A. Background

1. The Government of Nepal (GON) has a policy of providing all district headquarters with grid electricity as soon as practicable and of providing electricity to all the households by 2027. A clear policy on priorities and an execution plan for rural electrification is required. NEA does not have an Electrification Master Plan (master plan) though some sporadic works have been done in the past to prepare ad hoc electrification and distribution projects. This has resulted in unplanned and improper electrification using suboptimal technical solutions, and has contributed to high distribution system loss.

B. Objective of the Assignment

2. Against this backdrop, NEA intends to develop a master plan to articulate a plan for electrification of the entire country. A consulting firm will be engaged to work closely with NEA to develop the master plan. The overall objective of the assignment is to identify the least cost and economically viable means to reinforce, upgrade and expand Nepal’s distribution system including on- and off-grid to achieve universal access to electricity by 2027. The master plan will include policy recommendations, a comprehensive electrification and distribution augmentation program and detailed case studies.

C. Scope of Works for the Consulting Firm

3. As a firm, the Consultant shall provide the services covering: (a) review of existing legislation, regulation and policy relating to distribution system expansion and rural electrification and recommendations for enhancement and streamlining; (b) development of planning process and prioritization criteria; (c) data collection and preparation of demand forecasts; (d) desktop identification and evaluation of areas for grid extension and areas for off-grid electrification; (e) execution of sample physical and socio-economic surveys in selected un-electrified areas and preparation of standardized and sample designs; (f) economic and financial analysis; (g) identification of social and environmental safeguarding requirements; (h) design of business models and promotion policy; and (i) consolidation of the master plan; and (j) Coordination with Generation and Transmission Master Plan. A focus will also be given to NEA staff capacity building throughout the execution of the services.

(a) Review of Existing Legislation, Regulation and Policy

4. The Consultant shall undertake the following tasks:
   (i) Review existing reports regarding rural electrification plans and programs;
   (ii) Review and analyze all relevant laws and regulations;
   (iii) Review and analyze all relevant Government and NEA policy in relation to on- and off grid electrification;
(iv) Identify the key gaps that are hindering the development of off-grid solutions for rural electrification;
(v) Consult with stakeholder ministries, agencies and institutions regarding existing and planned approaches to on- and off-grid electrification; and
(vi) Summarize and provide recommendations for changes in legislation, regulation, policy and approaches to on- and off-grid electrification.

(b) **Develop Planning Process and Prioritization Criteria**

5. In light of the GON’s target date of 2027 for 100% electricity access, the Consultant shall:
   (i) Review NEA’s distribution and electrification planning process and recommend improvements; and
   (ii) Review electrification planning process of AEPC and other stakeholders such District Development Committee (DDC), Village Development Committee (VDC) and recommend improvements;
   (iv) Develop the coordination mechanism among the various stakeholders such as NEA, AEPC, NGOs, VDC, DDC for review and implementation of rural electrification plan;
   (iii) Propose criteria for prioritizing capital investment in distribution augmentation and rural electrification.

(c) **Data Collection and Preparation of Demand Forecasts**

6. The Consultant shall:
   (i) Collect the necessary data and information related to geographical divisions, political divisions, demography, available infrastructure, socio-economic indicators, environmental and vulnerability checks, short, medium plans at national, district and village levels including rural electrification, institutions and available resources;
   (ii) Investigate and report on trends of power demand and impacts after electrification in sample indicative electrified rural settlements; and
   (iii) Investigate the social and economic conditions of un-electrified rural settlements to assess the present and future electricity demand, keeping in mind affordability, willingness to pay, potential productive uses of electricity, and population growth.

(d) **Desktop Identification and Evaluation of Areas For Grid Extension And Areas For Off-Grid Electrification**

7. Following on from development of the planning and prioritization process and using demand forecasts as a backdrop, the Consultant shall perform the following activities:
   (i) Collect and analyze information on the potential for renewable energy systems in Nepal, specifically micro/mini hydro, solar, wind, biogas and biomass;
   (ii) Identify the potential sites/settlements for distribution line extension by NEA and also identify the areas for distribution augmentation;
(iii) Identify the potential sites/settlements for rural electrification through micro/mini hydro power plants and other renewable energy systems;
(iv) Identify off-grid areas for electrification through renewable energy based mini grids, and solar home systems and other renewable energy systems; and
(v) Hold initial consultation meetings in Kathmandu with representations from center and regional offices to discuss various aspects of master plan including relevancy, course of action and choice of technologies and agree on the context and criteria for initial target site selection.

