TERMS OF REFERENCE
CONSULTING SERVICES FOR DESIGN REVIEW AND CONSTRUCTION SUPERVISION FOR THE SMALL HYDROPOWER PROJECT

1. BACKGROUND AND JUSTIFICATION

1.1 The Government of Guyana has applied for financing from the Islamic Development Bank (IsDB) to implement the Small Hydropower Project which is designed to support Guyana's evolving energy sector. The current Low Carbon Development Strategy (LCDS) presents an energy sector that is transitioning from nearly 100% fossil fuel based to cleaner solutions involving an optimum utilization of indigenous renewable energy resources such as solar, hydro and wind power, a more diversified electricity generation mix and energy efficiency measures. Another strategy guiding the development of the energy sector is the Hinterland Electrification Strategy (2014 – 2023) which seeks to increase access to electricity services in hinterland communities using indigenous renewable energy resources, mainly solar, wind and hydro power. The intent of both strategies is to provide access to an affordable, reliable, secure and sustainable supply of energy. This will support social services and economic development while simultaneously reducing energy related greenhouse gas emissions.

1.2 In pursuit of these development strategies the government, over the last years, has implemented a number of projects aimed at: converting all government buildings to utilize renewable energy (solar PV) and energy efficiency systems and increasing access to electricity services in hinterland communities using solar PV standalone systems. Over the past 7 years, the Guyana Energy Agency (GEA) has installed a total of 4.8MWp of solar PV systems on 287 government buildings. The Agency is also currently implementing the IDB funded Energy Matrix Diversification and Institutional Strengthening of the Department of Energy Program under which three solar PV farms totaling 3.15MWp with battery storage will be installed in the hinterland townships of Lethem (1MWp), Bartica (1.5MWp) and Mahdia (0.65MWp). Also, the GEA has installed a 20kW micro hydropower system at Hosororo in Region 1, while the construction of a 0.15MW hydropower plant in the hinterland community of Kato, Region 8 is presently ongoing by the Hinterland Electrification Company.

1.3 The proposed Small Hydropower Project, which includes the construction of a 1.5MW hydropower plant at Kumu and the rehabilitation and upgrade of the defunct Moco Moco hydropower plant to 0.7MW capacity, will ensure access to an affordable, reliable and sustainable supply of electricity to the hinterland township of Lethem and the nearby villages of Moco Moco, Kumu, St. Ignatius and Quarrie in Region 9. The project will also form part of government's efforts to diversify the energy matrix in hinterland communities using renewable energy and will support the continued transition of the energy sector to cleaner and greener solutions.

1.4 In preparation for the appraisal and implementation of the project, the GEA has completed the following studies:

a) Feasibility study for the rehabilitation of the Moco Moco hydropower plant for an increased capacity of 0.7MW;

b) Feasibility study for the construction of a 1.5MW Kumu hydropower plant;

c) Environmental Assessment and Management Plans for the Kumu and Moco Moco hydropower projects; and

d) Geotechnical survey for the Moco Moco hydropower project. The survey will also inform the location of the penstock which was displaced by a landslide in 2003 and rendered the plant inoperable.

2. DESCRIPTION OF PROJECT

2.1 Project Location:

The Kumu and Moco Moco hydropower plants are both located near the Lethem township, which is about 450km to the south of the capital city Georgetown. Lethem, a small town on the Guyana-Brazil border, with its neighbouring villages of Moco Moco, St. Ignatius, Quarrie and Kumu, have an estimated population of 5,000 residents. The community, which is located in Administrative Region 9 (Upper Takatu - Upper Essequibo), is rapidly developing with its economic activity based largely on commerce between Brazil and Guyana. However, this is expected to change with the introduction of an affordable and reliable electricity supply to be provided by the project.

Presently, electricity supply in the Lethem area is provided by the Lethem Power Company Inc. (LMPC) on a 24-hour basis, generated from the company's six diesel units with a total installed capacity of 3.825MVA. Fuel, which accounts for 60-65% of operational costs, is transported by bulk transportation carriers from Georgetown and this can become challenging during the rainy seasons, resulting in delays in delivery. The peak demand for the Lethem grid is 1.2MW with an average of 0.83MW (March 2018). This is expected to increase in the short to medium term since government has recently completed infrastructure works for an industrial estate in the community, which will add to the demand for more affordable electricity supply.

