

Terms of References

OUTLINES OF TERMS OF REFERENCE

1. Background

Subproject A2 includes Construction of the 400 kV Tamakoshi-Kathmandu transmission line and associated facilities, which is under implementation by Nepal Electricity Authority (NEA). The associated facilities includes new bays at the Khimti substation, a new substation at Barhabise & Lapsiphedi. SCADA, communications, protection and interfaces will also be included.

However the TOR shall cover the scope of consulting services associated to Subproject A2 for 3 packages namely:

Package 1: Khimti-Barhabise 400 kV Transmission Line Project (Design, Supply & Install)

Package 2: Barhabise-Lapsiphedi 400 kV, Lapsiphedi-Bhaktapur 132 kV DC & MC Transmission Line Project (Design, Supply & Install)

Package 3: 220/132/11 kV Barhabise Substation (Design, Supply & Install) and communication works at new Khimti.

Physical Progress of Packages Till May 2021 is:

Package 1:

SN	Project Activities	Actual Percentage Completion Up to August, 2021 (In %)	Overall percentage Completion of transmission line (In %)
1	Design & Testing	72.9	40.8
2	Survey, Land Parceling	87.21	
3	Supply of materials	67	
4	Foundation	28.07	
5	Erection	2.63	
6	Stringing	0	

Package 2:

SN	Project Activities	Actual Percentage Completion Up to August, 2021 (in %)	Overall percentage completion of transmission Line (In %)
1	Design & Testing	98.8	63.37
2	Survey, Land Parceling	95.65	
3	Supply of materials	95.16	
4	Foundation	54.44	
5	Erection	43.33	
6	Stringing	0	

Package 3:

SN	Project Activities	Actual Percentage Completion Up to August,2021 In %)	Overall percentage completion of transmission line (%)
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1	Design/Drawings Submission	69.97	33.24
2	Vendor finalization	75	
3	Procurement/Supply	26.67	
4	Construction	31.06	

The above mentioned packages under this project has consultancy service which is still alive till January end, 2022. Many design drawings and documents were already commented and recommended by the existing consultant. These documents shall be treated as part of the document and based on these approvals the new consulting service (The Consultant) has to start their services.

2. Objectives of the Assignment

The consulting firm shall give technical assistance to review and approval of contractor's detailed design information, commissioning of the line and substations from the owner's perspective; and handling over the completed project including issuance of the provisional acceptance certificates and final acceptance certificates.

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

- **Supervision during construction, testing and commissioning of the project;**

➤ **Supervision**

The turnkey contract/s covers detailed design, construction, testing and commissioning of the transmission line, Barhabise substation, SCADA, communications (Khimti & Barhabise substations) and protection facilities. The Consultant shall provide oversight of all aspects of the construction in order to assure that it is conducted properly. This includes assisting in developing and implementing a quality assurance program for construction, review and approval of design, monitoring schedule, inspection of materials upon arrival and upon erection, review of documents to assure quality of delivered goods, comparison of as-built drawings to design, and addressing shortcomings in any of these areas.

➤ **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 require that any lack of compliance is addressed and that the equipment and overall systems shall be re-tested until compliant results are achieved.

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 and recommend the project (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.

4. Team Composition & Qualification Requirements for the Key Experts

- **Expertise and tasks**

- **Person-months**

It is expected that about 17.4 person-months of international consulting services will be needed from a firm specializing in EHV transmission lines and substations.

Table 1: Indicative Expertise and Person-Months: Transmission Line and Substations

Expertise	International Consultants (pm)
Team Leader/Transmission	5.7
Geotechnical Engineer	1.8
Electrical Engineer – Substations	3.6
Civil Engineer – Transmission/Substations	2.3
SCADA/Communications Engineer	2.0
Protection Engineer	2.0
TOTAL	17.4

- **Qualification/Experience of each Expert**

Team Leader/Transmission Electrical Engineer (International): With Bachelor's degree in a relevant engineering discipline and preferably 15 years' experience with 10 years of international experience in developing countries. The expert shall have previous experience as team leader in projects of similar size to the Khimti-Kathmandu transmission line project. Experience shall cover 400kV or higher EHV transmission line design, specification, construction, testing and commissioning. It is expected that the expert shall contribute from his home country with frequent short visits to the project site until commissioning is completed.

