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Guyana Utility Scale Solar Photovoltaic Program

Project Summary – Block 37

Linden

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Project Summary - Block 37

1. A detailed description of the proposed project, including:

(i) Physical location and its characteristics along with GPS coordinate/s; where applicable distances from the closest town, settlement, indigenous community, and nearby waterways such as creeks, rivers, closest town, etc; general/predominant land use (residential, tourism, agricultural, commercial, industrial, etc.) of the area; sensitive receptors (daycare facilities, schools, hospitals, etc.) likely to be affected by the proposed project; the relative abundance of natural resources in the area; and the non-disputed nature of the land.

Linden, is located at 105 km (65 mi) south of the capital city Georgetown and has an estimated population of has a population of 27,277. The community, which is located in administrative Region 10 (Upper Demerara-Berbice), is rapidly developing its cove of economic activities and is quickly becoming an economic hub for surrounding communities. The Electricity supply in the Linden area is provided by BOSAI Substation on a 24-hour basis. Block 37 also called Millie's Hideout is located approximately 500 meters from the Linden junction. Block 37 site is located about 0.62 miles from current power generation facilities and with access by current road networks, and thus can be considered disturbed. At Block 37 where current and planned developments is ongoing, mitigation measures for cumulative impact will be implemented such as supporting development of territorial organization plans in cooperation with the municipality to avoid significant impact on deforestation as well as other environmental and social impacts. Block 37 can be found at the following coordinates, Longitude: -58.242184°n and Latitude: 6.025547°.

Map showing the Block 37 site Linden

(ii) A description of all feasible and reasonable alternatives.

The identification of possible locations for the various projects was constrained by the availability of land; proximity to existing infrastructure, particularly access roads and GPL substations; and the solar resource potential. The area of land required was determined based on an estimation of 5 acres per MWp of installed capacity, which would provide adequate space for the solar panels, battery storage, roads, switchgear, proper buffer areas and other required infrastructure. The solar resource potential at each site was estimated for crystalline silicon modules with a fixed system loss of 14%. The European Commission's Photovoltaic Geographical Information System (PVGIS), which utilizes satellite images to calculate solar

radiation data, was used. The PVGIS-SARAH dataset was chosen, since it has hourly time resolution, a spatial resolution of 3 arc-minutes, and covers Guyana for a time-series of 2005-2016.

Joint site visits were done on 7-Apr-2021 with NICIL. Initially, Block 37, Retrieve, and Wisroc were identified by NICIL as available for GPL acquisition. However, GPL and NICL held additional site visits on April 24, 2021 to the Region and it was determined that there were too many squatters at the Wisroc Location, which would make surveying difficult and would result in significant social implications. As such, an alternative site at Dacoura was identified. NICIL began cadastral surveys on May 3, 2021 and completed the same on May 7, 2021. In the interim NICIL has granted permission for GPL to commence de-risking work at the locations on April 30, 2021. NICIL is currently processing GPL's acquisition of the Block 37, Retrieve, and Dacoura sites.

Being a multiple works program, the representative sample of the program has been identified from selected alternatives. As the proposed project envisions supply to two (2) geographical areas within Guyana, issues of land allocation, access to grid connection and terrain of specific locations have been considered. Lands are already allocated within NICIL and the BOSAI Bauxite Company, respectively for the project in each named location, since it was agricultural land for farming and industrial land for bauxite mining, currently no one of the sites have been used for cultivation or even mining in the recent years, the nature of the land is considered abandoned as State Land. State Land is divided into Government Land normally managed by the municipalities and Public Land normally managed by public institutions like NICIL for economic development. The land allocated for the project is held as public land and public land is available for energy potential development options: "Potential for solar arrays on abandoned land and/or unused back lands". It is important to mention that State Land differs from Private Land and Amerindian Land as the main classification of land rights in Guyana, it can be concluded that the proposed site locations are not within the Amerindian Land Titles therefore the Indigenous People are not being affected by any means with the proposed project site, this information have been verified also by physical inspection.

(iii) Description of any existing baseline information on the physical (landscape, soil, water, air, the use of natural resources), ecological (flora and fauna), and social environment (economic and cultural aspects).

Based on the ESA carried out the following existing baseline information was gathered:

The existing sound environment throughout the proposed Linden Project locations was characterized mostly as sounds of nature within a Residential Community. Noise measurements were taken at various strategic locations within and around the proposed location of the Solar PV Farm operation.

Noise levels were recorded at within the proposed project location 16th -18th of July, 2021using a Sound Level Meter (ExTech 407730). Noise decibel levels are not to be greater than the established permissible noise levels/limits of the Guyana National Bureau of Standards' (GNBS) Guideline Values for Noise in Specific Environment, which has been adopted by the Environmental Protection Agency (EPA).

Noise levels within the Linden Solar PV Farm at Retrieve ranged from 39.4 to 40.8 dB (Figure 10). During the time of monitoring within the proposed project location, the highest noise level recorded was at Retri-03 with 40.8 (dB). Another high noise level measurement was recorded at Retri-02 with 40.0 (dB), followed by Retri-04 (39.8dB) and Retri-01 (39.4dB). These noise measurements (Retri-01, Retri-02, Retri-03 and Retri-04) were high but negligible, since they are below 75 dB Residential Daytime limits.

These sample points showed noise levels as a result of sounds from high winds and machinery from the nearby bauxite plant. Nonetheless, these levels were all below the 75 dB Daytime (06:00 h - 18:00 h) Residential limits of the Guyana National Bureau of Standards (GNBS) Guidelines for the Measurement and Assessment of Noise in the Environment.

Air pollution is contamination of the indoor or outdoor environment by any chemical, physical or biological agent that modifies the natural characteristics of the atmosphere. This is becoming an increasingly significant problem to growth and development of cities and communities. The air pollutants of major public health concern include: particulate matter, carbon monoxide, ozone, nitrogen dioxide and sulphur dioxide and metals, such as lead.

