

*Economic Community
Of West African States*



*Communauté Economique
Des Etats de l'Afrique de l'Ouest*

WEST AFRICAN POWER POOL
SYSTEME D'ECHANGES D'ENERGIE ELECTRIQUE OUEST AFRICAIN
General Secretariat / Secrétariat Général

Client: West African Power Pool (WAPP)
Country: Liberia

WAPP/CLSG TA
ENERGY SUPPLY ALTERNATIVES STUDIES
& PROJECT PREPARATION IN LIBERIA

Preliminary Terms of Reference

**Feasibility Studies of the next Priority Investment Project on St. Paul River
(hydropower & solar projects) together with the Environmental & Social
Studies**

DRAFT

**Disclaimer: Terms of reference will be subject to changes within issuance of the Request
for Proposal package**

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List of Acronyms and Abbreviations

CLSG	Côte d’Ivoire-Liberia-Sierra Leone-Guinea Link
EPA	Environment Protection Agency - Liberia
E&S	Environmental and Social
ESCP	Environmental and Social Commitment Plan
ESF	Environmental and Social Framework (of World Bank)
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
FDA	Forestry Development Authority
FS	Feasibility Study
GBR	Geological Baseline Report
GDR	Geotechnical Data Report
GoL	Government of Liberia
GRM	Grievance Redress Mechanism
GWh	Gigawatt-hour (measure of energy)
HPP	Hydroelectric Power Plant
IDA	International Development Agency
IFI	International Financing Institutions
IR	Inception Report
ITAP	Integration and Technical Assistance Project
IWRM	Integrated Water Resource Management
kW	kilowatt (measure of instantaneous capacity or demand equal to 1000 Watt)
LEC	Liberia Electricity Corporation
LFT	Liberia Focal Team
LHS	Liberia Hydrological Services
LISGIS	Liberia Institute of Statistics and Geo-Information Services
LTDP	Long Term Development Plan
MME	Ministry of Mines and Energy (Liberia)
MFDP	Ministry of Finance and Development Planning (Liberia)
MoSWP	Ministry of State Without Portfolio (Liberia)
MW	Megawatt (measure of instantaneous capacity or demand equal to 1 million Watt)
NEP	National Electricity Plan

List of Acronyms and Abbreviations (cont'd)

NGO	Non-Government Organization
OS	Optimization Study
PAP	People/Population Affected by the Project
PIP	Priority Investment Project
PIPES	Planning, Investment Programming and Environmental Safeguard Department (WAPP)
PDU	President's Delivery Unit
PIU	Project Implementation Unit
PPA	Power Purchase Agreement
RP	Resettlement Plan
SC	Steering Committee
SEP	Stakeholder Engagement Plan
STA	Strategic Transaction Advisor
TA	Technical Assistance
TFP	Technical and Financial Partners
ToR	Terms of Reference
TSA	Transmission Service Agreement
WAPP	West African Power Pool
WB	World Bank

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1. INTRODUCTION

1.1. West African Power Pool

The West African Power Pool ("WAPP") was created in 1999 at the Conference of Heads of State and Government of the Economic Community of West African States ("ECOWAS"). There was a realization that the immense energy resources available to the region, even if not equitably distributed geographically, could be exploited for the mutual benefit of all Members to increase access to reliable and affordable electricity for the socio-economic development of countries. In 2006, the ECOWAS Conference of Heads of States and Government invested the WAPP with the mission of promoting and developing electricity generation and transmission infrastructure as well as coordinating exchanges of electrical energy between ECOWAS Member States.

The Strategy of WAPP is based on the implementation of infrastructure programs with various regional projects of generation and transmission of electric power, which are mutually complementary and reinforcing the regional network. Ultimately, the completion of these infrastructure projects will allow the integration of all power grids in West Africa. The WAPP Infrastructure Program is based on the results of the ECOWAS Master Plan for the Production and Transmission of Electrical Energy Resources approved by the Heads of State and Government in December 2018 through Supplementary Act A/SA.4/12/18.

1.2. ECOWAS Master Plan

Since its establishment, the WAPP Secretariat has taken a leading role in the development of the regional infrastructure and in the implementation of the priority projects defined in the ECOWAS Master Plan. This Master Plan identified 75 regional projects deemed priority for the period 2019-2033 of which 47 are generation projects with a total capacity of approximately 15.49 GW and 28 transmission projects totaling approximately 22 932 km of high-voltage transmission lines. The generation projects comprise of 31.1% thermal projects operating mainly with natural gas and 68.9% renewable energy projects (10.67 GW) including 24% hydroelectric power projects.

The Master Plan has shown the interest of the massive development of hydropower in West Africa and the construction of a reliable transmission network allowing the sharing of resources throughout the region. Nevertheless, it was pointed out that in a regional context where macroeconomic parameters could strongly influence the discounted cost, it is important to maintain a balanced energy mix between the different resources in order to guarantee stability of the electric system and at a reasonable development cost under all circumstances/seasons and ensure the technical and financial viability of the development plan. In order to achieve these targets, WAPP supports national companies in the implementation of the priority utility-scale projects and the completion of bankable feasibility studies including the environmental and social components required for their financing. In this context, WAPP has received financing from the World Bank for an Integration and Technical Assistance Project (ITAP) and intends to apply part of the proceeds for consulting services.

1.3. Solar Park Concept “Plug & Play”

It is proposed that solar power plants with an indicative total capacity of 90 MW will be developed in Liberia under the concept of utility scale Solar Park "Plug & Play". According to the Optimization Study (OS), this capacity should be progressively developed in three tranches. The concept of Solar Park "Plug & Play" has already been developed in many countries (e.g.: India), since it is easier to be controlled and less expensive to develop (Fig.1. refers).

The Consultant will support the government in identifying a site or various sites, based on the following criteria: (i) the capacity vicinity of a preselected substation and the network to absorb the electricity generated by the solar park ; (ii) the solar radiation; (iii) the availability of land to allow the development of a large-scale project to achieve economies of scale; and (iv) the site access . Analysis together with the hydro-studies will allow to optimize the capacity of new infrastructure (sub-stations, transmission lines...) and optimal location of solar parks (vis-à-vis grid stability and required ancillary services). It is of note that the CLSG project includes five (5) new substations as part of a new Liberian energy ‘spine’.

The government ensures the availability of land, obtains certain permits necessary to sign the Power Purchase Agreement ("PPA") and prepares the right of way (RoW) for transmission lines between the Solar Park and the utility connection substation.

The reduction of regulatory barriers and the development of an auction system organized with a bankable PPP would allow a significant reduction in the cost of repurchasing electricity and will permit the independent power producers ("IPP") to have a direct access to the grounds and infrastructure of the Solar Park.

2. BACKGROUND

2.1 Current Electricity Sector in Liberia

Liberia aims at achieving its modest goal of 35% electrification rate by 2030. The aspiration of Liberia to become a middle-income country by 2030 would be difficult to achieve with only about one-third of its population having access to modern energy services. Liberia is focusing on an accelerated access towards the goal of universal access to electricity using a combination of grid and off-grid solutions. Luckily, Liberia has sufficient renewable energy potential that could support both supply through the national grid and decentralized solutions through the private sector offering basic electrification services to many living in the remote rural areas before 2030. The country's preliminary estimates indicate sufficient renewable energy resources (solar and hydro etc.) that would be cost-effective with the advancement of technology going forward.

Liberia's current generation capacity is adequate to meet power demand with excess capacity only during the wet season (May-Dec). Total installed generation capacity is 126MW against a peak demand of about 33MW. Hydropower accounts for sixty-two (62) percent of installed capacity (88 MW – Mount Coffee), heavy fuel oil accounts for twenty-seven (27) percent (10 MW-World Bank HFO Plant, 18 MW- Government of Liberia HFO Plant, 10 MW – Japanese Int'l Cooperation Agency HFO Plant) and diesel fuel accounts for 11 percent (9 MW – Bushrod HSD, assumed to be decommissioned in 2035). The first out of four hydropower units at Mt. Coffee was in operation from December 2016, and the last was commissioned in July 2017. During the dry season, which runs from mid-December to mid-May, there is insufficient river inflow to dispatch the full capacity. During the driest months, output reduces significantly requiring power augmentation.

Liberia's electricity grid system has been developed since the civil war ended in 2004 and during the war all infrastructure was destroyed. The first step was to supply different parts of Monrovia through small 22 kV and LV distribution systems, supplied from diesel fueled containerized gensets (mostly 1 MW size). LEC officially revived its operations in 2007 with two (2) MW of installed capacity and a small number of connections and street lights. A 66 kV system in Monrovia was reconstructed around 2010, connecting the Monrovia suburbs of Paynesville, Krutown, Capitol and Bushrod, and creating a 66 kV grid connecting all generators and substations in Monrovia. The next major step was the rehabilitation of the Mt Coffee HPP, with 66 kV lines to Bushrod and to Paynesville substations, securing a grid from Mt Coffee to Monrovia with necessary redundancy. The first out of four hydropower units at Mt. Coffee was in operation from December 2016, and the last was commissioned in July 2017. This 66 kV grid has been limited to supplying the Monrovia area but is being expanded to nearby counties, including Bomi and Margibi. Other locations like Buchanan, Gbarnga, and Firestone have separate small grids operated isolated from the main grid in Monrovia.

Liberia's electricity demand studies have been conducted including i) options for development of Liberia's energy sector (October 2011)¹, ii) Liberia power sector capacity building and energy master planning (August 2013)² and iii) preparation of a government of Liberia least cost power development plan (LCPDP) (August 2014). LCPDP provides the most comprehensive study to date and feeds into the main transmission and distribution corridors currently under construction. The Rural and Renewable Energy Agency (RREA) of Liberia launched its rural energy strategy

¹ Source: http://siteresources.worldbank.org/EXTAFRREGTOPENERGY/Resources/717305-1266613906108/Liberia_Energy_ESW_11-4-11web.pdf

² Source: http://qsel.columbia.edu/assets/uploads/blog/2013/09/LiberiaEnergySectorReform_Phase4Report-Final_2013-08.pdf

and master plan (RESMP) in 2016 that envisions electrification rates of 10% in 2020, 20% in 2025 and 35% in 2030 for people living outside Monrovia. The master plan further targets more than 75% of all electricity coming from renewables by 2030 with 19% coming from other than large hydro resources and mainly from mini-hydro, solar and biomass. Government of Liberia vision is to reach access rate of 70% of the population in Monrovia and 35% countrywide by 2030 compared to the UN Sustainable Energy for All (SE4ALL) goal of universal access to electricity by 2030.

2.2 Current state of the Network

All grid components around and in Monrovia were installed from 2007 onwards, with a big part of the 66 kV system installed between 2010 and 2015. This should indicate that the 66 kV grid should be in a reasonably good standard, with remaining lifespan from 15 to almost 25 years, assuming the maintenance is kept at a normal level in the years to come. During recent years, LEC has attempted to replace much of the LV network which has degraded (e.g. wooden poles), but it is not known to what extent this has been completed. The operational statistics indicate that the LEC transmission system has a rather high interruption frequency, and a long average time for recovery after faults.

The losses in the LEC grid are extremely high. The biggest part is non-technical losses, which is due to non-measured consumption, non-billed consumption and especially energy theft. The technical losses are above the normal average, and the grid on the lower voltage level experiences very frequent outages. This indicates that the grid design and dimensioning of components should be reviewed and possibly improved.

2.3 Current state of the CLSG Interconnector

The CLSG Interconnector is the major ongoing investment of relevance for the power system in Liberia. This 225 kV line is planned to pass through Liberia from Côte d'Ivoire to Sierra Leone, connected to the local grid at 5 substations in Liberia. The most important connection point today is in the Monrovia area, with a substation connected to Mt Coffee HPP and the 66 kV lines to Monrovia (ref GTG 1 above). In addition, there are plans for substations in Yekepa (close to the Côte d'Ivoire border), in Buchanan (at the coast, a major load centre/ industrial centre) and in Mano (close to the Sierra Leone border). Further, a Botota substation is planned to be connected later, this will be the connection point for a future line from the upper parts of St Paul River (Via reservoir), passing through Gbarnga substation (ref GTG 2 above). The substations are planned with the following transforming capacity (from 225 to 66 kV) (i) *Mano 40 MVA*, (ii) *Monrovia (Mt Coffee) 70 MVA*, (iii) *Buchanan 40 MVA*, (iv) *Yekepa 40 MVA* and (v) *Botota N/A* (commissioning June 2020). The line is designed as a double circuit 225 kV line on steel towers, but is built for one circuit as the first step. The line between the four (4) substations in Liberia from Yekepa to Mano is planned to be commissioned in December 2019. (Transgo CLSG project, see Figure 2 below. The operation of the interconnector will be carried out by Transco CLSG. A SCADA system will be located in a Regional Control Centre (RCC) in Linsan (Guinea) and will use modern data processing systems communicating fibre cable incorporated in the earthing wire of the line. This will provide a safe, reliable and optimal operation of the CLSG transmission line.

The transmission line is relatively long and seems to connect into the synchronized system of Côte d'Ivoire. This may cause operating problems for maintaining frequency and system voltage between normal limits, or there is a back-to-back DC break in the connection making the two grids separate and operated separately from Côte d'Ivoire. If the latter case, it is likely that frequency is determined by the hydropower units in Guinea. A Power Purchase Agreement (PPA) on import to

Liberia on the coming CLSG line was signed between Liberia and Côte d'Ivoire 19.10.2016. This agreement regulates import to Liberia, but gives no obligation for Côte d'Ivoire to receive power from Liberia (buy power). The map below (Figure 2 refers) contains Priority Generation Projects and Priority Transmission Projects identified in ECOWAS Master Plan.

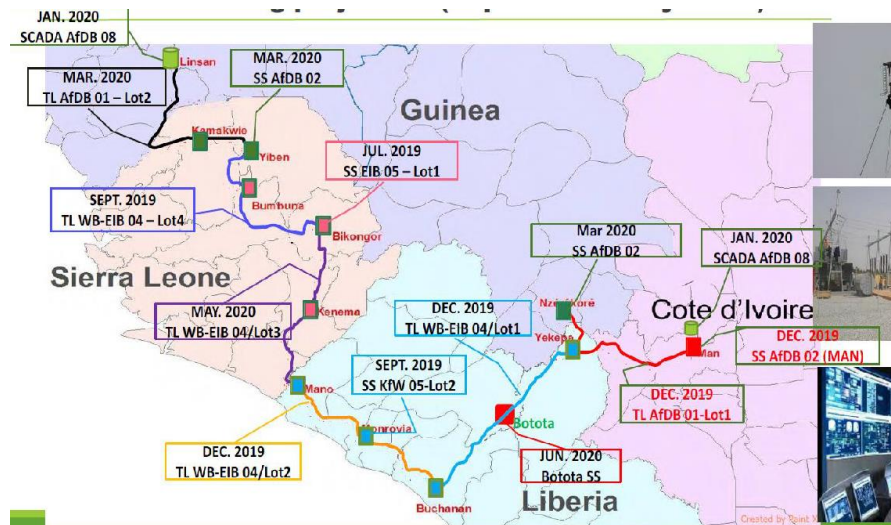


Figure 1: Overview of substations along the planned CLSG line

2.4 Development of Liberian Network, Hydropower and Solar plants

2.4.1 Development of the Liberian Network

The Rural Energy Strategy and Master Plan (Gesto, 2016) for the development of the Liberian grid is planned in three phases. Namely (i) Phase 1 up to 2020 is focusing on rural energy and implementation of ongoing/ planned projects, (ii) Phase 2 up to 2025 is focusing on acceleration of the electrification and roll-out of initiatives and (iii) Phase 3 will be a consolidation phase.

The strategy and master plan consist of five (5) main programs, where the first is most relevant for the transmission network development. The program is named Growing the National Grid, and includes the following 4 initiatives, as illustrated in the following Figure 1 below.

GTG 1: Extension of Monrovia corridor, i.e. expand grid towards West, North and East.

GTG 2: Extension of the Gbarnga corridor, i.e. expand the grid around the planned Gbarnga substation. This substation is located close to the upper parts of St. Paul River and the CLSG line.

GTG 3: Electrification along the CLSG, supplied from the substations or SWER.

GTG 4: Enable connection of renewable IPPs to the grid.

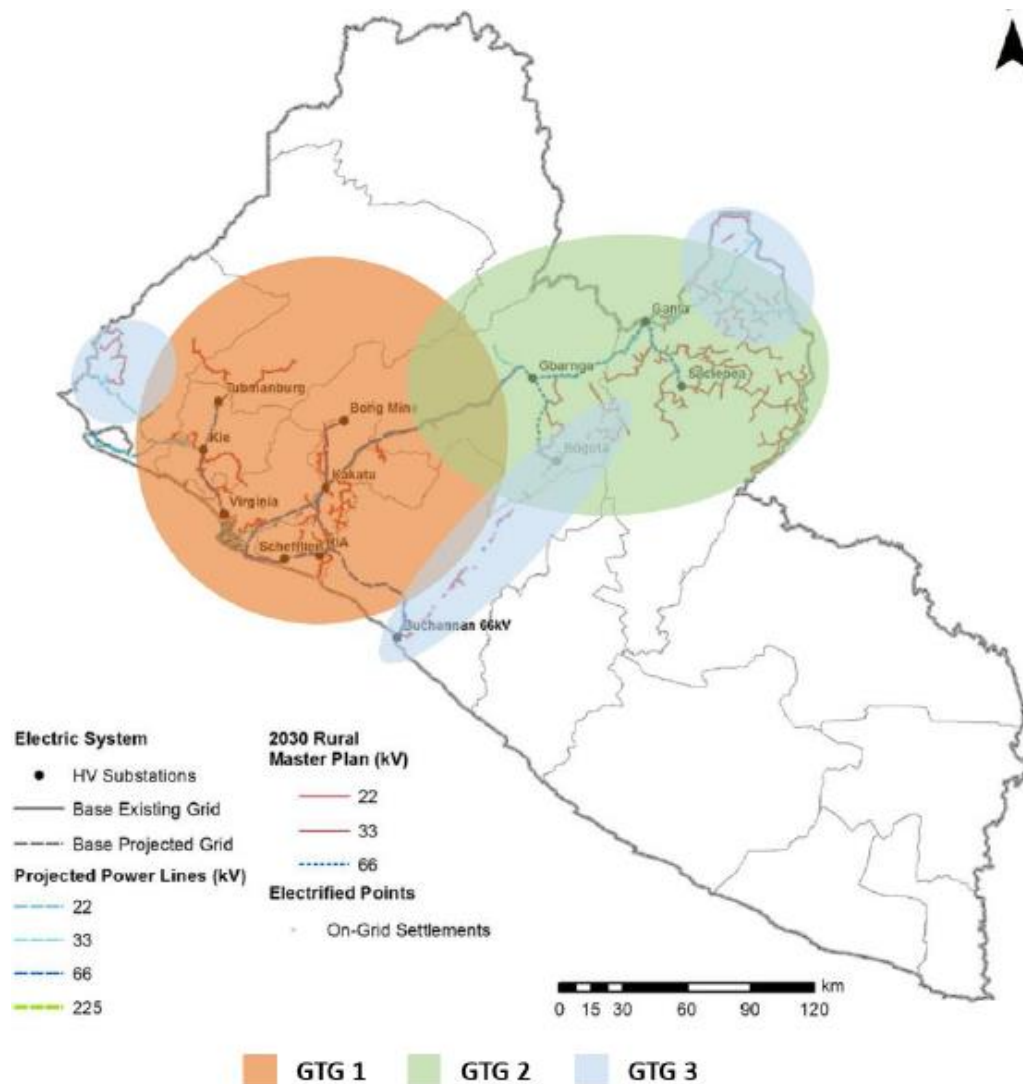


Figure 2:

Expansion the National Grid (GTG) initiatives in Liberia (Source: Rural Energy Strategy and Master Plan for Liberia until 2030 (Gesto, 2016). Prepared by Multiconsult.)

2.4.2 Development of the Liberian Hydropower

The St. Paul (SP) River has a technical hydropower potential of over 600 MW. As shown on in Figure 3 below, this potential could be exploited by means of one or two upstream regulating reservoirs (Via Reservoir and the Diversion Reservoir, also called SP4) and a downstream cascade of three to four main HPPs as follows: one plant at the foot of Via Reservoir (around 130 MW), one at SP 2 Dam (200 MW), one at SP 1B Dam (120 MW) and the existing Mount Coffee HPP.

Today only the Mount Coffee rehabilitated HPP exists, with an installed capacity of 88 MW (4 x 22 MW units). Two (2) additional units are recommended to be added to Mount Coffee HPP as two additional intake bays (from which two new penstocks could be installed downstream), were originally built into the intake structure to accommodate such an expansion.

As a run-of-river scheme, Mount Coffee HPP has, up to the end of June 2018, generated over 200 GWh since unit one came on line mid-December 2016. Previous studies have demonstrated that the scheme would benefit significantly from upstream storage development (& potentially

additional installed hydropower capacity) that would reduce its exposure to low river flows in the dry seasons and therefore increase its firm annual energy output.

Several reports have been written that have identified how the St Paul River catchment's hydropower potential could be developed in order to sustain Liberia's increasing need for additional generation to meet on-grid and off-grid demand.

These reports were first synthesized by Hydrotec Pty Ltd between December 2017 and August 2018, and further reviewed by Multiconsult in the first phase of the Optimization Study (OS), which overall objective is to identify the Priority Investment Project (PIP) including generation, storage, and transmission. This PIP is the subject of the present Terms of Reference for a Feasibility Study and associated Environmental and Social (E&S) studies.

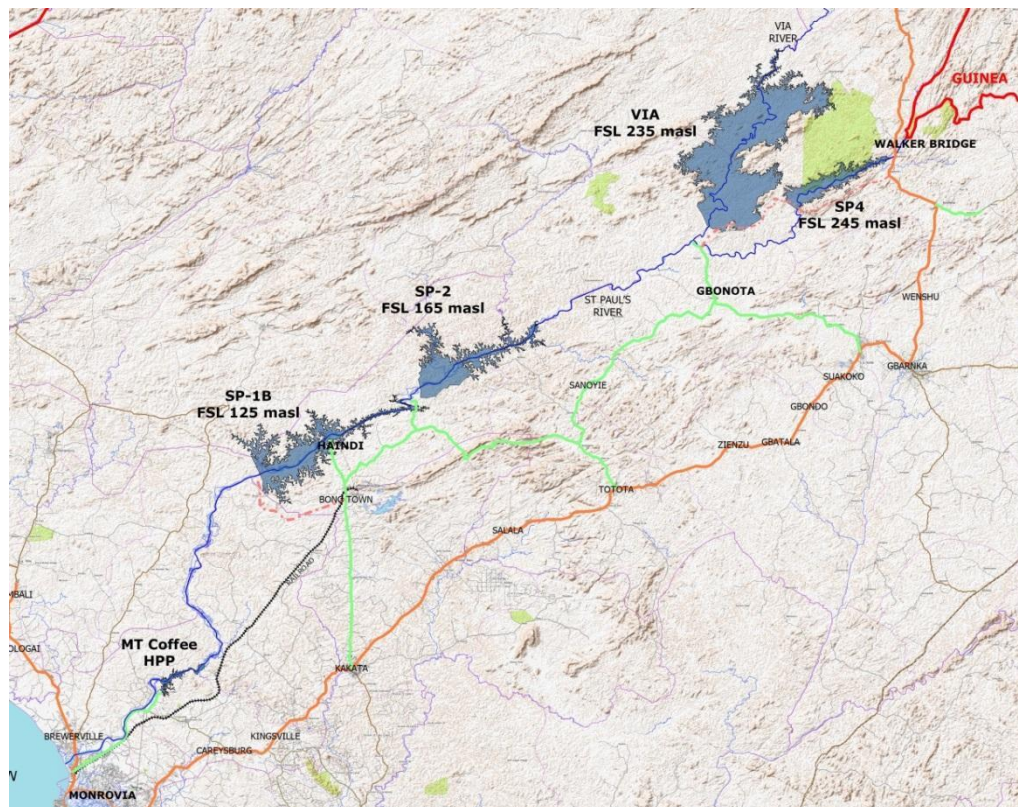


Figure 3: St. Paul River Hydropower Cascade as Studied by Chas. T. Main Int'l in 1982
(Figure updated by Hydrotec in 2018 using LiDAR)

As part of this previous work, the following key hydropower studies outcomes are of particular importance for the next phase of the studies:

- A database of background documents was compiled and added to a “cloud” based document storage and sharing platform called ShareFile. The Sharefile now has close to 200 documents stored on it for reference purposes, which are made available to all Consultants contributing to the development of the next PIP.
- LiDAR survey was carried out for the whole stretch of the St Paul River upstream of Mount Coffee, where new hydro developments are considered. This new data together with Digital Terrain Model (DTM), geo-referenced orthophotography and LiDAR information previously obtained downstream of Mount Coffee is available to all Consultants involved in the development of the next PIP.

- Preliminary results from the Optimization Study (OS) point towards the implementation of a ~150 MW hydropower plant at SP2 site with a small reservoir (upstream of Mount Coffee) as the next PIP to be developed within next 5-10 years. This SP2 project would be in the time complemented by up to 90MWp of solar PV capacity at several sites and later by the addition of two units at Mount Coffee (Mount Coffee Extension) (see in appendix draft executive summary of PIP). Package 1 will gather studies on SP2 and MC extension while package 2 will gather studies for solar development.
- Technical, economic and socio-environmental aspects of all potential schemes identified in the St Paul River catchment have been screened at a preliminary stage in previous studies.
- As presently envisaged, all future hydroelectric power plants to be developed within the Liberian national grid will also be connected to the ECOWAS regional grids via the CLSG interconnection line.

It is expected that the Consultant retained for the feasibility studies will draw on the results of the Optimization Study and other information from the Sharefile to quickly gain an in-depth understanding of key issues related to the PIP and address them further deeply in the course of the T& E and E&S Feasibility Studies.

2.4.3 The development of solar energy in Liberia

The solar resource is abundant, but the transmission and distribution infrastructure will probably limit the expansion of solar power projects. The development of solar packs will be optimized by approaching the neighboring countries for possible trade in both directions (import-export). According to the solar atlas for Liberia, the intensity of solar resources measured by global radiation (GHI) varies gradually from the coast to the interior of the country with better performance inside as shown in Figure 4 below. The fact that the price of Solar PV has been falling rapidly over the past decades made it possible for developing countries to develop solar energy. This fall in price is driven by the declining price in the vast majority of equipment required for the plant. The largest among these is the increased efficiencies in production of the modules, which are in general being produced with fewer materials and with higher efficiencies. In addition to reduction in equipment prices, the labour required to develop, design, procure, construct and commission a PV plant is also reducing across the board. All the above listed factors represent more than 70% of the investment cost. In addition to the financial aspect, the short turnaround times for the operation of solar power plants and the availability of abundant solar radiation (Figure 3 refers) have encouraged the Government of Liberia to begin the development of solar energy in the country as a quick response to the country's energy needs.

It is worthwhile to note that if local costs such as logistics and taxes barriers etc. can be overcome and reduced in Liberia, there will be significant savings to the project as can be seen in the recent announcement in Zambia where 120MW of PV has been procured with the lowest price of 3.999 USDc/kWh. No large-scale solar PV plants have been constructed yet in Liberia. Based on the cost drivers of solar PV as described above, this first round of project will successfully be managed to mitigate perceived project risks for developers to achieve prices in the range of the global average.



Figure 4: Solar irradiation map for Liberia (Source: SolarGIS7)

2.5 Context

In support to the WAPP Secretariat's program to establish an interconnected and coordinated network for fourteen countries in West Africa, the World Bank provided a grant for Phase 1 of the Cote d'Ivoire–Liberia–Sierra Leone–Guinea (CLSG) Interconnection Project in order to mobilize Technical Assistance aiming at:

- (i) enhancing WAPP integration;
- (ii) synchronizing WAPP transmission networks; and
- (iii) capacity building of the WAPP.

Component 2A of this Technical Assistance (*Supply Alternatives Studies & Project Preparation Support*) aims at ensuring that generation capacity will be developed along the CLSG line in a timely and least cost manner. Key supply alternatives identified through the masterplan adopted in 2012 by the Economic Community of West African States (ECOWAS) include the rehabilitation of the Mount Coffee Hydropower Plant (HPP) on the Saint Paul River in Liberia. As the rehabilitation of Mount Coffee HPP is now completed with all four 22MW units commissioned, the WAPP is exploring ways to further secure production of sustainable electricity generation over time while integrating variable renewable energy resources into the mix. As described in the revised ECOWAS Master Plan issued in January 2019, the optimal integration of these variable energy resources must duly take into account all economic, environmental and technical constraints.

Activities to be carried out under Subcomponent 2A.3 (*Supply Alternatives Studies & Project Preparation for Hydropower Development on St. Paul River*) of the Technical Assistance (TA) aims at addressing these issues through the assessment of the potential contribution of the St. Paul River's hydropower resources and potential storage (and generation) and the confluence of the St Paul and Via Rivers and other sources of energy (solar, thermal, imports/exports...) to electricity supply at Liberian and regional levels in the medium to long term. Planned activities under Subcomponent 2A.3 include:

- an **Optimization Study (OS)** to prepare a Long-Term Development Plan (LTDP) for new generation & storage projects in Liberia, from which a Priority Investment Project (PIP) was recommended together with transmission (cf. annex A with executive summary of OS and PIP);
- **Feasibility Studies** of the PIP selected by the Liberian authorities, including (i) **Technical & Economic Feasibility Studies (T&E FS)** and needed complementary field investigations and (ii) detailed **Environmental & Social Feasibility Studies (E&S FS)** of the PIP as per ESF requirements, including an E&S Impact Assessment (**ESIA**), an Environmental & Social Management Plan (**ESMP**), a Resettlement Plan (**RP**), an Environmental and Social Commitment Plan (**ESCP**), and a Stakeholder Engagement Plan (**SEP**). The ESIA will also include a comprehensive analysis of alternatives and a cumulative impact assessment, which will take into account the upper part of the St. Paul River Basin in Guinea;
- the support from a **Strategic Transaction Adviser (STA)** to identify adequate options for structuring and financing the PIP and to support Liberian government in updating and preparing new PPAs linked to the development of the PIP and the CLSG interconnection.

As per the OS, the two above activities are to be carried out by International Consultants who are under procurement by the WAPP.

In order to comply with the World Bank safeguards policies, the WAPP also relies on **two Panels of International Experts (PoE)** to review all aspects of dams and hydropower projects. These two Panels provide high-level technical and socio-environmental expertise and guidance throughout the pre-investment studies with a view to strengthen technical robustness and sustainability of the PIP (Subcomponent 2A.4i).

The schedule towards which the WAPP is working for the implementation of the TA program in Liberia is shown in Figure 1 below.

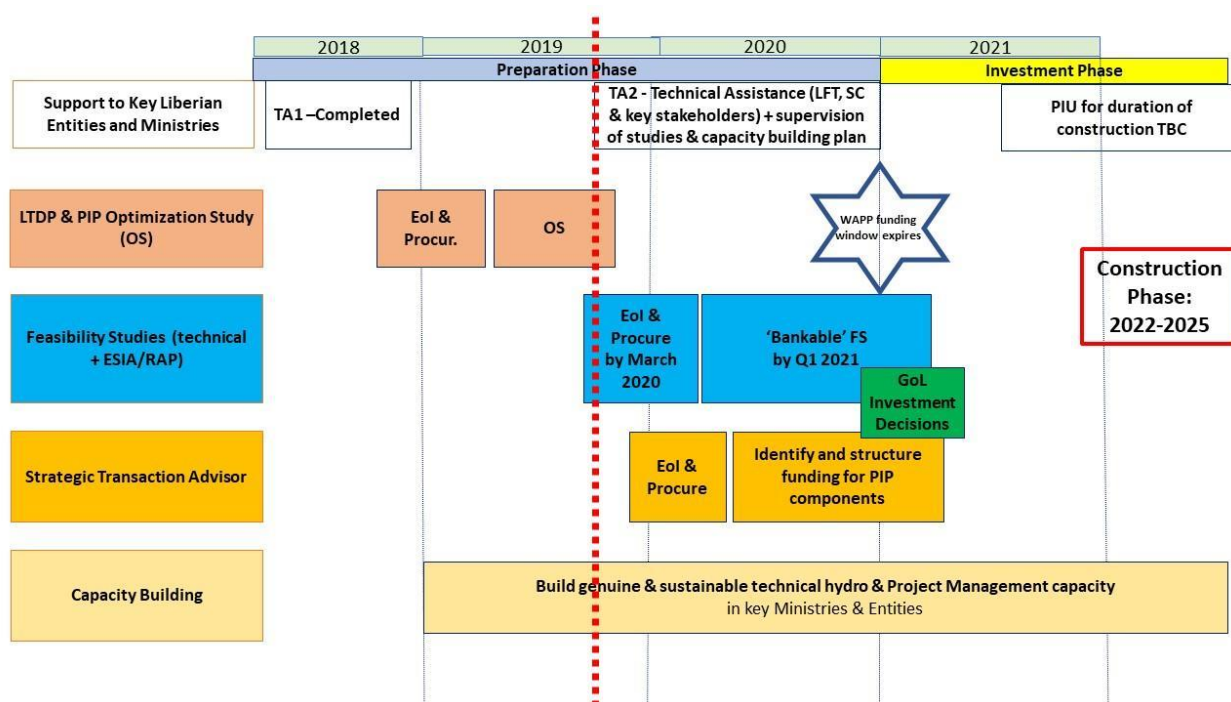


Figure 5 : Program Implementation Schedule

As of August 2019, the Optimization Study is well underway and expected to be completed by the end of September 2019. An International Consultant (the “TA2 Firm”) is also now in place to support Liberian stakeholders in every step of the preparation, procurement, and supervision of the pre-investment studies and ensure the diligent implementation of this ambitious fast track program, including the capacity building program. The PIP that was identified as a result of the OS consists of the following individual investments and accompanying policy priorities:

- A. An approximate 150MW hydropower plant on the St. Paul River (SP2) providing valuable energy, including storage by 2026 is proposed by the OS. Incorporate extra turbine bays into design thereby allowing rapid and cheap increase in generation once regional demand for export warrants the extra investment and /or the commercial model warrants development of the larger SP4 or via reservoir, (Figure 5 refers). This is the proposed primary new development on the St. Paul River for immediate prioritization.
- B. Up to 90MWp of total solar PV capacity is proposed on several sites. The capacity installation should start as soon as possible and be phased in over the period. An analysis of the capacity of the grid to absorb the intermittency of the solar PV power should also be prioritized so as to determine the maximum responsible pace for this scale-up. A pilot project of 10-20 MW should be initiated as soon as possible.
- C. A 44MW extension of Mt. Coffee (2 x extra intakes were incorporated into MCHPP construction). This is a very low cost source of power, but almost entirely for the wet season. This should thus be of high priority with a tentative in service date set at 2029.

These Terms of Reference aim at defining the role, scope of services and expected outputs of the Consultant who will carry out the Feasibility Study (Technical and Environmental Social Impact Assessment (ESIA) Studies) of the Priority Investment Project (PIP) that will be identified as a result of the Optimization Study (OS). Detailed information and findings are in the reports presented by Multiconsult that would be made available to the Consultant.

2.6 Institutional Framework

Institutional strengthening and capacity building target key stakeholders in Liberia, including staff from Liberia Electricity Corporation (LEC), the Ministry of Mines and Energy (MME), the Ministry of Finance and Development Planning (MFDP), the Environmental Protection Agency (EPA), the Forestry Development Authority (FDA), and the President Delivery Unit (PDU). To this end, a Liberian Focal Team (LFT) has been established within this project with representatives from these institutions as shown in Figure 4 below.