2.2 Project Description

The project includes the design, planning, engineering, procurement (manufacturing/supply), construction/erection, testing and commissioning of the Kumu and Moco Moco hydropower plants under an EPC Contract, to be procured through an Open International Competitive Bidding (Open ICB) process. The details for the plants are as follow:

a) New Kumu Hydropower plant (1.5 MW):

This component consists of the construction of a new 1.5MW run of the river type hydropower plant at Kumu. The works under this subcomponent includes:

i) The construction of the hydro intake and conveyance facilities:

- The Dam with 3m or 5m depth and 20 m long,
- The head race pipeline with 500 m long and 600 mm diameter,
- The forebay with a total length of 5 m and a maximum depth of 2 m, and
- The penstock with a total length of 1750 m long and 350 mm diameter.

ii) The construction of a powerhouse including:

- 1x1500 kW hydro turbine-generator system (Pelton type) and auxiliaries,
- Control, protection and metering panels,
- Low voltage switchgear panels,
- the step-up transformer size 1.875 MVA, and
- Switchyard works including earthing and fencing.

iii) The construction of 14km of 13.8kV single circuit power transmission line to connect the hydropower plant to the new 13.8kV substation under construction by Lethem power company. This new substation will connect the new hydropower plant, the new 1MW solar PV farm referred to above and the existing diesel power plant.

iv) Construction of one 13.8kV switchgear equipped with a single busbar, one tie breaker, and seven feeders with a local control system and data transmission links to the remote-control room in LMPC.

b) Moco Moco hydropower plant (0.7MW):

The plant was built in 1999, however it has not worked since 2001 due to a major incident (land slide) that occurred along the penstock and at the power house. The works under this subcomponent will include mainly:

ii) Rehabilitation of the existing Dam and intake facilities which will include civil works to the surface of the dam and installation of automated gates. Rehabilitation of the Head race and its associated structures which include civil works to improve its structural integrity.

iii) Rehabilitation of the forebay which include installation of an automated gate and new valve.

iv) The construction of a new steel penstock of 603 m long and 500 mm diameter.

v) The rehabilitation of the power house with the installation of 2x350 kW new hydro turbine-generator system and auxiliaries, control protection and metering panel, low voltage switchgear panels, switchyard works including earthing and fencing and a new step-up transformer size 875 kVA.

vi) The installation of a local control system and data transmission links to the remote-control room in LMPC.

The energy generated by this power plant will be dispatched via the existing 20km of 13.8kV transmission line from the hydropower plant to the Lethem distribution network.

2.3 Project Implementation Arrangements

The Guyana Energy Agency (GEA) is the Executing Agency for the project and will have overall responsibility for implementation of the project. Under the direction of the Chief Executive Officer (CEO) of the GEA, a Project Management Unit (PMU) has been established within the GEA for the execution of the Project. The PMU is comprised of technical and administrative staff with the following key positions: Project Manager, Finance Specialist, Procurement Specialist, Civil

Engineer Specialist, Electrical Engineer, three Hydropower Engineers, Environmental and Social Officer, Monitoring Assistant and two Technicians/Clerk of Works. The PMU is responsible for inter-alia: (i) technical execution of the Project; (ii) procurement and control management of all goods, works, services and consultancy services; (iii) managing contracts and processing payments; (iv) preparing annual budget and monitoring utilization of and compliance with the loan proceeds; (v) reporting periodically to GEA's CEO, the Ministry of Finance (MoF) and the IsDB on the activities of the project; and (vi) preparing quarterly progress and annual reports and project completion reports for submission to IsDB.

The Specific Procurement Notice (SPN) inviting bids for procurement of an EPC Contract for the construction and rehabilitation of the Kumu and Moco Moco hydropower plants was issued on July 28, 2021. It is anticipated that the contract with the successful bidder would be signed in January 2022 and is expected to be completed in 30 months. Procurement for construction of the 14km of 13.8kV single circuit transmission line to connect the Kumu hydropower plant to the new 13.8kV substation being constructed by the LMPC will be tendered separately.