This is the term for a mixture of solid particles (dust, dirt, soot, and smoke) and liquid droplets suspended in the air. These PM emissions originate from a variety of sources, such as vehicles, factories, industrial sites, construction sites, tilled fields, unpaved roads, stone crushing, and burning of wood. Particulate Matter comprises both coarse and fine particles. The coarse particles (PM_{10}) have an aerodynamic diameter between 2.5μm and 10μm. They are formed by

mechanical disruption (e.g., crushing, grinding, abrasion of surfaces); evaporation of sprays, and suspension of dust. Fine particles have an aerodynamic diameter less than 2.5μm ($PM_{2.5}$). These particles are formed from gas by chemical reactions; and condensation of high-temperature vapours during combustion.

This refers to all particles in the atmosphere that are less than 100 micrograms. The amount of PM_{10} and $PM_{2.5}$ are related to the amount of total suspended particulates (TSP) in the air.

Particulate Matter guidelines and standards are instituted due to short term and long-term health effects including premature mortality, chronic respiratory disease, acute respiratory systems, decreased lung functions and aggravated asthma, persistent cough, phlegm, wheezing and physical discomfort. These health effects are especially associated with PM_{10} and $PM_{2.5}$. The PM_{10} fraction from TSP is able to reach the lower regions of the respiratory tract. On the other hand, $PM_{2.5}$ is able to absorb more toxic and carcinogenic compounds than larger particles and penetrate more easily deep into the lungs. Additionally, there is increased harm to the environment as PM is a major source of haze that reduces visibility, causes changes to nutrient and chemical balance of the soil and aquatic environment, erosions and staining of structures (residential, commercial, or cultural monuments).

Air Quality Standards/Guidelines

The purpose of the ambient air quality standards is to establish maximum limits on parameters of air quality considered desirable for the preservation and enhancement of the quality of air resources. Air quality standards are set by each country to protect the public health of their citizens and as such are an important component of national risk management and environmental policies. National standards will vary according to the approach adopted for balancing health risks, technological feasibility, economic considerations and various other political and social factors, which in turn will depend on, among other things, the level of development and national capability in air quality management.

Air quality data in Guyana is extremely limited given the constraints relating to the unavailability of equipment and cost associated with this type of data collection. There was no historical air quality data for the three (3) areas i.e., in Prospect, and Linden.

Monitoring Procedure

The Particulate Matter (PM) measurements were taken using the Temtop Airing-1000 Air Quality Monitor Real Time Display High Accuracy $PM_{2.5}/PM_{10}$ Detector. $PM_{2.5}$ and PM_{10} measurements recorded in micrograms per cubic meter ($\mu g/m^3$), were taken at various sample locations after a log interval of 5 minutes. After the log time, the $PM_{2.5}$ and PM_{10} concentration in micrograms per cubic meter ($\mu g/m^3$) were recorded from each sample site. The Total Suspended Particulate (TSP) measurements were taken using the Thermo pDR-1000AN personal DataRAMTM Particulate Monitor. TSP measurements recorded in milligram per cubic meter (mg/m^3), were taken at various sample sites after a log interval of 5 minutes (Thermo-Electron-Corporation, 2005). After the 5-minute interval log time, the real time Concentration value, the Maximum Concentration value and the Time Weighted Average (TWA) concentration in milligrams per cubic meter (mg/m^3) were recorded from each sample site. The wind direction and temperature at time of monitoring at each site was recorded. Conversions from milligrams per cubic meter (mg/m^3) to micrograms per cubic meter ($\mu g/m^3$) were done by taking the milligrams per cubic meter (mg/m^3) measurements x 1000 (Hedges 2004, p.23). Micrograms per cubic meter ($\mu g/m^3$) results were then compared to the United States Environmental Protection Agency (USEPA) 1971- 2012 National Ambient Air Quality Standards (NAAQS) for Particulate Matter, as a current $PM_{2.5}$, PM_{10} and TSP limit permissible utilised. Quality assurance and quality control (QA/QC) was practiced, as well as routine parts of the air quality monitoring during the calibration, operation and maintenance of the monitoring equipment.

Linden PV site is located at Amelia's Ward and Old Kara Linden, respectively, which is located up the Demerara River. The site which has been identified for the project can be considered as disturbed in the Retrieve area since much of its primary vegetation and natural habitats have been lost, due to the many years of mining activities, as bauxite production was the main activity. The area of Amelia's Ward, however, is disturbed since the land is mostly for agricultural and housing purposes and exists within the biotic province of the Riverain ecosystem, which is consists of tidal wetlands which exist along river banks. This area contains relatively fertile, poorly drained sand soils developed on consolidated sediments.

Currently, the vegetation in the project area at Linden, can be classified as low evergreen swamp forest. Some of the characteristic species that are naturally occurring in the area of Linden are Symphonia globulifera, Tabebuia insignis/fluviatilis, Pterocarpus officinalis and Euterpe oleracea. Secondary species of shrubs black and sweet sage (cordia spp) spread out in

fragments along the area while species such as manicaria saccifera commonly found as a n Agricultural technicians working on the coastal belt employ aggressive tactics to combat insects and rats on plantations during the use of the sites. Such tactics eventually impact as well on many predators. In overall the impact of the proposed project on the fauna and flora in and around the project will low or insignificant.

It is important to mentioned that since the areas were use before for farming and agriculture, meaning that the existing vegetation can be considered as secondary vegetation, then the flora is not considered as primary source for food supply for fauna. During uses of the land, birds for example tend to migrated to the nearest biota that comply with the nutrients required for their existence, then for as a result of the disturbance of biodiversity from anthropogenic activities the PV sites selected for Linden (Block 37 and Retrieve) and Prospect.

Due to the land elevation relative the prone areas and the water sea level, a preliminary conclusion can be made related to the Flood risk factor for the PV sites chosen. According to the table above, only Prospect PV site shows a Very Low Impact (VLI) for maximum rain conditions of 1 meter of rain taking into consideration the land elevation of 8.8364 m and 16.3767 m respectively. Same PV sites related to Climate Change effect for the year of 2100 as extend flood shows No Internal Impact (NI) and Low External (LE). For both PV sites at Linden (Block 37 and Retrieve) for a Maximum Rain Fall shows Very low or No impact (VLI) and for Climate Change it shows No Impact (NI). Concluding with this preliminary Flood Risk Assessment that the sample for the PV proposed sites are feasible.