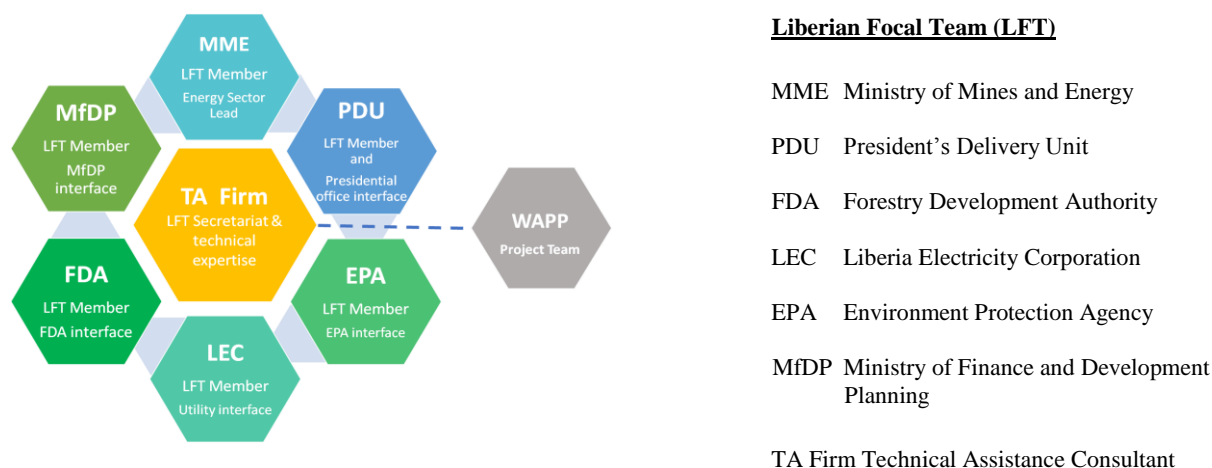


Figure 6: Liberian Focal Team (LFT)

Acting in collaboration with the WAPP, the LFT's main goal is to follow up on project preparation and to provide technical support to the Steering Committee (SC) (Figure 7 refers), with members reporting on progress and results of the on-going studies to their respective institution. The MME is the Sector Lead for this project and its Senior Representative leads the LFT and chairs the meetings.

As shown in Figure 7, the SC, it is composed of Senior Government Officials in Liberia as shown below, whose purpose is to ensure that the whole project is well aligned with Liberians interests. In specific terms, the objectives of the SC are to provide strategic direction to the studies, ensure their relevance and supervise the work of the Focal Team.

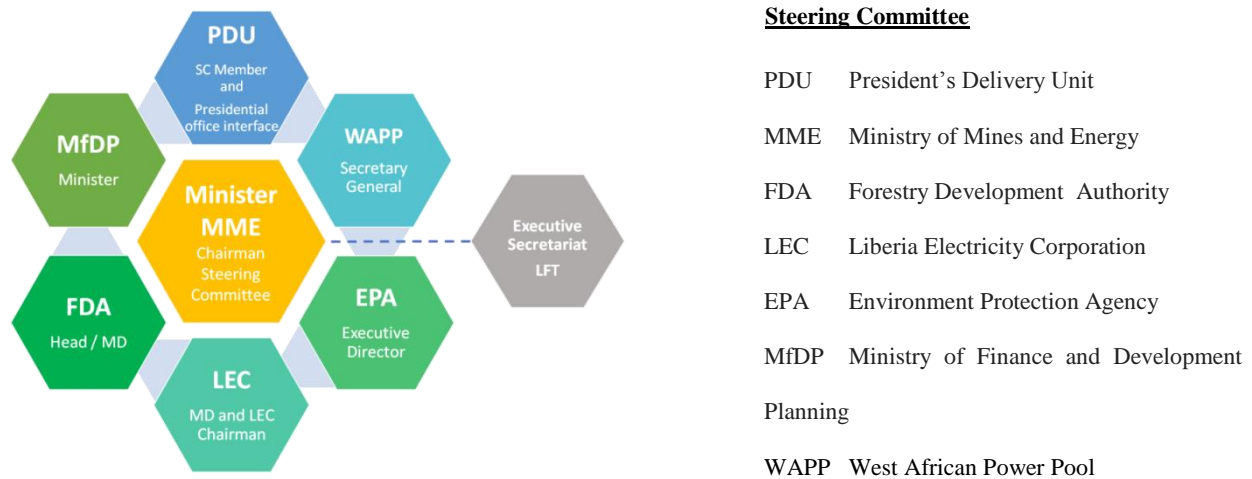


Figure 7: Steering Committee (SC)

3. OBJECTIVES OF THE STUDY

The overall objectives of these studies are:

- (i) to provide a full bankable Feasibility Study (FS) of the Priority Generation Investment Project (PIP) including hydropower & solar assets and associated transmission infrastructure;
- (ii) to carry out an Environmental and Social Impact Assessment (ESIA) to identify all eventual impacts on the biological, physical and human environments where the project is to be implemented, on the basis of which an Environmental & Social Management Plan (ESMP) and Resettlement Action Plan (RAP) will have to be developed to suggest appropriate solutions to mitigate negative impacts while enhancing positive spin off in order to offer best integration of the project into its host watershed. E&S activities will have to be compliant with the new World Bank (WB) Environmental & Social Framework (ESF) as well as the WB's Group Environmental, Health, and Safety Guidelines (EHSGs)³;and

³ EHSGs are technical reference documents with general and industry-specific statements of Good International Industry Practice. For complete reference, consult http://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/ifc+sustainability/our+approach/risk+management/ehsguidelines

- (iii) to prepare sustainable feasibility studies of the Priority Investment Project (PIP) for up to 90 MWp of total Solar PV that takes into account all technical, environmental and social, economic, and financial aspects.

The consultant will be required to prepare two (2) packages:

Package 1: Hydro-package with studies related to hydropower components of the project

Package 2: Solar-package with studies related to solar components of the project.

Only one contract will be signed for both packages. Each package should be self-standing for future development/investment, while reflecting on integrated analyses made by the Consultant on transversal matters such as: load-generation simulations, design of substations & transmission networks, stability studies, scheduling of projects & transmission lines. When deemed appropriate, the Consultant can propose such transversal deliverables (as background information &/or that could be shared by the two packages).

In the financial proposal, the Consultant will also provide the cost-estimate of each package in case only one package of the two was to be contracted. Requiring a shorter period of construction, the implementation and commissioning of a first PV solar plant could be envisaged as a first step of the PIP materialization in the near future.

While preparing such packages, the Consultant will also target:

- Establishing the project's optimal design characteristics taking into account future operation and maintenance aspects;
- Suggesting appropriate solutions to mitigate potential negative impacts while enhancing positive spin off in order to offer best integration of the project into its host watershed;
- Preparing a Resettlement Plan (RP) where needed;
- Developing cost estimates for the realization of the project;
- Preparing an Environmental & Social Monitoring Plan (ESMP);
- Developing an implementation program for the overall PIP and each package;
- Carrying out complete economic and financial analysis;
- Assessing the risks related to the project and
- Participating in discussions with Financial Partners and Donors in view of the financial closure for the project. This will be suitably done with associating the STA Consultant (Transaction Advisor). Interactions between the technical and socio-environmental teams in charges of feasibility studies shall allow the Consultant to optimize the PIP based on sustainable development principles, which calls for the design to consider simultaneously the technical, social and environmental aspects, and to address these issues from the inception of the project. In fact, this approach not only allows developers to give due considerations to identified concerns for the receiving environment without challenging the project's technical and economic viability, but also contributes to address key concerns with respect to design options and decisions.

The realization of a detailed E&S studies and subsequent steps to obtain a Certificate of Environmental Compliance (CEC) are also sine-qua-none conditions for the project to reach financial closure and authorization to proceed.

3.1 Specific objectives for Hydro-package (Package 1)

In specific terms, the Consultant shall review the available information and carry out all field surveys, site investigations and studies required in support to the preparation of the PIP including the interconnexion to the grid. This involves, without being limitative:

- Conducting field surveys as required to identify all eventual impacts on the biological, physical and human environments where the project is to be implemented;
- Developing and implementing a site investigation program to confirm the topography and geotechnical characteristics of the terrain;
- Confirming the optimal locations, scheme layouts for the projects and identifying the optimal route for the access roads and the transmission lines based on a multi-criteria approach;
- Establishing the project's optimal design characteristics taking into account future operation and maintenance aspects;
- Suggesting appropriate solutions to mitigate potential negative impacts while enhancing positive spin off in order to offer best integration of the project into its host watershed;
- Preparing a Resettlement Action Plan (RAP);
- Developing cost estimates for the realization of the project;
- Preparing an Environmental & Social Monitoring Plan (ESMP);
- Developing an implementation program for the PIP;
- Carrying out complete economic and financial analysis;
- Assessing the risks related to the project
- Participating in discussions with Financial Partners and Donors in view of the financial closure for the project.

Interactions between the technical and socio-environmental teams in charges of feasibility studies shall allow the Consultant to optimize the PIP based on sustainable development principles, which calls for the design to consider simultaneously the technical, social and environmental aspects, and to address these issues from the inception of the project. In fact, this approach not only allows developers to give due considerations to identified concerns for the receiving environment without challenging the project's technical and economic viability, but also contributes to address key concerns with respect to design options and decisions. The realization of a detailed E&S studies and subsequent steps to obtain a Certificate of Environmental Compliance (CEC) are also sine-qua-none conditions for the project to reach financial closure and authorization to proceed.

3.2 Specific objectives for Solar-package (Package 2)

The Consultant shall review the available information, studies including the findings of the OS and carry out all field surveys, site investigations and studies required in support to the preparation of the PIP including the interconnexion to the grid. This involves, without being limitative:

- (i) Produce technical and financial feasibility studies following the optimal Solar Park "Plug & Play" concept and taking into account future operation and maintenance aspects;
- (ii) Conduct site(s) surveys as required to identify all eventual impacts on the biological, physical and human environments where the project is to be implemented;
- (iii) Confirm the optimal site(s) for the projects and identify the optimal route for the access roads and the transmission lines based on a multi-criteria approach;
- (iv) Make a "land banking" exercise to secure site(s) for the development of the solar component of the PIP in Liberia

- (v) Define the optimal strategy for the phasing of the construction of this solar park with the consideration of battery storage needs based on system requirements and connection to the transmission network.
- (vi) Perform a diagnosis and an evaluation of the investments required for the creation of the pack and Dispatching Center with the view to integrate the solar electricity generation.
- (vii) Validate the site(s) from an environmental, social and geotechnical point of view by developing studies and preparing an ESIA, ESMP and a RAP after the site(s) validation, geotechnical report and assess the risks related to the project;
- (viii) Assist the Client in obtaining the Environmental Permit and Clearance;
- (ix) Participate in discussions with Financial Partners and Donors with the aim to achieve financial closure for the project.

✓ **The feasibility study must attain the following specific objectives of the study:**

i. Select the land of the Solar Park

The Consultant will identify land parcels and size of at least 135 hectares through a review of the cadastral and environmentally sensitive areas, residential areas (hamlets / villages etc.), geotechnical peculiarities of the area, access and solar irradiation and this in partnership with the Client and the local government.

Network stability study will analyze the potential constraint to connect the 90 MW solar park to the 225/30 kV substation in one or more phases, with storage. The analyses will also determine the capacity of the required battery storage.

The Consultant shall highlight the potential risks of each parcel of land and will work closely with the project's legal and environmental / social teams for all land safeguarding and verification. An environmental and social impact assessment (ESIA) following IFC's Equator Principles and World Bank Safeguard Framework shall also be developed. Based on the preliminary results of the integration study and field identification, the Consultant shall recommend the optimal site for the solar parks and the line route from the transmission line to substation.

ii. Finalize the technical aspects of the solar power station

The Consultant shall finalize the technical characteristics of the Solar Park(s) with storage to allow a shift in time of the solar production for two to three hours towards the peak of the evening as well as to control the generation during the day.

These points will have to be done in partnership with the team in charge of the network study, as well as through discussions with solar panel and battery equipment manufacturers, and the project's financial and technical teams.

Through the detailed integration study, the Consultant shall confirm and optimize the phasing for the solar park(s) construction and identify the prioritization and required investments for the Liberian network reinforcement and especially for the Transmission Lines and substation.

The Consultant will have to submit all the calculations and to draw up all the drawings relating to the preliminary technical design of the Solar Park with the connection to substation and the other potential reinforcements in the Liberian network.

iii. Diagnosis and investment evaluation for the creation of the National Dispatch Center

The Consultant shall undertake a diagnosis for the creation of Dispatching Center and rules of operation in order to establish an evaluation of required investments in capacity building (technology, training) and modernization (hardware equipment, software, smart grid technology, etc.) of the network and Dispatch Center to ensure the integration of solar generation. The Consultant has to review / establish the grid defense planning: (simulation with and without solar park).

✓ **The E&S study must attain the following specific objectives:**

In order to address the environmental and social concerns attributable to the project, the WAPP proposes carrying out an ESIA in accordance with the laws of Liberia, the international environmental conventions adopted by Liberia and the requirements of the technical and financial partners (TFPs) and the WAPP Secretariat at the sites. Recognizing the biophysical and social environmental management tools that constitutes the ESIA not only help the initiators design a project that is more environmentally friendly for the receiving environment, but also help determine the sustainability of the receiving environment and identify the key elements that will be the basis for selection decision-making without affecting its technical and economic feasibility.

The completion of the ESIA including ESMP, RAP and the geotechnical investigations, as well as the obtaining of the Environmental Permit is prerequisites for obtaining its funding and authorization. In deciding to implement this important solar project, the ESIA is an indispensable approach to identify the impacts on the biological, physical and human environments and to propose solutions to mitigate negative impacts and enhance the positive impacts to ensure the best integration of the project.

Specifically, the recommended ESIA aims to prevent and correct the nuisances/pollutions on the biophysical environment and the degradation of the framework and living conditions of the population of the project reception area, during the phases of installation of construction sites, works, operations/maintenance and dismantling. Specifically, the study should allow:

- (i) The prevention of environmental degradation, the management of the safety and hygiene of the site and the deterioration of the living environment of the populations following the completion of the project;
- (ii) Reducing and/or repairing environmental damage through the application of mitigation, compensation and correction of adverse effects resulting from the completion of the project, including compensation and relocation of affected people;
- (iii) The optimization of the balance between economic, technical, social and environmental development; And
- (iv) The participation of the populations and organizations concerned in the decision-making process on the project.

The Consultant will need to highlight the potential risks of each parcel of land and will work closely with the World Bank's legal and environmental / social teams for all land safeguarding and verification. This environmental and social impact study must follow the IFC's Equator Principles and World Bank Safeguards (" ESIA "). The Consultant shall identify the impacts of the project in generic terms, and propose mitigation measures where appropriate. The ESIA shall highlight sensitive biophysical zones in the area of the project (classified forests etc.), provide an estimation of affected properties, and identify the affected populations.

The ESIA should:

- (v) assist the Client in deciding to carry out work that is more respectful of the biophysical environment and socio-economic and cultural considerations;
- (vi) assist monitoring and works control staff in effectively monitoring the application of measures to optimize positive impacts mitigate and / or compensate for negative impacts identified;
- (vii) respect Liberia's regulatory obligations to obtain the Environmental Feasibility Permit from the mandated Ministries and Agencies;
- (viii) meet environmental, social, safety and health standards, both national and international, for the execution of the electrical construction project;
- (ix) assist in project planning and implementation of these phases to minimize environmental and socio-economic impacts;
- (x) help optimize the project's implementation by preventing, reducing or eliminating the environmental and social impacts of activities, equipment, personnel and other associated sources, as well as by funding positive impacts.

4. SCOPE OF WORK FOR PACKAGE 1 (HYDROPOWER)

The following sections present the scope of work that shall be carried out in accordance with internationally recognized practices for Consultancy Services.

In order to facilitate planning of the resources, activities to be performed by each independent team of experts have been described separately below for i) the bankable technical and economic FS, and ii) the detailed E&S FS (and accompanying RAP and ESMP).

The Consultant shall keep accurate and systematic records and accounts in respect of all Services and shall ensure the timely submission of the deliverables.

4.1 Bankable technical & economic Feasibility Studies of the PIP

The Consultant will be requested to mobilize skilled expertise and resources in order to realize all required tasks to complete the following activities:

- A) Project Definition
- B) Field Investigations
- C) Establishment of the Optimal Scheme
- D) Project Evaluation
- E) Capacity Building.

The tasks and outputs expected from these activities are detailed below. The Consultant shall thus describe in detail the approach, methodology and tools proposed to carry out each step and successfully fulfill this mandate.

4.1.1 Activity A: Project Definition & Updated concept design

The first activity to be carried out consists of reviewing all available information with the objective of defining a detailed work plan for the development of the study taking into account the work already done, and the interfaces with the E&S Team. Tasks involved include:

- A review of the adequacy and completeness of available information, and the identification of any gap or missing data; whenever required, the Consultant shall suggest a methodology and work plan to collect additional data and/or complement basic data to ensure that the quality of the database is fully aligned with the requirements of a bankable FS.
- A critical review and finalization of the conceptual studies already carried out for the PIP to confirm the following key parameters based on technical-economic and E&S considerations:
 - the general layout of the PIP, including the interconnection of generation project to the grid (transmission line);
 - the type, axis and height of the dam(s);
 - the adopted full supply level (FSL) and drawdown of the reservoir;
 - the plant installed capacity and output estimates (firm capacity and firm and average energy).
 Great attention will be given to find a balance between maximizing storage & energy capacity while minimizing E&S impacts. For maximizing storage at SP2 site, options to benefit from Wala Creek will be thoroughly explored. Any additional study and/or work required to bring the conceptual design to an optimal scheme fully supported in the bankable FS shall be described and the methodology included as part of the study work plan. Key output of this activity will be an updated conceptual design.
- Confirmation of required field investigations and the development of a detailed program for its implementation that specifies the limits and accuracy required; the field investigation program shall include land surveys (topography), bathymetry (river cross-sections etc.), discharge measurements, geological and geotechnical investigations, water sampling, and/or laboratory analysis as required to develop and design the project with sufficient accuracy to support a bankable FS.
- A review of project cost estimates (including generation, transport and E&S costs) and a comparison of unit rates with similar projects taking into account the specificities and challenges of Liberia and its power system. This review shall result in describing a way forward to deriving bankable cost estimates during the FS.
- A review of available hydrology data, and how it is intended to be used in the energy studies and for the establishment of the design flow and floods and sizing of the structures, and to derive operating conditions during construction and after the implementation of the project, with special care given to liaising with the E&S Team on all aspects related to sedimentation and environmental issues including an appraisal of potential climate change influence on the river's regime and discharge patterns.
- An appreciation of previous energy studies, basic data and simulation models shall be implemented for informing activities of this consultancy in order to check overall energy system consistency and review of the project's viability in the course of the FS.
- The description of the proposed methodology to further optimize the project's components at feasibility level. This shall include the identification of the alternatives that will be considered in the optimization of the various parameters (min. 3 alternatives), with special care given to the elaboration of scenarios most likely to be affected by E&S impacts, such as the variations in the dam height.
- The approach that will be adopted to estimate the costs and benefits of the PIP that will be used as an input to the economic and financial analysis with a view to confirm the project's viability.
- A review of the Institutional and regulatory framework

The Consultant will compile outcomes of this activity in an Inception Report which content is described in Section 5.1.1.

4.1.2 Activity B: Field Investigations

The Consultant shall review, complete where needed and validate all required information on topographical, geotechnical, geological and hydrological conditions at the project site. As such, he has the responsibility of finalizing the scope of necessary complementary investigations, implementing them or recruiting sub-contractors to carry out complementary field investigations. The Consultant shall thus provide all technical specifications and prepare subcontractor's contract as required for the diligent implementation of the site investigation program and the integration of the results into the studies as they become available.

The Consultant shall take into account all aspects related to data acquisition in his proposal on the basis of the preliminary field investigation program provided in Annex C to these Terms of Reference. All resources required for the implementation of the program shall be costed in the financial proposal including any sub-contract envisaged for the acquisition of the data required for the proper realization of the field investigations.

a) Topography, Mapping, Bathymetry and LiDAR

The Consultant shall ensure that available data are sufficiently detailed to allow for a proper comparison of the various schemes, and to identify the optimal location of all appurtenant structures.

To this effect, it should be noted that the quality of the available LiDAR data and the derived digitized terrain model are considered sufficient for hydropower schemes, so no additional topographical surveys are expected to be required at this stage to define the optimal layout and to confirm the preferred dam axis. The LiDAR data is also considered sufficiently accurate for the Consultant to identify all villages, households/buildings, trails and roads that lie within the upstream area that will be inundated. To note that the existing LiDAR does not cover the area which would be concerned/inundated if the Wala Creek becomes part of the overall foot print of the SP2 scheme. Arrangements for extending the LiDAR coverage for this area are being discussed and will be informed to candidates in due course.

However, additional surveys might be required to among others: (i) complement mapping at a 1:1000 or 1:5000 scale for specific parts of the works and/or to identify the best route for the required transmission line to connect the plant to the grid, (ii) visit sample households in order to convert buildings/households into estimate of population and (iii) develop understanding of the biodiversity and livelihood value of lands; provision shall be made for such surveys that shall be discussed, planned and shared with the E&S Team.

Similarly, the Consultant shall undertake bathymetric surveys in the project area to develop rating curves, refine the design of the intake, dam, and tailrace, and add confidence in the associated quantities and cost estimate. Cross sections in the river downstream of the dam site shall also be surveyed as required in support to the E&S studies.

All surveys shall be brought back to a common ground reference to ensure consistency between the various component of the E&S and the technical studies. This would also allow for a valid relationship to be established between the reservoir operating levels (and dam height) and the inundated area and resulting volume. This relationship shall be used to both the simulation of reservoir operation, and the assessment of the E&S impact of the project in the upstream reach. Costs associated with all these surveys shall be included in the Consultant's financial proposal.

b) Geology, Geophysical, and Geotechnical Investigations

For all major works including the dam site, reservoir, borrowing areas, and access roads, the Consultant shall make site visits and undertake detailed field investigations with the objective of adequately defining the physical, mechanical, seismic and hydrogeological characteristics of the overburden and the underlying rock. This shall allow to identify the types, locations, and volumes of material available upstream and downstream the projected reservoir.

Field investigations shall include, without being limited to, photogeology, geological mapping, geophysical surveys, test pits, drilling and/or boreholes, in-situ and laboratory testing, seismic analysis, etc. These investigations shall be in sufficient number and of adequate quality to fully characterize site conditions and allow for the comparison of the various options and the viability of the project to be established at feasibility level.

The investigations shall also cover the definition of the permeability of the rock below the foundation elevations to define potential grouting requirements.

It shall lead to identifying suitable location for construction materials, including potential quarries for sand, soils, rock and concrete aggregates and borrow areas. Maps shall be produced to show areas for material extraction and deposit.

For the purpose of this proposal and until such time as the extent of the field investigations has been fully confirmed at the Inception Phase, the Consultant shall base his financial proposal on the field investigation program described in Annex C. In case some adjustments will be needed to this program, unit prices of the bid will be used for updating associated financial costs.

Raw data and findings shall lead to a risk analysis and the preparation of a Geotechnical Data Report (GDR), which content is described in Section 5.2.2. Geological Baseline Report (GBR) will be later prepared as part of the preparation of the tender documents.

c) Hydrology and Sediment Sampling

The Consultant shall develop and implement a field program to collect additional hydrology data required to support a bankable FS. Such field program shall be coordinated with the E&S Team and may include:

- Discharge measurements to establish rating curve(s) at key location(s);
- Installing a hydrometric station relevant to the project;
- Carrying out sediment sampling to assess the volume and characteristics of solid material transported in the reservoir including particle size distribution and petrographic (hardness) analysis;
- Water quality analysis to determine the nature of the material entering the power waterways and their corrosive effectiveness.

Following the implementation of the field investigation program, the Consultant shall compile all data and results of the analysis performed in a Field Investigation Report, which content is described in Section 5.2.

4.1.3 Activity C: Establishment of the Optimal Scheme & Feasibility study

At this stage, the PIP retained at the end of the Optimization Study shall be brought up to a bankable feasibility level using the newly acquired detailed terrain information. This step should allow to better assess the scope of work for the implementation of the PIP including the transmission line, and to refine the related costs for its implementation.

The Consultant shall establish the final layout of the project and optimal scheme for the main components as described below, being understood that these proposed steps shall in no way be considered exhaustive nor limit the Consultant's responsibility to carry out the study with highest state-of-the-art standards.

a) Hydrology and Energy Studies

In the field of the hydrology and energy studies, main tasks to be performed are related to i) determination of the hydraulic characteristics of the layout (including backwater levels); ii) defining and optimizing the project's operational characteristics; iii) confirming the design flood for the spillway and the diversion during construction; iv) reservoir filling given the proposed implementation scheme; v) the operating rules of the reservoir and its impact on existing Mount Coffee plant and planned extension as well as other downstream developments; vi) estimating the PIP yearly output (firm and average), installed capacity, and contribution to peaking for the preferred alternative (established on the basis of a multi-criteria optimization including related sensitivity studies leading to the selection of scheme characteristics).

As a general rule, the Consultant shall complete at this stage all activities required to have ensure that the feasibility studies can count on adequate hydrology data that contribute to make the project bankable and comfortable with hydrological risks. This includes, consolidation by the Consultant of:

- Complete series of inflows
- Evaporation and infiltration rates
- Estimation of sedimentation and silting of the reservoir
- Other representative climatological data that might be required (temperature, rainfall, humidity, solar radiation, wind, potential evaporation, etc.), in particular to assess the impact of climate change.

Based on this data, the Consultant shall estimate the project flood that will be used for the design of the spillway taking into account other existing and planned developments in the cascade, and flood routing expected to occur through the reservoir during operation. This shall be complemented with modelling of any additional flood (return period of 2, 5, 10, 100, 1000, 10,000... years) as required for the E&S studies to assess impacts on upstream & downstream reaches. The Consultant shall also estimate the requirements for river diversion during construction and plan the sequence of realization of the works accordingly.

The Consultant shall examine available scientific information and World Bank works in the region to prepare a forecast of potential changes in water flows as a result of climate change and global warming. The result of the review shall be taken into account in evaluating the design flows and possible operating regime of the reservoir. The consultant may also consider available global and regional climate models and studies carried out with relevance for West Africa and the potential variation of the St-Paul River flow regime.

For the upstream reservoir and the downstream reach, the Consultant shall support the E&S studies in all steps leading to identifying and analyzing problems and possible mitigation measures related with water quality, bank erosion, and/or suspended particles through the identification of areas and periods where degradation of water quality is most likely to occur. Finally, the Consultant shall proceed with a simulation of the PIP (hydropower and solar development) within the planned long-term development of the generation system and optimize the energy output taking into account average and lower flow sequences as well as the proposed operating rules for the reservoir and resulting evaporation and infiltration.

All these analyses will be carried out using appropriate state-of-the-art software which shall be included in the proposal.

b) Technical Design/ FS of the PIP Components

The design services to be provided by the Consultant cover all technical activities required to identify the preferred scheme and to establish the technical characteristics of the project including the access roads and the interconnection required.

The design criteria proposed by the Consultant and the range of alternatives to be considered for the optimization of the technical parameters shall be described in the Inception Report to be submitted at the beginning of the study.

The basic layout established in the OS shall be further refined based on the latest information available from the field investigations, including the socio-environmental impacts identified by the E&S Team. Basic design studies shall confirm:

- the conceptual scheme (project head and design flow) and the preferred routes for the access roads and the transmission lines, in collaboration with the E&S Consultant;
- the type, axis and design of the main dam and appertaining dykes, taking into account the availability of construction materials and characteristics of the site;
- the arrangement and sizing of the spillway based on the project design flood including all related outlets and closure mechanisms (gates, bottom outlets, overflow weir, fuse plug, etc.);
- the temporary diversion of the river and the required diversion stages, including the design of the upstream and downstream cofferdams required to protect the working area at dam site and to divert the river flow;
- the intake and all water conveyance conduits and related mechanical systems (trashracks, head gates, stoplogs, valves, etc.) identified as part of the PIP;
- the required fish passages and facilities to accommodate the ecological flows and/or other ecological requirements;
- the main electro-mechanical equipment including the type of units (turbine/generator), their rating, operating characteristics, and sizing;
- sizing and floor elevations of the powerhouse housing these units (as well as offices, maintenance, storage & administrative facilities);
- the design for required mechanical equipment including, but not be limited to, inlet valve(s), governor, draft tube gates, etc., and auxiliary systems for cooling, lubricating, drainage, pressured oil, compressed air, sanitary and water supply, fire protection, ventilation, etc. as well as the relevant control systems;
- the arrangement of all lifting equipment for the proper operation of the HPP including, as required, the powerhouse main crane, lifting facilities and transport for stoplogs, lifting equipment for the maintenance of the gates, etc.;
- the design of required electrical equipment, including but not be limited to the excitation system, switchgears, transformers, switchyard, control, relay, & protection systems;
- the telecommunication/SCADA, instrumentation & monitoring systems;
- the layout and design of the infrastructures for the (permanent) construction camp and the buildings required for operation of the plant including all facilities.

The optimal scheme/design to be recommended for implementation shall be that which provides highest marginal benefits for the incremental cost, taking into account operation & maintenance costs as well as E&S aspects.

c) Integration of the PIP into the Grid

At this stage, the Consultant shall confirm transmission line requirements and optimize their characteristics for best integration of the PIP into the national and regional grids taking into account the current implementation of the CLSG line. This involves:

- Preparing and/or updating a single line electrical diagram of the interconnected grid;

- Analyzing the various options considered to evacuate the PIP's generation output towards load centres and estimating the transmission losses;
- Conforming energy generation forecasts after phased commissioning of PIP and analysis of supply/demand balance over different time horizons (short, medium and long terms), taking into account opportunities for imports & exports from neighboring countries.
- Identifying, in collaboration with the E&S Team, the preferred route for the connection of the PIP to the grid;
- Carrying out all required stability studies and transient analysis on the interconnected grid to confirm transfer capability/limitations and ensure proper integration of the PIP in the grid over a 20-year horizon;
- Performing short-circuit calculations and assess compensation & voltage regulation requirements;
- Designing the required transmission lines, substations to connect the PIP to the grid and establishing the technical characteristics of all related equipment (voltage, conductors, condensers, towers, etc.);
- Establishing required characteristics of the communication/SCADA interface & infrastructure for its compatibility with existing and planned coordination/dispatch centres including Control center at Mount Coffee, WAPP Information and Coordination Center (ICC), the CLSG Coordination Center, and the Operator of the Control area, as defined in WAPP Operation Manual for the Interconnected System. Need for development of a National Dispatch Center and associated SCADA infrastructure & systems will be analyzed by the Consultant.

If required, the Consultant shall suggest state-of-the-art generic information selected based on engineering judgment to replace any missing data, and provide justification for such assumption in the Basic Data & Design Criteria Report.

d) Construction Planning and Implementation Program

For the retained preferred design scheme, construction schedules and cashflows shall also be provided to feed the economic analysis. The consultant shall also analyze the impact of the month when construction starts on the duration of schedule.

As part of this activity, the Consultant shall assess available transportation facilities and plan all accesses to the project site, including port, heliport, and/or railroad facilities, main and local transport road(s) and bridge(s), that may be required for the implementation of the project. Location of construction camps shall be identified and layouts defined, including lodging and transportation for temporary workers, mixing and crushing plants, workshops, fuel depots, and permanent camps for operators' village as well as required offices. Power supply and telecommunication facilities shall also be considered and defined. The Consultant shall prepare a Project Implementation Schedule and present it in a bar chart showing all the major construction activities and the interfaces between all main activities. Critical path and significant milestones shall also be indicated in the bar chart.

e) Cost estimates

The Consultant shall also prepare detailed cost estimates for the PIP and all related works including those for environmental and social mitigation measures. The level of detail of these estimates shall be sufficiently accurate to allow for a comparison of the various options and the identification of the optimal scheme.

The Consultant shall display his best initial estimate of unit rates and quantities to obtain preliminary cost estimates in support to the comparison of the various design options.

Final cost estimates shall be presented for each major structure broken down into its key components in accordance with construction activities and/or specific items and based on consolidated unit prices.

Cost estimates for the civil works shall be based on quantities derived from design drawings and unit rates developed from prevailing labour rate, construction equipment rate and materials taking into account local conditions. The estimate shall be of EPC contractor's type and shall, therefore, also include all other indirect costs such as office overhead, contractor's financing cost, insurance, bonds, profit and risk margin. Evaluation of provisions for risks should be based on the risk assessment mentioned hereunder in next chapter.

Construction materials shall distinguish between those locally available and those to be imported (overseas). Unit rates shall adequately reflect the source of supply and expected mode of transportation of the materials, and their corresponding costs adjusted accordingly.

Cost estimates for the electromechanical equipment shall be based on current international prices and include all transport and shipment costs.

The Consultant will also provide a preliminary cost estimate of the distribution infrastructure to be developed in order to distribute energy produced by PIP to population and beneficiaries.

The Consultant shall also establish a cashflow for the project on the basis of the implementation schedule developed.

4.1.4 Activity D: Project Evaluation

Based on all above results, a full economical and financial evaluation of the project shall be performed to confirm (i) the economic performance of the proposed project and (ii) the viability of the PIP at bankable feasibility level. While performing these evaluations, the Consultant shall look into the interconnected grid to which the PIP will be integrated with the objective of identifying any required infrastructure(s) that would further promote energy exchanges between countries from the CLSG sub-region.

a) Economic Analysis

The objective of this part of the study is to confirm the cost-effectiveness of the project and to provide relevant economic justifications for the project to proceed to the next stage.

At the beginning of the studies, the Consultant shall identify all critical aspects that needs to be given due consideration to ensure that the project is economically viable, i.e. it must be cost effective over its life cycle while respecting all relevant international, regional and local standards. These issues and the proposed criteria for their due consideration in the optimization process and the evaluation of the preferred overall concept shall be presented in the Basic Data and Design Criteria Report.

The Consultant shall then evaluate and compare the benefits and the costs of the PIP under the adopted key assumptions and derive the Net Present Value (NPV), the benefit-cost (B/C) ratio, and the Economic Rate of Return (EIRR) of the PIP based on long-term benefits and implementation costs, including O&M and replacement cost. In doing so, the Consultant must look into the load-supply balance of the generation system over the 20-year horizon and make recommendations as to the best mode of operation and/or usage of the PIP for Liberia and the sub-region as a whole (local supply, exports, peaking, etc.).

The economic benefits of the project shall be valued on the basis of the avoided cost of displaced alternative energy sources, taking into account the project's dispatchable capability (capacity and energy) and the distinction between firm and secondary energy. Auxiliary services that the PIP can bring to the system such as frequency regulation, spinning reserve, black start, etc. shall also be defined and valued. Complementarity at different time steps between solar and hydropower should also be analyzed thoroughly (for ancillary services but also for hourly, daily and monthly energy mix planning).

