

**Project Supervision Consultant**  
**Proposed Power Transmission and  
Distribution Efficiency Enhancement Project**

**1. Background**

**1.1** Electricity is one of the key infrastructures for the acceleration of economic development of any country and is considered as an important input to improve quality of life. About 65% of the population of Nepal has access to grid electricity. Moreover, the accessibility to electricity is concentrated in the urban areas. Even if the generation and transmission projects are completed in time, the outdated distribution network would be the ultimate hurdle that shall halt the energy access in the major cities of the country. Currently Nepal Electricity Authority (NEA), the state owned electric utility provides electric service in all districts except one district. The total consumers as of July 2016 stand at 3,168,000. Out of the total consumers, Kathmandu valley which houses the capital of Nepal accounts for approximately 450,000 consumers, about 16% of the total consumers and other major urban centers account for 40% of the total consumers. The urban centers contribute about 75% of the total revenue generated from the sale of electricity.

**1.2** The average annual growth rate of peak demand of the country is 9% while the energy demand growth rate is 8%. Kathmandu Valley and major urban centers have witnessed a rapid growth in huge residential apartments and commercial complexes over the last decade putting heavy burden on NEA to meet the electricity demand. Because of the sudden jump in the peak demand, many feeders and transformers in Kathmandu valley and major urban centers have tripped due to overloading. In many cases, the distributions transformers were burnt due to overloading.

**1.3** The majority of the distribution networks in major urban centers including Kathmandu Valley were created decades ago and despite significant increase in electricity demand and the number of consumers, minimal reinforcement of the networks has been carried out. Despite the significant increase in electricity demand and the number of consumers, no systematic reinforcement of the distribution network has been carried out for more than a decade. Hence, a massive reinforcement and modernization of distribution networks is required to enhance the distribution capacity and improve reliability and quality of electric supply in the major urban centers including Kathmandu valley by reducing distribution system overloads and losses and by enhancing operational efficiency. In this backdrop, ADB has agreed to provide financing under for the Power Transmission and Distribution Efficiency Enhancement Project. The project will contribute to Nepal's distribution system reinforcement in the Kathmandu Valley and other major urban centers by scaling up distribution system efficiency and reliability, facilitating adequate power supply to meet ever-growing energy needs of the valley, increasing service reliability of the utility and building capacity for the overall distribution system development.

**1.4** Aimed at increasing reliability and distribution capacity of the grid and access to grid electricity, the propose loan shall finance the following subprojects:

- a. 220 kV Substation at Lapsiphedhi and 132 kV Substation at Changunarayan
  - b. 132 kV Substations at Kathmandu Valley
  - c. Enhancement of Distribution Network in Kathmandu Valley:
    - c1. Enhancement of Distribution Networks in the Central and Northern Region of Kathmandu Valley
    - c2. Enhancement of Distribution Networks in the Eastern and Southern Region of Kathmandu Valley
    - c3. Enhancement of Distribution Networks in the Western Region of Kathmandu Valley
  - d. Delivery of Distribution Transformers
  - e. Enhancement of Distribution Networks in Major Urban Centers of Nepal:
    - e1. Enhancement of Distribution Networks of Urban Centers in Eastern region of Nepal
    - e2. Enhancement of Distribution Networks of Urban Centers in Central region of Nepal
    - e3. Enhancement of Distribution Networks of Urban Centers in Western region of Nepal
- 1.5** Nepal Electricity Authority (NEA) is the Executing Agency (EA) for the propose project. The term “NEA”, “EA” and “the Employer” have the same meaning and may be used interchangeably in this document depending on the context.
- 1.6** All subprojects listed in 1.4 shall be collectively referred to hereafter in this document as “the Project”.
- 1.7** The engineering design, supply of plants and equipment, construction, installation, testing and commissioning of transmission lines and associated substations, communications and protection facilities for all subprojects of the Project will be completed through turn-key contracts awarded to contractors following ADB’s Procurement Guidelines.
- 1.8** NEA seeks through this TOR to engage a team of Project Supervision Consultants (PSC) through a firm in accordance with ADB’s Guidelines on the Use of Consultants by Asian Development Bank and Its Borrowers to supervise and implement the Project. In addition, the PSC shall also study & analyze the current status of the distribution networks in major urban centers other than Kathmandu valley and prepare and recommend the reinforcement plan for distribution networks. The Project is implemented such that the efficiency of the distribution system is improved; distribution capacity is enhanced; reliability of the distribution system is enhanced and the overall operational efficiency and financial performance of the distribution centers is improved.
- 1.9** The team of consultants is referred to hereafter as “the PSC” or “the Consultant”. The term “PSC” and “Consultant” may be used interchangeably in this document depending on the context. The services of the PSC are hereafter referred to as “the Services”.