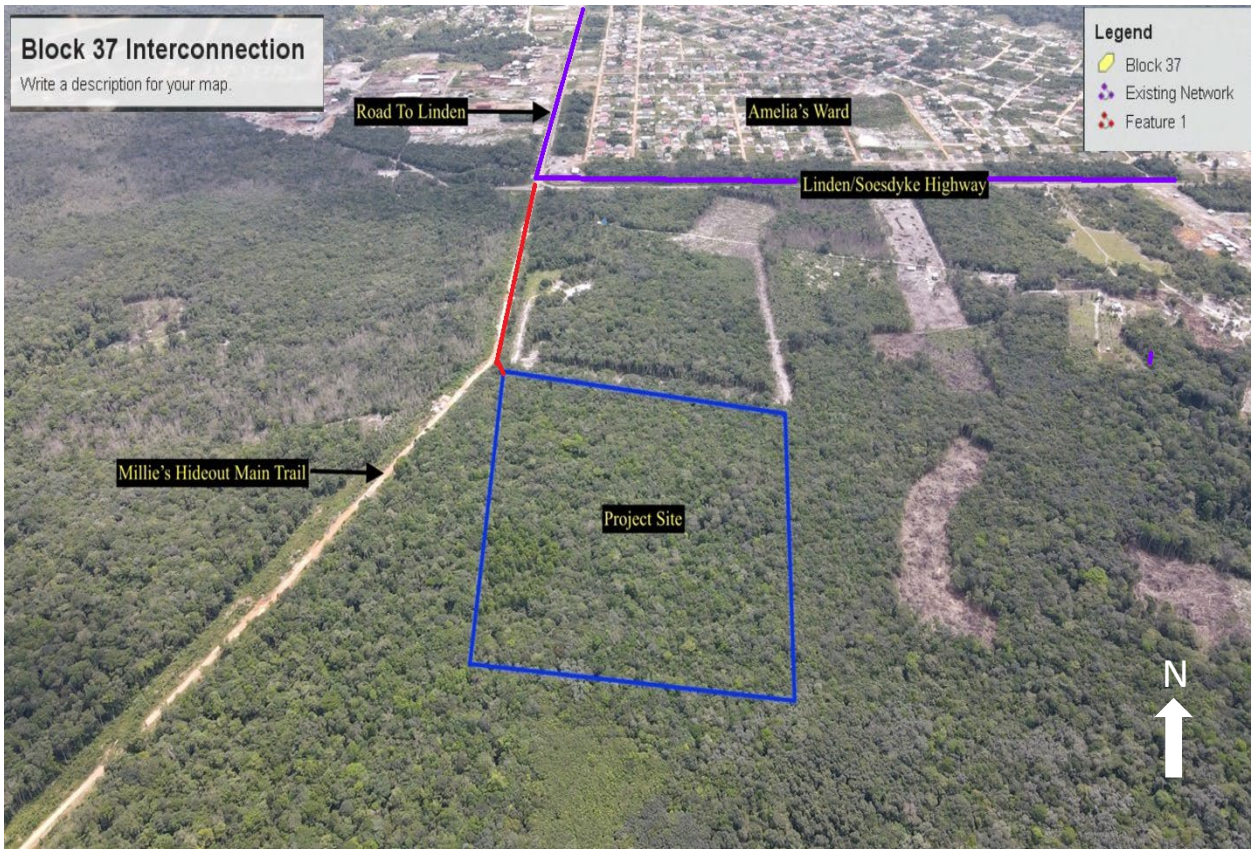
~~The~~ proposed site location for the PV system in Prospect comprises of 50 acres of land. The site is cleared of vegetation and is located about 0.47 miles from current power generation facilities and with access by current road networks, and thus can be considered disturbed. The land surrounding the site is currently vacant with empty cane field beds. While there are not yet specific plans for the development of the surrounding area, the project site is state-owned land which has been designated for the development of a solar farm. Most of the analysed impacts are considered minor or moderate. The effects of these impacts can be significantly reduced or minimized by the implementation of mitigation measures.

In Linden, there are two sites that are the focus of this assessment – Block 37 and Retrieve. For Block 37 site is cleared of vegetation and is located about 0.62 miles from current power generation facilities and with access by current road networks, and thus can be considered

disturbed. For the Retrieve site the power generation facilities is located about 4.34 . miles. The land surrounding the site is currently vacant. While there are not yet specific plans for the development of the surrounding area, the project site is state-owned land which has been designated for the development of a solar farm. Most of the analysed impacts are considered minor or moderate. The effects of these impacts can be significantly reduced or minimized by the implementation of mitigation measures.

At Block 37 where current and planned developments is ongoing, mitigation measures for cumulative impact will be implemented such as supporting development of territorial organization plans in cooperation with the municipality to avoid significant impact on deforestation as well as other environmental and social impacts

(iv) Layout of the project, presented on a map with a scale relevant to the size of the development with the following details:



3. A description of the design of the proposed which shall include:

Project Summary Guide "The Environment is Everybody's Business"

(i) Design\construction drawings, specification of any structures, volume of expected pollutants, etc.

The construction drawings are currently being developed and as soon as they are accepted and approved, they will be submitted to the agency.

(ii) The project size, e.g. capital investment, number of employees projected for each stage of the project, rates of production, transportation route etc;

The Capital investment for the entire GUYSOL project is 83.3 million united states dollars. The number of employees is yet to be determined. It is estimated that this project site will have an output of 4MWp.

(iii) Activities associated with all development stages from construction to closure:

a. operation and production processes and alternative design/s considered;

Approximately 70% of the 35 acres will be utilized for this project. When established this solar farm will produce 4MWp.

b. a guide for all stages of the project from raw material to the finished

product; and

This will be proved when the information is available

c. technical description of the proposed project's process/activity accompanied by a Process Flow Diagram/s;

This will be proved when the information is available

(iv) Use of Natural Resources: approximate quantities of raw materials required at each stage of the project and their possible sources;

The only foreseeable natural resources that will be utilized are white sand and loam to fill the project site and to create the accesses. There qualities are yet to be determined.