In addition to comparing various modes of operation and design characteristics for the PIP, the following sensitivity analysis shall be performed as part of the economic evaluation:

- Discount rate of 6% (base case), 4%, 8% and 10% (sensitivity)
- Capital cost increased by 20%
- Lower fuel cost (or lower cost of alternative generation)
- All load forecast scenarios developed in the OS
- A delay in the in-service date of the project.

b) Financial Evaluation

The financial evaluation of the project aims at establishing the financial internal rate of return (FIRR) of the PIP. The FIRR shall be based on financing conditions of the project and include duties, taxes, price escalation and interests on the implementation costs. The benefits will comprise the revenue generation from the sales of energy.

Following discussion with local stakeholders and the International Donors, the Consultant who acts as Strategic Transaction Advisor (STA) shall present a proposal for the structuring of the project (Public, Private, PPP, etc.), together with the suggested procurement strategies and associated financing conditions. The Consultant shall use this information to derive a tariff structure that will provide an acceptable FIRR and make the realization of the PIP financially viable. The financial forecast shall result in pro-format financial statements over the 20-year horizon showing the financial cash flow, including revenues, operating expenses, debt service (loan repayment), and royalty and tax payments.

This financial evaluation shall be repeated and compared for various scenarios to be defined in collaboration with the STA, including:

- Different structuring for the project
- A range of financing conditions for the International Donors
- Varying interest rates for commercial loans
- Additional financing through carbon credits etc.

At this stage, the Consultant is expected to take an active part in the establishment of the preferred structure for the project and shall support the financing of the project through preparation of relevant documentation on the PIP and participation in Donors Meetings (5 meetings proposed at this stage for facilitating costing in the financial proposal).

c) Risk analysis

The evaluation of the PIP shall be completed with an assessment of the optimum conditions for the integration of the project into the interconnected grid, and a detailed analysis of the risks that can jeopardize the project's bankability.

In order to do so, the Consultant shall identify and assess threats (other than E&S aspects) that may affect negatively the project's outcome during the implementation and/or the operation phases. Where appropriate, the Consultant shall recommend mitigation measures to prevent possible degradation with respect to delays, costs and technical specifications which are considered of critical importance for the justification of the project.

In specific terms, the analysis shall comprise the following tasks:

- Identification and classification of possible risks with respect to:
 - their relationship with the project: internal or external
 - their nature: political, economical, institutional, legal, technical, organizational, financial, etc.
 - their source: sub-contractor, public authorities, technical partners, financial supporters, customers, etc.
 - their impacts: cost overrun, delays, non-respect of the technical specifications, bad operational and/or financial performances, etc.
- Quantification of the risks identified in terms of their probability, severity, and criticality, and evaluation of the resulting potential direct and indirect impacts on the objectives of the PIP and their probability of occurrence; this analysis may be complemented as needed with a qualitative assessment of non-quantifiable risks;
- Proposing measures to prevent these risks and/or to reduce their impacts, including emergency action plans and allocating the duties and responsibilities of each risk to intervening parties.

The Consultant shall integrate the above in a strategy for the implementation of the PIP which minimizes the risks and offers a backup plan to ensure proper completion of the project. He shall also, in collaboration with the STA, suggest an institutional and organizational framework for the realization of the PIP that will limit risks while allowing for the project to remain within target costs and schedule. This shall be completed with a proposal for an optimal and realistic management structure for the operation phase.

Finally, the Consultant shall assist WAPP's Secretariat General, the STA and the Liberian Authorities in obtaining funding for the implementation of the project.

In specific terms, this will require participation of the Consultant to the following workshops at this phase:

- (i) Presentation of the FS to the (Liberian) Steering Committee, the WAPP and WB, and;
- (ii) Round-tables of Financial Partners (donors and investors) to present final results of the FS and start discussions on project funding. This would be carried out with, and supported by, the STA.
- (iii) The Consultant shall also evaluate the 44MW extension of Mt. Coffee (2 x extra intakes were incorporated into MCHPP construction). This is a very low-cost source of power, but almost entirely for the wet season. In order to achieve this assignment, the Consultant shall:
 - (i) establish the current status of power plant and evacuation substation;
 - (ii) inspect the intake conditions and gates;
 - (iii) inspect the conditions of the penstock and power house
 - (iv) layout plan and arrangement of the additional equipment
 - (v) describe and specify works to be undertaken at a later stage by the contractor
 - (vi) estimate the total of the project cost.

4.1.5 Activity E: Capacity Building

It is expected that the Consultant will contribute to building capacity as per recommendations of the Consultant in charge of the TA2. At this point, and until the Capacity Building Plan from the TA2 Consultant is approved, the Consultant shall base its estimate of the requirements (in time and money) on the following activities (in English):

a) On-the-job training:

While in Liberia, during field work and workshops, the Consultant shall integrate six (6) designated Liberian counterparts (from the LFT/ or the LFT entities) in its team and work in close collaboration with them. Contact will be maintained at other times through follow-up phone/Skype calls and emails as required.

b) Formal training:

A two-week formal training course for eight (8) designated members of the LFT (and/or key Liberian Government staff, and/or WAPP) shall be organized in the Consultant's head offices following the issue of the Basic Data and Design Criteria Report. The purpose of this training is to bring stakeholders involved in the FS to a higher technical level so they can provide valuable technical inputs and comments to the FS. All costs (travel, visa, insurance, subsistence etc.) of this training will be met by the Consultant and should be costed as such.

The Consultant's proposal shall detail the proposed content for the training programme, which should focus on the collection and analysis of basic field data (hydrology, geology and topography/bathymetry), the selection of design criteria for the PIP components (in particular for the dam/reservoir/spillway and the powerhouse operation), construction scheduling and cost estimating, the requirement for an understanding of the PPA and TSA process and the models and tools utilized for the economic and financial analysis of the PIP. The proposal shall also describe the approach and methodology to actually achieve significant transfer of knowledge to the LFT Counterparts throughout the FS.

Following the 2-week formal training, the Consultant shall submit a Training Report summarizing the activities that took place, together with the evaluation forms and/or other requirements requested by the TA2 Consultant. All background information and class/workshop material provided in the course of this training shall also be provided in electronic format to the WAPP (1 copy), TA2 Consultant (1 copy) and Liberia stakeholders (1 copy), including formal presentations, worksheets and/or other modelling tools or software (such as those used for the economic and/or financial analysis).

4.2 Environmental and Social Feasibility studies (E&S FS)

These studies aim at assessing the risks and impacts of the project design, construction and operation including its physical sub components such as the dam, reservoir, power house, switch yard, transmission line(s), intake, penstocks, discharge spillway, turbines and PV solar panels and associated infrastructure components on the environment and socio-economic conditions of people indigenous and Sub Saharan African historically underserved traditional local communities and non-indigenous and their physical and non-physical assets, livelihood systems, working conditions, cultural heritage, archeological, religious or traditional beliefs systems within the defined area(s) of investigation including but not limited to the watershed, airshed and social, economic, cultural areas that may be impacted by the proposed project. The environment risks and impacts assessment may comprise natural resources stocks, land, biodiversity both aquatic and terrestrial, natural resources stocks, water quality for existing beneficial uses, soil degradation, physical, biological and human aspects.

The studies shall facilitate the understanding and determination of the likely implications of the proposed project and the relevant considerations, planning and mitigation options that shall ensure that the project is designed and constructed and operated in an environmentally and socially sound and sustainable manner as per the World Bank's Environmental & Social Framework (ESF) requirements. The studies shall also form the basis for consideration for Safeguards approval by

the World Bank and other international funding agencies as the case may be and the issuing of permits from the Environmental Protection Agencies of Liberia for the implementation.

E&S FS shall cover all aspects of the development of the proposed PIP including the planned infrastructures (solar plants, dam, powerhouse, transmission lines, substations, access roads, etc.), the extent of population resettlement required and associated losses for the affected populations, the proposed new settlements, compensation for economic and land use losses, a Local Development Plan that ensures local benefits and economic growth, the worker's camp site and construction site, together with a plan for their effective management taking into account the influx of workers looking for work, etc.

The E&S consultant shall abide by EPA EIA process and assist the client with the work necessary to submit an Environmental Assessment Application, the Publication of a notice of Intent and the submission of Project Brief as part of the EPA Preliminary Environmental Review. The consultant shall ensure it obtains accreditation from EPA and ensure also that it associates with an accredited local firm for the duration of the EIA process.

This study shall be done in three (3) main phases as follows:

(a) Phase A: Baseline and Scoping Study, Stakeholder Engagement Plan

- A description of approach, methodology and work plan will be produced to explain how the consultant will undertake the studies, the resources and timing, broad logistics for site access.
- Confirmation of the project's areas to be studied under E&S FS. The areas to be considered as part of this phase includes the areas/watersheds upstream and around the infrastructure and reservoirs expected to be created and those downstream of the dam down to the river mouth, which may be affected by the new project during operation. Project construction areas likely to be impacted by quarries, spoil dumps, workers camps, access roads, transmission lines, and resettlements should also be considered.
- Thorough understanding of the environmental and social context and dynamics of the project's areas as they stand without the project (baseline conditions) including socio economic surveys providing thorough understanding of the livelihood, resilience, health and education and incomes and expenditure conditions of the people living in the project areas;
- Establishment of the environmentally and socially optimal route/alignment in terms of least impact for linear structures including access roads and the interconnection of the PIP (transmission line which voltage, length and corridor width will need to be defined jointly with the Technical Team responsible for the FS), and location of related switchyard and/or substation as they may apply.
- Update of the Terms of Reference for the detailed ESIA following the review of the documents provided and the analysis of the information previously collected and/or obtained from WAPP and Liberian Authorities and technical services and obtain final approval from WAPP of the updated TORs;
- The current operation of the existing Mount Coffee HPP on the St Paul River shall be included in the baseline studies and the environmental and social impacts of the design and operation of the proposed PIP shall be assessed to account for any cumulative impacts the cascade of projects may have on aquatic and terrestrial environment as listed above.

A review of the requirements of the regulatory environment including Liberia's EPA and all international agreements signed by Liberia that will be applicable to the development of the

PIP. The WB's Environmental and Social Framework shall be reviewed and both national and international sets of requirements will feature as frameworks for the ESIA.

The Scoping Report shall comprise, in separate distinct documents, all reports and annexes required to fully document the studies realized as part of this initial phase, including socio economic baselines, maps, drawings, and longitudinal profiles etc.

At the end of this phase, the Consultant will also provide a Stakeholder Engagement and Disclosure Plan (SEDP), including detailed work plans for phase B and guidelines for phase C.

(b) Phase B: Preliminary Environmental and Social Impact Assessment (ESIA)

In the preliminary ESIA, the Consultant shall identify the impacts of the project in generic terms, and propose avoidance, restoration and where these are not possible, mitigation measures and offsetting measures as appropriate. The ESIA shall highlight sensitive biophysical zones in the area of the project (RAMSAR areas, classified forests, endangered and critically endangered species etc.), provide an estimation of affected properties and economic assets for livelihood, and identify the affected populations.

The Consultant shall also present a detailed analysis of the proposed options for the development of the PIP including possible modifications to engineering design of the hydropower and solar components in the project area resulting from possible different reservoir sizes and operating scenarios. As part of this task, the Consultant shall analyze the E&S impacts of the different proposed locations for the implementation of the project including the dam, powerhouse, borrowing areas, worker's camp site, etc. Of particular relevance, this phase shall allow for the determination of the optimal design of the dam that minimizes resettlement in terms of numbers of people displaced and environmental impacts, including an analysis of the cumulative impacts for each option.

The Consultant shall also finalize the study of the proposed transmission line and substation to connect the project, which shall allow for the optimal route to be identified for the transmission line (as adopted in a validation meeting). Once completed, the Consultant shall then proceed with the delineation of the project boundaries including the transmission line route.

At this stage, a preliminary report on the Environmental and Social Impact Study (ESIA) shall be completed and submitted for integration into the optimization component to be included in the Feasibility Study. The analysis and recommendations on the optimal transmission line layout and boundary delineation for the project shall also be submitted as part of this phase.

At the end of this phase, the Consultant will update the Stakeholder Engagement Plan (SEP) with detailed action plan for Phase C.

(c) Phase C: Final ESIA, RP, ESMP & ESCP.

At this phase, all relevant activities shall be completed, and the following documents shall be produced:

- Final Environmental and Social Impact Assessment (ESIA);
- Resettlement Plans (RP);
- Environmental Management Plan (EMP);
- Social Development Plan (SDP)
- Environmental and Social Commitment Plan (ESCP)
- Final delineation of the project.

It should be noted that Phase C of the study will be treated as an Option which implementation will depend on the conclusions of the first two phases (A and B) as well as presentation of

satisfactory updated concept design for SP2 (cf. T&F FS); it shall only be considered if the performance of the Consultant in these previous phases is satisfactory.

If deemed appropriate by WAPP, the WB and GoL and recommended by the consultant a Liberian 'sensitization and communication' consultant (part time) of suitable standing and reputation will need to be recruited by the Consultant, for early engagement on sensitization and management of expectations. If deemed appropriate, a public campaign may be launched following completion of the studies to provide information and raise awareness on the project.

Capacity building and institutional strengthening are also expected to be included as part of this study.

The required tasks to complete the activities for each phase of the project are described below.

4.2.1 Phase A: Project Brief and Submission of information for Preliminary Environmental Review

The consultant shall assist the client to develop and submit an Environmental Assessment Application and the Notice of Intent to the EPA. Following this, the consultant shall develop and submit as part of the Environmental Review, the Project Brief in line with EPA requirements. A preliminary environmental assessment based on the submitted material will be undertaken by the EPA with input from concerned Ministries as directed by the Government of Liberia. Following this evaluation, the EPA will direct the client and the consultant to initiate the scoping study as part of the Environment Impact Assessment.

4.2.2 Phase B: Baseline and Scoping Study

The Consultant shall undertake a scoping study and carry out preliminary field investigations to generate a Scoping Report that will include, amongst others:

- A complete description of the PIP and the host watershed, including land occupation, economic activities;
- The planning of activities to be realized as part of the detailed ESIA as defined in the specific Terms of Reference to be prepared and approved in accordance with the requirements of the Environment Protection Agency (EPA) - the Liberian Authority responsible for the Environmental Evaluation (EE) procedures - and in compliance with applicable regulations and laws. To this effect, the consultant will undertake a full review of all Liberian laws and regulations applicable for the PIP as well as those of the WB under its E&S Framework, 2017. A gap analysis shall be performed to align these requirements and where discrepancies occur, explanation of how the gap in requirement is to be bridged by the project proponent. The proposed approach to align WB and National requirements will be discussed in detail and agreed with the client prior to submission to authorities.

In order to establish the scope of the ESIA, the Consultant shall review all previous studies available on the PIP and the St. Paul River, summarize pertinent sections and include these in an appendix in the Scoping Report as well as take into account the findings from these previous studies into the work plan for the full ESIA and associated documents.

The Consultant shall also make contact with agencies and services responsible for the management of the water resources in the basin as well as other services and communities involved in environmental decisions regarding the watershed management and incorporate their regulatory requirements into the Scoping Report and workplan. A list of all organizations / people met as part of this activity shall be appended to the Scoping Report.

The Consultant shall also examine the proposed options for the design of the PIP and make recommendations as appropriate to minimize project's footprint in terms of all social and environmental impacts as initially assessed at this phase of the ESIA process. For example, this may involve looking into various dam heights and axis, and/or different water reservoir operation rules (base or peaking operation, creating artificial floods, etc.) and assessing the impacts on flow regime, populations relocation and availability of adequate lands for resettlement etc. The Consultant shall report on all E&S sensitive areas including protected forests, cultural and patrimonial sites, RAMSAR sites and existing and planned mining zones and/or concessions.

When comparing and selecting the location of the project components (dam, HPP & switchyard), the Consultant shall ensure that, amongst others:

- Plans for future land use are obtained from competent Liberian Authorities responsible for urban and rural planning and territorial development;
- Technical, economical, environmental, cultural and social issues are all properly addressed for a harmonious integration;
- Liberia's prescribed requirements are met with respect to localization and urban planning standards.

The Consultant shall provide a detailed description of the selected sites (including land tenure/titles issues), together with geographic positioning of all project component within existing environment and landscape using any AutoCAD drawings provided and GIS base maps derived from satellite imagery and overlaid with LIDAR derived DTM.

For the comparison of the options, the Consultant E&S experts shall work in close collaboration with the Technical Team and use the LiDAR data to establish the optimal layout of the project. In doing so, the Consultant shall focus on dam heights (and related reservoir areas) and the mode of operation of the reservoir storage, and assess the E&S impacts for a range of alternatives with particular attention given to involuntary resettlement. This options assessment will depend heavily on the technical understanding of the hydrology and climatology of the PIP watershed, including current and forecasted withdrawals from St Paul River for irrigation and water supply and other beneficial uses and also the operation of the existing Mt Coffee HPP including turbine water regime and E-flows.

When comparing various alternatives and interconnection routes for the transmission line, the Consultant shall also:

- respect, to the extent possible, infrastructure easements (roads, watercourses, airfields, etc.);
- consider that transmission lines shall avoid passing through heavily populated communities, areas with steep transverse slopes, or zones narrower than the maximum possible length of the span;
- target for a transmission line route as close as possible to existing roads (between 100 m and 2 km if possible);
- avoid to the extent possible sensitive zones and infrastructures (dwelling, agricultural lands and/or other community livelihood, wildlife and forest reserves, marshy, mountainous and low elevation zones, watercourse arms, RAMSAR, classified patrimonial areas, airfields, mining concessions, etc.)
- aim at having the transmission towers in areas easily accessible, and distant from at least 100 m from last dwelling when crossing populated areas;
- compare and assess the advantages and constraints of using alternate paths for segments located in unreachable areas.

Similar considerations will apply to the access roads needed for all project construction lands intended for construction phase and operations phase

This activity will be concluded with a detailed description of the delineated perimeter of the project and transmission line with photographs and coordinates of all natural and artificial obstacles, including:

- (a) Man-made structures or obstacles (residential and non-residential) such as roads, streets, schools, dams & dykes, offices, commercial & government buildings, etc.
- (b) Public infrastructures such as existing transmission and distribution lines, communication lines and towers, railroads, churches, town halls, cemeteries, pedestrian paths, river crossing, etc.
- (c) Biophysical characteristics of the terrain such as the river network, relief (mountains and valleys), wetlands, agricultural lands, forest reserves, etc. Particular attention must be paid to the variation in terrain conditions/patterns between the wet and the dry season, for both construction and access.
- (d) Archeological sites and physical cultural sites identified by the Government and communities in the project area.
- (e) Any additional particularity specific to the area.

In its description of the “optimal” perimeter (with least impact in terms of resettlement numbers of people), the Consultant shall also itemize all communities potentially affected that need to be relocated by specifying the region, county, township, municipality, village or sector, as well as the GPS coordinates of:

- The limits of settlements and undeveloped areas or vacant land;
- The limits of household private farms and bounded lands;
- The limits of all natural resource concessions areas given to private sector operators within the PIP perimeter such as logging companies, palm oil and rubber concessions, mining leases etc.
- Protected areas, classified forests, hunting territories, national parks;
- Cultural and sacred sites, cemeteries;
- Markets and densely populated areas in informal settlements.
- Internationally agreed protected areas such as RAMSAR sites

4.2.3 Phase C: Preliminary ESIA and Boundary Delineation

For the preliminary (and detailed) ESIA, the Consultant shall undertake as a minimum, the following activities.

a) Quantitative baseline assessment of the natural environment and social condition in the project area

The Consultant shall provide a detailed description of the habitat where the project will be constructed in its present design, including, without being limited to:

- The physical setting: relief, geology, soils, climate (rainfall, evapotranspiration, temperature, relative humidity, wind, sunshine, etc.), surface and underground waters (quality, sediment transportation and granulometry, flow regime), etc.;
- The biological environment: aquatic and terrestrial fauna (large and small mammals, birds, reptiles, amphibians, fish, etc.) and aquatic and terrestrial flora, including ecologically sensitive aspects (e.g. wetlands, forest reserves, hunting zones, biodiversity, protected

species, national parks etc). This description shall include officially recognized endemic, endangered, and rare species (as per the IUCN red list of threatened species). It shall also describe the various habitats present in the project perimeter including those critical, and present condition of the state of the watershed upstream the proposed dam in terms of deforestation, sedimentation and erosion risks, pollution etc.

- The social environment (human, cultural and economic): population (ethnology, religion), demography, gender aspects, vulnerable groups including historically underserved traditional local communities and returned displaced groups from the civil war, as well yet to return displaced groups from the civil war who may have claims to land or natural resources within the perimeter of the proposed PIP, existing/potential conflicts, cultural heritage including places of worship, pilgrimage and cemeteries, historical, esthetical and touristic resources, infrastructures, land tenure and ownership, land use, employment/industrialisation, agriculture, public health, mining activities, exploitation of ligneous resources, hunting, fisheries, and all other human activities developed in the project zone, etc. With respect to these aspects, the Consultant shall identify how the project could avoid impacts in the first instance, minimize impacts of those which cannot be avoided and develop mitigation and offset measures for remaining impacts. The consultant will also identify how the project could contribute to improving the quality of life of the local population.

b) Risks & Hazard Study

The Consultant shall identify all areas where hazard exists and the risks and potential conflicts (e.g. with the host groups in case of resettlement) related to each component of the project. The Consultant shall assess the risk level and present all hazards that may arise from the construction and operation of the project (incl. in case of accidents), and justify the proposed measures to reduce their occurrence. The study shall also specify civil protection assistance means known to the Consultant and the organization of public and private means available to the developer and the manager/owner (and ready to mobilize) to prevent an eventual disaster and mitigate its consequences (safety study, emergency plan, and permanent action plan). The Consultant shall also identify proper mechanisms to resolve conflicts at local level.

In collaboration with the Consultant in charge of the TA2, the Consultant shall analyze the institutional capability of Liberian agencies/services to monitor and follow-up the implementation of the environmental and social measures with the objective of defining the capacity building actions to be planned and the related budget. The Consultant shall also provide a budget for the development of an emergency action plan.

c) Identification and Evaluation of Potential Environmental & Social Impacts

E&S impacts will occur in all phases of the construction, operation & maintenance, and decommissioning of the Project, including cumulative impacts from existing and on-going/committed projects. The Consultant shall identify, analyze, and assess the key sources of these impacts and provide a detailed description of the methodology adopted for the evaluation of these impacts.

The Consultant shall provide an assessment of the advantages of the project for the beneficiary countries/regions and their respective populations, its impact on development sustainability, and its contribution towards poverty reduction and the Millennium Development Goals.

The Consultant shall also identify and analyze the cumulative impacts on the present biophysical and social environments in the project area and globally, in the areas of the existing Mount Coffee and planned developments on the same river and watershed.

d) Mitigation and Enhancement Measures

The Consultant shall work with affected populations including women and vulnerable groups, as well as host communities specifically in but not limited to areas where resettlement is to occur and local development specialists for the identification of the potential E&S impacts resulting from the project's activities including construction and operation and the proposed mitigation and/or reinforcement measures that may be required. This is to be carried out with the objective of finding, in close collaboration with local population and local technical services, the approaches and means for the project to best contribute to the socioeconomic and cultural development of the area. The identification of these measures shall draw on the analysis of key issues related to poverty, wealth distribution, and existing social inequities (specifically those related to gender and vulnerable groups), to choose measures that are reliable, quantifiable and applicable locally.

e) Environmental Clauses to insert in the Tender Documents

The Consultant shall provide all technical and operational specifications that will allow the Contractor in charge of the project construction to properly protect the biophysical environment, take care of health & safety (H&S) of the workers and local populations, and ensure hygiene conditions on construction site.

The E&S management plan (ESMP) and the E&S clauses will be included in the tender documents. They shall provide the requirements to the Contractor in organizing its activities for the proper implementation of E&S and H&S measures, as well as identifying the methods, technical provisions, and implementation means for these measures (being understood that these firms shall prepare their own Construction EMSP and H&S plan and will recruit international specialists for the preparation and implementation of these plans). The same approach should apply for the Consultant who will be in charge of the construction supervision (and the Project Implementation Unit-PIU).

f) Public Consultations

In the preliminary ESIA and as per SEP proposed at the end of phase A, the Consultant shall meet with selected groups in the affected populations as identified in the baseline studies to record their opinions, concerns and fears with respect to the project. The Liberian 'sensitization and communication' consultant recruited for the project will attend these informal consultations which will be used to discuss major E&S issues related to the various activities and will introduce the ToR and the approach for the surveys as well as the communication means and modes intended to be used throughout the study. These informal individual and small group meetings will be carried out through interviews, focus groups, socioeconomic and cultural surveys, as well as information and site visits, and detailed investigations on biophysical and human issues in the project area. Consultation with women and youths shall be carried out in distinct focus groups.

The Consultant shall outline the discussions and conclusions of these meetings and establish a list of mitigation and/or compensation measures related to stakeholders' relevant concerns. These measures and the minutes of meetings must be shared and validated with each participants whose name and signature must appear in the list of presence for each meeting.

g) Environmental and Social Cost Estimate

The Consultant shall provide a preliminary estimate of the costs for:

- the proposed mitigation measures for the E&S impacts on the biophysical environment;
- compensation costs for the Populations Affected by the Project (PAP);
- land acquisition;
- indemnity for losses and accompanying measures for the resettlement of PAP.

h) Boundary Delineation

Delineation of the project boundaries shall be completed based on the latest layout of the Project, including the perimeter of the reservoir, required concession area for the permanent works (dam, powerhouse, etc.) and the corridor of the transmission line. This should be achieved using appropriate methods in accordance with standards in effect in Liberia.

Work shall include, without being limited to:

- Marking of the perimeter of the reservoir, concession area for the dam & powerhouse, and transmission line corridor;
- During construction all project lands need to be delineated including but not limited to quarries and spoil areas, access roads, batching plants, storage areas, vehicles maintenance areas, workers camps, possible zones for camp followers.
- Detailed presentation of the roads, paths, buildings, waterbodies, and other visible landmarks;
- Elaboration of construction maps, plans and sections.

The target perimeter and transmission line corridor shall be mapped using Geospatial coordinate system acceptable to the WAPP, LFT and the MME, with XYZ coordinates presented in tabular form.

It should be noted that the selection of wet perimeter and layout of the transmission line will only be considered definitive following written approval from the Steering Committee and final acceptance of the Scoping Report by Liberia and the Technical and Financial Partners (TFP).

At the end of this Phase, the Consultant shall submit for approval a report summarizing findings of the ESIA including detailed mapping of the project infrastructure for construction phase and operation phase and transmission line corridor, detailed mapping of natural resources conditions in the project area, detailed mapping of the socio-economic conditions within the project area. This report shall be illustrated with maps, plans, profiles, photos, etc. Maps shall be at a scale 1:10 000 and highlight including but not limited to:

- Hydropower infrastructure
- villages, towns, hamlets
- agricultural fields both households and corporate leases including agricultural infrastructure
- National parks, areas of conservation value, ecosystem boundaries
- Characteristics of the relief, including without being limited to, hedges, fences, marshes, rivers, streams,
- Details of existing infrastructure including without being limited to, dwellings, roads, foot paths pipelines, bridges, natural areas and others.

4.2.4 Phase D: Detailed ESIA, RP and ESMP

At this stage, the Environmental and Social (E&S) Studies of the project shall be split into three (3) specific components as follows:

- the detailed ESIA, revised as required to account for observations, comments and/or modifications since completion of Phase B;
- the Resettlement Plan (RP); and

- the Environmental and Social Management Plan (ESMP).

Each of these components shall be submitted in separate reports comprising multiple volumes each as necessary

It should be noted that the delivery of Phase C of the E&S Studies depends on technical, economical and socio-environmental findings from Phases A and B of the ESIA and is subject to the satisfactory performance of the Consultant on these two previous phases.

Only if these conditions are adequately met should the Consultant be requested to proceed with Phase C. The detail tasks and outputs expected from these activities are detailed below. Additional details on the content of the ESIA, RP and ESMP reports can be found in Section 5.3.2.

a) Detailed ESIA

A detailed ESIA shall be carried out using the preliminary ESIA completed in Phase B as a starting point, and taking into account details of the final design and revisions brought to the project. It shall be realized following similar rules as for the preliminary ESIA (except for few points noted below) and include additional public consultations.

Water Management

The ESIA shall establish the final pattern for the required environmental flow (in m³/s), including artificial flood and/or pulse flows if deemed necessary. The ESIA shall clearly establish the best approach to water management procedures based on integrated water resources management principles. The water management shall account for offtake for other beneficial uses including irrigation and domestic water supply.

Public Consultations

The Consultant in conjunction with its Liberian ‘sensitization and communication’ consultant shall conduct formal public consultation meetings as required to provide information on the project and on-going studies, and to involve all stakeholders in the decisions related to the project by collecting their opinions, advices, concerns, and preoccupations with respect to the project’s activities and their impacts and to advise to those communities how their concerns will be incorporated into the design of the project. It is understood that the consultant will have to hold working level consultations with communities and stakeholders generally during the entire ESIA phase that will collectively lead to the formal consultations described here. The number, location and timing and content of the community meetings, workshops, discussions will be decided at the working level by the consultant and local authorities as the planning and implementation of the ESIA unfolds. In this section we focus on formal consultations related to milestones of (i) project presentation, (ii) impact presentation (iii) resettlement presentation. As a minimum, the Consultant shall undertake at least three formal public consultations with populations affected, concerned, and/or involved; these should be duly documented with an agenda, minutes, list of presence etc., and held in the presence of relevant authorities, competent technical services, and project developer/sponsor.

- The first formal public consultation shall present the project in its proposed design. The objective of the consultation is to inform stakeholders and collect their opinions and concerns on the project in order to ensure all possible design changes have been included based on community and stakeholder concerns
- The second formal public consultation shall present the expected impacts of the project, the recommended measures and their proposed management, and the results of the surveys of the affected properties and PAP to fix potential errors and/or inaccuracies. The objective of the consultation is to inform stakeholders and collect their opinions and concerns on the

project in order to give them due consideration in the mitigation, capacity building, enhancement, and compensation measures including deadlines and eligibility conditions.

- The third formal meeting shall take place as part of the RP, to further pursue the issue of resettlement, including the conditions, specifications, participation, organization and communication under which this is to take place. This public consultation shall be based on the result of the inventories/surveys carried out and the results of the previous meeting as noted in the relevant report. For the RP, the surveys shall be extended to include all PAPs and consultations carried out as part of its development and implementation.

These consultations shall be carried out using the Liberian ‘sensitization and communication’ consultant with the active participation of representatives from (amongst others) the LFT, competent local agencies and/or technical services involved in various environment fields, civil societies/NGO, PAP, and any other stakeholders who carry an interest in the project. The Consultant may need to repeat the same (type of) meeting in several places if the high number of PAP and/or affected communities, local practices and/or administrative issues requires it. In this case, the places and dates must be planned in advance in collaboration with the administrative and civil authorities.

As for the preliminary ESIA, Minutes of Meetings shall be written in accordance with the format required by the Liberian Authorities and shall include the list of participants, the dates, photos, an outline of the discussions that took place, the documents presented, and/or any other relevant archive on these consultations. These minutes must be shared and validated with the participants.

b) Resettlement Plan (RP)

The Consultant shall prepare a detailed Resettlement Plan (RP) in accordance with Liberia’s applicable legislative and regulatory requirements, and World Bank’s ESF... Both sets of requirements will have to be individually satisfied in their entirety. In some instances such as compensation for losses of infrastructure for example, some discrepancy and conflicts may occur in the application of both sets of requirements. The consultant will bring this to the attention of the WAPP, LFT, SC, POE, WB and all other interested parties for resolution. The general rule is that the highest level requirement or strongest standard will apply unless it is agreed by stakeholders as listed earlier. The usual step is to undertake a gap analysis of all applicable laws and regulations at the beginning of the ESIA process so as to flag possible conflicts in requirements and advise how these will be resolved. The consultant will be expected to follow these steps.

The RP shall be prepared together with the other reports of the detailed (final) ESIA.

The MME and the Government of Liberia will need to acquire the “occupancy rights” for the areas where the project will be located to ensure the smooth implementation and operation of the dam, powerhouse, transmission line etc. To this effect, the Consultant shall carry out a detailed survey and comprehensive review of the land to be acquired and provide information with respect to the affected people, dwellings and forest and agriculture and mining and all other concessions, and the compensation measures that might be required to acquire these rights. There is likely informal activities going on the project areas and according to the WB ESF, these will have to be considered carefully in consultation with the authorities. Informal income generating activities will in some cases be considered formal income despite these not being recognized as formal activities by local government. This includes informal artisanal mining. This review shall also provide clear indications as to lands available that could be considered as replacement (compensation), and prepare a Register of Affected Properties to be included as an annex to the RP. The RP shall comprise:

- a comprehensive list of private property owners formal or usufruct based, complete with their identity (name, references and addresses);
- the amount, quality and nature of each owner's property(ies) and assets and productive goods;
- The quantities (footage) for each tree species/land use found in classified areas (forests, parks, agricultural lands, reserves, etc.) and the name of the owner, concessioner, and/or farmer;
- The unit costs and total amounts of affected private and public properties in accordance with national and international standards which will need to be validated by competent technical services.

Special attention shall be given to sensitive issues such as the sacrificial places, sacred trees or forests, cultural or scientific sites, bounded tenures or parcels with land title, classified forests, protected areas, etc.

In each community and/or village, the inventory shall be carried out in presence of the owner and the traditional leader(s).

As part of the RP, the Consultant shall consult informally with small groups and carry out formal public consultations. As presented above, the purpose of the public consultations is to further pursue with all stakeholders (PAP, technical services, civil & administrative authorities, project sponsor/promoter etc.), the conditions, specifications, participation, organization and communication under which resettlement will take place. This public consultation will be based on the result of the inventories/surveys carried out and the results of the meetings will be included in the RP.

Annex B provides a sample of what should be considered in the RP.

c) Environmental and Social Management Plan (ESMP)

The Consultant shall develop an Environmental and Social Management Plan (ESMP) to adequately follow the evolution of the impacts during the construction, operation & maintenance, and decommissioning phases and monitor the proper implementation of the proposed mitigation measures to record that standards set by environmental protection laws of Liberia and those inherent in the WB ESF have duly been met.. A monitoring program will be developed in the ESMP to be effective especially but not exclusively during construction. The consultant will define all parameters to be monitored, tools to be used, analysis as needed, reporting, non compliance system and escalation protocol of the latter.

The Consultant shall also, in collaboration with the Consultant in charge of the TA2, identify the needs for capacity strengthening in the management of environmental, social, health & safety (H&S) issues in the LFT and their parent entities, as well as other structures within Liberia (including civil society). He will suggest accompanying measures (training, material support, etc.) required for the proper development of each phase of the project.

The Consultant shall learn from past experience in similar ESMP established for other projects and apply these lessons to the present case. The Consultant shall produce reports which details are provided in Section 5.3.2. At this stage, the Consultant shall prepare the Environmental and Social Commitment Plan (ESCP) as per WB ESF (cf. ESS1—Annex 2).

4.2.5 Public Information and Awareness Campaign (Post-Study)

Aside from the consultations carried out as part of the ESIA, the Consultant shall hold information meetings with the communities concerned with the project after the adoption of the ESIA final report and the delivery of the Certificate of Environmental Compliance (CEC) by the Government of Liberia.

The Consultant shall launch these meetings to return and disseminate relevant information on key points adopted at the end of the E&S Studies. This activity may be subcontracted to specialized organizations working at community level: NGO, local actors in communication media (radio, television, newspapers, traditional informants), technical services responsible for the environment, local and regional authorities, etc., but the Consultant remains responsible for the results of this activity and must intervene and realign it whenever required. The consultant shall obtain prior to signing approval on its selection of specialized organization and the details of their intended outsourcing arrangements from the WAPP and WB.

