TERMS OF REFERENCE OF PRE-FEASIBILITY, FEASIBILITY, ENVIRONMENT SOCIAL IMPACTS ASSESSMENT STUDIES, DETAILED DESIGNS, AND TENDER DOCUMENTS OF HV TRANSMISSION LINES

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1 Introduction

Rwanda’s Energy Development Corporation Limited (EDCL) is mandated to:

a) Increase investment in the development of new energy generation projects in a timely and cost-efficient manner, to expand supply in line with EDPRS and other national targets;

b) Develop appropriate transmission infrastructure to evacuate new plants and deliver energy to relevant distribution nodes;

c) Plan and execute energy-access projects to meet the national access target.

Specifically, EDCL develops and implements various transmission and distribution projects for the on-grid national electrical system and regional transmission grid that facilitate the exchange of electricity in the regional market.

On July 12, 2018, EDCL developed a transmission master plan of 110KV and 220KV electrical lines in compliance with minimum technical losses, enabling reliability and network flexibility in order to address the following challenges:

- The isolated transmission networks of neighboring countries;
- No N-1 design of existing HV transmission lines and associated substations;
- Long HV transmission with excessive technical losses.

As of April 2019, Rwanda’s current electricity access rate is 49 percent (38 percent on grid access and 13 percent off-grid access). The target in fiscal year 2019/2020 is 56 percent both on-grid and off-grid, which requires financing and new construction in transmission and distribution grid extension. EDCL plans to construct 1044km of transmission lines and to have technical losses of 18 percent (compared to 19 percent in the previous fiscal year). Following the existing transmission master plan, these are the projects planned in FY2020:

Table 1: 2020 Projects

<table>
<thead>
<tr>
<th>No.</th>
<th>Project Name</th>
<th>Components</th>
<th>Length/ Capacity</th>
<th>Estimated Cost (USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>11kV Nyabarongo I-Nyabihu</td>
<td>Construction of Transmission Line</td>
<td>46</td>
<td>14,073,091</td>
</tr>
<tr>
<td>2</td>
<td>Construction of Bugesera Industrial Park substation</td>
<td>110/30kV substation 2 x 20MVA</td>
<td>2 x 20MVA</td>
<td>9,000,000</td>
</tr>
<tr>
<td>3</td>
<td>110kV Gasogi-Bugesera</td>
<td>Construction of Transmission Line</td>
<td>17.8</td>
<td>3,382,000</td>
</tr>
<tr>
<td>4</td>
<td>110kV Nyamugari-Rwinkwavu</td>
<td>Construction of Transmission Line</td>
<td>57.2</td>
<td>10,868,000</td>
</tr>
<tr>
<td>5</td>
<td>220kV Mamba-Gisagara</td>
<td>Construction of Transmission Line</td>
<td>21</td>
<td>4,620,000</td>
</tr>
<tr>
<td>6</td>
<td>Installation of 220/110kV Transformer at Rubavu SS</td>
<td>Upgrade of Rubavu SS 75/93.8MVA</td>
<td>75/93.8MVA</td>
<td>2,057,819</td>
</tr>
<tr>
<td>7</td>
<td>220kV Kigoma-Gisagara-Burundi Border</td>
<td>Construction of Transmission Line, Construction of Gisagara SS</td>
<td>64</td>
<td>19,601,009</td>
</tr>
<tr>
<td>8</td>
<td>New Gasogi Substation</td>
<td>Construction of new Gasogi Substation</td>
<td>2 x 15 MVA</td>
<td>23,542,130</td>
</tr>
</tbody>
</table>

| Total |                                           |                                                |                  | 87,144,049          |

Source: EDCL transmission masterplan, July 2018.
1.1 Project Background

The Ministry of Infrastructure of Rwanda (MININFRA) prioritized energy sector activities for 2019/2020 to:

1) implement ongoing generation projects to bring the total installed capacity to 305 MW;
2) increase household electricity access from 51% to 56% for both on grid and off grid;
3) Strengthen the national grid network to focus on network upgrade initiatives, transmission system expansion, and protection across the country;
4) reinforce national and urban street lighting;
5) promote biomass alternatives to encourage urban dwellers towards cleaner and more efficient cooking methods; and
6) develop the strategic fuel reserve.

EDCL has ambitious targets to increase on-grid access to electricity from 972,920 household connections (36%) as of end April 2019 to approximately 1,055,920 (40%) connections by end June 2020. EDCL also must establish 404 socio-economic productive areas by 2019/20.

The following projects are planned to be commissioned in the 2019/2020 fiscal year, including the main electrical transmission lines associated to Regional Rusumo Falls Hydropower Plant (82 MW) and Mamba-Hakan Peat to Power Plant (80 MW):

- 220 kV HV TL Rusumo-Rilima-Shango (117.8km);
- 220kV TL Mamba-Rwabusoro- Rilima (61.8 Km) and 110kV Rilima-Gahanga (17.5 Km) with associated substations (Mamba, Rwabusoro and upgrading Rilima substation).

EDCL is internally developing transmission line projects and upgrading/reinforcing the existing lines for the stability and reliability of the national electrical system of Rwanda. As such, Bugesera – Gasogi and Rusumo Falls – Kirehe–Rwinkwavu 110 KV transmission lines and others are under acceleration.

Beyond the 2019/2020 fiscal year, completion of the 220 HV TL Kigoma (Rwanda) – Gitega (Burundi) – 63.5Km and associated substations are planned. The Kigoma-Gitega line will be connected to Gisagara substation in Huye district. This is an important connection point for the two planned HV transmission lines under this scope of work: 1) 110 KV HV line from Mamba to Gisagara with 110/30 KV at Huye, and 2) 110 KV HV 40.7 Km from Rukarara – Huye – Gisagara.