(v) Source of utility services such as water supply and treatment options, energy/electricity and communication facilities;

The source for water supply will be from GWI. While in this case GPL transmission lines

(vi) Waste production: types of waste, the monthly quantity/volume of waste managed (generated, stored, transported), the volume of effluent to be discharged along with a chemical analysis indicating the effluent's composition and methods of waste disposal/treatment. Potential locations for recovery/disposal sites shall be identified with justifications for the site selection;

(vii) The duration of the project for each phase; and

To be determined

(viii) Decommissioning plan (where applicable).

NA

4. Potential Impacts and their Significance

An assessment of the potential impacts of the proposed development and its significance

in relation to:

(i) the extent of the impact or the area of influence: the geographical area that may be affected by the proposed activity and the manner in which the various aspects of the environment: physical (landscape, soil, water, air, the use of natural resources), ecological (flora and fauna), and social (economic and cultural aspects) may be impacted;

Air Quality		
Construction Phase	**Operation**	**Decommissioning**
Dust generation: expected to be brief, frequent, and localized due to preparation of the site and use of heavy machinery (clearing, levelling, excavation, grading). Dust generation from road proximity to the site may generated dust from heavy duty traffic based, on physical inspection, the road that lead to the sites and where households are located are completed paved in all three sites. Effects can be minimized with adequate mitigation measures. The impact is considered minor. Nitrogen and Carbon oxides emission: expected to be brief and localized due to the operation of heavy machinery, transportation trucks, generators, compressors and other construction equipment. The impact is considered minor.	No carbon emission (+): since substation only distributes power. The impact is considered insignificant	Dust generation: expected to be brief, frequent, and localized due to preparation of the site and use of heavy machinery (clearing, levelling, excavation, grading). Effects can be minimized with adequate mitigation measures. The impact is considered minor. Nitrogen and Carbon oxides emission: expected to be brief and localized due to the operation of heavy machinery, transportation trucks, generators, compressors and other construction equipment. The impact is considered minor.
Noise		
Elevated noise levels: Due to the nature of the land designated to the PV Plant, the surroundings are cane fields and a public drain for irrigation purposes,	Low noise levels: localized low levels of noise due to operation of electrical components of the PV plant,	Elevated noise levels: Brief, frequent and localized elevated noise levels due to dismantling of facilities, increased

concluding that the site have low noise levels as expected	maintenance activities, and vehicular traffic. The impact is considered minor.	vehicular traffic, and movement of equipment. The impact is considered minor.
Soil		
Loss of top soil: Long-term and localized loss of top soil during site clearing and preparation activities. Sugarcane cultivation does not require chemical inputs higher than average – in fact, the use of insecticides and fungicides is below the average for comparable cash crops. Nevertheless, traces of agrochemical may be present on top soil, protection equipment will be needed during construction (Markku Lehtonen and François-Régis Goebel, 2019). The impact is considered minor. Soil compaction: Long-term and localized soil compaction which may cause soil erosion and surface water runoff and riverbed silting. Effects can be minimized with adequate mitigation measures. The impact is considered minor. Soil contamination: Brief and localized soil contamination due to oil spills or other substances. Effects can be avoided with	No impacts expected.	Soil contamination: Brief and localized soil contamination due to oil spills during dismantling activities. Effects can be avoided with adequate mitigation measures. The impact is considered minor.

adequate mitigation measures. The impact is considered minor.		
Land Use		
Land use: The proposed sites comprises 50 acres of State-owned land (25 acres for Linden and 25 acres for Retrieve). Therefore, there are no foreseen conflicts with regards the Land use. The impact is considered minor. There is access road for both PV Site plans at Linden; therefore, there are no conflicts with the Land use of the land. The proposed transmission line, are close by GPL still on the design for interconnection. It does not interfere with any current economic activities; no conflicts are expected.	Land use: The site will be used for energy generation for the lifetime of the facility. There is no significant change in the land use of the site. The installation of the PV systems will not significantly impact the economic activities of the area. The impact is considered minor.	Land use: The site will be dismantled, and the facilities removed. The future site use shall be in line with the land use of the area or be restored to its initial stage. The impact is considered minor
Landscape and Visual Impacts		
Visual landscape: The installation of the PV system will alter the visual landscape of the project site. The components of the PV system will become a dominant feature of the environment. The effects can be minimized with adequate mitigation measures. The impact is considered mayor.	Visual impact: The PV systems will reflect sunlight and may become a distraction for motorists and aircrafts. The effects can be minimized with adequate mitigation measures. The impact is considered major.	Visual landscape: The decommissioning of the system will reverse the visual impacts at the proposed site. The impact is considered minor.
Solid Waste		

Construction waste and domestic waste generation is expected to be temporary and localized but significant in volume. As an indirect impact, it is highly probable that temporal food supply business will increase nearby the project site. These businesses will also be a source of increased generation of solid waste that will need to be considered in the project. Poor solid waste management on site may lead to improper disposal, burning, and pollution of water resources. The effects can be minimized with adequate mitigation measures. The impact is considered moderate.	Solid waste generation Increased: Domestic waste generation may be expected during maintenance activities on site. Although the generation will be long-term and localized, the volume generated can be considered low. The effects can be minimized with adequate mitigation measures. The impact is considered minor.	Solid waste generation Increased: Solid waste generated is expected to increase in the decommissioning stage. Solid waste generated is expected to be localized, temporary and significant volume of domestic, scrap metal, construction waste, and hazardous waste. The effects can be minimized with adequate mitigation measures. The impact is considered moderate.
Surface Water		
Surface water pollution: Construction activities may result in pollution of nearby surface water due to runoff (increased turbidity, organic load). This is expected to be temporary and controlled with adequate drainage and wastewater management at the site. Potential spills of oil could cause contamination of the nearby surface water through run-off. This aspect is temporary and easily avoidable. Wastewater generation from construction crew living quarters may	Surface water pollution: During operation, wastewater will be generated from security/maintenance staff offices and cleaning of the PV cells. The effect is expected to be long term and can be mitigated with adequate collection and management practices. The removal of soil cover might generate minor impacts due to erosions during operation also.	Surface water pollution: Activities may result in pollution of public irrigation canal due to runoff (increased turbidity, organic load). This is expected to be temporary and controlled with adequate drainage at the site. Potential spills of oil could cause contamination of the nearby public irrigation canals. This aspect is very