- 1.10** This document sets forth terms of reference (TOR) for the Services.
- 1.11** The ADB has engaged a team of project preparation support consultants to assist NEA in conducting survey, carrying out design, preparing bidding documents and providing procurement support till contract award of turn-key contracts for all of the subprojects of the Project.

## **2. Objective of the Assignment**

2.1 The services aim at providing high quality professional services to assist NEA in supervising and implementing the Project and to ensure that the Project will be completed according to the schedule and that the completed Project will deliver the quality, capacity, performance, reliability and economic life as required by the Employer's requirement defined in the turn key contracts with the contractors.

## **3. Scope of the Services, Tasks (Components) and Expected Deliverables**

### **3.1 Scope of the Services**

The PSC is expected to deliver the Services for:

- a) Project supervision of subprojects in **1.4**;
- b) Procurement support for subproject ( e) in **1.4**;
- c) Capacity building of NEA staff.

### **3.2 Detailed Tasks**

The PSC's detailed tasks are as follows:

#### **3.2.1 Project supervision**

**3.2.1.1** For each and all turn-key contracts for the Project, the PSC shall review and advise the NEA on approval of contractor's detailed design in accordance with the Employer's requirements and technical specifications in the contract.

**3.2.1.2** For each and all turn-key contracts for the Project, the PSC shall provide oversight of all aspects of the construction in order to assure that it is conducted properly in accordance with the contract.

**3.2.1.3** To ensure quality in project implementation, the PSC shall develop and implement a Quality Assurance Program (QAP). The QAP shall ensure that the plants and equipment supplied and installed meet the performance standards and technical characteristics of the technical specifications. The QAP shall cover all aspects of the project implementation including review and approval of design; quality of works during construction; monitoring schedule; inspection of materials before shipment, upon arrival and upon erection; review of documents to assure quality of delivered goods and comparison of as-built drawings to design. Furthermore, shortcomings in any of the aforementioned areas shall be addressed adequately by QAP.

**3.2.1.4** For each and all turn-key contracts for the Project, the PSC shall supervise the testing and commissioning. All components of the lines, substations, SCADA, communications and protection will be subject to an acceptance test to demonstrate their capability to meet warranted design criteria. For each component subject to test, the Consultant will review the contractor's test procedures for compliance with manufacturers' requirements and design criteria. The Consultant shall witness the tests and review the test results. If test results are not satisfactory, the consultant shall ensure that any lack of compliance is addressed and that the equipment and overall systems shall be re-tested until compliant results are achieved. During the commissioning phase, the Consultant shall provide training on the testing and commissioning of all aspects of the project. The Consultant shall assist NEA in this phase of the project and coordinate with the Contractor in addressing any issues with the project components that are unsatisfactory. At the end of this period, and when all acceptance tests have been completed to the Consultant's satisfaction, the Consultant will advise NEA that the construction is complete and all the project components are ready to be declared fully operational. The Consultant shall also prepare and recommend a provisional taking over certificate whenever due for the works or part of the works and alert NEA of work deficiencies and outstanding items, if any. The Consultant shall also confirm the remedial measures taken by the contractor, and recommend a final taking over certificate after expiry of the warranty period.

**3.2.1.5** The PSC shall hand over the completed Project including issuance of completion certificates, provisional acceptance and final acceptance certificates to NEA.

#### **3.2.2 Project Preparation Support for subproject (e) in 1.4**

**3.2.2.1** PSC shall also prepare the modernization and reinforcement requirements for subprojects (e) in 1.4 for procurement in addition to the monitoring and construction supervision of this subproject. The preparation will include analysis, study of the reinforcement requirement, cost estimate, bidding documents and procurement support to NEA until contract award. The PSC shall among others perform the followings:

**3.2.2.2** The Consultant shall develop long term electricity demand projection for major urban centers of Nepal excluding Kathmandu valley using the suitable forecast methodology. The demand forecast shall cover a period of 20 years. The demand forecast shall be developed for each category of consumer class. The load survey for demand forecast shall include among others number of houses, population, new construction anticipated, hospitals and other public health systems, industries, commercial complexes, apartments, hotels, recreation centers and development programs envisaged. The Consultant shall consult with various stakeholders such as municipalities, Department of Urban Planning and Development, Ministry of Industry, Ministry of Tourism and so on to ensure the accuracy of the demand forecast.

**3.2.2.3** The major activities to be performed by the Consultant shall include but not limited to the followings:

- a) The consultant shall conduct the load flow studies of distribution networks based on the demand forecast and develop the distribution system reinforcement and expansion plans to meet the forecasted demand.

