Terms of Reference
Project Management Consultant for Nepal Electricity Authority: Electricity Supply Reliability Improvement Project

I. Introduction

The Government of Nepal (GoN) has received US$120 million of IDA credit to implement the Electricity Supply and Reliability Improvement Project (ESRIP or the Project). The objective of the Project is to improving distribution network and enhancing the quality, resilience and reliability of electricity services in different areas of Nepal. The Project is also expected to bring expanded and more dependable electricity service to the consumers and supplement the GoN's and other development partners efforts in enhancing the distribution system in Nepal. The Project will be implemented by Nepal Electricity Authority (NEA). Following activities are planned to be implemented under the Project:

- **Activity 1: Strengthening of NEA's Distribution Network:** This activity will support: (a) construction of new 33/11 kilovolt (kV) substations near the load centers identified by NEA in selected areas of Nepal; (b) construction of new 33 kV lines to these substations; (c) upgrade of existing and construction of new 33, 11, and 0.4 kV feeders and distribution lines and 11/0.4 kV distribution transformers in load centers of selected areas.
- **Activity 2: Installation of automated control and operation system:** This activity will support: (a) installation of auto reclosure (AR), smart load break switches (SLBS) and fault pass indicators (FPI) in 33 and 11kV feeders; (b) installation of their control and communication mechanisms; (c) interfacing of these newly installed system with NEA's current structure.
- **Activity 3: Strengthening of NEA's Commercial Systems:** This activity will support: (i) installation of Automated Metering Infrastructures (AMI) replacing the conventional metering systems for consumers; (ii) installation of meter data management (MDM), customer information system (CIS), consumer portal, communication systems and gateways, and other related infrastructure; (iii) establishment of relevant functionalities, such as data recording and management systems, and data analytical tools;

For this assignment, NEA is looking for a consulting firm, to be employed as a Technical Advisor and Project Management Consultant (TA&PMC), to support the implementation of **Activity 2 and 3.**

Specifically, under Activity 2, the scope includes, among others, the supply, installation, and integration of Auto Reclosure (AR), Smart Load Break Switch (SLBS) and Fault Pass indicator along with their associated systems including communication and interfacing systems in several 33kV and 11kV feeders of NEA. The tentative number of feeders and their length are provided in the table below. This activity will support NEA's ongoing efforts in implementing automation in operation, management, and maintenance of its distribution networks.

Table 1: Tentative feeder numbers, lengths, and automation system requirements

S. No.	Province	33 kV feeder		11 kV feeder	
		Nos	Length	Nos	Length
1	Koshi	57	1,235.42	190	10,267.66
2	Madhesh	40	791.70	170	7,207.67

3	Bagmati	44	853.84	349	11,286.50
4	Lumbini Division	24	1,242.09	79	3,889.10
5	Karnali	13	542.50	62	3,047.78
6	Sudurpaschim	28	780.05	91	4,543.26

Under Activity 3, the scope includes the supply, installation and integration of smart meters at Kailali and Kanchanpur Districts of Nepal. Approximately 3,00,000 Nos. of single-phase and three-phase smart energy meters will be installed under this project. This includes the replacement of existing meters with smart meters. The scope also includes installation/integration of meter data management system (MDMS), customer information system (CIS), consumer portal, communication systems and gateways, and other related infrastructure. Furthermore, the scope also includes integration of the newly installed meters with the existing revenue management system (RMS)of NEA.

The contract for the feeder automation (Activity 2) and smart meters (Activity 3) is expected to be packaged separately. The table below shows the tentative arrangements of the contracting package.

Table 2: Contracting arrangement of the proposed activities

Package	Lot	Activity Reference No. / Description
Package 1	Lot 1	Feeder automation (Province: Koshi and Madhesh)
	Lot 2	Feeder automation (Province: Bagmati)
	Lot 3	Feeder automation (Province: Karnali)
	Lot 4	Feeder automation (Province: Sudurpaschim)
Package 4	Lot 1	Smart Meter (Kailali and Kanchanpur Districts of Sudurpaschim Province))

II. Objective of the Assignment

The objective of the assignment is to:

- Develop, maintain and enforce a comprehensive integration management plan. This plan shall detail protocols, testing procedures, roll back strategies for interfacing new systems with NEA's existing SCADA, DMS, MDMS etc. to ensure operational continuity and cyber security.
- Assist in procuring the services of contractors for implementing the works adhering to relevant guidelines and standards for Activities 2 and 3 under the Project.
- Conduct design, technical, and engineering review services of the works, including on-site supervision and interface management.
- Conduct construction management services, including on-site QA, ensuring effective interface management between various construction contracts.

