Transmission Lines and Substation for Guyana Integrated NGL Plant and 300 MWe CCGT Power Plant.

PROJECT SUMMARY

Guyana Power & Light Inc. / the Government of Guyana

Lot 91 Duke Street, Kingston. Georgetown. Guyana

Contact details: Telephone #: 225-4618
Website: gpl.net

Prepared by:
Mr. Kesh Nandalall
Team Leader

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Glossary of Terms:

1. GTE- Gas to Energy
2. NGL- Natural Gas Liquids
3. CCGT- Combined Cycle Gas Turbine
4. NESC- National Electrical and Safety Codes
5. EPC- Engineering, procurement, and construction (contracts).
6. RFP – Request for Proposal

1. INTRODUCTION:

The Guyana Power and Light Incorporated is submitting this Project Summary to provide the Environmental Protection Agency with all the relevant information required for the processing of its Environmental Authorization Application for the construction, installation, and operation of Power Transmission Lines and Substation for the Guyana Integrated NGL Plant and 300 MWe CCGT Power Plant Project. This project will connect the Power Plant to the current National Grid, expand it and improve its overall reliability and stability.

2. PROJECT DESCRIPTION:

The Transmission Lines and Substation for the Guyana Integrated NGL Plant and 300 MWe CCGT Power Plant Project, are geared at evacuating and transmitting bulk power generated by the 300 MW GTE CCGT Power Plant and distribute it at three (3) points of interconnection with existing substations. This will feed into the existing National Grid, and three (3) new substations that will distribute electricity directly to customers within their vicinity. Additionally, the project also caters to upgrade two (2) existing 69 kV transmission lines and expand one (1) substation. Below is a list of the various transmission lines, inclusive of their approximate lengths, and substations to be constructed.

List of New 69 kV Transmission Lines (all lengths are approximate):

1. Total length of the three (3) double circuit 69 kV transmission lines from the 300 MW GTE 69kV substation to the Wales Industrial 69/13.8kV Substation is 1.1 km.
2. Total length of the double circuit 69kV Transmission Line from Wales Industrial 69/13.8kV Substation to Wales Residential/Commercial 69/13.8kV Substation is 8.25 km.
3. Total length of the double circuit 69kV Transmission Line from Wales Residential/Commercial 69/13.8kV Substation to Vreed-en-Hoop 69/13.8kV Substation is 18.6 km.

List of 69 kV Transmission Lines to be upgraded (all lengths are approximate):

1. Total length of the double circuit 69kV Transmission Line from Golden Grove 69/13.8kV Substation to Old Sophia and New Substations is 18.89 km.

List of 230 kV Transmission Lines (all lengths are approximate):

1. Total length of double circuit 230 kV transmission line from 300 MW GTE 230kV substation to West Bank of Demerara River (West Bank River Crossing point) is 2.13 km.
2. Total length of double circuit 230 kV transmission line from West Bank river crossing point to East Bank river crossing point at Garden of Eden is 1.55 km. Per EPC Contract, this 230kV section will be an overhead line across the Demerara River, within Garden of Eden.
3. Total length of line double circuit 230 kV transmission line from East Bank River crossing point at Garden of Eden to the Amailia Falls Transmission Corridor (running parallel to the East Demerara Water Conservancy) is 3 km. Refer to Section 5 for additional details.
4. Total length of line double circuit 230 kV transmission line from Amailia Falls Transmission Corridor and Eastern end of Garden of Eden to Goedverwagting 230/69/13.8 kV Substation is 16 km.

Note:

1. Maximum height of 230 kV river crossing and anchor towers, on both sides of the Demerara River, is estimated to150 m maximum.
2. Maximum height of 230 kV towers/pole structures for the remaining sections of the 230 kV transmission line is to be determined by the EPC Contractor.
3. Dimension of the widths of all Rights-of-Way will be in accordance with the technical requirements of the relevant section(s) of the National Electrical and Safety Codes (NESC).

1. List of Substations and Estimated Footprint/Area within Perimeter fence lines:

1. Wales Industrial Substation: 5 acres
2. Wales Residential/Commercial Substation: 4 acres
3. Goedverwagting Substation: 62 acres

1. Physical Location of Project:

Transmission Lines:

The Transmission Lines for the Guyana Integrated NGL Plant and 300 MWe CCGT Power Plant Project will start at the site of the 300MW GTPP, located within Zone HI-2 of Maria's Lodge, within the Wales Development Zone (WDZ), West Bank Demerara. The 230kV Transmission Line will make its way to the West Bank river crossing point and then to East Bank river crossing point at Garden of Eden. The river crossing section will be an overhead line across the Demerara River. Subsequently, this Line will then be routed from Garden of Eden to Amailia Falls Transmission Corridor. This corridor runs parallel with the East Demerara Water Conservancy. The 230 kV Line will then be terminated and connected to the Goedverwagting 230/69/13.8 kV Substation, East Coast Demerara.

