Central Luzon Premiere Power Corp.

Project Description

for the

4x355MW Pagbilao Power Plant Project

Barangay Ibabang Polo, Pagbilao, Quezon

December 2020

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LIST OF ACRONYMS

ADA	Ash Disposal Area
BOD	Biological Oxygen Demand
BWRO	Brackish Water Reverse Osmosis
CAA	Clean Air Act
CADC	Certificate of Ancestral Domain Claim
CARP	Comprehensive Agrarian Reform Program
CCS	Carbon Capture and Sequestration
CCTV	Closed-Circuit Television
CEMS	Continuous Emission Monitoring System
CFB	Circulating Fluidized Bed
CLPPC	Central Luzon Premiere Power Corp.
CO	Carbon Monoxide
CO_2	Carbon Dioxide
COD	Chemical Oxygen Demand
CSR	Corporate Social Responsibility
DENR	Department of Environment and Natural Resources
DIA	Direct Impact Area
DO	Dissolved Oxygen
DOE	Department of Energy
EIA	Environmental Impact Assessment
EMB	Environmental Management Bureau
ERA	Environmental Risk Assessment
ESP	Electrostatic Precipitator
EPC	Engineering, Procurement and Construction
FGD	Flue Gas Desulfurizer
FIFO	First In-First Out
H_2	Hydrogen
HDPE	High Density Poly Ethylene
HELE	High Efficiency Low Emission
HP	High-pressure
HR	Human Resources
IGCC	Integrated Gasification Combined Cycle
IIA	Indirect Impact Area
IP	Intermediate-pressure
LETI	Lumiere Energy Technologies, Inc.
LGU	Local Government Unit
MPa	Megapascal
MW	Megawatt
NAMRIA	National Mapping and Resource Information Authority
NGCP	National Grid Corporation of the Philippines
NOx	Nitrogen Oxides
NREL	National Renewable Energy Laboratory
OFA	Overfire air
PC	Pulverized Coal
PD	Project Description
PCO	Pollution Control Officer
PPE	Personal Protective Equipment
RO	Reverse Osmosis
SC	Supercritical
SCR	Selective Catalytic Reduction
SLEX	South Luzon Expressway

SMC	San Miguel Corporation
SOx	Sulphur Oxides
SO_2	Sulphur Dioxide
SPC	Supercritical Pulverized-coal
STP	Sewage Treatment Plant
SWFGD	Seawater Flue Gas Desulfurizer
SWMP	Solid Waste Management Plan
SWRO	Sea Water Reverse Osmosis
TPH	Tons per hour
USC	Ultra-supercritical
USEPA	United States Environmental Protection Agency
WWTF	Wastewater Treatment Facility
WWTP	Wastewater Treatment Plant

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PROJECT DESCRIPTION

1.0 PROJECT FACT SHEET

<table>
<tr><td>Name of Project</td><td colspan="3">4x355MW Pagbilao Power Plant Project</td></tr>
<tr><td rowspan="2">Project Location</td><td>Province</td><td>Municipality</td><td>Barangay</td></tr>
<tr><td>Quezon</td><td>Pagbilao</td><td>Ibabang Polo</td></tr>
<tr><td>Project Area</td><td colspan="3">Approximately 132 hectares</td></tr>
<tr><td>Nature Type of Project</td><td colspan="3">Thermal power plant</td></tr>
<tr><td>Proposed Installed Capacity</td><td colspan="3">4x355MW (gross)</td></tr>
<tr><td rowspan="9">Summary of Major Components</td><td>Major Components</td><td colspan="2">Brief Description</td></tr>
<tr><td>Jetty</td><td colspan="2">Length: 1,700 m</td></tr>
<tr><td>Boiler System</td><td colspan="2">4 units x 355 MW – Super Critical PC</td></tr>
<tr><td>Steam Engine</td><td colspan="2">4 units x 355 MW</td></tr>
<tr><td>Stack</td><td colspan="2">2 stacks with 2 flues each; 150m height</td></tr>
<tr><td>Ash handling system</td><td colspan="2">~ 30 hectares ADA with leachate treatment facility</td></tr>
<tr><td>Cooling Water Intake Pipe</td><td colspan="2">Length: 810 m
Depth: 8.5 m</td></tr>
<tr><td>Cooling Water Outfall</td><td colspan="2">Length: 414 m
Depth: -1 m</td></tr>
<tr><td>Electrical Switchyard</td><td colspan="2">500 kV</td></tr>
<tr><td>Project Cost</td><td colspan="3">Php 140 Billion</td></tr>
<tr><td>Construction Period</td><td colspan="3">March 2021 – September 2026</td></tr>
<tr><td>Commercial Operation Date</td><td colspan="3">January 2025 for CLPPC Unit No.1</td></tr>
<tr><td>Proponent Name</td><td colspan="3">Central Luzon Premiere Power Corporation (CLPPC)</td></tr>
<tr><td>Proponent Authorized Representative</td><td colspan="3">Elenita D. Go
General Manager</td></tr>
<tr><td>Proponent Address and Contact Details</td><td colspan="3">19th Floor SMPC Building, St. Francis Street, Ortigas Center, Mandaluyong City
Contact Number: (632) 8667 5000</td></tr>
<tr><td>EIA Preparer</td><td colspan="3">Aperçu Consultants, Inc.</td></tr>
<tr><td>Preparer Contact Person</td><td colspan="3">Lilli Beth S. Yazon
Managing Director</td></tr>
<tr><td>Preparer Address and Contact Details</td><td colspan="3">Unit 307 Philippine Social Science Center
Commonwealth Avenue, Diliman, Quezon City
Telephone Number: +63 2 8929 2778
E-mail Address: bethyazon@apercu.biz.ph</td></tr>
</table>

