75 MW POWERSHIP

PROJECT SUMMARY

Guyana Power & Light Inc. / the Government of Guyana

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INTRODUCTION

The generation of electricity is whereby electric power from a primary source converts to energy. In the utilities (electric) industry, the stage of delivery is through transmission and distribution until it reaches to consumers home. Given the demand for electricity, the Guyana Power and Light Incorporated (GPL Inc.) is submitting this Project Summary to furnish the Environmental Protection Agency (EPA) with all the required and relevant information for the processing of the application for Environmental Authorization. GPL has signed a contract with **UCC Holding** to charter a powership with a total installed capacity of 75 Megawatts (MWs) for a period of two (2) years, which would result in the availability of a more stable supply of electrical power to the Demerara Berbice Interconnected System (DBIS). The company will provide an initial 60MW of electrical power and will provide an additional 15MW as needed. Under the contractual agreement, the following provisions are adhered to:

- Operation and maintenance (O&M) are done by the Power ship (Inclusive of waste management and removal).
- GPL will purchase the generated megawatts of electric power.
- Fuel (Heavy Fuel Oil (HFO)/Light fuel oil (LFO), is supplied by GPL.

1. PROJECT DESCRIPTION

The objective of this project is to increase generation to satisfy the growing demand for electricity by our customers. Power ships are utility-scale, integrated, flexible, and quickly deployable floating power plants. They utilize conventional reciprocating engine technology in combined cycle mode, with flexible capacities ranging from 30 MW to 470 MW. These ships can be fully customized depending on the host countries' requirements.

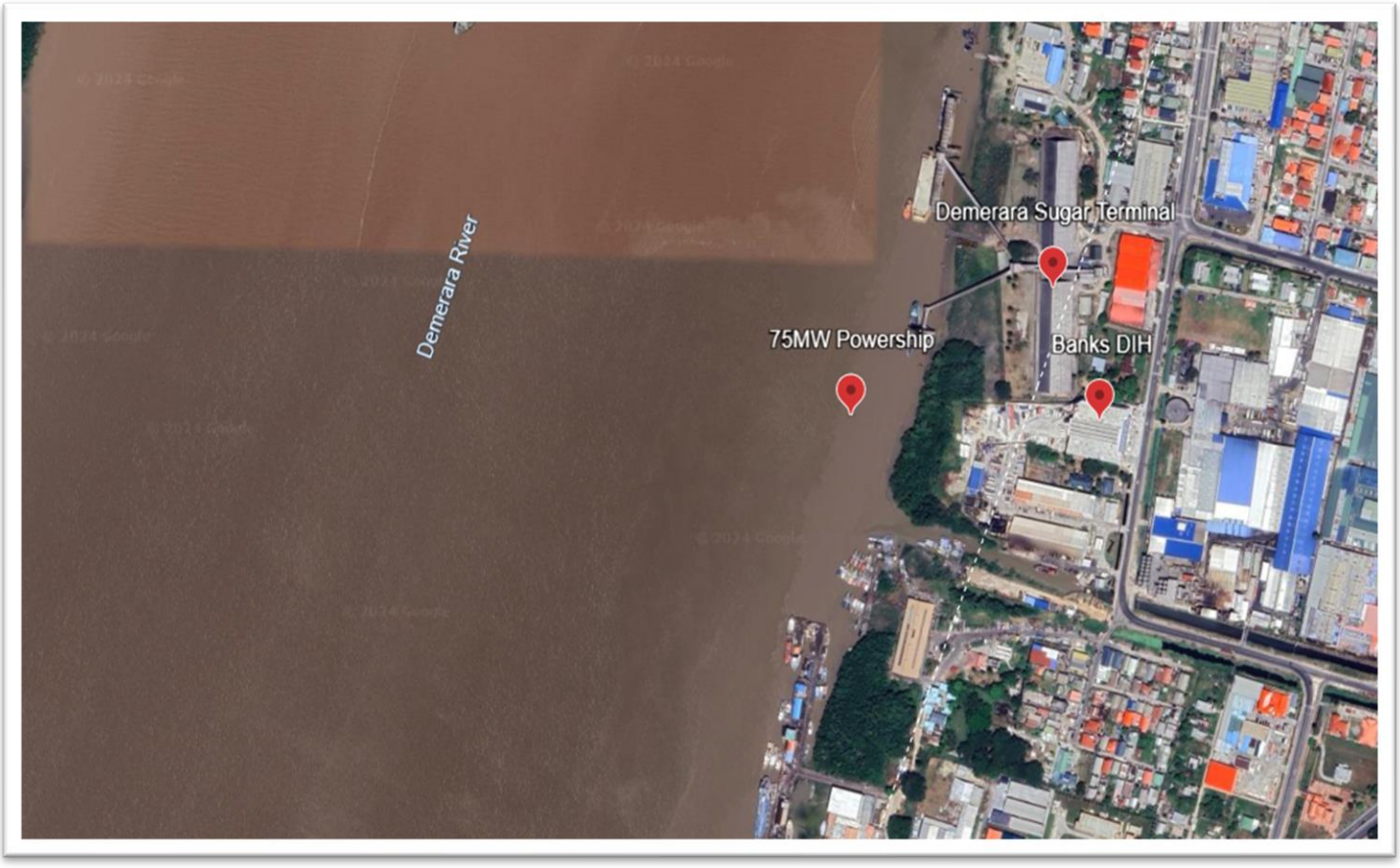
The **75MW KARADENIZ POWERSHIP ELA SULTAN,** chartered by GPL, is installed at a coastal site within the Demerara River, at the intersection of the Demerara Sugar Terminal and Banks DIH located at Ruimveldt Cresent, Georgetown. The power ship has adequate capacity for electrical connection to the "New Georgetown" Substation located at Aubrey Barker Road, Georgetown. After safe mooring, approximately 3.9km of transmission line, with and supporting structures were installed to facilitate the interconnection of the Powership to the Main Grid (DBIS). Heavy Fuel Oil/Light Fuel oil, which is supplied by GPL, is done so via Barge through a "Bunkering" process.

