HT Cable (3Cx300 sqmm., 3Cx120 Sqmm.)
- ✓ Laying of underground 1.1 KV, XLPE, LT Power Cable (4Cx240 Sqmm., 4Cx95 Sqmm., 1Cx630 Sqmm.)
- ✓ Laying of underground 1.1 KV, PVC, LT armoured Service Power Cable (4Cx25 sqmm, 4Cx16 Sqmm. 2Cx10 sqmm., 2Cx6 Sqmm.)
- ✓ Supply , Installation , testing & comissioining of RMU as defined in BOQ as per technical specification.

3. Horizontal Direction Drilling

- 8.1. HDD or Horizontal Directional Drilling is a trenchless boring method for installing underground cables, pipes and conduits in a shallow curve along a prescribed bore path with the use of a surface-launched rig / machine, which minimises the disruption of th surrounding area, for example, roads and driveways. The laying of U/G cables shall normally be done direct in ground through trenchless boring by using HDPE pipes. However in exceptional circumstances the cables may have to be laid in covered trenches or in racks fixed to the walls or supported from the ceilings. The scope shall cover supply of all the material as per the BOQ, erection

equipments, labour and all the other items required for the laying of the power cables. The cable route markers, at a maximum distance of 200 mtrs, and danger boards shall be provided for the information of all concerned and for their safety. Any additional requirement in terms of safety perspective shall be provided by the Contractor without any extra cost. It is the responsibility of the Contractor to maintain the required statutory clearances from other utility services. Any damage caused to any utility services/ human life / public property etc shall be the sole responsibility of the Contractor. The Contractor will lay the underground power cable in such a fashion that no straight through joints are required and only end terminations joints are required, however wherever the joints are required in HT cable then the same shall be carried out overhead on PCC poles structure. In circumstances such as where length of line is more than the standard cable length in drum and overhead jointing is not possible then straight through joints will be allowed. The Contractor shall have ISO 9001-2008/18001-2007

- 8.2. The Horizontal drilling shall be for a distance of not less than 90 mts at each stretch and subsequently thereafter. The reinstatement of road dug up for drilling at every 90 mts shall be incorporated in the price for Horizontal Directional Drilling.
- 8.3. Disposal of extra excavated material such as mud, slurry, stones etc shall be also included in the rate per meter of horizontal drilling and shall not be charged extra.
- 8.4. The trenchless technology shall be used with HDPE casing for the portion of the cable route such as road, railway, nullah crossing and without HDPE casing for major portion of the cable route. The outer diameter of the HDPE pipe shall be suitable for insertion in an 8" diameter horizontally drilled bore. The HDPE pipe shall be of PE 80 grade with pressure rating PN4 conforming to IS 4984/1995 and shall have wall thickness of 6.20 to 7.10 mm. The HDPE pipes shall be joined by using Butt welding and a 7/20 G.I wire shall be provided along the entire length of each pipe duct.
- 8.5. The directional drilling equipment shall consist of a directional drilling rig of sufficient capacity to perform the bore and pull back the pipe/cable, a drilling fluid mixing, delivery, and recovery system of sufficient capacity to successfully complete the installation, a drilling fluid recycling system to remove solids from the drilling fluid so that the fluid can be reused (if required), a magnetic guidance system or walk over system to accurately guide boring operations, a vacuum truck of sufficient capacity to handle the drilling fluid volume, and trained and competent personnel to operate the system. All equipment shall be in good, safe condition with sufficient supplies, materials and spare parts on hand to maintain the system in good working order for the duration of this project.
- 8.6. The directional drilling machine shall consist of a hydraulically powered system to rotate and push hollow drilling pipe into the ground at a variable angle while delivering a pressurized fluid mixture to a guidable drill (bore) head. The machine shall be anchored to the ground to withstand the bulling, pushing and rotating pressure required to complete the installation. The hydraulic power system shall be self-contained with sufficient pressure and volume to power drilling operations. Hydraulic system shall be free of leaks. Rig shall have a system to monitor and record maximum pullback pressure during pullback operations.

- 8.7. There shall be a system to detect electrical current from the drill string and an audible alarm which automatically sounds when an electrical current is detected.
- 8.8. The drill head shall be steerable by changing its rotation and shall provide necessary cutting surfaces and drilling fluid jets.
- 8.9. Mud motors shall be of adequate power to turn the required drilling tools.
- 8.10. Drill Pipe shall be constructed of high quality 4130 seamless tubing, grade D or better, with threaded box and pins. Tool joints should be hardened to 32-36 RC.

4. Accessories

- 8.1. This being a Turnkey contract, successful installation, commissioning & integration with existing system, of those equipment/accessories/material not specifically mentioned in the specifications, shall be the responsibility of Contractor. No extra payment shall be made for these inherent works.
- 8.2. He shall also supply all other associated equipment/ material/accessories not specifically mentioned in this tender specification but are required for successful and trouble free operation of the executed work as a whole. For that no extra payment shall be made to the Contractor.

5. Technical Standards

- 8.1. The electrical equipments and materials required during erection should be of high standard. Technical features of these equipments and materials must conform to the technical specification given in this bidding document. Wherever the same is not specified, it must conform to the relevant I.S for that material.
- 8.2. Materials conforming to other international standards, which ensure equal or higher quality than the standards mentioned above, shall also be acceptable. In case the bidders who wish to offer materials conforming to other standards, salient points of difference between standards adopted and specific standards shall be clearly brought out in the respective schedule. Four copies of such standards with authentic English version shall be furnished along with the offer.
- 8.3. Whenever a material or an article is specified or described by the name of a particular brand, manufacturer or trade mark, the specific item shall be understood as establishing type, function and quality desired. Products of other manufacturers may also be considered, provided sufficient information is furnished, so as to enable the Employer to determine that the products are equivalent to those mentioned.
- 8.4. Materials supplied/used shall conform in all respects to the relevant Indian Standard Specification with latest amendments there to.

