



300MW GAS TO POWER PROJECT (300MW GTPP)

PROJECT SUMMARY

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Table of Contents

Glossery Of Terms:	3
1. Introduction	4
2. Project Description	4
2.1 Physical Location of Project:	4
2.2 Distance of project from stipulated locations:	9
2.3 Settlement/ Indigenous Communities:	9
2.4 Land Dispute:.....	9
2.5 General/ Predominant Land use currently	9
2.6 Baseline Information on the Physical, Ecological and Social Environment	10
2.6.1 Physical Environment:.....	10
2.6.2 Land:.....	10
2.6.3 Drainage and Access Roads	10
2.6.4 Soil and Site Elevation	10
2.7 Ecological Environment:.....	11
2.8 Social Environment	12
2.8.1 Human Habitation:	12
2.8.2 Cultural and Traditional Use of project site:	12
3 Project Layout	12
3.1 Land Size	12
4. Project Design	12
4.2.3 The Diesel fuel supply system will consist of the following major components:.....	19
4.3.2 Environmental, Safety and Quality consideration for components:	21
4.6 Development stages from construction to closure:	23
4.8 Project Duration:	29
4.9 Decommissioning plan:	29
4. Borders and Boundaries	40
6 Minutes Of Public Consultations/ Meetings Held By The Project	40
7. ProponentWith Key Stakeholders	40
8. A Non-Technical Project Summary	40

Glossary of Terms:

1. GTPP- Gas to Power Project
2. WPA– Wales Planning area- (the Entire Wales Development Zone)
3. Site- The specific location designated for the construction of the 300MW Gas-fired Power Plant
4. WDZ- Wales Development Zone
5. WRD-Wales Regional Development Plan Report Final Draft Dec 2021
6. GLS& C- Guyana Lands and Surveys Commission
7. EPC- Engineering, procurement, and construction (contracts).
8. RFP – Request for Proposal

1. Introduction

The Guyana Power and Light Incorporated is submitting this Project Summary to furnish the Environmental Protection Agency with all the required relevant information for the processing of the Environmental Authorization application. The application seeks a permit for the construction and operation of a 300MW Gas-Fired Power Plant within the Wales Developmental Zone, West Bank Demerara. The project will result in the establishment of a power generation facility to supply Guyana with cheaper, cleaner, and stable electricity that will bolster national economic growth.

2. Project Description

The Gas to Power Project (GTPP), involves the construction and operation of a gross installed generating capacity of 300MW of Combined Cycle Gas Turbine (CCGT). The CCGTs will be capable of combusting rich and lean natural gas as their primary fuel.

The primary fuel will be supplied by an onsite Natural Gas Liquefaction (NGL) facility. The NGL facility will be supplied with pipeline quality natural gas via a 12-inch diameter pipeline, connecting to the Floating Production Storage and Offloading (FPSO) vessels located in the Atlantic Ocean. Additionally, the current functional technical specifications of the 300MW GTPP require the CCGTs to consume propane and/or diesel as their back-up fuel. The definitive back-up fuel for the CCGTs will be known at the end of the Engineering Procurement and Construction (EPC) bidding process.

2.1 Physical Location of Project:

The 300MW GTPP will be located within Zone HI-2 of Maria's Lodge of the Wales Development Zone (WDZ), West Bank Demerara. **See Figure 1** for the location of Maria's Lodge. Zone HI-2 is defined in the 2022-2042 Wales Regional Development Plan as the Heavy and Hazardous Industrial Zone. **See Figure 2** for zoning details of the 2022-2042 Wales Regional Development Plan.

As shown in Figure 2, the heavy and hazardous industrial zone (**Zone H, Classification HI**) will be located at the south-west corner of the WDZ. The following coordinates define the boundary lines of the plot identified to locate the 300 MW GTPP.

These coordinates of the corners of the plot are:

- A. 363468.00 m E, 734612.00 m N;
- B. 364146.00 m E, 734426.00 m N;
- C. 363989.00 m E, 733882.00 m N;
- D. 363294.00 m E, 734062.00 m N.

See Figure 3 for mapping details of the plot for the 300 MW GTPP.

Additional to the 300 MW GTPP located within this plot would be the Natural Gas Liquefaction (NGL) facility and other related heavy industrial facilities. These includes equipment that will be use in the processing, storage, transport, and handling of hazardous industrial materials.

As shown in Figure 3, the plot for the 300 MW GTPP and NGL and other heavy industrial facilities will be located to the extreme south (leeward side) of the WDZ. As a result, it is expected for the industrial activities within this zone to have low/no impact on the other planning zones identified in the WDZ. Additionally, least to no impact to the commercial airline travel route to and from the Cheddi Jagan and Eugene F Correia international airports.