2.0 PROJECT LOCATION AND AREA

The project will be situated in Pagbilao Grande Island, Sitio Tubahin, Barangay Ibabang Polo, Pagbilao in the Province of Quezon within an approximately 140-hectare land area that will be leased from Dewsweeper Industrial Park, Inc. The project site is bounded by Pagbilao Bay to the west and northwest; by Tayabas Bay to the southwest; and is less than 3 km south of the existing Pagbilao Power Plant owned by TeaM Energy. **Figure PD-1** is the project location map along with other power plants in relation to the proposed project. The proposed power plant will be situated north of the existing Pagbilao Power Station (TeaM Energy) which is about 2.6 km and 2.5 km northwest of Energy World LNG Terminal. Another power plant in Quezon province located in Mauban is the Quezon Power Limited which is located 34.5 km north of the proposed project area. **Figure PD-2** and **Figure PD-3** show the current conditions of the project site, composed of open areas (20%), forested areas (30%), special agricultural areas (30%), mangrove forests (5%), and residential areas (15%).

2.1 Impact Areas and Rationale for Selection

Following the Philippine Environmental Impact Statement (EIS) System IRR or DAO 2003-30, the project-affected areas are defined as follows:

- Primary Impact Area/ Zone, also referred as Direct Impact Area (DIA); and,
- Secondary Impact Area/ Zone also referred as Indirect Impact Area (IIA).

According to DAO 2003-30 guidelines, the DIA generally refers to areas where the project facilities or infrastructures are proposed to be constructed/located or traversed such as buildings or structures, irrigation, drainage and other utility areas, quarry sites, access roads and others to be set up during the construction and operation phases.

The IIA generally refers to the influence area of the project that could be indirectly affected by the proposed development. This could include areas in the vicinity of the DIA. Examples of these may include communities or settlements outside of the DIA which can also be benefited by the employment opportunities created by the project; sub-tributaries of the river system which can be indirectly affected by project induced pollution, and/or areas where water sources will be indirectly affected by drawdown in the DIA.

For the project, the DIA is the area where all project facilities are proposed to be constructed and operations are proposed to be undertaken. For this project, the DIA shall be the approximately 132 hectares allotted for the following: 30 hectares for the ash pond; 18 hectares for the coal yard; 14 hectares for the power plant; 10 hectares for the water treatment and auxiliaries; 3 hectares for the buffer zone; 2 hectares for the admin building and warehouses; 2 hectares for the CLPPC transmission line; 2 hectares for the TeaM Energy transmission line (within the leased property); and 51 hectares of unused areas. The project area is located in Sitio Tubahin, Barangay Ibabang Polo, Pagbilao, Quezon.

The barangays where the DIA is located (i.e. where permanent and temporary structures will be located) are referred to as directly affected barangays. People and households where both permanent and temporary facilities will be located will be referred to as directly affected persons/households all of whom/which may be subject to physical/economic resettlement/ compensation.

As defined above, the IIA includes the area of influence of the project facilities. For environmental impacts and benefits, the IIA is considered to cover the land area and receptors which are located approximately 2.5km from the DIA. For socio-economic benefits and impacts, the rest of Barangay Ibabang Polo is considered as an IIA since the LGU will receive benefits from the Project and people may be employed from these areas. Ilayang Polo is also considered as part of the IIA which will be included in the Environmental Impact Assessment (EIA) study. **Figure PD-4** delineates the impact area on a NAMRIA topographical map.

Once the EIA study is done, the impact areas will be more technically defined per environ.

2.2 Shapefile Configuration

Table PD-1 and **Figure PD-5** show the project area and its corresponding geographic coordinates.

Table PD-1
Shapefile Configuration of the CLPPC Project

ID	Latitude	Longitude	Notes	ID	Latitude	Longitude	Notes
1	13.92115872°	121.7470915°	1-19 Ash Storage	43	13.90871365°	121.7474008°	
2	13.92057847°	121.7490938°		44	13.91085198°	121.7442603°	44-46 Seawater Intake Pipe
3	13.91968062°	121.7500766°		45	13.91036401°	121.7443996°	
4	13.91968062°	121.7500766°		46	13.90869223°	121.7415639°	
5	13.91968062°	121.7500766°		47	13.91085198°	121.7442603°	