- b) The consultant shall develop design norms and parameters to be used in the design of distribution system. The consultants shall propose the reinforcement plans based on internationally accepted design norms and standards on distribution system management. Such reinforcement plan shall aim at reducing the distribution system losses and promote distribution automation to the extent possible. The proposed reinforcement plan shall update and remodel the existing power distribution networks with focus on future demands of the distribution centers of these urban centers including implementation schedule.
- c) Study and recommend a suitable GIS based distribution automation system that will utilize the SCADA system. The distribution automation shall include and not be limited to fault detection, localization, isolation, and load restoration (FDIR). These sequences will detect a fault, localize it to a segment of feeder, open the switches around the fault, and restore un-faulted sources via the substation as available. This shall result in safely minimizing the fault duration and significantly improving the SAIDI (system average interruption duration index), CAIDI( Customer average interruption duration index), SAIFI (system average interruption frequency Index) and CAIFI (Customer average interruption frequency Index), performance metric for the customers on those feeders.
- d) The consultant shall prepare bidding documents including detail technical specifications, layouts and other drawings and designs. The consultant shall also prepare the detail cost estimate for the reinforcement packages and provide support in contract award and negotiation.

### **3.2.3 Capacity Building of NEA staff**

**3.2.3.1**The PSC shall perform a needs assessment and develop a training program for NEA staff associated with the subprojects and working on the Project as PSC's counterpart staff. The training program shall include 220 kV and higher voltage class substation design, protection system coordination, distribution system planning, distribution automation, smart grid technology and loss reduction techniques. The NEA counterpart staff will assist the consultant to the extent possible during all phases of the project. All international experts of PSC are expected to work closely with the NEA staff and shall ensure that the NEA staff persons achieve higher skill levels as a result of their involvement.

**3.2.3.2**One of the basic objectives of the consulting services is the transfer of technology in this field to the NEA's engineers. This will be achieved by involving the NEA engineers with the international experts as much as possible in various activities of the project implementation during field works of the Consultant.

**3.2.3.3** The Consultant shall arrange a two week study tour for NEA's 8 (eight) officials to visit utility (ies) in order to study distribution system planning process, distribution business plans, advanced technology in the field of distribution. The cost of such study tour including the cost of travel, boarding, lodging and subsistence allowance will be quoted under the Provisional Sum.

**3.2.3.4**In addition to above the Consultant shall arrange one (1) training sessions in its home office for a total of 20 (twenty) engineers. The duration of each session shall be one month. The cost of such training including the cost of travel, boarding, lodging and subsistence allowance in connection with the Engineer's training on

Consultants offices will be quoted under Provisional Sum. The training shall be conducted in the in following disciplines:

- a) Planning and Design of distribution networks by using the software approved by NEA and practical training on latest loss reduction and energy efficiency measures of distribution systems to meet the overall objective of this project.
- b) Distribution system automation

**3.2.3.5**The Consultant shall provide hands on training on the latest version of internationally recognized distribution system design and planning software. Consultant shall provide with its proposal the details of proposed software.

#### 4. Team Composition &Qualification/ Experience Requirements for the Experts and their Responsibilities

##### 4.1Team Composition

It is estimated that in total 329 person-months of services are required with 125 person months from international experts and 204 person months by national non-key experts. Details on expertise and person month requirements are in Table 1. The international expertise should be provided by a consulting firm specializing in designing the transmission and distribution networks reinforcement and expansion in partnership with national firm(s) and/or individual national consultants in Nepal.

Table 1: Expertise and person month inputs

Expertise	No of PM	Total REM	
		Field	Home
<b>A. International Consultant</b>			
1.Team Leader/Distribution System Engineer	30.00	26.00	4.00
2. Substation Engineer- Electrical	18.00	15.00	3.00
3. Transmission Engineer –Electrical	4.00	3.00	1.00
4. SCADA/Communications Engineer	7.00	6.00	1.00
5. Distribution Automation/Smart Grid Expert	18.00	15.00	3.00
6. Environmental Safeguard Specialist	7.00	5.00	2.00
7. Social Safeguards Specialist	7.00	5.00	2.00
8. Structure Engineer-Transmission and Distribution	7.00	6.00	1.00
9. Utility Management/Reforms Specialist	8.00	6.00	2.00
10. Human Resource Expert	4.00	3.00	1.00
11. GIS Expert	15.00	12.00	3.00
<b>Sub Total- A</b>	<b>125.00</b>	<b>102.00</b>	<b>23.00</b>
<b>B. National Consultant (Non-key)</b>			
1.Transmission Electrical Engineer	3.00	3.00	

2. Substation Engineer (3 number)- Electrical	72.00	72.00	
3. Distribution System Engineer( 3 numbers)	72.00	72.00	
4. SCADA/Communications Engineer	4.00	4.00	
5.Environmental Safeguard Specialist	6.00	6.00	
6. Social Safeguards Specialist	6.00	6.00	
7. Structure Engineer-Transmission and Distribution	3.00	3.00	
8. Utility Management/Reforms Specialist	8.00	8.00	
9. GIS Expert	30.00	30.00	
<b>Sub Total-B</b>	<b>204.00</b>	<b>204.00</b>	<b>0.00</b>
<b>Total (A+ B)</b>	<b>329.00</b>	<b>306.00</b>	<b>23.00</b>

