Energy Audits of Public Institutions, Facilities, and Street Lighting Bartica, Guyana

Inception Report

187801.00 ● Report ● June 2018

Prepared for:

Caribbean Community Climate Change Centre

Prepared by:

CBCL LIMITED
Consulting Engineers

Issued for Review	J. Smith	06/22/18	A. Hlahatsi
Issue or Revision	***Reviewed By:***	***Date***	***Issued By:***

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Solving today's problems with tomorrow in mind

June 22, 2018

Alison Williams
Procurement Officer
Caribbean Community Climate Change Centre (CCCCC)
2nd Floor, Lawrence Nicholas Building, North Ring Road
Belmopan City, Belize

Dear Ms. Williams:

RE: Energy Audits of Public Institutions, Facilities, and Street Lighting – Bartica, Guyana – Inception Report

Please accept this Inception Report as the first required deliverable for the project "Energy Audits of Public Institutions, Facilities, and Street Lighting – Bartica, Guyana".

A project kickoff meeting and workshop was held on Tuesday, June 19, 2018 in Georgetown where the various consultants were introduced to one another, to the OCC project team, and to the Georgetown based stakeholders. In this workshop, CCCCC was represented by Doctor Mark Bynoe. A second workshop was held in Bartica on the following day on June 20, 2018 to include the Bartica based community, interest groups, and the local elected officials and Mayor. CBCL team personnel in attendance to provide a presentation and participate in the discussions at the workshops were:

- Anthony Hlahatsi, Senior Mechanical and Energy Engineer
- Jared Smith, Electrical Engineer
- Constance Vigilance, Energy Economist and Socio-Economic Expert

Yours very truly,

CBCL Limited

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CHAPTER 1 UPDATED WORK PLAN

CBCL Limited was engaged to conduct an energy audit of the public institutions, facilities, and street lighting in Bartica, Guyana. This energy usage baselining exercise will establish a standard which future efficiency improvements and new construction will be compared to in order to ensure that the Bartica township stays ahead of the curve and becomes a leader in energy efficiency and clean energy development for its new buildings and for those buildings scheduled to undergo retrofits.

The energy audits are intended to determine the current energy utilization baseline for the following ten (10) facilities:

- The Guyana Water plant (GWI) in Bartica
- Police Station
- Town Council Hall
- Regional Hospital
- Bartica Community Centre
- Bartica Secondary School
- Three Mile Secondary School
- Two Mile Primary School
- St. Anthony Primary School
- St. John Baptist Primary School

The project objectives also include a deliberate team effort to provide encouragement and education of the residents and businesses in Bartica to embrace the transition to clean energy.

The CBCL team will execute the project as follows:

- Conduct stakeholder sessions to establish how the current energy situation influences economic and social indicators in Bartica, establish the monetary and non-monetary cost and benefits and socio-economic impact of the activities and projects to transitioning Bartica to a model green town.
- Review the historic energy consumption records for ten municipal buildings and facilities in Bartica including schools, water treatment plant, and community centre(s).
- Review any available drawings to understand building age, size, and construction elements including orientation and insulation levels.
- Perform energy performance calculations by deriving the building energy utilizing index (EUI in GJ/m^2) and the building energy cost index (BECI in $\$/m^2$) for each building and facility.

- Establish baseline energy utilization indexes for each of the ten buildings and the associated carbon footprint.
- Work with building custodians and caretakers to examine areas of energy waste and discuss opportunities for energy conservation as part of participating in the vision to transition Bartica to a green town.
- Identify energy conservation projects and perform cost-benefit analysis for each project.
- Recommend economically and technically viable projects for implementation with budget costs and payback estimates.

Activities for review and audit of the street lighting will involve field data collection for streetlights and their associated support structures using a high-accuracy GPS data collector, and using a laser rangefinder and measuring tape (as required) to extract key measurements (heights, lengths, etc.). At each existing light fixture location, a series of relevant parameters will be collected by our lighting designer, including (but not necessarily limited to) the following:

- Pole type and material
- Fixture mounting height
- Setback from edge of road or playing surface
- Fixture bracket length

The parameters mentioned above will inform future LED lighting design as required for green towns. All data points and associated attributes will be compiled using Geographic Information Systems (GIS) software, to facilitate recordkeeping, data querying/reporting, and generation of requisite design backgrounds for future streetlight replacement. Illumination level output will be estimated based on the fixture type, wattage, and mounting arrangement.

For all potential projects, financial parameters, per facility, will be used to determine if a project is worthwhile for investment. These parameters are usually expressed in payback length or return on investment. Energy efficiency measures and renewable energy projects that show attractive financial indicators and are also consistent with the objectives for a green Bartica as a model town will be recommended and subjected to more rigorous scrutiny. Other measures that do not meet the economic and financial requirements will be further evaluated subjectively based on their alignment with the project objectives of educating, demonstrating, and encouraging the current and future Bartica residents to embrace and invest in clean energy, energy efficiency, and energy security.