Transmission Lines upgrades and Substation improvements:

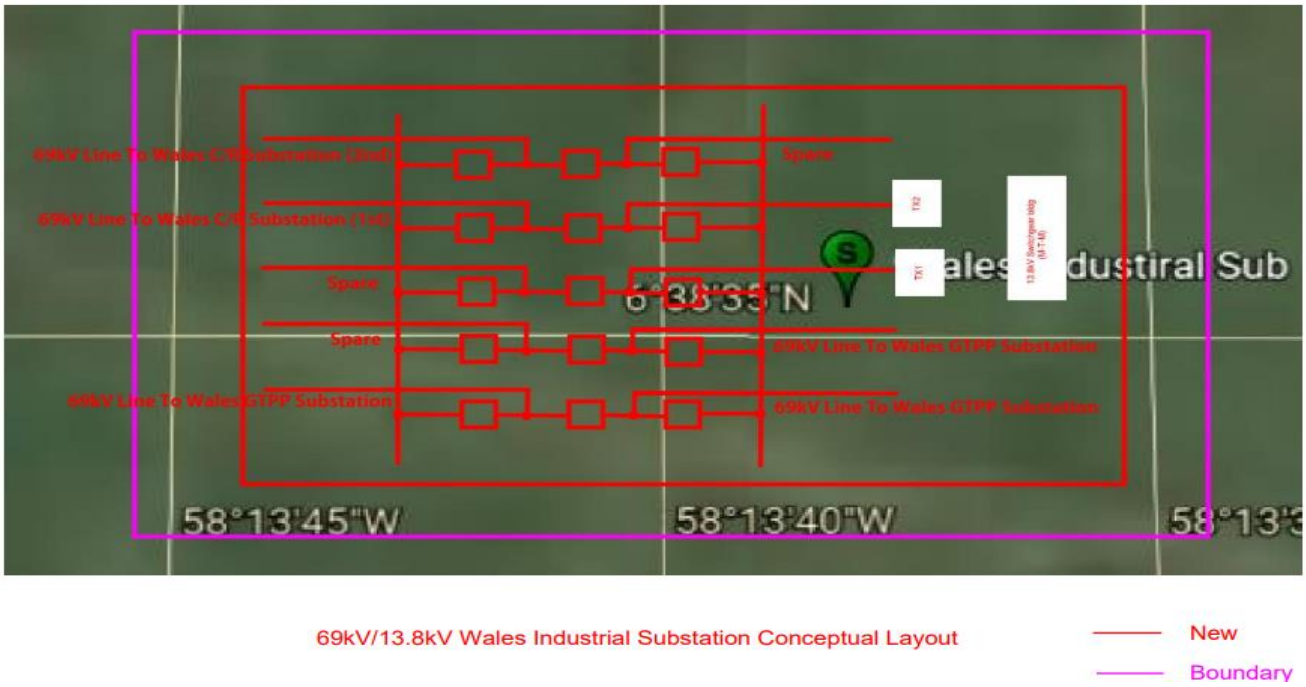
Additionally, upgrades will be done to following transmission lines:

1. Upgrade existing 69kV L2 Transmission Line from Golden Grove 69/13.8 kV Substation to connect with the new Goedverwagting 230/69/13.8 kV Substation, located on the East Coast Demerara.
2. Upgrade existing 69kV L4 Transmission Line from Golden Grove 69/13.8 kV Substation to connect with the new Goedverwagting 230/69/13.8 kV Substation, located on the East Coast Demerara.

3. Upgrade existing 69kV L2 Transmission Line from new Goedverwagting 230/69/13.8 kV Substation to old Sophia substation, located in greater Georgetown.
4. Upgrade existing 69kV L4 Transmission Line from new Goedverwagting 230/69/13.8 kV Substation to New Sophia substation, located in greater Georgetown.
5. 69kV bay expansion at Vreed-en-Hoop 69/13.8kV substation to allow for the interconnection of the 300 MWe CCGT Power Plant at 69 kV in the Western section of the National Grid.

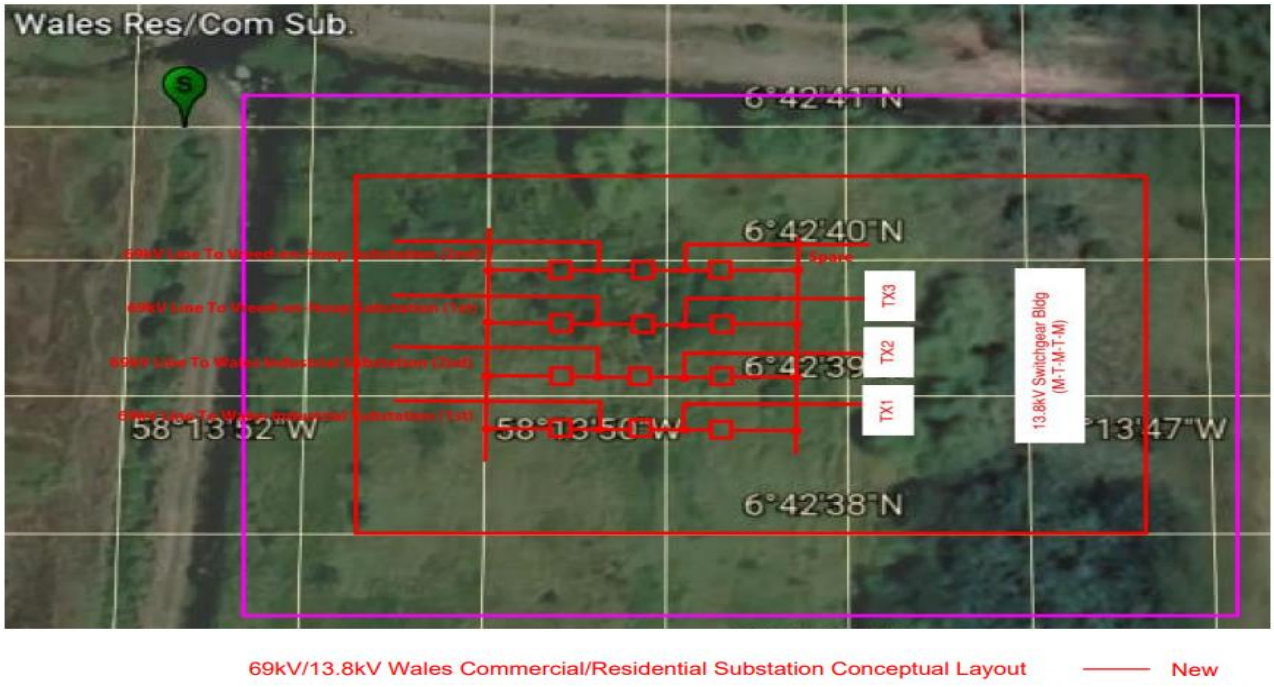
Please see attached Google Earth Map for all physical locations mentioned above.