## 4.2 Qualification/Experience Requirements for the Experts

### 4.2.1 International Experts

- a) **Team Leader and Distribution System Engineer** shall have preferably Master's Degree in Electrical Engineering/High Voltage Engineering/Power System Engineering and preferably more than 15 years' experience in planning and developing distribution system designs, remodelling and modernizing distribution networks, planning distribution reinforcements, expansion and loss optimization of 33 kV, 11 kV and 400 V distribution systems. The expert shall have previous team leader experience in detail planning, design, remodelling of distribution systems. It is expected that the amount of time spent by the Team Leader in the field will not be less than 80 percent of the required total person month inputs from the Team Leader during the execution of the project.
- b) **Substation Engineer-Electrical** shall have preferably Master's Degree in Electrical Engineering/High Voltage Engineering, preferably with more than 15 years of experience in design/construction supervision of transmission and distribution substations. The expert shall also have experience in designing GIS substations. The expert shall have previous experience in detail design, preparation of technical specifications, cost estimate and construction supervision of transmission and distribution substations of different voltage levels.
- c) **Transmission Line Engineer-Electrical** shall have preferably Master's Degree in Electrical Engineering/High Voltage Engineering/Power System Engineering and shall have preferably more than 10 years of experience in designing transmission line projects. The past experience shall include design of transmission line components and line of 220 kV or above voltage level, preparing technical specifications and designing underground transmission network of 132 kV or above voltage level.
- d) **SCADA/Communications Engineer** shall have preferably Master's Degree in Electrical/Communications Engineering or other relevant discipline with preferably over 10 years of experience in the design, selection and preparation of specification of SCADA and communication systems for transmission lines, substations and control

center interfacing. The expert shall have previous experience in designing/planning SCADA/communication system for interconnected/integrated power grid system.

- e) **Distribution Automation/ Smart Grid Engineers** shall have preferably Master's Degree in Electrical/Communications Engineering or other relevant discipline with preferably over 10 years of experience in the designing automation of distribution networks for urban centers. The experience in the designing of distribution automation shall cover multiple substations and service area involving consumer not less than one million. The expert shall also have experience in designing smart grid system for distribution and transmission networks.
- f) **Environmental Safeguard Specialist** shall have preferably Master's Degree in Environmental Science, Environment Management, Environmental Engineering or closely related discipline with more than 10 years of professional experience. The expert shall have experience in conducting environmental impact analysis (EIA), initial environmental examinations (IEE) of 220 kV or above voltage class transmission line projects as per international standard and practice as well as well as latest ADB or other donor agencies guidelines with regard to environmental protection and resettlement. The specialist should be conversant with national laws relating to Initial Environment Examination (IEE)/Environmental Impact Assessment (EIA) and ADB's Safeguard Policy Statement 2009.
- g) **Social Safeguard Specialist** shall have preferably Master's Degree in Sociology/Social Science/Anthropological Science with more than 10 years of professional experience. The Specialist shall have experience in preparation of resettlement plan and indigenous peoples plan (IPP) etc., in 220 kV or above voltage class transmission line projects in accordance with the international practices as well as latest donor agencies' guidelines, preferably ADB Guidelines with regard to environmental protection and resettlement. The Specialist should be conversant with national laws relating to land acquisition and resettlement and ADB's Safeguard policy Statement 2009.
- h) **Structural Engineer- Transmission and Substations** shall have preferably Master's Degree in Structural Engineering, with preferably more than 10 years of experience in design of 220 kV and above voltage level transmission line towers and substation structures. The expert shall have previous experience in design and construction supervision of 220 kV and above voltage level transmission line projects.
- i) **Utility Management/Reforms Specialist** shall have preferably Master's Degree in Utility Management / Energy Economics/Power System Engineering/ Business Administration, preferably with more than 10 years of experience in developing best practices/guidelines/norms for enhancing the operation efficiency of the distribution entities. The expert shall also have experience in designing and organizing training programs.
- j) **Human Resources Expert** shall have preferably Master's Degree in Electrical Engineering or Personnel Management, preferably with more than 10 years of experience in human resources management of the electric distribution

utilities/companies or in the electricity distribution sector. The expert shall also have experience in designing and organizing training programs.

- k) **GIS Expert** shall have preferably Master's Degree in GIS or related fields with at least five years of experience in GIS and spatial mapping of the distribution networks.