Existing operations and maintenance plans and energy efficiency plans will be reviewed and then discussed with the appropriate facility authority to ensure that everyone understands and that the plan for moving the municipality forward is a shared vision by engineers, stakeholders, and the local government leadership.

For each viable energy conservation measure, we will utilize our in-house financial analysis models and our energy economist will provide a liaison to reflect the socio-economic impacts and the direct and indirect overall economic implications to the town of Bartica and the country at large to be in concert with the objectives of the Green State Development Strategy. This assessment will go beyond just the

computation of financial outputs such as return on investment, net present value, and internal rate of return.

For renewable energy potential, our audit team will assess the suitability and capacity of the following options:

- Solar PV
- Solar hot water (thermal applications)
- Micro wind turbines for facilities with exposure to uninhibited wind profiles
- Run of the river mini hydro turbines for facilities or water/wastewater facilities located near the river
- Potential biomass or biogas gas fired cogeneration plants where power and thermal needs co-exist

A final report containing the findings of the energy audits, street lighting assessments, cost-benefit analysis, monitoring and evaluation framework, and assessment of the socio-economic impacts of identified green projects will be finalized and issued following receipt of client comments on the draft report to be issued two weeks before the project deadline of September 30, 2018.

1.1 Work Plan and Staffing

Our Project Team is as illustrated on the Organization Chart in Figure 1.1 below.

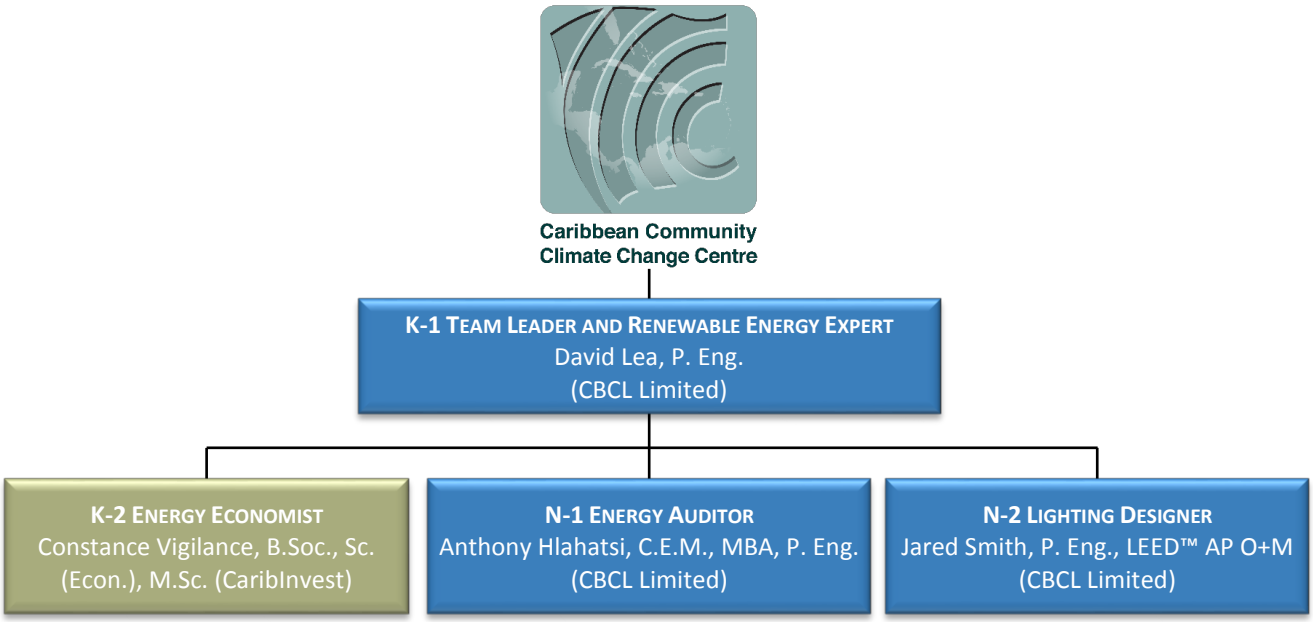

Figure 1.1: Organization Chart

Messrs. Hlahatsi and Smith will conduct the field energy audits of the buildings and street lights and take the required measurements to analyse appropriate renewable energy projects including solar PV potential of each site and for the street lights. Ms. Vigilance will use intelligence gathered from stakeholder consultations and the outcome of the engineers' green projects identification for Bartica to

understand the economic and social impacts of the projects for the Bartica residents. Mr. Lea will assist with the development of the audit protocols based upon information obtained in advance about each building. He will review the inception report and all milestone deliverables prior to issue to the Client. Our lighting designer will obtain information on all the public light fixtures included in the project and enter the data into our GIS database for later use by designers, if fixture replacement is implemented. Our lighting designer will also determine the potential energy and maintenance cost savings associated with LED upgrades for each class of fixture identified.