	Title	IS No.
1.	Cement	IS 269
2.	Steel	IS 6003/1970
3.	Fasteners	IS 6639/1972
4.	Concrete mix	IS 1343
5.	RCC	IS 456

6. Cable laying and jointing IS 1255

Installation work pertaining to equipment, cable laying etc should be in accordance with the applicable standards, safety codes etc.

6. Site Storage/ Transportation

8.1. It shall be the responsibility of the Contractor to store, move/transport from stores/storage yard etc., relevant items and accessories to the place of installation wherever necessary he will assemble all parts of equipment. In accordance with the specific installation instructions as directed by Site Engineer.

8.2. The stores should be dismantled and site cleared after the work is completed

7. HT/LT Line Road crossing

Separate cables shall be laid in separate HDPE pipe enclosures. At a time, one shall be used and another shall be kept idle as spare in ready to join condition. Cable termination, cable identification, protective covering, laying of jumpering cable etc shall all be completed in this head.

Detail survey of location of Road crossing be performed by Contractor to avoid multi-crossing at nearby location. Prior permission for execution of this work shall be obtained by Project Manager for which necessary technical support shall be provided by Contractor. Line crossing shall be performed using underground cabling. Contractor should ensure timely completion of work during block period by mobilizing requisite man, materials and machine at crossing location.

6. Quality & Quantity inspection and compliance to the observation:

The line works, before or after commissioning/energisation, shall be inspected by Quality Inspectors and State Inspection Inspectorate. Contractor shall provide all requisite details of line like approved survey report, as built drawings and joint measurement sheet to the inspector to conduct. Contractor shall rectify defects/deficiencies and submit compliance to the observations with supporting photographs in digital form within one month from receipt of observations.

7. Statutory clearances:

During execution of 11 KV Line work, all statutory clearances shall be ensured for ground clearance, line-to-line clearance, road crossing clearance, horizontal and vertical clearances from buildings/objects etc. All road crossings and line crossings shall be guarded as per specifications. Conductor joint should not be provided in mid span length. Instead, it should be nearer to the support.

8. Erection, Testing and Commissioning

- 8.1. All the works covered under the scope of the tender shall be done in accordance with the norms defined by the Employer, unless the same is not specifically defined in the specification or with the provisions of Indian Electricity Rules/Acts/Other Government Rules/Regulations as prevalent at the time of execution of the job/work.
- 8.2. Installation shall be carried out strictly in accordance with the approved drawings Modifications, if any, required to suit site conditions, shall be carried out only with the prior approval of the Site Engineer. All such changes shall be incorporated in "As built" drawings to be furnished by the Contractor.
- 8.3. Responsibility for successful installation of other equipment accessories, purchased but not mentioned specifically above, and their commissioning shall be on Contractor. For all such items the Contractor shall be supplying all material and equipment required to accomplish the job complete in all respect.
- 8.4. Installation work pertaining to equipment, cable laying etc should be in accordance with the applicable standards, safety codes etc.
- 8.5. The Contractors shall themselves be responsible for timely arrangement/ procurement of all the raw materials required for the manufacture of all tendered items by them/ their and / or by their vendors.
- 8.6. While Repairing & Replacing the equipment, if any other equipment gets damaged due to negligent handling of the Contractor the same shall be replaced by the Contractor at his cost to the Employer satisfaction.
- 8.7. He shall be responsible for dismantling of defective equipments, there proper handling and shifting.
- 8.8. All charges on account of damages/losses/claims/thefts etc. involved under the conditions laid down above shall be borne by the Contractor. It's cost shall be recovered from his bills /security deposits /other assets.
- 8.9. In order to avoid hazards to personnel moving around, the equipment such as Transformer, Capacitor Banks, Switchgears etc. if required to be kept charged after installation till their commissioning, shall be cordoned off by suitable barriers to prevent accidental injury to personnel moving around.
- 8.10. Where the equipments/ assemblies are supplied in more than one part, the Contractor shall make all necessary mechanical and electrical connections between the sections. The Contractor shall also do necessary adjustment in the alignments required for its proper operation.
- 8.11. Care shall be taken in handling instruments relays and other delicate devices where instruments and relays are supplied separately they shall be mounted only after the associated switch gear/control panels are erected and aligned.
- 8.12. Precaution: The Contractor shall exercise all possible care to avoid damage to public utilities e.g. water/ sewage pipes telephone and power lines/cable already existing. In case of any

accidental damage during the work, the Contractor shall be responsible to repair/replace the same at his own cost, and shall ensure that the purchaser is not put to any loss.