The services are to be carried in two stages. Stage 1 will be Lump Sum Contract whereas Stage 2 will be Time Based Contract. Commencement of Second Stage will be subject to approval by NEA.

III. Scope of Work

Lump-Sum Contract (Stage 1)

Task 1: Review of existing assessments and preparatory studies and filling of technical and knowledge gaps. Under this task, TA&PMC is expected to carry out the following:

- Study of existing NEA's distribution system and prepare comprehensive integration management plan. This plan shall detail protocols, testing procedures, roll back strategies for interfacing new systems with NEA's existing SCADA, DMS, MDMS, OMS (Outage Management System) etc. to ensure operational continuity and cyber security.
- Carry out required assessment, reviews, audits etc. to determine specifications, quantities/locations of all relevant systems and equipment for automated and control systems including but not limited to, Auto Reclosures (AR), Smart Load-Break Switches (SLBS) and Fault Pass Indicators (FPI) on 33kV/11kV feeders; communication backhaul (fiber, RF, GSM/GPRS, HPLC/BPLC) and SCADA/DMS interface upgrades; compatibility of the identified equipment and systems NEA's existing and planned equipment and systems; upgrade requirement in the existing substation and communication and control systems required etc.
- Carry out required assessment, reviews, audits etc. to determine specifications, quantities/locations of all relevant systems and equipment for metering and communication systems, including but not limited to, for smart meters (CT/PT and single/three-phase), data concentrators unit (DCU), head-end system (HES), Meter Data Management (MDM); Customer Information (CIS), consumer web/mobile portals, analytics engines, DR servers, and assessment of cyber security.
- Compile findings into a location-specific bill-of-materials, construction drawings, and phased implementation plan.
- Prepare cost estimates for Activities 2 and 3 cross-referencing unit rates, local/regional market conditions, and specialized equipment and software costs.

Task 2: Preparation of the procurement documents.

TA&PMC is expected to carry out the following main procurement activities, which will be based on relevant World Bank Standard Procurement Documents to be provided by NEA. The procurement will be conducted using two-stage process and using World Bank's Rated Criteria (RC). PMC is expected to carry out the following:

- Formulate measurable technical criteria for bidders. Those may include, but not limited to SAIFI/SAIDI reduction targets, optimized breaker reclosing cycles, applicable meter accuracy Class, > 99% daily meter data retrieval, cyber-security compliance (ISO 27001/NIST CSF), system availability ≥ 99.5%, and other. The formulated values, criteria, etc. will be finalized based on the discussion with NEA.
- Define reliability, safety (IEC 62271-200, IEC 62052/3), interoperability (IEC 61850, DLMS/COSEM), and data-privacy benchmarks.
- Prepare equipment, software, and installation specifications for AR/SLBS, pole-mount control cubicles, RTUs, communication gateways, SCADA adapters, meters, modems, Head End Systems (HES), Meter Data Management (MDM) systems, CIS, DCU, customer portals, WAN/LAN infrastructure, and integration middleware etc.

- Specify factory acceptance, site acceptance, and cyber-penetration test protocols, include digital certificates, encryption, and key-management requirements.
- Prepare itemized price schedules for inclusion into procurement documents pertaining to supply, installation, commissioning, spare parts, software licenses, warranty, and O&M support.
- Draft minimum technical qualifications requirements for potential bidders.
- Identify up to three rated criteria and propose weightings and evaluation methodology.
- Embed into procurement documents ESF-compliant E&S clauses, which should cover but not limited to OHS, waste disposal, labor management, stakeholder engagement, grievance redress, and other.
- Prepare procurement separate procurement documents for Activity 2 and incorporate NEA/World Bank comments, and deliver final to NEA final ready-for-issue bid packages.