#### 4.2.2 National Experts

- a) **Electrical Engineer (Transmission)** shall have preferably Master's Degree in Electrical Engineering/High Voltage Engineering/Power System Engineering and preferably 10 years of experience in preparation of transmission line design and specifications or in construction, testing and commissioning of 132 kV or above voltage class transmission lines.
- b) **Distribution System Engineer** shall have preferably Master's Degree in Electrical Engineering/High Voltage Engineering/Power System Engineering and preferably more than 10 years' experience in planning and developing distribution system designs, planning distribution reinforcements, expansion of 33 kV, 11 kV and 400 V distribution systems.
- c) **Substation Engineer-Electrical** shall have preferably Master's Degree in Electrical Engineering/High Voltage Engineering, preferably with more than 10 years of experience in design/construction supervision of transmission and distribution substations. The expert shall have previous experience in detail design, preparation of technical specifications, cost estimate and construction supervision of transmission and distribution substations of different voltage levels.
- d) **SCADA/Communications Engineer** shall have preferably Master's Degree in Electrical/Communications Engineering or other relevant discipline with preferably over 10 years of experience in the design, selection and preparation of specification of SCADA and communication systems for transmission lines, substations and control center interfacing.
- e) **Environmental Safeguard Specialist** shall have preferably Master's Degree in Environmental Science, Environment Management, Environmental Engineering or closely related discipline with more than 10 years of professional experience. The expert shall have experience in conducting environmental impact analysis (EIA), initial environmental examinations (IEE) of 220 kV or above voltage class transmission line projects as per international standard and practice as well as well as latest ADB or other donor agencies guidelines with regard to environmental protection and resettlement. The specialist should be conversant with national laws relating to Initial Environment Examination (IEE)/Environmental Impact Assessment (EIA) and ADB's Safeguard Policy Statement 2009.
- f) **Social Safeguard Specialist** shall have preferably Master's Degree in Sociology/Social Science/Anthropological Science with more than 10 years of professional experience. The Specialist shall have experience in preparation of resettlement plan and indigenous peoples plan (IPP) etc., in 220 kV or above voltage class transmission line projects in accordance with the international practices as well as latest donor agencies' guidelines,

preferably ADB Guidelines with regard to environmental protection and resettlement. The Specialist should be conversant with national laws relating to land acquisition and resettlement and ADB's Safeguard policy Statement 2009.

- g) **Structural Engineer- Transmission and Substations** shall have preferably Master's Degree in Structural Engineering, with preferably more than 10 years of experience in design of 132 kV and above voltage level transmission line towers and substation structures.
- h) **Utility Management/Reforms Specialist** shall have preferably Master's Degree in Utility Management / Energy Economics/Power System Engineering/ Business Administration, preferably with more than 7 years of experience in utility management/ developing best practices/guidelines/norms for enhancing the operation efficiency of the distribution entities. The expert shall also have experience in designing and organizing training programs.
- i) **GIS Expert** shall have preferably Master's Degree in GIS or related fields with at least five years of experience in GIS and spatial mapping of the distribution networks.

#### **4.3 Responsibilities of the Experts**

##### **4.3.1 International Experts**

All international experts indicated in Table 1 are considered as key experts. The main responsibilities of each international experts are highlighted, but not limited to, as follows:

##### **(a) Team Leader and Distribution System Engineer**

- (i) As the Team Leader, the expert is responsible for:
  - Leading and managing the entire team including both international and national experts and act as the team's point of contact with NEA and ADB.
  - Preparing or leading the team to prepare all the reports as listed in the Reporting Requirements in 10.
  - Handling contract administration matters related to the PSC contract.
  - Assisting PMD/NEA in administration of all turn-key contracts for the Project.
  - Reviewing the turn-key contractors' health and safety plans.
  - Monitoring project progress against plan, report on progress, and propose remedial measures as necessary.
  - Reviewing the contractor's claims for extension of time or additional costs; and preparing variation instructions and cost review; certifying invoices/volume of works completed and recommend for payment.
  - Providing technical support to NEA in settlement of claims and disputes arising from the turn-key contracts.
- (ii) The Team Leader as a Distribution Engineer-Electrical shall perform the following:
  - Provide inputs and advice to the project team and to NEA on distribution line and substation technical matters.

- Analyze reinforcement requirements of the existing distribution system and develop optimum distribution networks in the major urban centers to supply the future demand.
- Prepare reinforcement and expansion plan with the remodelled distribution system that will meet the internationally accepted standards for urban distribution system.
- Lead the team to study and recommend a suitable GIS based distribution system or SCADA system which shall include and not be limited to fault detection, localization, isolation, and load restoration (FDIR). These sequences will detect a fault, localize it to a segment of feeder, open the switches around the fault, and restore un-faulted sources via the substation as available.
- Prepare the technical specifications, cost estimate and bidding documents for the distribution reinforcement packages for major urban centers.
- Contribute to capacity building of NEA counterpart staff.
- Assist NEA in review and approval of contractor's drawings and technical information.
- Witness and certify main equipment shop inspections and assist NEA with inspections and certifications of manufactured main equipment prior to shipment and upon receipt.
- Supervise site construction and installation works in conjunction with NEA and other team members.
- Review, certify, and supervise the contractor's testing and commissioning plans of distribution lines and substations in conjunction with NEA and other team members.
- Review, check and certify suppliers' equipment design, and approve the technical documents.
- Assist with the review of contractor's claims for extension of time or additional costs; and prepare variation instructions and cost review; certify volume of works completed withdrawal applications and issue of monthly and final payment certificates.
- Assist with the certification of substantial completion and/or completion of main project components as defined in the contract documents.
- Perform other functions as may be assigned or delegated by Team Leader from time to time during the time of assignment.