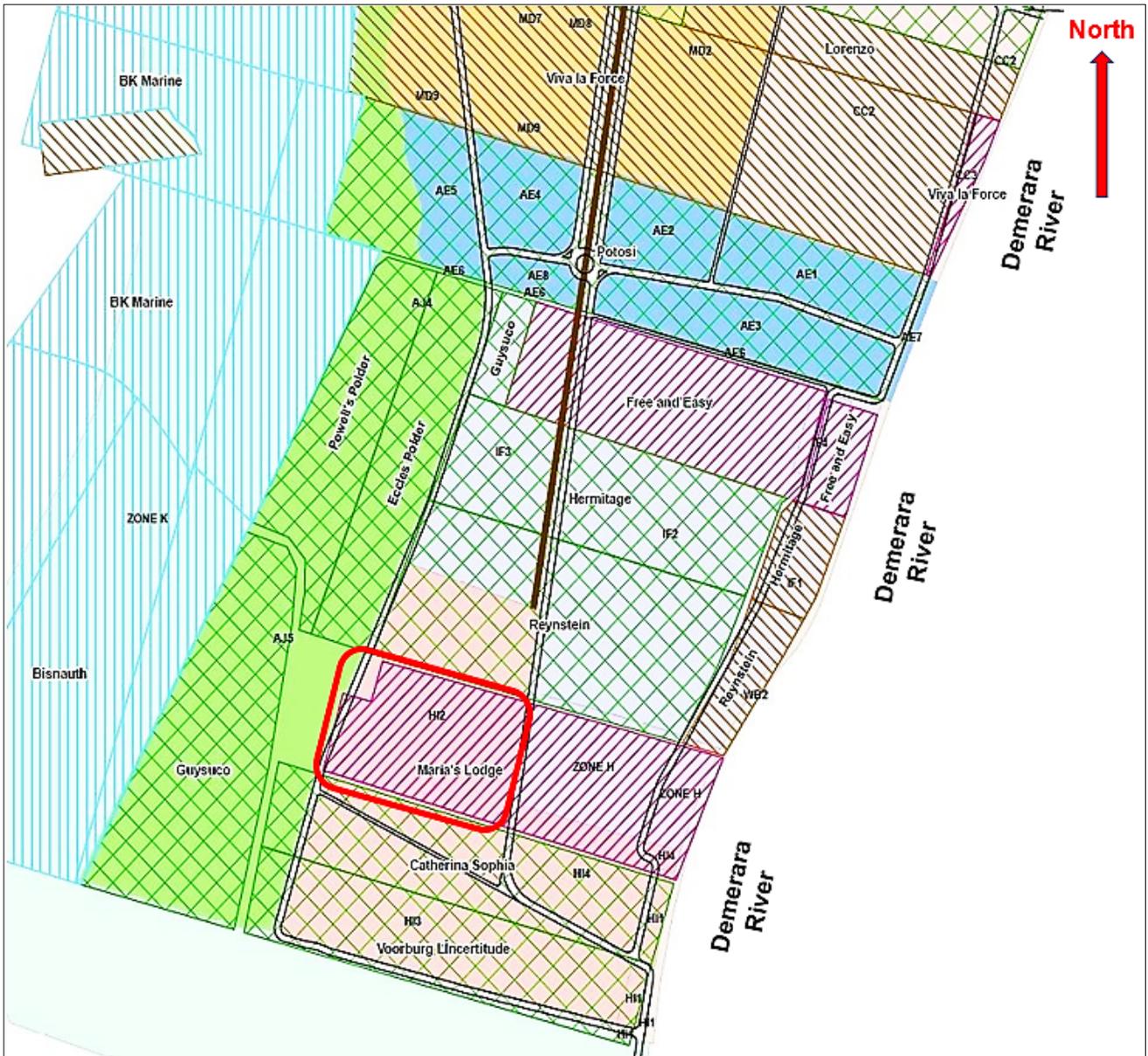


Figure 1: Location of Maria's Lodge within the Wales Development Zone. (Source WRDP 2022-2024).

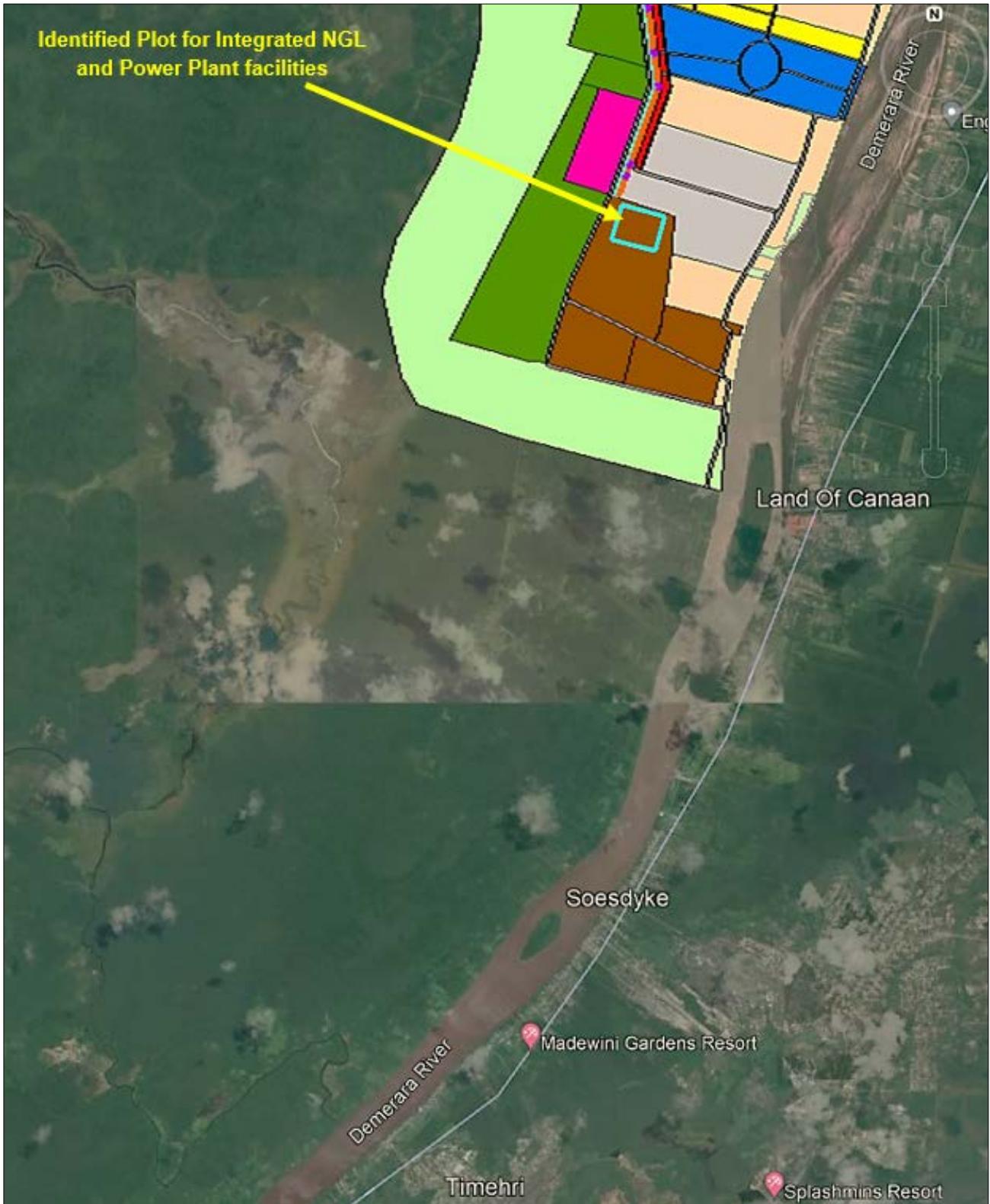


Figure 3: Location of Integrated NGL and Power Plant facilities within Zone HI-2

2.2 Distance of project from stipulated locations:

The closest town to the site is Georgetown. With reference to the Light House (in Georgetown), the approximate distance from the earmarked site is 28.6 km – driving distance and 22.3 km – liner/straight line distance.

2.3 Settlement/ Indigenous Communities:

As per “Land Tenure overlayed on Planning Zones for Wales”, provided by CH&PA, there are no indigenous settlement/ Indigenous communities within the Wales Development Zone. However, the closest settlement external to the WDZ Protected/Containment Area is the Santa Aratak Mission.

2.4 Land Dispute:

All land related matters are currently under the purview of the Government of Guyana and will be determined at the policy level.

2.5 General/ Predominant Land use currently

The land at the site for the proposed project is predominantly abandoned sugarcane cultivation plots (agricultural lands). As such there are no, residential, Commercial, Institutional, Industrial and Mix use of the land currently, relative to the earmarked project site.

Sensitive receptors likely to be affected by the proposed project are shown in Table 1.

Table 1: Proximity to various locations

Locations	<50 meters	50m-100m	101m-500m	501m-1000m	>1km
Sensitive ecosystems e.g. Wetlands/Mangroves					X
Protected Areas					X
Major Water Courses					X
Threatened or endangered flora and fauna					X
Residences					X
Place of Worship					X
Schools					X
Hospitals					X
River / Sea Defense					X

Other – Town						X
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2.6 Baseline Information on the Physical, Ecological and Social Environment

2.6.1 Physical Environment:

The Wales Development Zone is defined by the Demerara River to the east; the Boerasirie Conservancy and agriculture lands to the west; the Canal No. 2 Road to the north and agriculture lands to the south. A section of this planning area, categorized as Zone (H), Classification (HI) for Heavy Hazardous Industrial use will accommodate the 300 MW Gas to Power Project and other related heavy industrial facilities. This area is currently known as the “Wales Estate”, within the Wales Development Zone.

2.6.2 Land:

The land at the site for the proposed project is predominantly abandoned sugarcane cultivation plots (agricultural lands).