(e) **Execution of Sample Physical and Socio-economic Surveys in Selected Un-Electrified Areas**

8. The Consultant shall base the overall master plan on the detailed work undertaken in selected pilot areas and perform, inter alia, the following activities:
   (i) Organize regional level workshop at 8 regions with Alternative Energy Promotion Center (AEPC) representatives to identify the un-electrified target sites/settlements;
   (ii) Select five high-priority target sites/settlements with different characteristics (technical, social, economic, and environmental) and representing a range of electrification technology solutions (that is, grid extension, solar, solar/wind hybrid, etc);
   (iii) Carry out the detailed feasibility survey of the target sites;
   (iv) Assess the survey results in line with the provisional planning parameters and prioritization process and adjust if necessary;
   (v) Prepare designs and cost estimates for the targeted sites, adopting a standardized approach to the extent possible so that designs and cost estimates can be used as pro forma for other sites/settlements.
   (vi) Ensure that data collected is sex – disaggregated.

(f) **Economic and Financial Analysis**

9. The Consultant shall:
   (i) Develop a rapid assessment tool to identify the least cost means to electrify villages/settlements;
   (ii) Develop and articulate approaches to economic and financial analysis in relation to the master plan;
   (iii) Undertake detailed economic analysis of the target sites, including calculation of economic internal rate of return based on assessed willingness to pay;
   (iv) Estimate an indication weighted average cost of capital for each target site;
   (v) Estimate tariff requirements for customers at off-grid target sites;
   (vi) Calculate financial internal rates of return for customers at on-grid target sites and estimate tariffs required for financial viability;
   (vii) Indicate financial and economic rates of return and tariff requirements for the overall master plan; and
   (viii) Prepare economic and financial evaluation models to be handed over to NEA staff.
10. The Consultant shall:
   (i) Identify the possible environmental and social impacts, both positive and negative from the planned rural electrification methods;
   (ii) Recommend appropriate mitigation measures to address the adverse impacts;
   (iii) Suggest strategies and actions for enhancing favorable impacts; and
   (iv) Undertake detailed safeguarding analysis at target sites in line with ADB, WB and GON safeguarding requirements.

11. As a complement to the economic and financial analysis, the Consultant shall:
   (i) Analyze the investment, recurrent costs and tariff structures of different proposed rural electrification methods with and without the provision of grants and/or subsidies;
   (ii) Assess the willingness and affordability to pay of targeted consumers together with the existing and future electricity needs, demand and tariff and formulate the optimum promotion policy for rural electrification making the tariff structure comfortable to pay by the consumers; and
   (iii) Recommend business models of all proposed rural electrification methods, with and without the participation of private sector, community, elected bodies and NGOs.

12. Based on policy and prioritization recommendations and the findings and results of other work streams, the Consultant shall:
   (i) Consolidate all data for rural electrification;
   (ii) Integrate all data, target sites/ settlements including relevant socio-economic parameters such as schools, health centers, police stations, information and communication centers, market centers into a GIS map and database;
   (iii) Prioritize electrification programs to achieve universal access by 2027;
   (iv) Identify the optimal electrification method for each of all un-electrified areas;
   (v) Prepare the overall master plan, including indicative cost estimates and economic and financial analysis;
   (vi) Through discussions with stakeholders and development partners, prepare an indicative financing plan for the master plan; and
   (vii) Suggest institutional development and strengthening of existing organizations to implement the master plan.

13. An optimal expansion of the distribution system and/or rural electrification depends to a large extent on spread of electricity generating facilities and coverage of the transmission facilities. In this back drop, the Distribution System Master Plan needs to be coordinated with Generation Expansion Plan and transmission System Master Plan. While developing
the DSMP, identification and prioritization of the distribution programs for different areas shall be consistent with the Generation Expansion Plan and Transmission System Master Plan.

(k) **Capacity Building**

14. Strengthening the capacity of NEA and other institutions in master planning, least cost analysis, on- and off-grid designs, economic and financial analysis, safeguarding and business planning is a key part of the services. In this context the Consultant shall:

(i) Review the existing status of and strategies and plans for capacity building of all key stakeholders;

(ii) Identify the gaps and areas for capacity building needed to prepare, update and implement the master plan;

(iii) Select capacity development initiatives for institutions and key individuals from short, medium and long term perspectives;

(iv) Prepare the plan of action including the details of the courses, budget, potential training (HRD) institutions for the execution of the proposed capacity development initiatives;

(v) Ensure on-the-job skills transfer through the involvement of NEA counterpart staff in all aspects of master plan preparation; and

(vi) Develop a Monitoring and Evaluation Plan for NEA officers to make periodic field visits to project sites in order to observe physical execution of works and to consult and interact with local level stakeholders and partners.