Figure 1: 69kV/ 13.8kV Wales Industrial Substation Conceptual Layout.



The **Wales industrial Substation** is located within Zone HI-2 of Maria's Lodge of the Wales Development Zone (WDZ), West Bank Demerara, immediately North West of the project site for the 300MW GTPP. The total area to be occupied by the substation is five (5), acres of unoccupied land. ***GPS coordinates of the Wales Industrial Substation site can be found on conceptual layout attached.***

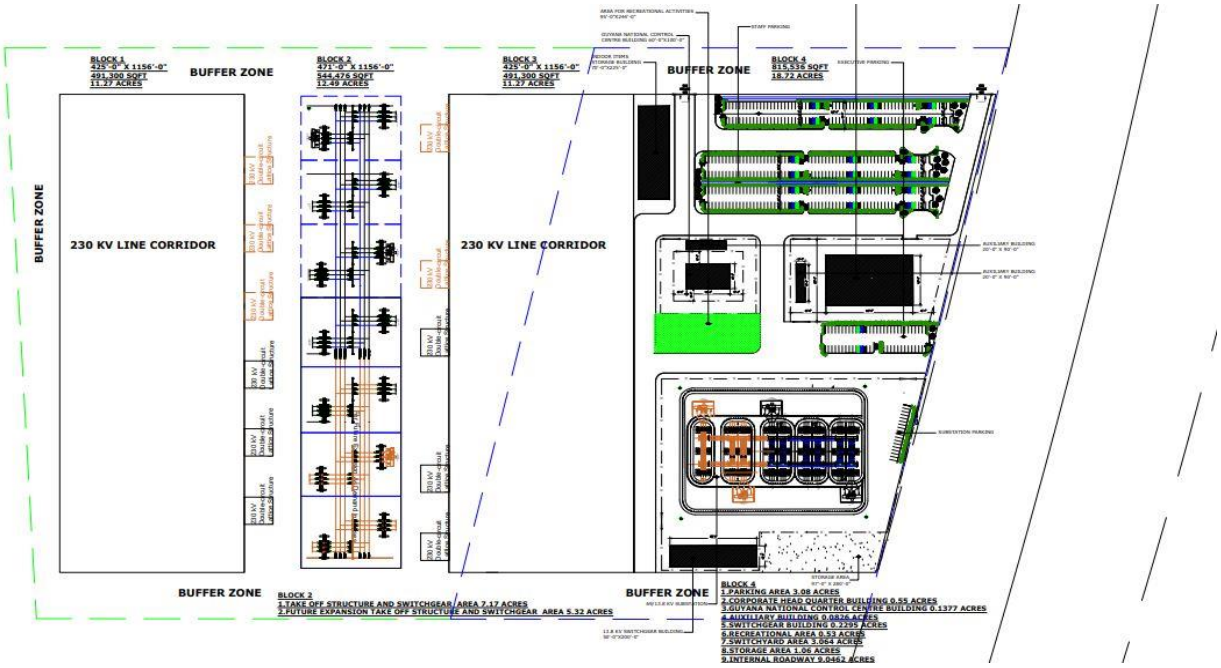
Figure 2: 69kV/ 13.8kV Wales Commercial/ Residential Substation Conceptual Layout.



The **Wales 69kV/ 13.8kV Wales Commercial/ Residential Substation** is located within the Wales Development Zone, North of the Wales Industrial Substation, Wales West Bank Demerara. The total area to be occupied by the Wales Residential/Commercial 69/13.8kV Substation is four (4), acres of unoccupied land.

GPS coordinates of the Wales Residential/Commercial Substation site can be found on conceptual layout attached.

Figure 3: 230kV/ 13.8kV Wales Goedverwagting Substation Conceptual Layout.



The 230kV/ 13.8kV Goedverwagting Substation is located on East Coast Demerara. The total area to be occupied by the substation is sixty two (62), acres of unoccupied land.

GPS coordinates of the Goedverwagting 230/69/13.8 kV Substation site can be found on conceptual layout attached.

1. Distance of project from stipulated locations:

1. The closest town to the Transmission Line along its length is Georgetown. Please see Google Earth Map.
2. The closest town to the Wales Industrial Substation site is Georgetown. With reference to outer boundaries of Georgetown (Agricola) to the

Wales Industrial Substation, located on the East Bank Demerara is approximately 17.22 km in a straight Line.

3. The closest town to the Wales Commercial/Residential Substation site is Georgetown. With reference to outer boundaries of Georgetown (Agricola) to the Wales Commercial/Residential Substation, located on the East Bank Demerara is approximately 7 Miles in a straight Line.
4. The closest town to the Goedverwagting 230/69/13.8kV Substation site is Georgetown. With reference to outer the boundaries of Georgetown, Industry Crown Dam, the Goedverwagting Substation is located on the East Coast Demerara, approximately 11.3 km in a straight Line from Georgetown.