2.6.3 Drainage and Access Roads

A number of drainage and irrigation canals and undeveloped farm access roads dissects the Wales Development Zone. The roads to access the site are essentially part of the infrastructure system to support the former agricultural land use activities- Sugar Cane Cultivation by GUYSCO.

2.6.4 Soil and Site Elevation

At this time, no **geotechnical study or onsite surveys have** been done for the project site. **Upon the completion of the geotechnical the results** will be provided, along with other relevant studies. Although, the geotechnical data is currently not available for the “Project Site,” data for the Wales Planning Area/ Development Zone is as followed:

The prevailing soil type is Canje Clay, which encompasses 90% of the Planning Area, followed by the Lamaha Muck, Corentyne Clay, Cola Silt Loam, and Inki and Mara Clay, which can be found to the northwestern and southernmost portions of the Planning Area. The proposed zone for Industrial Activities (i.e., GTPP) is generally flat with elevations reaching up to 10m above average sea level.

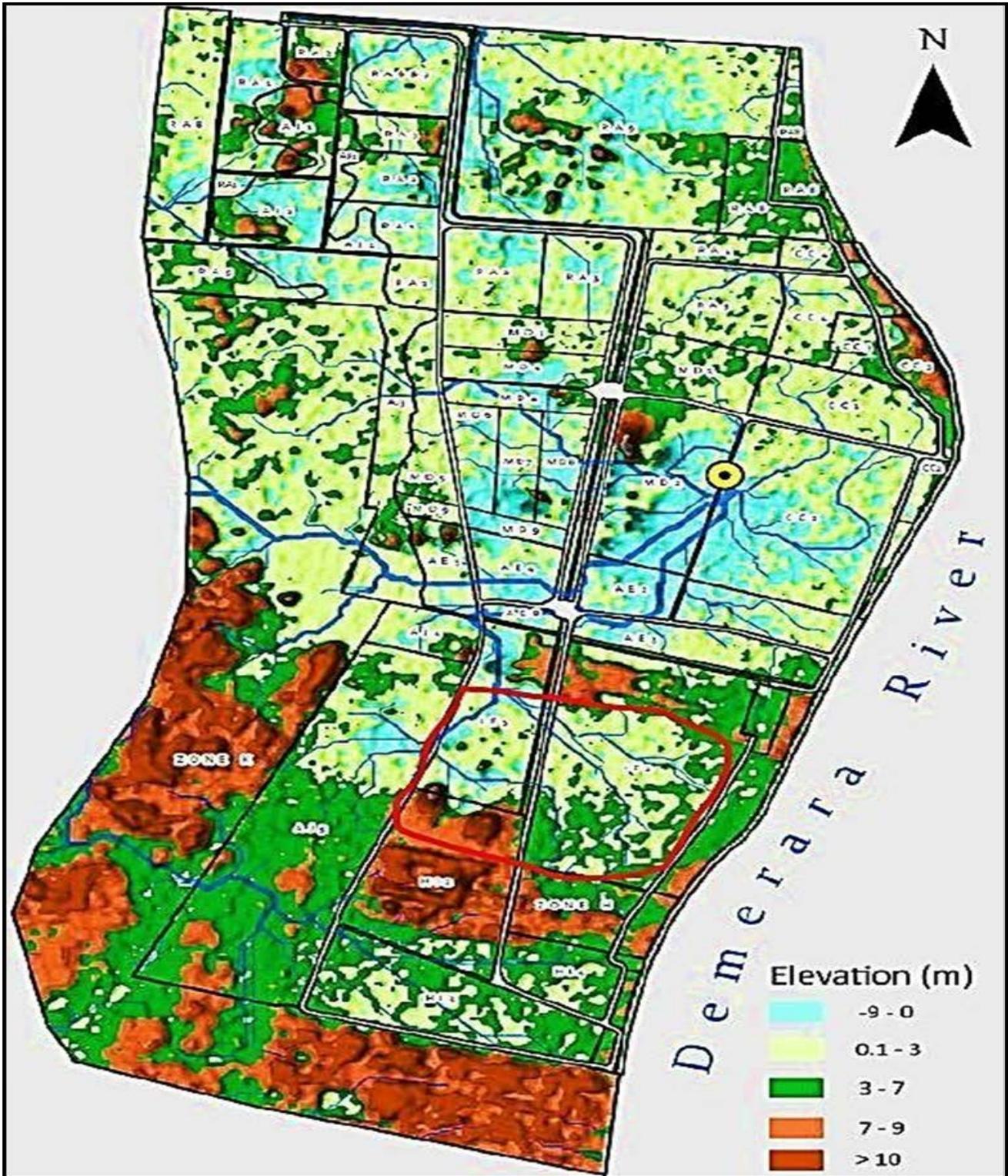


Figure 4. Site Elevation (Source WRDP 2022-2024).

2.7 Ecological Environment:

2.7.1 Land use

The earmarked site, which was previously used for sugarcane production is currently

underdeveloped and overgrown with herbaceous shrub and vegetation. However, there may be some small-scale sugarcane farming and cattle rearing occurring at a section of the site (This information is yet to be verified).

2.7.2 Flora at the Earmarked project site

The land at the site is populated with flora such as:

1. Jamoon
2. Moco- Moco
3. Bloodwood
4. Cecropi
5. Black Sagebrush and a variety of grasses.

2.7.3 Biodiversity:

There is no critical biodiversity expected at this area and the land is of low value to most wildlife.

2.8 Social Environment

2.8.1 Human Habitation:

Currently there are no human habitation of the site, as it is controlled by GUYSUACO. As mentioned in the section “Land Use” there may be some small-scale sugarcane farming and cattle rearing occurring at a section of the site (This information is yet to be verified). However, there are no other significant human use of this site at this point.

2.8.2 Cultural and Traditional Use of project site:

There are no known cultural or traditional uses of the proposed site

3 Project Layout

3.1 Land Size

The earmarked plot of land that is required for the 300 MW Natural Gas-fired Power Plant is approximately 100 acres; this includes the substation and other critical power evacuation facilities. However, at the time of project execution, the required project footprint may vary, but not in such a manner that the project would exceed the available space described by the above-mentioned boundaries.

4. Project Design

The Government of Guyana will be engaging a Contractor for the design, supply, construction, startup, commissioning, and handover of a fully functional and complete Gross installed

capacity of 300 MWe Combine Cycle Gas Turbine Power Plant that will form part of an integrated facility shared with an average 50. MMSCFD Gas Conditioning and Natural Gas Liquids (NGL) Fractionation Plant.

The Power Plant will have the following main facilities:

- 300 MWe gas turbine combine cycle power plant comprising of multiple gas turbine power generators, waste heat recovery steam generators, and one or more steam turbine power generator that will operate in both simple and combined cycle modes
- A Battery Energy Storage System (BESS) consisting of rechargeable batteries that stores energy generated by the combined cycle plant and discharges the stored energy when one of the gas turbines trips offline. The BESS will have an optimum size.

The primary fuel will be supplied by an onsite Natural Gas Liquefaction (NGL) facility. The NGL facility will be supplied with natural gas via a 12-inch diameter pipeline, connecting to the Floating Production Storage and Offloading vessels located in the Atlantic Ocean.