- 8.13. The Contractor shall have to provide proper lighting, barricading, signboards etc. at the work site as a necessary precautionary arrangement to avoid accident/ damage/ losses to the public /utilities/properties.
- 8.14. Site Solution: It may be possible due to some reasons or others that it would not be possible to work as per the procedure. In such case/cases, the solution to the problem shall be achieved by the purchaser with the consultation of Contractor, and the Contractor shall work as per procedure proposed by the purchaser. Such cases shall in variably be informed to the engineer of the contract for which no extra payments shall be made.
- 8.15. Space Constraints: While executing the job it is quite possible that some of the specified work may not be carried out due to space/land/ other technical constraints etc. In such case the concerned Employer, if required, may divert this work at some other site or cancel the left over portions of work.
- 8.16. The Contractor shall ensure that the equipment under erection as well as the work area and the site are kept clean to the satisfaction of the Engineer. In case, the Engineer is not satisfied about the cleanliness he will have the right to carry out the cleaning operations and expenditure incurred in this regard will be to Contractor's account. Packing cases and packing materials shall be promptly cleared from sites.

14.2 Replacement of Existing Consumer Service Connections

14.2.1 Service Connection Types

The applicable service connection types are as follows;

SC Type	Connected Load No of Phases / Contract Dmd	Service Cable Size (cores / sqmm)
SP-1	Single Phase / upto 4 kW	2C x 6 mm ²
SP-2	Single Phase / above 4 kW	2C x 10 mm ²
TP-1	Three Phase / upto 4 kW	4C x 16 mm ²
TP-2	Three Phase / above 4 kW	4C x 25 mm ²

14.2.2 Service Cable Types

The service cable shall be 1.1 KV grade PVC insulated, PVC sheathed, armoured multicore stranded aluminium cable as per sizes indicated in above table

14.2.3 Service Cable Span

Permissible maximum span for service cable shall be 25 m. Existing service cables shall be replaced with armored service cables only in certain specified areas which are high theft prone

areas. This will be specified by the Project Manager during execution. No service cable replacements shall be carried out without the approval of Project Manager.

In this case existing service cables shall be replaced with new armoured cables. Existing un-armoured service cables shall be removed and returned to Employer warehouse. Any non-standard supports used as supports for existing service cables shall also be removed.

New armoured service cables shall be drawn from the LT Distribution Box (Type-C) upto the meter board. PVC heavy guage pipe of size 50 mm shall be used for extending single phase and three phase connections for underground portion/area. New service cable shall be connected to existing consumer meter terminals or incoming fuse / MCB / MCCB terminals. Care should be taken not to damage the existing meters in the process. Terminal cover of the meter or fuses shall be sealed upon connection of new service cable as arranged with the Employer.

All work required to install service cable from LT Distribution Box shall be carried out as per BOQ/Drawing.

15.0 SCADA System

Brief Scope of Work

1. Replacement of 11 kV Indoor Switchgear with SCADA Compatible Indoor Switchgear at 33/11 kV PTC Substation and 33/11 kV Taxi stand Substation
2. Replacement of 33/11 kV Transformer Control and Relay Panel at Taxi Stand Substation
3. Installation of SCADA Compatible RMUs in the feeders of the substation earmarked for this project. Details of Substations and Feeder details are given separately in the below paragraphs
4. Field survey, design ,engineering, supply, installation, testing & commissioning of SCADA/DMS software applications, Dispatcher Training Simulator (DTS), hardware (including PCs, Servers, Routers, Switches, VPS, RTU, FRTUs, FPIs, Multi function Transducers (MFTs), Communication equipment, Auxiliary power supply etc), software (including operating system, databases, network management system etc.), network (LAN, WAN), etc. (SCADA/DMS Control center is to be located at 33/11 kV Company Bagh Substation) (Location of SCADA/DMS Control Center will be intimated separately during detailed engineering)
5. Supply, Installation and commissioning of 6 core OFC Cable. (6 Core OFC Cable is to be laid between the 33//11 kV substations earmarked for this project and 33/11 kV Company Bagh Substation (location of SCADA/DMS Control Center)
6. Integration with existing /under implementation IT system under R-APDRP & any other relevant SCADA/ DMS legacy system in the identified project areas of the utility
7. Facilities management services for maintaining infrastructure, post successful completion of acceptance tests for a period of five years from the date of completion of acceptance test.

Scope of work**1. 33/11 kV PTC Substation**

- A. Dismantling of existing 11 kV indoor switchgear (2 Nos incomers, 1 Bus sectionalizer and 5 outgoing bays)
- B. Supply, Installation, Erection, Testing and Commissioning of SCADA Compatible 11 kV Indoor Switchgear complete in all respects as per specification and as per the decision of Engineer In Charge. Single line Diagram of 11 kV Switchgear is attached.
- C. Supply, Installation, Erection, Testing and Commissioning of SCADA Compatible RMUS along 11 kV Feeders-1, 3 4 & 5 of 33/11 kV PTC Substation complete in all respects as per specification and as per the decision of Engineer In Charge.
- D. Supply, Laying, Testing and Commissioning of 11 kV Cables from overhead pole/Distribution Transformers to the RMUs along 11 kV Feeders-1, 3 4 & 5 of 33/11 kV PTC Substation with all necessary supporting arrangement complete in all respects as per specification and as per the decision of Engineer In Charge.
- E. Supply and Laying of 160 mm HDPE Duct for road crossings for 11 kV underground Cable complete in all respects as per specification and as per the decision of Engineer In Charge.
- F. Supply and jointing of straight through joint Heat shrinkable terminating kit for 11kV cable 3C X 185 sqmm
- G. Earth work excavation for cable trench up to required depth below existing ground level extends from 0.5 m to 0.6 m and width varies from 0.3 to 0.4 mtr as per requirement, Rate to include dressing the sides and bottom. Bailing out water if encountered shoring, sheeting, planking and strutting during excavation, construction and compacting by the sides of cable trench and depositing on bank for all lifts and with initial load of 10 meters including all operational, incidental, labour charges complete for finished items of work excluding dewatering charges.
- H. Preparation of construction drawings, supply and construction of foundation with cement concrete 1:3:6 and height of foundation shall be 900 mm above ground level including providing and laying an average of 20mm thick sand faced cement plastering with single coat in CM 1:4 and applying 2 coats of snowcem to plastered surface and supplying, fabricating and fixing of frame of GI channel 100 X 50 mm and GI angle 50X50X6 mm welding etc. complete for RMU marking as per drawing approved by Engineering Incharge including cost of material, labour and Transport. The rate includes excavation of earth, earthing of GI mounting channels, GI Nuts, washers and all materials.