The information campaign shall be held in the main language spoken in each zone concerned. Meetings shall take place in each community where formal public consultation were previously held, and target at least the same mobilized public.

In support to these meetings, the Consultant shall prepare (in both English and French), a non-technical summary of the ESIA, including the RP and the ESMP and make copies available in local language. He shall also provide a complete copy of the E&S study reports (ESIA, RP, ESMP) to local administrative authorities. A list of diffusion shall be prepared and submitted to WAPP, LFT, WB, MME and LEC for approval before issuing these copies.

The Consultant shall also submit for approval a plan for the realization of the information campaign together with a draft version of all documentation intended to be used during this campaign. The plan and documentation are to be submitted to the WAPP, the LFT, the WB, the MME and LEC at least one month prior to the beginning of the campaign.

4.2.6 Capacity Building and Institution Strengthening

It is expected that the Consultant will contribute to building capacity as per recommendations of the Consultant in charge of the TA2. At this point, and until such time as the Capacity Building Plan from the TA2 Consultant has been approved, the Consultant shall base its estimate of the requirements (in time and money) on the following activities:

a) On-the-job training:

While in Liberia, during field work and workshops, the Consultant shall integrate up to six (6) designated Liberian counterparts in its team and work in close collaboration with them. Contact will be maintained at other times through follow-up phone/Skype calls and emails as required.

b) Institution Strengthening:

The Consultant will be required to support the TA2 in the skill-gap analysis and the identification of the requirements for institutional strengthening.

c) Formal training:

A two-week formal training course for six (6) designated participants shall be organized in the project's offices in Liberia. The purpose of this training is to bring stakeholders involved in the realization of E&S study and the supervision of the ESMP and RP to a higher technical level so they can take an active part in future activities.

The training will be extended to twenty (20) identified individuals from the LFT, LEC, WAPP / SG, MME, PDU, Ministries, local consultants and Liberian national services responsible for different aspects of the environment (population, health, safety, water, forests, biodiversity, agriculture, farming, fishing, habitats, land use, development, planning, etc.), all of whom will be involved in the application, surveillance, and monitoring of the ESMP and RP of the project.

The training shall allow the reinforcement of human resources in the sector and provide state-of-the-art tools in E&S Study. The approach adopted shall be participatory and proactive and favor implication of participants to debates, and experience sharing. Classes shall be based on lectures adapted to adult training and include simulation exercises, role-play, and two (2) field trips: one institutional, and the other for the observation of concrete cases (to be defined with the LFT).

Examples on issues raised in the course of the E&S Study for the project (and/or other similar projects) shall be given. Training activities shall be conducted by a specialized trainer mobilized by the Consultant.

The Consultant shall bear all costs related to the training programme including those associated with a one-week workshop for the twenty (20) participants to be held in the field. To this end, the Consultant shall include in its financial proposal an amount in USD to account for transport to/from the site, airfare to Monrovia for participants outside Liberia, lodging and per diem for all participants.

The Consultant's proposal shall detail the proposed content for the training programme, which should cover the following subjects:

- 1) Introduction to Environment: definition, components, interrelationships, disciplines, etc.;
- 2) Introduction to environmental assessment: scope, technical means and methods, references, objectives, scoping, etc.;
- 3) Relationship between sustainability and environmental assessment;
- 4) Introduction to international environmental law: purpose, role, principles, international texts, enforcement methods and techniques;
- 5) Environmental Impact Assessment: source, scope, purpose, procedures and stakeholder roles, key component of an ESIA (e.g. comparison of alternatives), etc.;
- 6) Scoping Study (Project definition);
- 7) Delineation of project right-of-way and acquisition of right of use (for power generation and transmission);
- 8) Impacts: definition, sources, classification (positive, negative, undefined, direct, indirect, cumulative and residual), techniques for the identification, analysis and assessment of the impacts;
- 9) Mitigation and enhancement measures and institutional support: identification approach SMART (Specific, Measurable, Attainable, Relevant, Timely);
- 10) Comparison of alternatives in E&S Studies (power generation and transmission);
- 11) Public participation in E&S Studies: scope, methodologies, advantages, inconvenients, etc.;
- 12) RP in E&S Studies: purpose & scope, PAP, techniques for the identification and evaluation of properties, involuntary resettlement, property and PAP relocation, institutional management of the RP;
- 13) ESMP in E&S Studies: purpose & scope, stakeholder roles, implementation constraints, key components;
- 14) Environmental monitoring and surveillance: definitions, scope, techniques such as compliance system and tool (for power generation and transmission projects).

The Consultant shall develop the training programme in collaboration with the Consultant in charge of the TA2 and prepare all teaching material in support to the training. The training programme, list of participants, proposed modules and logistic details shall be discussed with the TA2 Consultant and presented to the WAPP /, LFT, and WB one month prior to the beginning of the session.

Following the 2-week formal training, the Consultant shall submit a Training Report summarizing the activities that took place, together with the evaluation forms and/or other requirements requested by the TA2 Consultant. All background information and class/workshop material provided in the course of this training shall also be provided in electronic format to the WAPP (1 copy), TA2 Consultant (1 copy) and Liberia stakeholders (1 copy), including formal presentations, worksheets and/or other modelling tools or software (such as those used for the economic and/or financial analysis).

5. OUTPUTS AND DELIVERABLES (PACKAGE 1)

Deliverables to be produced as part of this mandate are described below. The exact content and timing of these deliverables will be established at the time of issuing the Inception Report, and will be agreed to with the WAPP and the LFT.

All reports and communications shall be in English and submitted (electronically) in draft and final form to the following entities for their review and comments:

- WAPP (with transmission to the POE)
- Liberia MME (Chairman of the LFT) and LEC
- PDU and WAPP institutional coordinator
- TA2 Consultant
- WB project sponsors

As a general rule, it should be noted that the Consultant is expected to compile all comments and observations received from stakeholders in a matrix indicating how each of them will be addressed as well as the page number where these comments have been integrated in the revised version of the report. The Consultant shall also be aware that Technical and Financial Partners (TFP) may, from time to time, bring additional comments following the issue of the Final Report. Should this be the case, the Consultant shall take all required actions to diligently respond to these comments and integrate them as needed in a revised Final version of the report.

5.1 Management Reports

5.1.1 Inception Report

The Consultant shall submit an Inception Report for the St. Paul River Hydro Electric Power Feasibility and ESIA Studies in electronic form four (4) weeks from the agreed commencement date, to propose an approach and work plan to realize the mandate. The Inception Report shall rely on a thorough review of available information and preliminary contacts with key stakeholders to present:

- The Consultant's understanding of the key issues and the proposed approach and methodology to develop the scope of work described above;
- Findings of the Consultant's review of the available information and summary of all relevant data for the FS and E&S studies including the legal and institutional framework, main characteristics of the PIP, topographic information, LiDAR, maps, geology, hydrology, power system, load and supply, etc.;
- The list of planned actions to complement the basic data with the required level of accuracy, including the detailed program for the field investigations with technical specifications;
- A detailed work plan and schedule to implement the proposed program with specific dates for all deliverables, points of interaction between the Technical and the E&S Team, and stakeholder meetings (with the WAPP, the LFT, the TA2 and the World Bank);
- The proposed organizational structure of the delivery team.

It should be noted that capacity building of Liberian key stakeholders is considered of utmost importance for the success of the program, and the Consultant shall take all required actions to facilitate technical training within its mandate. Of particular relevance, the work plan of the Consultant shall give due consideration to:

- Integrating local counterparts in the Consultant's team during the site visits as required by EPA for example with accredited local partner companies, field investigations and surveys, ensuring that they work with Consultant's staff whenever in Liberia;
- Organizing and delivering a two (2) week training session on the work carried out as part of the FS and ESIA studies in the Consultant's Head Office for six (6) Liberian counterparts.

The draft Inception Report shall be submitted to the WAPP and the LFT members for their review and approval. It will be the subject of a 2-day workshop to be held in Liberia two (2) weeks after issuing the draft version. All comments received at that time shall be taken into account, and integrated in the final version of the Inception Report that will be issued electronically 2 weeks after the workshop. Hard copies of the final report shall only follow upon approval of the electronic copy of the Final Inception Report by the WAPP. The Inception Report shall be submitted as follows:

❖ Draft Report

- One (1) electronic copy to be delivered by email.

❖ Final Report

- One (1) electronic copy to be delivered by email
- Three (3) USB keys and five (5) hard copies to be delivered by courier.

5.1.2 Quarterly Progress Report

In the course of its assignment, the Consultant shall prepare concise quarterly reports, which summarize activities undertaken during the period, progress against the program, and a program of work to be undertaken during the next quarter, to be approved by the WAPP. The reports shall include a project schedule updated quarterly to reflect the progress achieved to date in comparison with planned activities. The quarterly reports shall also include a financial outlook with a comparison of expenses to date to budgeted disbursements as well as a forecast to complete.

The Quarterly Progress Reports shall be kept as brief as possible and shall be limited to highlighting progress, key issues and constraints encountered during the reporting period. They are to be submitted electronically (via email) on the 10th calendar day following the end of the quarter. The first quarterly report will be issued 3 months after submission of the Draft Inception Report. The last quarterly report will take the form of a Completion Report that summarizes all activities that took place during the assignment of the Consultant.

5.2 Technical Reports (FS)

5.2.1 Data & Design Criteria Report

The Data & Design Criteria Report shall be issued in a draft form following completion of the technical field investigation program and will include:

- a summary of the activities that took place in the data collection phase;
- a list of references available of relevance to the FS;
- a compendium of the data used in the FS (topography/Lidar, mapping, geology, hydrology, power system, load-supply balance, institutional and legal framework for the sector, etc.);
- a description of the field investigations program that was developed;
- all data, logs, measurements taken as part of the field investigation (in an annex);

- the Geological Data Report, a stand-alone report which synthesizes all available information and knowledge on the geology at the project (see detailed description of content in Section 5.2.2) (A Geological Baseline Report (GBR) will be later prepared as part of the of the tender documents package);
- key information on E&S issues and approach to data collection from the Consultant.

Design criteria and assumptions adopted for the realization of the FS and in particular, the design and optimization of the PIP, shall also be specified as part of this report. Such technical criteria and assumptions shall cover:

- Hydraulic components (head losses, spillway & diversion floods, freeboard requirements, dead storage, etc.)
- Concrete structures (design loads, safety factors, loading conditions, allowable pressures, etc.)
- Foundations (slopes, drainage, grouting, etc.)
- Dams (Typical cross-sections, stability, water tightness and seepage control, physical properties, imperviousness, cofferdams, etc.)
- Waterways (support requirements for tunnels, penstock lining, stilling basin, etc.)
- Electro-mechanical equipment (turbine/generator units, hydrostatic & hydrodynamic loads, allowable stresses, gates, valves, transformers, etc.)
- Economic and financial aspects (discount rates, valuation of power, implementation costs including construction, E&S, Owner's cost estimates, project funding, etc.)

The draft version of the Data Report shall be submitted for review and validated in a 2-day workshop to be held in Liberia 2 weeks after issuing the draft version. All comments received at that time shall be taken into account in subsequent activities and integrated in the final version of the Data Report that will be issued two (2) weeks after the validation workshop.

The Consultant shall also provide an electronic copy of all data collected for their inclusion in Liberia's project database, together with working, editable versions (Excel / Word etc.) of all documents produced as part of this task.

The number of copies to be submitted is as follows:

❖ Draft Report

- One (1) electronic copy to be delivered by email (pdf document)
- One (1) working version of the material to be loaded on the Sharefile.

❖ Final Report

- One (1) electronic copy to be delivered by email (pdf document)
- One (1) working version of the material to be loaded on the Sharefile.
- Three (3) USB keys and five (5) hard copies to be delivered by courier.

5.2.2 Geotechnical Data Report (GDR)

The Geotechnical Data Report (GDR) shall be presented as a stand-alone report that will be annexed to the Data Report and submitted at the same time. The GDR provides the detailed and fully informed results and findings of the geotechnical investigations performed in accordance with the proposed scope described in Annex C;

The GDR shall comprise:

- The description of geological conditions (tectonic setting, structure, geomorphology, petrography) and geotechnical conditions in the region and the project area, where main works are to be implemented;
- A detailed account of all manual surveys (wells, trenches, auger holes etc.);
- A report of geophysical reconnaissance including details of seismic lines and/or other measurement mechanisms; A report of boring and drilling investigations carried out including a systematic description of coring and complete analysis of field investigations logs and reports;
- A geological and geotechnical map showing the location of all petrographic, geotechnical, structural and tectonic surveys together with relevant geological cross-sections;
- The report on laboratory testing, with clear referencing, classification and listing of rock and soil samples; the Consultant shall also ensure their appropriate conservation in an adequate location.

The GDR constitutes the main document in support to the assessment of risks related to underground conditions. As such, the Report shall be completed with an analysis of such risks and a recommendation of a suitable repartition between the Owner and the Contractor. For example, risks associated with known, expected or probable conditions might be bore by the Contractor, with unexpected risks left to Owner's charges.

As indicated above (see Section 5.2.2), the GDR shall be submitted as an annex to the Data Report. The number of copies and timing for the issue, review, and approval of the GDR will follow those for the Data & Design Criteria Report.

5.2.3 Feasibility Study Report

The Consultant shall present the work undertaken and the results of the FS to all stakeholders in a complete draft report for their review and comments.

The report shall be comprised of:

- an Executive Summary;
- the Main Report which shall describe all the analysis and recommendations of the Consultant as specified in the Scope of Work, and provide a detailed description of the retained layout and the technical characteristics of the preferred scheme;
- a complete set of drawings showing the layouts considered in the comparison and optimization of the PIP, as well as the detailed design for the retained scheme;
- the bill of quantities and schedule of unit rates used to estimate the construction cost of the project as well as details of all other implementation costs (E&S, Permitting, Engineering, etc.);
- the proposed PIP's implementation schedule;
- the project's financing structure (as proposed in collaboration with the STA (Transaction Advisor));
- the Data & Design criteria Report (as an annex), which can be used for the next phase of the studies;
- the GDR as a stand-alone document.

The feasibility study report shall be submitted to the WAPP in draft form for review and comments as follows:

❖ Draft Report

- One (1) electronic copy to be delivered by email (pdf document)
- One (1) working version of the material to be loaded on the Sharefile.

Its content shall be presented in a three-day validation workshop to be held in Liberia two (2) weeks later. The Consultant shall compile in a matrix all comments and observations from stakeholders and specify in writing how he intend to address them prior to issuing the Final FS Report.

Following approval from the WAPP, the Consultant shall integrate the comments in the final version of the feasibility study Report, which will be submitted as follows, no later than two (2) weeks following reception of comments from all stakeholders at the workshop.

❖ Final Report

- One (1) electronic copy to be delivered by email (pdf document)
- One (1) working version of the material to be loaded on the Sharefile.
- Three (3) USB keys and eight (8) hard copies to be delivered by courier.

5.3 E&S Study Reports

5.3.1 Scoping Report

Following the inception of the study and initial field surveys (Phase A of E&S studies), the Consultant shall submit to the WAPP, LFT, and WB a Scoping Report that will include, without being limited to, the following key items:

a) Background to Scoping with:

- Project overview;
- Recall of contractual requirements and understanding of the TORs;
- Context and project justification;
- Political, regulatory, legislative and institutional framework including ESF;
- Project description: activities, planned infrastructures, duration of each phase, etc.;
- Project Risks
- Overview of the services to be provided, methodology, highlighting relevant activities to be carried out vs. those abandoned, and the revised calendar as per the Consultant's proposal and present ToR;
- Statement of the impacts of the project on the E&S environment in the project area, including the watershed resources;
- Identification of key issues and constraints for the study and the project: survey of all physical obstacles in the zone of influence of the project, including their geographical coordinates;
- Identification and preliminary assessment of properties and Populations Affected by the Project (PAP);
- Budgetary estimate of lost properties and livelihood losses;
- Review and comparison of the proposed options for the project;
- Observations and comments on the proposed options;

- Recommendations as required.
- b) Distinct Reports for the E&S baseline study for the host watershed and transmission line route, with, for each report:
- The location of the project and the host watershed with a delineation of the areas that will be directly affected, and the zones where the project's influence is more diffuse;
 - The characteristics of the project: dam, powerhouse, switchyard and transmission line, site infrastructures (work camp/town, yards, etc.), and other main works;
 - The environmental description of the project area, including the characteristics of:
 - St Paul's River watershed: climate, drainage area, topography, geology, hydrology (flow regime, low flow and floods), fauna and flora resources, area of project's direct influence, etc.
 - The area within the project's right-of-way: delineation of the reservoir, inundation maps, monthly flow, communities and areas affected by the impoundment of the reservoir, etc.
 - Social aspects in the project's area: population and lifestyle, land use, tenure, property titles, dimensions, socioeconomic and cultural activities at household level present in the area that will be affected, etc.
 - Existing, committed and planned projects and/or national and international programmes in the watershed and/or the transmission line corridor and their potential cumulative impact on the project;
 - Initial survey of assets and possible obstacle for each alternative to identify red flags and/or fatal flaws;
 - Benchmarking study of the alternatives in terms of their biophysical, social, technical and financial impacts on the environment for the selection of:
 - the proposed sites for the infrastructures (dam, powerhouse, transmission line, access roads, workcamp, etc.)
 - the transmission line layout (route, type of towers, voltage, substation, right-of-way sizing etc.)
 - the type of project retained (Run-of-river vs. storage, hydropower vs. solar, etc.).
- This analysis must identify all positive, negative and residual impacts of the various options and be sufficiently detailed to support the selection of the dam height and corresponding reservoir area, and to establish the best way to manage the reservoir storage during the operation phase including recommendation on the possible need to create artificial floods;
- Estimate of the costs related to mitigation measures, compensation and indemnities for each option considered;
 - Proposed options for the transmission line layout and recommendation of the route of least impact;
 - Any additional support (tables, figures, maps, photos, lists, etc.).
- c) Terms of Reference (ToR) for Phase B, written and defined by the Consultant based on:
- Actual data updated for the project;
 - Information collected in the field;
 - Elements from the present TOR;
 - Applicable legal / regulatory texts;
 - Applicable conventions/treaty/agreements, and protocols from international laws;
 - Requirements from the TFP and the WAPP.

These ToR shall be submitted for comments to the WAPP project team prior to being submitted

to the Liberian Authority responsible for the Environmental Evaluations (EE). They shall include, without being limited to:

- Context & justification of the study;
- Short description of the project (components, activities, phases, duration, staff, equipment etc.);
- Presentation of the proposed study
- List of relevant/applicable national texts and codes, and requirements from the WAPP and the TFP;
- A description of the relevant tasks (to be defined following project review and field reconnaissance);
- The actual duration of the services proposed by the Consultant and related schedule of activities
- An outline of the expected deliverable
- Key staff
- An outline of the general services.
-

The Consultant shall include all expenses related for the production and approval of these ToR, including visits to national competent services and the acquisition of national guides/codes/norms/standards as required.

The Scoping Report shall be submitted as follows:

❖ Draft Report

- One (1) electronic copy to be delivered by email.

❖ Final Report

- One (1) electronic copy to be delivered by email
- Three (3) USB keys and five (5) hard copies to be delivered by courier.

The draft version shall be presented to WAPP, LFT, and WB for their review and comment prior to a 2-day validation workshop that will take place two weeks after being issued. Final version of the Scoping Report including the ToR for Phase B (ESIA) in an annex, will also need to be approved prior to start of the ESIA.

5.3.2 ESIA Report, RP and ESMP Report

The ESIA deliverables will be comprised of the following three separate documents.

- a) ESIA Report (Preliminary and Final);
- b) Resettlement Plan (RP);
- c) E&S Management Plan (ESMP).

a) ESIA Report (Preliminary and Final)

The ESIA Report shall include, without being limited to the following key items:

- A non-technical summary of the ESIA in both French and English with few figures and photos to illustrate the project;
- A summary of the approach developed;
 - Content/organization of the report;
 - Context, project justification and integration in the ECOWAS grid;
 - Expected outcomes of the ESIA;
 - Adopted methodology for realization of the ESIA;
 - Presentation of stakeholders.

- Project Description:
 - Project Location;
 - Delineation of the project area using appropriate technology including GIS, LIDAR, DTM;
 - Planned activities (phases and duration);
 - Staff and work organization;
 - Type, nature and characteristics of permanent structures envisaged.
- Political, legislative, regulatory and institutional framework:
 - Political Framework;
 - Legislative and regulatory framework (relevant national & international documents and requirements, guidelines from the TFP);
 - Institutional Framework.
 - Gap analysis of national and international requirements.
- Description of biophysical and socioeconomic/cultural environment in project area;
- Alternatives and options considered for the project and comments on the recommended project;
- Risk and Hazard Study;
- Identification, analysis and assessment of E&S impacts;
- Mitigation measures and compensation for negative impacts, enhancement measures for positive impacts, and accompanying measures for institutional support;
- Public consultation;
- E& S clauses to include in tender documents;
- Clause “Chance Find” related to cultural heritage to be inserted in every contract;
- Advice on project’s E&S acceptability and recommendation to the various stakeholders for the implementation of E&S measures.

Annexes to the ESIA shall include (without being limited to):

- ToR for the ESIA together with the approval letter (if available from the relevant Authorities);
- Minutes of all meetings;
- List of participants in public consultation activities;
- List of people met;
- A Boundary Report;
- All other relevant document.

At the end of each section, the Consultant shall include an insert that summarizes main comments and analyses which highlights the key issues addressed and their link with the project. Whenever relevant, information shall be presented on visual support: photos, maps, figures, schema, plans, etc.

b) Resettlement Plan (RP)

In the RP, the Consultant shall present at least the following elements:

- Non technical summary of the RP (in both French and English with few figures and photos to illustrate the project);
- Description of each project’s component and/or activity, together with its anticipated impact on land and populations;
- The context, justification and objectives of the RP;
- The applied methodology to develop the RP (preparation of inventories, assessment of properties and assets, methods to identify the PAP and mode of communication);
- Expected outcomes;
- Political, legislative, regulatory and institutional framework relevant to resettlement activities;

- Description of the socioeconomic and cultural components affected;
- Types of affected assets;
- Census and socioeconomic study;
- Survey results and PAP's perception;
- Presentation of compensation procedures;
- Land ownership in Liberia: national estate, territorial jurisdiction, etc.;
- Eligibility to indemnity (general provisions, criteria, deadlines, national expropriation procedures, World Bank's Environmental Framework, property assessment and loss compensation, census, resettlement and compensation);
- Assessment of affected assets;
- Specific measures for vulnerable groups;
- Indemnity matrix;
- Measures for the physical relocation;
- Organizational responsibilities;
- Mechanism for handling complaints;
- Consultations and methods to ensure active participation of the PAP and the affected communities;
- Mechanisms adopted to process compensations;
- Evaluation grid for the affected assets (agricultural cultures, plantations, tenure, property assets, housing, etc.);
- Type of compensation applicable (individual assets, community assets, environmental protection and management);
- Arbitration procedures and conflict resolution such as grievance mechanism (types of complaints and conflicts to handle, acceptable treatment mechanisms);
- Constitution and operation of the Compensation Board;
- Agreements with the eligible owners and informal "owners";
- Evaluation of personal assets for the PAP;
- Detailed and total estimated costs of assets lost;
- Compensation payments;
- Payments of future accidental damages (compensation payment committee);
- Executive schedule;
- Process monitoring and evaluation;
- Budgetary estimate.

Annexes will be comprised of:

- Samples of survey/census questionnaires/forms
- Register of Affected Properties with the following key information:
 - Name, Surname and photo of all PAP;
 - Geographic coordinates of all affected properties;
 - Municipalities where PAP are coming from;
 - Record of affected properties;
 - Number of people in the household (adults, children below/above 18-year old, children still in school, other people);
 - Presence of a vulnerable person;
 - Average annual income of the household and its source (percentage per activity, e.g. agriculture x%; arming y%, small business);
 - Status: land owner, transfer;
 - Detailed individual amount for damage compensation.

If available, the Consultant shall also conform to national (Liberian) guidelines with respect to the RP, and further expand its content as needed to ensure completeness; the format given in Annex B may serve as an example to this effect.

c) Environmental and Social Management Plan (ESMP)

The ESMP report shall include, without being limited to, the following key items:

- Non-technical summary of the ESMP;
- Recall of the potential (positive & negative) impacts of the project on the biophysical and human environment and the proposed mitigation and enhancement measures;
- Recall of the potential (positive and negative) impacts of the project on the socioeconomic and cultural environment and the recommended compensation/indemnity and enhancement measures;
- Reminder of the potential risks and hazards;
- Recall of existing projects' cumulative impacts and planned measures;
- Management of permanent works and monitoring system;
- Management of the potential impacts on each physical component that may be affected;
- Management of the potential impacts on each biological terrestrial and aquatic component that may be affected;
- Management of the potential impacts on each socioeconomic/cultural component that may be affected;
- Management of risks and hazards;
- Capacity building plan to strengthen the country's institutional capacity in environmental monitoring and follow-up;
- Environmental Monitoring and Follow-up Plan;
- Institutional responsibilities in the implementation of the ESMP;
- Objectively verifiable indicators;
- Budgetary estimate for the implementation of the ESMP.

The ESMP must clearly distinguish the actions that need to be taken for a) the Construction Phase and b) the Operation Phase.

- i) The **ESMP for the Construction Phase** shall include: an Environmental and Social Impacts Management Plan, Health & Safety Plan, Transportation Plan, Waste Management Plan, Worker Influx Management Plan, Camp Management Plan, Blasting Plan, Cultural Heritage Management Plan etc. These plans must have a budget. The aspect of Gender Based Violence (GBV) will be taken into consideration as recognized as a sensitive issue for large infrastructure projects. The guidelines and recommendations of the World Bank will be referred to for the proper treatment of the GBV aspect.

The Construction ESMP shall clearly identify the responsibilities of the construction firm(s): elaboration and implementation of a Construction ESMP (CESMP) and a H&S Plan (HSP), recruitment of qualified staff with international experience. All employees shall sign a code of conduct that prohibit misbehaviors such as sexual or psychological harassment. The ESMP shall also indicate that the firms cannot use children (<18-year old) as part of their workforce.

The Construction ESMP must include a Complaint Management Service able to operate in line with the procedures of a Grievance Redress Mechanism (GRM) accessible to both neighboring communities and workers. It must also describe the responsibilities of other intervening parties during construction and operation, such as the obligation for the project Sponsor to establish a Project Management Unit that includes environmental, social, and H&S specialists.

A Dam Safety Plan must be elaborated with all required elements to protect downstream populations against flood, hazards, and spillages, and include and Emergency Action Plan (EAP).

- ii) The **ESMP for the Operation Phase** shall include, amongst others: a Water Management Plan, Environmental Flow Management, including artificial floods and/or pulse flows if needed, a Plan to manage erosion and sedimentation in the upstream watershed, Biodiversity Management Plan, Warning and Alerts Management Plan, etc. A budget shall be estimated for all these plans.

As for the Scoping Report, the Consultant shall organize, in collaboration with the LFT, WAPP, and WB a validation workshop following the submission of the draft report. Participants to this workshop shall include the Service responsible for the issue of the Certificate of Environmental Compliance (CEC).

Following this workshop, the Consultant shall integrate the observations and comments from all stakeholders in the final version of the report. Should the final report be rejected by the Service emitting the CEC, then the Consultant shall redo the work at its own expenses until such time as the report is approved and the CEC delivered.

The Preliminary ESIA Report shall be submitted as follows:

❖ Draft Report

- One (1) electronic copy to be delivered by email, at least two weeks prior to the scheduled date for the validation workshop;
- Eight (8) paper copy to be distributed at the validation workshop.

❖ Final Report

- One (1) electronic copy to be delivered by email.

The three (3) documents composing the Detailed ESIA Report shall be submitted as follows:

❖ 1st Draft Report

- One (1) electronic copy by email, at least two weeks prior to the scheduled date for the validation workshop;
- Eight (8) paper copy to be distributed at the validation workshop.

❖ 2nd Draft Report

- One (1) electronic copy by email, at least two weeks prior to the scheduled date for the validation workshop;
- Eight (8) paper copy to be distributed at the validation workshop.

❖ Final Report

- One (1) electronic copy by email;
- Three (5) USB keys and eight (8) hard copies by courier.

d) Environmental and Social Commitment Plan (ESCP)

The Consultant will produce an ESCP with an accurate summary of the material measures and actions to address the potential environmental and social risks and impacts of the project in accordance with the mitigation hierarchy. It will form the basis for monitoring the environmental and social performance of the project. All requirements will be set out clearly, so that there is no ambiguity around compliance, timing and monitoring. The ESCP will also specify funding to be made available for completion of measures and actions. The ESCP will also include a process that allows for adaptive management of proposed project changes or unforeseen circumstances. The process will set out how such changes or circumstances will be managed and reported and how any necessary changes will be made to the ESCP and relevant management tools.

The ESCP will also set out a summary of the organizational structure that the Borrower will establish and maintain to implement the actions agreed in the ESCP. The organizational structure will take into account the different roles and responsibilities of the Borrower and the agencies responsible for implementing the project and identify specific personnel with clear lines of responsibility and authority.

The ESCP will set out a summary of the training that the Liberian Authorities will provide to address the specific actions required under the ESCP, identifying the recipients of such training and the required human and financial resources. The ESCP will set out the systems, resources and personnel that the Authorities will have to put in place to carry out monitoring, and will identify any third parties that will be used to complement or verify the Authorities' monitoring.

The ESCP will be submitted in draft form to WAPP and all relevant Government entities as well as the TA2 consultant and the WB. Comments will be received and included in the ESCP for final draft and submission to the WAPP.

5.3.3 *ESIA Non-Technical Summary*

Once obtained the CEC, the Consultant shall prepare (in both English and French), a non-technical summary of the ESIA, including the RP and the ESMP. This document will serve as basic support when conducting the post-study information campaigns.

The non-technical report shall present:

- Context and justification of the project;
- The objectives of the project and the study;
- Brief presentation of engaged stakeholders;
- Summary of Public Consultations & meetings;
- Synthesis of negative impacts of the project and mitigations/compensation measures;
- Synthesis of positive impacts of the project for the country and the population, and enhancement measures;
- Summary of the ESMP (follow-up and monitoring);
- Indicative costs of the ESMP;
- Results of the evaluation of the activities.

The Consultant shall submit the non-technical summary of the ESIA in English, French, and any other local language used in the project area (The LFT will indicate to the Consultant the languages used in the project area). The report shall cover in three separate sections the content of the three (3) documents that form the detailed ESIA, namely the ESIA, the RP and the ESMP. The report shall be illustrated with few maps and photos. The ESIA Non-Technical Summary shall be submitted as follows:

❖ Draft Report

- One (1) electronic copy by email, at least two weeks prior to the scheduled date for the validation workshop.
- Eight (8) paper copy to be distributed at the validation workshop

❖ Final Report

- One (1) electronic copy by email
- Fifty to a hundred (50-100) paper copies to be printed in English and any other languages spoken in the project area.

5.4 Public Information and Awareness Campaign (Post-Study): Plan and Report

5.4.1 *Public Information and Awareness Campaign Plan*

Following the acceptance of the ESIA report and the obtention of the Certificate of Environmental Compliance (CEC), the Consultant shall submit for approval a plan for the realization of the public information and awareness campaign. This plan shall describe the approach that will be adopted and present key aspects such as:

- The context of the project;
- The justification, objective, and scope of the campaign;
- The expected outcomes;
- The performance indicators;
- A description of the proposed methodology, methods and techniques for its implementation;
- The target stakeholders and actors involved;
- The activities to be conducted: number, type, duration, organization, sites, estimate of the concerned population in each community, estimate of the number of participants and the response/participation rate;
- The expected results from each activity;
- The performance indicators for each activity;
- The material, human and financial resources that need to be mobilized.

The Consultant shall propose the number of copies to be produced for the support material (ESIA report, non-technical summary, slide show, etc.) as part of the Draft Plan. Final decision will depend on the number of concerned communities, the local civil and administrative authorities, the competent technical services, population to be reached, etc. The Consultant shall consider this aspect in the preparation of its financial offer.

5.4.2 *Public Information and Awareness Campaign Report*

Following completion of the public information and awareness campaign, the Consultant shall produce a detailed report on the activities carried out. This report shall include:

- A recall of the context of the project;
- A recall of the justification, objective, and scope of the campaign;
- A description of the methodology applied;
- The outcomes;
- The activities conducted;
- The material, human and financial resources utilized;
- Key issues presented, highlighting those that gave rise to significant debates;
- The local communities;
- The opinions and impressions on the campaign from population, administrative and civil authorities, competent technical services (in social development, communication etc.), and the Service in charge of the Environment;
- Recommendations for the different stakeholders (population, authorities, LEC, MME, Technical services, WAPP, WB etc.)

This report must be supported by photos, figures, tables etc. The Consultant shall also provide a commented video of the campaign.

5.5 Capacity Building Report

Following the 2-week formal training, the Consultant shall submit a Training Report summarizing the activities that took place, together with the evaluation forms and/or other requirements that would be requested by the TA2 Consultant. All background information and class/workshop material provided in the course of this training including formal presentations, worksheets and/or other tools or software, shall also be provided in electronic format to:

- the WAPP (1 copy)
- the TA2 Consultant (1 copy)
- Members of the LFT (6 copies)
- All participants (20 copies).

5.6 Meetings, Visit and Workshops

In addition to the above deliverables, the Consultant shall plan the organization of meetings/workshops to collect and integrate the comments from the stakeholders. In his proposal, the Consultant shall make provision for the organization and delivery of workshops and meetings to present the approach and schedule adopted for the study as well as draft reports issued to discuss key issues and collect comments. These workshops are to be planned jointly with the WAPP's Secretariat General and will involve the participation of the Panel of Experts. All shall take place in Liberia (Monrovia) *except* the 2-week training, which shall be in the Consultant's Head Office. They will involve 10 participants, of which three (3) from WAPP's head office in Cotonou, in addition to the Consultant's staff.

- (a) Kickoff Meeting: (3 days for 15 participants)
- (b) Workshop to review the Draft Inception Report (5 days for 15 participants)
- (c) Workshop to review the Draft Data & Design Report (3 days for 15-20 participants)
- (d) Training Session in Consultant's Head Office (12 days for 10 participants)
- (e) Workshop to review the Preliminary ESIA Report (3 days for 15-20 participants)
- (f) Workshop to review the Draft FS Report (5 days for 15-20 participants)
- (g) Meeting to present the Final FS Report to the SC (2 days for 15 participants)
- (h) Workshop to review 1st and 2nd ESIA Report (4 days for 15 participants each)
- (i) Meeting with International Donors & Lenders (2 days for 15-20 participants)
- (j) Three (3) meetings with ST and/or TFP in one ECOWAS countries (2 days each)
- (k) One (1) meeting with the Service responsible for the delivery of the CEC to validate the ESIA (1 day).

The Consultant is expected to take an active part in a meeting with the Technical and Financial Partners to present the project in view of its possible financing. As such, he shall plan for the preparation of relevant documents and presentations and their delivery at the meeting, and shall provide any additional information and /or clarification that may be requested in the course of

these meetings.

The dates and place where these meetings may take place shall be established jointly by the WAPP Secretariat General, the International Donors, and Liberia's Authorities, and will be communicated to the Consultant in due time.

The LFT and the TA2 will provide support in the organization of the above meetings and workshops and associated logistic.