(iii) The Team Leader will lead the capacity building and be responsible for:

- Perform a training needs assessment for NEA staff and preparing a training program with the assistance of the consultant team.
- Contribute to capacity building of NEA counterpart staff.

**b) Substation Engineer (Electrical)**

- Assist the consultant team to perform a training needs assessment for counterpart staff and prepare a training program and contribute to capacity building of NEA counterpart staff.

- Make necessary inputs and advice to the project team and to NEA on related subject matters.
- Assist NEA in review and approval of contractor's drawings and technical information.
- Witness and certify main equipment shop inspections and assist NEA with inspections and certifications of manufactured items prior to shipment and upon receipt.
- Supervise site construction and installation works in conjunction with NEA and other team members.
- Review and certify the contractor's testing and commissioning plans.
- Supervise testing and commissioning of substations in conjunction with NEA and other team members.
- Review, check and certify suppliers' equipment design, and approve the technical documents.
- Assist with the review of contractor's claims for extension of time or additional costs; and prepare variation instructions and cost review; certify volume of works completed withdrawal applications and issue of monthly and final payment certificates.
- Assist with the certification of substantial completion and/or completion of main project components as defined in the contract documents.
- Develop and finalize the design parameters for the transmission and distribution substations keeping in view the best practices and advance technology in consultation with NEA.
- Evaluate different substation schemes including GIS substation and keeping in view the difficulty of the land acquisition.
- Prepare detail substation design for GIS and AIS substations.
- Prepare specifications for substation components such as transformers, SAS, CB, instrument transformers, control and relay panel, instrument transformers etc.
- Prepare bidding documents and detail cost estimate for the substations component.
- Perform other functions as may be assigned or delegated by Team Leader from time to time during the time of assignment.

**c) Transmission Line Engineer-Electrical**

- Develop and maintain a project quality assurance plan for NEA; and ensuring that works are executed in line with the plan and project requirements.
- Checking the drawings and technical designs submitted by the contractors and recommending them to NEA for approval.
- Review, check and certify suppliers' equipment design, and approve the technical documents.
- Witness and certifying main equipment shop inspections.
- Assist NEA with inspections and certifications of manufactured items prior to shipment and upon receipt.
- Recommend the acceptability of designs and works carried out by the contractors and suggest corrective measures to be undertaken.

- Supervise the installation, testing and commissioning of the transmission line and substations.
- Review and certify the contractor's testing and commissioning plans.
- Supervise testing and commissioning in conjunction with NEA and other team members.
- Certify substantial completion and/or completion of main project components as defined in the contract documents.

**d) SCADA/Communications Engineer**

- Make necessary inputs and advice to the project team and to NEA on transmission line and substation communication matters.
- Assess NEA's existing SCADA and communications systems and prepare design concepts for interfacing with the transmission line and substations.
- Assist NEA in review and approval of contractor's drawings and technical information with regard to communication/SCADA system.
- Supervise site construction and installation works in conjunction with NEA and other team members.
- Review and certify the contractor's testing and commissioning plans.
- Supervise testing and commissioning in conjunction with NEA and other team members.
- Review, check and certify suppliers' equipment design, and assist NEA in approving the technical documents.
- Supervise installation, testing and commissioning of the transmission line and substations SCADA and communication systems. Monitor project progress against plan, report on progress, and propose remedial measures as necessary.
- Perform other functions as may be assigned or delegated by Team Leader from time to time during the time of assignment.

**e) Distribution Automation / Smart grid Expert**

- Assist the consultant team to perform a training needs assessment for counterpart staff and prepare a training program.
- Make necessary inputs and advice to the project team and to NEA on distribution automation system and smart grid technology.
- Assess the transmission and distribution networks of major urban centers excluding Kathmandu valley and recommend the suitable distribution automation system.
- Prepare conceptual designs and layouts for the distribution automation system and smart grid technology for implementation in major urban centers.
- Prepare the technical specifications, performance specifications, schedules and drawings for bidding of the project on a turnkey basis.
- Assist NEA in review and approval of contractor's drawings and technical information related to automation/smart grid technology.
- Supervise site construction and installation works in conjunction with NEA and other team members.
- Review and certify the contractor's testing and commissioning plans.