2. 33/11 kV Taxi Stand Substation

- A. Dismantling of existing 11 kV indoor switchgear (1 Nos incomer and 4 outgoing bays)
- B. Supply, Installation, Erection, Testing and Commissioning of SCADA Compatible 11 kV Indoor Switchgear complete in all respects as per specification and as per the decision of Engineer In Charge. Single line Diagram of 11 kV Switchgear is attached.

- C. Replacement of existing 33/11 kV Transformer Control & Relay panel with SCADA Compatible 33/11 kV Transformer Control and Relay panel.
- D. Supply, Installation, Erection, Testing and Commissioning of SCADA Compatible RMUS along 11 kV Arya Samaj and Malviya Nagar Feeders of 33/11 kV Taxi Stand Substation complete in all respects as per specification and as per the decision of Engineer In Charge.
- E. Supply, Laying, Testing and Commissioning of 11 kV Cables from overhead pole/Distribution Transformers to the RMUs along 11 kV Arya Samaj and Malviya Nagar Feeders of 33/11 kV Taxi Stand Substation with all necessary supporting arrangement complete in all respects as per specification and as per the decision of Engineer In Charge.
- F. Supply and Laying of 160 mm HDPE Duct for road crossings for 11 kV underground Cable complete in all respects as per specification and as per the decision of Engineer In Charge.
- G. Supply and jointing of straight through joint Heat shrinkable terminating kit for 11kV cable 3C X 300 sqmm
- H. Supply and jointing of straight through joint Heat shrinkable terminating kit for 11kV cable 3C X 185 sqmm
- I. Earth work excavation for cable trench up to required depth below existing ground level extends from 0.5 m to 0.6 m and width varies from 0.3 to 0.4 mtr as per requirement, Rate to include dressing the sides and bottom. Bailing out water if encountered shoring, sheeting, planking and strutting during excavation, construction and compacting by the sides of cable trench and depositing on bank for all lifts and with initial load of 10 meters including all operational, incidental, labour charges complete for finished items of work excluding dewatering charges.
- J. Preparation of construction drawings, supply and construction of foundation with cement concrete 1:3:6 and height of foundation shall be 900 mm above ground level including providing and laying an average of 20mm thick sand faced cement plastering with single coat in CM 1:4 and applying 2 coats of snowcem to plastered surface and supplying, fabricating and fixing of frame of GI channel 100 X 50 mm and GI angle 50X50X6 mm welding etc. complete for RMU marking as per drawing approved by Engineering Incharge including cost of material, labour and Transport. The rate includes excavation of earth, earthing of GI mounting channels, GI Nuts, washers and all materials.

3. Detailed Scope of Work of Gurhatti - PeeliKothi - Jigar Colony Road

- A. Supply, Installation, Erection, Testing and Commissioning of SCADA Compatible RMUS in all respects for the feeder Details as mentioned below as per specification and as per the decision of Engineer In Charge.

- I. Company Bagh Substation
 - i. Ekta Dwar Feeder
 - ii. Saket Nagar
 - iii. Ganj Gurhatti Feeder
- B. Supply, Installation, Erection, Testing and Commissioning of Field RTUS and Fault Passage Indicators in all respects for the feeder Details as mentioned above as per specification and as per the decision of Engineer In Charge.
- C. Supply, Laying, Testing and Commissioning of 11 kV Cables from overhead pole/Distribution Transformers to the RMUs along above mentioned feeders of substations with all necessary supporting arrangement complete in all respects as per specification and as per the decision of Engineer In Charge.
- D. Supply and Laying of 160 mm HDPE Duct for road crossings for 11 kV underground Cable complete in all respects as per specification and as per the decision of Engineer In Charge.
- E. Supply and jointing of straight through joint Heat shrinkable terminating kit for 11kV cable 3C X 185 sqmm
- F. Earth work excavation for cable trench up to required depth below existing ground level extends from 0.5 m to 0.6 m and width varies from 0.3 to 0.4 mtr as per requirement, Rate to include dressing the sides and bottom. Bailing out water if encountered shoring, sheeting, planking and strutting during excavation, construction and compacting by the sides of cable trench and depositing on bank for all lifts and with initial load of 10 meters including all operational, incidental, labour charges complete for finished items of work excluding dewatering charges.
- G. Preparation of construction drawings, supply and construction of foundation with cement concrete 1:3:6 and height of foundation shall be 900 mm above ground level including providing and laying an average of 20mm thick sand faced cement plastering with single coat in CM 1:4 and applying 2 coats of snowcem to plastered surface and supplying, fabricating and fixing of frame of GI channel 100 X 50 mm and GI angle 50X50X6 mm welding etc. complete for RMU marking as per drawing approved by Engineering Incharge including cost of material, labour and Transport. The rate includes excavation of earth, earthing of GI mounting channels, GI Nuts, washers and all materials.