ID	Latitude	Longitude	Notes
6	13.91979794°	121.7507034°	
7	13.91935984°	121.7513153°	
8	13.91939380°	121.7525004°	
9	13.91899106°	121.7530576°	
10	13.91899106°	121.7530576°	
11	13.91892762°	121.7530430°	
12	13.91874930°	121.7533332°	
13	13.91871088°	121.7539024°	
14	13.91820955°	121.7546868°	
15	13.91816015°	121.7549325°	
16	13.91816015°	121.7549325°	
17	13.91813978°	121.7552852°	
18	13.91790068°	121.7557863°	
19	13.91729527°	121.7561783°	
20	13.91604791°	121.7548149°	
21	13.91568625°	121.7547147°	
22	13.91521145°	121.7549370°	
23	13.91510437°	121.7553794°	
24	13.91474588°	121.7555945°	
25	13.91556132°	121.7571591°	
26	13.91556132°	121.7571591°	
27	13.91510543°	121.7573351°	
28	13.91415111°	121.7562566°	28-43 Ash Storage
29	13.91184054°	121.7538019°	
30	13.91115164°	121.7536476°	
31	13.91115164°	121.7536476°	
32	13.91033151°	121.7532972°	
33	13.91000012°	121.7531443°	
34	13.90952462°	121.7515690°	
35	13.90916707°	121.7508352°	
36	13.90916707°	121.7508352°	
37	13.90916707°	121.7508352°	
38	13.90900434°	121.7500363°	
39	13.90900434°	121.7500363°	
40	13.90900434°	121.7500363°	
41	13.90852582°	121.7485504°	
42	13.90861389°	121.7477743°	
48	13.91184695°	121.7452644°	
49	13.91266548°	121.7454865°	
50	13.91345051°	121.7445779°	
51	13.91340054°	121.7441498°	51-53 Pier/ Jetty
52	13.91396692°	121.7358787°	
53	13.91396692°	121.7358787°	
54	13.91450024°	121.7446288°	
55	13.91450024°	121.7446288°	
56	13.91510382°	121.7444742°	56-59 Seawater Intake Pipe
57	13.91187400°	121.7411463°	
58	13.91187400°	121.7411463°	
59	13.91187400°	121.7411463°	
60	13.91560172°	121.7440790°	
61	13.91599070°	121.7443481°	
62	13.91619763°	121.7443968°	
63	13.91691865°	121.7442238°	
64	13.91691865°	121.7442238°	
65	13.91729475°	121.7439570°	
66	13.91746967°	121.7438321°	
67	13.91758959°	121.7435695°	
68	13.91779993°	121.7434877°	
69	13.91797413°	121.7434171°	
70	13.91797413°	121.7434171°	
71	13.91797413°	121.7434171°	
72	13.91797413°	121.7434171°	
73	13.91797413°	121.7434171°	
74	13.91797413°	121.7434171°	
75	13.91797413°	121.7434171°	
76	13.91882235°	121.7438897°	
77	13.91882235°	121.7438897°	
78	13.91917004°	121.7437717°	
79	13.91938619°	121.7435898°	
80	13.91976955°	121.7435379°	
81	13.92045379°	121.7440228°	
82	13.92228568°	121.7453147°	82-83 Seawater Discharge Pipe
83	13.92228568°	121.7453147°	

2.3 PROJECT SITE ACCESSIBILITY

From Metro Manila, located approximately 140 km southeast, the site can be accessed via the South Luzon Expressway (SLEX) exiting at Sto. Tomas, Batangas. Then, one follows the Maharlika Highway traversing the municipalities of Tiaong, Candelaria, Sariaya and the city of Lucena going to the Municipality of Pagbilao. The 15-km Quipot Mirant Road, through barangays Binahaan, Silangan Malicboy and Kanluran Malicboy, provide the current access point to a bridge that leads to Pagbilao Grande Island and into Barangays Ilayang Polo and Ibabang Polo. The Quipot Mirant Road, entering Barangay Ibabang Polo, provides direct access to the approximately 140-hecatare project site. The project vicinity map is presented as **Figure PD-6**.