The USAID-funded Power Africa East Africa Energy Program (EAEP) prepared these terms of reference in close coordination with EDCL to recruit a qualified consulting firm in compliance with the requirements of Task Order (TO) 720-674-19-F-00004, implemented by RTI International. These terms of reference outline the needs for a project to complete studies associated with Rukarara-Huye-Gisagara and Nyamugari (Rusumo Falls) – Kirehe–Rwinkwavu transmission lines.

1.2 Information on Country Power Structure

The Government of Rwanda (GoR) envisions transitioning from a developing country to a middle-income country. To achieve this goal, the government is targeting 100% electricity access by 2024. Rwanda is endowed with natural energy resources including hydro, solar, and methane gas. It currently only has 218 MW of installed generation capacity. According to the International Energy Agency (IEA), Rwanda’s national electrification rate is estimated at 30% (12% in rural areas, 72% in urban areas).

Rwanda’s Electricity Sector Strategic Plan (ESSP), part of the National Strategy Transformation (NST1), outlines how the GoR will provide electricity access to all households by 2024. The National
Electrification Plan 2018-2024 (NEP) was developed by EDCL/REG to guide the investments in electrification and how to achieve the access targets within the framework defined by NSTI and ESSP. In general, GoR is focused on the implementation of Y2019/20 priorities pertaining to on-going generation projects, electricity access rollout, national grid network strengthening and implementation of energy efficiency initiatives.

Figure 1: 2021 Rwanda Network Configuration

Source: EDCL transmission masterplan July, 2018
Figure 2: 2020 Transmission Network

Legend
Substations
2020
- Existing
- Ongoing
- Planned

HV Lines
2020
- Existing 110
- Existing 220
- Existing 220 Operating on 110kV
- Ongoing 110
- Ongoing 220
- Ongoing 220 to be operated on 110kV
- Planned 110
- Planned 220

Source: EDCL transmission masterplan July, 2018
2 Project Objective
The objective of this project is to carry out the pre-feasibility, feasibility, environment and social impact assessment (ESIA), resettlement action plan (RAP), detailed design, and tender documents of the following transmission lines and associated substations:

1) Nyamugari (Rusumo Falls) - Kirehe - Rwimkwavu, 64.5 km, 110kV single circuit transmission line and upgrade of Rwinkwavu substation 110 /30kV;
2) Rukarara - Huye - Gisagara, 40.7 km, 110 kV single circuit transmission line and Huye 110KV/30 KV substation.

3 Scope of Work
The project requires a pre-feasibility, feasibility study, detailed design ESIA, resettlement action plan (RAP), and development of tender documents for both transmission lines and associated substations. Each stage of the study (see section 7 on schedule) will require review and approval from both EAEP counterparts and EDCL.

3.1 Study Implementation Structure
The consulting firm selected will work closely with the Project Steering Committee (PSC). The PSC will be comprised of two members from EDCL and two members from EAEP.

The PSC will ensure all necessary information is available in a timely manner, validate the findings of the study, and resolve any issues that might arise during the execution of the study. EAEP will be the Secretariat of this PSC as the contracting body. The PSC will provide input and approval of TORs and conduct the evaluation of bids and contract negotiations for the selected consulting firm.

EDCL will provide guidance, participate in various phases of the study, monitor progress, and review reports on a regular basis with the Managing Director of EDCL. All milestone and deliverable documents will require approval from EDCL management.

EAEP will be responsible for fiduciary and administrative management of the consulting firm’s contracts.

3.2 Capacity Building for EDCL Staff
In addition to the two PSC-EDCL staff, up to three EDCL staff will join the Consultant in preparation of studies, data review, and fulfillment of the project in order to develop skills associated with procurement of transmission line and substation terms.

It is anticipated that one electrical engineer, one finance and economics specialist, and an environmental-social expert from EDCL will join the Consultant. If travel or a change of duty station for those three EDCL staff is anticipated, the Consultant will detail the estimated costs in their cost proposal.

Additionally, the Consultant will provide formal training in power flow simulations using power factory (Dig silent) and AutoCAD electric for substation design and other relevant software used by EDCL in power planning to EDCL staff in Kigali.

All trainings will undergo evaluation, and the consultant will work closely with the EAEP monitoring and evaluation team to ensure that performance was improved. In addition, entry behavior of the personnel to be trained will be measured to enable evaluation of skills and knowledge gained at the end of the training program. The consultant will be expected to put in place mechanisms to enable transfer of knowledge to EDCL staff, to ensure sustainability of initiatives to be implemented.
3.3 Gender Integration
The consultant is expected to assess how gender equality and female empowerment will be considered in project development.

The consultant will be expected to facilitate regular sessions aiming at building the capacity of EDCL to consider the gender dimensions of project development. This can include, but is not limited to, possible benefits that would accrue to men and women as a result of the project and recommended measures to support benefits to women.

4 Place of Performance
The selected consulting firm for this Project will perform most of the work at its own facility. In addition, the consulting firm is expected to complete the project in the following locations (note that period of performance in each location is not limited):

1) Kigali, Rwanda
2) On site at the proposed locations of:
   a. Nyamugari-Kirehe-Rwimkwavu line;
   b. Rukarara-Huye-Gisagara line; and
   c. associated substations.

The consultant will be expected to make transport and travel arrangements and should provide the detailed costing of logistical arrangements as a separate cost line in their bid.