4. Detailed Scope of Work of MDA Office - Wave Mall Road

- A. Supply, Installation, Erection, Testing and Commissioning of SCADA Compatible RMUS in all respects for the feeder Details as mentioned below as per specification and as per the decision of Engineer In Charge.
- I. Ram Ganga Vihar I & II Substations
 - iv. Ashiyana Feeder
 - v. Deen Dayal Nagar

- vi. Paramapara
- vii. Avanthika

II. Vivekananda Substation

- i. Ashiyana-1
- ii. Ashiyana-2

- B. Supply, Installation, Erection, Testing and Commissioning of Field RTUS and Fault Passage Indicators in all respects for the feeder Details as mentioned above as per specification and as per the decision of Engineer In Charge.
- C. Supply, Laying, Testing and Commissioning of 11 kV Cables from overhead pole/Distribution Transformers to the RMUs along above mentioned feeders of substations with all necessary supporting arrangement complete in all respects as per specification and as per the decision of Engineer In Charge.
- D. Supply and Laying of 160 mm HDPE Duct for road crossings for 11 kV underground Cable complete in all respects as per specification and as per the decision of Engineer In Charge.
- E. Supply and jointing of straight through joint Heat shrinkable terminating kit for 11kV cable 3C X 185 sqmm
- F. Earth work excavation for cable trench up to required depth below existing ground level extends from 0.5 m to 0.6 m and width varies from 0.3 to 0.4 mtr as per requirement, Rate to include dressing the sides and bottom. Bailing out water if encountered shoring, sheeting, planking and strutting during excavation, construction and compacting by the sides of cable trench and depositing on bank for all lifts and with initial load of 10 meters including all operational, incidental, labour charges complete for finished items of work excluding dewatering charges.
- G. Preparation of construction drawings, supply and construction of foundation with cement concrete 1:3:6 and height of foundation shall be 900 mm above ground level including providing and laying an average of 20mm thick sand faced cement plastering with single coat in CM 1:4 and applying 2 coats of snowcem to plastered surface and supplying, fabricating and fixing of frame of GI channel 100 X 50 mm and GI angle 50X50X6 mm welding etc. complete for RMU marking as per drawing approved by Engineering Incharge including cost of material, labour and Transport. The rate includes excavation of earth, earthing of GI mounting channels, GI Nuts, washers and all materials.

5. Detailed Scope of Work of Hallet Road - Gurhatti – Chakkarki Milak Road

- A. Supply, Installation, Erection, Testing and Commissioning of SCADA Compatible RMUS and Fault Passage Indicators in all respects for the feeder Details as mentioned below as per specification and as per the decision of Engineer In Charge.

- I. Town Hall Substation
 - i. Tarikhana Feeder
 - ii. Katra Naj Feeder
- II. Daulat Bagh Substation
 - iii. Daulat Bagh Feeder
 - iv. Tehsil School Feeder
- III. Jigar Colony Substation
 - i. Deputy Ganj Feeder
 - ii. RTS Feeder
 - iii. Police Line Feeder
 - iv. Ziyarat Feeder
- B. Supply, Installation, Erection, Testing and Commissioning of Field RTUS in all respects for the feeder Details as mentioned above as per specification and as per the decision of Engineer In Charge.
- C. Supply, Laying, Testing and Commissioning of 11 kV Cables from overhead pole/Distribution Transformers to the RMUs along above mentioned feeders of substations with all necessary supporting arrangement complete in all respects as per specification and as per the decision of Engineer In Charge.
- D. Supply and Laying of 160 mm HDPE Duct for road crossings for 11 kV underground Cable complete in all respects as per specification and as per the decision of Engineer In Charge.
- E. Supply and jointing of straight through joint Heat shrinkable terminating kit for 11kV cable 3C X 185 sqmm
- F. Earth work excavation for cable trench up to required depth below existing ground level extends from 0.5 m to 0.6 m and width varies from 0.3 to 0.4 mtr as per requirement, Rate to include dressing the sides and bottom. Bailing out water if encountered shoring, sheeting, planking and strutting during excavation, construction and compacting by the sides of cable trench and depositing on bank for all lifts and with initial load of 10 meters including all operational, incidental, labour charges complete for finished items of work excluding dewatering charges.
- G. Preparation of construction drawings, supply and construction of foundation with cement concrete 1:3:6 and height of foundation shall be 900 mm above ground level including providing and laying an average of 20mm thick sand faced cement plastering with single coat in CM 1:4 and applying 2 coats of snowcem to plastered surface and supplying, fabricating and fixing of frame of GI channel 100 X 50 mm and GI angle 50X50X6 mm welding etc. complete for RMU marking as per drawing approved by Engineering In charge including cost of material, labour and Transport. The rate includes excavation of earth, earthing of GI mounting channels, GI Nuts, washers and all materials.