Task 3: Support to NEA during procurement of contractors.

TA&PMC is expected to carry out the following:

- Prepare responses to clarifications requests that may be submitted by potential bidders.
- Prepare or review addenda/amendments to procurement documents as needed.
- Organize and participate in pre-bid meetings/site visits, providing technical insights.
- Conduct a thorough review of each bidder's qualifications (track record, staffing, method statement, etc.) and finalize technical evaluation of first stage Technical Proposals.
- Prepare the technical evaluation reports highlighting compliance with technical specifications, qualification criteria, and identifying any non-material and material deviations.
- Review and evaluate second stage Combined Technical and Financial Proposals and prepare combined technical and financial evaluation report.
- Clarify questions and help prepare responses to complaints that may be submitted by bidders during stand-still period, and participate in conference calls/meetings to provide clarifications.
- Prepare responses to questions or comments from the World Bank regarding evaluation reports and make the required revisions to those evaluation reports.
- Prepare the contracts and support the Client in contract negotiations.

Time Based Contract (Stage 2)

Task 4: Design review during implementation of contracts under Activities 2 and 3.

As part of this task, TA&PMC will review and comment on design documents, drawings, other relevant technical documents, including those of equipment, materials, plans, procedures, schedules, etc. submitted by contractors and manufacturers. The review and comments shall be carried out in close association with NEA's engineers. TA&PMC is specifically expected to carry out the following:

- Review and comment on all aspects of design and standards proposed by contractors. The minimum list of drawings to be reviewed has been attached as Annexure I.
- Ensure that contractors provide calculations and design in accordance with current standards and codes of practice.

- Check calculations and drawings prepared by contractors.
- Review the results of technical investigations done by contractors.
- Review the final design and recommend for approval.
- Review and comment on engineering documents, detailed specification, installation procedures and equipment installation methods.
- Review the proposed measures related to adjustment and commissioning of all new equipment to be installed.
- Maintain a dialogue with the contractors' design staff to review and comment on contractors' design documentation.
- Attend design review and progress meetings with NEA and contractors/manufacturers and issue minutes of meeting to NEA.
- Prepare necessary tools such as Design Control Progress Record (DCPR) as per the format agreed with NEA required for review process of design, drawings, manuals, method statements, etc. to track and check the progress of the review process.
- Coordinate the activities of different contractors as appropriate.
- Prepare and update project schedule (in Gantt chart) by using commercially available software (MS project, Primavera) etc. in coordination with the NEA and the contractors

Task 5: Construction supervision, quality assurance and inspection for contracts.

TA&PMC will carry out supervision of Activities 2 and 3 during implementation. PMC is specifically expected to carry out the following:

- Prepare the Design and Monitoring Framework (DMF) for reporting purpose, which may include project indicators, their baseline, benchmarks, milestones, and achievements.
- Conduct construction site supervision.
- Monitor progress of the supply, construction, and installation schedules.
- Provide the required guidance to contractors to comply with the specifications.
- Review comment and compile construction and as-built drawings for accuracy and adequacy
- Review comment and compile the Operation and Maintenance (O&M) manuals provided by contractors for accuracy and adequacy.
- Prepare a detailed Project/Contract Control Program using the Gantt chart. Prepare suitable formats required by site representatives for site supervision.
- Assist NEA in all aspects related to factory tests organized by contractors, including but not limited to: inspections and witnessing of acceptance tests during manufacture (factory test) of materials and equipment to be supplied for incorporation in works.
- Review and provide feedback on the installation plan
- Review and verify the measurement sheets submitted by the contractor for the completed works at the site.
- After thorough verification, check and recommend the interim (Running Bills) and Final Bills for payment.