5 Work Requirements
In order to achieve the specific scope of work outlined above, the studies will be carried out in the following phases:

1) Pre-feasibility study;
2) Feasibility study;
3) Detailed design and development of tender documents;
4) ESIA and RAP.

5.1 Pre-Feasibility Studies
The selecting consulting firm (referred to as “the Consultant”) will:

1) Analyze, compare, and evaluate different alternatives to select the preferred scheme, considering that the transmission lines and two substations end-to-end must be extended as required.
2) Carry out optimization studies for the alternatives, in order to recommend the best technical and economical solution.

The Consultant will carry out optimization studies for the different alternatives to select the preferred scheme. The analyses of the different options will be presented to PSC, as well as development partner participants (as potential financiers of project implementation). The analyses option presentation will be reviewed by the PSC and development partners and comments will be provided before the final recommended option is undertaken. The Consultant will carry out the feasibility study for the transmission lines and associated substations; the impact of the planned generation and transmission projects in the same areas will also be analyzed.

5.1.1 Data Collection and Review
The Consultant will visit EDCL in Kigali for data collection and review of all previous studies pertaining to the project. This will include recent data on existing facilities, power demand, expansion plans, maps, and other relevant information. The Consultant will review the consistency of basic economic
assumptions, such as cost for unserved energy, discount rates, and other relevant parameters. The consultant will consult the relevant important documents in the Rwandan energy sector, including, but not limited to, the Energy Sector Strategic Plan (ESSP), National Electricity Plan (NEP), National Strategy for Transmission (NST1), Least Cost Power Development Plan (LCPDP), Transmission Master Plan, Distribution Master Plan, and various existing final reports on 220kV and 110kV transmission lines and associated substations under construction or being planned in the project sites.

The Consultant will review the technical options selected in the light of technological changes and generate reports with appropriate maps showing the locations of the substations. All data collection and analysis activities will be harmonized with other on-going activities and studies on the Rwandan electrical system and regional interconnector development.

5.1.2 Power Demand forecast
The Consultant will analyze Rwanda’s previous country demand forecasts and compare them with actual registered demand levels to explain the differences observed and determine explanatory parameters of the demand. The current power demand forecast is not available at the local area level for the transmission line sites, and the Consultant will need to complete a local area power demand forecast for those areas. This will not include rural electrification areas.

The Consultant will estimate the power demand of the substations located along the line corridors without assessing future rural electrification. Based on collected data and various investigations that will be analyzed, the Consultant will develop a power demand forecast for the horizon of 25 years.

5.1.3 Definition of alternative power line routes and substation layouts
The Consultant will:
1) Based on available 1:50,000 scale maps in Rwanda, and on any previous study report, determine a minimum of three alternative routes for each transmission line and layouts of associated substations end-to-end;
2) Carry out perfunctory exploration of layouts on the ground to check obstacles and important information mentioned in documents or on maps, particularly access roads to future line construction sites, forests and protected sites, swampy areas, etc. The Consultant must walk the line and utilize local sub-consultants to avoid desktop studies;
3) During this exploration exercise, collect necessary information, such as topographical and geological data.

The power line routes will, as much as possible, avoid ecologically sensitive zones, congested areas and protected sites. During the route selection work, the Consultant will work closely with REG (EDCL and EUCL) and key stakeholders.

5.1.4 Definition of Rural Electrification
The Consultant will use the NEP results related to Nyamugari - Kirehe - Rwinkwavu and Rukarara – Huye – Gisagara for rural electrification context. EDCL can provide village-level data for the Consultant in less than a week, on request. This project does not envisage extensive consideration of rural electrification in the studies.

5.1.5 Definition of the Characteristics of Structures
The Consultant will study the functioning of REG (EUCL and EDCL) grids. The Consultant will carry out simulations to define the main characteristics of the equipment, considering also temperature and environmental conditions, in particular: operating voltage, level of insulation, conductors’ sections, behavior in dynamic state, reactive powers compensation equipment, and telecommunications
equipment. Use of the PSSE tool will be preferred. EDCL can provide stability studies on request and the Consultant will not need to develop a simulation from the start.

5.1.6 Inception Report
The layout of the different alternatives will be presented in the Inception Report which will describe the information collected, field work that needs to be carried out, comments on TORs, and an updated methodology and work plan. The Consultant will also present findings and comments on demand and the characteristic structures of the transmission lines and equipment.

The Consultant will submit five hard copies of the Inception report, as well as a copy on CD, within two weeks of the start of the Project.

The Inception Report will be reviewed by the PSC as well as MININFRA, USAID, and relevant development partners two weeks after submission, and revised as needed by the Consultant. The Consultant will be required to present the inception report in Kigali and should budget accordingly in their proposal.

5.1.7 Development of criteria for classification and selection of best option
The Consultant will propose the criteria to be used in the choice of the best option, based on network analysis, economic analysis, and overall assessment. These criteria should be clearly defined and justified. The Consultant will propose a classification of options which will be reviewed and approved by the PSC, MINIRFA, USAID, and relevant development partners. The approval will be submitted to the Consultant in written form.

5.1.8 Prefeasibility Report
The preliminary reports will include work under section 3, above, with adequate maps, drawings and other illustrative materials for the preliminary options. The draft report will be submitted in five hard copies, as well as in electronic format, within three months of the project start date.

The Consultant will submit five hard copies of the pre-feasibility study, as well as a copy on CD, within four months of the start of the Project and four weeks after the submission of the comments on the draft.

The pre-feasibility study will be reviewed within two weeks after submission and revised as needed by the Consultant. The Consultant will be required to present the pre-feasibility study in Kigali and should budget accordingly in their proposal.