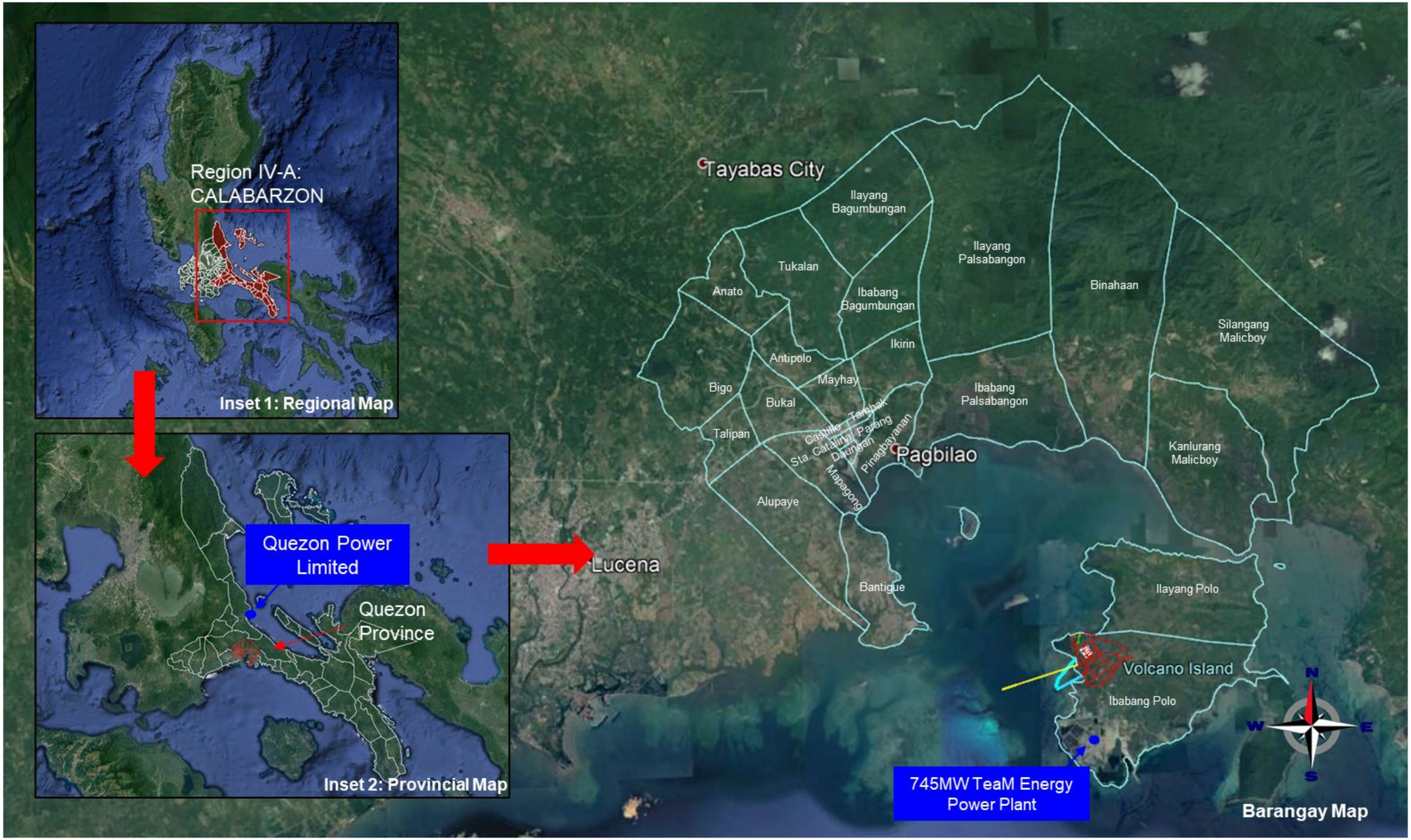

Figure PD-1. Project location map

ENVIRONMENTAL IMPACT STATEMENT
4X355MW PAGBILAO POWER PLANT PROJECT

LEGEND:

- Administrative boundaries
- Project Delineation
- Pier/ Jetty
- Seawater Intake Pipe
- Seawater Discharge Pipe

DATA INFORMATION/SOURCE:
Basemap: GOOGLE EARTH IMAGERY, 2020
Project Boundary: CLPPC, 2020
Boundaries: NAMRIA BOUNDARY, 2019
Imagery Date: JANUARY 2020
Created by: APERCU CONSULTANTS, INC., 2020

Central Luzon Premiere Power Corp.

apercu CONSULTANTS INC.