The Power ship required minimal onshore infrastructure, since the Powerships come complete with all spares and consumables, a built-in workshop for required repairs, a high-voltage substation (no new substation onshore is required), and a built-in fuel storage to convert the fuel into energy. Finally, once fully operational, GPL will be supplied with 60MW of electrical Power, depending on demand requirements and an additional 15MW on standby, to be utilized based on demand.

Physical Location of Project:

The 75MW Powership is located within the Demerara River, at an intersection between the Demerara Sugar Terminal located at Cresent, Ruimveldt, Georgetown in the Northeastern direction and Banks DIH located at Thirst Park, Ruimveldt, Georgetown in the Southeastern. The coordinate is 6.79141-58.172523.

Image 1: Map of Project Site



Distance of project from stipulated locations:

The power ship is moored within the Demerara River approximately 30 meters from land. at an intersection between the Demerara Sugar Terminal located at Cresent, Ruimveldt, Georgetown in the Northeastern direction and Banks DIH, Thirst Park, Riumveldt, Georgetown in the Southeastern direction.

Feasible and reasonable alternatives:

Due to the electrical interconnection required, onshore infrastructure and availability of the nearest substation, there is no other site that was deemed suitable.

Settlement/ Indigenous Communities:

There are no known settlement/ Indigenous communities in proximity of the project site.

Land Dispute:

There are no Land disputes at the Project site. However, a section of the Transmission Corridor located in "Rasville" Roxanne Burnham Gardens, has been occupied by squatters for the purpose of Agricultural farming. The GPL visited the site and determined that only one of the three farmers present would be significantly affected, due to site preparation works. As such, stakeholder engagements were conducted, and the farmer was notified of the project details. Further, GPL would have invited the farmer to a formal meeting to discuss preparatory work on the area occupied by the farmer amongst other matters.

General/ Predominant Land use currently:

The land at the site for the Power ship is not occupied by anyone. The land along the existing transmission line corridor is predominantly unoccupied. A section of the land, located in "Rasville" Roxanne Burnham Gardens, Georgetown is squatted by three (3) farmers on the government reserve (T-Line Corridor) for the purpose of Agricultural farming. The GPL visited the site and determined that only one of the three farmers would be significantly affected, due to site preparation works. As such, stakeholder engagements were conducted, and the farmer was notified of the project details. Further, GPL would have invited the farmer to a formal meeting to project details and other matters.