5.2 Feasibility Studies
The Consultant will carry out feasibility studies based on the findings of the preliminary design study and the selected scheme approved by the PSC. The Consultant will complete the collection of data and incorporate any new information likely to influence the optimization and determination of the economic viability of the whole project considering ESIA and RAP results.

5.2.1 Load Forecast
The Consultant will review the EDCL-provided load forecasts for the specific areas and work with the existing load forecasts at the national level. The economic life of the project will be partitioned into discrete durations of 5, 10, 15, and 20 (50 in total) years starting from 2020.
5.2.2  Generation and Transmission Expansion Plan
Based on LCPDP and the Transmission Masterplan, the Consultant will be expected to perform any necessary enhanced analysis of demand forecasts of the country and the proposed national electrical transmission system. The Consultant will also propose scenarios for sensitivity analysis that will cover but not be limited to:

(i) generation capacity and demand forecasts;
(ii) fuel prices;
(iii) regional power trade profiles;
(iv) any other parameter that may impact the economic justification of the project.

5.2.3  Optimal Route Selection
The Consultant will carry out a desk review of the line route using maps of scale 1:50,000 and relevant satellite imagery. The maps and imagery will be digitized in ArcGIS 9 software and the alternative line alignments superimposed on the resulting digital maps. A ground survey using GPS will be conducted along the entire line route in order to verify the results of the desk study.

The Consultant will come up with a minimum of three optimal line route selections based on technical, environmental, economic, and financial analysis, considering the suggested terminal points.

After selection of the optimum line routes, the Consultant will prepare longitudinal and transversal profile drawings, including tower spotting, using digital elevation models generated from the Shuttle Radar Topography Mission. PLS-CADD or similar software will be necessary for this exercise.

The Consultant will also carry out geo-technical and other relevant investigations for the selected routes.

5.2.4  Network Analysis
The system studies will include, but are not limited to, the following:

a) Load Flow Analysis: Load flow studies will be performed in order to determine the load flows in normal (high and low load) and disturbed (loss of generation and major transmission lines) conditions. This analysis will be used to determine the system requirements of reinforcement and reactive power compensation, and for proper dimensioning of the transmission line and substation equipment.

b) Fault Current/Short Circuit Study: Fault current analysis for the complete range of fault types will be carried out. Based on the results of the study, the appropriate protection system and switch gear capacity will be designed for the interconnected system, taking into consideration other interconnection projects ongoing within the region. Low fault current study values will feed into distribution protection analysis.

c) Network Stability Analysis: Stability studies will be performed with the simulation of different abnormal conditions in order to determine the system requirement of stabilization and compensation. Stability analysis will include, but is not limited to, transient and sub-transient analysis, dynamic analysis, network islanding and restoration analysis, and voltage and angle stability analysis.

d) Communication and Control System Study: The existing and planned communication and control systems will be studied, and an appropriate communication and control system designed for the project. The design of the transmission line should incorporate the installation of the OPGW with enough fibers as part of the communication system; this should cover lease-out cores as well as internal-use cores.

e) Other studies, as determined by the Consultant, to ensure completion of the assignment in accordance with internationally accepted best practices.
5.2.5 Project cost
The Consultant will determine costs of project components and equipment based on current prices of inputs, such as metal prices and quotations from equipment suppliers. The costs will be prepared for equipment installation, and operation and maintenance of the transmission lines and associated substations.

The project cost estimate will be prepared by work component (transmission line, substation, protection and communication, civil works, rural electrification, and consultancy services) and by categories of expenses, and will be broken down into foreign and local components. The costs of the major components (e.g. transmission line and substation) will be broken down in the highest detail possible (e.g. conductors, towers, insulators, etc.). The cost estimates will show operation and maintenance, physical contingency, price contingency, and taxes and duties levied separately.

The total costs should consider the results of the ESIA and RAP.

5.2.6 Project Viability
The Consultant will determine the financial and economic viability of the project. The Consultant will calculate the economic internal rate of return, the financial internal rate of return, benefit/cost ratio, and net present value. To perform such economic and financial analysis, the Consultant’s tasks will include, but not be limited to, the following:

5.2.6.1 Project Benefits
The potential measurable benefits of the project include:
1) Increased reliability of the network.
2) Reduced cost of reserve capacity in the country;
3) Reduced cost of new generation due to economics of scale;
4) Additional revenues from power exchanges
5) Increased direct female users.

The Consultant will analyze the economic, social and environmental externalities to determine the benefits, which they will use in the economic and financial evaluations. The Consultant will also identify other benefits the project might generate in a modern power sector setting.

5.2.6.2 Economic Analysis
The Consultant will develop cost estimates for the implementation of the project, including engineering, financing costs, mitigation measures, and the value of tangible benefits and drawbacks. The project cost estimates will include unit costs and estimates of quantities for project components and physical and price contingencies, as well as construction phase, operational Phase, and line and equipment retirement phase costs. The Consultant will provide comparison costs for similar projects undertaken in different countries in the region.

Once the costs and benefits associated with the project for the selected scheme have been calculated, the Consultant will determine the economic viability of the project from indicators such as economic internal rate of return, social benefit ratio, and net present value. Sensitivity analysis and other factors that the Consultant may determine will also be carried out in the economic evaluation of the project. The Consultant will propose a methodology for determining the adequacy of the tariff compared with the economic costs and requirements to meet financial targets.
5.2.6.3 Financial Analysis
The Consultant will determine and recommend a tariff scheme for (i) use of transmission lines to ensure cost recovery of line capital and operation costs and (ii) an off-take and supply tariff for bulk energy and capacity depending on marginal costs. Financial analysis will determine the impact of the project on the overall financial position of EUCL.