2. Settlement/ Indigenous Communities:

There are no known Indigenous communities along the length of the Transmission Lines and the site of the three (3) Substation (Wales Industrial, Wales Residential/Commercial and Goedverwagting).

3. Land Dispute:

All land related matters are currently under the purview of the Government of Guyana and will be determined at the Policy Level. There are several structures within the vicinity of Vreed-en-Hoop, which are in the path of the 69 kV transmission Lines right-of-way. Relocation may be required. Additionally, near Friendship, EBD, there are sections of Private owned lands, which are in the right-of-way of the 230kV Transmission Line. Land Acquisition efforts will be led by the Gas to Energy- Task Force. There are no structures or current inhabitation of these privately owned lands, specifically the sections to be occupied by the 230 kV transmission line right-of-way.

4. General/ Predominant Land use currently

The land at the site for the proposed Substations is predominantly abandoned sugarcane cultivation plots (agricultural lands). As such there are no residential, commercial, institutional, industrial or mix use of these parcels of land, relative to the earmarked project site. Further, the Transmission Line will in some sections will pass traverse active communities and businesses, while other major sections of the line, that is, along the length of the Amailia Corridor, there are no residential, commercial, institutional, industrial or mix use of the land. The land is currently unoccupied and reserved for Government Projects.

Figure 4: Land use along the length of the 230 kV transmission line

Land use along the length of the 230 kV transmission line from Garden of Eden to Amailia Falls Transmission Corridor (parallel to the East Demerara Water Conservancy) and ending at the site of the Goedverwagting substation.

Figure 5: Land use along the length of the 230 kV transmission line

Land use along the length of the 230 kV transmission line from Garden of Eden to Amailia Falls Transmission Corridor (parallel to the East Demerara Water Conservancy) and ending at the site of the Goedverwagting substation.

Figure 6: Land use along the length of the 230 kV transmission line

Land use along the length of the 230 kV transmission line from Amailia Falls Transmission Corridor and Eastern End of Garden of Eden to Goedverwagting intersects and passes through the community of Friendship EBD.

Table 1, 2 & 3: Proximity to various locations/ Sensitive receptors

1 Wales- Industrial Substation

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

2 Wales Residential/Commercial Substation: 4 acres

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

3 Goedverwagting Substation: 62 acres.

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

6. Baseline Information on the Physical, Ecological and Social Environment

Physical Environment

1. Land:

The land at the site for the proposed substations is predominantly abandoned sugarcane cultivation plots (agricultural lands). The transmission lines do intersect communities at Garden of Eden and Friendship, where the land may be used for agricultural purposes. However, this is not evident in the immediate zone for the transmission line. The larger sections of the transmission line spans along the length of the Amaila Corridor, which are lands that are unoccupied and not used for any industrial, commercial, residential, agricultural or mix use.

2. Drainage and Access Roads

A number of drainage and irrigation canals and undeveloped access roads dissect.

3. 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.

7. Ecological Environment:

1. Land use

The earmarked sites are currently underdeveloped and overgrown with herbaceous shrub and vegetation.

2. River use

A section of the 230 kV Transmission Line will cross "over" the Demerara River, whereby both ends of the line will be mounted and held securely structure via "Anchoring" and "Guiding" Towers, both with (100ft×100ft) clearance. The transmission line will not, at any point, interact with the river below – there will be adequate vertical clearance established by the New Demerara River Harbor Bridge and as set forth in the relevant sections of the NECS to allow for the required safety clearance of all marine tariff.

The maximum height of the towers relative to this section of the 230 kV line would be 150m and which would also allow for adequate safe clearance to air traffic relative to national and international flights/aircrafts.

3. Flora at the Earmarked project site:

The land at the site is populated with grass and shrubs.

4. Biodiversity:

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

8. Social Environment:

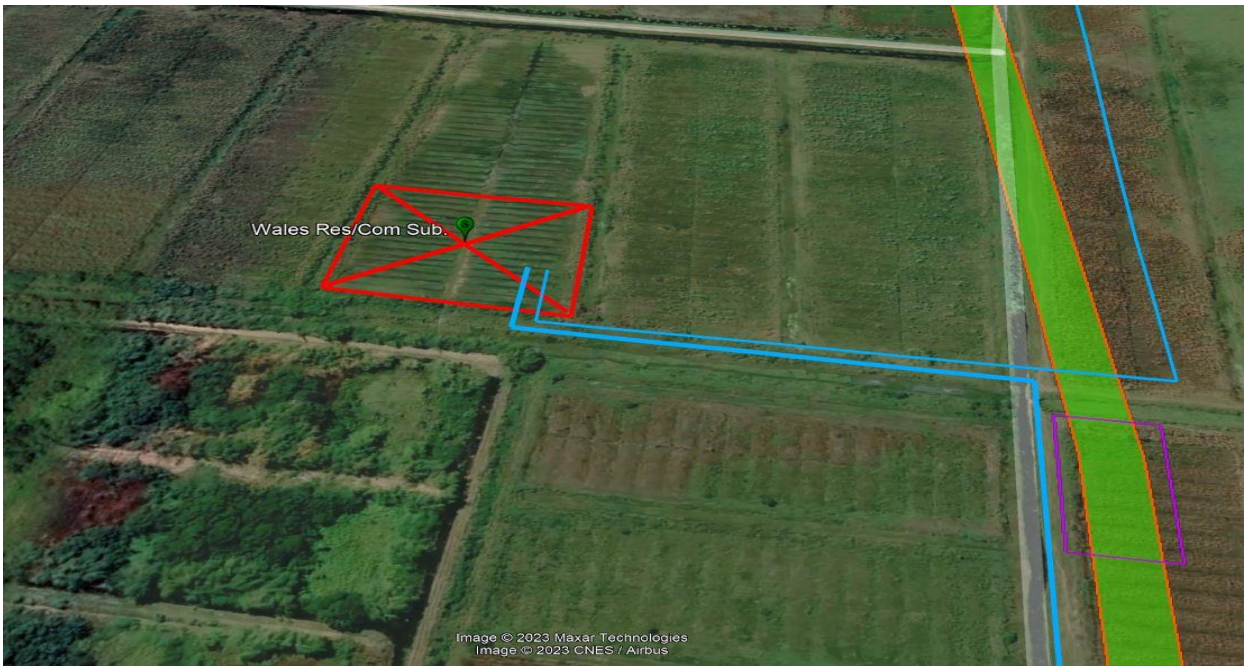
1. Human Habitation:

Currently there is no human habitation at the Wales Industrial, Residential and the Goedverwagting Substation, the land is unoccupied. There are inhabitation in several sections along the length of the Transmission Line in the areas of Garden of Eden and Friendship East Bank Demerara.

Figure 7: The site for the Wales industrial Substation

The site for the **Wales industrial Substation** is located within the project site of the 300MW GTPP, located within Zone HI-2 of Maria's Lodge of the Wales Development Zone (WDZ), West Bank Demerara. The site is currently unoccupied by human habitation.

Figure 8: The site for the Wales 69kV/ 13.8kV Wales Commercial/ Residential Substation



The site for the **Wales 69kV/ 13.8kV Wales Commercial/ Residential Substation** is located in Wales West Bank Demerara. The site is currently unoccupied by human habitation.

Figure 9: The site for the 230kV/ 13.8kV Goedverwagting Substation

The site for the **<u>230kV/ 13.8kV Goedverwagting Substation</u>** is located on East Coast Demerara. The site is currently unoccupied by human habitation.

2. Cultural and Traditional Use of project site:

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

3. <u>PROJECT LAYOUT:</u>

1. Land Size

<u>List of New 69 kV Transmission Lines (all lengths are approximate):</u>

1. Total length of the three (3) double circuit 69 kV transmission lines from the 300 MW GTE substation to the Wales Industrial Substation is **<u>1.1 km.</u>**
2. Total length of the double circuit 69kV Transmission Line from Wales Industrial Substation to Wales Residential/ Commercial Substation is **<u>8.25 km.</u>**

3. Total length of the double circuit 69kV Transmission Line from Wales Residential/ Commercial Substation to Vreed-en-Hoop Substation is **18.6 km.**

List of 69 kV Transmission Lines to be Upgraded (all lengths are approximate):

1. Total length of the double circuit 69kV Transmission Line from Golden Grove Substation to Sophia Substation is **18.89 km.**

List of 230 kV Transmission Lines(all lengths are approximate):

1. Total length of double circuit 230 kV transmission line from 300 MW GTE substation to West Bank of Demerara River (West Bank River Crossing point) is **2.13 km.**
2. Total length of double circuit 230 kV transmission line from West Bank River Crossing point to East Bank River Crossing point, Garden of Eden is **1.55 km.** This will be an overhead line across the Demerara River.
3. Total length of line double circuit 230 kV transmission line from East Bank River Crossing point, Garden of Eden to Amailia Falls Transmission Corridor (parallel to the East Demerara Water Conservancy) is **3 km**. Refer to Section 5 for additional details.
4. Total length of line double circuit 230 kV transmission line from Amailia Falls Transmission Corridor and Eastern End of Garden of Eden to Goedverwagting is **16 km.**

2. List of Substations and Estimated Footprint/Area within Perimeter fence lines:

1. Wales Industrial Substation: **5 acres**
2. Wales Residential/Commercial Substation: **4 acres**
3. Goedverwagting Substation: **62 acres**

4. PROJECT DESIGN:

Transmission Lines to be installed:

1. The total length of the transmission lines will be 69.49 Km, with a maximum height of 230 kV River Crossing and Anchor Towers on both sides of the Demerara River is **150 m.**
2. Maximum height of 230 kV towers/pole structures for the remaining sections of the 230 kV transmission line is to be determined by the EPC Contractor.
3. Dimension of the Widths of all Rights-of-Way will be in accordance with the technical requirements of the relevant section(s) of the National Electrical and Safety Codes (NESC).

Transformers to be installed at various locations:

The Government of Guyana, through Guyana Power and Light Inc. (GPL), will be engaging an original equipment manufacturer for the design, manufacture, shop testing, pre-delivery inspection, and delivery of the 69kV/13.8kV transformers listed below:

• Four (4) 69kV/13.8kV, 60MVA ONAN, 3 phase, 60 Hz. Power Transformers
• Three (3) 69kV/13.8kV, 35MVA ONAN, 3 phase, 60 Hz. Power Transformers

69kV/13.8kV Transformer Technical Specification:

The high voltage (HV) side the transformers will be directly connected via overhead lines to the 69kV switchyard. The low voltage (LV) side of the transformer will be connected via bus duct to the 13.8kV switchgear bus. Each transformer will be installed in a separate outdoor transformer bay. The no-load excitation current shall be as low as possible for economic considerations. The maximum tolerance for no load and load

losses shall be within +/-5% of the declared losses. The windings of the transformers shall withstand mechanical and thermal stresses caused by short-circuit fault current stipulated in the applicable IEEE standard. The transformers must be capable of continuous operation at the rated power without exceeding the rated temperature rise and without incurring any degradation and/or deterioration. The transformers shall be capable of continuous operation under frequency and voltage variations according to the applicable IEEE standard.