Additionally, the current functional technical specifications of the 300MW GTPP require the CCGTs to consume propane and/or diesel as the back-up fuel. All relevant stakeholders at the end of the Engineering Procurement and Construction (EPC) bidding will know the definitive back-up fuel type. Similarly, at the end of the Engineering Procurement and Construction (EPC) bidding process a definitive position on the installation of a BESS will be known.

4.1 Configuration details for major Components of Power Plant:

The Power Generation project shall consist of a combined cycle configuration as recommended by the EPC Contractor and accepted by the Employer, consisting of multiple Gas Turbines (GTs) exhausting into Heat Recovery Steam Generators (HRSGs). The steam produced from the HRSGs will power one or more Steam Turbine Generator(s) (STGs). The STG exhaust steam will be condensed in a water-cooled condenser, which uses a circulating water system and cooling tower to displace steam cycle heat.

A reference study was conducted to provide technical guidance to the EPC bidders on the power plant configuration. While this study recommends the 3x (2+1) and 4x (2+1) as feasible configurations (see Table 3 for further details on configuration), it is expected for the

Engineering Procurement and Construction (EPC) bidding process to derive the most competitive, technical, and environmental compliant configuration.

At this stage, it is proposed to include a BESS to provide electric power and grid stability when one gas turbine trips off-line.

Table 2. Configuration details for major components of Power Plant

<p>MAJOR COMPONENT OF GAS-FIRED POWER PLANT</p>	<p>CONFIGURATION DETAILS</p>
<p>COMBINED CYCLE GAS TURBINE (CCGT)</p>	<p>The 300 MW Gas to Power Project will comprise of combined cycle generator units. The techno- economic and stability study, which considered six commercially available combined cycle gas turbines, resulted in two feasible power plant configurations. These are 3x (2+1) and 4x (2+1).</p> <p>Each feasible configuration consists of a block comprising two (2) gas turbines and one (1) Heat Recovery Steam Generator, hence the terminology 2+1. The difference between the two feasible configurations is the number of blocks of the 2+1 Gas Turbine/Steam Generator configuration. As elaborated below, each configuration will result in different generator unit sizes.</p> <ul style="list-style-type: none"> • For the 3x (2+1), each gas turbine would be rated at 35MW and the HRSG at 30 MW – resulting in 100 MW per block. Three blocks will total 300 MW. • For the 4x (2+1), each gas turbine would be rated at 22.9MW and the HRSG at 21.9 MW – resulting in 67.7 MW per block. Four blocks will total 270.8 MW. <p>While the above-mentioned technical plant configuration specifics emanate from the results of a detailed study, the procurement process will result in the definitive plant figuration</p>

	<p>to deliver the gross installed generation capacity of 300 MWe.</p> <p>HEAT RATE</p> <p>Given that the power plant will be equipped with combined cycle gas turbines, each generator unit will be capable of operating in simple and combined cycle. For the feasible power plant configurations, typical heat rate values are:</p> <ul style="list-style-type: none"> • 3x (2+1) - Simple Cycle = 8,972 Btu/kWh and Combine cycle = 6,264 Btu/kWh. • 4x (2+1) – Simple Cycle = 9,557 Btu/kWh and Combine cycle = 6,510 Btu/kWh. <p>Factory Acceptance test of the definitive CCGTs to be installed on site will provide the preliminary simple and combined cycle heat rate values. However, the definitive heat rate values for the simple and combined cycle of the CCGT will be determined at the project commissioning stage.</p>
<p>HEAT RECOVERY STEAM GENERATOR (HRSG):</p>	<p>The HRSGs will be a multi-pressure natural circulation type with horizontal gas turbine exhaust flow through vertical tube heat transfer sections. The function of the HRSG will be to generate steam from the gas turbine exhaust for producing power in the steam turbine generator.</p> <p>Environmental consideration for the HRSG design:</p> <p>The HRSGs will be designed for outdoors and set on concrete foundations.</p> <p>The HRSG will have top supported tubes for expansion, and have extended surface, and finned tubes. The units will be internally insulated at the module seams.</p> <p>Silencers will be provided for the safety valves and start-up vents.</p> <p>The HRSGs will include a spool section for potential future installation of a Selective Catalytic Reduction (SCR) system for the control of NOx emissions to meet required limits, and catalyst for CO and VOC reduction.</p> <p>The Stack will be equipped with ports for emissions sampling in</p>

	<p>accordance with regulatory requirements.</p> <p>Platforms and ladders and personnel protection will be provided to permit adequate access to the emissions sampling ports, as well as local lighting and power outlets for sample equipment.</p> <p>Electric hoist, lighting, and electrical service will be provided on the Continuous Emissions Monitoring System (CEMS) platform.</p> <p>The Stack will be self-supporting. The Stack will be equipped with ports for emissions sampling in accordance with regulatory requirements. Platforms and ladders and personnel protection will be provided to permit adequate access to the emissions sampling ports, as well as local lighting and power outlets for sample equipment. Electric hoist, lighting, and electrical service will be provided on the Continuous Emissions Monitoring System (CEMS) platform by Contractor. The stack inside surfaces will be painted by the HRSG supplier at the manufacturing facility. The Contractor will be responsible for painting the field seams and the reinforcement support steel locations with corrosion resistant paint on-site. The stack height and diameter are identified in the Guyana air emissions regulations.</p>
<p>STEAM TURBINE GENERATOR (STG)</p>	<p>The steam turbine generator(s) will be a multi-stage condensing turbine. The STG(s) will be located on an elevated foundation, enclosed in an acoustical enclosure. The Contractor will supply access platforms around the operating elevation.</p>
<p>SUBSTATION</p>	<p>With the power plant exporting electricity at 13.8 kV, the GTPP will be equipped with a 230/69/13.8 kV substation on site.</p> <p>The concept layout of the substation indicates that it will be comprise:</p> <ul style="list-style-type: none"> 4 – 230/13.8 kV voltage step-up transformer 3 – 230/69 kV voltage step-down transformers <p>Air insulated buses operating at 230 kV and 69 kV</p> <p>SF6 circuit breakers rated at 230 kV and 69 kV</p>

	<p>Other relevant equipment that includes, but not limited to gantry/take-off structures, circuit breakers, disconnect switches, electrical bus, equipment support structures, surge arresters, current and potential transformers, metering, protective relaying, control building, ground grid, security and surveillance, lighting, and fence.</p> <p>All indoor electrical equipment will be accommodated within enclosed buildings on site</p> <p>The transformers to be used on the site will be oil immersed type. The oil is specifically used to transfer heat from the transformer windings and core to the radiators through convection current. It is estimated that each 230/13.8 kV transformer will contain a total of 86,943 liters of oil and 69/13.8 kV, 69,554 liters. As such, the estimated total amount of oil associated with transformers on site would be 556,434 liters.</p>
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NB: The power plant configurations mentioned herein are subject to review and evaluation as per the EPC tendering process. As such, all results presented herein, based on these plant configurations will be subject to review.

4.2 Fuels

The power plant will be designed for the full operating range while for natural gas, diesel fuel oil and propane firing, while maintaining emission requirements. The plant will be designed for sustained “simple cycle” operation to accommodate conditions where the steam turbine(s) are unavailable due to a forced outage or schedule maintained. Contractor will identify minimum plant turndown.