In the financial analysis, the internal rate of return, benefit-cost ratio, and net present value will be calculated. The financial analysis for the project will also include sensitivity analysis, which in addition to scenarios as defined above will cover variations in capital cost, fuel cost, amount of energy transmitted, and delay in project implementation.

5.2.7 Schedule of implementation
The Consultant will come up with the shortest possible schedule for construction works. The programming of duties will be specific and comprehensive, in order to produce a schedule implementation for competitive bids.

5.2.8 Risk analysis
The Consultant will analyze all the potential risks involved in the development of the project, including, but not limited to, technical, financial, legal, regulatory, operational, commercial, delays in implementation, etc. The Consultant will analyze various risks and propose concrete measures for removing or mitigating them in a prioritized matrix format.

5.2.9 Feasibility Report
The Consultant will prepare a Draft Feasibility Study Report which will present all work carried out under the TOR, including the required maps, drawings and figures to illustrate technical solutions. The report will contain clear conclusions as to the project's economic, financial, technical, environmental, and social viability. Information regarding Environment and Social aspects will be provided by the Consultant for ESIA and RAP study. The draft report will be submitted in five hard copies six months after the start of the project.

The Consultant will submit five hard copies of the draft feasibility study, as well as a copy on CD, within six months of the start of the Project. The Final Feasibility Study will be reviewed by the PSC as well as MININFRA, USAID, and relevant development partners two weeks after submission and revised as needed by the Consultant. The Consultant will be required to present the feasibility study in Kigali and should budget accordingly in their proposal. The Final Report will be submitted within one month of receipt of the comments. The Final Report will be submitted in five hard copies and five copies on CD; all reports are to be submitted in English.

Approval of the Final Feasibility Study Report will depend on the response of the Consultant to comments. A synopsis report will be produced in tandem and include key findings of the feasibility studies and high-level information for decision makers.

All electronic copies of reports will be provided in Microsoft Office software, diagrams in AUTOCAD, PSSE files, and maps in ArcGIS as applicable.

5.3 Detailed Design and Tender documents

5.3.1 Detailed Design
The Consultant will carry out a comprehensive design for the construction of power lines and associated substations. The Consultant will refine the technical analyses and operating simulations of the
national grid, carried out during the preceding phases, with a view to preparing detailed technical
specifications of equipment, comprehensive directives, and documents required for launching invitations
to tender, as well as the execution of works.

5.3.1.1 Geotechnical investigations and complementary topographical works
The Consultant will carry out preliminary geotechnical investigations that will determine (i) soil features
relating to their adequacy as foundations for pylons and (ii) the stability of the talus. The Consultant will
collect geotechnical information necessary for the construction of transmission line and substations.

The Consultant case longitudinal sections and define the constraints of the stringing of conductors. The
Consultant will keep a field book for staking out that will indicate the types of pylons (anchorage,
alignment, and angle) needed. The Consultant will prepare complete details on the staking that, at a
minimum, indicate the locations of all the pylons which will be shown by markers.

5.3.1.2 Detailed Engineering Design
The detailed engineering design will include:

1) **Sub-station**: The Consultant will determine the configurations and characteristics of equipment
for the substation, and establish operating schedules for protection, monitoring/control/automation, metering, telecommunication, and essential telemetry for the
construction of project structures. For the purpose of spare parts management and ease of
operations, the specifications of the equipment must include existing equipment on the national
grid.

2) **Protection, monitoring and control equipment**: The Consultant will establish detailed
diagrams for the protection, monitoring, control and metering of new installations. They will
indicate on the diagrams all the settings to be shown on relays and automatic controls, including
control setting modifications on existing installations. The Consultant should consider that the
substations will be remotely controlled and supervised from the national grid control centers.

3) **High voltage Transmission lines**: The Consultant will carry out longitudinal sections and
define the constraints of conductor stringing. They will determine the number and
characteristics of pylons, conductors and accessories, and the size of the pylon foundations. The
Consultant will define the arrangements for the grounding of pylons.

The draft detailed design report will be submitted in five hard copies, in English, within nine months of
the beginning of the project. The detailed design will contain: the description of structures; plans, maps
and diagrams; details on standards used; technical specifications of equipment; and the terms of
reference for the supervision and monitoring of works.

The draft report will be reviewed by PSC and other development partners within two weeks after
submission and revised as needed by the Consultant. The Consultant will include travel to Kigali for
presentation of this inception report in their cost proposal.

The Final Detailed Design Report will be submitted within ten months of the start of the project in five
hard copies.

5.3.2 Preparation of Bidding Documents and Assistance During Bidding Period
The Consultant will prepare bidding documents using the relevant and latest versions of the African
Development Bank’s Standard Bidding Documents (SBDs), the SBD entitled “Procurement for Plant,
Design, Supply and Installation," or BSDs from other international financial institutions like the World Bank, the European Investment Bank, etc. The draft tender documents will be submitted 11 months of the beginning of the study in five hard copies and five copies on CD; all reports are to be submitted in English.

The draft bidding documents will be reviewed by PSC and relevant development partners two weeks after submission and revised as needed by the Consultant. The Final Tender documents will be submitted within 12 months of the beginning of the project, and the consultant will provide PSC with five hard copies in English.

Optional Activity: The Consultant will be available to assist EAEP and EDCL during the bidding period until a final award is made. This is optional work, depending on the schedule for bidding following the conclusion of the final feasibility study.