However, all costs associated with the participation of the Consultant to these workshops and meetings shall be include in its financial proposal.

6. QUALIFICATION REQUIREMENTS (PACKAGE 1)

6.1 Key Experts

The Consultant shall be made up a team of international experts with previous experience in feasibility studies for hydropower developments and the ESIA for dam/reservoir projects.

Key positions which will form the core team, and for which a curriculum vitae must be submitted, include:

- i. Project Manager
- ii. Project Coordinator for package 1.
- iii. ESIA Expert - Team Leader for the E&S component
- iv. Civil Engineer (Layouts / Dam) – Team Leader for the Technical & Economic (T&E) Component
- v. Geologist / Geotechnical Engineer
- vi. Hydrotechnical specialist (Hydrology/Hydro modelling)
- vii. Ecologist x 2 (Aquatic and Terrestrial Biodiversity and habitat)
- viii. Social specialist (Resettlement Planning)
- ix. Livelihood /Rural Development Specialist
- x. Mechanical Engineer
- xi. Electrical Engineer (Switchyard & Transmission)
- xii. Control & Protection/SCADA Specialist
- xiii. Cost Estimator
- xiv. Financial Analyst.

Candidates will be required to put in place the conditions that will foster balanced views between technical and E&S aspects and prevent any conflict of interest, including (i) independence of the two teams (T&E and E&S) and (ii) mobilization of neutral/balanced overall coordination. The Consultant will develop in his proposal detailed arrangements that will be put in place to make sure that these objectives will be reached.

6.2 Non-key Experts

The Consultant shall also demonstrate its capacity to complement the core team with the following type of experts as supporting staff whose inputs may be required on an ad hoc basis at various stages of the Studies:

- i. Specialist in Integrated Water Resource Management
- ii. Sediment Specialist / Geomorphologist
- iii. Power Economist*
- iv. Dam Specialist*
- v. Legal expert or lawyer (specialized in environment law)
- vi. Medical doctor in public health (specialized in water borne and infectious diseases)
- vii. Fisheries Specialist*
- viii. GIS specialist / surveyor
- ix. Sensitization and Communication specialist.

CVs for non-key experts should not be submitted in the tender but the tenderer will have to demonstrate, providing explanations on how these non-key experts can be selected and mobilized on an ad hoc basis at various stages of the Studies.

6.3 Staff Qualifications

The proposed candidates shall meet the qualifications and requirements described below and be prepared to work in Liberia. All staff shall be fluent in English, have excellent interpersonal, oral, and written communication skills and proven competences in technical training and capacity building. The proposed staff must be well versed in the use of standard computer tools such as the Microsoft Office Suite.

The person designated as Project Manager must also have excellent skills in Project Management as well as a high level of organizational & managerial abilities.

Knowledge of French is not compulsory but would be an asset.

The Consultant is invited to submit a detailed CV and evidence to demonstrate the staff qualification based on the requirements in Table 2 below.

Table 1: Staff qualification for the Feasibility and ESIA Studies (Package 1)

(i)	Title	Project Manager
	Years of Professional experience	15
	Specific Expertise	Management or planning of at least three (3) major renewable energy generation projects, including Feasibility Studies, and preparation of the Bidding Documents and Contracts (see above). One or more of the projects should have a value of at least US \$ 1, 000, 000 and should be in Africa. Knowledge of energy system planning, hydropower and solar will be an advantage.

(ii)	Title	Project Coordinator for package 1
	Years of Professional experience	15
	Specific Expertise	Must have directed Feasibility Studies for at least three (3) hydroelectric power projects, with at least one in Africa. The cost of each FS carried out should be at least 1.5 million USD and the involvement of the candidate as Project Manager must sum up to a minimum of 10 person-months.
(iii)	Title	ESIA Expert
	Years of Professional experience	15
	Specific Expertise	A professional with a University Degree in Environmental Management or equivalent qualifications and at least fifteen (15) years' experience in ESIA. The ESIA Expert shall have experience in the assessment of socio-environmental issues related to river basin developments with hydropower projects, seasonal reservoirs, and associated transmission lines. S/he conducted environmental impact assessments for at least five (5) dam projects of which at least two (2) involved the development of an ESMP, two (2) are located in Africa, and one two (2) include HV transmission lines. S/he shall have working knowledge of World Bank Safeguard Policies as well as local & international regulatory standards on environmental and resettlement issues.
(iv)	Title	Civil Engineer (Layouts /Dams)
	Years of Professional experience	15
	Specific Expertise	Work experience should be focused on pre-investment studies for major hydropower projects and reservoirs, including prefeasibility and feasibility studies. The candidate must have extensive experience in field works for the development of new projects, and in the preparation of general layouts of HPP of at least 50 MW, and the design of dams with large seasonal regulation. He/she must have worked in at least four (4) projects of a similar nature where such skills were utilized, of which at least one (1) is in Africa.
(v)	Title	Geologist / Geotechnical Engineer
	Years of Professional experience	15

	Specific Expertise		Participation in at least three (3) Feasibility Studies in same capacity. Experience should include the preparation and supervision of field investigations for large dams with seasonal storage of which at least one should be in Africa. Must demonstrate expertise in the design of embankment dams and dykes, as well as foundations.
(vi)	Title		Hydrotechnical Specialist (Hydrology/Hydro Modelling)
	Years of Professional experience		10
	Specific Expertise		
(vii)	Title		Ecologists
	Years of Professional experience		10
	Specific Expertise		A professional with a Degree in aquatic and terrestrial Biology or equivalent qualifications and at least ten (10) years' experience in biodiversity and habitat studies. Involved in at least three (3) watershed development projects of which at least two (2) with dams & seasonal reservoirs and two (2) which involved the identification of risks and hazards of the construction and operation of the project on fauna and flora biodiversity.
(viii)	Title		Senior Social specialist
	Years of Professional experience		10
	Specific Expertise		A professional with a University Degree in Social Sciences or equivalent qualifications and at least ten (10) years' experience in sociologic and/or anthropologic studies. S/he must have lead in the elaboration of RPs in this role on at least five (5) planning projects involving the development of watersheds of at least 1000 ha and/or the construction of hydroelectric dams and associated transmission lines, of which two (2) should be in Africa.
(ix)	Title		Mechanical Engineer
	Years of Professional experience		10
	Specific Expertise		Participation in at least three (3) feasibility studies as key staff responsible for the design of all mechanical equipments of a

		HPP, including turbine, gates, valves, penstocks etc.
(x)	Title	Electrical Engineer (Switchyard & Transmission)
	Years of Professional experience	10
	Specific Expertise	Electrical Engineer specialized in the design of high voltage (225 kV+) transmission lines and associated substations. Involved in at least two (2) power system studies of which one should be in Africa, and one for the interconnection of a HPP. The candidate should also be familiar with E&S guidelines and issues.
(xi)	Title	Control & Protection/SCADA Specialist
	Years of Professional experience	10
	Specific Expertise	Electrical Engineer involved as key staff for the design of control& protection and SCADA systems for at least three (3) projects for the development of a HPP of which at least one is in Africa.
(xii)	Title	Cost Estimator
	Years of Professional experience	10
	Specific Expertise	Demonstrated experience in cost estimating and construction planning at feasibility level for at least three (3) hydropower projects. The candidate must have good knowledge of conditions prevailing in Africa, and preferably in Liberia.
(xiii)	Title	Financial Analyst
	Years of Professional experience	10
	Specific Expertise	10 years of experience in power generation from various sources. Involved in at least two (2) hydroelectric projects in Africa. Good knowledge of International and regional E&S policies and WB Safeguards as they relate to hydro developments, as well as legal framework and property/land issues in Liberia and the region.

7. CONTRACT EXECUTION (PACKAGE 1)

7.1 WAPP Project Implementation Team

During the execution of its assignment, the Consultant shall work in close collaboration with WAPP's Project Implementation Team for the diligent delivery of the FS. Key resources which take an active part in the implementation of Liberia's TA program include:

- WAPP's Project Coordinator who has contractual authority, and makes sure that deadlines and budgets are respected;
- An Institutional Coordinator who works in the Liberian President's Delivery Unit (PDU) to increase the effectiveness of the delivery of the CLSG link (now under construction), and acts as a counterpart for WAPP project's team in Liberia to facilitate liaison with local stakeholders;
- The TA2 Consultant, who prepare and oversees Consultants' activities related to the TA Program, including capacity building and data management components;
- A Panel of Experts who brings their expertise to the team to ensure that technical aspects are all adequately covered and treated with due consideration in all steps of the program implementation, in particular with respect to Dam Safety and the integration of E&S aspects;
- World Bank representatives who ensure that available funds are utilized in the most profitable manner and in line with applicable financing agreements;
- Other IFIs who might show interest to support &/or finance the project.

In addition to assuming its supervisory role of the contracted Consultants, WAPP's team maintains close links with the LFT and the SC to ensure that their interests, needs, and priorities are clearly defined and taken into account in each phase of the pre-investment studies. It also supports Liberians Authorities in achieving higher level of autonomy through capacity building and institutional strengthening.

7.2 Liaison with Stakeholders

In addition to WAPP's implementation team and its designated representatives, the Consultant shall cooperate and liaise fully with other stakeholders in the course of its assignment, in particular (but not limited to):

- The Government of Liberia and in particular the Liberian Focal Team (LFT) that have been set up, together with the Ministry of Mines and Energy (MME), the Ministry of Finance and Development Planning and the Presidents Delivery Unit (PDU) energy team; Members of the LFT will stand as entry points for the Consultant in these institutions.
- The Liberia Electricity Corporation (LEC) and, the newly established Liberia Energy Regulatory Commission (LERC);
- Various agencies like the Liberia Hydrological Services (LHS), the Environmental Protection Agency (EPA), the Liberian Forestry Development Agency (FDA) the Liberia Institute of Statistics and Geo-Information Services (LISGIS), the Rural renewable Energy Agency (RREA) etc.;

- Consulting firms and/or Consultants contracted under the TA program as well as all parties working in the sector, including funding agencies.

7.3 Reporting

The Consultant will be accountable to the WAPP Secretary General, and will work closely with WAPP Secretariat's Planning, Investment Programming and Environmental Safeguard (PIPES) Department, WAPP's Project Coordinator for the World Bank Technical Assistance Program, and the Consultant in charge of the TA2.

The WAPP considers communication of utmost importance. Liaison and coordination of all stakeholders must be duly taken into account for the successful completion of the mandate. To this effect, the Consultant shall hold regular (twice a month) updates/briefings/video conferences with the WAPP and other stakeholders on works in progress, problems encountered, and achievements.

In addition, the Consultant shall pay attention to:

- Providing draft copies of Technical Notes and/or Reports to key stakeholders at least two (2) weeks in advance of the validation workshop(s);
- Preparing presentations to be given at the validation workshop(s) and circulating in advance the material to be presented;
- Timely respond to comments received from key stakeholders, explaining how their concerns will be treated and/or integrated into the studies;
- Reporting diligently to the WAPP any unusual event outside his control, which may compromise the progress of the studies.

7.4 WAPP Contribution and Consultant Expenses

The WAPP will provide a focal point for the project at the strategic level in the PDU and relevant Ministries, and work in close collaboration with the Consultant to coordinate inputs from Liberians Authorities. To this effect, it is worth noting that the WAPP is in the process of setting up a project office in Monrovia where the Institutional Coordinator and the TA2 Consultants will be based when in Liberia. For the Consultant, the project office can serve as a meeting place (with meeting room and dial-in facilities) to exchange information with the Consultant in charge of the TA2 as well as local stakeholders. It will house available documentation and reference material required for the performance of the services including the Sharefile database.

The WAPP shall provide documents, where available, and grant access to the Sharefile and the database of reference material for the performance of the services at the beginning of the Consultant's mandate.

The Consultant shall provide his own office and computer facilities and bear the cost of printing/copying in the execution of the services. It shall also provide transportation (vehicles and drivers) as well as plant, equipment and tools needed to undertake the study.

Where required, the Liberian Authorities (and the LFT) shall provide assistance in obtaining work permits and visas for the Consultant's staff travelling in Liberia. They shall also provide assistance in facilitating access to the sites, being understood that the cost of vehicles and

insurances are to be borne by the Consultant. All other expenses shall be accounted for in the Consultant budget. The assignment being financed by the World Bank, the relevant World Bank requirements shall be applicable in this regard.

7.5 Schedule of deliverables for Package 1 - Hydro

The services are expected to be performed over a **14-month period** with the proposed following timeline for the submission of key deliverables. The Consultant is invited to submit a detailed calendar which to cover the schedules in Table 1 below.

Table 2: Schedule for the implementation of the feasibility and ESIA studies (Package 1)

Key Milestones	Dates(Weeks)
Agreed date for the start of the project / access to Sharefile & LiDAR Data	So
Kickoff Meeting	So + 2
Draft Inception Report submitted	So + 6
Validation workshop on the Draft Inception Report	So + 8
Final Inception Report submitted	So + 10
Draft Scoping Report submitted including TOR for the ESIA	So +18
Validation workshop on Draft Scoping Report: Validation of the ToR for the preliminary ESIA and update of work plan	So + 20
Draft Data & Design Criteria Report submitted including GDR and updated general conceptual design	So + 22
Final Scoping Report submitted	So + 23
Validation workshop on - Confirmation of the retained general concept design for the hydropower PIP and optimization of key characteristics (dam height/FSL and design flow/installed capacity) - Draft Data & Design Criteria Report - Final Scoping Report	So + 24
ToR for the ESIA submitted to the Authority responsible for the CEC	So + 24
Training at the Consultant's Head Office	So+26/ So+27
Capacity Building Report	So + 28
Final Data & Design Report including GDR submitted	So + 28
Draft Preliminary ESIA Report (incl. transmission) submitted	So + 32
Workshop to validate - Draft Preliminary ESIA Report - Proposed workplan for Phase C of the E&S studies	So + 34
Final Preliminary ESIA Reports submitted	So + 36
Draft Technical and Financial Feasibility Study Report submitted	So + 44
Workshop to validate - Draft T&E Feasibility Study Report	So + 46
Final T&E Feasibility Study Report	So + 47
1 st Draft Detailed/Updated E&S FS Reports incl. ESIA, RP, ESMP & ESCP submitted for comments	So + 47
1 st Meeting with International Donors & Lenders	So + 49

Workshop to review 1 st Draft Detailed/Updated E&S FS Reports	So + 50
Submission of PTF Comments	So + 52
2 nd Draft Detailed/Updated E&S FS Reports incl. ESIA RP, ESMP & ESCP submitted to the Authority responsible of the CEC for validation	So + 54
Workshop to validate 2nd Draft Detailed/Updated ESIA Report	So + 56
Final E&S Reports submitted to obtain CEC	So + 57
Submission of: - Draft Non-technical Summary - Draft Plan for the Public Information & Awareness Campaign - Capacity Building / Institutional Strengthening training plan (2-week workshop)	One week after receiving CEC
Submission of Final Non-technical Report	CEC+2
Training in Consultant's Office	CEC+3/4
Submission of Draft & Final Training Report	CEC +5/+7
Submission of Draft & Final Report for the Public Information & Awareness Campaign	CEC +8/+10

NB: This Terms of Reference and schedule is still being worked on by the Team.

8. SCOPE OF WORK FOR PACKAGE 2 (SOLAR)

The Consultant shall provide services in accordance with internationally recognized practices. The Consultant will also provide its services independently, in accordance with usual international standards and the laws and regulations in force in Liberia and other countries involved in the project.

In order to facilitate planning of the resources, activities to be performed by each independent team of experts have been described separately below for i) the bankable technical and economic FS, and ii) the detailed E&S studies.

Hereafter the term “Solar Park” indifferently designates the set of several PV solar plants of utility scale or one of them.

8.1 Feasibility Studies

In support of the detailed objectives, the activities and expected results of the project that should be delivered by the Consultant must cover the scope below but not limited to:

- Ensure the collection of data on all elements to be considered for the development, construction and operation of regional renewable energy source in Liberia;
- Develop a map with the different selection criteria represented - cadaster, environmental sensitive areas, residential areas (hamlets / villages etc.), geotechnical peculiarities of the area, and solar irradiation nearby connection substation;
- Organize discussions with the Governments and LEC on the choice of Solar Park close to substation;
- Identify parcels of land that could be used for the Solar Park and confirm with the ESIA expert, and local and national governments, the feasibility and availability of the selected parcels of land;
- Validate with LEC and /or CLSG the configuration of the substation for the connection of a total of 90 MWp of utility scale solar plants with battery storage;
- Perform a load flow study and voltage stability in order to analyse the impacts of solar park generation on the stability of the national grid (LEC) and/or on CLSG network. This study

will be carried out on a static and dynamic model of the network and will make it possible to ensure the feasibility of the evacuation and the connection to the network as well as an evaluation of the investments necessary for the connection (line and substation) and the possible reinforcement of the network;

- Finalize the selection of land for 90 MWp and line route/right of way for transmission/distribution line;
- Perform a thorough analysis of the solar potential of the site (after selection of the land), with a Solar GIS **data** analysis;
- Determine the technical feasibility of the Solar Park and technical design of a level of detail corresponding to the feasibility stage;
- Confirm the technological solution and the recommended Solar Park configuration and phasing with a storage system, with a greater focus on storage size. The Consultant will have to confirm or suggest the optimal phasing with the different steps to reach 90 MWp;
- Finalize the optimization for battery storage with Solar Park and its phasing;
- Finalize the transient stability study with the technical solution selected to ensure Solar Park integration into the network;
- Develop a simulation of the complete solar and battery system using the PVSyst software after selecting the technology. The PVSyst shall be added as an appendix to the Final Report;
- Determine the viability of the Solar Park by developing a financial analysis and an economic analysis and a risk analysis;
- Determine the potential of solar export to neighboring countries via CLSG network;
- Prepare and submit Final Report that will include the following points
 - Overview of the Solar Park: description, local and national government support, solar potential of the site, environmental and social benefits;
 - Site evaluation: location of the site, its current use, its acquisition status, technical evaluation (topographical, geological, climatological and hydrological, flood risk), social assessment (demographic, economic and social regional development);
 - Network Integration Study: Description of installed capacity, current and future energy demand, power grid and integration study of solar park in the grid;
 - Description of the technical solution: description of the system and its configuration, description of its production with the use of batteries and phasing;
 - Economic and financial analysis: Levelized Cost of Energy (LCOE), net present value (NPV) and internal rate of return (IRR) according to different technical and financial setup scenarios;
 - Risk analysis.
- Define required capacity building of staff of the Ministry of Energy, Secretary General of WAPP, LEC and other operators concerned through a program of assistance for the preparation of the Solar Park including all technical, economic and financial;
- Conduct a diagnosis of the procedures and means used for management of generation park to meet the demand and subsequently evaluate the investments needed to create a national dispatching center;
- Review the electric grid defense planning;
- Specify application for forecasting the PV power plant generation a day ahead (D+1) and three hours ahead (H+3).

8.1.1 Activity A: Data Collection and Review

The main purpose of the data collection is to determine (i) the physical and socio-environmental data of the power plant areas, (ii) the connection conditions with the substation, (iii) international data relevant for the analysis of options technical characteristics of the regional power plant, their sizing and costs and (iv) collect from LEC the characteristics of the existing and planned network with future investments in the areas.

In this context, the Consultant will collect, review and compile all relevant technical, economic and cost data on Liberia's transmission networks as well as existing and planned exchanges with neighboring countries, which are essential for the conduct of the study.

Regarding the physical and socio-environmental aspect, the Consultant will collect among other data:

- Site characteristics: location and contact information, area, shape of the land, topography, geotechnical and seismic data, close elevations may create shadows (such as hills, trees and building), cadaster, environmental sensitive areas, and zones of houses;
- Information concerning the vicinity of the sites: presence of nearby water (surface water and groundwater, available flow), roads and access roads, flood areas, telecommunication coverage (mobile telephone - network), housing and economic activities, land close to an existing HT / MT substation or that can be realized at short and medium term;
- Geotechnical particularities of the area (topographical, geological, flood risk) An outline of the types and methods of geotechnical investigations of relevance to the sites of the solar plants is provided in Annex C.
- Solar irradiation;
- Weather Conditions such as sunlight, temperature, humidity, wind speed and prevailing directions, the level of air pollution, etc. These data must be used to determine the daily, monthly or seasonal variations of these parameters and establish the corresponding typical curves, as well as potential outliers. The existence of a nearby weather station will be verified to validate this data;
- Specific meteorological phenomena and their impact (for example, the harmattan). The Consultant will have to estimate the deposit of dust or sand on the installations for both sites and analyze the corresponding impact on the performance and estimate the maintenance cost for the optimal performance.

These data will be completed during visits to these sites. In the event that some data is not available, the Consultant will use common sense, based on international practice, to provide replacement data. However, the Consultant will provide a rationale for the selection of data in the data report.

The Consultant will create a map with the different selection criteria within a radius of around 10km from substation area.

WAPP network data in a GIS format will be made available to the Consultant. The characteristics of all the potential sites will be included in the data report. These characteristics will also be provided in a GIS format approved by the WAPP.

The interconnection analyzes will define the rules for connection and operation of the Solar Park, the design of the solar park substation, the capacity of the interconnection transmission line to the substation and its possible extension in order to specify its main technical characteristics and optimize its operation. The data will cover, but not be limited to:

- Expansion plans for the generation and transport system;
- Current network operating conditions;

- Single-line diagrams, site plans, installation diagrams, protection plans, types of circuit-breakers and their ratings (nominal values) of substations in the interconnected network near preferential sites;
- The conditions and connection requirements including all the technical limits applicable to the connections of solar power plants connected to the Medium and/or High Voltage LEC networks.

8.1.2 Activity B: Determination of the site(s)

✓ Preliminary Study of Network Integration

A preliminary study of integration into the network will support the finalization of the selection of the site. A complete stability study will be developed under Phase 2 below.

The integration study (load flow and voltage plan study) in the network will be done for a 90 MWp Solar Park in one or more sites with between 50 and 100 MWh of battery.

The analysis of the impacts of the production of the solar parks on the stability of the network will be carried out on a static and dynamic modeling of the network. This modeling of the national network includes existing generators, lines and substations. It allows technical analysis point of view of power flow, voltage profile, short-circuit currents and protection, harmonic and transient stability.

Phase 1: Modeling

This phase focuses on the modeling of the network for the stability studies. The studies will consider the commissioning of the different phases of the solar park, with storage. This model will detail the transmission network with the CLSG interconnection. The distribution networks will be detailed in the candidate area near the substation to accommodate the solar parks.

The consultant will collect information from LEC and local stakeholders to take into account the existing generation and network as well as the planned new infrastructure projects. The following minimum data will be collected:

- Data on the evolution of the load of the network and in particular on the distribution networks near the targeted sites;
- Data on the evolution of the export-import contract via CLSG interconnection with neighboring countries;
- Characteristics of the generation park (existing and planned) and also the LEC substations.

On this basis, the Consultant will prepare:

- Preparation of collection sheet on generation, transmission data, demand evolution;
- Planned power plants and transmission lines;
- Assumption work for missing data;
- Synthesis of input data in a study report;
- Modeling of the perimeter network described above, integrating the planned solar park and others PV generation and future LEC projects and interconnections;
- Description of models and their validation based on calculations of current baseline scenario.

Phase 2: Load flow study and voltage stability

This fundamental calculation will define the load flow by determining the active and reactive powers passing through each structure, the voltage plan in all the nodes of the network for seasonal or annual peak load or during dip load.

These load flow calculations will be performed both in the normal state of network operation and in the disturbed state following an incident, rule "n-1". The load flow study for static operation will address the following questions:

- The study of the coupling / decoupling of plants;
- Load flow calculations of the entire network with and without solar generation;
- Consideration of network incidents (n-1);

These calculations will be made without solar power station (reference) and with the phased addition of solar parks. Absorption capacities are verified by the following criteria:

- Absence of thermal constraints (mainly on transmission lines or transformers rating in substations) and definition of possible reinforcements to be provided for the connection;
- Failure to exceed the voltage criteria. In the case of the distribution network and the connection within a loop in particular, it is necessary to control the voltage rise along the transmission lines during maximum solar generation and for low local consumption;

In the case of the transport network, the influence of solar parks of significant power on the flows in the transmission lines and CLSG interconnections with neighboring countries (Côte d'Ivoire-Sierra Leone – Guinea) will be studied to define the principles of voltage adjustment (regulated reactive power).

This phase includes the following tasks:

- Definition of the configurations and extreme scenarios of the load flow / voltage plan depending on the number of generating sets in service, the state of the CLSG interconnections, the state of the load, etc;
- Simulations of N-1 approach scenarios with the objective of validating the load flow and voltage plan for extreme cases considering:
 - the conformity requirements imposed by LEC or to be defined (voltage level, line load, etc.);
 - the need of reactive power for the operation of the inverters;
 - The wheeling capacity of LEC network.
- Specific analysis of the constructive capacities to require from the point of view of reactive power generation;
- Calculation of losses in different situations.

The expected results of this study are:

- i) The technical feasibility of the interconnection of the solar park (or the individual solar plant(s)) on the preselected substation and integration to LEC's network;
- ii) The necessary investments for the interconnection (solar park substation, transmission lines and extension to the interconnection substation) and the possible reinforcement / extension of the LEC network;
- iii) The most appropriate phasing for solar park with the associated storage;

✓ **Identification of Potential Land & Sites**

The Consultant will have to identify several parcels of land larger than 135 hectares around the substation(s) according to a review of the cadaster (land ownership), environmental sensitive areas, residential areas, geotechnical peculiarities of the area, and solar irradiation.

The parcels selected must meet the following criteria:

- (i) Be located within a 10 to 15 km radius of the substation;
- (ii) Have an overall area of at least 135 hectares that can be divided into two (a minimum of 70 hectares each);

- (iii) Not be in a sensitive environmental zone or in an area with geotechnical and geological properties that are not compatible with the development of a solar park;
- (iv) Minimize the local population to relocate for the implementation of the solar park and the transmission line interconnection to the substation; and
- (v) Have excellent solar irradiation.
- (vi) Easy to access

The analysis will include the environmental sustainability of the sites in collaboration with the consultant in charge of the environmental study, the possibilities of connection to the interconnected network LEC-CLSG in the substation, the location of the loads and the capacity of transit of the network, the possibilities to export to the countries of the sub region with CLSG interconnection.

Discussions with local governments should be held to ensure the availability of land and their potential allocation for a Solar Park.

Options for floating solar could also be considered at Mount Coffee HPP (cf. existing Optimization Study and Prefeasibility) and future hydro SP2 site identified as part of the PIP

✓ **Selection of the Final Site(s)**

The Consultant will present the results of the preliminary study of integration and the identification of the parcels of land and will develop an analysis of the potential sites near the substation presenting their potential to develop the Solar Park.

When the final land will be selected on one approved site, the consultant will also propose the routing of the transmission line for the interconnection to the substation

The Consultant should highlight the potential risks of each site and will work closely with the legal teams of the various stakeholders and the consultant in charge of the ESIA concerning safeguard clauses and verification of the land.

✓ **Solar radiation measurement**

In order to complete and validate the data already available on solar radiation in Liberia, a solar radiation measurement campaign will be carried out on the selected sites.

This measurement campaign will be initiated by WAPP separately as soon as possible. Measurements should make it possible to supplement the data available from satellite surveys or measurements made at existing weather stations, in order to specify the most appropriate technology and the selection of recommended sites.

The data of measurements will be available for the Consultant who can use them to optimize the dimensioning of installations and refine the technical-economic analysis and the design of solar park generation.

The necessary readings and parameter records will be taken for a minimum period of one year after commissioning.

8.1.3 Activity C: Feasibility study/Preliminary Technical Design

The services to be provided by the Consultant in the context of this study must cover all the preliminary technical studies that will confirm the technical feasibility and establish the operational specifications for the installations, equipment and works of the solar park. The preliminary design will:

- Define the operational specifications and the main design criteria for the plant and the associated substation of the solar park;

- Define the specifications and the main design criteria of the interconnection transmission line, the extension of the selected substations and the reinforcement / extension of the LEC network;
- Analyze alternatives of energy storage;
- Propose optimization for the phasing of the realization of the solar park(s);
- Examine the operation and maintenance requirements and evaluate the consequences of the design on LEC equipment;

The Consultant will identify the key issues that the study should consider in order to ensure that the project is economically viable (based on its total discounted cost over the minimum life cycle).

The Consultant will define:

- (i) Delimitation of the proposed area for the installation of the PV panels and the solar park;
- (ii) Technical conditions including among others:
 - Engineering conditions taking into account the relevant international, national and electricity company standards
 - Ambient conditions taking into account climatic and environmental data such as: air quality (density, aerosols), wind speed and direction (at a height of 3 m), temperature, hygrometry, pollution level, geotechnical data, seismic data, surface and groundwater, taking into account the seasonal variations of these conditions and their medium and long-term
- (iii) Technical requirements including among others:
 - The dimensioning of panel control and DC / AC Inverters technologies
 - The sizing of the storage system
 - The SCADA system

The choice of technologies proposed should take care to minimize the problems of operation, maintenance or repair of equipment. The technologies should be already proven from an industrial point of view, having been continuously exploited for a minimum of 5 years (with the exception of storage where the main criterion will be linked to its relevance for the specified use).

The Consultant will propose a limited number of operating options to be examined (maximum 3) with the agreement of the Client. The analysis of the alternatives and operating options to be examined will be based on a limited number of realistic scenarios for the development of national networks, international interconnections and the generation capability planned in Liberia and in the region.

These scenarios should be based on the development plans proposed by the WAPP and the Liberia Government and be validated by all stakeholders in the study.

8.1.4 Activity D: Transient Stability Study of the Network for Finalized Technology

The consultant should develop a transient stability study to confirm the results of the preliminary network study developed in Phase2. This study will cover the solar park with the interconnection to the substation(s) and the rest of the LEC's network in order to the network improvements: substations, SCADA systems, dispatching and possibly required communications.

This study will analyze the impact and phasing of the solar park on the dynamic stability of its entire network in order, among other things, to verify the impact of intermittent high-power solar generation in relation to the total power of the generating leading to low inertia and higher sensitivity on frequency fluctuation during an incident.

The study will define the solar limit penetration rate for which any excess can lead to excessive frequency variations. The following points will be refined:

- Define the level of spinning reserves, national or regional via the CLSG interconnections to maximize the share of solar generation and evaluate the minimum share that must be guaranteed on these interconnections.
- Calculate the risk of curtailment, load shedding, and the behavior of the network during frequency fluctuation in case of incident.

The proposed dynamic study will aim to analyze the transient behavior of the electrical system studied during disturbances of high amplitude (loss of generation due to solar intermittency, but also interconnection or thermal power plants) during peak load or other penalizing conditions.

The initial state of the network is the one determined by the static study in peak load situation or in penalizing configurations such as non-interconnected and low-load network situations where solar power plants account for a larger share of total output (strong penetration rate).

This involves verifying that the solar park does not lead to destabilizing the frequency and the voltage in a minimal configuration with the risk of activation of the protections and load shedding.

The most interesting cases being among others:

- clouds passing with reduced production on the solar parks (80% in a few tens of seconds) and the rise of power that can follow.
- The loss of a plant or a significant group (not solar) and the reaction given the new rotating reserve.
- Loss of loaded line (especially interconnection).

From this approach the results are analyzed for (i) the determination of limits, special specifications on plant equipment or reinforcement to be provided (ii) suggestions for an optimal dispatching that define the activation rules as merit order/pro rata of the sources and thermal / hydraulic reserve to be planned and the management of spinning reserves (availability, operational procedures and settings).

The tools and methods put in place will be detailed in a study report.

Dynamic analysis involves a dynamic modeling of existing generators, this modeling is conducted on the basis of collected data supplemented by typical penalizing assumptions where appropriate.

The Consultant will work in coordination with the LEC planning team in charge of the Liberian network development to analyze the impacts of solar park integration into the network.

✓ **Integration study**

The Consultant will perform the necessary simulations to analyze the integration modalities in the network and the constraints generated. This study will confirm the maximum level of solar production penetration and the corresponding implementation constraints (maximum size of plants, means of compensation to **implement**, phasing, storage size ...).

This integration study should determine the impacts of solar generation, the installed capacity limits induced and the investments needed to ensure the stability and operation of the LEC and CLSG networks within the WAPP.

The Consultant will carry out all the simulations necessary for the examination of the impact of the solar park on the operation of the system and the dimensioning of the equipment of the plant. The analyzes will include at a minimum:

- Power transits calculations in order to establish the potential HV network reinforcement needs related to the presence of the solar park, including the possible needs in reactive compensation;
- Calculation of network losses for different technological alternatives and operating options;

- Calculation of the level of storage necessary to limit the impact of the regional power plant on the national reserve and to limit variations in generation. The storage should be analyzed with the 2 main services for the systems: frequency regulation and electric energy time-shift to peak load;
- Voltage regulation - Reactive compensation needs;
- Frequency regulation - Impact on the required spinning reserve (national or regional) or battery storage;
- Specific protections associated of the solar park operationalization;
- Control and supervision: Required information to be sent to the future national and regional dispatch center and the regional Information and Coordination Center (ICC);

The Consultant will ensure compliance with the technical limits applicable to the connection of solar park to the substation(s). The technical limits mean the limits and technical constraints that a photovoltaic power station must meet in order to be able to access the LEC and CLSG network. The consultant will check the requirements (non-exhaustive list) in terms of:

- Power Quality System Control in normal an abnormal range;
- Frequency control and operating range;
- Voltage Control (Voltage and Quality);
- Reactive Power / Active Power;
- Behavior during abnormal voltage conditions (Harmonics, Flicker, Imbalance);
- Protection System;
- Information exchange (Communication and Control);
- Black Start (Specific requirements);
- Voltage level to be maintained at different input conditions;
- Frequency and Voltage range (LVRT, HVRT) / Fault-ride through capability;
- Contribution to the system inertia (fast frequency reserve);
- Provide particular reserve margin for Load Frequency Control (ramp reserve);
- Flexible contribution to reactive power control modes (voltage control mode, reactive power control mode and power factor control mode);
- Services that address the quality of the supply (damping actions);
- Active and Reactive Power (Characteristics and specifications of the controllers);
- Characteristics, power ratings, and operational requirements of the converter stations;
- Timing requirements for the decision-making and taking the necessary actions;
- Protection system for variable operating conditions;
- Generation Forecasting;

✓ **Solar Park Interconnection design**

The Consultant will carry out the engineering studies related to solar parks interconnection that include the following infrastructures: power substation of the solar park, interconnection transmission line to the substation(s) and/or its extension/reinforcement. Engineering studies will specify the preliminary design and give all the required inputs to verify the technical and economic feasibility. The studies will cover the components below at least:

- The study of the line routing for the interconnection lines;
- Engineering design of transmission lines and substations and the associated equipment (battery, compensation, etc);
- Preparation of single line and auxiliary diagrams and all the required drawings for transmission lines and substations;
- Summary estimates of projects for works and installation.

The engineering design of the transmission lines and substations will be done according to the Standards in Liberia and/or international Standards. The Consultant will approach LEC to ensure that these requirements are considered. The following conditions and requirements must be respected.

(i) Technical conditions but not limited to:

- Technical conditions taking into account relevant international and national standards and those applicable in LEC;
- Site Conditions taking into account the climatic and environmental data such as air quality (density, aerosols), speed and wind direction, temperature, humidity, pollution levels, geotechnical, seismic, surface water and groundwater, etc., taking into account seasonal variations of these conditions
- Network conditions taking into account the stability of frequency and voltage, eligible disturbances (harmonics, flicker, etc), The short-circuit power, the risk of congestion, the protection plan, keeping the levels short-circuiting of equipment, breaking capacity of circuit breakers, grounding networks and communication systems including optical fiber, SCADA system and their compatibilities etc.