Table 4: Transformer Ratings

The ratings of the transformers shall be as follows:

Number of units Four (60MVA ONAN) Three (35MVA ONAN)	7
Installation	Outdoors
Number of Windings	2
Number of phases	3

Rated frequency	60 Hz
Type	Oil immersed unit
Cooling system	ONAN
Rated unit power (ONAN)	60 MVA and 35 MVA
Rated Voltage, kV: - HV winding (Secondary) -LV Winding (Primary)	 69 13.8
On load Tap Changer (OLTC)	Four steps of 1.25% above and eight steps of 1.25% below the nominal voltage of 69kV (HV winding)
Impedance 60MVA ONAN Rated Transformer 35MVA ONAN Rated Transformer	 Between 12.5% to 14% Between 8.0% to 10.9%
Three phase vector diagram	YNd11
Polarity	Subtractive
Neutral HV	Solidly grounded
Max. average sound level (at 2 m)	according to IEEE C57.12
Maximum Transformer Losses: 60MVA ONAN Rated Transformer No Load Loss Load Loss at 60 MVA 35MVA ONAN Rated Transformer No Load Loss Load Loss at 35 MVA	 36 kW 264 kW 25 kW 178 kW
Voltage Class HV (69kV) LV (13.8kV)	 72.5 kV 15 kV
Basic Insulation Level HV (69 kV) LV (13.8 kV)	 350 kV 110 kV
Power frequency withstand voltage, 60 Hz. Dry 1 minute HV (69 kV) LV (13.8 kV)	 160 kV 36 kV
Power frequency withstand voltage, 60 Hz. Wet 10 Seconds	

HV (69 kV) LV (13.8 kV)	140 kV 30kV
Lightning/Surge Arrestors on HV side (69kV)	57 kV (as per ANSI/IEEE) MCOV Station Class (72.5 kV Duty Cycle) Nominal discharge current - 20 kA TOV capability - 1s – 62.1 kV rms, 10s – 59.4 kV rms

230kV/69kV Transformer Technical Specification

The high voltage (HV) and low voltage (LV) side the transformers will be directly connected via overhead lines to the 230 kV switchyard/69kV switchyard, respectively. Each transformer will be installed in a separate outdoor transformer bay. The no-load excitation current shall be as low as possible for economic considerations. The maximum tolerance for no load and load losses shall be within +/- 5% of the declared losses. The windings of the transformers shall withstand mechanical and thermal stresses caused by short-circuit fault current stipulated in the applicable IEEE standard.

The transformers must be capable of continuous operation at the rated power of 375 MVA without exceeding the rated temperature rise and without incurring any degradation and/or deration. The transformers shall be capable of continuous operation under frequency and voltage variations according to the applicable IEEE standard.

Table 5: Transformer Ratings

The ratings of the transformers shall be as follows:

Number of units	2
Installation	Outdoors
Number of Windings	2
Number of phases	3
Rated frequency	60 Hz
Type	Oil immersed unit
Cooling system	ONAN
Rated unit power (ONAN)	375 MVA
Rated Voltage, kV: - HV winding (Secondary) -LV Winding (Primary)	 230 69
On load Tap Changer (OLTC)	+/-16 x 0.625% (HV winding)
Impedance	Between 12.5% to 14%
Three phase vector diagram	YNyn0

Polarity	Subtractive
Neutral HV	Solidly grounded
Neutral LV	Solidly grounded
Max. average sound level (at 2 m)	according to IEEE C57.12
Maximum Transformer Losses: No Load Loss Load Loss at 375 MVA	 330 kW 1586 kW
Voltage Class HV (230kV) LV (69kV)	 242 kV 72.5 kV
Basic Insulation Level HV (230 kV) LV (69 kV)	 900 kV 350 kV
Power frequency withstand voltage, 60 Hz. Dry 1 minute HV (230 kV) LV (69 kV)	 425 kV 160 kV
Power frequency withstand voltage, 60 Hz. Wet 10 Seconds HV (230 kV) LV (69 kV)	 350 kV 140kV
Lightning/Surge Arrestors on HV side (230kV)	144 kV (as per ANSI/IEEE) MCOV Station Class (180 kV Duty Cycle) Nominal discharge current - 20 kA TOV capability - 1s - 205 kV rms, 10s - 195 kV rms

5. PROJECT SIZE:

1. Capital Investment:

The estimated capital investment for the development and installation of the Transmission Lines, Substations and upgrades is currently pegged at US $159.9 Million Dollars.

2. Production Rate:

The project will distribute 300MWe of electricity generated from the GTE Power Plant.

3. Number of Employees projected for each stage:

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

4. Source of Utility Services:

Guyana Water Incorporated (GWI) will supply water to the various Substations and the Guyana Power & Light Inc. (GPL) will supply Electrical power.