Image 2: Transmission Corridor

Sensitive Receptors:

See attached table below.

Table 1: Proximity to Various Locations

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

Other – State Fishing Camp		[redacted]			

Baseline Information on the Physical, Ecological and Social Environment

Physical Environment:

1.1.1 Land:

The land at the site for the project and the transmission line corridor is predominately overgrown with weeds, shrubs and fruit trees. The area is squatted by farmers for agricultural purposes.

1.1.2 Drainage and Access Roads:

The Transmission Line is connected in a transmission corridor (Dam) bordered by small canals to both sides in the northern and southern direction. Additionally, within the compound where the ship is moored, there is a narrow road, leading to the site. Further, there are access roads along the length of the Transmission Line corridor.

Ecological Environment:

The Onshore site is covered by weeds and vegetation. There is no significant wildlife present at the site. Along the transmission corridor there are fruit trees (planted by farmers), and some sections are overgrown with weed and vegetation. There is no significant wildlife occupying the transmission corridor.

1.1.3 Land use:

The site, which is an existing transmission corridor, was overgrown with weed and vegetation and a section is occupied (squatted) by Farmers for Agricultural use.

1.1.4 River use:

The section of the Demerara River where the ship is moored was unoccupied and not in use, prior to the ship's arrival.

1.1.5 Flora at the Earmarked project site:

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

- Varying grass varieties.
- Marine Flora at the site is unknown.

1.1.6 Biodiversity:

There is no critical biodiversity expected in this area and the land is of low value to mostwildlife. Marine life surrounding the project site is unknown.

Social Environment

1.1.7 Human Habitation:

There is no human habitation on the project site, where the ship is moored.

1.1.8 Cultural and Traditional Use of project site:

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

2. PROJECT LAYOUT

.1 Introduction of the KARADENIZ POWERSHIP BARIS BEY

The **KARADENIZ POWERSHIP ELA SULTAN** is a utility-scale, integrated, flexible, and quickly deployable floating power plants. They utilize conventional reciprocating engine technology in combined cycle mode, with flexible capacities ranging from 30 MW to 470 MW, they can be fully customized depending on the host countries' requirements.

Image 3: Karaseniz Powership

Table 2: Power ship Specifications

Field	Information
Ship's Name	KARADENIZ POWERSHIP ELA SULTAN
Ex Name	LAMNALCO 3
IMO Number	N/A
Flag	Liberia
Port of Registry	Monrovia
Call Sign	5LUM7
Year of Build / Date of Delivery	23 June 2011
Date of Keel Laying	22.12.2008
Built At	Nanjing Sandingli Shipyard Co. Ltd, China
Hull No.	DONGHENG08806
Type of Vessel	Special Purpose Ship - Power Plant
L.O.A. (Length Overall)	93.44m
L.B.P. (Length Between Perpendiculars)	91.06m
Breadth	24.40m
Depth Moulded	5.50m
Moulded Draft	4.30m
Summer Draft	4.254m
Gross Tonnage	13,499
Net Tonnage	4,049
Displacement	8,578.2 metric tons
Lightship	7570.4 tons
TPC (Tonnes per Centimeter)	Approx. 18.5 - 22 T/CM
Prime Movers for Electricity Generation	MAN 51/60 DF
Number of Engines	4x18.46 mw
Number of STG	0
Installed Capacity	78.84 MW
Classification Society	Bureau Veritas
BV Number	24831S
Registered Owner	Karpowership Energy Solutions Company Limited
Registered Owner Address	TRUST COMPANY COMPLEX, AJEL TAKE ROAD, AJEL TAKE ISLAND, MAJURO, MARSHALL ISLAND
IMO Company & Registered Owner ID	5931634
Managers	Karadeniz Karadeniz Denizcilik ve Ticaret A.S.
Managers' Address	DEVELI SOKAK NO.14 KAGITHANE 34406, ISTANBUL, TURKEY

Field	Information
IMO Company & Registered Owner ID	5648183
Main Towing Bridle	2 x 5m, 34mm diameter
Delivered to KH	15th November 2016, at Takoradi, Ghana

4.1 Equipment and Components on Powership:

4.1.1 Engines:

- 4 Engines
- 18V51/60 DF
- Each produces 18465 kw/h of power.
- Total 18465 * 4 = 73860 kw/h
- STG : 6000 kw/h
- %100 load consumption: 90 mton/day
- The facility operates with Heavy Fuel Oil (HFO)/Light Fuel oil (LFO).