In addition to the above works, which are specific to each substation/smart road, the following works are common for supply and Installation of SCADA/DMS Control Center at 33/11 kV Company Bagh Substation and SCADA/DMS DR Control Centre

1. Supply, Erection, Testing and Commissioning of 6 core self Supporting metal free Aerial /underground Optical Fibre complete in all respects as per specification and as per decision of Engineer In Charge. Bidders are advised to visit the site in order to accustom the requirement of self supporting Aerial/Underground OFC Cable and quote accordingly. OFC Cable is to be laid between the substations earmarked for this project (details provided elsewhere) and the SCADA/DMS Control Center at 33/11 kV Company Bagh Substation.
2. Supply, Erection, Testing and Commissioning of Fibre Optic Termination Equipment complete in all respects as per specification and as per the decision of Engineer In Charge. The Communication system would support the data requirements of SCADA/DMS in point to multi point and/or multipoint to multipoint configurations using Ethernet over SDH. .The communication system is based on fibre optic network considering the lowest bit rate of the Synchronous Digital Hierarchy (SDH) ie. STM-1 between the substations and SCADA/DMS Control Center. However, the bidder may offer higher bit rate SDH systems to meets the data requirements of the offered SCADA/DMS systems if required to meet the functional & performance requirements of the system.
3. Field survey, design ,engineering, supply, installation, testing & commissioning of SCADA/DMS software applications, Dispatcher Training Simulator (DTS), hardware (including PCs, Servers, Routers, Switches, VPS, RTU, FRTUs, FPIs, Multi function Transducers (MFTs), Communication equipment, Auxiliary power supply etc), software (including operating system, databases, network management system etc.), network (LAN, WAN), etc. (SCADA/DMS Control center is to be located at 33/11 kV Company Bagh Substation) (Location of SCADA/DMS Control Center will be intimated separately during detailed engineering)
4. Integration with existing /under implementation IT system under R-APDRP & any other relevant SCADA/ DMS legacy system in the identified project areas of the utility
5. Facilities management services for maintaining infrastructure, post successful completion of acceptance tests for a period of five years from the date of completion of acceptance test.

Major components that a SCADA /DMS implementation would include are given as under.

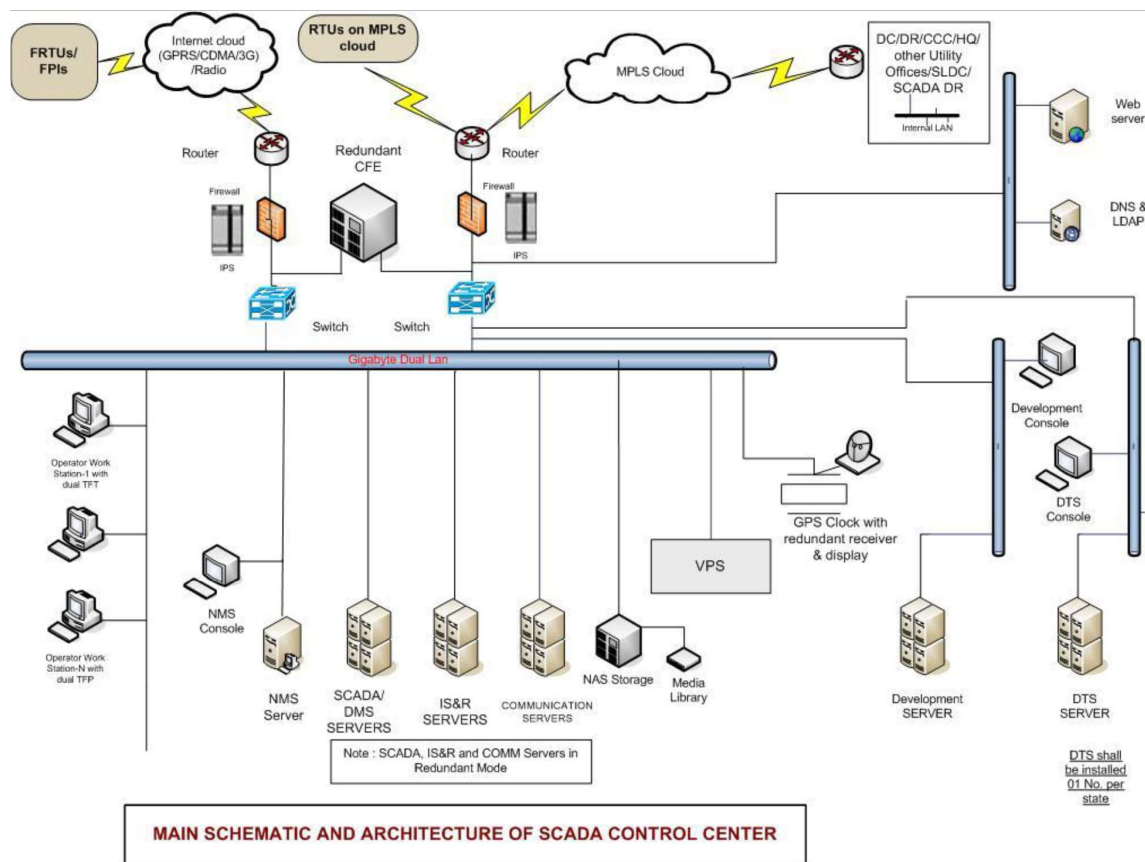
- ✓ SCADA/DMS Control Centre for SCADA/DMS
- ✓ SCADA/Information Storage & Retrieval (ISR) Functions
- ✓ DMS Functions
- ✓ Network Connectivity Analysis (NCA)
- ✓ State Estimator (SE)
- ✓ Load Flow (LF)