(ii) Technical requirements but not limited to:

- Wheeling capacity under given conditions (in normal or degraded system conditions) taking into account the voltage regulation, the reactive power production;
- Coupling capacity taking into account the adjustment voltage, reactive losses;
- Operational reliability taking into account the availability and the maintenance;
- Environmental aspects from electrical noise, visual impact, acoustic noise, the influence of electric and magnetic field,
- Safety Constraints during the implementation phases and operation;

✓ **Control-command and SCADA**

The Consultant shall review existing and planned control and communication systems including Remote protection, Remote control, Supervisory Control and Data Acquisition (" SCADA").

The Consultant will propose, where appropriate, the extension of these systems to take into account the solar plant(s). If they are unsuitable, the Consultant will make an appropriate proposal.

Any new extension proposed will be digital type. The Consultant will also need to take into account, as appropriate, the ongoing developments of the WAPP Information and Coordination Center (" ICC").

The Consultant will ensure that any proposed communication and SCADA systems are compatible with existing and planned systems in the short and medium term. The use of an optical fiber link as the main communication channel will have to be considered. A back-up system will also be provided, as appropriate via a PLC link.

The Consultant will recommend the equipment and tools needed for the estimation of the solar generation in real time and the forecasting in the short and medium term. The data collected by the meteorological equipment installed at the site (including solar radiation measurements) should be able to be transmitted to the national control center and the ICC.

8.1.5 Activity E: Generation and Economic Viability Studies

These studies must be conducted in coordination with the studies for the hydro package, the PIP program being considered as an integrated power generation system.

✓ **Power Generation study**

The Consultant will carry out a thorough analysis of the solar potential of the site after selection of the land, with a SolarGIS data analysis reviewed according to the ground data of the 2IE which will be shared with the Consultant.

With the selection of the technical design, the Consultant will produce a generation simulation on a software such as PVsyst to allow the use of this generation simulation data in the financial analysis.

✓ **Study of the export to the neighboring Countries**

Electricity from the Solar Park will be sold by the IPP to LEC. As the Solar Park is a regional project under the WAPP, part of the electricity generated by the Solar Park could be exported to neighboring countries. This will be of particular relevance during the wet season and until domestic demand fully absorbs the MCHPP generation.

In the framework of the formulation of tariff proposals, the Consultant (in conjunction with the Strategic Transaction Advisor [STA]) will also have to carry out consultations with the ECOWAS Regional Electricity Regulatory Authority ("ERERA"), as well as with the authority in charge of the regulation of electricity sector in Liberia (LERC) and in neighboring countries.

The Consultant will have to work with the members of the WAPP to assess their interest in the Solar Park, their potential use of this electricity (i.e. daytime need, for their evening peak etc.) and the optimum price for the Solar Park that they would have identified.

✓ **Economic and Financial Studies**

The objectives are to determine the economic and financial viability of the Solar Park, and provide relevant and sufficient justifications for its realization.

The Consultant will also have to carry out the analyzes and justify in detail a development plan for the implementation and operation of the Solar Park after its completion.

The consultant will need to evaluate and compare project costs and benefits against alternative scenarios (local and / or imported thermal generation and other renewable options) to determine the economic viability of the project.

The benefits from the Solar Park will be measured using the concept of comparing the best scenarios "with the project" and "without the project". The consultant will calculate the cost of avoiding the ton of CO₂. The economic benefits of reducing CO₂ emissions compared to an "equivalent" thermal power plant will be quantified in terms of volume and value based on reasonable assumptions and acceptable to stakeholders. Non-quantifiable benefits such as reducing local pollution will be examined

The Consultant will calculate among other indices the Net Present Value ("NPV"), the Financial Rate of Return and the Internal Economic Rate of Return ("IERR") of the project and explain in detail the results.

The main basis for the calculation of cost benefits will be based on the electricity capacity. This calculation must be carried out with the P90 values (PVsyst) and must consider all the losses of the installation as well as the efficiency of the different technical parts of solar field, inverters, electrical storage if necessary, etc. for the solar park.

The Consultant will propose the optimum financial model and simulate its bankability using the usual financial ratios. The financial analysis should propose and evaluate different project tariffs and institutional structures, as well as financial arrangements that would make the project financially viable and guarantee an acceptable return on investment for project completion. The inputs used will be discussed upstream with the Liberian Authorities.

Tariff proposals will be based on a regional market analysis and will also need to propose additional measures to ensure the financial viability and sustainability of the project. To this end, the consultant will determine the financing gap of the project taking into account the difference between the average price of electricity and the cost of the Solar Park over the life of the facilities.

The economic and financial studies will include a sensitivity analysis on parameters affecting the viability of the project, among others, load forecasting, generation costs, plans for expansion of generation and transmission, investment costs, the mode of development and operation envisaged, delays in the implementation of the project, and economic parameters.

✓ **Risk studies**

The Consultant will identify and assess the different potential risks (Political and Governance, Macroeconomic, Sector Strategies and Policies, Technical Design and Construction, Institutional, Implementation, Fiduciary, Environment and Social, and others perceived Risk to Project Sustainability). For each risk, the Consultant will recommend appropriate measures to prevent failure or at least decrease the profitability of the project, or justify the main objectives of the project, as regards delays, costs and technical contingencies; this during the implementation and implementation phase, as well as during the operational phase.

This study will cover the following services:

- (i) Identification of potential risks and classification of these risks according to:
 - Relationship with the project: internal or external;
 - Nature: political, economic, institutional, legal, technical, organizational, financial risks, etc.;
 - Origin: Subcontractors, Public authorities, Donors, Consumers, etc.;
 - Impact: cost overruns, non-compliance with deadlines and technical specifications, operational underperformance;
- (ii) Quantitative risk assessment to assess the direct and indirect impacts on project objectives and the likelihood of their occurrence. This evaluation can be supplemented by a qualitative analysis.
- (iii) Proposal for measures to prevent risks and reduce their impacts, any contingency plan scenarios, and a definition of the duties and responsibilities of risk management.

The Consultant will propose an appropriate strategy for the implementation of the Solar Park which mitigates the identified risks and foresees contingency scenarios that consider the complete execution of the project.

8.1.6 Activity F: Evaluation of Investments required for the creation of the National Dispatch Center

It is important for Liberia to have a high-performance National Dispatch Center to control the intermittency of various solar power plants by ensuring the stability of the network and the quality of the electrical service. The planned development of solar generation must therefore be accompanied by the creation of a dispatching center with a view to:

- Increase the RES penetration while considering the integration capabilities on the grid without jeopardizing its overall stability;

- Operation and management of the network with the management of the intermittency of solar generation;
- Reduce the technical and commercial loss;

In order to meet these objectives, in addition to the usual network rehabilitation and reinforcement work, the implementation of "smart" grid systems (real-time operation, automation of the primary reserve and frequency adjustment, forecasting in solar output, etc.) in addition to traditional SCADA must be seen as a development priority.

The Consultant will have to undertake besides the technical requirement (hardware equipment, software, etc.), an evaluation of the investment required for the creation of the National Dispatch Center and the operational rules to establish an evaluation of capacity building investments (research, training) to ensure the integration and forecasting of solar generation.

The Consultant will conduct field visits to ascertain the current state of the electrical system to gather all the data required for his mission.

These visits will enable him to analyze all available documents in order to understand and analyze the following points:

- Description of the current and future electrical system on the operating conditions of the plant and the operational process;
- Evaluation of the impact of solar power plants on operational constraints for the tele-control of the network;
- Analysis and proposal for improvement of the new operation rules to be adopted;
- Proposal of methods for analyzing events and making good decisions for the integration of solar power plants;
- Proposal for the creation of the dispatch center including the implementation of (i) WAMS (Wide Area Measurement System) to measure in real time the level of stability of the network (ii) of an operating station dedicated to the management of renewable energies (ii) curtailment system for solar generation taking into account the financial implications of the obligation in the PPA of IPP (iv) Integration of remote management systems for solar power plants (v) implementation tools (software to study the integration of VRE on networks) and procedures (vi) telecom interface / integration of all data between dispatch center and PV plants;
- Establishment of empowerment of RES forecasting and reduction of deviations from generation programs. The Consultant will have to make sure that this forecasting system, as well as the information exchanges with the renewable energy production parks, will allow the operators the optimal control of the electrical system;
- Identification of gaps and suggestions for improvement in terms of studies, investments and training;
- Evaluation and definition of the capacity building for the dispatchers to ensure the operations and ideal dispatching of the RES power plants;
- Suggest the optimal configuration (creation of dispatching with a post dedicated to renewable energy or creating a dedicated dispatching renewable energy) to operate in real-time renewable energy source ("RES") in Liberia, considering the other projects currently planned. The Consultant will recommend hardware, software and tools needed for real-time operation based on Smart Grid technology.

The Consultant will submit in his offer a detailed methodology of his approach to this task.

Following these visits and the critical examination of the situation thus established, he would establish the technical possibilities of installing modern systems equipped with the tools required to increase the safety and reliability of the supply of electricity. These analyzes will enable it to define the financing required in terms of investment, study and training for the creation of the dispatch center to ensure the integration of solar generation. The Consultant will establish a financial estimate for these 3 components by prioritizing the investments for a realistic upgrade of the solutions to be implemented.

The report on this task will include two parts:

- A diagnosis of the operation and management of the transport network (source substations, automation, control-command, dispatching, information system) to evaluate "smart grid projects that will allow a rapid improvement of the quality of service and facilitate the integration of renewable energies into existing and future network;
- An assessment of the investment needs on the transmission network for conventional works or equipment (transmission line reinforcement / extension, installation of HV substations, GIS, etc.) as well as on intelligent systems to improve its performance. reduce technical and commercial losses, facilitate its management and allow the integration of a large proportion of intermittent renewable energies.

8.1.7 Activity G: Capacity Building

The Consultant's services will include knowledge transfer and training. Trainings should be implemented as much as possible locally using existing facilities including at Mount Coffee HPP. The transfer of knowledge will be done in the field.

To this end, the Consultant will have to integrate the counterparts designated by the respective beneficiaries in his teams and work closely with them during the different phases of the study. Training in the Consultant's premises will be provided after receipt of the Feasibility Study Report by the WAPP General, the LFT Secretariat and the Ministry of Energy (MME). In addition to capacity building in the areas covered by the study, this training should allow local experts to better understand the content of the report and give their initial response. It will also be an opportunity for the Consultant to obtain clarifications or clarifications on the expectations of the beneficiaries. This training will be in English. The Consultant's proposal must include the details of the training program. The Consultant will support all client costs associated with the organization of the training of experts in the Consultant's premises. The training should last at least one week. The Consultant's proposal should also contain the approach and methodology that he intends to use to achieve real knowledge transfer to the counterparts. The training program will focus on, among other things:

- The choice of design criteria, the organization of the measurement campaign, the site survey and the design of the plant, including the choice of equipment, the specifications, as well as the software / models used;
- The model and methodology used for the technical analysis of the plant and networks and the software / models used. Project studies will be explained in detail during the training program;
- The model and methodology used to conduct economic and financial studies. Studies on the project should be explained in detail during the training program;

Therefore, the proposal should also include the costs associated with the full assignment to the WAPP General Secretariat and to each of the project beneficiaries, the hardware and the various software / models used in the technical, economic and financial studies.

At the end of the training, the Consultant will have to submit a detailed report on the training provided.

8.2 Environmental and Social Impact Study

The E&S study scope addresses the World Bank Environmental and Social Framework Guidelines as they will relate to this project and will be carried out in three (3) distinct phases in harmonization and complementarity with the feasibility study. To do this, it will begin upon receipt of the draft technical feasibility report.

A. In the First Phase:

- (i) According to the requirements of the World Bank's OP 4.01 on Environmental Assessment, and since this is a Category B project, well-advertised consultation meetings are required. The Consultant will present, during the inception meeting, its methodology, strategies, mobilized resources, planned activities and the data needed in its draft Inception Report. This process will provide a basis for reviewing the issues that should be considered in the preliminary ESIA. The changes needed in terms of the project environmental and social mitigation plan and how this plan will be implemented will be discussed. The process, at the meeting, will allow the Consultant to provide a more concrete response to comments, and how they will be incorporated in the study.

B. In the Second Phase:

- (i) According to these preliminary results of the integration study and field identification, the feasibility study Consultant with the Client will select the optimal site for the solar park and the line routing from the transmission line to Soma's substation. The ESIA study will cover the site(s), the stations (if required) and the line routing for electricity evacuation (this step will be carried out in direct collaboration with the Consultant in charge of the feasibility study) and the production of the scoping report integrating the results of the cited studies, including the production of maps, plans and profile drawings. To do this, the *Consultant will review the site(s) proposed by the Consultant in charge of the feasibility study and recommend the most appropriate site(s) and route of the connection line.* The choice of the site(s) will then be finalized with the team of the Consultant in charge of the feasibility study;
- (ii) The demarcation of selected site(s) and line routes and production of the boundary report.

C. In the Third Phase:

- (i) The Consultant will produce an ESIA on selected site(s) (including access road, resettlement sites, workers' estates, camp sites and management plans). This study will cover all the phases of the project, namely, pre-construction, construction, operation / maintenance and dismantling;
- (ii) The Consultant will support the Client in acquiring the Environmental Permit; and
- (iii) The Public consultation, information and awareness campaign, reporting to stakeholders and production of the related report is also needed.

The Consultant must develop an Environmental and Social Impact Assessment of the Solar Pack and the substation, as well as the potential connection line according to the requisite procedures for conducting and validating the strategic environmental assessment study and the environmental and social impact statement.

A. Phase 1: Inception Phase

The Consultant will be required to submit an Inception Report outlining the planning of the activities to be carried out as part of the study in accordance with this term of reference. To fit the work of the ESIA, the Consultant will need to establish contacts with key Ministries, Departments and Agencies involved in environmental decision-making, including the LFT.

A first meeting will be held to present the methodology, strategies, resources and various activities that will be put in place under this consultancy.

A planning of the activities will be submitted for observation by the Secretariat of the WAPP, and the LFT of Liberia. This will provide information without limiting: (i) The presentation of the context and justification of the study; (ii) The brief description of the project (components, activities, phases, duration, personnel, equipment, etc.); (iii) The presentation of the proposed study; (iv) The listing of national provisions and legislative texts and requirements of the WAPP Secretariat and applicable technical and financial partners; (v) The Consultant's description of relevant tasks (retained after learning about the project and the terrain) of the Consultant; (vi) The actual duration of the services offered by the Consultant and the timetable for completion; (vii) Recalling the requested deliverables; (viii) Key personnel; (ix) Recalling general and contractual services; and (x) The Bibliography and Potential Appendixes.

B. Phase 2: Scoping and Demarcation

8.2.1 Activity A: Scoping Study

The project site(s) will be recommended by the Consultant in charge of the feasibility study and finalized in this phase. The study of the line routing should therefore possibly concern the lines between this/these site(s) and the regional electricity transport network. The Consultant in charge of the ESIA must undertake the required surveying activities on the basis of the possible layout of these connection lines and the sites of the substations (or extensions of posts) and the envisaged solar project with storage.

The Consultant will undertake a scoping and preliminary field investigation exercise to prepare the Scoping Report presenting, among other things, a study of sites (substations and central) and lines (between sites and between sites and the international network). This study will describe the occupation, the activities developed on and around the project area, the cumulative impacts. It will detail the planning of the activities to be carried out as part of the study in accordance with the ToR, in the form and format required by the Authorities in charge of the Environmental Assessment procedure and as required by the regulations and laws concerning the management of the environment.

The Consultant shall present the Scoping Report to the WAPP Secretariat and the LFT among other institutions prior to submission of the Final Scoping Report. The Scoping Report must be approved prior to the commencement of Phase 3.

For consistency, the Consultant must obtain all necessary and available studies on the project and its area (Preliminary and detailed project outline). It should take advantage of this activity to establish contacts with agencies and departments in charge of natural resources management as well as other services (ESIA Management Service) and communities involved in environmental decision-making in Liberia. Among other things, a list of people met and meetings should be annexed to the report.

The Consultant shall review and propose alternatives (including the analysis of options/options proposed in the feasibility study) for the occupancy of the project's right-of-way and make a justified recommendation to minimize environmental and social impacts. Establish the optimal route for the interconnection of the project (transmission line which voltage, length and corridor width will need to be defined with the Consultant responsible for the feasibility study), and location of related switchyard and/or substation as may apply. The diagnostic of the environmental and social context and inventory data should help to identify all sensitive environmental and social areas, including protected forests, cultural and heritage sites, as well as existing and planned RAMSAR sites and mine sites. The Consultant will also carry out an Analysis of Alternatives: how the electricity to be supplied can be met by the other means: dams, wind, thermal, etc.

The Consultant shall provide a detailed description of the baseline conditions of the selected sites and corridors, including photographs and GPS coordinates specifying the location of all natural obstacles such as terrain features and obstacles as well as any other useful detail.

This description should include, among other things, the location of the following obstacles that must be on the maps and diagrams to be provided:

- (i) Man-made structures or barriers (all types of residential and non-residential structures such as roads, streets, schools, dams, hospitals, offices, commercial buildings, buildings of the State, etc.).
- (ii) Infrastructure (including existing transmission and distribution lines, existing telephone lines, railway and pedestrian lines, ultra-shortwave towers, river crossings, etc.).
- (iii) Biophysical characteristics including national park boundaries (rivers, mountains, valleys, wetlands, croplands/farms, forest reserves, etc.)
- (iv) Livelihood productive assets such as agricultural fields, fisheries zones, NTFP collection zones etc.

In the baseline description of the sites (posts, power stations, right-of-way) that are optimal or of least impact, the Consultant must also draw up an exhaustive list of the localities / properties to be moved by specifying the region, the city, the community, the village or sector. The following items should be listed in the relevant area with the GPS coordinates:

- (i) Boundaries and non-lot boundaries;
- (ii) Boundaries of farms and privately owned and bounded lands belonging to individuals;
- (iii) Protected areas, hunting areas, classified forests;
- (iv) Cultural and sacred sites, cemeteries;
- (v) Deposit sites for materials and / or materials; and
- (vi) Markets and areas of high concentration of dwellings in unplanned/undeveloped areas.

In choosing the route of the line, one should consider among other things:

- (i) The fact that the line should not cross areas with high agglomeration rates, areas with steep cross-slopes, or areas narrower than the maximum possible span;
- (ii) The pylons are located in easily accessible areas, if possible at least 50 m from the last dwellings when crossing inhabited areas;
- (iii) Respect, as much as possible, for usefulness of infrastructure (roads, waterways, airfields, industrial units, etc.);
- (iv) The line route is as close as possible to the main roads at a distance, between 100 m and 2 km;
- (v) The route avoids as much as possible sensitive areas and equipment (houses, wildlife and forest reserves, swampy, mountainous and low attitudes areas, areas of extension of rivers and RAMSAR, listed/ classified heritages, airfields, mining areas...);
- (vi) The fact that if inaccessible areas are crossed, it is important to compare and judge the advantages and constraints of choosing alternative routes on these segments;
- (vii) Future land use plans to be obtained from the urban planning departments;

- (viii) Environmental, social and cultural issues;
- (ix) Prescriptions, on the respective routes and planning standards in Liberia.

The Consultant's mission is also to study and establish a right-of-way over the entire length of the line route, in accordance with the terms and rules and codes of "Right of Way" in Liberia. It is important to note that the width of the right-of-way and the minimum distance of the right-of-way, from the middle of any road infrastructure, are as follows:

The right-of-way, from the middle of any road infrastructure, are as follows: Width of the right-of-way	Minimum Distance of Transmission Line from Median of Road
40 m	40 m

In selecting site(s), one should take into account, among other things, to:

- (i) That the post sites will not be located on areas with steep cross-slope areas;
- (ii) That plans for future land use should be obtained from the relevant departments of Urban Planning and Territorial Planning;
- (iii) Technical, economic, environmental, cultural and social issues will inevitably arise;
- (iv) Country requirements for tracking and site planning standards will need to be enforced.

The Consultant shall provide a detailed description of the selected site(s), with the location of all structures, terrain features and any other details.

8.2.2 Activity B: Demarcation Study

The boundary should follow, after the customer's approval of the pre-selected route. It will be carried out using appropriate methods and in accordance with the standards in force in the country. The work should include, without being limiting:

- (i) The marking of the line corridor and the sites of the posts and solar park stations including the installation of concrete bollards;
- (ii) The detailed presentation of roads/country tracks, buildings, water bodies and other visible landmarks; and
- (iii) The development of the implementation maps as well as the plans and profile diagrams.

In conducting the demarcation, the Consultant will note the following:

- (i) The number of angles should be limited. The angles should preferably be placed on a flat terrain at a relatively high altitude; angles should not be placed on slopes or at low altitudes as compared to the profile on both sides;
- (ii) Corner points should be appropriately selected and well defined. They must be visible from one corner point to another; if obstacles are present, visible intermediate bollards must be placed;
- (iii) An angle should not be located on a mountain;
- (iv) Reference points should be erected to allow effective control and validation of the diagrams;
- (v) The visibility of the terminals must be maintained at all times; and
- (vi) A uniform gap of no more than 400 meters should be maintained between contiguous terminals, except in the case of steep pitch, which could hinder the mutual visibility between terminals.

The Consultant should note that the choice of site(s) (stations and power stations) and the route of the line will only be considered final after a written decision of the Government of Liberia or the obtaining of the of Environmental Compliance Certificate, as well as the adoption of the study of the sites and the layout of the line by the country and the TFPs.

During the site(s) selection and line routing study, the targeted right-of-ways and the line corridor will be mapped to an XYZ coordinate system presented in a spreadsheet format acceptable to the WAPP Secretariat and the LFT.

At the end of the study, a scoping report containing the study of the project's host site(s) and the layout of the lines will be submitted for approval. The Consultant should note that the choices made may be modified based on the results of the ESIA. To this end, it will update the initial study according to the new routes and site(s) identified.

The report will be illustrated maps, plans and profile diagrams; photos ... The maps will be at the scale of 1: 10,000 showing the following details:

- (i) Terrain features including but not limited to hedgerows, fences, wetlands, rivers, streams; and
- (ii) Details of obstacles including, but not limited to, houses, roads, pipelines, bridges, natural surfaces and others.

C. Phase 3: Environmental and social impact assessment (ESIA)

Under the ESIA Report, the Consultant must deliver an ESIA report including an ESMP at the end of a participatory and iterative process.

8.2.3 Activity C: Environmental and Social Impact Assessment (ESIA)

To complete the ESIA the Consultant will undertake the following activities, but not limited to:

- (i) Description of the baseline environment of the Project's hosting area:

The Consultant shall provide a detailed description of the project's area of influence and environment. It should include, but not be limited to:

- The **physical environment**: relief, geology, soils, climate (rainfall, evapotranspiration, temperature, relative humidity, winds, sunshine...), surface and underground water ...;
- The **biological environment**: fauna (including large and small mammals (rescues), birds, reptiles, amphibians, fish ...) and flora, including sensitive ecological zones (e.g. wetlands, forest reserves, hunting areas, animal and plant biodiversity, protected animal and forest species, if necessary microfauna and microflora ...). This description should identify the endemic, endangered and rare species on the IUCN red list and the different natural habitats and critical natural habitats in the project area and present its status (deforestation): sedimentation risks and erosion;
- The **human, cultural and economic environment**: population (ethnic, religious) and demography, cultural heritage including places of worship, pilgrimages and cemeteries, historical, aesthetic and tourist resources, infrastructure, land tenure and land ownership, land use , employment / industrialization, agriculture, public health, mining, timber exploitation,

hunting, fishing ... including all other activities developed in the project area. The Consultant will identify how the project will improve the quality of life of the local population.

(ii) Hazard / risk study:

The Consultant will identify all hazard positions and risks associated with each component of the project. It will assess the risk levels and expose all hazards that may be involved in the establishment and operation (including accident) of the project by justifying measures to reduce their likelihood. It will specify the means of public relief brought to its attention and the organization of the private and public means of relief of which the manufacturer and the operator have and whose assistance they have obtained in order to prevent and mitigate the effects of a possible disaster (safety study, emergency plan and permanent intervention plan).

The Consultant will analyze the institutional capacity of the agencies / services concerned to monitor and monitor the implementation of environmental and social measures, in order to evaluate capacity building actions to plan. The Consultant will provide a budget for the contingency plan and the capacity building plan.

(iii) Identification and assessment of potential environmental and social impacts (positive, negative)

Environmental and social impacts will occur during the construction, operation / maintenance and dismantling phases of the project, including cumulative impacts from existing and ongoing projects. The Consultant will identify the main sources of these impacts, describe them, analyze them and evaluate them. The Consultant will explain in detail the methodology used to evaluate the impacts.

The Consultant will have to evaluate the benefits of the project for the beneficiary countries and their respective populations, the impact of the project on the sustainability of the development, the contribution for the reduction of poverty and the achievement of the Millennium Development Goals.

Also, the Consultant will however need to identify and analyze the cumulative impacts on the biophysical and social environments of the project hosting environment and overall existing projects.

(iv) Suppression, mitigation, compensation and enhancement measures

The Consultant should involve local populations and development specialists in proposing mitigation or enhancement measures if necessary in identifying the potential environmental and social impacts that will result from project activities. The aim is also to find, together with the local population and local technical services, the relevant ways and means (in terms of project) that contribute effectively to the socio-economic and cultural development in the area and in harmony with the project. The identification of these measures must be based on the essential aspects of the analysis of poverty, the distribution of wealth, existing social inequalities, especially those relating to gender in order to choose reliable, quantifiable and locally applicable measures.

(v) Environmental clauses to be included in the construction company's tender file

The Consultant will present the technical and operational requirements that will allow the construction company to take into account in its activities, the protection of the biophysical environment, the safety and health of its employees and populations, and hygiene conditions on construction sites. The ESMP and environmental and social clauses will be included in the tenders.

They will also guide companies and the Consulting Engineer in the organisation of the implementation of environmental and social measures, Quality, Hygiene, Safety and Health attributable to its activities, in identifying the terms and conditions, technical provisions and means of implementation of these measures (companies prepare their own site ESMP, Crisis and Emergency Management/Response Plan, Safety Plan, Hygiene, and Health and Other Plans (Management of waste, water, loans, clearing planting, communication, etc.) and recruit specialists with international experience for the preparation and execution of these plans).

(vi) Public consultations

The Consultant will have to undertake public consultations with all stakeholders involved and involved in the project to mobilize them, including the communities affected by the project. These consultations will be carried out in accordance with Liberia's LFT procedures in this area. It would be better to consult regularly. These would include relevant technical agencies and services in the various areas of the environment, private companies in the energy sector (works, products, services), civil society (including NGOs, directly affected and/or interested population), and academia.

Apart from limited and often informal one-on-one and collective meetings (conducted through interviews, focus groups and socio-economic and cultural surveys), the Consultant will be required to hold formal meetings public consultation necessary to first inform them about the project (nature, duration, potential impacts, etc.) and then to involve all stakeholders in the decision-making of the project in collecting their opinions, grievances, complaints, grievances, suggestions, recommendations and concerns about activities, the project and its impacts. For informal consultations, the Consultant should consult with women and youth in separate focal groups.

Minutes must be written in accordance with the format required by the competent Liberian services and must include the list of participants, dates, photos, discussions/minutes and any other archive on these consultations. The Consultant will list the outlines chosen and discussed at the meetings and establish a series of mitigation and/or compensation measures on relevant stakeholder concerns. These measures, as well as the Minutes must be shared with the participants to validate them. Each participant at each formal meeting must have his / her name, occupation and contacts on the attendance list that he/she must sign. The Annexes will consist of: ToR of the ESIA, letter of approval of ToRs, minutes of meetings, lists of participants in public consultation meetings, list of persons met and any other relevant documents.

At the end of each chapter, the Consultant should present a box highlighting analyzes and comments necessary for a good understanding of the essential aspects treated and making the link with the project. The relevant information must be illustrated with supports: photos, maps, figures, diagrams, plans etc.

8.2.4 Activity D: Environmental and Social Management Plan (ESMP)

The ESMP should include an appropriate program for monitoring the impacts of the construction, operation/maintenance and decommissioning phases as they are processed and for monitoring the implementation of the proposed measures to determine project impacts on the physical, biological and human environment.

The Consultant must also identify the needs for strengthening the environmental management, social, health, safety and health management of the LFT and other structures (including members of civil society) and propose the necessary support measures (training, material support, etc.) for each stage of project development.

- (i) The ESMP should be designed to clearly identify the ESMP in the following phases: site preparation, construction and operation / maintenance. This site ESMP must:
 - Contain among other things: (i) Environmental and Social Impact Management Plan; (ii) Safety and Health Plan; (iii) Transport Plan; (iv) Waste Management Plan; (v) Management Plan for the influx of workers; (vi) Camp Management Plan or Remote Sites; (vii) Cultural Heritage Management Plan, (viii) Physical Heritage Management Plan, particularly in case of incidental discoveries; (ix) a communication, awareness and information plan; (x) a Stakeholder Engagement Plan and (xi) a Compensation Planting Plan (Re-vegetation). Each plan must be accompanied by a budget and a precise timeline and responsibilities.
 - Also include the section on gender-based violence and one on Citizen Engagement.
 - Clearly present the responsibilities of Companies: preparation and proper execution of ESMP and a Plan Hygiene, Health & Safety, recruitment of qualified personnel with international experience. All employees sign a Code of Conduct, which prohibits unacceptable behavior, e.g. sexual acts or "prohibition of" sexual harassment "with minors (<18 years). The ESMP must also mention that the use of minors for work by companies is prohibited. Include a Complaints / Grievance Mechanism for communities and residents, site users and corporate employees. The ESMP should also clearly describe the responsibilities of other stakeholders during the construction period and the operation, e.g. the establishment of a Project Management Unit (PMU), which must include environmental, social, hygiene, health and safety specialists.

- (ii) The operational ESMP must:
 - Include, among other things: (i) a Re-vegetation Management Plan (compensatory reforestation), (ii) a Soil Restoration Plan, (iii) Biodiversity Management Plan, (iv) a Crisis and Emergency Response Plan/contingency, (v) a draft Quality, Health & Safety and Environmental Management Plan, (vi) a Capacity Building Plan and (vi) a Site Withdrawal Plan. Each plan must be accompanied by a budget, an investment plan, indicators (monitoring, verification, performance) and execution responsibilities.

The Consultant will systematically include in the report an Analysis on Climate Change and appropriate actions: the impact of the project on Climate Change, the impact of Climate Change on the project.

8.2.5 Activity E: Social Evaluation and Resettlement Action Plan

(i) Social Evaluation

Using the collected and analyzed data from the ESIA, the Consultant will carry out a social assessment to identify the People affected by the Project ("PAP") and will evaluate the potential social impacts related to the work on the populations, their property and possibly their income for the preparation of a Resettlement / Compensation Action Plan.

Description of socio-economic conditions in the project area:

- Based on surveys and consultation with PAPs, identify and confirm major issues that could impact PAPs.
- Make a brief analysis of the socio-economic situation of PAPs and their situation on each site: social structure, demographic, land use, inventories of capital assets, income, vulnerable groups, etc.
- Study the issue of population displacement, expropriation of land, the risk of conflict and propose solutions in perfect harmony with the proposals resulting from the consultations taking into account the opinions of the PAPs.
- Take into account the concerns of vulnerable groups including women, children, and the poor to integrate them into development potential.

Census of affected persons, property and livelihoods:

- Conduct a census covering the current occupants of the impact zone of the work, to establish the impact mitigation program in order to limit the case of those who would arrive after the census of eligibility for Resettlement Action Plan (RAP) benefits. This census will have to be carried out in a relatively short period of time and its closure is the deadline for recognition of the rights (deadline). This date will then have to be disseminated to the populations in the impact zone of each investment, both to guard against future complaints and to prevent "opportunistic invasions and installations" once mitigation measures are met.
- Describe the characteristics of those affected: a description of activities including income levels from formal and informal activities in the work area.
- Define the criteria for the identification and eligibility of PAPs.
- Take inventory of the heritage of PAPs and vulnerable groups affected. For each type of property or livelihood assigned, define the methodology used to assign a value (have in mind that the assessment of the assets assigned to provide equitable compensation to displaced persons, while granting special attention to vulnerable groups).
- For absent PAPs, describe the monitoring mechanism, assessment of their assets/potential assets and validation mechanism with other PAPs as well as their legal process including disclosure.
- Supports for PAPs (Provide a detailed description of the types of assistance (e.g., compensation, resettlement assistance, compensation or compensation related to access restrictions or decrease in income during the work) to be provided to persons/ affected groups. - Also describe the terms of agreements with those affected and how they are prepared to accommodate the support and timing discussed.

The report of the social evaluation will be the subject of a separate report. The Office of Studies will take into account the time it takes to validate the interim report with stakeholders at the local or community level. The consultation / validation process should be described in the final report. The social assessment report shall contain at least the following elements: (i) Executive Summary; (ii) a summary description of Project activities; (iii) description of the social environment of the subproject intervention area; (iv) description of the political, institutional and regulatory framework applicable to the Project; (v) methodological approach; (vi) identification and analysis of the potential social impacts of the various components of the sub-project; (vii) proposing measures to avoid or minimize potential social impacts; (viii) proposal of options and arrangements for the further process (with decision support elements, especially for variants) and (ix) proposal for a monitoring mechanism.

(ii) Resettlement Action Plan (RAP)

Based on the social evaluation of the various stakeholder consultations, the scale and nature of the impacts, the Consultant will develop a population Resettlement Action Plan (RAP), based on the chosen option.

The RAP will establish a mechanism to be used to identify, estimate, address and monitor impacts as a consequence of involuntary resettlement. The detailed RAP must be implemented in accordance with Liberia's legislative and regulatory requirements and the World Bank's safeguards policies, including the Operational Policy ("OP") 4.12. The requirements of OP 4.12 apply whenever those in Liberia have deficits in the resettlement of affected persons. To avoid conflicts of interest, the Consultant must comply with the requirements of the most rigorous, stringent and non-confrontational directives and standards in this area.

The Consultant will be required to conduct a detailed review of all land to be acquired, and provide information on the affected persons, properties and forest reserves and the compensation measures that may be necessary for the acquisition of the right of occupancy. This review should also provide information on land availability as one of the methods of compensation. To this end, the Register of Affected Properties (RPA) will be prepared as part of the ESIA, but in the form of an annex.

The RPA will have to highlight, among other things:

- The exhaustive list and identity (references and addresses) of the owners (natural or legal person) of private property;
- The quantities, qualities and nature of each owner's property;
- The amounts per species of trees belonging to classified areas (classified forests, parks and reserves): the names of farmers (field owners) and/or traditional landowners must be systematically identified; And
- Unit costs and total costs of private and public assets affected in accordance with national and international legislation (OP 4.12) and which will need to be validated by the relevant technical services.

Particular attention will be paid to sensitive aspects such as places of sacrifice, sacred trees or woods, cultural and scientific sites, landmark or land with land ownership, or plots with land title, classified forests, protected areas, etc. In each village/community, the inventory will take place in the presence of the owner and the traditional chiefs or authorities.

The Consultant will identify the social impacts on the affected people and determine the measures to be applied to avoid/reduce these impacts. It will also establish the methods of consultation and redress mechanism and institutional arrangements for the implementation of the RAP.