The Executing Agency, Guyana Energy Agency, now intends to hire an International Consulting Firm (the Consultant) to supervise the day-to-day implementation of the EPC Contract for the hydropower plants. The Consultant is also expected to facilitate knowledge transfer to GEA-PMU personnel. The Consultant will coordinate its activities with the Project Manager (PM) of the PMU. The PM through the Supervisory Firm will be responsible for the day-to-day monitoring of the EPC Contractor to ensure proper and timely execution of the project.

3. OBJECTIVES OF CONSULTING SERVICES

The objectives of the consulting services shall be to assist with project management, supervising construction, testing and commissioning, and capacity development. This is to ensure that the Project is implemented with a high standard of workmanship and quality of materials, on schedule, and within the budget, in accordance with the specifications and drawings of the EPC Contract, to internationally acceptable engineering practices, environmental and social standards and in accordance with the Employer's requirements and the Bank's Safeguard Policy. The objectives of the services will be achieved through the following major activities:

a) Designs and contract Documents Review;

b) Support Contract Management; and

c) Construction supervision, pre-commissioning and completion, commissioning and operational acceptance.

4. SCOPE OF CONSULTING SERVICES

The scope of the consulting services includes, but is not limited to, design review, contract management and overall construction supervision and quality control of all civil and hydromechanical, electromechanical, and substation and transmission line works under the EPC Contract. The selected Consultant shall act as an implementation engineer on taking over responsibility for engineering/design activities for the entire implementation phase until commissioning and operational acceptance certificate and defects liability period. The consulting

services shall be provided for approximately 33 calendar months. The services shall include, but not be limited to the following tasks:

4.1 Designs and Documents Review

The scope of services shall include but not limited to:

a) Review and approval of the following submissions by the EPC Contractor:

   i) Engineering designs, drawings and their support documents for the project. Certify that specifications and methodologies are in keeping with the requirements of the Contract;

   ii) Working drawings, construction drawings, shop drawings and other related documents for the project;

   iii) Construction method, data on materials and construction machines furnished;

   iv) Monitoring and oversight of construction to ensure conformity with designs and standards as detailed in **4.3**;

   v) Program of Work for execution of the project;

   vi) The Health, Safety and Environmental Protection Plan, including all updates and revisions;

   vii) The Quality Management and Control Plan and Procedures and the Code of Conduct;

   viii) As-Built drawings of the permanent works; and

   ix) Operational and Maintenance Manuals for the completed plants and all subsystems/equipment. The Consultant shall liaise with the Contractor and GEA-PMU to ensure that uniform, complete, high-quality O&M manuals are prepared for the Project;

   x) Factory test inspection reports and certificates

   xi) Advice to the GEA-PMU on designs, quality measures, implementation plans, etc. and assist in preparing contractual letters to the Contractor in case of any non-compliance with the contract requirements.

   xii) The monthly and fortnightly progress reports of the EPC Contactor and recommend same to the GEA-PMU.

4.2 Supporting Contract Management

4.2.1 Contract Procedures

a) The Consultant shall formulate and establish procedures for the proper management, administration and quality assurance/control of the EPC Contractor's works as well as the Consultant's own services, and shall effect monitoring and control of these procedures to ensure adherence to all contractual obligations;

b) Provide technical support to GEA-PMU in settlement of claims and disputes;

c) Advise the parties under the Contract on any dispute arising under the Contract to ensure that disputes are resolved amicably as soon as possible without affecting the project.

4.2.2 Project Program

a) Within 60 days of award of the Consulting Contract, the Consultant shall prepare, and submit to the GEA-PMU for consent, a detailed program of all the activities related to the execution of the Project. The Consultant's program shall be based on the reviewed and accepted Program of Work of the EPC Contractor. Submission of program data shall include as a minimum:

   i) Tabular listings giving early starts and finishes and late starts and finishes;

   ii) Free and total floats; and

   iii) Computer generated bar charts.

b) When this program has been approved by the GEA-PMU, it shall become the new base-line program for monitoring the execution of the Project.

c) If updating of the Project program is required, a revised program shall be prepared by the EPC Contractor and reviewed by the Consultant, and re-submitted to the GEA-PMU for its consent. When approved, this program will become the new baseline program for all future work. During the performance of the work, the Consultant shall monitor the program and shall provide updated reports on a monthly basis together with monthly report on progress of the works. The monthly updates shall be monitored against the approved program and all variations noted. The future impact of major variations shall be determined and analyzed. Necessary corrective measures or re-planning of the Consultant's work shall be established by the Consultant. The GEA-PMU shall be notified of corrective measures. When approved, this program will become the new baseline program for the project.