- ✓ Voltage VAR Control (VVC)
 - ✓ Load Shed application (LSA)
 - ✓ Restoration Fault Management and System Restoration (FMSR)
 - ✓ Feeder Reconfiguration, Loss Minimisation, Load Balancing, etc (LMFR, LBFR)
 - ✓ Operation Monitor (OM) Distribution Load Forecasting(DLF)
 - ✓ SCADA/DMS/ Dispatcher training simulator (DTS)
 - ✓ SCADA/DMS system to supervise primary S/S & HV Distribution network
 - ✓ RTUs at all primary S/S & FRTUs at RMUs, /Auto Reclosures/Sectionalizers on HV Distribution network etc.
 - ✓ MFTs at Feeder, RMUs
 - ✓ Secured Communication using VPN/SSL
 - ✓ FO Ring/MAR/VPN, Broadband, leased line, etc., connecting all S/S RTUs to Main centre
 - ✓ Secured CDMA/GPRS/Radio based communication, etc. for communicating with control centres
- Protocols for communication
- IEC 60870-5-104 –RTU, IEC 60870-5-104/101 for FRTUs, FPI to control centres.
- MODBUS or IEC 60870-5-101/104 – MFTs to RTUs/FRTUs.
- ICCP between SCADA/DMS Control centre /DR centre & state load dispatch centre
- Support /compliance to IEC61850 ,IEC60870-5 suite for RTU/CC
- ✓ Conducting Factory Acceptance Test (FAT), Site Acceptance Test (SAT), Type test (as required), etc. successfully, Go live, operational acceptance & handing over to customer.

Generic system architecture and Requirements of SCADA/DMS System to be executed by the Contractor

The intent of this specification is to establish (i) SCADA/DMS System along with RTUs/FRTUs (ii) Associated Auxiliary Power Supply System (iii) Communication System (iv) integration with IT system under R-APDRP or any legacy system.

Configuration of Data centre (Schematic configuration diagram)



The key components include & not limited to following:

- 1) Hardware: site survey, planning, assembly/ manufacturing, design & Engineering, Supply, loading, transportation, unloading, insurance, delivery at site, handling, storage, installation, testing, commissioning and documentation of all necessary hardware and networking equipments and its connectivity, as specified in the detailed specifications. The CONTRACTOR shall take the responsibility to install the servers, RTU/FRTU, MFTs, Video Projection System (VPS) switches, routers, backup and tape devices, Workstation PCs, Aux Power supply, communication equipment etc and other necessary hardware/software at the sites. The CONTRACTOR shall provide the time frame for procuring and delivering all the necessary hardware. Though the

scope covers establishment of a SCADA/DMS control centre along with associated hardware and software, the CONTRACTOR shall design and provide the Software & hardware at SCADA/DMS control centre including RTU/FRTU locations with 100% expandability for future growth in electrical distribution network of the city. The delivered hardware (Processor ,HDD, RAM & software) for servers, PCs ,RTU, FRTU etc shall be sized for ultimate system sizing while maintaining the performance, availability & functions as per specification. . However, other items such as I/O modules, additional workstation can be added as per the growth in the network The CONTRACTOR shall provide the necessary design & engineering documents, drawings and plan, sizing, cabling and connectivity and the bill of material, etc. & obtain approval from utility 2)

- 2) Software: Site survey, planning, assembly/ manufacturing, design & Engineering, Supply, loading, transportation, unloading, insurance, delivery at site, handling, storage, installation, testing, commissioning and documentation of operating systems at servers/desktops, database and SCADA/DMS application software, etc.
- 3) Facilities management services (FMS) for maintaining infrastructure, post successful completion of acceptance tests for a period of five years from the date of completion of operational acceptance of the SCADA/DMS System. However, under R-APDRP scheme, utilities will be funded for FMS for one year only but bids will be evaluated considering five years of FMS.

The Contractor shall be required to provide the services under FMS so as to manage SCADA / DMS system including all equipments, installations including hardware, software & networks installed & commissioned by Contractor for the utility in order that they meet the availability requirement as specified in the document. The System Management Services shall be provided by FMS Contractor in order that maximum uptime & performance levels of SCADA/DMS systems installed are ensured. As such, FMS Contractor is expected to provide services as per ITIL (IT Infrastructure Library) standards with performance levels meeting or exceeding those mentioned in Service Level Agreement (SLA) agreed between utility & Contractor. To achieve the desired Service Levels, the Contractor may need to interact, coordinate and collaborate with the other Service Providers as required. The Contractor will act as the Single Point of Contact for all issues relating to the Service Levels. The Contractor will have the responsibility to deal with the other vendors (during warranty period) /other vendors as selected by utility (after warranty period) as the case maybe, to provide the services at agreed service levels. However, the prime responsibility of providing desired services shall be that of lead Contractor during warranty period. The role of FMS Contractor shall start immediately after systems are installed, commissioned and handed over to the owner after Operational acceptance of the SCADA/DMS System.

The Scope of Work shall include the software and hardware maintenance support to be provided by the Contractor in respect of the system supplied under this project during five year Facility Management Services(FMS) period along with Supervision & Operationalizing five year

warranty of the SCADA/DMS System after the Operational Acceptance of the SCADA/DMS System. :

- 4) **System Design and Engineering:** The CONTRACTOR shall be responsible for detailed design and engineering of overall system, sub-systems, elements, system facilities, equipments, services, including systems application software and hardware etc. It shall include proper definition and execution of all interfaces with systems, equipment, material and services of utility for proper and correct design, performance and operation of the project. CONTRACTOR shall provide complete engineering data, drawings, reports, manuals and services offered etc. i.e. complete set of documentation /drawings for Utilities review, approval and records 5)
- 5) **Supply of Equipment and Material:** The CONTRACTOR shall also be responsible for manufacture, inspection at manufacturer's works, supply, transportation, insurance, delivery at site, unloading, storage, complete supervision, installation and successful commissioning of all the equipment, systems and application software. The proposed deliverables should be state of the art in architecture and engineering practices In case of third party products/software packages, CONTRACTOR should furnish at least 5 years warranty along with supporting plan from respective OEMs