The RAP will have to cover at least the following elements:

- Description of the sub-project and its possible impacts on the land
- Main objectives of the resettlement program
- Presentation of the results of socio-economic studies and the census of affected people, property and livelihoods.
- Legal and Institutional Context (from the Summary of the Resettlement Policy Framework)
- Eligibility and rights to compensation / resettlement
- Evaluation and compensation of losses
- Resettlement measures: resettlement measures (in case of physical displacement); economic rehabilitation measures
- Describe the PAPs consultation mechanism
- Procedures for handling complaints and conflicts
- Organizational responsibilities
- Implementation schedule, covering all actions from preparation to completion, including dates for resettlement of project actions and various forms of assistance to resettlers
- Cost and budget and chronogram. Cost-per-action tables for all activities planned for resettlement
- Monitoring and evaluation. Organization of monitoring of resettlement actions by the implementing agency, intervention of external agencies for monitoring, information collected, including performance indicators and measurement of results, as well as the participation of displaced persons in the process of implementation. resettlement
- Signature of stakeholders and Minutes of agreed commitments.

The Consultant will take into account the time required to validate interim Resettlement Policy Framework (RPF) with local stakeholders. The consultation / validation process should be described in the final report with all the Minutes of commitments agreed in the annex.

8.2.6 Activity F: Environmental Impact Statement (EIS)

In Liberia, activities that could have significant environmental impacts are subject to advance notification from the EPA of Liberia. The opinion will be drawn up on the basis of a *Strategic Environmental Assessment* (SEA), an *Environmental Impact Assessment* (EIA) or an ESIA and Liberia's legislative instruments on conditions and procedures for carrying out and validating the strategic environmental assessment study and the environmental and social impact statement categorized according to their impact on the environment to decide which environmental assessments will be needed. Renewable energy installation projects are classified in Category B, as are projects for the transport and distribution of energy with a voltage of less than 225 kV. The Solar Park and its lines are therefore subject to an Environmental Impact Statement. Prior to the construction of the Project, the EIS (EIS, a final report summarizing the impact of the above listed assessments) must be submitted to the LFT.

The EIS is made up of a short resettlement plan when the number of physical and and/or economic involuntary displaced persons is between fifty (50) and ninety-nine (90) persons. When the number of physical and / or economic involuntary displaced persons is less than fifty, the measures and modalities of resettlement are included in the report of the environmental and social impact statement or notice (EIS).

The procedure to follow to validate the EIS is as follows:

- (i) Information by any appropriate means of the local administrative authority and the population of the location of the proposed project for the realization of the EIS;
- (ii) Transmission of the draft terms of reference in three (3) copies in paper format and the electronic version to the SC of the LFT members for review and approval respectively:
 - The Ministry has a period of fourteen (14) working days from the date of receipt of the draft Terms of Reference of EIS for commenting;
 - The results of the comments are transmitted to the proponent in the form of a directive or specifications and form the basis on which the rest of the EIS evaluation procedure is based.
- (iii) Information to the public about the realization of the EIS and participation in collaboration with the competent bodies of the territorial collectivity concerned.
- (iv) The EIS carried out at the expense of the project leader who can use one or more experts of his choice among the experts approved by the Ministry in charge of the environment.

The Minister in charge of the environment, after receiving the report of the environmental and social impact study, appoints investigators to carry out a public inquiry. The local administrative authority of the proposed project location is informed and the proponent may request the addition of one or more experts of its choice as observers.

The procedure is as follows:

- (i) Public notice of the opening of the inquiry by posting, insertion of notices in at least two (2) daily newspapers and by radio or any other appropriate means depending on the social circumstances and the place.
- (ii) The duration of the public inquiry is thirty (30) days from the insertion of the notice in the newspapers.
- (iii) Within seven (7) days of the expiry of the thirty-day period of the public inquiry, the investigator (s) may request from the promoter additional information or the production of any other useful document.
- (iv) The public inquiry is closed at the end of the seven-day period during which all elementary investigations are carried out.
- (v) The local administrative authority of the place of realization of the planned activity and the competent organ of the local authority has, after closure, a period of five days to examine the file and formulate their opinion.
- (vi) The report of the investigation is written within fifteen days after the closing of the investigation. The motivated findings and recommendations of the investigators are recorded in the public inquiry report.
- (vii) The report of the public inquiry is sent to the Minister in charge of the environment within five (5) days.
- (viii) The EIS and ESIA report is reviewed by the EPA including other LFT members.
- (ix) The Consultant will be in charge of assisting the Client in the holding of the Technical Committee for Environmental Assessments and obtaining a ***Certificate of Environmental Compliance (CEC)***. The realization of a detailed ESIA and subsequent demarches for the obtention of a CEC are sine-qua-none conditions for the project to reach financial closure and authorization to proceed.

8.2.7 Activity G: Public Information and Awareness Campaign (Post-Study)

Aside from the consultations carried out as part of the ESIA, the Consultant shall hold information meetings with the communities concerned with the project after the adoption of the final report of

the ESIA, the development of the RAP and the issuance of the decree or CEC giving a reasoned opinion on the environmental feasibility of the project.

The Consultant will have to undertake meetings to return and disseminate relevant information on the key points of the environmental and social studies after the validation and adoption process. It can subcontract this activity with local specialized organizations NGOs, local actors involved in the field of communication (radios, televisions, newspapers, traditional informants ...), the technical services in charge of the environment, the local authorities, but the Consultant is responsible for the results of this activity and must intervene and realign it whenever required and necessary.

The information campaign shall be held in the main language spoken in each zone concerned. Meetings shall take place in each community where formal public consultation were previously held, and target at least the same mobilized public.

In support to these meetings, the Consultant shall prepare (in both English and French), a non-technical summary of the ESIA, including the RAP and the ESMP and make copies available in local language. He shall also provide a complete copy of the E&S Report (ESIA, RAP, ESMP) to local administrative authorities. A list of diffusion shall be prepared and submitted to WAPP, WB and the LFT for approval before issuing these copies.

In addition, one month before the start of the campaign, the Consultant shall also submit, for approval by the Secretariat of WAPP, WB and the LFT, a plan for the realization of the information campaign together with a draft version of all documentation intended to be used during this campaign.

8.2.8 Activity H: Capacity Building and Institution Strengthening

It is expected that the Consultant will contribute to building capacity. This will include knowledge transfer and training at the Consultant's premises. The Consultant shall base its estimate of the requirements (in time and money) on the following activities:

- i) **On-the-job training:** While in Liberia, during field work and workshops, the Consultant shall integrate up to six (6) designated Liberian counterparts in its team and work in close collaboration with them. Contact will be maintained at other times through follow-up phone/Skype calls and emails as required.
- j) **Institution Strengthening:** The Consultant will analyse skill-gap of local experts and the identification of the requirements for institutional strengthening.
- k) **Formal training:** A two-week formal training course for twenty (20) designated participants shall be organized in the project's offices in Liberia. The purpose of this training is to bring stakeholders involved in the realization of Environmental and Social (E&S) studies and the supervision of the ESMP and RAP to a higher technical level so they can take an active part in future activities.

The training will be extended to identified individuals from the LFT, WAPP SG, local Consultants and Liberia national services responsible for different aspects of the environment (population, health, safety, water, forests, biodiversity, agriculture, farming, fisheries, habitats, land use, development, planning, etc.), all of whom will be involved in the application, surveillance, and

monitoring of the ESMP and RAP of the project. The training shall allow reinforcing human resources in the sector and providing state-of-the-art tools in E&S Study.

The Consultant's proposal shall detail the proposed content for the training programme, which should cover the following subjects:

- Introduction to Environment: definition, components, interrelationships, disciplines;
- Introduction to environmental assessment: scope, technical means and methods, references, objectives, scoping, etc.;
- Relationship between sustainability and environmental assessment;
- Introduction to international environmental law: purpose, role, principles, international texts, enforcement methods and techniques;
- Environmental Impact Assessment: source, scope, purpose, procedures and stakeholder roles, key component of an ESIA (e.g. comparison of alternatives), etc.;
- Scoping Study (Project definition);
- Delineation of project right-of-way and acquisition of right of use (for power generation and transmission);
- Impacts: definition, sources, classification (positive, negative, undefined, direct, indirect, cumulative and residual), techniques for the identification, analysis and assessment of the impacts;
- Mitigation and enhancement measures and institutional support: identification approach SMART (Specific, Measurable, Attainable, Relevant, Timely);
- Comparison of alternatives in E&S Studies (power generation and transmission);
- Public participation in E&S Studies: scope, methodologies, advantages, inconvenients, etc.;
- RAP in E&S Studies: purpose & scope, PAP, techniques for the identification and evaluation of properties, involuntary resettlement, property and PAP relocation, institutional management of the RAP;
- ESMP in E&S Studies: purpose & scope, stakeholder roles, implementation constraints, key components;
- Environmental monitoring and surveillance: definitions, scope, techniques and tool (for power generation and transmission projects);

The Consultant shall develop the training programme in collaboration with the Consultant of the feasibility study and prepare all teaching material in support to the training. The training programme, list of participants, proposed modules and logistic details shall be discussed with the LFT and presented to the WAPP and WB one month prior to the beginning of the session. The Consultant shall bear all costs related to the training programme including those associated with a one-week workshop for the twenty (20) participants to be held in the field. To this end, the Consultant shall include in its financial proposal an amount to account for transport to/from the site, airfare to Liberia for participants outside Liberia, lodging and per diem for all participants.

9. DELIVERABLES (PACKAGE 2)

The services to be provided by the Consultant include the preparation and submission, within the deadlines, of all documents and reports. Deliverables to be produced as part of this mandate are described below. The exact content and timing of these deliverables will be established at the time of issuing the Inception Report and will be agreed to with the WAPP and Liberia institutions. All documents and reports must be prepared in English and must be submitted by the Consultant in paper and electronic versions simultaneously to the WAPP General Secretariat and the LFT in accordance with the specifications below.

The reports will be sent with an official letter from the WAPP General Secretariat to the LFT. All maps will be provided in computerized form in a Geographic Information System (GIS) format that has been developed by stakeholders. Printed copies will be provided in the specified number of copies to each recipient.

The electronic versions will be provided on a USB key and also by email and will include:

- complete PDF version of the printed report, possibly in the form of a portfolio so as to limit the size of the individual files. This PDF version will be produced from the source files so that it can be indexed; a scan of the printed report is not acceptable;
- the original source files of the documents in a format approved by the stakeholders (for example, word file for texts or Excel for tables). The maps will be provided in a GIS format approved by stakeholders. Other schematics will be provided in Autocad format.

In its offer, the Consultant should schedule a kick-off meeting and workshops to present all draft versions of the reports to facilitate the preparation of comments. All these meetings and workshops will be held in Monrovia, Liberia.

The Consultant will support on behalf of the Client all costs related to the organization of meetings and seminars, in accordance with the practices of the WAPP General Secretariat. All reports and presentations must also be available on a website dedicated to the project to be set up by the Consultant.

9.1 Management Report

9.1.1 Inception Report

The Consultant shall submit to the WAPP and the institutions involved in the project, an Inception Report in electronic form two (2) weeks from the agreed commencement date, to propose an approach and work plan to realize the mandate. The Inception Report shall rely on a thorough review of available information and preliminary studies to present:

- (i) The Consultant's understanding of the key issues and the proposed work plan and methodology to develop the scope of work described above;
- (ii) Findings of the Consultant's review of the available information and summary of all relevant data for the Feasibility and E&S Studies including the legal and institutional framework, main characteristics of the Solar Pack, available data, assessment from previous studies, survey information, etc.;
- (iii) A detailed work plan and schedule to implement the proposed program with specific dates for all deliverables, points of interaction with the team and stakeholder meetings (with the WAPP Secretariat, the LFT, and the World Bank);
- (iv) The proposed organizational structure of the delivery team for collaboration with TA2, LFT and WAPP secretariat.

It should be noted that capacity building of Liberians key stakeholders is considered of utmost importance for the success of the program, and the Consultant shall take all required actions to facilitate technical training within its mandate together with the Consultant in charge of the Feasibility Study. The work plan of the Consultant shall give due consideration to:

- (i) Integrating local counterparts in the Consultant's team during the site visits and surveys, and more generally, ensuring that they work with the local Consultant's staff whenever in Liberia;
- (ii) Organizing and delivering a two (2) week training session on the work carried out as part of the E&S Studies in the Consultant's Head Offices for twenty (20) participants.

The draft Inception Report shall be submitted to the WAPP and the project institutions for their review and approval. It will be the subject of a 2-day workshop to be held in Liberia 2 weeks after issuing the draft version. All comments received at that time shall be taken into account in subsequent activities and integrated in the final version of the Inception Report that will be issued electronically two (2) weeks after the virtual workshop. Hard copies of the final report shall only follow upon approval of the electronic copy of the Final Inception Report by the WAPP Secretariat.

The Inception Report shall be submitted as follows:

I. Draft report:

- Seven (7) printed copies and seven (7) electronic copies to LFT;
- Five (5) printed copies and one (1) electronic copy to the WAPP Secretariat;

II. Final report:

- Seven (7) printed copies and Seven (7) electronic copies to LFT;
- Five (5) printed copies and one (1) electronic copy to the WAPP Secretariat;

9.1.2 Quarterly Progress Report

In the course of its assignment, the Consultant shall prepare concise quarterly reports, which summarize activities undertaken during the period, progress against the program, and a program of work to be undertaken during the next quarter, to be approved by the WAPP. The reports shall include a project schedule updated quarterly to reflect the progress achieved to date in comparison with planned activities. The quarterly reports shall also include a financial outlook with a comparison of expenses to date to budgeted disbursements as well as a forecast to complete. The Quarterly Progress Reports shall be kept as brief as possible and shall be limited to highlighting progress, key issues and constraints encountered during the reporting period. They are to be submitted electronically (via email) on the 10th calendar day following the end of the quarter. The first quarterly report will be issued 3 months after submission of the Draft Inception Report. The last quarterly report will take the form of a Completion Report that summarizes all activities that took place during the assignment of the Consultant.

9.2 Main Reports for the Feasibility Studies

9.2.1 Data Collection Report (Activity A)

Based on the results of the preliminary study, the Consultant will have to prepare a data report after the completion of the data collection and analysis task. The report will include all technical and economic data on the national transport networks, including the single-line diagram of HV network and the transformer substations.

It will also indicate the physical and environmental data collected on the sites identified for the installation of the solar parks' power stations. These data will be represented on a map within a radius of 15 km with the following selection criteria:

- Cadaster (land register)
- Environmental sensitive areas
- Housing areas
- Site Access
- Grid distance
- Geotechnical features of the area
- Solar irradiation

The data collection report should also indicate the assumptions and input data for conducting the feasibility study. In addition, the report must specify the design criteria that will be used in the technical study of the solar park, the substation and the HV network connection line.

The number of copies of the reports to be submitted will be as follows:

I. Preliminary Data Collection Report

- Seven (7) printed copies and Seven (7) electronic copies to LFT;
- Five (5) printed copies and one (1) electronic copy to the WAPP Secretariat;

II. Final Data Collection Report

- Ten (10) printed copies and ten (10) electronic copies to LFT;
- Ten (10) printed copies and one (1) electronic copy to the WAPP Secretariat;

9.2.2 Site Selection Report (Activity B)

The report will include all the data collected for the selection of the site(s) for the Solar Park. The following elements should be part of the report, among others:

- Mapping with the various selection criteria represented - land register, environmental sensitive areas, residential areas (villages etc.), geotechnical characteristics of the area, and solar irradiation - within a 15 km radius of the selected connection station;
- Summary of discussions with local governments;
- Technical, Legal, Environmental & Social arguments for the selected site (s);
- Features of the interconnection to LEC network and preliminary integration study;
- Detailed analysis of the solar potential of the selected site with a SolarGIS data analysis review based on the 2IE ground data that will be shared with the team of consultants;

The number of copies of the reports to be submitted will be as follows:

I. Preliminary Report

- Seven (7) printed copies and seven (7) electronic copies to LFT;
- Five (5) printed copies and one (1) electronic copy to the WAPP Secretariat;

II. Final report

- Ten (10) printed copies and ten (10) electronic copies to FLT;
- Ten (10) printed copies and one (1) electronic copy to the WAPP Secretariat;

9.2.3 Report on the Technical Design & feasibility of the Solar Park (Activity C and D)

The report on the configuration of the solar park and its connection to the LEC/CLSG networks will include the recommendations of the Consultant regarding (i) the technology to be implemented in the selected site (solar panel, inverters, set up, battery suppliers, etc), (ii)

configurations for the implementation phasing (iii) the study of integration and (iv) required infrastructure and equipment (SCADA, etc) for the connection and operating.

In addition, the report will include the results of the stability study. The report on the technological choice, the configuration of the phasing of the plant and the connection to the LEC/CLSG networks will be based on this integration study.

The number of copies of the reports to be submitted will be as follows:

I. Preliminary Report

- Seven (7) printed copies and seven (7) electronic copies to LFT;
- Five (5) printed copies and one electronic copy to the WAPP Secretariat;

II. Final report

- Ten (10) printed copies and ten (10) electronic copies to LFT;
- Ten (10) printed copies and one (1) electronic copy to the WAPP Secretariat;

9.2.4 Memorandum on the Interest of the neighboring Countries (Activity E)

The Consultant will produce a memorandum on the interest of neighboring countries in the purchase of electricity from the Solar Park by organizing meetings with WAPP countries.

The number of copies of the reports to be submitted will be as follows:

I. Preliminary Memorandum:

- Seven (7) printed copies and seven (7) electronic copies to LFT;
- Five (5) printed copies and one (1) electronic copy to the WAPP Secretariat;

II. Final Memorandum

- Ten (10) printed copies and ten (10) electronic copies to LFT;
- Ten (10) printed copies and one (1) electronic copy to the WAPP Secretariat;

9.2.5 Feasibility Study Report (Activity A - E)

The report should include a synthesis report and a main report. The Consultant will submit a preliminary report for the Client's comments, and a draft Feasibility Study Report incorporating all required comments and a final report incorporating the comments of the Client and Donors.

The Final Report will include:

- (i) Overview of the project: description, local government support, solar potential of the site, environmental and social benefits;
- (ii) Site evaluation: site location, current use, acquisition status, technical assessment (topographic, geological, climatological and hydrological, flood risk), social assessment (demographic, economic and social regional development);
- (iii) Network Integration: Description of Installed Capacity, Current and Future Energy Demand, Power System and Network Analysis of the Park Solar;
- (iv) Description of the chosen technical solution: description of the system and its configuration, description of generation profiles (if batteries are used);
- (v) Economic and financial analysis: evaluation of the economic impact and financial viability of the project under different scenarios and financial packages;
- (vi) Risk Analysis;

The number of copies of the reports to be submitted will be as follows:

I. Preliminary report of the feasibility study

- Seven (7) printed copies and seven (7) electronic copies to the LFT;
- Five (5) printed copies and one (1) electronic copy to the WAPP Secretariat;

II. Provisional report of the feasibility study

- Seven (7) printed copies and seven (7) electronic copies to the LFT;
- Five (5) printed copies and one (1) electronic copy to the WAPP Secretariat;

III. Final report of the feasibility study

- Ten (10) printed copies and ten (10) electronic copies to the LFT;
- Ten (10) printed copies and one (1) electronic copy to the WAPP Secretariat;

The final report of the feasibility study must be delivered in an appropriate form (with a cover page and formatting in particular) in accordance with the good practices acceptable to the Client and the International Financing Agencies.

9.2.6 Needs Assessment for the creation of the National Dispatch Center (Activity F)

The Consultant will produce (i) a diagnosis of the operation and dispatching of the LEC network (source substations, automation, control-command, dispatching, information system) to evaluate the "smart grid" projects that will allow an improvement of service quality and facilitate the integration of renewable energies into existing and future network ; as well as (ii) an evaluation of the needs for investments in the transmission network for conventional works or equipment (line reinforcement / extension, installation of HV substations, GIS in particular, etc.) as well as on intelligent systems to improve its performance, reduce technical and commercial losses, facilitate its management and allow the integration of a large proportion of intermittent renewable energies.

The number of copies of the reports to be submitted will be as follows:

I. Preliminary report

- Seven (7) printed copies and Seven (7) electronic copies to the LFT;
- Five (5) printed copies and one (1) electronic copy to the WAPP Secretariat;

II. Final report

- Ten (10) printed copies and ten (10) electronic copies to the LFT;
- Ten (10) printed copies and one (1) electronic copy to the WAPP Secretariat;

9.2.7 Capacity building (Activity G)

The Consultant's services will include knowledge transfer and training at the Consultant's premises in the areas covered by the study. This training will take place at least one week and the Consultant must submit a detailed report on the training provided.

The number of copies of the detailed report to be submitted will be as follows:

I. Detailed Report

- Ten (10) printed copies and ten (10) electronic copies to the LFT;
- Ten (10) printed copies and one (1) electronic copy to the WAPP Secretariat;

9.3 Environmental and Social Studies Reports

9.3.1 Scoping and Demarcation Reports (Activity A)

After the signature of the Contract and the launching of the study, the Consultant shall, after the first field investigations, prepare and submit for the approval of the WAPP Secretariat, WB and the LFT, a Scoping Report.

The background to Scoping Reports will include the following elements, but not limited to:

- Project overview
- Recall Contractual requirements
- Context and project justification
- Political, regulatory, legislative and institutional framework
- Project description: activities, planned infrastructures, duration of each phase...
- Overview of the services to be provided, highlighting relevant activities to be carried out vs. those abandoned, and the revised calendar as per the Consultant's proposal and present ToR
- Statement of impacts on the environmental and social components of the project area, including resources;
- Identification of key issues and constraints for the study and the project: survey of all physical obstacles in the zone of influence of the project, including their geographical coordinates
- Identification and preliminary assessment of properties and populations affected by the Project (PAP)
- Budgetary estimate of lost properties
- Review and comparison of the proposed options for the project
- Observations and comments on the proposed options
- Recommendations as required.

The Site Survey Report (substations & Solar Pack) and the transmission line route (E&S diagnostic study): (Activity A-B)

The report will include the following essential elements, but not limited to:

- Actual location of the project (its exact delimitation if possible);
- The characteristics of the project (essential components (substation, power plant, line), human infrastructure (workers' cities, etc.) and other facilities);
- Environmental and social description and characteristics of the project area:
 - Site characteristics (substations, power plants, lines): length, areas actually affected by the works, affected fauna and flora resources, other hydraulic and hydrological data, sizing;
 - The characteristics of the project's hosting area: population and their way of life, current exploitation, title, sizing, main socio-economic and cultural activities developed and affected in the area;
 - National and international programs in the project area (existing, ongoing, in preparation) and in the corridor of the transmission line and their possible cumulative impacts on this project;
- Existing, committed and planned projects and/or national and international programmes and/or the transmission line corridor and their potential cumulative impact on the project;

- Initial survey of assets and possible obstacle for each alternative to identify red flags and/or fatal flaws. Initial removal of assets and barriers on each option to ensure their viability;
- Proposal and comparative analysis (in terms of impacts on the biophysical and human environment, technical and financial) of alternatives: the choice of project sites (components: power plants, substations, workers' camps, access roads ...), at the choice of the route of the evacuation line (option 1, 2 ...), at the choice of the components of the high-voltage line (pylon or concrete post, voltage level, types of substations, dimensions of the right-of-way ...) and the choice of the project (replacement with hydroelectric, thermal, hybrid, wind turbine ...). This analysis should provide a clear idea of the alternative to sites in the proposed area;
- Benchmarking study of the alternatives in terms of their biophysical, social, technical and financial impacts on the environment for the selection of:
 - Identification of positive, negative and residual impacts attributable to different options / variants / alternatives;
 - Estimation of mitigation, compensation and compensation costs related to property losses in the project footprint attributable to different options / variants / alternatives. Estimate of the costs related to mitigation measures, compensation and indemnities for each option considered;
- Proposed options for the transmission line layout and recommendation of the route of least impact;
- Any additional support (tables, figures, maps, photos, lists, etc. Lists illustrations (tables, maps, photos, lists, figures ...).

9.3.2 Demarcation Report (Activity B)

The report will include the following essential elements, but not limited to:

- Background and justification of the project;
- Brief description of the project;
- Brief description of the affected areas;
- Description of the project footprint;
- Information to facilitate the recovery or restoration of angular points in the event of destruction of terminal, either by control terminals or otherwise;
- The detailed list of reference points and their locations along the route and how they were drawn;
- The types of instruments used and their precision, standard deviation and variance; The accuracy of levels and angles;
- Observation books, spreadsheets and all related documents, hard copy/ both paper and electronic;
- Information presenting the access routes closest to each segment of the line and sites (substations, power stations); and
- Photos showing the nature of the existing land between the terminals and confirming the absence or presence of buildings (Buildings, etc.) along the route and on the sites of the substations and power stations.

The report on Scoping and Demarcation shall be submitted as follows:

III. Draft report:

- Seven (7) printed copies and seven (7) electronic copies to LFT;
- Five (5) printed copies and one (1) electronic copy to the WAPP Secretariat;

IV. Final report:

- Seven (7) printed copies and seven (7) electronic copies to LFT;
- Five (5) printed copies and one (1) electronic copy to the WAPP Secretariat;

9.3.3 Environmental and Social Impact Assessment (ESIA) Report (Activity C)

This ESIA report will consist of two separate sub-reports.

9.3.3.1 Environmental and Social Impact Assessment (ESIA) Report

The ESIA report (Preliminary and Final) shall include, but not limited to the following items:

- The non-technical summary of the ESIA;
- A summary of the approach developed:
 - Content/Organization of the ESIA report;
 - Context/Background and rationale for the project and the ESIA;
 - Context, project justification and integration in the ECOWAS grid
 - Objectives of the ESIA;
 - Expected results of the ESIA;
 - Methodology for conducting ESIA and impact assessment;
 - Energy situation of the country concerned and in the ECOWAS region;
 - Stakeholder presentation;
- Description of the project:
 - Location of the project;
 - Delimitation project Location
 - Delineation of the rights of way;
 - Phases, duration and planned work;
 - Personal/staff and work organization;
 - Types, nature and characteristics of permanent structures envisaged;
- Policy, legislative, regulatory and institutional framework of the project;
 - Policy framework;
 - Applicable legislative and regulatory framework (relevant national texts, applicable international treaties, applicable TFP requirements and guidelines);
 - Institutional framework;
- Description of the biological, physical, and socio-economic and cultural environments in the project area;
- Alternatives and options considered for the project and comments on the recommended project;
- Risks and Hazard Study;
- Identification, analysis and evaluation of environmental and social impacts;
- Mitigation and compensation measures for negative impacts, positive impact improvement measures and institutional support measures;
- Public consultations;
- Environmental and Social clauses to be included in the construction company's tender documents (including a "Chance Find" clause in relation to Physical Cultural Resources, OP / BP 4.11);

- Pronunciation on the environmental and social acceptability of the project, suggestions and recommendations to the various stakeholders on the implementation of environmental measures.
- Annexes to the ESIA shall include (without being limited to):
 - The copy of the approved ToR and the letter of approval;
 - Minutes of all meetings
 - List of participants in public consultation activities
 - List of people met
 - All other relevant document.
 - The environmental route map should show the following details:
 - Crossings of high and low voltage lines;
 - Telecommunications lines or towers;
 - All crossings including, but not limited to, intersections of roads, pedestrian lanes, tracks, canals, railways, etc.;
 - Terrain features including, but not limited to, wetlands, rivers, streams, hedgerows, fences and the environment (wooded areas ...);
 - The angles between two adjacent segments of a straight line;
 - Details of obstacles including, but not limited to, houses, roads, drains, bridges, natural surfaces and others, at a distance of 20 m on either side of the centerline, other environmental barriers (big trees)
- Whenever relevant, information shall be presented on visual support: photos, maps, figures, schema, plans, etc.

At the end of each section, the Consultant shall include an insert that summarizes main comments and analyses which highlights the key issues addressed and their link with the project.

9.3.1.2 Environmental and Social Management Plan (ESMP) Report (Activity D)

The ESMP report shall include, without being limited to, the following essential elements:

- Non-technical summary of the ESMP;
- Recall of the potential (positive and negative) impacts of the project on the biophysical and human environment and the proposed mitigation and enhancement measures;
- Recall of the potential (positive and negative) impacts of the project on the socioeconomic and cultural environment and the recommended compensation/indemnity and enhancement measures;
- Reminder of the potential risks and hazards
- Recall of existing projects' cumulative impacts and planned measures;
- Management of permanent works and monitoring system;
- Management of the potential impacts on each physical component that may be affected;
- Management of the potential impacts on each biological component that may be affected;
- Management of the potential impacts on each socioeconomic/cultural component that may be affected;
- Management of risks and hazards;
- Capacity building plan to strengthen the country's institutional capacity in environmental monitoring and follow-up;
- Environmental Monitoring and Follow-up Plan
- Institutional responsibilities in the implementation of the ESMP

- Objectively verifiable indicators
- Budgetary estimate for the implementation of the ESMP.

The ESMP must clearly distinguish the actions that need to be taken for i) the Construction Phase and ii) the Operation Phase.

- The **ESMP for the Construction Phase** shall include: An Environmental and Social Impacts Management Plan, Health & Safety Plan, Transportation Plan, Waste Management Plan, Worker Influx Management Plan, Camp Management Plan, Blasting Plan, Cultural Heritage Management Plan etc. These plans must have a budget.

The Construction ESMP shall clearly identify the responsibilities of the construction firm(s): elaboration and implementation of a Construction ESMP (CESMP) and a H&S Plan (HSP), recruitment of qualified staff with international experience. All employees shall sign a code of conduct that prohibits misbehaviors such as sexual or psychological harassment. The ESMP shall also indicate that the firms cannot use children (<18-year old) as part of their workforce.

The Construction ESMP must include a Complaint Management Service accessible to both neighboring communities and workers. It must also describe the responsibilities of other intervening parties during construction and operation, such as the obligation for the project Sponsor to establish a Project Management Unit that includes environmental, social, and H&S specialists.

- The **ESMP for the Operation Phase** shall include, amongst others: a Solar Park Management Plan, Resources and Environmental Management, including force majeure that can destroy the project if needed, a Plan to manage dust, erosion and weeds etc. A budget shall be estimated for all these plans.

The Consultant will organize with the Project team a validation workshop of the draft ESIA report, which will bring together all stakeholders including the LFT and the WAPP Secretariat.

After this workshop, s/he will be required to integrate the observations to produce the amended report at the workshop organized by the EPA of Liberia. It will issue a final report incorporating comments and comments from stakeholders at this last meeting.

In the event of rejection of the ESIA report by the LFT, the Consultant shall take back at his own expense all work leading to the amendment and acceptance of the said report and the final issue of the Environmental Authorization.

The final report should incorporate the comments made during the various workshops. The report should be delivered in a form (with cover page (s) and formatting) acceptable to the WAPP Secretariat, WB and the LFT.

The ESIA report shall be submitted as follows:

I. Draft report:

This is a draft ESIA report for the analysis and internal stakeholder's comments. It shall be submitted as follows:

- Seven (7) printed copies and seven (7) electronic copies to LFT;
- Five (5) printed copies and one (1) electronic copy to the WAPP Secretariat;

II. Draft report:

This revised ESIA draft report for the workshop of the Technical Service in charge of Liberia EA procedure. It shall be submitted as follows:

- Seven (7) printed copies and seven (7) electronic copies to LFT;
- Five (5) printed copies and one (1) electronic copy to the WAPP Secretariat;
- Twenty (20) printed copies and one (1) electronic copy to EPA of Liberia (number to be confirmed in the scoping report);

III. Final report:

This is the final ESIA report. It shall be submitted as follows:

- Ten (10) printed copies and ten (10) electronic copies to the LFT;
- Ten (10) printed copies and one (1) electronic copy to the WAPP Secretariat;

9.3.4 ESIA Non-Technical Summary (Activity A-H)

Once obtained the CEC, the Consultant shall prepare (in both English and French), a non-technical summary of the ESIA, including the RAP and the ESMP. This document will serve as basic support when conducting the post-study information campaigns.

The report shall present:

- Context and justification of the project
- The objectives of the project and the study
- Brief presentation of engaged stakeholders
- Summary of Public Consultations & meetings
- Synthesis of negative impacts of the project and mitigations/compensation measures
- Synthesis of positive impacts of the project for the country and the population, and enhancement measures
- Summary of the ESMP (follow-up and monitoring)
- Indicative costs of the ESMP
- Results of the evaluation of the activities.

The Consultant shall submit the non-technical summary of the ESIA in English, French, and any other local language used in the project area (This will be indicated to the Consultant if needed by the SC of the LFT). The report shall cover in three separate sections the content of the three (3) documents that form the detailed ESIA, namely the ESIA, the RAP and the ESMP. The report shall be illustrated with few maps and photos.

I. Draft report:

This draft non-technical summary report of the ESIA shall be submitted for internal stakeholder comments as follows:

- Seven (7) printed copies and seven (7) electronic copies to LFT;
- Five (5) printed copies and one (1) electronic copy to the WAPP Secretariat;

II. Final report:

This is the final ESIA report. It shall be submitted as follows:

- Ten (10) printed copies and ten (10) electronic copies to the LFT;
- Ten (10) printed copies and one (1) electronic copy to the WAPP Secretariat;

9.3.5 *Public Information and Awareness Campaign (Post-Study): Report & Plan (Activity G)*

9.3.5.1 *Report*

Following completion of the public information and awareness campaign, the Consultant shall produce a detailed report on the activities carried out. This report shall include:

- A recall of the context of the project;
- A recall of the justification, objective, and scope of the campaign;
- A description of the methodology applied;
- The outcomes;
- The activities conducted;
- The material, human and financial resources utilized;
- Key issues presented, highlighting those that gave rise to significant debates;
- The local communities;
- The opinions and impressions on the campaign from population, administrative and civil authorities, competent technical services (in social development, communication etc.), and the Service in charge of the Environment;
- Recommendations for the different stakeholders (population, authorities, LEC, MME, Technical services, WAPP, WB etc.)

The report should be illustrated with photos, figures, tables etc and the Consultant will provide a commented video of the campaign (5-10 copies).

9.3.5.2 *Plan*

Following the acceptance of the ESIA report and the obtention of the CEC, the Consultant shall submit for approval a plan for the realization of the public information and awareness campaign. This plan shall describe the approach that will be adopted and present key aspects such as:

- The context of the project;
- The justification, objective, and scope of the campaign;
- The expected outcomes;
- The performance indicators;
- A description of the proposed methodology, methods and techniques for its implementation;
- The target stakeholders and actors involved;
- The activities to be conducted: number, type, duration, organization, sites, estimate of the concerned population in each community, estimate of the number of participants and the response/participation rate;
- The expected results from each activity;
- The performance indicators for each activity;
- The material, human and financial resources that need to be mobilized.

The Consultant shall propose the number of copies to be produced for the support material (ESIA report, non-technical summary, slide show, etc.) as part of the Draft ESIA. Final decision will depend on the number of concerned communities, the local civil and administrative authorities, the competent technical services, population to be reached, etc. The Consultant shall consider this aspect in the preparation of its financial offer.

The number of copies of reports shall be as follows:

I. Draft report:

- Seven (7) printed copies and seven (7) electronic copies to LFT;
- Five (5) printed copies and one (1) electronic copy to the WAPP Secretariat;

Final report:

- Ten (10) printed copies and ten (10) electronic copies to the LFT;
- Ten (10) printed copies and one (1) electronic copy to the WAPP Secretariat;
- A video on the USB Pendrive of the phases and highlights of the campaign in the localities concerned at the WAPP Secretariat and the LFT.