also cause increased organic load to nearby water bodies if not adequately managed. The impact is considered moderate.	Potential spills of oil could cause contamination of the nearby public irrigation canals. This aspect is very localized, temporary and easily avoidable. The impact is considered minor.	localized, temporary and easily avoidable. The impact is considered moderate.
Ground Water		
Contamination of groundwater resources: Groundwater resources may be impacted during the construction stage from oil spills and leaks or due to improper storage and handling. Improper solid waste and wastewater management can also impact the groundwater resources. The effects are considered temporary and medium spread. Adequate measures can minimize potential effects. The impact is considered moderate.	Contamination of groundwater resources: Groundwater resources may be impacted by improper solid waste and wastewater management can also impact the groundwater resources. The effects are considered long term, and medium spread. Adequate measures can minimize potential effects. The impact is considered moderate.	Contamination of groundwater resources: Groundwater resources may be impacted during the decommissioning stage from oil spills and leaks or due to improper storage and handling. Improper solid waste and wastewater management can also impact the groundwater resources. The effects are considered long term, and medium spread. Adequate measures can minimize potential effects. The impact is considered moderate.
Natural Habitat		
Loss of natural habitat: The project site is considered highly disturbed with regards to its vegetation, since the land allocated for the PV plant is land unattended.	Visual effects: Solar panels reflection may affect birds as the main wildlife in the surroundings, and transmission lines	Noise levels: Noise generated by decommissioning activities is more likely to impact any wildlife in the surrounding area

There are also low levels of biodiversity with regards to fauna. There is no indication of presence of threatened or protected flora or fauna species at the proposed site for construction. The impact is localized, long term, with low intensity due to the disturbed conditions of the site. Hence, the impact is considered minor. More specifically related to Block 37, revegetation is needed since the area was naturally revegetated after anthropogenic activities. However, the Retrieve area is highly disturbed and would not require revegetation. Noise levels: Noise generated by construction workers and machinery is more likely to impact any wildlife in the surrounding area of the site. The effects are limited to the project site and immediate surroundings. Due to the low fauna biodiversity of the area the impact is considered minor.	may affect bird mortality. The effects will be long term and localized. PV plants can impact bird communities through habitat loss and the risk of avian collision mortality. The extrapolated mortality studies have shown based on a bird density of 38 to 50 species per ha (15 to 20 species per acre) may occur 4.5 bird fatalities per MW per year (Visser, Elke et. al 2019). For linden PV plants with 50 acres area or with 10 MW it's expected to impact 45 bird fatalities per 10 MW per year in a modest projection. Future data are needed in order to have a better accuracy in bird density and to understand the risk of PV solar energy developments on birds. The impact can be considered moderate.	of the site. The effects are limited to the project site and immediate surroundings. Due to the low fauna biodiversity of the area the impact is considered minor.
Demography		

Demography: During the construction phase an increase of population is expected in the area. While residents are expected to take part in some construction activities, there may also be the need for influx of workers with specific skills. The effects are considered temporary, and localized. In general, this will bring a positive socio-economic impact to the area. However, demographics are not expected to be significantly impacted during this stage. The impact can be considered as minor.	Demography: Operation of the PV systems doesn't require a large group of staff. Additionally, maintenance and operational activities are expected to be carried out by GPL staff already living in the area. The effects will be long term, localized but insignificant with regards population increase due to system operation. The impact is considered minor. Socio-economic activities: An expected indirect impact of the operation of the PV systems is the increase of population in the area. The increase of energy production with the current reliable service from GPL, will naturally promote an expansion of socio-economic activities in the area thus impacting also the demography. This effect is considered high spread, long term and significant for the community. The impact is considered major.	Demography: Decommissioning activities will need to ensure the quality of the GPL service is not affected negatively. In such case, the removal of the system is more likely to have an impact in the socio-economic activities of the area and its demography. For the purpose of this assessment, it is assumed that GPL service after decommissioning will be maintained, therefore, decommissioning of the system is not considered to have a significant impact.

Employment		
Employment: During the construction phase employment opportunities will be generated for local skilled and unskilled labour. There will also be a demand for local goods and services which will have an impact on the earning capacity of local businesses. These impacts while positive are expected to be only temporary and localized. The impact is considered minor.	Employment: The operation of the PV systems will be managed by GPL staff. Therefore, a direct impact on employment generation is not expected during this phase. Socio-economic activities: An expected indirect impact of the operation of the PV systems is the increase of employment in the area. The expected improvement on the reliability of the GPL service, will naturally promote an expansion of socio-economic activities in the area thus impacting employment opportunities. This effect is considered high spread, long term and significant for the community. The impact is considered major.	Employment: Similarly, than the construction phase, there may be employment opportunities during the dismantling of the plant. However, this is expected to be in a much lesser extent than in the construction phase. The impact is considered minor.
Displacement		
Displacement: The proposed site is State-owned land. There are no human settlements or economic activities	No impacts expected on the operation phase.	N0o impacts expected in decommissioning phase.

currently at the proposed site. Therefore, the project will not cause any type of displacement. The process for the GPL to obtain the Land Title has begun through a request to the NICIL. There are no foreseen issues for GPL to obtain the land title.		
Livelihood		
Livelihood: There are no known economic activities currently developed on or near the site. Therefore, the construction of the PV system is not expected to affect means of livelihood for persons in the area.	Livelihood: The operation of the PV system will increase energy security and access in the area and will support the development of a greener economy. It is highly likely that because of the project economic activities will expand and diversify bringing new employment opportunities and improving also the quality of life in the community. The effects will be spread at the community level and will be long term. There is also an anticipated positive effect on income generation opportunities for women. The impact is considered major.	Livelihood: For the purpose of this assessment, it is assumed that GPL service after decommissioning will be maintained, therefore, decommissioning of the system is not considered to have a significant impact.
Socio- Cultural		