4.2.1 Fuel types:

The CCGT will be capable of combusting rich and lean natural gas as the primary fuel. The primary fuel will be supplied by an onsite Natural Gas Liquefaction (NGL) facility. The NGL facility will be supplied with natural gas via a 12 inch diameter pipeline, connecting to the Floating Production Storage and Offloading vessels located in the Atlantic Ocean.

Additionally, the current functional technical specifications of the 300MW GTPP require the CCGTs to consume propane and/or diesel as the back-up fuel. The definitive back-up fuel type(s) will be known to all relevant stakeholders at the end of the Engineering

Procurement and Construction (EPC) bidding process.

Table 3: Fuel used by CCGT

Primary Fuel for CCGT:	Secondary/ Backup Fuel for CCGT
1. Rich Natural Gas	1. Diesel Fuel Oil; and/or
2. Lean Natural Gas	2. Propane.
3. Blend Rich and Lean Natural Gas	

4.2.2 Projected amount of natural gas and components of the gas to be used as fuel.

A combined-cycle gas turbine will have lower aggregated heat rate value or fuel/electricity ratio (BTU/MWh). Therefore, for the same amount of fuel, more electricity (MWh) will be produced, thus an increase in plant efficiency. **Table 4 below** shows preliminary natural gas consumption rates for each of the feasible power plant configuration, operating in simple and combine cycle modes. The CCGTs would only operate in simple cycle mode due to a forced outage on a gas turbine or due to planned gas turbine outage for maintenance.

Table 4. Estimated Natural Gas Consumption

Heat Rate (Btu/kWh)					
Plant Configuration	Simple Cycle (SC)	Combine Cycle (SC)			
3x(2+1)	8,972	6,264			
4x(2+1)	9,557	6,510			

3x(2+1)	Average Heat Rate	Unit	4x(2+1)	Average Heat Rate	Unit
Simple Cycle (SC)	8.972	MMBtu/MWh	Simple Cycle (SC)	9.557	MMBtu/MWh
Combine Cycle (CC)	6.264	MMBtu/MWh	Combine Cycle (CC)	6.510	MMBtu/MWh
Natural Gas Gross Heating Value (typical)	1,050	Btu/ft ³	Natural Gas Gross Heating Value (typical)	1,050	Btu/ft ³
	0.00105	MMBtu/ft ³		0.00105	MMBtu/ft ³
	19,750	Btu/lb		19,750	Btu/lb
	0.01975	MMBtu/lb		0.01975	MMBtu/lb
SC Consumption	8,544.76	ft ³ /MWh	SC Consumption	9,101.90	ft ³ /MWh
	8.54	ft ³ /kWh		9.10	ft ³ /kWh
	454.28	lb/MWh		483.90	lb/MWh
	0.45	lb/kWh		0.48	lb/kWh
CC Consumption	5,965.71	ft ³ /MWh	CC Consumption	6,200.00	ft ³ /MWh
	5.97	ft ³ /kWh		6.20	ft ³ /kWh
	317.16	lb/MWh		329.62	lb/MWh
	0.32	lb/kWh		0.33	lb/kWh

NB: The power plant configurations mentioned herein are subject to review and evaluation as per the EPC tendering process. As such, all results presented herein, based on these plant configurations will be subject to review.

4.2.3 The Diesel fuel supply system will consist of the following major components:

1. Diesel Fuel Oil Storage Tank(s) with a minimum aggregate capacity equivalent to 3 days of fuels for the maximum continuous rating of the power plant. The planned minimum storage capacity for 3 days of fuel is expected to be 22,364 UK barrels, which is equivalent to 1,073,471 imperial gallons.
2. Fuel Oil Unloading Pumps, 2 x 100%
3. Diesel Fuel Oil Forwarding Pumps, 1 for each combustion turbine generator (CTG), each pump sized to supply diesel to one CTG at maximum firing rate
4. Control valves, 1 for each CTG
5. One 100% meter for each CTG
6. Fuel oil recirculation system
7. The diesel fuel oil system will be a permanent system.
8. Emergency/Black-Start Diesel Generator Day Tank (sized to accommodate the black- start of the power plant) supplied with Diesel Generator.
9. All fuel piping will be above ground, unless otherwise approved by the Employer. Fuel piping will be carbon steel or equal.

4.2.4 Propane

Propane will be supplied onsite by the NGL facility and stored onsite in ISO tanks. Storage capacity would be for 4 days to support continuous plant operation at full capacity. Given the Propane (C₃) composition shown in Table 6, it allows a small quantity of C₄⁺. As such, the Lower Heating Value of propane having a composition of 97.5% of C₃ and 2.5% of C₄ result to 618,538 Btu/ft³.

Table 6. Components of the Natural Gas to be used.

		Rich Export Gas	Lean Sales Gas	Propane	Butane	Naptha
		Mol Fraction	Mol Fraction	Mol Fraction	Mol Fraction	Mol Fraction
<ul style="list-style-type: none"> Product streams are approximate and based on simulations Actual product streams may vary from approximations provided 	H2O	0.0000	0.0000	0.0000	0.0000	0.0000
	CO2	0.0068	0.0079	0.0000	0.0000	0.0000
	H2S	0.0000	0.0000	0.0000	0.0000	0.0000
	Nitrogen	0.0045	0.0050	0.0000	0.0000	0.0000
	Methane	0.8068	0.9001	0.0000	0.0000	0.0000
	Ethane	0.0710	0.0784	0.0098	0.0000	0.0000
	Propane	0.0655	0.0080	0.9711	0.0093	0.0000
	i-Butane	0.0089	0.0002	0.0158	0.2497	0.0001
	n-Butane	0.0226	0.0003	0.0033	0.7254	0.0038
	i-Pentane	0.0047	0.0000	0.0000	0.0141	0.3227
	n-Pentane	0.0045	0.0000	0.0000	0.0015	0.3274
	n-Hexane	0.0024	0.0000	0.0000	0.0000	0.1760
	Mycyclopentan	0.0005	0.0000	0.0000	0.0000	0.0344
	Benzene	0.0001	0.0000	0.0000	0.0000	0.0054
	Cyclohexane	0.0003	0.0000	0.0000	0.0000	0.0132
	n-Heptane	0.0006	0.0000	0.0000	0.0000	0.0539
	Mycyclohexane	0.0002	0.0000	0.0000	0.0000	0.0156
	Toluene	0.0001	0.0000	0.0000	0.0000	0.0065
	n-Octane	0.0002	0.0000	0.0000	0.0000	0.0299
	E-Benzene	0.0000	0.0000	0.0000	0.0000	0.0000
p-Xylene	0.0000	0.0000	0.0000	0.0000	0.0000	
o-Xylene	0.0000	0.0000	0.0000	0.0000	0.0000	
n-Nonane	0.0001	0.0000	0.0000	0.0000	0.0110	

Given the above and considering the capacity factor of each power plant configuration as per the 300 MW Gas Fired PP_Technoeconomic Study - Stage 1, the minimum daily propane consumption for combine cycle is:

A. For the 3x (2+1) Configuration:

- 58,697 ft³/day at an average capacity factor of 80.5%;
- Minimum 4 days storage capacity is 234,788 ft³

B. 4x (2+1) Configuration:

- 58.964 ft³/day at an average capacity factor of 86.2%.
- Minimum 4 days storage capacity is 235,855 ft³

However, as per GPL production cost modelling results, the average capacity factor for the 3x (2+1) configuration would be approximately 92% and the 4x (2+1), 98%. As a result, the minimum daily propane consumption for combine cycle would be 67,191 ft³/day for each plant configuration. As such, the minimum 4 days propane storage capacity on site would be 268,764 ft³. Notwithstanding the above, daily consumption rates and storage capacity are expected to be refined at the end of the EPC tender evaluation stage.