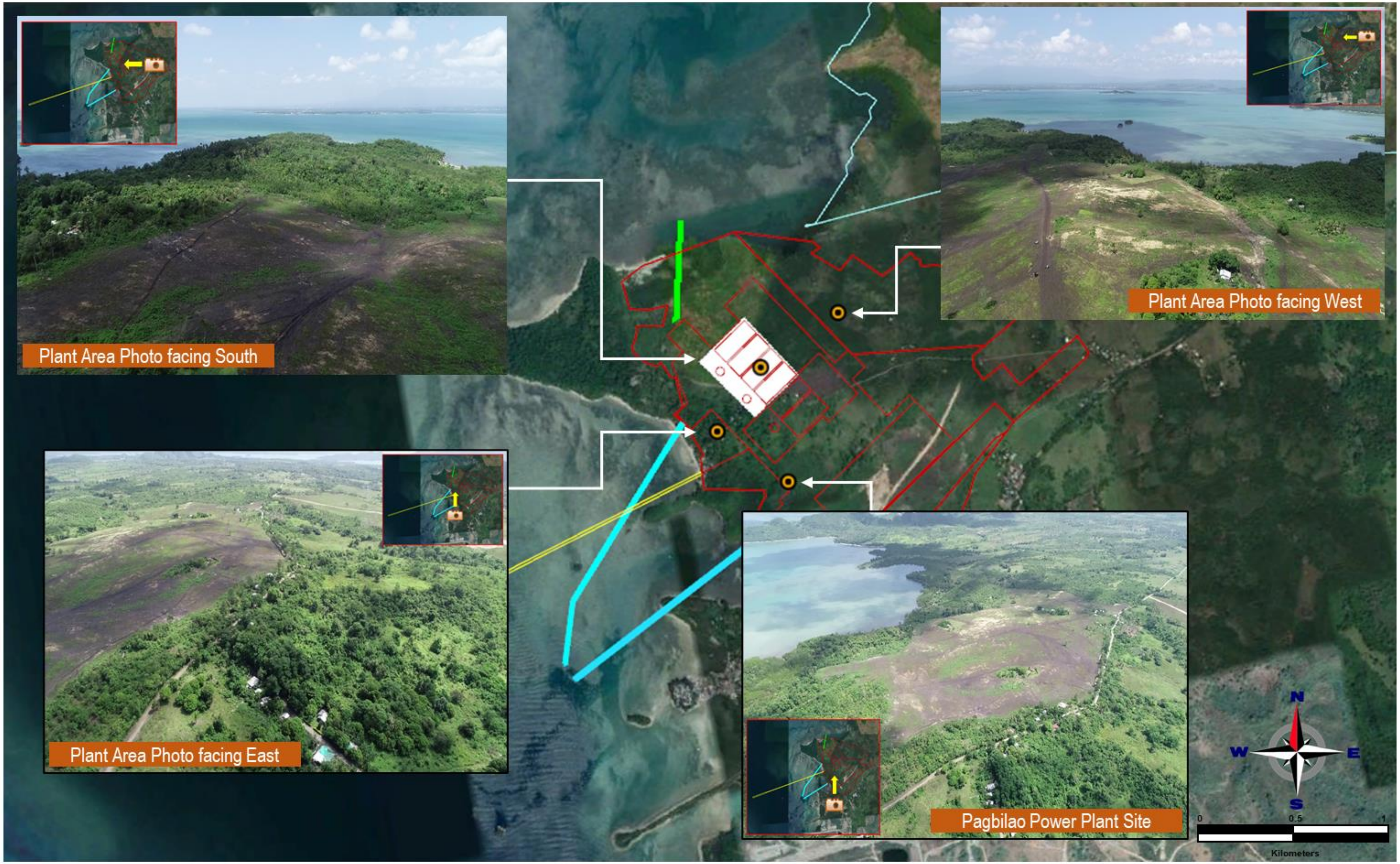

Figure PD-2. Site map and photos **ENVIRONMENTAL IMPACT STATEMENT** **4X355MW PAGBILAO POWER PLANT PROJECT**	LEGEND: Administrative boundaries Project Delineation Reference Point Seawater Intake Pipe Seawater Discharge Pipe Pier/ Jetty	DATA INFORMATION/SOURCE: **Basemap:** GOOGLE EARTH IMAGERY, 2020 **Project Boundary:** CLPPC, 2020 **Boundaries:** NAMRIA BOUNDARY, 2019 **Imagery Date:** JANUARY 2020 **Created by:** APERCU CONSULTANTS, INC., 2020	PAGE 5 *Central Luzon Premiere Power Corp.* apercu CONSULTANTS INC.

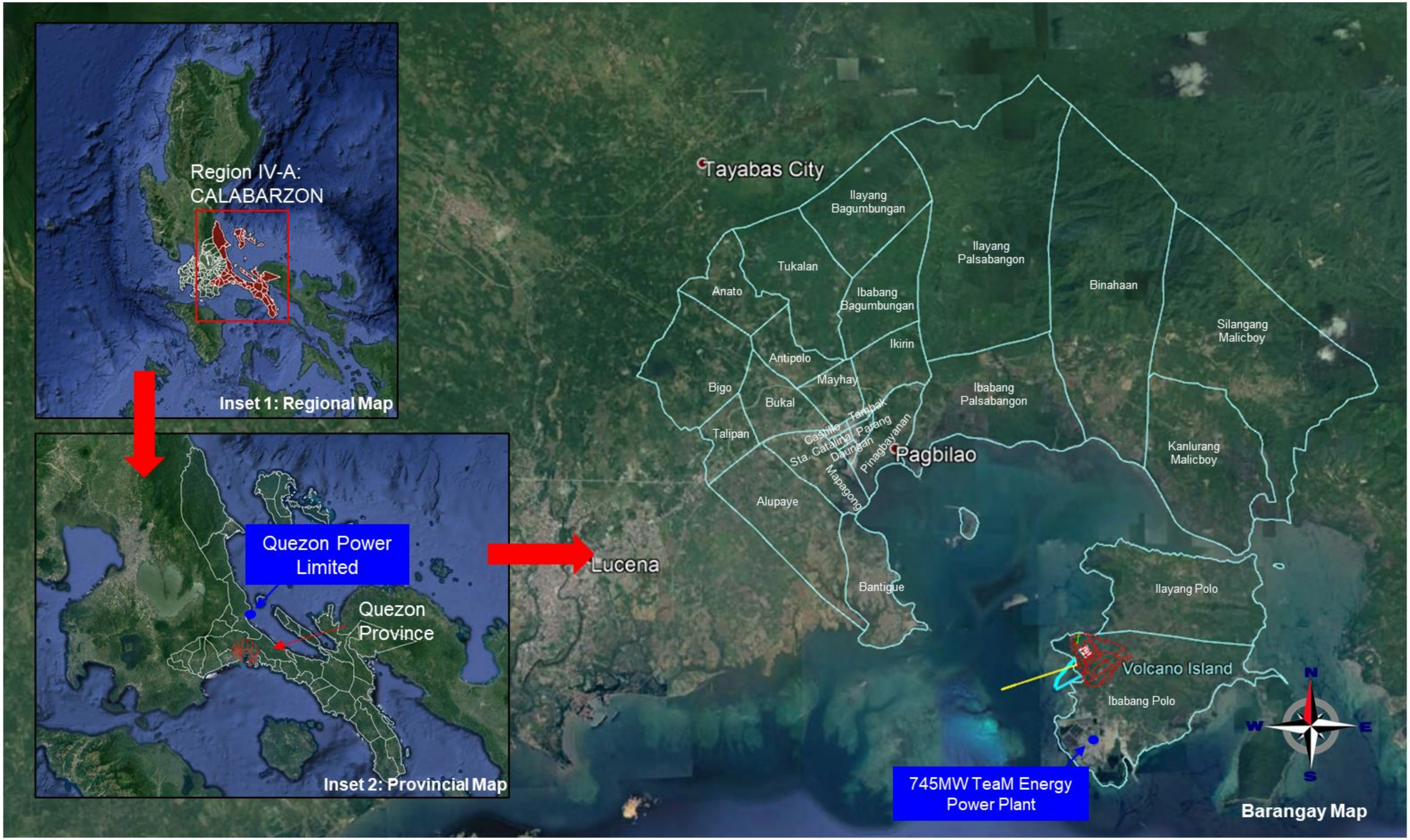

Figure PD-4. Impact area map	LEGEND:	DATA INFORMATION/SOURCE:	PAGE 6
ENVIRONMENTAL IMPACT STATEMENT **4X355MW PAGBILAO POWER PLANT PROJECT**	Administrative boundaries Project Delineation Pier/ Jetty Seawater Intake Pipe Seawater Discharge Pipe	**Basemap and Boundary:** NAMRIA TOPOGRAPHIC SHEET **Project Boundary:** CLPPC, 2020 **Imagery Date:** JANUARY 2020 **Created by:** APERCU CONSULTANTS, INC., 2020	*Central Luzon Premiere Power Corp.* aperçu CONSULTANTS INC.