Image 4: Engine

Image 5: Alternators

4.1.2 Alternators and Main Specifications:

THERE IS AN ABB BRAND ALTERNATOR.

- Output: 21.723 kVA
- Power Factor: 0,85
- Power:18.465 kW
- Frequency: 60 Hz
- Voltage : 15.000 V

Image 6: HV Switchyard

- There is one 100 MVA Transformer.
- 9 KV output setting was made.
- It can operate at HV – 120 kV – 154 kV voltage levels upon request

Image 7: Busbar System

- There is 1 440V busbar in the system (MDP01). There are 2 2000KVA 15000/400V ELTAŞ brand dry type transformers connected to the MDP01 busbar. There is 1 spare transformer. There is 1 15000V busbar on the HV side, MV BUSBAR.
- There is 1 ABB brand 170kV 2500A Hybrid breaker.
- There is 1 Gural brand (170kV, 1250A) disconnector.

Image 8: Steam Generation Room

4.1.3 Steam Generation System:

- 1 TRIVENI Steam Turbine is available.
- 1 Auxiliary Boiler ERENSAN HDR 400 / 8 BAR
- Turbin power: 6000 kw/h
- Turbine speed: 7603 rpm
- Gear box output speed: 1800 rpm

- Steam inlet pressure:14,7 bar
- Steam inlet temp: 350 c

Image 9: Boiler System

- 4 exhausts. Gas boiler
- Alfa laval aalborg av-6n / 14 bar opr. Pressure / capacity 6247 kw
- 1 port boiler
- Erensan hdr 400 8 bar – capacity 2619 kw

Image 10: HFO/LO Separator

4.1.4 HFO/ LO Separator:

- 4 oil separators
- Gea ose-20
- 4 HFO separators
- Gea ose-80

Image 11: Compressors

4.1.5 Compressors:

- 2 start air compressors
- *- nk 80.2.3.02.02.10.63 30 bar*
- 2 service air compressors
- *- nk renner rs-pro2-30 htn 10 bar*
- *Ekomak dmd 150 11 bar*
- *2 pıeces control aır compressor*
- *Kaeser sm 10 11 bar*
- *Ekomak dmd 400 10 bar*
- 4 pıeces denox system aır comprressor
- *Ekomak dmd 250 7 bar*
- *1 workshop aır compressor*
- *- ekomak dmd 100 7 bar*

Image 12: Cooling systems

4.1.7 Cooling systems:

- ADET LT cooler
- ADET SW cooling pump
- 2 ADET stg SW cooling pump
- 2 ADET aux. Machınery fw pump
- 4 ADET fwg sw pump

Image 13: Water Production

4.1.10 Water Production:

- 4 PIECE FWG
- SONDEX Brand. Daily 50 m3 Cap.
- Salinity max.: 0-15 PPM
- 1 Reverse Osmos
- AQUA MATCH Brand. Daily 60 m3 Cap.
- Conductivity max.: 0-20 µS

Image 14: Emergency Generators

4.1.10 Emergency Generator:

- There is a 1 1000 kw Blackstart generator to re-start the facility in case of any disruption in power supply.

Image 15: Sewage Treatment Unit

4.1.11 Sewage treatment unit:

- There is 1 bio-treatment unit
- The unit has a daily reclamation capacity of 3.24 m^3

Table 3: Tank Capacities

	% 100 m3
HFO FUEL	2882,648
MDO FUEL	176,393
OIL	147,651
DIRTY OIL	48,688
FRESH WATER	383.399
BALAST	2461,568
SLUDGE	160,477
BILGE	160,477
BLACK and GREY W.	299,704

Image 16: Control Room

4.1.12 Control Room:

All systems are monitored and controlled through GCP, CCP panels, and SCADA computers in the control room

4. PROJECT DESIGNS

4.1 Development stages from construction to closure:

The planned activities associated with all development stages from construction to closure (End of contractual period) are, but not limited to the following:

Table 4: Development stages from construction to closure

Project Stage	Activity
Stage: 1 Early work	Land clearing at Project site and along sections of Transmission Corridor
	Alteration and construction of access, road, Mooring/ Anchoring piles and Wharf for waste removal.
Stage 2: **Installation of transmission Line and components to support transmission and distribution of electricity generated from 75MW Powership.**	Civil/Construction works for constructing and installation of a section of transmission line.
	Equipment Installation, placement of Anchor Piles to stabilize Powership
Stage 3: **Pre-commissioning and Commissioning.**	Pre-Commissioning of Powership
	Commissioning of Powership
	Operation of Powership
Stage 4: **End of Contract**	The Powership has been charted for a period of 2 years. After this is completed, the Powership will leave the project site.

4.2 Waste production and Management:

Since the Powership will mostly utilize Heavy Fuel Oil, (HFO), most of the oily waste known as Sludge, will come from generation and maintenance processes.

Quantity of Hazardous waste generated:

- Approx. Daily rate: 1300 IG Sludge
- Monthly Rate: 40,000 IG Sludge
- Yearly Rate: 480,000 IG sludge

Table 5: Waste Management (Hazardous and Non-Hazardous Waste)

Waste Type	Source	Management/ Treatment	Quantity Of Waste Generated
Waste During Construction Process			
Transmission materials	N/A	Small quantity of transmission materials generated (Wires and Cables) were removed from site and returned to waste collection area at T&D Locations.	Data unknown
Waste during operation of facility			
Wastewater containing oily residues	Engines Workshop	From maintenance of generating engines and from the washing of parts in the workshop would be directed to the oily water separator, where the waste will be removed via a suction truck and then transported to a Waste treatment facility, where it would be incinerated. ***See attached waste management plan for Powership.***	Dependent on the amountof lube oils used during maintenance.
Graywater and Sanitary Water	Sinks and Toilets	Removal of waste via Private contractor ***See attached HSSE management plan for Powership.***	Data unknown
Sludge	Engines Oily Water separators	The generated Hazardous waste will be directed to either the oily water separator or to the sludge tank housed on the Powership. Subsequently, the waste will be removed via a suction truck and then transported to a Waste treatment facility, where it would be incinerated.	Approx. Daily rate: 1300 IG Sludge • Monthly Rate: 40,000 IG Sludge • Yearly Rate: 480,000 IG sludge

		See attached HSSE management plan for Powership.	
Oily Rags	Cleaning of Engine components Used for wiping parts in workshop.	All Oily rags will be stored on the Powership in designated bins and will be removed from the facility via Hazardous Waste disposal company. ***See attached HSSE management plan for Powership.***	Approximately 60lbs per month.
Non-Hazardous Waste			
See attached HSSE management plan for Powership.			

4.3 Project Size

4.3.1 Capital Investment:

The Guyana Power and Light Incorporated signed a contract with **UCC Holding** to charter a powership with a total installed capacity of 75 Megawatts (MWs) for a period of two years.

- The Capital investment is in excess of 1 million USD for the Mobilization Fee.

4.3.2 Production Rate:

The installed capacity is 75MW, but this will vary based on the demand for electrical power.

- Quantity of electricity production per month/year: 4 Engines
- 18V51/60 DF
- Each produces 18465 kw/h of power.
- Total 18465 * 4 = 73860 kw/h

Total monthly production = 43,200 MW

4.3.3 Number of Employees projected for each stage:

The Powership currently consists of 44 Employees responsible for Generation.

4.4 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 and ENET for telecommunication.

4.1 Project Duration:

The project was entered into commercial operation by the 23rd of December 2024. The Powership has been charted for an estimated duration of 2 years.

4.2 Decommissioning plan:

Since the Power ship is utility-scale, integrated, flexible, and quickly deployable floating power plants, at the end of the contract, all that would be required is for the disconnecting of the interconnection from GPL's network and the power ship will leave the location.

5. POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Table 6: Potential Environmental impacts and proposed Mitigation Measures

Receptor(s)	Source of Impact	Possible Effects of Impacton Human Life and Environment	Mitigation Measures
Installation of Transmission Line			
Soil	Land clearing	Loss of topsoil	The area will be allowed to regenerate naturally. Soil will not be disturbed after installation of transmission structures.
Air Quality	Emission from Trucks, Equipment and Machines used for installation and land clearing	Damage to ozone layer, increase greenhouse gases, contribute to global climate change.	Work will be completed in a short time frame, thus limiting excessive and consistent emissions.
Noise Quality	Machines, vehicles and equipment.	Noise pollution	Work will be limited to daytime where possible and workers will be fitted with PPE.
Water Quality (Ground and Surface Water)	N/A	N/A	N/A
Flora and Fauna	Weeding and grading of transmission	Loss of habitat, Damage to Carbon sinks and ecosystem disturbance	The area will be allowed to regenerate naturally. Soil

	corridor		will not be disturbed after installation of transmission structures.
Operation of Powership			
Soil	Spillage from waste removal Process	Contamination of Soil and potential damage to ecosystems.	An EPA authorized waste transportation company will be utilized. Waste Transfer procedures established and implemented Availability of Spill Kits on Tanker Use of Power ship's Pollution Prevention Procedure. Training of staff Use of spill collection pans during transfer. Use of Seals and Union at all connection points on transfer hose. Compliance with MARPOL Requirements. Use of Powerships Oil Spill management plan.
Air Quality	Emission from Generating Engines via emission stacks.	Damage to ozone layer, increase greenhouse gases, contribute to global climate change.	See attached emission data MARPOL Requirements. Emission monitoring will be conducted to ensure emissions are in compliance with EPA air emission limits.

			Fuel will be tested at an accredited lab to ensure quality, prior to use. This may result in reduced emissions. Use of Power ship's Pollution Prevention Procedure.
Noise Quality	Noise emission from Generating Engines	Noise pollution	All employees are fitted with noise protection PPE. Warning signs are mounted at various locations. Engines are housed in contained areas within vessels. The control room and offices are used to reduce noise levels. No residence near the vessel. MARPOL Requirements. Use of Power ship's Pollution Prevention Procedure.
Water Quality	Spillage from Bunkering activities. Spillage from fuel and Liquid Hazardous waste storage and removal activities from vessel.	Damage to Marine Flora and Fauna, Potential Effects to fishing industry. Impact on human health. Water pollution.	The Power ship is double hulled, this will act as an added containment for fuel stored on vessel. Use of EPA approved waste removal company. Transfer procedures established and implemented Availability of Spill Kits on Tanker

			Training of staff Use of spill collection pans during transfer. Use of Seals and Union at all connection points on transfer hose. Installation of Containment Boom during Bunkering activities. MARPOL Requirements. Use of Power ship's Pollution Prevention Procedure. Use of Powerships Oil Spill management plan.
Flora and Fauna (Marine)	Spillage from Bunkering activities	Damage to Marine Flora and Fauna, Potential Effects to fishing industry. Impact on human health.	The Power ship is double hulled, this will act as an added containment for fuel stored on vessel. Use of EPA approved waste removal company. Transfer procedures established and implemented Availability of Spill Kits on Tanker Training of staff Use of spill collection pans during transfer. Use of Seals and Union at all

			connection points on transfer hose. Installation of Containment Boom during Bunkering activities. MARPOL Requirements. Use of Power ship's Pollution Prevention Procedure. Use of Powerships Oil Spill management plan.
See attached HSSE management plan for additional details.			

6. BORDERS AND BOUNDARIES

The Project does not cross-country borders or boundaries

7. A NON-TECHNICAL SUMMARY OF PROJECT

The Powership situated within the Demerara River facilitates the generation of electricity and the storage of Heavy Fuel Oil/Light Fuel oil. This process starts with the use of Heavy fuel oils (HFO) taken from a fuel storage tank via a fuel pipeline, where it passes through a mechanical fuel separator and heating mechanism before it travels to Four engines (if LFO is utilized, the mechanical separator will not be required). The four combined cycle engines then utilize this fuel by injecting small amounts at precise timing within a cylinder. This cylinder contains compressed air, thus the combination of the air/ fuel mixture results in a spark that produces heat; this heat energy moves several pistons up and down. The up and down movement of these pistons is called a stroke, and the consistent strokes of the engine's pistons generate electrical energy or Electricity. This Electrical power is then fed to a grid and then to substations, and subsequently to consumer