4.3 Emission rates of exhaust gases and typical makeup of such:

Combined-cycle generation unit's produce electricity and capture normally wasted heat energy. Like cogeneration applications, this increases energy efficiency of the power plant. In other words, for every MW generated, a combined cycles burns about 35% less fuel than a simple cycle and, consequently, produces 35% less carbon dioxide.

4.3.1 The makeup of exhaust gas is as followed:

Table 7. The Types of air emissions

TYPE OF AIR EMISSIONS
Carbon Dioxide (CO ₂)
Methane (CH ₄)
Carbon Monoxide (CO)
Nitrogen Oxides (NO ₂)
Sulfur Dioxide (SO ₂)
Particulates

(Please note these values are to be used as a guide and does not represent actual emissions of the proposed 300MW Gas-fired power plant).

(Data Source: Spath, P. L., & Mann, M. K. (2000). *Life cycle assessment of a natural gas combined cycle power generation system* (No. NREL/TP-570-27715). National Renewable Energy Lab.(NREL), Golden, CO (United States).

4.3.2 Environmental, Safety and Quality consideration for components:

Contractor will be responsible to provide the following performance guarantees.

1. Rich Natural Gas - Net Unit Electrical Output and Heat Rate at full-load, ISO Conditions
2. Lean Natural Gas - Net Unit Electrical Output and Heat Rate at full-load, at ISO Conditions
3. Blend Rich and Lean Natural Gas – Net Unit Electrical Output and Heat Rate at full- load, ISO Conditions
4. Diesel Fuel Oil – Net Unit Electrical Output and Heat Rate at full-load, unfired, ISO Conditions
5. Propane – Net Unit Electrical Output and Heat Rate at full-load, unfired, ISO Conditions
6. Combined cycle and simple cycle operations. BESS operation and integration with the power plant operations

7. Contractor will be responsible to provide heat balances demonstrating the full range of service and guarantee conditions, simple cycle operation, as well as identify start-up and shutdown ramp rates with associated emissions.
8. Diesel Fuel System Low Sulphur Diesel (LSD) or Ultra Low Sulphur Diesel (ULSD) meeting the specification requirements of ASTM D-975 (Grade No. 2 - S500 (LSD) or S15 (ULSD)) will be used as fuel for the emergency generator and as a back-up fuel for the Power Plant during start- up, commissioning and possibly during initial operation.
9. The system will include an unloading station designed to allow the unloading of two trucks simultaneously, located within a curbed unloading area to contain any spills.
10. The diesel fuel oil system will consist of an adequate numbers fuel oil storage tank for the specified storage capacity, forwarding pumps, and controls to convey the diesel to the suction of the high-pressure oil pumps for each combustion turbine.
11. Spill/Secondary containment will also be provided for pumps. The diesel fuel oil storage tanks will be in accordance with (Functional requirements for Atmospheric Storage Tanks).

4.4 Project Size

4.4.1 Capital Investment:

The estimated capital investment for the development of both power generation and inclusive of water supply and treatment, is currently pegged at US\$300,000,000 and is subject to review based on tenders' submission

4.4.2 Production Rate:

Regarding production, the project will be executed by end of 2024 in one phase with installation of the 300 MW Gas- fired Power Plant Project.

4.4.3 Number of Employees projected for each stage:

Information will be provided at the end of the tender evaluation process.

4.5 Source of Utility Services:

Initially, the project site will be supported with water supply from planned extended

GWI service lines – from the nearest point to site. Later into the project development stage, intended to construct a minimum of two water wells and a treatment facility, which will be project specific. The Guyana Power & Light Inc. (GPL) will supply electricity to the site, by extending the nearest 13.8 kV primary distribution line to the site. Lower voltages that are site and project specific will be furnished by GPL. With the current remoteness of the site, cellular and wireless services will be used to facilitate all communication needs of the Project.

4.6 Development stages from construction to closure:

The planned activities associated with all development stages from construction to closure are, but not limited to the following:

Table 8. Development stages from construction to closure

Project Stage	Activity
Stage 1 Early work	Construction of a Material Offloading Facility (MOF) – Demerara River (To be constructed by EEPGL)
	Construction of access road(s) to site
	Site Clearing and Preparation for the 300 MW Gas-fired Power Generation and Power Evacuation Facilities.
Stage 2 Construction of Gas-fired Power Plant and support facilities	Civil/Construction works for constructing Natural Gas- Fired Power Plant (Inclusive of a water well and water treatment facility – for plant cooling purposes) and Power Evacuation Facilities
	Equipment Installation/Assembling on site for both Power Plant and Evacuation Facilities
	Power Generation and Evacuation Facilities Testing
	Pre-Commissioning of both Power Generation and Evacuation Facilities

Stage 3 Operations	
	Commissioning of both Power Generation and Evacuation Facilities
	Operation of Power Generating facilities
Stage 4 Decommissioning	Subject to decommissioning plans for the pipeline under the purview of EEPGL, at this time there are no plans for decommissioning of the power plant. Any future or preparatory plans shall be in accordance with the EPA Act.

4.7 Waste production and Management:

Since the Combine Cycle Turbines will utilize Natural Gas, the majority of oily residue will come from used Lube Oils and grease during maintenance. Major maintenance is expected to take place at intervals of 48,000 to 50,000 Operating Hours (OH) that is approximately every 5 years. The OEM would determine additional planned maintenance activities that is specific to auxiliary equipment. Therefore, the quality of oily waste (Lube oil and water) from the system will be minimal.

Table 9. Waste Management (Hazardous and Non-Hazardous Waste)

WASTE TYPE	SOURCE	MANAGEMENT/ TREATMENT	QUANTITY OF WASTE GENERATED
WASTE DURING CONSTRUCTION PROCESS			
Graywater Black Water (Sewage)	<ul style="list-style-type: none"> • Sinks • pipes • Toilets 	Graywater and Black water (Sewage) will be stored in tanks onsite until removal via local waste disposal provider.	To be determined
Runoffs from construction process (Sediments)	<ul style="list-style-type: none"> • Runoffs from road 	During the course of construction, the contractor will perform, construct, and maintain on-site soil erosion and sediment control measures. These measures shall be consistent with the provisions of the applicable Erosion / Sediment Control and Stormwater Management Plans, while utilizing the existing site drainage patterns to the maximum extent feasible, and to promote the protection of groundwater, surface water, adjacent properties, and any wetlands encountered.	To be determined
WASTE DURING OPERATION OF FACILITY			
Wastewater containing oily residues	<ul style="list-style-type: none"> • Cooling water systems • Cooling Tower Blowdown 	Cooling water functions on a closed system. Cooling Tower Blowdown will be pumped to wastewater collection tank	Dependent on the amount of lube oils used during maintenance. Others to be determined