EAEP and EDCL do not anticipate that the Consultant will conduct all the following activities illustrative of support for the bidding process:

Coordinating between EAEP and EDCL on the bidding process, demonstrating expertise, a spirit of teamwork, and close collaboration;

Replying to contractual and technical questions raised by Bidders in consultation with EAEP and EDCL:
1) Preparing and issuing addendum(s) to the bid documents or “Clarification Notes to Bidders” as required in consultation with the client;
2) Advising during joint bid evaluation, including helping to prepare evaluation reports in English;
3) Advising on the contract award discussions and assisting in the minutes
4) Assisting with the contract award process, to ensure that both parties meet all conditions of effectiveness, and to ensure timely contract signature by both parties.

The Consultant will prepare a report on bidder consultations addressing any proposed modifications of design and recommendations for responses to bidders. The report will be reviewed by the EAEP and EDCL and discussed with the Consultant before final approval.

5.4 Environmental and Social Impact Assessment and Resettlement Action Plan

The detailed scope of work for ESIA and RAP is available in ANNEX 3.

6 Period of performance

The period of performance for studies is twelve months, beginning on the day the selected consultant signs the contract. All work must be completed within this timeframe. Any modifications or extensions will be requested through EAEP.

7 Schedule/Milestones/Deliverables

The Consultant will produce the following reports over the course of the project:

<table>
<thead>
<tr>
<th>No.</th>
<th>Activity/Deliverable</th>
<th>Time</th>
</tr>
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<table>
<thead>
<tr>
<th></th>
<th>Activity</th>
<th>Timeframe</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Commencement with kick off meeting + Non-disclosure Agreement</td>
<td>J+1 week</td>
<td>Exchange of documents</td>
</tr>
<tr>
<td>2</td>
<td>Inception report</td>
<td>J+1 month</td>
<td>Final inception report (Kigali)</td>
</tr>
<tr>
<td>3</td>
<td>Pre-feasibility study draft submitted PSC</td>
<td>J+ 3 months</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Final Pre-feasibility study and progress report</td>
<td>J+ 4 months</td>
<td>Final pre-feasibility study and progress report (Kigali)</td>
</tr>
<tr>
<td>5</td>
<td>Draft Feasibility study</td>
<td>J+6 months</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Final Feasibility study, synopsis report, and progress report</td>
<td>J+7 months</td>
<td>Final feasibility study (Kigali)</td>
</tr>
<tr>
<td>7</td>
<td>Draft Detailed Design study</td>
<td>J+9 months</td>
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<tr>
<td>8</td>
<td>Final Detailed Design study and progress reports</td>
<td>J+10 months</td>
<td>Final detailed design study (Kigali)</td>
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<tr>
<td>9</td>
<td>Draft Tender Document</td>
<td>J+11 months</td>
<td></td>
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<tr>
<td>10</td>
<td>Final Tender Document and progress report</td>
<td>J+12 months</td>
<td>Final tender documents (Kigali)</td>
</tr>
<tr>
<td>11</td>
<td>Support competition process with EDCL and EAEP</td>
<td>J+14 months</td>
<td>(Optional)</td>
</tr>
</tbody>
</table>

8 **Acceptance Criteria**

Progress reports will be submitted every two months in electronic format (e-mails) to the PSC, beginning after one month of the final inception report submission. Progress reports will include information on work in progress and completed; a staffing matrix outlining each team member’s level of effort associated with each task; and the estimated percentage of work completed by task. Progress reports will also address any challenges that cause or could cause delays, as well as a financial summary indicating amounts to be invoiced and disbursed.

The Inception, Prefeasibility, Feasibility and Detailed design reports will first be produced in draft version and then finalized after they have been reviewed by PSC. The final reports should be ready a month, at the latest, after receipt of comments and observations.

9 **Obligations of the Consultant**

The Consultant will be entirely responsible for carrying out the study. The Consultant will supply specialists, support staff and logistics necessary for the required execution of the project. The Consultant will, for each phase of the study, define in detail which activities will be carried out.

10 **Required Expertise**

The Consultant will have a solid background and knowledge in electric power system planning and transmission line project evaluation and analysis, and a strong local Rwandan capacity to conduct ESIA on transmission line projects. Experience in each of these fields should not be less than 10 years. In particular, the following expertise and knowledge are required:

1) Conducting feasibility studies of transmission line projects that interconnecting national power grids and grids of contiguous countries,
2) Conducting power system planning studies at a national level for the purpose of cross-border grid interconnections,
3) Conducting Power System modeling and analysis for the purpose of cross-border grid interconnections,
4) Carrying out geological and route surveys for transmission line projects,
5) Conducting an economic and financial analysis of HV transmission lines projects,
6) Developing detailed design documents for HV transmission lines projects,
All key staff must have clear written and spoken English skills for the project.

The Consultant will be required to demonstrate successful execution of three similar assignments in the last five years, by submitting documented evidence in the form of completion certificates and references to support each of the above required levels of expertise. Consultants are also encouraged to include local professionals among key personnel directly involved in executing the assignment.

II Obligations of EAEP and EDCL

EAEP and EDCL have constituted the PSC that will work closely with the Consultant in coordination of data collection and analysis, site visits, and liaising with other institutions.

EDCL: Fully responsible for review and acceptance of all milestone and final deliverables for content.

EAEP: Responsible for guiding the Consultant and approving final deliverables for contract requirements.

PSC will serve as a liaison between the Consultant and the various agencies and government departments associated with or interested in the project. The Consultant, however, will be fully responsible for collecting data and information from these agencies. The Consultant will be given unhindered access to the relevant agencies and the country of Rwanda in order to carry out the study. This access will be provided once a non-disclosure agreement has been signed.