This final report will include a ToRs project for the recruitment of the project's Environmental Safeguards and HQSE Specialists.

9.4 Resettlement Action Plan (RAP) (Activity E)

The development of the Social Assessment and Resettlement Action Plan (RAP) should enable the Client to have a resettlement plan for the populations affected by the Project, for a better adequate management of the displacement of the populations. This study is to develop a Resettlement Action Plan in accordance with the requirements of donors and the laws in force in Liberia, for each site, and taking into account the investment rights-of-way.

To mitigate this risk, the Consultant shall develop an Action and Resettlement Plan in accordance with national legislation and operational policy PO 4.12 on involuntary resettlement, in order to enable the Client to make a decision and to better control the resettlement process of the persons who will be affected by the project.

On the basis of the results of the preliminary environmental and social assessments and the feasibility study, confirming the need for resettlement action plans, the Consultant will prepare the required reports, once the sites have been identified, delimited and approved.

The Consultant's tasks will be to:

- analyse the status of the project's host site;
- present the project through its activities and by phase;
- analyse the likely risks during the implementation of project activities;
- develop a Resettlement Action Plan (RAP) for each site, taking into account the World Bank's PO/BP 4.12 and the texts in force in Liberia.

The Consultant will have to:

- identify each person impacted under the requirements of OP 4.12 (physical displacement, loss of resources resulting from temporary or permanent loss of land), document their status including their level of socio-economic vulnerability, discuss with them, objectively assess in accordance with market parameters (full replacement and restoration cost) the losses and damages they suffer, discuss with them and agree on an agreement for compensation;
- consult with all persons affected by the project (PAP) and ensure that they have the opportunity to participate in all key stages of the development and implementation of involuntary resettlement and compensation activities;
- determine with the PAPs the most appropriate compensation options based on the impacts suffered, in order to ensure that no person affected by the project has their standard of living reduced by the project and also on aspects of collective interest (access to sociocommunity infrastructures, in particular schools for children from households to be physically moved, etc.);
- establish a fair, transparent, efficient and reassuring compensation process;
- assist affected persons in their efforts to improve their livelihoods and standard of living, or at least to restore them, in real terms, to their pre-displacement or pre-project levels, whichever is more beneficial to them;

- design and implement involuntary resettlement and compensation activities as sustainable development programmes, providing sufficient investment resources for those affected by the project to have the opportunity to share the benefits
- produce a socio-economic analysis, including the identification of all the impacts related to the economic movements of the PAPs, in order to deduce basic indicators for monitoring the restoration of their quality of life;
- develop, if necessary, a Restoration Plan for Livelihoods integrated into the RAP that will respond to international best practices;
- pay special attention to the needs of the most vulnerable people among displaced populations
- etc

The expected results are as follows:

At the end of this study, the Consultant shall submit a RAP for each site in accordance with national legislation and World Bank requirements. Each RAP should cover at least the following elements (where an element is not adapted to the project situation, this should be noted in the relocation plan and justified):

- General description of the said projects and identification of their areas;
- Potential impacts: Identification of (i) the components or activities that result in the relocation of the project, (ii) the impact area of the component or activity, (iii) the alternatives considered to avoid or minimize relocation and (iv) the mechanisms put in place to minimize relocation, to the extent possible, during project implementation;
- Main objectives of the resettlement program;
- Socio-economic studies: with the participation of potentially displaced persons, including the results of a census survey covering (i) the current occupants of the affected area, (ii) the standard characteristics of displaced households, (iii) the extent of expected loss of assets - total or partial; (iv) information on vulnerable groups, (v) provisions for updating information, (vi) the inventory of affected assets, (vii) the public infrastructure and social services to be affected, and the social and cultural characteristics of displaced communities;
- Analysis of the legal framework, considering the specific case of the project and the elements of the CPR;
- Institutional framework, covering (i) the identification of resettlement agencies and NGOs that may have a role in the implementation of the project, (ii) an assessment of the institutional capacity of these agencies and NGOs, and (iii) any measures that are proposed to strengthen the institutional capacity of agencies and NGOs responsible for the implementation of resettlement;
- Eligibility / definition of displaced persons and criteria for determining the categories of PAPs, their eligibility for compensation and resettlement assistance, including deadlines and a specific eligibility matrix;
- Loss assessment: methodology used to assess losses to determine their replacement cost, and description of the types and levels of remuneration proposed under local law and the additional measures that are necessary to achieve the replacement cost of lost property;
- Relocation measures: description of compensation packages and other relocation and support measures;
- Selection of the relocation site, site preparation, and relocation, as well as the necessary housing, infrastructure and social services;
- Protection and environmental management of the relocation site;
- Community participation of resettled persons and host communities;
- Grievance procedures: mechanism, device, processing circuit, deadlines, contact persons;

- Organizational responsibilities for RAP implementation;
- Timetable for the implementation of all relocation activities, the timetable should indicate how the relocation activities are related to the implementation of the overall project;
- Costs and budget: with tables showing detailed cost estimates for all relocation activities, spending schedules, sources of funds and arrangements for payment of compensation;
- Monitoring and evaluation: with performance monitoring indicators on the results of resettlement activities, participation of displaced persons, grievance management, assessment of the impact of resettlement;
- Annexes required:
 - Signed Minutes of consultations and attendance list;
 - List of PAPs and list of vulnerable persons,
 - Individual compensation and assigned assets sheets (with the photo of the PAP, its complete identity, contact, losses incurred, compensation and support measures, corresponding amounts, etc.)
 - Agreement signed by each PAP,
 - Database on PPP: summary of compensation/support, in the form of an Excel with a complete list of PPPs, losses suffered by each, geographical coordinates of the properties affected (buildings, trees, etc.), compensation and support, evaluation of corresponding amounts (unit considered, quantity, unit cost, amount),
 - Complaint form and a summary of the complaints collection and processing system with the names and contacts of the persons to be contacted.

The RAPs should be written in a precise and concise manner and contain all listed annexes, in order to facilitate successful implementation within the required time frame. The Consultant will take into account the time required to validate the provisional RAPs with local stakeholders. The consultation/validation process must be described in the final report with all the minutes of the commitments agreed in the annex. A RAP feedback workshop will be held before the RAP is finalized.

NB: The design office / Consultant will be based on the total rights-of-way of the planned investments. The impacts of the rights-of-way and areas considered must be well described in the RAPs. The project will oversee the development of the RAPs, ensure details, ensure the quality of the report before it is sent to the World Bank and make arrangements for the validation and publication of the RAP at the national level. Responsibility for the implementation of RAPs rests with the project. It will prepare and forward a report on the implementation of the RAPs to the World Bank for approval before the actual start of work. The comments of all funders should be taken into account by the Consultant.

9.4.1 Methodological Approach:

The Consultant's methodological approach will follow the main steps:

- document review;
- stakeholder consultation
- collection of data in the field (socio-economic survey, census of PAPs, inventory of impacted assets);
- data processing and analysis;
- drafting of interim reports;
- restitution of provisional reports;
- taking into account the amendments and
- production of the final and definitive RAP

Based on a methodological approach specific to the elaboration of the RAP, the Consultant shall carry out the mission on the basis of World Bank OP 4.12 and the texts in force in Liberia. The Consultant must present and follow a methodological approach adopted from the inventory to the development of the RAP. The RAP will also clearly include practical provisions for the implementation, monitoring and management of PAP claims.

The Consultant shall identify all activities and persons who will be affected (directly or indirectly, physically or economically, temporarily or permanently) by the construction and operation of the works. It should describe the compensation and support measures for the people affected, regardless of their status as owners or not of the occupied areas. It will define the categories of PAPs according to the eligibility criteria, identify all PAPs, and make an exhaustive inventory of the assets affected with the involvement of PAPs, in compliance with the deadline properly and previously set. To this end, the Consultant must conduct investigations with groups of people living or having activities in the construction area of the works and assist the Municipality in the development and implementation of all the tools necessary for the public inquiry. For each site, the Consultant will develop a Resettlement Action Plan (RAP) that will cover the following points:

- Project description;
- Baseline conditions
- Social impacts of the project;
- Objectives of the resettlement action plan;
- Socio-economic studies on PAPs;
- Legal and regulatory framework for resettlement;
- Institutional framework for resettlement;
- Identification and characterization of PAPs;
- Eligibility criteria (formal rights holders, squatters, tenants, etc. all eligible to varying degrees);
- Eligibility criteria;
- Valuation and compensation of property losses;
- Economic resettlement measures and livelihood restoration plan;
- Selection and preparation of resettlement sites;
- Environmental protection of reception areas and sites;
- Participation of PAPs ;
- Integration with host populations;
- Dispute resolution mechanisms;
- Organizational responsibilities and RAP implementation;
- Implementation schedule;
- RAP costs and budget;
- Monitoring and evaluation;
- Cited appendices.

9.4.2 Approval of the RAP Report:

After the transmission of the provisional reports by the Consultant as provided for in his working schedule, and after examination by the project team, a feedback workshop will be organised and the results of the study validated at a date to be confirmed by the project preparation team. The workshop will bring together all parties, including administrative and customary authorities, representatives of local communities bordering the subproject sites, the PAPs.

At the end of the feedback workshop, the Consultant will incorporate the observations and recommendations made by stakeholders into the new version of his interim report. The workshop is in charge of the project. All reports must be reviewed by the client before transmission to the

World Bank. The World Bank's comments must be taken into account before the production of the final report, which will be published once approved.

The number of copies of RAP reports shall be as follows:

I. Draft report:

- Seven (7) printed copies and seven (7) electronic copies to LFT;
- Five (5) printed copies and one (1) electronic copy to the WAPP Secretariat;

II. Final report:

- Ten (10) printed copies and ten (10) electronic copies to the LFT;
- Ten (10) printed copies and one (1) electronic copy to the WAPP Secretariat;

9.5 Geotechnical Analysis Report (Activity A-H)

The proposed geotechnical study will be based on the guiding lines provided in Annex C and will include a site survey and geotechnical laboratory analysis to provide additional information on soil properties and soil conditions for the proposed solar installation. The work and tests included may vary depending on the characteristics and conditions encountered on the sites. The survey is necessary to gather all the geotechnical information and analysis, as well as the parameters and recommendations necessary for the engineering design and construction of the Project. The Consultant shall provide all manpower, tools, materials, equipment and instruments necessary to conduct the geotechnical survey.

Field investigations and laboratory procedures and tests must comply with all applicable standards and regulations. All work must be performed in accordance with local, regional and national regulatory requirements for safety, health and security and environmental controls. The methods of investigation and field testing and in situ testing shall be selected by the Consultant based on known or suspected soil or bedrock types present at the site or in the area or region, and in accordance with industry practices. The number of tests for each element and per site shall be determined by the Consultant on the basis of his assessment of the sites' conditions during the pre-bid site visit. The quantities and number of tests should be filled in the tables of Annex C to be part of the Consultant's financial proposal. The quantities can be reduced if uniform conditions are met at the time of implementation of the investigations and upon approval by the Client (WAPP).

A draft report of the field investigation shall be provided, as well as a final report after receipt of the laboratory test results and certificates. The report will include

- a site plan;
- test well records;
- laboratory test certificates and
- comments and recommendations regarding, but not limited to, the following points:
 - Geomorphological and geological mapping of the site (including photographic documents);
 - Groundwater status at the site;
 - Comment on the presence of expansive or weakening soils (if any);
 - Excavation conditions;
 - Temporary and permanent roads to be used during construction;
 - Site basement class for seismic design;
 - Dynamism of underground materials in relation to underground structures;

- Preliminary comments on the stability characteristics of the site slopes as a function of the instability observed during site visits;
- The estimated geotechnical design parameters, (including γ_{dry} , γ_{sat} , C_u , ϕ , E_s , K_s , ν and G);
- Ultimate and permissible load-bearing capacity for shallow foundations;
- Friction and load capacity for piles;
- Resistance reduction factor according to AS 2159-2009;
- Minimum installation depth.

The number of copies of the Geotechnical reports shall be as follows:

I. Draft report:

- Seven (7) printed copies and seven (7) electronic copies to LFT;
- Five (5) printed copies and one (1) electronic copy to the WAPP Secretariat;

II. Final report:

- Ten (10) printed copies and ten (10) electronic copies to the LFT;
- Ten (10) printed copies and one (1) electronic copy to the WAPP Secretariat;

9.6 Capacity building (Activity H)

The Consultant's services will include knowledge transfer and training at the Consultant's premises in the areas covered by the study. This training will take place at least one week and the Consultant must submit a detailed report on the training provided.

The number of copies of the detailed report to be submitted will be as follows:

I. Detailed Report

- Ten (10) printed copies and ten (10) electronic copies to the LFT;
- Ten (10) printed copies and one (1) electronic copy to the WAPP Secretariat;

9.7 Meetings, Visit and Workshops

In addition to the above deliverables, the Consultant shall plan the organization of meetings/workshops to collect and integrate the comments from the stakeholders. In his proposal, the Consultant shall make provision for the organization and delivery of workshops and meetings to present the approach and schedule adopted for the study as well as draft reports issued to discuss key issues and collect comments. These workshops are to be planned jointly with the WAPP's Secretariat General, and will involve the participation of the LFT and TA2 members. All shall take place in Liberia (Monrovia) except the 2-week training, which shall be in the Consultant's Head Office. They will involve 10 participants, of which three (3) from WAPP's head office in Cotonou, in addition to the Consultant's staff.

The Consultant is expected to take an active part in a meeting with the TFPs to present the project in view of its possible financing. As such, he shall plan for the preparation of relevant documents and presentations and their delivery at the meeting, and shall provide any additional information and /or clarification that may be requested in the course of these meetings.

The dates and place where these meetings may take place shall be established jointly by the WAPP Secretariat General, the International Donors, and Liberia's Authorities, and will be communicated to the Consultant in due time. The attendance by the STA Consultant (The Transaction Advisor)

The LFT and the TA2 will provide support in the organization of the above meetings and workshops and associated logistic.

However, all costs associated with the participation of the Consultant to these workshops and meetings shall be include in its financial proposal.

9.8 REQUIREMENTS AND TIMETABLE (PACKAGE 2)

The Consultant will work under the supervision of the WAPP Secretariat assisted by a project team set up by Liberian Authorities. The progress of the studies will be monitored on an ad hoc basis through the submission of progress reports to be provided by the Consultant on a monthly basis (see the description of the content of the monthly reports in the Reports/Deliverables section). The Consultant shall also promptly report to the WAPP Secretariat any unusual events beyond its control and/or that may compromise the progress of the studies. The Consultant is also expected to hold a coordination meeting (at least by telephone) at least once a month with the Client, TA2 and the LFT. This coordination meeting in addition to the reports and should allow for regular monitoring at regular intervals.

9.8.1 Deadlines

The Consultant's services include the timely preparation and submission of all documents, maps, diagrams and reports etc. The reports must be sent with an official letter to the WAPP Secretariat, the LFT. Deliverables must comply with the contractual requirements. The consultant will assist the LEC in following up with the national agencies/services and Ministries responsible for approving the reports.

The Consultant should note that one of the deliverables of this mission is the holding of public consultations, taking into account the participation of government authorities and local administration, relevant national institutions, funding agencies, non-governmental organizations, the academia, communities affected by the project and civil society. These public consultations will continue throughout the study period and the Consultant must provide proof of their holding, through photos, signed minutes of meetings and lists of participants. In addition, the consultant should attach signed minutes of all consultations to the draft and final Feasibility and ESIA reports.

The Consultant should note that situations may arise where the LFT, national environmental protection authorities/agencies and TFPs concerned decide to provide additional comments on the Final Reports. If this happens, the consultant will have to incorporate the comments made in the revised final versions and forward them. All reports will be written in English.

With knowledge of the project's host area, the Consultant should specify in the scoping report the number of meetings necessary for the formal public consultation and the post-EIES information and awareness campaign, including the municipalities, prefectures and sub-prefectures concerned hosting these activities.

In addition to the above requirements, for each map and scheme, the Consultant shall submit to the WAPP Secretariat, the LFT, a paper copy, three (3) rewritable CDs, and three USB on the latest version of the AUTOCAD graphics software. The paper copy must be on tracing film (Unotrace) - 75 micrometers - paper 0.003" (translating paper). All costs associated with the study,

the various services including visits, purchase, preparation of maps and diagrams are deemed to be included in the Consultant's financial proposal.

9.8.2 Execution schedule and Duration of services

The duration of the detailed feasibility and environmental studies must not exceed 10 months (40 weeks) and would happen simultaneously. The Consultant will propose in his offer, a detailed schedule of execution of the consultation. To this end, the following timetable is proposed as an indication in Table below.

Table 3: Schedule for the implementation of the Feasibility and ESIA studies (Package 2)

#	Activities	Milestones
	Common Schedules for Feasibility and ESIA Studies	
1	Agreed date for the start of the project / Date of Commencement of Services	Wo
2	Kick-off (Meeting)	Wo + 2 weeks
3	<i>Submission of Draft Inception Report</i>	Wo + 6 weeks
4	<i>Validation workshop on the Draft Inception Report</i>	Wo + 8 weeks
5	<i>Final Inception Report submitted (After last commenting on Draft Final)</i>	Wo + 9 weeks
6	Data Collection Report (Feasibility Activity A)	
7	<i>Preliminary Report</i>	Wo + 11 weeks
8	<i>Validation Meeting</i>	Wo + 12 weeks
9	<i>Final Report (After last commenting on Draft Final)</i>	Wo + 13 weeks
10	Site Selection Report (Feasibility Activity B) + Scoping and Demarcating Report (E&S Activity A&B)	
11	<i>Preliminary report and discussions with local authorities</i>	Wo + 16 weeks
12	<i>Validation Meeting</i>	Wo + 18 weeks
13	<i>Final Reports (After last commenting on Draft Final)</i>	Wo + 19 weeks
14	Schedule for Feasibility Studies (Simultaneously occurs with the E&S)	
15	Solar Park Conception Design Report (Feasibility Activity C&D)	
16	<i>Preliminary Report</i>	Wo + 21 weeks
17	<i>Approval Meeting</i>	Wo + 23 weeks
18	<i>Final Report (After last commenting on Draft Final)</i>	Wo + 24 weeks
19	Feasibility Report (Feasibility Activity E)	
20	<i>Preliminary Report</i>	Wo + 28 weeks
21	<i>Approval Meeting</i>	Wo + 30 weeks
22	<i>Final Report (After last commenting on Draft Final)</i>	Wo + 32 weeks
23	Diagnostic of the National Dispatch Center Report (Feasibility Activity F)	
24	<i>Preliminary Report</i>	Wo + 19 weeks
25	<i>Approval Meeting</i>	Wo + 21 weeks
26	<i>Final Report (After last commenting on Draft Final)</i>	Wo + 22 weeks
27	Training (Feasibility Activity G)	
28	<i>Training</i>	Wo + 26 weeks
29	<i>Final Report (After last commenting on Draft Final)</i>	Wo + 27 weeks
30	Schedule for Environmental Studies (Simultaneously occurs with feasibility)	
31	ESIA Report (incl ESMP submitted to Authority responsible for the CEC) (E&S Activity C)	
32	<i>Draft report and discussions with local authorities</i>	Wo + 21 weeks
33	<i>Validation Meeting</i>	Wo + 23 weeks
34	<i>Final Report (After last commenting on Draft Final) – submitted to obtain CEC</i>	Wo + 24 weeks

35	RAP (Activity E)	
36	<i>Social Evaluation and discussion with the local communities</i>	<i>Wo + 26 weeks</i>
37	<i>Validation Meeting</i>	<i>Wo + 28 weeks</i>
38	<i>Draft Report</i>	<i>Wo + 30 weeks</i>
39	<i>Final Report (After last commenting on Draft Final)</i>	<i>Wo + 32 weeks</i>
40	Training (E&S Activity H)	
41	<i>Training</i>	<i>Wo + 23 weeks</i> <i>Wo + 28 weeks</i>
42	<i>Final Report (After last commenting on Draft Final)</i>	<i>Wo + 32 weeks</i>
43		
44	Geotechnical Study Report (E&S Activity A-H)	
45	<i>Draft Report</i>	<i>Wo + 28 weeks</i>
46	<i>Validation Meeting</i>	<i>Wo + 30 weeks</i>
47	<i>Final Report (After commenting on Draft Final)</i>	<i>Wo + 32 weeks</i>
48	ESIA Non-Technical Report (E&S Activity A-H)	
49	<i>Report (After commenting on Draft Final)</i>	<i>Wo + 34 weeks</i>
50	Final comments on Geotechnical Report	
51	Public Information and Awareness Campaign Report	
52	<i>Report (After commenting on Draft Final)</i>	<i>Wo + 36 weeks</i>
53	<i>Final comments on Public Information and Awareness Campaign Report</i>	
54	<i>1st Meeting with International Donors & Lenders</i>	<i>So + 40 weeks</i>

NB: This Terms of Reference and schedule is still being worked on by the Team.

Commenting will be received from TFP, WAPP, LFT and other stakeholders. The Consultant will also be in charge of the Monthly Activity Reports in addition to the Quarterly activity reports as presented in these terms of reference. Support for obtaining the EIA will be provided from the beginning of the consultancy.

10. QUALIFICATION REQUIREMENT (PACKAGE 2)

10.1 Selection Criteria

The consultants invited for submitting proposals have been selected further to a process of shortlisting where they submitted their credentials on their technical capacity, experience and qualifications in the fields related to this assignment as per the details of the Request for Expression of Interest.

10.2 Key Experts

The Consultant shall be made up a team of international experts with previous experience in Technico and Economic feasibility and the Environmental, Social studies for the solar pack project.

Key positions which will form the core team, and for which a curriculum vitae must be submitted, include:

- i. Power Engineering Expert (Specialized in Utility Scale Solar Systems)
- ii. Network Expert
- iii. Expert in Solar Energy (Solar Resource and Technologies expert)
- iv. Expert in Economy and Financial Energy

- v. Expert Control& Protection/Scada / Dispatching
- vi. ESIA Expert - Team Leader for the E&S component
- vii. Environmental Specialist
- viii. Environmental Law Specialist or Jurist
- ix. Socio-economist Exper (Specialized in Property Assessment and Miscellaneous) (Head of PAR report)
- x. Geologist / Geotechnical Engineer
- xi. Cost Estimator
- xii. Financial Analyst.

The Consultant will mention key staff who will be shared between package 1 and 2. One sole Key Expert can be proposed when his speciality and relevant experience is common to the package 1 and 2. Shared CV would then be scored based on requirements from each package so as to reduce the number of experts. The staff must be fluent in English. The minimum required experience of key personnel is as follows:

Table 4: Staff qualification for the Feasibility and ESIA Studies (Package 2)

Power Engineer Expert	
Year of Professional Experience	15
Specific Experience	Involved in the design and implementation of at least three (3) solar power connection studies including Network Simulations and Analyzes, Preliminary Designs, Transmission Line / Substation/Scada Feasibility Studies, and the preparation of Tender. The studies should have a value of at least US \$ 1,000,000 each and one should ideally concern a project in Africa or in similar conditions.
Network Expert	
Year of Professional Experience	10
Specific Experience	Engineer specialized in electrical engineering modeling and calculation network with at least 10 years of experience in simulations on studies stability and connection and involved in integration study of at least three (3) solar power generation projects of more than 10 MWp minimum, including Feasibility Studies, Preliminary Designs and preparation of Tender Documents. At least one of the projects should have a value of at least US \$ 1,000,000 and one should ideally be located in Africa or in similar conditions.
Expert in Solar Energy	
Year of Professional Experience	10
Specific Experience	Involved in the design and implementation of at least three (3) projects of solar power plants of more than 10 MWp minimum, including Feasibility Studies, Preliminary Designs and the preparation of the Call File. Offers. At least one of the projects should have a value of at least US \$ 100,000 and one should ideally be located in Africa or in similar conditions.

Expert in Hybrid Projects	
Year of Professional Experience	10
Specific Experience	Involved in the design and implementation of at least three (3) projects of solar power generation plants with hybrid systems (diesel / batteries / solar) including Feasibility Studies, Preliminary Designs and the preparation of the Tender File. Fully conversant with the use of specific software for hybrid systems (like HOMER). At least one of the project should to have a value of at least US \$ 100,000 and should be ideally located in Africa or in conditions similar.
Expert Economist and Financial Energy:	
Year of Professional Experience	10
Specific Experience	Ten 10 years of experience in conducting economic and financial analyses for investment projects energy in Africa, especially for projects generating solar power plants connected to the network.
Expert Scada/Dispatching	
Year of Professional Experience	15
Specific Experience	15 years of experience in the design, installation and commissioning of SCADA and Dispatching systems. Involves in at least two (2) projects of rehabilitation and strengthening of Conduct Center including 1 project with the installation of Smart Grid technology.
Title	Project Manager for ESIA
Years of Professional Experience	15
Specific Expertise	Conducting ESIA's in at least three power plant projects of 10 MW or more, and 132 kV power lines over at least 50 km (including at least one solar plant).
Title	Environmental Specialist
Years of Professional Experience	15
Specific Expertise	Conducting ESIA's in at least four power plant projects of 10 MW or more, and 132 kV power lines over at least 50 km (including at least one solar plant). Each study should include the development of an Environmental Management Plan and be in West Africa.
Title	Environmental Law Specialist or Jurist
Years of Professional Experience	5
Specific Expertise	Conducting or managing the RAP. Involvement in the development of RPPs, on the same basis, for at least five power plant projects of 100 MW or more, including three in West Africa and 132 kV power line projects over at least 50 km.
Title	Socio economist (Specialized in Property Assessment and Miscellaneous) (Head of PAR report)
Years of Professional Experience	10
Specific Expertise	The mission for the elaboration of the PAR will be carried out by an expert holding at least a degree in Social

	Sciences (Sociology, Geography, Economics, Law), justifying at least ten years of experience in the realization of social studies and/or environmental and social assessments. He must have completed at least one CPR and at least five Resettlement Action Plans (RAPs) within the last ten years. There must also be at least one reference in the implementation of RAPs. The candidate with the most references will be selected. He/she must have a thorough knowledge of social protection and land management issues. He or she should be familiar with World Bank environmental and social standards, including land acquisition, land use restrictions and involuntary resettlement/removal, and have a good knowledge of the country's laws and regulations on land management and public utility expropriation. He/she must also have proven experience in the implementation of Action Plans for the Resettlement of Populations Affected by Development Projects financed by the WB in Liberia. The Consultant will be responsible for setting up auxiliary staff to carry out studies and field surveys.
Title	Geotechnical Expert
Years of Professional Experience	10
Specific expertise	Carrying out at least 5 geotechnical analyses, including at least one for a solar power plant and with proven experience in West Africa.
Title	PC-7/Engineer Surveyor
Years of Professional Experience	10
Specific expertise	Identification of the route and demarcation of the rights of way of at least three linear projects (energy transport, roads, pipelines, etc.) in West Africa of at least 50 km in length, as executing surveyor, team leader, etc.
Title	Cost Estimator
Years of Professional experience	10
Specific Expertise	Demonstrated experience in cost estimating and construction planning at feasibility level for at least three (3) hydropower projects. The candidate must have good knowledge of conditions prevailing in Africa, and preferably in Liberia.
Title	Financial Analyst
Years of Professional experience	10
Specific Expertise	10 years of experience in power generation from various sources. Involved in at least two (2) hydroelectric projects in Africa. Good knowledge of International and regional E&S policies and WB Safeguards as they relate to hydro developments, as well as legal framework and property/land issues in Liberia and the region.

The consultant will add, at his own expense, any other skills that he deems useful to the success of the study.

11. OTHER INFORMATION (PACKAGE 1 AND PACKAGE 2)

Information and data to be provided to the Consultant

At its request, the LFT will provide the Consultant with the available data on the project as well as any other relevant document available to facilitate the study.

The Consultant shall inquire about the guidelines, requirements and policies of the TFPs with a view to using them for the benefit of the study.

Reporting Requirements

The Consultant will report to the SC of the LFT and work in collaboration with the TA2. All correspondence from the Consultant to one of the parties should be copied to all other stakeholders (SG/WAPP/ SC/LFT/) for information.

Conduct of Activities

Close coordination between the WAPP Secretariat, the Ministry of Energy and Petroleum of Liberia, and the Consultants in charge of the Feasibility Study and the Stability Study will be required. The Consultant will be responsible for the overall management of all aspects of the services. The Consultant will participate in all other meetings with the LFT on behalf of the study. The Consultant shall apply its internal quality control and assurance procedures during the performance of the contract and shall demonstrate that they are effectively applied.

Participation of the LFT

The LFT and the TA2 will introduce, if necessary, the Consultant to state structures, the local population and any other local partners involved in this project. The Consultant shall make its own arrangements for any other service/services that the LFT cannot provide.

Documentary References and Information

- *Sources of Data and Information Collected*

The people met at the ministries and structures consulted, the field data collection program, written opinions and public participation must be recorded in the study. The main difficulties encountered in data collection will also be mentioned in this part of the study.

- *Bibliographical References and Appendices*

The Consultant shall mention in the appendices all the documentation used to prepare the report.

- *Reference Documents*

In addition to the similar studies available and any other personal documents available from the Consultant, the use of the following reference documents is recommended:

- Legislation and regulations applicable in the Republic of Liberia;
- International treaties applicable to the Republic of Liberia in the field of international environmental law;

- Relevant directives, guides and policies of TFPs;
- All other relevant documents;
- Present ToR;
- Any existing studies available on the project and its reception area;

- *Anti-Plagiarism Policy*

Plagiarism will not be tolerated whatsoever in the publications. Any report, working document or other document prepared must constitute original work, in which all sources for information or data receive complete and accurate attribution. Passages taken from prior publications or other works must either be presented as direct quotations (marked "..."), paraphrased or clearly cited in either case. The team uses plagiarism-detection to review all draft publications. Passages found to resemble existing publications too closely may require rewriting and more explicit source citation. Passages copied from prior publications cannot be accepted as original work and may be returned to the commissioned writer or partner entity for further revision. The Team reserves the right to withhold payment to a commissioned writer or partner entity until any such revision is satisfactorily undertaken. Plagiarism, including either copy-and-paste text production or failure to cite sources, may result in rejection of the draft with no financial obligation on the part of programme team.

- *Visibility and Anti-Advertisement*

The Consultant must make sure that the communication and visibility measures accompanying the project improve the operational efficiency and effectiveness of the World Bank, WAPP Secretariat and the LTF. This must include the followings:

- (i) Guidelines on visibility of Funding agencies
- (ii) Accurate and factual information
- (iii) Allow for the local context
- (iv) A structured communication and visibility plan
- (v) Must to be an advertisement platform for the Consultant.

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ANNEXES (PACKAGE 1 AND PACKAGE 2)

ANNEX A: Summary of a Resettlement Plan (RAP)

Summary of RP should cover the followings:

1. Executive Summary in French and English
2. Description of the component or activity and its potential impacts on land
 - 2.1 General Description of the Project and Identification of the Area of Intervention
 - 2.2 Impacts and Identification of:
 - 2.2.1 The component or activities of the project that will cause the movement/loss of property
 - 2.2.2 The impact zone of these components or activities
 - 2.2.3 Alternatives to avoid or minimize travel
 - 2.2.4 The mechanisms put in place during the implementation of the project to minimize as much as possible the displacement or resettlement
3. Goals: Key goals of the resettlement program
4. Socio-economic studies and census of affected persons, property and livelihoods: The findings of the studies and the census should include:
 - 4.1 Results of a census covering the current occupants of the affected area, to establish the basis for the design of the resettlement program and to exclude those who would arrive after the census of eligibility for the benefits of the program Resettlement
 - 4.2 Characteristics of displaced households: descriptions of production systems, household organization, including levels of production and income from formal and informal activities, and living standards (particularly in terms of health) of the displaced population
 - 4.3 Magnitude of total or partial losses of property, and magnitude of physical and economic displacement
 - 4.4 Information on vulnerable groups or persons, for which specific arrangements must be made
 - 4.5 Provisions for updating information on displaced persons, including their livelihoods and standard of living, so that current information is available during displacement
 - 4.6 Other studies outlining the following:
 - 4.6.1 Land system and land transactions, including inventory of natural resources used by affected persons, non-written rights of use (including fishing, grazing, or use forest) and governed by traditional systems, and any other land system issues in the area
 - 4.6.2 Social interaction in affected communities, including social and solidarity networks, and how they will be affected by the displacement
 - 4.6.3 Infrastructure and public services likely to be affected by the project
 - 4.6.4 Social and cultural characteristics of displaced communities, including descriptions of formal and informal institutions (community organizations, religious groups, NGOs), which may be associated with the consultation and participation in the design of resettlement actions.
5. Legal and institutional context:

The legal framework, by reviewing the agreement between national laws, regulations, environmental and social safeguard policies, and the measures to be taken to fill the gaps between these texts.

 - 5.1 Possible local features
 - 5.2 Local institutional and organisational specificities:

The legal framework, reviewing the concordance between national laws and regulations and environmental and social safeguard policies as well as the measures to be taken to fill the gaps between these texts

5.3 Any local features: Local specificities in institutional and organizational matters

5.3.1 Identification of agencies responsible for resettlement, and structures that may have a role in implementation

5.3.2 Assessment of the institutional capacity of the implementing actors;

6. Eligibility and rights to compensation or resettlement: Definitions and categories of eligible displaced persons, and rules for determining eligibility for compensation or other assistance for resettlement, including the rule of setting the deadline

7. Evaluation and compensation of losses: Evaluation methodologies to determine the full cost of replacement, description of the methods and levels of compensation provided by local legislation, and measures necessary to achieve compensation at full replacement cost

8. Resettlement measures:

8.1 Description of the planned measures (compensation and / or resettlement) to assist each category of affected persons

8.2 Selection of resettlement sites, site preparation, and resettlement, including description of alternatives

8.3 Legal mechanisms of land allocation and regularization for resettlers

8.4 Housing, Infrastructure, and Social Services

8.5 Protection and management of the environment

8.6 Community participation, participation of displaced persons, participation of host communities

8.7 Specific assistance measures for vulnerable people and groups

9. Consultation procedures and inclusion of PAPs in the resettlement planning; description of the consultations conducted for the RP, including minutes of meetings with the PAPs and their questions and the answers given. Explain the consultation plan during RP implementation.

10. Procedures for handling complaints and conflicts: Description of simple and affordable mechanisms for third party arbitration and settlement of resettlement disputes and disputes; These mechanisms must take into account the effective judicial remedies and traditional dispute resolution mechanisms.

11. Organizational Responsibilities: The organizational framework for implementation of resettlement, including identification of the actors responsible for resettlement measures, coordination mechanisms for actions, and capacity-building measures, etc.

12. Implementation schedule, covering all actions from preparation to completion including dates for resettlement of project actions and various forms of assistance to resettlers: The schedule should indicate how the resettlement actions are related to the timing of the entire project

13. Cost and budget: Cost-per-action tabled for all activities planned for resettlement, including provisions for inflation, population growth, and other contingencies. Expenditure forecasts, source of funding and mechanisms for making funds available.

14. Monitoring and evaluation: Organization of monitoring of resettlement actions by the implementing agency, intervention of external agencies for monitoring, information collected, including performance indicators and measurement of results, as well as the participation of displaced persons in the process of implementation of resettlement.

ANNEX B: Summary of Optimization Study and PIP.

File is attached.



25.09.2019 Liberia OS
Executive Summary Fi

ANNEX C: Preliminary program of field investigations

File is attached.



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