5. 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 6: The Installation of Transmission Lines as listed below will include the following stages of development:

STAGE 1- Early Work	STAGE 2- Construction of	STAGE 3- Operation

	Transmission Towers	
Site preparation- Land Clearing (Removal of Trees and vegetation at project sites for Towers and Poles).	Civil/Construction works for installation of all High Voltage Transmission towers and Poles (Crossing and anchoring Towers).	Pre-Commissioning of Transmission Lines
Excavation may be required in some area as part of site preparation	Installation and assembling of Equipment, Transmission lines	Commissioning of Transmission Lines
-	Connecting of all Transmission Lines to the appropriate Substations	Control and distribution via GPL's Transmission and Distributions Dept.

6. WASTE PRODUCTION AND MANAGEMENT:

Table 7: Waste during construction/ installation process of transmission lines and substations

Waste Type	Source	Management/ Treatment	Quantity of Waste Generated
Graywater	Portable sinks on worksite	Graywater and Black water (Sewage) will be stored in tanks on site until removal via local waste disposal provider at various construction sites.	To be determined
Black Water (Sewage)	Portable toilets on worksite	Graywater and Black water (Sewage) will be stored in tanks on site until removal via local waste disposal provider at various construction sites.	To be determined
Runoffs from construction process (Sediments)	Land preparation process, excavation	During the course of construction, the contactor will perform,construct, and maintain on-site soil erosion and sediment control measures. Adequate drainage will be designed for the site to minimize run off Drainage systems will be monitored and frequently maintained Adequate temporary sanitary facilities will be provided for workers on-site Frequent collection of waste generated by sanitary facilities will be done by an EPA approved contractor	To be determined
Solid waste	Generated	Waste Generated by Workers during construction phase	To be determined

	from workers onsite	An EPA approved contractor will collect all waste generated on site. The site will be provided with an adequate number of bins for the disposal of domestic waste Burning of waste on-site will be prohibited	
Waste during operation of facility- substations			
Graywater	Portable sinks on worksite	Graywater will be directed to onsite drainage system and collection pits	To be determined
Black Water (Sewage)	Portable toilets on worksite	Black water (Sewage) will be directed to onsite sewage system.	To be determined
Storm Water run-off	Rainfall	All storm-water will be directed to established drainage system of the facility	To be determined
Oily Waste	Oil from transformer tank	The transformer tanks shall be constructed in welded sheets of high-quality carbon steel suitable for the application, reinforced in order to withstand the most severe conditions of operation, transport and vacuum treatment. All the transformer tanks shall be water and hot oil tight and resistant to 100% vacuum. The necessary gaskets will be tight under all conditions especially against the hot oils (synthetic rubber or neoprene bonded cork will be preferred).	To be determined

		Means shall be provided to prevent over compression of the gaskets. All tanks will be suitably braced to withstand, without distortion or buckling, the stress imposed during transport and operation. The necessary lifting lugs and shackles shall be provided to enable the whole transformer to be lifted by crane. All steel components shall be treated to remove rust and scale in accordance with an approved specification. All steel components including the inside of the tank, the cover and the expansion vessel shall receive paint and corrosion protection in accordance with the Manufacturer's standards that is suitable for the environmental conditions (humid, tropical, marine environment) prevailing in coastal Guyana. Oil used in the filling of the transformer will be pure mineral oil, unmixed with any other substance, refined especially for use in transformers, free from moisture, acid, alkali and sulphur components. It shall be suitable for the ambient conditions prevailing at site. The transformer oil shall be non-corrosive on the basis of tests in accordance with IEC	

		62535. The transformer oil will comply with the corresponding IEEE recommendations and standards. The transformer shall be fitted with the required number of valves for filling, draining and oil treatment. The valves shall be able to be sealed against transformer oil above 212°F. The transformer tanks shall be fitted with a pressure relief device or explosion vent. It shall be built on the covers to protect against high pressures inside the oil tanks. It shall be provided with closed cover used as diaphragm which ruptures at a gauge pressure of 7.98 to 10.15 psi (0.55 to 0.7 bar) (preferably, the sealing of the explosion vent may be accomplished by a spring closed cover, having the same pressure gauge as before).	
General non-hazardous waste	Generated by operators and other staff Control rooms/ security etc.	Utilizing external registered waste disposal company. GPLcurrently utilizes Cevons Waste Disposal Services-.	To be determined

1. Project Duration:

The project is expected to start on 01st July, 2023 and to be completed by 17th October, 2024.

Task Mode	Task Name	Duration	Start	Finish
	EPC) Services for TL and SS for Guyana INGL Plant and 300 Mwe CCGT Power Plant	323 days	01 Jul '23	17 Oct '24

2. Decommissioning plan:

Unknown at this stage of the Project.

7. POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES:

Table 8: Potential Environmental impacts from construction and operation of proposed project and Mitigation measures

Receptors	Source of impact	Possible effects of impacton human life and Environment	Mitigation measures
Construction of Transmission lines and Substations.			
Soil	Land clearing and excavation for Transmission line towers and substations.	Erosion and Compaction, Earthworks/ land clearing will disturb soils and ecosystems.	Adequate drainage will be developed for relevant sites and the Implementation of re-vegetation measures in critical areas where necessary.
Water Quality (Ground and	Earthworks related to site	Runoffs from site Preparation can lead	Adequate drainage will be designed for the site to