Any item though not specifically mentioned, but is required to complete the project works in all respects for its safe, reliable, efficient and trouble free operation & to meet performance ,availability & functional requirements as envisaged in the RFP shall also be taken to be included, and the same shall be supplied and installed by the Contractor without any extra cost

- 6) **Testing and Commissioning:** The CONTRACTOR shall be responsible for the testing processes such as planning (includes preparing test plans and defining roles and their responsibilities), preparation (consists of preparing test specification, test environment and test data) for all tests viz. Type tests, FAT, SAT and successful commissioning.
- 7) **Geographical Scope:** The Locations where the systems shall be implemented is already briefed out in the scope of work.
- 8) **Integration Scope:** Contractor should ensure that legacy systems and the new solutions lined up by them are tightly integrated and do not remain stand-alone and shall perform on real time basis as envisaged in specifications. All required external systems shall be integrated using an integration middleware layer. The scope of integration of external systems includes, legacy SCADA/DMS system, RTU/FRTU, IT systems under R-APDRP including billing , customer care , GIS etc already existing and functional in the utility, but outside the present scope of work. The integration is expected to be Industry Standards Based on IEC 61968-1 Bus (SOA Enabled on enterprise Bus) using CIM/XML, OPC, ICCP etc., which is, on-line, real time or offline where appropriate and shall operate in an automated fashion without manual intervention, which is documented for future maintenance.

Contractor shall make necessary provisions/software linkages in the proposed solution so that the IT system or any legacy SCADA/DMS system may be integrated seamlessly.

- 9) Training for Employees: The CONTRACTOR shall organize training to the core Group of implementation team of the utility as well as end user training. Representatives from the successful bidder, Purchaser's implementation project and change management teams will be involved throughout in the development of training strategy, training material design and development, standards and training delivery to ensure that change management issues are incorporated, and that training strategies and materials are aligned to the requirements of the project and as business-specific as possible.
- 10) Assist Utility and SCADA/DMS Consultant for responding to queries to Nodal Agency: CONTRACTOR may be responsible for preparing responses to the queries raised by the Nodal Agency. Adequate support will be provided by the utilities to the CONTRACTOR.
- 11) Progress Update: The CONTRACTOR may also provide periodic status update reports highlighting critical issues to the utility. Further, any information (progress report, etc.) as and when sought by the Nodal Agency/Ministry of Power shall be furnished by the CONTRACTOR.
- 12) In addition to the above, following works are also in the scope of the contractor:
 - (a) Database and display development
 - (b) Training
 - (c) Obtaining the statutory clearances required, if any from Ministry of Communication/ Govt Authority. All the charges deposited to aforesaid authority for obtaining statutory clearance will be reimbursed by the owner. The owner will also provide the necessary support if required in getting the clearances.
- 13) Other Services and Items: The scope also includes, but not limited to the following services/items described herein and elsewhere in specification:
 - a. Project Management and Site Supervision: The bidder shall be responsible for the overall management and supervision of works, including the implementation of risk management as well as change management initiatives. He shall provide experienced, skilled, knowledgeable and competent personnel for all phases of the project, so as to provide the utility with a high quality system
 - b. Interface Coordination: The bidder shall identify all interface issues with utility and other agencies if any, and inform utility which shall interface, coordinate and exchange of all necessary information among all concerned agencies.
 - c. Scope Change Management: Utility to finalize the scope change management procedure during development/Implementation stage.

14) Specific Exclusions:

- a) All civil & architectural works, internal and external electrification, special electronic earthing for Server system, Air conditioning and ventilation, fire fighting system and Access control system required for SCADA/DMS system are outside the scope of the CONTRACTOR, however contractor has to indicate the space requirement for SCADA/DMS control centre , DR centre, RTU / FRTU/Auxiliary power supply & communication equipment any other specific requirement, power supply requirement including standby supply requirement, so that the utility can provide the same as per bidder's requirement.
- b) Manpower required for managing SCADA/DMS system

The responsibility of the Contractor shall include supplying, laying and termination of the cables, wherever required for:

- a) Acquiring analog data using MFT, transducer, sensor which shall be connected with the primary devices.
- b) Acquiring the digital data for status of field devices, relays in the control room.
- c) Extending control output to field devices through heavy duty relays
- d) Interconnection between Contact Multiplying Relays (CMRs) and RTUs/FRTUs & field devices (CMRs to be supplied by the contractor as per BOQ),
- e) Power and signal cabling between the supplied equipment & Owner's equipments.
- f) Any other cabling required for completion of the project.

Generic requirements:

The contractor shall undertake detailed site survey immediately after award of the contract of all the sites to access the various requirements such as space, identification of input terminals, and availability of air-conditioning, spare contacts etc for completion of engineering, site installation, testing and commissioning of the project. The type and number of hardware and software elements (Bill of Quantity) within the scope of the project to be supplied for the various sites are identified in the Appendices. The individual functions to be performed by the hardware and software and system sizing criteria are described in the relevant sections. The specification defines requirements on functional basis and does not intend to dictate a specific design. On the other hand certain minimum requirements must be met in accordance with the particular details provided elsewhere in the specification.

The items, which are not specifically identified but are required for completion of the project within the intent of the specification, shall also be supplied & installed without any additional cost implication to the employer/owner.