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12 ANNEX 1: Key Expert Requirements

Project Manager: Electrical engineer with 10 years’ experience in the design, planning and supervision of power projects and with experience in the developing countries. He/she must have a minimum experience of working on at least three similar projects.

Power Systems Engineer: Electrical engineer specialized in electrical networks with 10 years’ experience in electrical systems engineering, particularly in networks and research management. He/she must have a minimum experience of working on at least three similar projects.

Substations Engineer: Electrical engineer specialized in stations design. He/she must have at least 10 years’ experience. He/she must have a minimum experience of working on at least two similar projects.

Transmission line Engineer: Electrical engineer specialized in the design of power transmission lines. Must have at least 10 years’ experience in the projects/studies initiated in developing countries. He/she must have a minimum experience of working on at least two similar projects.

Civil Engineer: Engineer specialized in civil engineering, with at least 10 years’ experience in major infrastructure projects and particularly in power transmission lines projects. He/she must have a minimum experience of working on at least two similar projects.

Telecommunications Engineer: Telecommunications Engineer specialized in communication on power lines, having at least 10 years of experience. He/she must have a minimum experience of working on at least two similar projects.

Power Demand Forecast Expert: must have at least 10 years’ experience in the field. He/she must have a minimum experience of working on at least three similar projects.

Financial Analyst /Economist: must hold an M.A. in finance or in economics and have at least 10 years’ experience in financial and economic analysis of power projects. He/she must have a minimum experience of working on at least two similar projects.

Surveyor: Engineer with qualifications in topography and at least 7 years’ experience in major infrastructure projects and particularly in power transmission lines projects. He/she must have a minimum experience of working on at least two similar projects.

The Consultant is encouraged to involve the local/national key staff in the Consultant’s key personnel in order to create national expertise.
13 **ANNEX 2: Estimated Person-Month Allocation**

It is estimated that approximately 42 person months of effort will be required for this project; however, the Consultant, based on the complexity of each activity and understanding of the required services to be rendered, will propose their own quantities of person-months for any of key personnel. The total person-months should not be less than the estimated 42 person-months.


Please see attached terms of reference for the ESIA, ESMP, and RAP studies.

15 **ANNEX 4: Existing and Relevant Documents to be Provided Upon Award**

1) Rusomo Falls 220 kV – prefeasibility, feasibility, ESIA (ESMP + RAP), and tender documents for transmission line associated detailed design (still under approval process) not able to share as of September 2019;
2) Rwanda – Burundi line 220 kV – prefeasibility, feasibility, ESIA (ESMP + RAP), and tender documents for transmission line associated: detailed design (still under approval)
3) Mamba- Rwabusoro - Bugesera (220 kV) – prefeasibility, feasibility, detailed design, ESIA (ESMP + RAP), and tender documents for transmission line associated
4) National Energy Plan
5) Substation details
6) Transmission Master Plan
7) Line load capacity simulations
8) Energy sector strategy plan (ESSP)
9) Least Cost Power Development Plan (LCPDP)

15 **ANNEX 5: Template Non-Disclosure Agreement with EDCL**

NON-DISCLOSURE AGREEMENT

Entered into by and between

Energy Development Company Limited (EDCL) with its registered address

________________ represented by

, Managing Director
(Hereinafter “the Disclosing Party”)

AND
THIS NON-DISCLOSURE AGREEMENT (“Agreement”) is made as of this ___________ (“Effective Date”) with reference to the following facts:

A. For the purpose of carrying out the objectives of the [Contract number] to facilitate Receiving party’s submission of relevant information. Receiving Party wishes to receive information that EDCL wants to keep confidential relating to EDCL’s proprietary information.

B. EDCL, in order to permit the Receiving Party to make such a determination, wishes to disclose to the Receiving Party certain confidential information of EDCL.

NOW, THEREFORE, in consideration of the mutual promises and covenants contained in this Agreement, and other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the parties hereto agree as follows:

1. Definition of Confidential Information

1.1 For purposes of this Agreement, “Confidential Information” means any data or information that is proprietary to the Disclosing Party and not generally known to the public, whether verbal or written, disclosed by EDCL to the Receiving Party and relating to the EDCL’s project feasibility, strategies, and research, including, without limitation, Institution confidential information, product design information, client, customer, vendor, prices and pricing policies not otherwise published, and projects under development. The Receiving Party acknowledges that the Confidential Information is proprietary to the Disclosing Party, has been developed and obtained through great efforts by the Disclosing Party and that Disclosing Party regards all its Confidential Information as institutional secrets.

1.2 Notwithstanding anything in the foregoing to the contrary, Confidential Information shall not include information which: (i) was known by the Receiving Party prior to receiving the Confidential Information from the Disclosing Party; (b) becomes rightfully known to the Receiving Party from a third-party source not known (after diligent inquiry) by the Receiving Party to be under an obligation to Disclosing Party to maintain confidentiality; (c) is or becomes publicly available through no fault of or failure to act by the Receiving Party in breach of this Agreement; (d) is required to be disclosed in a judicial or administrative proceeding, or is otherwise requested or required to be disclosed by law or regulation, although the requirements of section 4 hereof shall apply prior to any disclosure being made; and (e) is or has been independently developed by employees, consultants or agents of the Receiving Party without violation of the terms of this Agreement or reference or access to any Confidential Information.

2. Use of Confidential Information
The Receiving Party agrees to use the Confidential Information solely in connection with the contemplated potential in research and not for any purpose other than as authorized by this Agreement without the prior written consent of an authorized representative of the Disclosing Party.