	<ul style="list-style-type: none"> • Gas turbine compressor • HRSG • Evaporative cooler • Equipment drains • Safety showers • lab sinks • Other Machinery components • Hot processes 	<p>Gas turbine compressor wash water will be collected in the water wash drains tank and trucked off site for disposal.</p> <p>HRSG blowdown shall be quenched, and cooled with service water, prior to being sent to the wastewater collection tank.</p> <p>Evaporative cooler blowdown shall be sent to the wastewater collection tank.</p> <p>The equipment drains, process floor drains, safety showers, lab sinks, and miscellaneous plant drains system shall collect plant and equipment drains and route them to sumps. The sumps shall discharge this drainage to the oily water separator system/ unit to remove oil, grease, and gross suspended solids. Drainage shall be designed for gravity flow to sumps for pumping to the oily water treatment system. The oily waste from the oil/water separator shall be collected in a separate accumulation tank.</p> <p>Water output from the oil/water separator shall be directed to the wastewater collection tank.</p> <p>Hot process drain piping shall be carbon steel with cathodic protection where the temperature exceeds HDPE limits.</p>	
Graywater	<ul style="list-style-type: none"> • Sinks 	Sanitary waste shall be directed to the septic tank then routed to the on-site above ground septic system. Two separate	To be determined

Sanitary Water (Sewage)	<ul style="list-style-type: none"> • Pipes • Toilets 	<p>septic systems should be on site. One for the control room building and one for the substation control building. Sewage will be removed via local waste disposal provider when necessary.</p>	
Storm Water run-off	<ul style="list-style-type: none"> • Compound • Transformer Pit • Secondary containment 	<p>The site storm drainage system shall include all the necessary components to collect, convey, treat and discharge stormwater as required by local permits and local/international standards, to prevent on-site ponding, soil erosion, soil collapse, wash out, flooding, and polluting the receiving environment.</p> <p>The site shall be graded to drain stormwater away from buildings and equipment, and to prevent localized ponding.</p> <p>The site drainage system shall consist of site grading, catch basins, manholes, piping, oil/water separators and detention ponds, as necessary to collect and treat site stormwater prior to discharging to the receiving environment.</p> <p>Hydrocarbon-contaminated stormwater runoff shall be treated through oil/water separators to achieve oil and grease concentrations below applicable local/international standards.</p> <p>Stormwater should be separated from process and sanitary wastewater streams in order to reduce the volume of wastewater to be treated prior to discharge.</p>	To be determined

		<p>Surface runoff from process areas or potential sources of contamination should be prevented. However, where this approach is not practical, runoff from process and storage areas should be segregated from potentially less contaminated runoff.</p> <p>A stormwater pollution prevention plan for industrial water discharges that complies with applicable permits and standards shall be prepared.</p>	
Oily Rags	<ul style="list-style-type: none"> From the cleaning of Engine Components during maintenance 	Incineration either onsite or at other GPL facilities	Approx. 50lbs of rags per maintenance intervals.
General non-hazardous waste	<ul style="list-style-type: none"> Kitchenette, Compound, Offices, Control rooms etc. 	Utilizing external registered waste disposal company. GPL currently utilizes Cevons Waste Disposal Services-.	To be determined

4.8 Project Duration:

The project is expected to enter commercial operation by July 2024. Given the required completion timeline, each project phase is expected to have an estimated execution duration of 2 years. Please utilize the attached the Project Schedule Draft for the Gas-Fired Power Plant to view a more detailed description of each phase:

<https://drive.google.com/file/d/1DBF1k6I0VCWy0HVMcqY24U9A9U3LfAAv/view?usp=sharing>

4.9 Decommissioning plan:

Subject to decommissioning plans for the pipeline under the purview of EEPGL, at this time there are no plans for decommissioning of the power plant. Any future or preparatory plans shall be in accordance with the EPA Act.

5. POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Table 10. Potential Environmental impacts from construction and operation of proposed project and Mitigation measures

Receptor(s)	Source of Impact	Possible Effects of Impact on Human Life and Environment	Mitigation Measures
CONSTRUCTION PHASE			
Land Preparation and construction of access Road leading to Site			
Soil	<ol style="list-style-type: none"> 1. Land clearing. 2. Excavation. 	Earthworks/ land clearing to install road will disturb soils/ ecosystems, which could have associated effects to receptors utilizing that soils/land.	Mitigation measures during construction stage include reusing of the excavated topsoil (where practicable) as backfilling materials near or within the proximity of the project. Materials suitable for backfill, landscaping and site grading shall be stockpiled at designated locations using proper erosion protection, moisture control, and safety methods.
Air Quality	<ol style="list-style-type: none"> 1. Emissions from construction equipment and Generators. 	Air emissions resulting from the Project have the potential to affect ambient air quality in the Project area on a localized basis and to contribute to	<p>The roads will be soaked with water to limit dust circulation.</p> <p>Emissions from vehicles and generators are too minimal to manage.</p>

	<ol style="list-style-type: none"> 2. Dust from vehicles traversing roads. 3. Construction of access roads (Land clearing, excavation, laying of sand and stone). 	<p>greenhouse gas (GHG) emissions.</p> <p>The decreased ambient air quality can pose potential health risk to humans and wildlife in close proximity to construction site.</p> <p>Combustion from hydrocarbons can contribute to greenhouse gas emissions</p>	<p>Person involved in construction will be equipped with PPE (Respirators and Mask where necessary)</p> <p>Emissions from equipment, vehicles and generators are too minimal to manage.</p>
Noise Quality	<ol style="list-style-type: none"> 1. Operation of Construction Machines 2. Operation of Generators 	<p>The noise from construction can potentially affect wildlife.</p> <p>Any construction activity in close proximity to residents can create noise pollution.</p>	<p>The majority of construction work will not be in close proximity to residents. However, activities will be limited to daylight hours, where practicable.</p>
Water Quality (Ground and Surface Water)	<ol style="list-style-type: none"> 1. Runoffs from construction process 2. Wastewater (Gray water and Sewage) accumulated 	<p>Earthworks related to construction of the access roads and the Power Plant can result in the discharge of sediment to canals or drainage features. This can lead to sedimentation in drains, canals</p>	<p>During the course of construction, The contractor will perform, construct, and maintain on-site soil erosion and sediment control measures.</p> <p>These measures shall be consistent with the provisions of the applicable Erosion / Sediment Control and Stormwater Management Plans, while utilizing the existing site drainage patterns to the</p>

	during construction process.	and trenches. This can affect aquatic ecosystems and can affect human health. The Project has the potential to affect groundwater quality.	maximum extent feasible, and to promote the protection of groundwater, surface water, adjacent properties, and any wetlands encountered. Graywater and Black water (Sewage) will be stored in tanks onsite until removal via local waste disposal provider.
Flora and Fauna	1. Removal of Vegetation.	The clearing of plants and trees can disturb ecosystems.	Where practicable, trees, shrubbery, topsoil, grass, and other landscape materials shall be replanted/ reappplied.
Construction of Generating facility			
Land Use	1. Site preparation	Construction of Project facilities and associated temporary changes to land use. Humans or other receptors utilizing land within the Project construction or operational footprint could experience changes to or loss of benefits deriving from that land use.	The area is unoccupied
Air Quality	1. Emissions from construction	Air emissions resulting from the Project have the potential to affect ambient air quality in the	The project site is not within close proximity to residents.