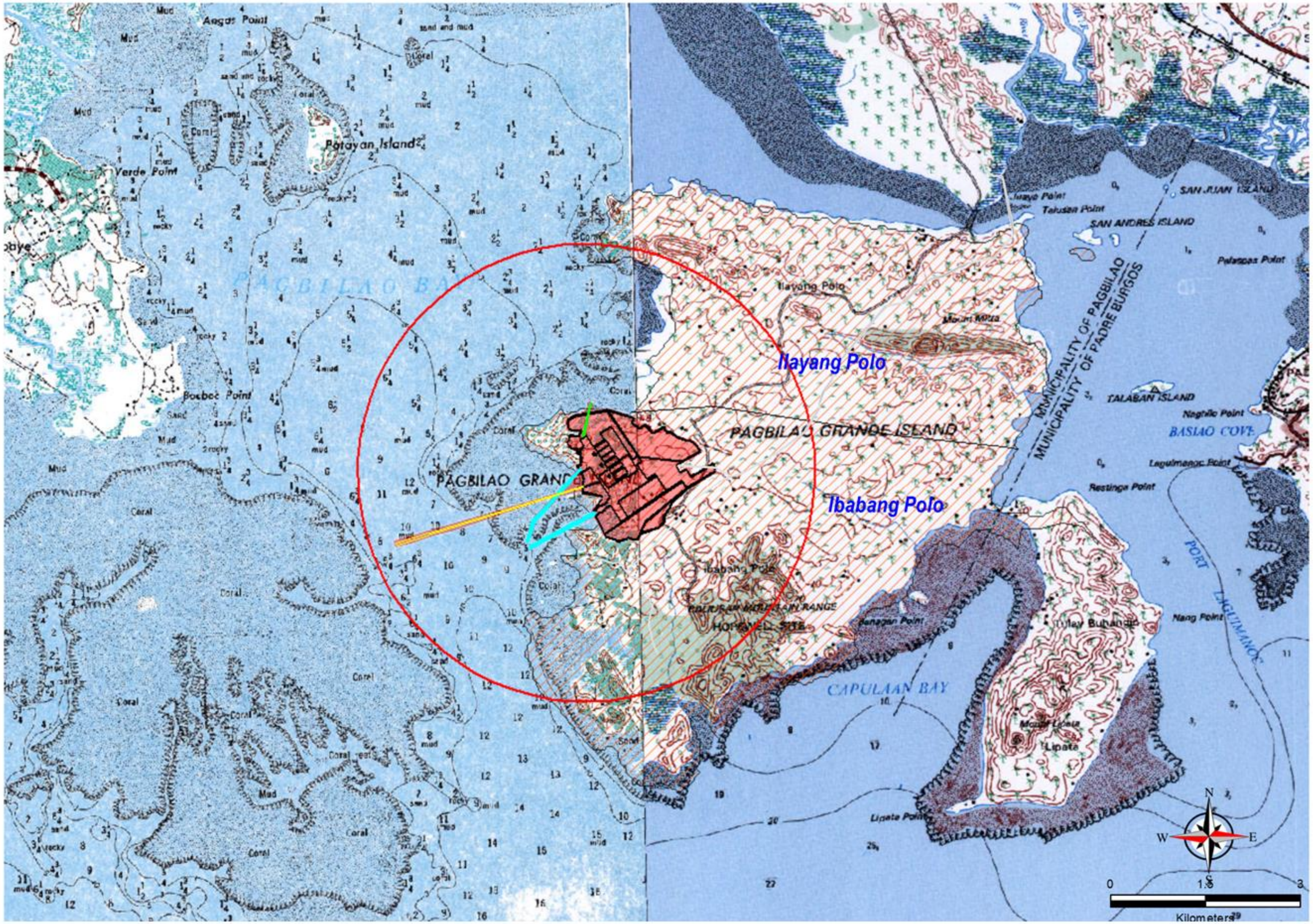

Figure PD-4. Impact area map	LEGEND:	DATA INFORMATION/SOURCE:	PAGE 7
ENVIRONMENTAL IMPACT STATEMENT 4X355MW PAGBILAO POWER PLANT PROJECT	Project boundaries Direct Impact Area Indirect Impact Area Pier/ Jetty Seawater Intake Pipe Seawater Discharge Pipe 2.5km radius / Indirect Impact Area	**Basemap and Boundary:** NAMRIA TOPOGRAPHIC SHEET **Project Boundary:** CLPPC, 2020 **Imagery Date:** JANUARY 2020 **Created by:** APERCU CONSULTANTS, INC., 2020	Central Luzon Premiere Power Corp. aperçu CONSULTANTS INC.

Unit	Latitude	Longitude	Notes
1	13.92115872°	121.7470915°	1-19 Ash Storage
2	13.92057847°	121.7490938°	
3	13.91968062°	121.7500766°	
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8	13.91939380°	121.7525004°	
9	13.91899106°	121.7530576°	
10	13.91899106°	121.7530576°	
11	13.91892762°	121.7530430°	
12	13.91874930°	121.7533332°	
13	13.91871088°	121.7539024°	
14	13.91820955°	121.7546868°	
15	13.91816015°	121.7549325°	
16	13.91816015°	121.7549325°	
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35	13.90916707°	121.7508352°	
36	13.90916707°	121.7508352°	
37	13.90916707°	121.7508352°	
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42	13.90861389°	121.7477743°	