Socio-cultural: While there may be a temporary increase of construction workers in the area, the local customs, cultures, and social relations are not expected to be significantly impacted. There are no cultural sites on the project site.	Socio-cultural: The operation of the PV systems is expected to be performed by local GPL staff. There are no expected impacts on local customs, culture, and social relations directly related to the operation of the PV systems.	Socio-cultural: There are no expected impacts on local customs, culture, and social relations directly related to the decommissioning of the PV systems.
Infrastructure		
Upgrading of the access road to the proposed site may not create traffic disturbances. The use of the current trail should be considered and relevant stakeholders contacted to ensure no significant disruption of activities to users. The impact is considered moderate.	Infrastructure: During the operation of the PV system, the energy service is expected to be reliable. Modular PV systems are resilient to disruptive events. Even if a module is damaged, the system would remain operational. This will benefit the customers and will minimize power outage in the area. Water supply service is expected to be impacted positively, since power disruptions to the distribution system will also be minimized. Effects will be long term and spread at the community level. The impact is considered major.	Infrastructure: For the purpose of this assessment, it is assumed that GPL service after decommissioning will be maintained, therefore, decommissioning of the system is not considered to have a significant impact.

Public Health and Safety		
Health and Safety: During the construction phase there will be health and safety hazards on site and in areas surrounding the site due to increase vehicular traffic, heavy machinery operation, excavation, and other construction activities. The effects will be localized and temporary. However, the effects can be minimized by strict adherence of the Contractor to approved safety procedures. Influx of construction workers may lead to increase in the prevalence of sexually transmitted diseases among the local population, as well as sexual violence. Considering that local labour is expected to play a major role, this concern can be regarded as low. However, health and awareness campaigns as well as a code of conduct indicating clear repercussions can minimize any effect. The impact is considered moderate.	Health and Safety: workers will be exposed to occupational hazards. The probability of occurrence can be minimized by strict adherence to occupational safety procedures. The impact is considered minor.	Health and safety: Similarly, than in the construction phase, exposures to hazards are expected from the decommissioning activities. Health and safety procedures shall be observed to minimize the effects. The impact is considered moderate.

(ii) the trans frontier nature of the impacts i.e. does it cross country borders or boundaries;

Response: Not applicable

(iii) the magnitude and complexity of the impacts;

Response: Not applicable

(iv) the probability of the impacts;

Response: Not applicable

(v) the duration, frequency and reversibility of the impacts; and

Response: Not applicable

(vi) Cumulative impacts with other projects: additional surveys and assessment may be required to determine whether existing projects in combination with the proposed project will have a significant cumulative effect on the receiving environment.

Response: Not applicable

5. Description of proposed environmental management and mitigation measures for all environmental, ecological and social impacts.

	Issue/ Impact	Mitigation Measures	Monitoring Indicators	Responsibility for Implementation	Responsibility for Monitoring	Estimated Cost for Each Site (US$)
Air Quality	Dust generation	▪ Covering of stockpiles to minimize dust generation. ▪ Suppress dust from construction, stock piles and increased vehicular traffic by sprinkling water. ▪ Consider wind direction when stockpiling construction materials. Orientation shall avoid downwind sensitive locations.	▪ PM monitoring. ▪ Dust generation observation. ▪ Complaints register.	All contractors on site.	Site Supervisor.	5,000
	NOx and COx emissions	▪ Regular maintenance of vehicles and on-site construction equipment	▪ Equipment maintenance records according to schedule. ▪ Vehicle fitness certificates.	All contractors on site.	Site Supervisor.	10,000
	Noise	▪ Use of padding/noise isolators for construction equipment and machinery.	▪ Monitoring of dB. ▪ Complaints register.	All contractors on site.	Site Supervisor.	5,000

		▪ Fixed noise sources or activities to be carried out away from site boundaries, particularly boundaries close to sensitive environments. ▪ Adequate maintenance of construction vehicles and machinery. ▪ Use of ear plugs or ear muffs for specific activities by workers. ▪ Stakeholders' consultation (immediate surroundings of site) to plan activities accordingly.	▪ Equipment maintenance records according to schedule. ▪ Workers compliance to H&S procedures. ▪ Consultation records.			
Soil	Top soil loss	▪ Limit the removal of forest to the site footprint. ▪ Whenever possible, removed top soil should be conserved and used for remediation of affected areas.	▪ ESMP Compliance records.	All contractors on site.	Site Supervisor.	15,000
	Soil compaction and erosion	▪ Adequate drainage will be developed for the site. ▪ Planting grass or use of rocks under the solar panels is also recommended.	▪ ESMP Compliance records.	All contractors on site.	Site Supervisor.	

Land Use (ROW)		▪ Current land use of the ROW is road reserves commonly used for installation of infrastructure networks such as the one for the proposed project. The new transmission lines for interconnection of PV Farm to the grid and substations will be done within the existing right oof way. Therefore, there is no expected modification of the Land use of the proposed transmission lines. The impact is considered insignificant. New transmission/Interconnection line is about 200 meters in length for Retrieve PV site and 423 meters in length for Block 37.	▪ Complaints register. ▪ ESMP Compliance records.	All contractors on site.	Site Supervisor.	
	Landscape and visual impact	▪ It is recommended to landscape the boundaries with adequate trees to provide a visual screen. ▪ Consultation meetings with aeronautical authorities with regards	▪ ESMP Compliance records. ▪ Consultation meeting records.	All contractors on site.	Site Supervisor.	1,000

		positioning and direction of solar panels to avoid conflicts with airplanes.				
	Solid waste generation	▪ Waste will be disposed in an authorized landfill. ▪ Adequate planning and coordination will be done with the landfill management to manage the increased volume expected to be generated from the site. ▪ The site will be provided with an adequate number of bins for the disposal of domestic waste. ▪ Hazardous waste management plan will be developed by contractor. Hazardous waste such as spent oil, oily rags, etc. will be stored on site and disposed of according to an approved plan and in line with EPA recommendations.	▪ ESMP Compliance records. ▪ Consultation records with solid waste management authorities. ▪ Compliance with Hazardous waste management plan. ▪ Complaints records. ▪ Valid contract with solid waste collection contractor. ▪ Existence of at least one container	All contractors on site.	Site Supervisor.	50,000