- Supervise testing and commissioning in conjunction with NEA and other team members.
- Review, check and certify suppliers' equipment design, and assist NEA in approving the technical documents.
- Supervise installation, testing and commissioning of the automation system.
- Perform other functions as may be assigned or delegated by Team Leader from time to time during the time of assignment.

**f) Environmental Safeguard Specialist**

- Make necessary inputs and advice to the project team and to NEA on environmental distribution networks and distribution substation technical matters.
- Support NEA in incorporating comments from approving agencies until it is approved.
- Prepare EMP for the transmission reinforcement component.
- Prepare construction contractors' environmental health and safety plan (EHS).
- Prepare Detailed Monitoring Framework to effectively monitor the implementation of various plans during construction and operation phase
- Assist NEA as necessary to complete the IEEs and/or EIAs if necessary.
- Conduct a detailed qualitative and quantitative analysis of the anticipated changes to the baseline to determine the direct, indirect, induced and cumulative impacts of the project in construction, phase. These impacts may include, but not limited to, loss of habitat and ecosystems, loss of flora and fauna, impacts on wildlife, food supply chain and migration patterns of wild life, water quality, emission of greenhouse gases, erosion and sedimentation, loss of physical and cultural resources, impacts associated with construction etc.
- Update the IEEs and/or EIAs and EMP for the individual subprojects and assist NEA in implementation of EMPs for the subprojects.
- Update the Social Impact Assessment (SIA) for each subproject.
- Update/ Review construction contractors' environmental health and safety plan (EHS) and recommend revisions as necessary.
- Conduct routine inspections of construction/installation activities including visual survey of ROW clearance, construction equipment storage areas, waste disposal areas and construction camps.
- Prepare semiannual safeguard monitoring report.
- Prepare an annual report on reforestation for each project component and sub-component requiring a reforestation program.
- Perform other functions as may be assigned or delegated by Team Leader from time to time.

**g) Social Safeguard Specialist**

- Update existing resettlement plan (RP) based selected transmission route alignment in accordance with the national laws, regulations and ADB's SPS 2009.
- Make necessary inputs and advice to the project team and to NEA on social safeguard issues as required by the national laws, regulations and ADB's SPS 2009.
- Prepare and /or update land acquisition and resettlement impact assessment based on selected route alignment and substation details.
- Prepare/review the entitlement matrix for each subproject listing all likely effects, such as permanent and or temporary land acquisition, and a study to determine the replacement costs of all categories of losses based on the asset valuation process, with particular attention to vulnerable groups including indigenous peoples, women, children and the poor and socially excluded.
- Update/Prepare the implementation schedule consistent with all the resettlement plan requirements, making sure that major components are carried out before the civil works
- Establish dialogue with affected peoples for incorporating their suggestions.
- Ensure compliance with all government rules and regulations and ensure that the RPs are in compliance with ADB's SPS 2009.
- Provide guidance to the national environmental safeguard specialist and NEA's concerned staff responsible for social safeguard in data collection and census surveys of affected persons.
- Submit all finalized/updated RPs to ADB for review and clearance for ADB review and clearance.
- Perform other functions as assigned or delegated by Team Leader from time to time during the time of assignment

**h) Civil Engineer -Transmission and Distribution**

- Make necessary inputs and advice to the project team and to NEA on transmission line and transmission substation structural matters.
- Prepare structure designs for towers and tower foundations (if required) and substation equipment structures.
- Prepare structure designs for underground cabling and other civil works
- Check the tower, tower foundation, pole foundation and substation structure designs including control buildings and other civil structures submitted by the contractors and assist in approval of contractor's designs, drawings and technical information.
- Perform other functions as may be assigned or delegated by Team Leader from time to time during the time of assignment.

**j. Human Resource Expert**

- Assist the consultant team to perform a training needs assessment for counterpart staff and prepare a training program.
- Recommend ways to promote corporate reform and institutional development in the distribution business.

- Study the existing human resource availability & organogram and recommend required changes to meet the objective of this study.
- Prepare Job Description and Job Specification for all jobs in the distribution center.
- Make necessary inputs and advice to the project team and to NEA on related subject matters.
- Contribute to capacity building of NEA counterpart staff.
- Perform other functions as may be assigned or delegated by Team Leader from time to time during the time of assignment.

**k. Utility Management/Reforms Specialist**

- Assist the consultant team to perform a training needs assessment for counterpart staff and prepare a training program.
- Recommend ways to promote corporate reform and institutional development in the distribution business.
- Develop industry practice and service standard for improving operational efficiency of the distribution centers.
- Develop financial modules for revenue and cost control
- Develop norms and guidelines for setting up the reliability and service standards, customer satisfaction
- Make necessary inputs and advice to the project team and to NEA on related subject matters.
- Contribute to capacity building of NEA counterpart staff.
- Perform other functions as may be assigned or delegated by Team Leader from time to time during the time of assignment.