Unit	Latitude	Longitude	Notes
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49	13.91266548°	121.7454865°	
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55	13.91450024°	121.7446288°	
56	13.91510382°	121.7444742°	56-59 Seawater Intake Pipe
57	13.91187400°	121.7411463°	
58	13.91187400°	121.7411463°	
59	13.91187400°	121.7411463°	
60	13.91560172°	121.7440790°	
61	13.91599070°	121.7443481°	
62	13.91619763°	121.7443968°	
63	13.91691865°	121.7442238°	
64	13.91691865°	121.7442238°	
65	13.91729475°	121.7439570°	
66	13.91746967°	121.7438321°	
67	13.91758959°	121.7435695°	
68	13.91779993°	121.7434877°	
69	13.91797413°	121.7434171°	
70	13.91797413°	121.7434171°	
71	13.91797413°	121.7434171°	
72	13.91797413°	121.7434171°	
73	13.91797413°	121.7434171°	
74	13.91797413°	121.7434171°	
75	13.91797413°	121.7434171°	
76	13.91882235°	121.7438897°	
77	13.91882235°	121.7438897°	
78	13.91917004°	121.7437717°	
79	13.91938619°	121.7435898°	
80	13.91976955°	121.7435379°	
81	13.92045379°	121.7440228°	
82	13.92228568°	121.7453147°	82-83 Seawater Discharge Pipe
83	13.92228568°	121.7453147°	

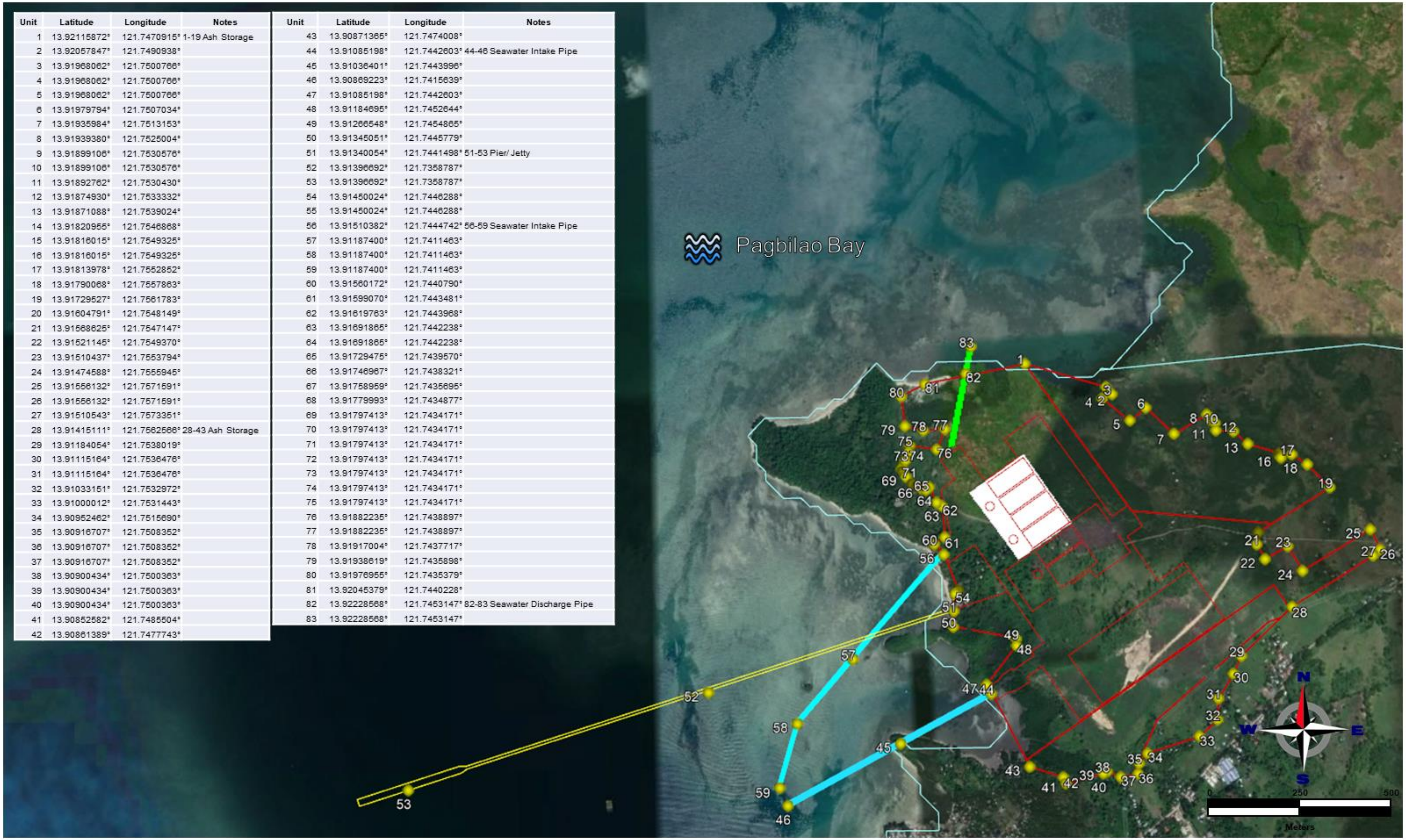


Figure PD-5. Project shapefile configuration

LEGEND:
- Administrative boundaries
- Project Delineation
- Reference Point
- Seawater Intake Pipe
- Seawater Discharge Pipe
- Pier/ Jetty

DATA INFORMATION/SOURCE:
Basemap: GOOGLE EARTH IMAGERY, 2020
Project Boundary: CLPPC, 2020
Boundaries: NAMRIA BOUNDARY, 2019
Imagery Date: JANUARY 2020
Created by: APERCU CONSULTANTS, INC., 2020

ENVIRONMENTAL IMPACT STATEMENT
4X355MW PAGBILAO POWER PLANT PROJECT

Central Luzon Premiere Power Corp.

apercu CONSULTANTS INC.