Geotechnical Engineer (International): With Bachelor's degree in civil engineering and preferably 7 years' experience, with experience internationally in developing countries and with 400kV or above transmission line tower foundations soil testing and for substation structures.

Electrical Engineer – Substations (International): With Bachelor's degree in electrical engineering, with preferably 10 years' experience in substation for 400kV or higher. The expert shall have previous experience on projects of similar size to the Khimti-Kathmandu transmission line project and shall have previous international experience.

Civil Engineer – Transmission/Substations (International): With Bachelor's degree in civil engineering, with preferably 10 years' experience in the design of foundations for substation towers and substation structures for 400kV or higher. The expert shall have previous experience on projects of similar size to the Khimti-Kathmandu transmission line project and shall have previous international experience.

SCADA/Communications Engineer (International): With Bachelor's degree in electrical, communications or other relevant discipline, with preferably 10 years' experience in the selection and specification of SCADA and communication systems for 400kV or higher transmission lines, substations and control center interfacing. The expert shall have previous experience on projects of similar size to the Khimti-Kathmandu project and shall have previous international experience.

Protection Engineer (International): With Bachelor's degree in electrical engineering with protection specialization and/or further qualifications and training in protection for 400kV transmission systems and substations, with preferably 10 years' experience. The expert shall have previous experience on projects of similar size to the Khimti-Kathmandu project.

➤ **Tasks for Each Expert**

Team Leader/Transmission Electrical Engineer (International):

- Make necessary inputs and advice to the project team and to NEA on transmission line and transmission substation technical matters.
- Oversee and lead the assignment and the consultant team, and act as the team's point of contact with NEA and ADB.
- Make necessary inputs and advice to the project team and to NEA on transmission line and transmission substation technical matters.
- Prepare regular reports in accordance with ADB requirements, including Project Completion Report for the entire Electricity Transmission Expansion and Supply Improvement Project with inputs for other subprojects from NEA.
- Assist NEA in administration of the contract.
- Assist NEA in review and approval of contractor's design, drawings and technical information.
- Assist NEA with inspections and certifications of manufactured items prior to shipment and upon receipt.
- Review the contractor's health and safety plans.
- Advice and assist NEA to develop and maintain a project quality assurance plan, and monitor contractor's designs and works are executed in line with the plan and project requirements.

As and when referred by NEA speedily advise on acceptability of such designs and works, and suggest corrective measures to be undertaken.

- 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 approve the technical documents.
- Witness and certify main equipment shop inspections.
- Supervise the installation, testing and commissioning of the transmission line and substations. Monitor project progress against plan, report on progress, and propose remedial measures as necessary.
- Review the 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
- Certify substantial completion and/or completion of main project components as defined in the contract documents.

Geo-technical Engineer (International)

- Make necessary inputs and advice to the project team and to NEA on transmission line and transmission substation geotechnical matters.
- Make necessary inputs and advice to the project team and to NEA on transmission line and transmission substation structural matters.
- Assist NEA in review and approval of contractor's 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.

Electrical Engineer - Substations (International):

- Make necessary inputs and advice to the project team and to NEA on transmission line and transmission substation technical matters.
- Assist NEA in review and approval of contractor's design, drawings and technical information.
- 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.
- Assist with the review and certify the contractor's testing and commissioning plans.
- Assist with the supervision of testing and commissioning in conjunction with NEA and other team members.
- Review, check and certify suppliers' equipment design, and approve the technical documents.
- Witness and certify main equipment shop inspections.
- Supervise the testing and commissioning of the substations.
- 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.