4.2.3 Meetings

a) The Consultant shall conduct joint meetings to facilitate the project management, which will consist of:

   i) Progress meeting to be held fortnightly with the EPC Contractor to review construction progress and status;

   ii) Interface meeting to be held periodically with attendance of all subcontractors; and

   iii) Other meetings as and when required.

b) The Consultant shall also attend project level meetings with the GEA-PMU and IsDB's Supervisory Missions as required.

4.2.4 Project Relations

The Consultant shall promote good project relations and in so doing shall monitor project labour relations, living conditions, health and safety programs, and community relations to identify potential problems and resolve them promptly. Problems that cannot be resolved promptly by the Consultant shall be reported forthwith to the GEA-PMU for action at the earliest possible time.

4.2.5 Additional Assistance to GEA-PMU

The Consultant shall assist the GEA-PMU in carrying out specific tasks directly or indirectly related to the Project, such as, but not necessarily limited to, the following:

a) In the event that the Consultant is required to deal with any dispute pursuant to the EPC Contract, the services required and the renumeration for such services shall be deemed to be additional to the scope of the Consulting Services Agreement, provided that such dispute does not arise from any failure of the Consultant to properly perform his duties under the Agreement and provided further that the Consultant shall assign senior staff other than the field staff responsible for the supervision work to deal with such dispute. If required, the Foreign Expert can be assigned for short time, with prior approval of the GEA-PMU.

b) Capacity building to enhance the O&M personnel technical knowledge on the management, operation and maintenance of hydropower plants.

4.3 Construction Supervision

The Consultant shall be responsible for monitoring construction activities to ensure that all civil, hydro-mechanical, electromechanical, and substation and transmission line construction works are carried out in accordance with the approved design, specifications and contract documents. The Consultant shall also ensure that the works are carried out in a healthy, safe and appropriate manner according to international standards.

The scope of services shall include, but not limited to the following:

4.3.1 Supervision Activities

a) Monitor and evaluate the progress of the works as performed by the Contractor against the approved baseline program and all variations shall be noted. The future impact of major variations and necessary corrective measures shall be determined and analyzed, and the GEA-PMU shall be provided with necessary recommendation.

b) In the event the Contractor's program fails to comply with the Contract works or the actual progress is inconsistent with the Contractor's stated intentions, the Consultant shall inform and advice the GEA-PMU of the situation in time and act accordingly with the Contract provisions. The Consultant shall also review and assess the revised program submitted by the Contractor and take necessary actions as needed.

c) Participate in weekly progress meetings with the Contractor and Project team.

d) Check the setting out of the works to make sure that construction conform to the approved construction drawings and specifications;

e) Approve all items of equipment, plant, materials, etc. to be used for the civil works;

f) Carry out pre-dispatch inspection and tests of turbines and ac generators to confirm the performance characteristics and requirements of the specifications;

g) Monitoring all the activities of the project, according to the Environmental Assessment and Management Plan Report, Contract Documents and the prevailing laws in Guyana.

h) Witness all the necessary tests of material & equipment received at the sites before they are incorporated into the works; such tests may be done directly by the Contractor or by other approved competent entities and submit the report to the GEA-PMU;

i) Check measured or estimated quantities of the work completed and certify payment certificates for interim payment for the Contractor based on the Contract;

j) Certify payments for equipment and materials for the Contractor based on the Contract.

k) Provide continuous liaison with the GEA-PMU on all possible changes on the designated scope of works;

l) Record all claims and submit recommendations to the GEA-PMU for review and ultimate settlement, if justifiable;

m) Advise the parties under the contract on any dispute arising under the Contract to ensure that disputes are resolved amicably as soon as possible without affecting the project;

n) Keep updated all records including site diaries, correspondence, instructions given to Contractor, test records, measurement and quantity calculations, payment records and all other relevant documents pertaining to the supervision of the works.