- Review of the commissioning plan and program, and acceptance tests.
- Witness and assist NEA during acceptance testing and commissioning of distribution system equipment and systems.
- Assist NEA to take over the completed infrastructure.
- Assist NEA in preparing necessary operational, completion, etc. certificates.
- Prepare the Certificate of Work Completion and Operational Acceptance Certificate for later use by NEA.
- Submit the Project Completion Report providing details of project implementation, problems encountered, mitigation adopted, and detailing and explaining any variation in project cost and implementation from the original estimates.
- Participate in regular planning and progress meetings to monitor the contractors' work progress, delays etc. and issue minutes of meeting to NEA.
- Assist NEA with overall quality assurance mechanism, including implementation of Field Quality Plans (FQP), cost control, and project accounts, etc. Also advise NEA on quality assurance issues during construction and manufacturing process.
- Monitor and advise NEA on quality assurance issues during construction and manufacturing process.

Task 6: Capacity Building of NEA Staffs

TA&PMC will oversee the capacity building of project personnel including operational staff from the respective Distribution Centers. Specifically, the PMC is responsible for following activities:

- Induction Training: Deliver comprehensive induction training to all project staff to ensure a thorough understanding of project objectives and procedures.
- Post Project Training: Conduct Training sessions upon project completion, focusing on the operation and maintenance of the implemented systems and associated communication technologies.
- International Exposure Visit: Organize an international exposure visit of maximum seven days in Asian Country to showcase advanced automation and metering systems and operational best practices.

IV. Team Composition and Qualification Requirements for the Key Experts

PMC's key staff shall include a team of international experts with extensive experience of design and construction supervision of Distribution System Automation and Smart Grid Technologies. The team shall be supported by local expertise as relevant. The members of the team shall have the skills and experience necessary to undertake the range of tasks set out in this TOR.TA&PMC shall arrange for appropriate home office support for the construction supervision and post-construction teams. The minimum staffing requirement is provided in the Table 3 below.

Table 3: Minimum Staffing of Key Experts and Experience Requirements

Key Expert	Location	Qualification Requirements
International Experts		
Team Leader	Resident in Project Office with frequent site visits	At least master's degree in electrical engineering. At least 12 years of relevant international experience in management of power distribution network construction projects, Automation Control, Feeder SCADA or protection coordination, AR and AMI systems in developing countries. Excellent knowledge of English language.
Electrical Engineer (2 Nos.)	Resident in Project Office with frequent site visits	At least bachelor's degree in electrical engineering. At least 10 years of relevant international experience in BoQs for ARs, SLBS, FPI, Feeder field level automation, protection and coordination of feeders (fault detection, fault location, isolation, and restoration); reviews of contractors' drawings & calculations; site supervision. Experience in Feeder Automation Design, Control Logic, RTU Configuration and communication networks is preferred. Excellent knowledge of English language.
Smart-Metering AMI Systems Specialist (1 Nos.)	Resident in Project Office with frequent site visits	At least bachelor's degree in electrical/ electronic /computer engineering with specialization in instrumentation and control systems. At least 10 years of relevant international experience in Smart Meter, AMI roll-out, as well as Device Language Message Specification (DLMS)/Companion Specification for Energy Metering (COSEM). Excellent knowledge of English language.
SCADA Specialist (1 Nos.)	Resident in Project Office with frequent site visits	At least bachelor's degree in electrical /electronic/computer engineering with specialization in instrumentation and control systems. At least 10 years of relevant international experience in SCADA, Substation Automation System (SAS) Distribution Management System (DMS), Outage Management System (OMS). Excellent knowledge of English language.
Cyber-Security & Data-Privacy Specialist (1 Nos.)	Resident in Project Office with frequent site visits	At least bachelor's degree in electrical/ electronic/computer engineering, computer science or other relevant field. At least 10 years of relevant international experience in i. substation/feeder level cyber security (secure communication for FPIs/AR/SLBS devices) ii.SCADA / DMS system integration, feeder automation communication networks (fiber-optic, RF, GSM / LTE), and configuration of IEC 61850 and IEC 60870-5-104 based systems. iii. Real-time data acquisition, remote-terminal-unit (RTU) configuration, and integration of field IEDs (Auto Reclosers, Smart Load Break Switches,