		▪ Burning of waste on-site will be prohibited. ▪ Adequate arrangements will be done for the frequent collection of domestic, construction and hazardous waste. ▪ The project will facilitate bins outside the site to food supply entrepreneurs and will arrange for the collection of such waste. ▪ Site and immediate surroundings cleanliness will be maintained at all times.	bin outside the project site where food services providers are located (if necessary).			
	Surface water pollution	▪ Adequate drainage will be designed for the site to minimize run-off. ▪ Drainage system will be monitored and frequently maintained. ▪ Adequate temporary sanitary facilities will be provided for workers on-site while permanent facilities are constructed	▪ ESMP compliance records. ▪ Existence of temporary sanitary facilities. ▪ Valid contract with waste collection contractor.	All contractors on site.	Site Supervisor	30,000

		▪ Frequent collection of waste generated by sanitary facilities will be done by an EPA approved contractor.				
	Groundwater pollution	▪ Oil spills, fuel spill and other site contaminants will be rapidly cleaned. ▪ Adequate temporary sanitary facilities will be provided for workers on-site while permanent facilities are constructed. ▪ Frequent collection of waste generated by sanitary facilities will be done by an EPA approved contractor	▪ ESMP compliance records. ▪ Existence of temporary sanitary facilities. ▪ Valid contract with waste collection contractor.	All contractors on site.	Site Supervisor.	28,000
	Loss of natural habitat	Revegetation Plan (for Block-37) ▪ Pre-vegetation weed control ▪ Fencing ▪ Dieback mapping & Site Hygiene ▪ Ripping Fauna Rescue Plan ▪ Record fauna find ▪ Allow fauna to leave without intervention ▪ Cease work if species are threatened.	▪ Note the effectiveness of the mitigation measures or the need for improvement of such. ▪ Protect soil during climate change (eg.	Overseeing – GPL Environmental Health & Safety Officers Implementation OfficerBiodiversity Consultant (Revegetation)	Overseeing-GPL Environmental Health & Safety Officers Implementation OfficerBiodiversity Consultant (Revegetation)	28,000

		▪ Relocate fauna find ▪ Call experienced fauna ecologist to carryout fauna handling especially if seriously injured	Erosion from heavy rainfall) ▪ Restore site to its previous state ▪ Loss of endangered species ▪ Injuries to fauna			
	Demography and Employment	▪ Employment of local labour should be maximized. ▪ Transparent recruitment process will take place.	▪ Employment records. ▪ Number of local labour employed at the site.	All contractors on site.	Site Supervisor.	1,000
	Socio-cultural	▪ Regular community consultation meetings will take place.	▪ Monthly community consultation records.	All contractors on site	Site Supervisor.	5,000
	Infrastructure	▪ Timely and adequate public announcements with regards any service interruption due to the project.	▪ Service interruption records. ▪ Duration of service interruption.	All contractors on site.	Site Supervisor.	5,000

	Health and Safety and Security	▪ Health and Safety plan will be implemented by contractor on site. ▪ Workers awareness sessions on health and safety issues will be carried our regularly. ▪ awareness campaigns to the population and training to workers to mitigate community health and safety impacts ▪ Training on security forces on proportional use of force and employment of unarmed security ▪ All persons on site will use personal protective equipment (PPE). ▪ Site emergency response plans will be developed. Including Fire Safety Plan. ▪ Adequate fire-fighting equipment will be provided on site.	▪ H&S Plan compliance records. ▪ H&S awareness sessions attendance records. ▪ Site emergency response and Fire Safety plans developed and implemented. ▪ ESMP compliance records. ▪ Visible traffic and speed signage.	All contractors on site.	Site Supervisor.	20,000

		▪ Adequate signage on site and in surrounding areas should be visible and properly maintained. ▪ Traffic control and speed limits will be observed. Working hours will be limited to day-light, unless otherwise agreed with relevant stakeholders. ▪ Occupational hazards should be marked on site and staff trained on hazard recognition. ▪ Cleanliness of the site will be maintained at all times.				
	Health: HIV/AIDS	▪ Use code of ethics, conduct, and good practices from GPL standards and guidelines ▪ Especial Training, awareness, and education on the use of infection control measures in the workplace during the period of construction phase; ▪ Equip with appropriate equipment and materials	▪ Compliance with the code of ethics ▪ Behaviours which facilitate unintentional injuries and violence, ▪ Tobacco use, ▪ Alcohol and	Health and safety officer. Program should be adapted to comply with local laws.	Health and safety officer	3,500

		to protect colleagues from the risk of exposure to HIV; ▪ Disseminate information on HIV/AIDS including occupational health and first aid training.	drug use, ▪ Sexual behaviours related to pregnancy and sexually transmitted diseases, ▪ Unhealthy dietary behaviours, and ▪ Physical inactivity and being overweight.			

6. A summary of minutes of any public consultations/ meetings held by the Project proponent with key stakeholders expressing their views and opinions.

Meeting Minutes for Linden (November 18th, 2021)

Public Consultation Meeting for Linden Utility Scale Solar PV Projects

Watooka Guest House, Mackenzie, Linden

Public Consultation Report

Meaningful Consultation Meeting

The consultation meeting related to the above-mentioned project was conducted with the community members, as it was seen that they are the most crucial part of the implementation of the project; whilst taking into consideration the social and environmental impacts of such a project, as well as issues surrounding land ownership. All other relevant stakeholders were invited, and the meeting was held on Thursday November 18th, 2021 in the Watooka Guest House, Mackenzie, Linden The meeting was called to order at 1:00 PM.