Updated Work Schedule

No.	Activity	Months					TOTAL
		1	2	3	4	5	
D-1	**Project Management, Project Inception and Workplan**						5.00
1.1	Project Management						5.00
1.2	Project Inception and Workplan						0.15
D-2	**Documentation Review, Energy Analysis, Develop Building Selection Criteria**						0.45
2.1	Review of Building Blueprints, Operating Manuals, Other						0.1
2.2	Review and Analysis of Historic Energy Records						0.1
2.3	Development of Criteria for Building Selection for Audits						0.15
2.4	Development of Final List of Audit Buildings						0.1
D-3	**Perform Energy Audits of Buildings**						0.7
3.1	Field Data Gathering						0.35
3.2	Analysis of Field Data to Identify Efficiency Projects						0.2
3.3	Perform Technical and Economic Evaluation of Projects						0.15
D-4	**Perform Audit of Street Lighting**						0.45
4.1	Field Data Gathering on Existing Equipment and Type						0.2
4.2	Development of Strategies for Improved Lighting Layout						0.2
4.3	Development of Procurement and Analysis for LED Uptake						0.05
D-5	**Renewable Energy Analysis and Carbon Neutrality Analysis**						0.45
5.1	Field Assessment and Evaluation of Shortlisted RE Projects						0.1
5.2	Evaluate Suites of RE Projects with Software/PV Syst Model						0.15
5.3	Perform Cost Benefit Analysis for RE Projects						0.05
5.4	Draft Report for RE Assessment Findings						0.15
D-6	**Cost Analysis, Socio-Economic Impact Analysis, Reports**						1.1
6.1	Perform Economic Assessment for All Measures						0.25
6.2	Develop Cost and Quantify Requirements to Deploy Projects						0.15
6.3	Develop Overall Recommendations for Implementation and Transitioning						0.35
6.4	Final Reports						0.35

Overall Phase Duration Task Duration Submission/Meeting

CHAPTER 2 CURRENT PROJECT STATUS

The three CBCL professionals have completed eight (8) stakeholder consultations to understand the different views and concerns on the viability of the project. In addition to the two OCC organized stakeholder workshops, the following meetings were completed with key stakeholders and members of the Office of the Climate Change (OCC):

- June 18, 2018 – Meeting with the OCC project manager and team
- June 18, 2018 – Meeting with Guyana Energy Agency
- June 18, 2018 – Meeting with the Department for Environment
- June 19, 2018 – OCC organised stakeholder workshop in Georgetown (meetings in the margins with other consultants, Ministry of Health, Guyana Power and Light and Guyana Water Inc. [GWI])
- June 20, 2018 – OCC organised stakeholder workshop in Bartica (meetings in the margins with Bartica Town Clerk, Regional Education Officer, GWI)
- June 20, 2018 – Presentation to the Mayor and Municipal Council of Bartica
- June 20, 2018 – Meeting with the Bartica Regional Hospital
- June 20, 2018 – Meeting with the Bartica Regional Education Office
- June 21, 2018 – Meeting with Bartica GWI office
- June 21, 2018 – Meeting with the Regional Democratic Office
- June 21, 2018 – Meeting with the Department of Works, GEA, and GPL

Meetings have been held with the Works Department, GPL, and GEA representatives to verify the total number of streetlights, as well as the various lamp wattages and types based on maintenance information and replacement lamps. LED replacement recommendations will be the required capacity to meet IES guidelines for the service provided, not to match the current fixture illumination levels if those levels are less than the minimum IES guideline levels. Cost and savings estimates, as well as payback calculations, will be completed for each recommended LED replacement or improvement on the existing street lighting infrastructure.

Table 2.1 presents the list and current operational status of the public facilities to be audited in this project.

Table 2.1: Building Operational Status

	Building	Operational	Comments
1	The Guyana Water plant (GWI) in Bartica	In operation	
2	Police Station	In operation	
3	Municipal Town Hall	In operation	
4	Regional Hospital	In operation	
5	Bartica Community Centre	In operation	
6	Bartica Secondary School	In operation	
7	Three Mile Secondary School	In operation	Audits completed
8	Two Mile Primary School	In operation	Audits completed
9	St. Anthony Primary School	In operation	
10	St. John Baptist Primary School	In operation	

CHAPTER 3 AUDIT VISIT SCHEDULE

Table 3.1 presents the schedule of energy audit visits.

Table 3.1: Energy Audit Visit Schedule

Number	Facility
	Thursday, June 21
1	Three Mile Secondary School
2	Two Mile Primary School
	Friday, June 22
3	Guyana Water Plant
4	Bartica Secondary School
5	St Anthony Primary
6	St John Baptist Primary
	Saturday, June 23
7	Regional Hospital
8	Police Station
9	Municipal Town Hall
	Sunday, June 24
10	Bartica Community Centre

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