		Fault Passage Indicators) with utility control centers. iv. Network architecture design, firewall / router configuration, and cybersecurity implementation in operational-technology (OT) environments. Excellent knowledge of English language.
Procurement & Contract Management Specialist (1 Nos.)	Resident in Project Office with frequent site visits	At least bachelor's degree in civil engineering, electrical engineering, or other relevant field. At least 10 years of experience in procurement and contract management of AR, substation, AMI and transmission sector projects procured consistent with procurement regulations of IFIs including procurement of automation and SCADA equipment compliant with IEC standards. Excellent knowledge of English language.
Quality-Assurance & Testing-Commissioning Engineer (1 Nos.)	Resident in Project Office with frequent site visits	At least bachelor's degree in electrical engineering. At least 10 years of relevant international experience in QA/QC & T&C on power automation projects. Familiarity with IEC 60255, IEC 61850 testing or relevant standard.
National Experts		
Electrical Engineer (1 Nos.)	Resident at Site	At least bachelor's degree in electrical engineering. At least 7 years of relevant experience in BoQs for ARs, SLBS, FPI, Feeder field level automation, protection and coordination of feeders (fault detection, fault location, isolation, and restoration) of feeders, substations; reviews of contractors' drawings & calculations; site supervision. Experience in Feeder Automation Design, Control Logic, and communication networks is preferred. Excellent knowledge of English language.
Smart-Metering AMI Systems Specialist (1 Nos.)	Resident at Site	At least bachelor's degree in electrical/ electronic /computer engineering with specialization in instrumentation and control systems. At least 7 years of relevant international experience in Smart Meter, AMI roll-out, as well as Device Language Message Specification (DLMS)/Companion Specification for Energy Metering (COSEM). Excellent knowledge of English language.
SCADA Specialist (1 Nos.)	Resident at Site	At least bachelor's degree in electrical /electronic/computer engineering with specialization in instrumentation and control systems. At least 7 years of relevant international experience in SCADA, Substation Automation System (SAS) Distribution Management System (DMS), Outage Management System (OMS). Excellent knowledge of English language.

Cyber-Security & Data-Privacy Specialist (1 Nos.)	Resident at Site	At least bachelor's degree in electrical/ computer engineering, computer science or another relevant field. At least 7 years of relevant experience in substation/feeder level cyber security (secure communication for FPIs/AR/SLBS devices), Real-time data acquisition, remote-terminal-unit (RTU) configuration, and integration of field IEDs (Auto Reclosers, Smart Load Break Switches, Fault Passage Indicators) with utility control centers. Network architecture design, firewall / router configuration, and cybersecurity implementation in operational-technology (OT) environments. Excellent knowledge of English language.

V. Deliverables and Reporting Requirements

The activities, deliverables and reporting requirements are mentioned below in Table 4 below.

All reports and deliverables shall be in the English language and submitted with all supporting documentation in electronic format (MS Word or the original file format) and accompanied by at least one hard copy. Technical reports shall be submitted in draft for review and comment by NEA, followed by the final report incorporating these comments. Draft documents are not required for progress reports, but any corrections shall be noted in subsequent reports.

Each deliverable will be reviewed by NEA and will be:

- Rejected, where it fails to meet the requirements of the TOR and the contract, or
- Accepted with Comments, where modest editorial revisions are required, or
- Fully Accepted.

Any "Rejected" report shall be resubmitted in draft for further comment. A deliverable 'Accepted with Comments' shall be corrected and then resubmitted until accepted as the final report. Acceptance will not be unreasonably withheld.

The detailed contents of project supervision, implementation progress, and final reports will need to be proposed by the potential consultants as part of their technical proposals and agreed with NEA prior to finalization of contract negotiations.

The Consulting Firm will support the attainment of performance targets corresponding to the Activities mentioned above.