**D. Expertise and Tasks**

a. **Person-months**

15. It is expected that about 110 person-months of international consulting services and 91 person-months of local consulting services will be needed from a firm specializing in distribution and electrification master planning. Indicative expertise required to execute the services is identified in Table 1.

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<th>S. No.</th>
<th>Expertise</th>
<th>Home Office, person month</th>
<th>Field Office, person month</th>
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### B. National Experts: Non Key

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### b. Individual Expert’s Qualification

16. The consulting firm undertaking this assignment shall have necessary credentials to undertake the job by virtue of its successful completion of similar assignments. The consultant shall have expertise in resources mapping, regional and bottom-up planning, electricity generation, micro/mini hydro, other RETs, load forecasting, generation expansion, socio-economic studies and sustainable development. The consultant shall comprise of a minimum of 10 individual experts with stipulated academic qualifications and professional experience. However, consultants should propose their best staffing plan covering the following functional areas:

#### Key Experts: International

i. **Team Leader**: Shall have preferably Master's Degree in Electrical Engineering/Renewable Energy or Energy Economics with over 15 years of experience in distribution system planning and/or rural electrification planning. The expert shall have previous team leader experience in developing rural electrification plan. The experience shall cover policy development with regard to rural electrification, distribution system planning covering 33 kV and 11 kV networks and on and off grid expansion of distribution networks.

iii. **Socio-Economist**: Shall hold preferably Masters’ Degree in Energy Economics/Sociology/Development Economics or an MBA with at least 10 years of experience in demand forecasting.

iv. **Distribution System Planner**: Shall hold preferably Masters’ Degree in Power System Engineering/Electrical Engineering/High Voltage Engineering and training in power system analysis of distribution systems, both on grid and off grid. The expert shall have preferably over 10 years of experience in planning and analysis of distribution system including distribution sectoral load forecast, load flows and short circuit analysis.

v. **Distribution Engineer**: Shall hold preferably Masters’ Degree in Power System Engineering/Electrical Engineering/High Voltage Engineering with at least 10 years of experience in planning expansion of distribution networks, loss optimization and reinforcement of distribution system.

vi. **GIS Expert**: Shall hold preferably Masters’ Degree in GIS or related fields with at least five years of experience in GIS and spatial mapping.

vii. **Institutional and Capacity Development (HR) Expert**: Shall hold preferably Masters’ Degree in Business Management or Human Resources Development with at least 10 years of experience in developing training programs, training curricula, conducting training programs and other HR related fields.

viii. **Environmental Expert**: Shall hold preferably Masters’ Degree in Environmental Science, Environment Management, Environmental Engineering or closely related discipline with more than ten (10) years of professional experience. The expert shall have experience in conducting environmental impact analysis (EIA) or initial environmental examinations (IEE) of distribution networks 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.

ix. **Economic/Financial Analyst**: The Financial Analyst shall have preferably Master’s Degree or equivalent in Finance or Business Administration or Engineering Economics or other relevant discipline with more than ten (10) years of professional experience. The expert shall have experience in economic and financial analysis of on grid and off grid rural electrification projects as financial specialist.
x. **Policy Expert:** Shall hold preferably Masters’ Degree in Energy Economics/Development Economics or related fields with at least 10 years of experience in developing/drafting policies for promoting rural electrification, developing action plans to implement energy policies, particularly in collaboration with Governments in developing countries.

**Non Key experts: Local**

There will be equal number of local consultants as the counterparts to all seven international consultants. These local consultants shall have preferably Masters’ degree in the respective subject areas. In addition, there shall be local support staffs including enumerators and field assistants for the project administration, finance and logistic arrangements. The number and duration of such support staffs shall be determined as per the requirements.

**E. Output**

17. The Consultant shall produce the following deliverables during execution of the services:
   (i) Inception Report within 4 weeks of commencement;
   (ii) Quarterly Progress Reports detailing work undertaken and work planned for the subsequent quarter;
   (iii) Socio Economic Survey report within 10 months of commencement;
   (iv) Two Interim Reports, the first one within 8 months of commencement and the second within 16 months of commencement;
   (v) Environmental and Social Safeguard Report within 15 months of commencement;
   (vi) Economic and Financial Model within 12 months of commencement;
   (vii) Draft Final Report within 22 months of commencement, including the draft master plan;
   (viii) Final Report within 24 months of commencement, incorporating all comments and suggestions received in relation to the Draft Final Report, and incorporating the Final Master Plan.

18. The Consultant shall maintain records documenting decisions made at meetings, progress on project implementation, and decisions taken. The Consultant will assist ADB in preparing a project completion report and monitoring and evaluation reports as required.

19. All documents and reports shall be made available in electronic format to ADB and NEA.

20. All reports shall be in English language.