	<p>equipment and Generators.</p> <p>2. Dust from vehicles traversing roads</p> <p>3. Construction process of power plant</p>	<p>Project area on a localized basis and to contribute to greenhouse gas (GHG) emissions.</p> <p>The decreased ambient air quality can pose potential health risk to humans and wildlife in close proximity to construction site.</p> <p>Combustion from hydrocarbons can contribute to greenhouse gas emissions</p>	<p>Person involved in construction will be equipped with PPE (Respirators and Mask where necessary)</p> <p>Emissions from equipment, vehicles and generators are too minimal to manage.</p>
Noise Quality	<p>1. Operation of Construction Machines cranes, excavators, trucks, pumps, drills, jack hammers</p> <p>2. Operation of Generators</p>	<p>The noise from construction can potentially affect wildlife</p> <p>Any construction activity in close proximity to residents can create noise pollution.</p>	<p>There is no significant amount of wildlife at site</p> <p>The majority of construction work will not be in close proximity to residents.</p>

Waste water Management (Graywater and Sewage)	1. Sinks, pipes and Toilets	Can result in water pollution and Eutrophication.	Waste water (Graywater) and sewage will be stored in tanks onsite until removal via local waste authorized disposal provider
Water (Ground and Surface water)	1. Runoffs from construction process	Runoffs can lead to sedimentation in drains and trenches.	During the course of construction, The contractor will perform, construct, and maintain on-site soil erosion and sediment control measures. These measures shall be consistent with the provisions of the applicable Erosion / Sediment Control and Stormwater Management Plans, while utilizing the existing site drainage patterns to the maximum extent feasible, and to promote the protection of groundwater, surface water, adjacent properties, and any wetlands encountered.
Flora and Fauna	1. Clearing of vegetation for the construction of Power Plant.	The Project has the potential to affect terrestrial habitats at the project site.	Where practicable, trees, shrubbery, topsoil, grass, and other landscape materials shall be replanted/ reappplied.
Operation of Generating facility			
Air Quality	1. Electricity Production process.	The production process can result in a decreased in ambient air quality, which can	Utilizing a Combined-cycle generation Unit for electricity production. The Combined-cycle generation unit's produce electricity and capture

		<p>pose potential health risk to humans and wildlife in close proximity to construction site.</p> <p>Combustion from hydrocarbons can contribute to greenhouse gas emissions.</p>	<p>normally wasted heat energy. Like cogeneration applications, this increases energy efficiency of the power plant. In other words, for every MW generated, a combined cycles burns about 35% less fuel than a simple cycle and, consequently, produces 35% less carbon dioxide.</p> <p>Use of heat recovery system</p> <p>Steam Generator (HRSG) shall be provided with a sufficient level of air emissions control equipment to meet the requirements of the Guyana Environment Protection Agency (EPA) and the project's Environmental Authorization Permit's Air Management requirements. At a minimum, once finalised this equipment should include but not limited to:</p> <ol style="list-style-type: none"> 1. Dry Low NOx (DLN) combustors. 2. The Heat Recovery Steam Generator (HRSG) shall include a spool section sized for future installation of Selective Catalytic Reduction (SCR) for CO and VOC reduction.
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			<p>3. CO Catalyst's emission control systems if necessary should emission limits be less than what is obtainable with DLN combustors.</p> <p>Ancillary equipment such as the black start diesel generator(s), and natural gas dew point heater (if required) shall be equipped with emission controls as required to meet the requirements contained in the Environmental Authorization Permit's Air Management requirements.</p>
Sound	<ul style="list-style-type: none"> • Operation of Natural Gas Fired Combined Cycle Turbines and other. • HRSG's • Steam Turbine • Noise producing equipment. 	<p>Excessive noise can create noise pollution</p> <p>This can affect humans and wildlife.</p>	<p>The gas turbine shall, as a minimum, be provided with the following.</p> <ul style="list-style-type: none"> • Inlet silencers • Outdoor acoustical enclosures including HRSG: <ul style="list-style-type: none"> • Silencers shall be provided for the safety valves and start-up vents. <p>Steam Turbine:</p> <ul style="list-style-type: none"> • enclosed in an acoustical enclosure noise reduction panel for the engine hall and solid concrete walls, curb height, perimeter fencing. These noise deflection

			structures are intended to be done using Industry best practices.
Water (Ground and Surface water)	<ul style="list-style-type: none"> • From cooling water • Oily water from maintenance process. • Run-offs from storm water 	<p>Contamination of ground water sources</p> <p>Pollution of surface water.</p> <p>Damage to ecosystems</p>	<p>Oily wastewater will be processed in Oily water separator.</p> <p>The discharge from the oil/water separator shall be collected in a sump and pumped to a storage tank and disposed of in accordance with applicable regulations.</p> <p>The site storm drainage system shall include all the necessary components to collect, convey, treat and discharge stormwater as required by local permits and local/international standards, to prevent on-site ponding, soil erosion, soil collapse, wash out, flooding, and polluting the receiving environment.</p> <p>The site shall be graded to drain stormwater away from buildings and equipment, and to prevent localized ponding. The site drainage system shall consist of site grading, catch basins, manholes, piping, oil/water separators and detention ponds, as necessary to collect and treat</p>

			<p>site stormwater prior to discharging to the receiving environment.</p> <p>Hydrocarbon-contaminated stormwater runoff shall be treated through oil/water separators to achieve oil and grease concentrations below applicable local/international standards.</p> <p>Stormwater should be separated from process and sanitary wastewater streams in order to reduce the volume of wastewater to be treated prior to discharge.</p> <p>Surface runoff from process areas or potential sources of contamination should be prevented. However, where this approach is not practical, runoff from process and storage areas should be segregated from potentially less contaminated runoff.</p> <p>A stormwater pollution prevention plan for industrial water discharges that complies with applicable permits and standards shall be prepared.</p>
Flora and Fauna	<ul style="list-style-type: none"> From discharge points 	<p>Damage to aquatic organisms.</p> <p>Polluting water source.</p>	<p>Oily wastewater will be processed in Oily water separator before being discharged. Regular testing</p>

			of effluent discharge will be done to ensure discharge is free of contaminants.
Soil	<ul style="list-style-type: none"> • From cooling water • Oily water from maintenance process • Machinery components 	Soil pollution and Damage to ecosystems	<p>Oily wastewater will be processed in Oily water separator.</p> <p>Testing of effluent discharge will be done to ensure discharge is free of contaminants.</p> <p>Extracted Oily residue will be Incinerated</p>

4. Borders and Boundaries

The Project does not cross-country borders or boundaries

6 Minutes of Public Consultations/ Meetings Held By The Project

7. Proponent with Key Stakeholders

Given the current stage of the Project such, a hearing/activity is still to be conducted.

8. A Non-Technical Project Summary

The project is strategically aimed at utilizing piped natural gas from the Floating Production Storage and Offloading (FPSOs), which will be processed by a Natural Gas Liquids (NGL) facility which will generate lean gas that will be used to fuel a power plant that will generate and deliver electricity into GPL's existing power grid (Demerara Berbice Interconnected System – DBIS). The completed project is expected to deliver on a monthly basis 187.56 GWh of electricity into the Demerara Berbice Interconnected System to support Guyana's current and projected economic development