3. Term

This Agreement shall remain in effect for 3-year term (subject to a 2 years’ extension if the parties are still discussing and considering the research at the end of the started period). Notwithstanding the foregoing, the parties’ duty to hold in confidence Confidential Information that was disclosed during term shall remain in effect for three (3) years from the Effective Date.

4. Compelled Disclosure of Confidential Information

The Receiving Party may disclose Confidential Information pursuant to any governmental, judicial, or administrative order, provided that the Receiving Party promptly notifies, to the extent practicable, the Disclosing Party in writing of such demand for disclosure so that the Disclosing Party, at its sole expense, may seek to make such disclosure subject to a protective order or other appropriate remedy to preserve the confidentiality of the Confidential Information; provided in the case of a broad regulatory request with respect to the Receiving Party business (not targeted at Disclosing Party), the Receiving Party may promptly comply with such request provided the Receiving Party gives the Disclosing Party prompt notice of such Disclosure.

5. Remedies

Both parties acknowledge that the Confidential Information to be disclosed hereunder is of a unique and valuable character, and that the unauthorized dissemination of the Confidential Information would destroy or diminish the value of such information. The damages to Disclosing Party that would result from the unauthorized dissemination of the Confidential Information would be impossible to calculate. Therefore, both parties hereby agree that the Disclosing Party shall be entitled to injunctive relief preventing the dissemination of any Confidential Information in violation of the terms hereof. Such injunctive relief shall be in addition to any other remedies available hereunder, whether at law or in equity. Disclosing Party shall be entitled to recover its costs and fees, including attorneys’ fees, incurred in obtaining any such relief. Further, in the event of litigation relating to this Agreement, the prevailing party shall be entitled to recover its attorney’s fees and other expenses.

6. Return and Review of Confidential Information

The Receiving Party shall immediately upon completion of the research send to the Disclosing Party, all tangible material embodying the Confidential Information provided to the Disclosing Party for review and approval before publication. Hereunder and all notes, summaries, and all copies of any of the foregoing, including “copies” that have been
converted to computerized media in the form of image, data or word processing files either manually or by image capture) based on or including any Confidential Information, in whatever form of storage or retrieval, upon the earlier of (i) the completion or termination of the dealings between the parties contemplated hereunder; (ii) the termination of this Agreement; or (iii) at such time as the Disclosing Party may so request. Notwithstanding the above, the Receiving Party may retain one copy of Proprietary Information solely for compliance purposes.

7. **Notice of Breach**
   Receiving Party shall notify the Disclosing Party immediately upon discovery of any unauthorized use or disclosure of Confidential Information by Receiving Party or its Supervisors, or any other breach of this Agreement by Receiving Party or its Supervisors, and will cooperate with efforts to help the Disclosing Party regain possession of Confidential Information and prevent its further unauthorized use.

8. **Dispute Resolution**
   (a) **Amicable solution:**
   Any dispute or differences between the parties arising out of this Agreement shall in the first instance be settled amicably by submitting such a dispute to a panel of senior representatives of the Parties to consider and resolve the Dispute. Each senior representative serving on such panel shall have full authority to settle the Dispute.
   (b) **Litigation:**
   “If the parties cannot settle the dispute amicably, the matter shall be referred to national courts of competent jurisdiction.”

9. **Governing Law**
   This Agreement shall be governed in all respects by the laws of the Republic of Rwanda. This Agreement shall be binding upon the successors and assigns of the respective parties.

10. **Termination**
    This Agreement may be terminated from time to time provided such termination is done with prior notice of 30 days by either party given in writing. In the case of termination of this agreement, the obligations of non-disclosure of confidential information provided under this agreement shall survive the termination event as prescribed in Article 3.

11. **Warranty**
    The parties acknowledge that although they shall each endeavor to include in the Confidential Information all information that they each believe relevant for the purpose of this Agreement, the parties understand that no representation or warranty as to the accuracy or completeness of the Confidential Information is being made by the Disclosing Party. Further, neither party is under any obligation under this Agreement to disclose any Confidential Information it chooses not to disclose. Neither Party hereto shall have any liability to the other party nor to the other party’s Representatives resulting from any use of the Confidential Information except with respect to disclosure of such Confidential Information in violation of this Agreement. The Disclosing Party shall have no liability to
the Receiving Party (or any other person or entity) resulting from the use of the Disclosing Party's Confidential Information or any reliance on the accuracy or completeness thereof.

12. Miscellaneous

12.1 In the event that any of the provisions of this Agreement shall be held by a court or other tribunal of competent jurisdiction to be illegal, invalid or unenforceable, such provisions shall be limited or eliminated to the minimum extent necessary so that this Agreement shall otherwise remain in full force and effect.

12.2 This Agreement supersedes all prior discussions and writings and constitutes the entire agreement between the parties with respect to the subject matter hereof.

12.3 This Agreement may not be modified or amended except by an instrument in writing signed by the parties hereto. Accordingly, no course of conduct shall constitute an amendment or modification of this Agreement.

12.4 Any failure by either party to enforce the other party’s strict performance of any provision of this Agreement will not constitute a waiver of its right to subsequently enforce such provision or any other provision of this Agreement.

By signing below, the Disclosing Party and the Receiving Party acknowledge terms and conditions contained within this Agreement and further acknowledge that this Agreement represents a complete contract between the Disclosing Party and the Receiving Party.

“For and On behalf of the Disclosing Party”

EDCL MD

Print Name       Signature       Date

“For and on Behalf of Receiving Party”

[Consultant]

Print Name       Signature       Date