**l. GIS Expert**

- Assist the consultant team to perform a training needs assessment for counterpart staff and prepare a training program.
- Prepare GIS maps consisting of information on distribution networks of the under the jurisdiction of Distribution centers. The GIS mapping shall include 33 kV, 11 kV distribution lines, distribution transformers, 400 V networks, consumer connections.
- Develop computerized data base for lines and consumers based on voltage and consumer class/category.
- Make necessary inputs and advice to the project team and to NEA on related subject matters.
- Contribute to capacity building of NEA counterpart staff.
- Perform other functions as may be assigned or delegated by Team Leader from time to time during the time of assignment.

**4.3.2 National Experts**

Although national consultants are classified as non-key in the proposal evaluation, they play important role in the PSC team with local knowledge of dealing with social, technical and

geographical issues arising from the Project. Each national expert will perform the same or similar duties as his/her counterpart in the international team in his/her respective field.

## **5. Reporting Requirements, Time Schedule for Deliverables and Implementation Arrangement**

**5.1** The Consultant shall prepare various reports and maintain records documenting decisions made at meetings, progress on project implementation, financial records and changes to the contract plans. All documents and reports would be made available on electronic format to ADB. The reporting shall, in general, comprise of the following:

- (i) Inception report
- (ii) Demand forecast report for major urban centers of Nepal
- (iii) Distribution system design and reinforcement plan for major urban centers. This report shall include remodelling and modernization of the prevailing distribution networks; SLD of the remodelled networks; recommendations to reduce distribution loss and improve customer service.
- (iv) Bidding documents including technical specifications for transmission and distribution reinforcement components for major urban centers.
- (v) Manual for checking drawings of towers and foundations, substation structures
- (vi) Report on shop inspection and test witnessing
- (vii) Formats for site supervision and site supervision reports
- (viii) At NEA's request, all necessary reports concerning special matters related to the project (installation, work methodology, safety, claims, checklist for equipment testing and commissioning etc.)
- (ix) Monthly reports concerning physical progress/status of works, expenditures, delivery of materials etc. in the formats acceptable to NEA and ADB.
- (x) Quarterly progress report giving the progress status, schedules, costs, budgets etc. in the formats acceptable to NEA and ADB.
- (xi) Semi -annual and annual environmental report.
- (xii) Project Completion Report (PCR) as per requirement of NEA and ADB.
- (xiii) Report on a suitable distribution management system or SCADA system which shall include and not be limited to fault detection, localization, isolation, and load restoration (FDIR). These sequences will detect a fault, localize it to a segment of feeder, open the switches around the fault, and restore un-faulted sources via the substation as available. This shall result in safely minimizing the fault duration and significantly improving the SAIDI (system average interruption duration index) and SAIFI (system average interruption frequency Index) performance metric for the customers on those feeders.

**5.2** All documents and reports would be made available on electronic format to ADB. All reports will be in English language.

**5.3** The PSC shall report to the Project Management Directorate (PMD) of NEA and headed by the Deputy Managing Director who reports directly to the Managing Director of NEA. The PSC shall work closely with subproject managers, Distribution Centers' Chiefs and their engineers, and NEA's specialized departments if necessary.

**5.4** The Consultant is expected to commence the service in May 2017, and the duration of the service will be forty eight (48) months from May 2017- May 2021.

## **6. Client's Input and Counterpart Personnel**

**6.1**Administrative support for Consultant Team: If required by local regulations, NEA will provide Consultant with necessary support letters for obtaining visas and permits for its experts. The cost and timing of obtaining the above is entirely the responsibility of the consultants.

**6.2**Office Space, Office Equipment, Transportation and Accommodation: NEA will provide office space, necessary furniture and office equipment (computers, fax, telephone etc.) in Kathmandu. The Consultant shall make his own arrangements for transportation and accommodation for its personnel in Nepal. The Consultant shall arrange itself any other equipment and planning software required during execution of works. Consultant shall be responsible for international telephone bills, maintenance of office equipment and consumables necessary for its own use.

**6.3**NEA Project Team: The subprojects shall have its own contract management team comprising of project manager, engineer and other support staff. The subproject team shall assist the consultant in collecting data required for study. The subproject team shall work in close collaboration with the Consultant's team and be fully involved in all aspects of the consulting services. Both NEA and Consultant's teams shall work together as one single team in all matters related to the Project.

## **7. Client will provide the following inputs, project data and reports to facilitate preparation of the Proposals:**

7.1 NEA will facilitate access of the consultant to other government agencies for communications, collecting of relevant information, data documents, etc. and other activities related to the consultant's assignment.