4.3.2 Assistance during Commissioning, Guarantee Tests and Operational Acceptance

The Consultant shall carry out the following activities:

a) Review and approve the commissioning program and test procedures submitted by the Contractor for hydromechanical and electromechanical equipment for both dry and wet tests;

b) Examine the works and assure that they are ready for commissioning, if not prepare a list of defects/deficiencies to be corrected before commissioning;

c) Issues completion certificates once the Contractor corrects the defects and/or deficiencies to the satisfaction of the Consultant;

d) Witness Guarantee Tests during commissioning of the plants to ascertain functional guarantees specified in the contract agreement and recommend the acceptability of such tests to GEA-PMU;

e) Prepare and issue a detailed technical report confirming the tests and clearly specifying any instructions to be issued to the Contractor;

f) Ensure that the necessary tools and equipment for effective operational and maintenance of the plants are furnished by the EPC Contractor;

g) Ensure that the operation maintenance manuals for the plants are complete, and the operation staff are adequately trained by the EPC Contractor;

h) Ensure the contractor has supplied all spare parts as per contract;

i) Recommend for issuance the Operational Acceptance Certificates of the facilities to GEA-PMU.

j) Prepare and issue the final payment certificate.

k) Recommend the return of the Performance and Advance Payment Securities and ensure the submission of a bank guarantee to cover the defects liability period of 12 months.

5. CONSULTANT TEAM COMPOSITION & QUALIFICATION REQUIREMENTS OF KEY EXPERTS

To provide the consulting services for the duration of the Project, the Consultant shall ensure a multidisciplinary team of engineers and other specialists, experienced in the detailed designing and construction for the Project.

Emphasis is placed on the need for relevant design and construction supervision engineers to have knowledge and previous experience of similar works to work at the Project sites. In particular, the Engineers concerned with the design review and construction supervision of the civil works, hydro-mechanical, electromechanical and transmission line works have substantial previous experience in this type of construction. It is particularly important that the Team Leader shall have substantial previous experience in dealing with contractual matters under Conditions of EPC/Turnkey Projects.

Responsibility for management of all services as per the Contract shall be with the Consultant's Team Leader who shall provide overall technical direction and coordination of the Services.

The total time period of the consulting service shall be 33 months. The estimated requirement of Consulting Services is shown in the table below.

Sr. #	Position	Qualification	General Experience (Years)	Job Specific Experience (Years)	Tentative Input of Experts (Months)
KEY EXPERTS					
1	Team leader	BSc. Civil/Mechanical/ Hydropower Engineering and MSc. Construction Management or Civil Engineering	20	15 years' professional experience in hydropower construction projects including 10 years specific experience in planning, designing & construction supervision of two (2) hydropower projects of similar magnitude and capacity.	33
2	Electrical Engineer	BSc. Electrical Engineering An additional MSc. Electrical Engineering is preferable and would be rated higher	15	10 years' professional experience in hydropower plants design and construction including 5 years specific experience in similar position on at least two (2) projects of similar magnitude and complexity.	15
3	Mechanical engineer	BSc. Mechanical Engineering	15	10 years' professional experience in	15

		An additional MSc. In Hydro-mechanical Engineering is preferable and would be rated higher		hydropower plants design and construction including 5 years specific experience in similar position on at least two (2) projects of similar magnitude and complexity.	
4	Civil engineer	BSc. Civil Engineering and an MSc. In Civil/Structural Engineering	15	10 years' professional experience in hydropower plants design and construction including 5 years specific experience in similar position on at least two (2) projects of similar magnitude and complexity.	15
5	Geotechnical engineer or engineering Geologist	Geologist with MSc. in BSc. Civil Engineering and an MSc. degree In Civil/Structural Engineering	15	10 years' professional experience related design of geotechnical works on major structures including 5 years' specific experience in similar position on at least two (2) projects of similar magnitude and complexity.	12
6	Quantity Surveyor	BSc. In Quantity Surveying/Civil Engineering/ Building Economics	10	5 years' professional experience in conducting measurement of quantities in hydropower plants construction including 5 years' specific experience as a Measurement/Quantity Surveyor in at least two (2) projects of similar magnitude and complexity.	18
7	Environmental Specialist	MSc. In Environmental Sciences/Environmental Engineering or equivalent	15	10 years' professional experience in conducting environmental screening/assessment of large construction	18

				projects including 5 years' specific experience in similar position on at least one (1) project of similar magnitude and complexity.	
8	Unallocated Professional Expert				6

The Consultant shall state in his proposal the name of each category of staff and personnel who he considers appropriate to perform the services. The person-month should be allocated for each year within the limit of total allocation mentioned as above.