Civil Engineer – Transmission/Substations (International):

- Make necessary inputs and advice to the project team and to NEA on transmission line, transmission substation, SCADA, communications and control center technical matters.
- Assist NEA in review and approval of contractor's design, drawings and technical information.
- Supervise site construction and installation works in conjunction with NEA and other team members.
- Assist with review, check and certify suppliers' equipment design, particularly with respect to foundations and bolting down, and assist, NEA in approving the technical documents.
- Assist NEA in supervising the installation, of the transmission line and substations. 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.

SCADA/Communications Engineer (International):

- Make necessary inputs and advice to the project team and to NEA on transmission line and transmission substation regarding SCADA/Communication related technical matters.
- Assist NEA in review and approval of contractor's design, drawings and technical information.
- 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.
- Advice and assist NEA to develop and maintain a project quality assurance plan, and monitor contractor's designs and works are executed in line with the plan and project requirements. As and when referred by NEA speedily advise on acceptability of such designs and works, and suggest corrective measures to be undertaken.
- 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.
- Witness and certify main equipment shop inspections.
- Assist NEA in supervising the 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.

Protection Engineer (International):

- Make necessary inputs and advice to the project team and to NEA on transmission line and transmission substation technical and protection matters.
- Assist NEA in review and approval of contractor's design, drawings and technical information.

- 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 in conjunction with NEA and other team members.
- Review, check and certify suppliers' equipment design, and assist NEA in approving the technical documents.
- Witness and certify main equipment shop inspections.
- Supervise the testing and commissioning of the transmission line and substation protection 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.

➤ **Reporting Requirements**

The reporting shall comprise of the following:

- Design report for the transmission line
- Report on shop inspection and test witnessing
- Formats (e.g. earthing measurement, concrete pouring, tower erection etc.) for site supervision
- Site supervision reports
- 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.)
- Minutes of meetings attended by the consultants
- Monthly reports concerning physical progress/status of works, expenditures, delivery of materials, etc. in formats acceptable to NEA.
- Quarterly progress report giving the progress status, schedules, costs, budgets etc. in formats acceptable to NEA including the other components under Electricity Transmission Expansion and Supply Improvement Project, for which information NEA provides will be consolidated.
- Project Completion Report (PCR) as per requirement of NEA and ADB for the contract packages under supervision and consolidated for Electricity Transmission Expansion and Supply Improvement Project.
- The Consultant shall maintain records documenting decisions made at meetings, progress on project implementation, financial records and changes to the contract plans. The Consultant will assist ADB in preparing a project completion report and monitoring and evaluation reports as required. All documents and reports would be made available on electronic format to ADB. All reports will be in English language.

➤ **Inputs provided by NEA**

The responsibilities of NEA in carrying out the assignment are defined as following:

- NEA Project Team

The NEA project team has been working from the very beginning of contract implementation and 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.

- Construction Supervision

NEA technical staffs shall do construction supervisions.

- Equipment and Tools

The Consultant shall recommend to NEA all necessary equipment and tools needed by the Consultant for site tests. NEA will make delivery arrangement with the transmission line/substations contractor during test period.

- Office, Furniture and Office Equipment

Not Applicable

- Local Transportation

NEA shall provide vehicles for the use of NEA seconded field staff. However, the Consultant shall make its own transportation arrangement for its expatriates and local consultant personnel.

- Accommodation

The Consultant shall make its own arrangements for accommodation for its staff.

- Administrative support for Consultant Team

If required by local regulations, NEA will provide Consultant with necessary support letters for obtaining visas for consultant staff and other personnel permits. The cost and timing of obtaining the above is entirely consultant responsibility.

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

- Relevant Project information
- Assistance to facilitate site visit if required by shortlisted consultant with prior notice at the following address:

Raman Raj Sharma
Project Manager
Tamakoshi-Kathmandu 220/400 kV Transmission Line Project
Project Management Directorate
Nepal Electricity Authority
Kharipati, Bhaktapur, Nepal
E mail: tk400kV@gmail.com