MEMBERS PRESENT:

Name	**Position**
Amir Dillawar	GPL Special Projects Coordinator
Chitra Singh	GPL Social Management Specialist
Hugh Stephens	RDC Councillor Reg. 10
Charles Sampson	Chairman
Jhonnah	Guyana Revenue Authority
Bleze Benjamin-Hall	RDC Councillor Reg. 10
Deron Adams	Regional Chairman
Waneka Arrindel	Mayor-LMTC
Residents	Residents (Fourteen person including six women)
Isidro Ubaldo Espinosa	EES Team

Shamika Higgins	EES Team
Jamal Lewis	EES Team
Roopnarine Kalpan	EES Team

1. CALL TO ORDER

- Meeting called to order by Ms. Waneka Arrindel. Pledge repeated. Introduction of GPL staff.
- Introduction of members of table (GPL Staff, Regional Vice Chairman).
- Introduction of Project: Name of project. Stakeholder meeting a requirement of project and to gain feedback from community.
- Amir Dillawar explained importance of Guyana's natural resources and the impacts of energy consumption, such as the importation of fuel. This means that there are higher expenses for energy consumption through importation and power plant setup. Guyana's Laws and regulations need to be followed and an assessment of the feasibility, environmental and social aspects of the project. Guidelines are followed according to EPA. The project is divided into 2 main components (Project Areas across country). The location of the project was pointed out.
- Mr. Dillawar expounded on the site location, which is Block 37 and Retrieve.
- Findings from environmental assessment pointed out and procurement and execution processes, explaining the 8 months to commence and 10 months of regulations, 3 months for tendering process.
- Presentation concluded at 2:10 PM,
- Amir Dillawar opened the floor to have feedback, comments, questions. Technical questions will be directed to Ms. Chitra

2. MATTERS ARISING FROM THE MEETING

Area for the project: Charles Sampson, asked about the area of the land available and how much area is needed even for expansion in the future.

Effects of the project on Linden. Ms. Waneka (Mayor) asked about how this project will affect Linden? Mr. Dillawar explained the project will not have effects or impacts since the positive aspect it to add more production of electricity to Linden.

Also Ms. Waneka advice that the project also should have educative session related to energy (electricity conservation) in order to minimize the waste of electricity.

Financial. Resident asked related to either the electricity tariff will be reduced and what will be the investment cost.

Mr. Dillawar responded that the initial cost will be like capital cost the only investment a heavy cost for construction and initial operation of PV Farms. Also Mr. Amir mentioned that the only economic benefit will be directly impact the government since the PV Farms will help to reduce significantly the annual subsidiary.

Cost of electricity production. Resident inquired about the cost of electricity from fuel and renewables energies as PV systemsMr. Amir explains that electricity generation from fuel is about 28 cents, 14 cents from PV systems and Hydropower from Amalia may cost around 7 cents in Guyana currency, currently he mentioned that the electricity tariff at Linden is about 65 cents per kWh. Mr. Amir mentioned that the two PV Farms will not be changing the current cost of electricity. Mr. Amir confirm that the two PV Farms will save about 10 million of annual subsidy cost that currently government spend in electricity production.

Communication about the project: RDC Councillor highlight the first intervention with the public during the meeting, the Councillor highlight the need to use other ways to reach out more residents in order to let them know about the plant of Government and GPL related to PV Farm. Communication related to: opportunities to explain PV farms, PV farm can help to reduce poverty, ads in newspapers, radio and social media channels, message to public (video), zoom meetings between others.

Limitations. Mr. A. Rutherford (resident) asked to Mr. Dillawar if there is any limitation to the project. By knowing that PV Farms is thinking ahead for a better future. Mr. Dillawar explain the only limitation so far is the injection of power to the feeders, but also limitation in knowledge in PV Farm that will require technical training at the beginning of the projects.

Land used and biodiversity. Resident asked to Mr. Dillawar related to land availability.

Mr. Dillawar mentioned that land is from NICIL and its available for project of this nature

3. ANY OTHER BUSINESS

No other business

4. CLOSING REMARKS

Mr. Dillawar: Mentioned the interest of the resident and authorities to attend the meeting and thank you to the support of the Mayor Ms. Waneka Arrindel for attending the meeting.

Mr. Dillawar thank to the invites and resident of linden for attending and for having their queries and feedback.

Meeting concluded at 2:46 pm

7. A description of any assumptions, uncertainties and gaps in knowledge.

NA

8. A non-technical summary of the project (a summary of what the project is about in layman's language that clearly describes your project).

As part of Guyana's commitment to contributing to a sustainable energy future and in alignment with the Low Carbon Development Strategy, the Guyana Power and Light Incorporated (GPL) will be undertaking the Guyana Utility Scale Solar Photovoltaic Program
(GUYSOL).
GUYSOL is financed via the Guyana/Norway partnership, which allowed Guyana to earn financing through its forest climate services. GUYSOL is being administered through the Inter-American Development Bank to support the diversification of Guyana's energy matrix towards the use of climate-resilient renewable energy resources in the electricity generation matrix. The total cost of the Program is estimated at eighty-three million, three hundred thousand United States of America dollars (US$83,300,000), which includes the costs allocated for the installation of 33 Megawatt-peak (MWp) of solar photovoltaic (PV) farms and battery energy storage systems (BESS) in regions: 2,5,6 and 10. By 2025, GUYSOL intends to complete:

- Installation of 10 MWp of solar PV capacity at the Hampshire (Region 6), Prospect (Region 6) and Trafalgar (Region 5) solar Farms injected into GPL Demerara-Berbice Interconnected System (DBIS).

- The installation of 8 MWp of solar PV capacity at the Charity and Onderneeming (Region 2) solar farms connected to the Essequibo Coast Isolated System including a BESS with a minimum capacity of 8 MWh;

- Installation of 15MWp of solar PV capacity at the Block 37, Retrieve and Dacoura solar farms into the Linden isolated system inclusive of a BESS with a minimum capacity of 15 MWh

In addition to these physical outputs, GUYSOL will execute a number of social and developmental initiatives. These include:

- Training of at least 50 women in solar PV, solar job and workforce development with a paid apprenticeship opportunity.

- Implementation an apprenticeship program t provide 'hands-on experience' to 20 Guyanese men and women inclusive of persons with disabilities in areas related to energy management, financial, procurement and environmental/social safeguards

With the completion of the (8) Solar Photovoltaic Farms with an aggregate of 33MWp, the Program aims to:

- Reduce generation cost and simultaneously add generating capacity to GPL via renewable source of energy.

- Avoid Co2 emissions by displacing the use of fossil fuel from electricity production;

- Increase reliability in the service to residents in the isolated systems located in regions: 2 and 10.

- Empower Guyanese to become more participative in the renewables industry in Guyana.