Table 4: Output and Deliverables to corresponding activities

Activities	Outputs and deliverables
1st Stage (Lump Sum Contract)	
Review of existing assessments and preparatory studies and filling of technical and knowledge gaps.	Inception Report
Preparation of the procurement documents (Specifications, drawing, cost estimate, price schedules and procurement documents etc.)	Bidding Documents
Support to NEA during procurement of contractors	Bid Evaluation Report
2nd Stage (Time Based Contract)	
Design review during implementation of contracts	Recommendation Letter for Approval
Witness site testing and inspection of equipment	Comments sheets and final recommendation reports
Factory Acceptance Test (FAT) (one person, one visit with maximum 7 (Seven) days per each contract for the FAT of following equipment as applicable. 1.Load Break Switch, 2. Auto Reclosure, 3. Fault Pass Indicator, 4. Control and Communication Devices, 5. Smart Meters	FAT reports and comments sheets and recommendations Report on shop inspection and test witnessing and on arrival site acceptance of materials
Construction supervision, quality assurance and inspection for contracts and review of as built drawings.	Monthly Progress Report
Verify the completed tasks and recommendation for interim and final payments	Recommendation letter of payment
Witness and assist NEA during acceptance Testing and Commissioning (T&C)	T & C completion report
Review of operation and maintenance manual	Recommendation Letter for Approval
Capacity Building of NEA Staffs	Completion Report

VI. Client's Inputs

The Employer will provide all necessary data and information related to the Project. TA&PSC shall make its own arrangements for office accommodation, residential accommodation, transport, and any other required facilities both at the site and in its main office in Kathmandu.

VII. Remuneration and Payment

Remuneration Payment for Consulting Services: Remuneration payment will be based on deliverables and output completed for 1st Stage. The payment for 2nd Stage will be based on the monthly basis based on the timesheet submitted by the consultant and approved by NEA and as specified in the contract agreement.

Reimbursable expenses and payment: The reimbursable expenses will be paid based on actual expenses occurred. PSC needs to take prior approval from NEA before incurring reimbursable expenses. For claim of reimbursables, the TA&PSC shall submit the required original bills and receipts. Tentatively following expenses are expected to be reimbursed. However, the details of reimbursable expenses are specified in the contract agreement.

- Travel expenses to and within sites
- Lodging expenses – for travelling away from base location
- Miscellaneous (Communication, Printing, stationeries etc.)

VIII. Implementation Time Schedule and Effort Level

The Consulting Contract is expected to be about 24 months (6 Months for Stage 1 and 18 Months for Stage 2). PMC's time schedule and effort level shall reflect the Project's expected timeline. The level of experts' time input is estimated at 33.21 person-months of International Experts and 38.21 person-months of National Experts. It is anticipated that TA&PMC shall mobilize immediately after the contract is effective. Indicative breakdown of expertise time required to execute the services is provided in Table 5. below

Table 5: Indicative Expertise Requirement

Expertise	International Consultants (pm)		National Consultants (pm)	
	Lump Sum	Time Based	Lump Sum	Time Based
Team Leader	1.23	2.27	-	
Electrical Engineer	3.45	9.91	2.36	9.00
Smart-Metering AMI System Specialist	0.95	2.59	1.95	7.00
SCADA Specialist	1.09	2.68	1.95	7.00
Cyber-Security & Data-Privacy Specialist	1.09	2.68	1.95	7.00
Procurement & Contract Management Specialist	1.68	0.73	-	
Quality-Assurance & Testing-Commissioning Engineer	0.50	2.36	-	
TOTAL	**9.99**	**23.22**	**8.21**	**30.00**

Annexure – I

The minimum list of design, drawings and calculations that needs to be reviewed and recommended for approval are attached herewith. However, the Consultant shall have to prepare detail Master Design Drawing List (MDDL) for each package for review, comments, observations and recommendation for approval on the design drawings available to NEA and submitted by the Contractor

S.N.	DRAWINGS/DOCUMENTS TITLE
1.	Project Execution Plan (PEP)
2.	Quality Assurance & Quality Control (QA/QC) Plan
3.	Detailed Project Schedule
4.	Overall Feeder Automation System Architecture Diagram
5.	Communication Network Architecture
6.	SCADA Hierarchy Diagram
7.	FLISR Functional Flow Diagram / Logic Diagram
8.	Redundancy & Failover Architecture Diagram
9.	Feeder Single Line Diagrams (SLD)
10.	Automation Equipment Layout Drawings
11.	Protection Coordination Study & Curves
12.	Relay Settings & Logic Diagrams
13.	Communication & Cybersecurity Documents
14.	SCADA / DMS / FLISR Configuration Documents
15.	Equipment & Vendor Submittals
16.	Installation, Testing & Commissioning
17.	O&M, Handover & Close-out Documents