Surface Water).	preparation can result in the discharge of sediment to canals or other drainage features	sedimentation in drains, canals and trenches. This can affect aquatic ecosystems and can affect human health. The Project has the potential to affect groundwater quality.	minimize runoff Drainage systems will be monitored and frequently maintained Adequate temporary sanitary facilities will be provided for workers on-site Frequent collection of waste generated by sanitary facilities will be done by an EPA approved contractor
Air Quality	Emission from site preparation activities to facilitate the construction of Substations and components of Transmission Lines and Towers. Emissions from Equipment/ Machinery and Vehicles.	Dust Generation and Exhaust Emissions may affect Ambient Air Quality at the Project area on localized basis. Combustion from hydrocarbons can contribute to greenhouse gas emissions	Covering of Stockpiles to minimize dust generation, Suppressing dust from construction, stockpiles and increased vehicular traffic by sprinkling water, Consideration of wind direction when stockpiling construction materials, and Orientation shall avoid downwind residences or sensitive locations. Regular maintenance of vehicles and on-site construction equipment
Noise and Vibration	Operation of Equipment	Noise Pollution may pose a nuisance to the tranquillity of the environment, and may	Noise and vibration shall be to control and limit noise and vibration level from activities

	and Machinery in ROW and substation sites	have an impact on human health. Further, Increase Noise Pollution can affect wildlife (E.g. nesting birds etc.)	at the source by the use of Best Practicable Means (BPM) (E.g. Noise barriers/ screening) and ensuring compliance with relevant legislation. Additionally, the use of ear plugs or ear muffs for specific activities by workers Activities will be limited to daylight hours, where practicable.
Flora and Fauna	Land Clearing for the construction of substations and Clearing of ROW/ area surrounding Transmission Towers, will require some amount of vegetation clearance.	Disturbance of Ecosystems, wildlife breeding/ feeding patterns, increased erosion and habitat destruction.	Where practicable, trees, shrubbery, topsoil, grass, and other landscape materials shall be replanted/reapplied.
Solid waste pollution	Waste Generated via site preparation activities and from workers during site preparation.	Garbage Pollution	An EPA approved contractor will collect all domestic waste generated on site. The site will be provided with

			an adequate number of bins for the disposal of domestic waste Burning of waste on-site will be prohibited
Potential Environmental impacts from operation of proposed project			
Soil	Spillage of Transformer oil at Substations.	Oil from transformer Conservator tank	The transformer tanks shall be constructed in welded sheets of high-quality carbon steel suitable for the application, reinforced in order to withstand the most severe conditions of operation, transport and vacuum treatment. All the transformer tanks shall be water and hot oil tight and resistant to 100% vacuum. The necessary gaskets will be tight under all conditions especially against the hot oils (synthetic rubber or neoprene bonded cork will be preferred). Means shall be provided to prevent over compression of the gaskets. All tanks will be suitably braced to withstand,

			without distortion or buckling, the stress imposed during transport and operation. The necessary lifting lugs and shackles shall be provided to enable the whole transformer to be lifted by crane. All steel components shall be treated to remove rust and scale in accordance with an approved specification. All steel components including the inside of the tank, the cover and the expansion vessel shall receive paint and corrosion protection in accordance with the Manufacturer's standards that is suitable for the environmental conditions (humid, tropical, marine environment) prevailing in coastal Guyana. Oil used in the filling of the transformer will be pure mineral oil, unmixed with any other substance, refined especially for use in transformers, free from

			moisture, acid, alkali and sulphur components. It shall be suitable for the ambient conditions prevailing at site. The transformer oil shall be non-corrosive on the basis of tests in accordance with IEC 62535. The transformer oil will comply with the corresponding IEEE recommendations and standards. The transformer shall be fitted with the required number of valves for filling, draining and oil treatment. The valves shall be able to be sealed against transformer oil above 212°F. The transformer tanks shall be fitted with a pressure relief device or explosion vent. It shall be built on the covers to protect against high pressures inside the oil tanks. It shall be provided with closed cover used as diaphragm which ruptures at a gauge pressure of 7.98 to 10.15 psi (0.55 to 0.7 bar) (preferably, the sealing of

			the explosion vent may be accomplished by a spring closed cover, having the same pressure gauge as before).
Water Quality (Ground and Surface Water).	Spillage of transformer oil	Contamination of ground water sources Pollution of surface water. Damage to ecosystems	All run-offs and storm water will be redirected to an established drainage system. The Transformer will rest on a gravel bed. Oil used in the filling of the transformer will be pure mineral oil, unmixed with any other substance, refined especially for use in transformers, free from moisture, acid, alkali and sulphur components.
Air Quality	N/A	N/A	N/A
Noise	Humming noise from Transformers at substations. Fire Drills at the location.	A persistent humming noise may affect the tranquillity of the environment for residents in close-proximity of the substation.	There are no residents in close-proximity of the substations. Fire Drills occur for a period of 2 minutes, quarterly. Therefore, it pose no significant noise pollution.
Solid waste pollution	Waste Generated from operators on substation.	Garbage Pollution	An EPA approved contractor will collect all domestic waste generated on site.

			The site will be provided with an adequate number of bins for the disposal of domestic waste Burning of waste on-site will be prohibited

8. BORDERS AND BOUNDARIES:

The Project crosses regions from Regions the GTE Project site Region three (3), Wales and spans along the East Coast of Demerara in Regions Four (4).

9. MINUTES OF PUBLIC CONSULTATION/ MEETINGS:

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

10. PROPONENT WITH KEY STAKEHOLDERS:

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

11. A NON-TECHNICAL SUMMARY:

The Transmission Lines and Substation for the Guyana Integrated NGL Plant and 300 MWe CCGT Power Plant Project will distribute generated electrical power to three (3) points of interconnection with existing substations. This will feed into the existing National Grid (Demerara Berbice Interconnected System –DBIS), and three (3) new substations that will distribute electricity directly to customers within their vicinity to support Guyana's current and projected economic development.