The unallocated professional experts shall be deployed upon request by the Consultant and approved by the GEA if required during the execution of consulting service. The qualification and experience of unallocated professional experts shall be equivalent to the other professional deployed to the consulting service.

It is mandatory for all key experts to be fluent in written and spoken English.

6. REPORTING REQUIREMENTS AND TIME SCHEDULE FOR DELIVERABLES

The Consultant will have a dual function to the Executing Agency and the IsDB. A brief description of some important reports is given below.

a) Inception Report: – The Consulting firm shall present, within the first twenty-one days of the commencement of the Contract, an inception report in Pdf format which will include:

- Review and assessment based on the updated techncial documents related to the project and received from the EPC Contractor and the approved baseline prgram.
- Review of the work plan and schedules proposed by the Contractor, making an assessment of their reasonableness.
- Review of monitoring indicators and their likelihood to measure the progres, efficiency and quallty of the works, also with a veiw to ensuring necessary and timely changes can be made during the execution.

b) Monthly Progress Report: The firm will prepare monthly Progress Reports directed to the GEA/PMU, which will include at minimum the following information:

- Analysis of the execution status, considering the economic and financial aspects as well as work progress as against the schedule approved at the onset of work.
- The amount of work executed for the period and determination of the cumulative amounts
- Possible risks identified and mitigating measures.

- ESHS reporting
- Consulting firm's recommendations
- Details regarding materials delivered to the sites and test results where applicable.
- At the end of each report the Consultant shall append colored progress pictures for physical progress at site for the particular reporting period. These reports shall be submitte to the GEA-PMU by the 7th day of the month following the end of the monthly period covered by each report.

c) Quarterly Progress Report on project deliverables as they relate to scope, schedules, milestones, cost, conflicts, lessons learned, etc. for submission to the GEA-PMU and the IsDB. The report is due by the 7th of the following quarter.

d) Design Review Report on the review process and recommendations of the design drawings and technical documents submitted by the EPC Contractor.

e) Project Completion Report: Upon completion of the project and for submission to the GEA/PMU and the IsDB. The report is due two months after the anticipated completion date of the project. The report will mark the start of the Defects Notification Period of twelve (12) months. The report shall cover at least the following items:

- Background, objectives, and scope of the EPC Contract
- The quantity, conformity, consistency of construction practices
- The fitness for purpose, utility and quality of constructed assets
- The outstanding defects that the Contractor must rectify before operational acceptance and handover of completed works
- Schedule for rectifying defects
- Schedule of defects and maintenance criteria to guide assignment of liability for defects arising during the defects notification period, including environmental liabilities

Upon completion of the project, the Consultant will prepare the pratical completion certificate and handing over to the GEA-PMU

7. CLIENT'S INPUT AND COUNTERPART PERSONNEL

7.1 The GEA-PMU will make available to the Consultant all reports and documents relevant to the project.

7.2 The GEA-PMU, in consultation with the Consultant, shall provide the following professional staff to work closely with the Consultant as counterpart staff.

- Hydropower Engineers (3)
- Civil Engineer Specialist (1)
- Electrical Engineer (1)

- Technicians/Clerk of Works (2)

It is expected that the counterpart staff will be fully integrated within the Consultant's operations for capacity building. The cost of the counterpart staff shall be borne by the GEA/PMU.

8. OBLIGATION OF CONSULTANT

The Consultant shall be responsible for the execution of the entire assignment as described in the Terms of Reference and shall provide facilities, staff and equipment that will enable it to execute the assignment in a timely and efficient manner.

The Consultant will make provision for their office accommodation and facilities inclusive of transportation. The Consultant shall ensure that the experts are adequately supported and equipped. It shall ensure that there is sufficient administrative provision to enable the experts to concentrate on their primary responsibilities.

The Consultant shall be responsible for organizing his office. He will be responsible for his accommodation, transport, equipment, supplies, and such other services that are necessary for smooth and efficient execution of the assignment.

9. COORDINATION

The Consulting firm will report to the CEO of GEA and the Project Manager, PMU on all matters pertaining to this assignment and will work in close association with staff of the PMU.

10. PLACE OF WORKS

The consultant will establish an office based in Georgetown, Guyana and will be required to visit the project sites where the works take place.