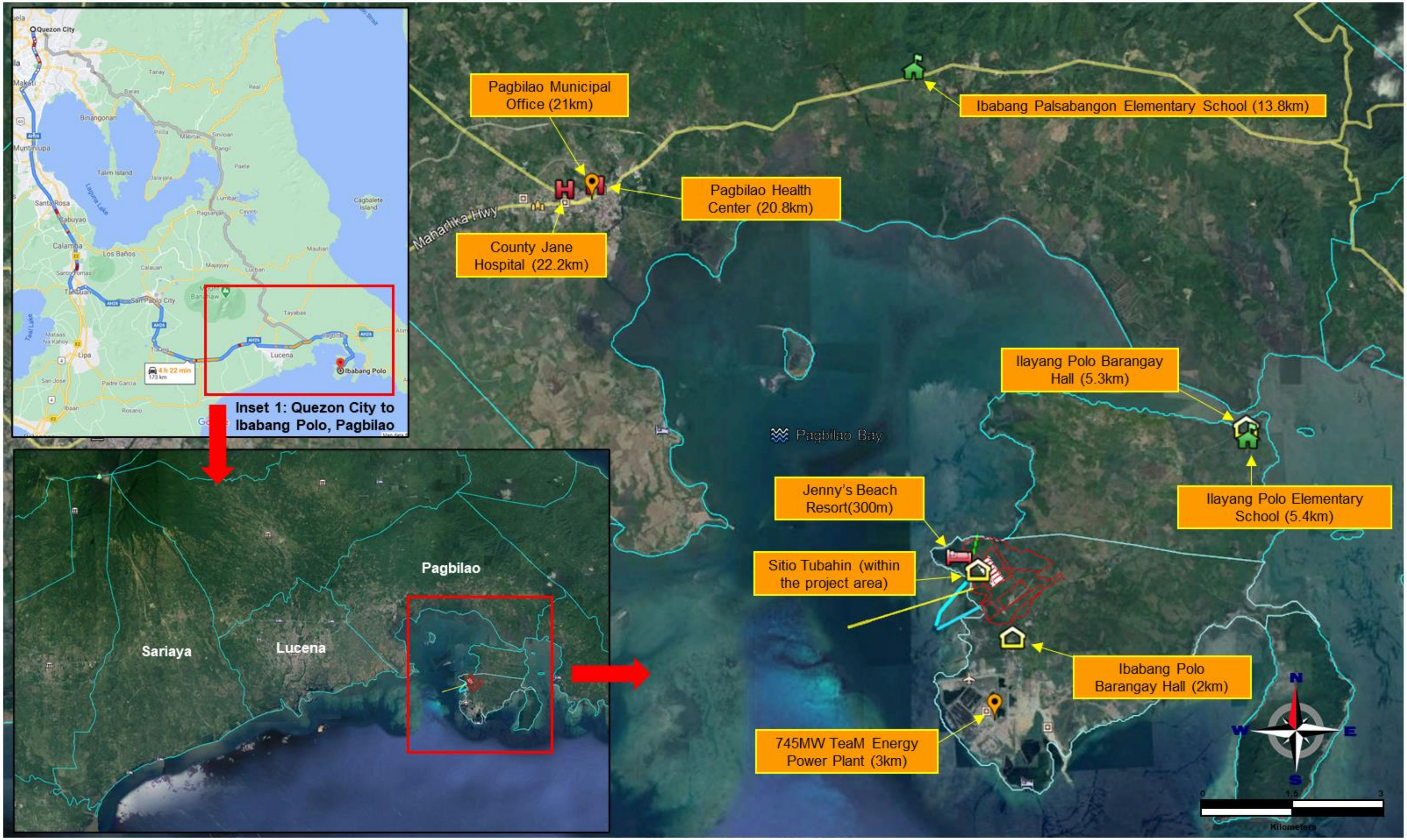


Figure PD-6. Project vicinity map	LEGEND:	DATA INFORMATION/SOURCE:	PAGE 9
ENVIRONMENTAL IMPACT STATEMENT 4X355MW PAGBILAO POWER PLANT PROJECT	Administrative boundaries Project Delineation Reference Point Seawater Intake Pipe Seawater Discharge Pipe Pier/ Jetty	**Basemap:** GOOGLE EARTH IMAGERY, 2020 **Project Boundary:** CLPPC, 2020 **Boundaries:** NAMRIA BOUNDARY, 2019 **Imagery Date:** JANUARY 2020 **Created by:** APERCU CONSULTANTS, INC., 2020	*Central Luzon Premiere Power Corp.* aperçu CONSULTANTS INC.

3.0 PROJECT RATIONALE

3.1 PROJECT NEED AT THE NATIONAL LEVEL

Given the country's rapidly growing economy, the proposed power project will augment the demand for reliable and affordable baseload power supply. The proposed power plant will not only supply enough electricity to Filipino households and businesses but will also contribute to the national development.

As a developing country, the Philippines' energy usage is increasing because of growth in our industries and the growing demand from households. Daily activities in large and small businesses, hospitals, schools, offices, government agencies and households are heavily dependent on electricity. However, the power supply from existing power plants is not enough to meet the continually increasing demand. The Philippines, by 2040, will need an additional capacity of 62,248 MW based on the Power Demand Supply and Outlook of the DOE for year 2018 – 2040 (**Figure PD-7**).

In the 2019 Power Situation Report of DOE[1], the country's total peak demand in 2019 was recorded at 15,581 MW, which is 799MW or 5.4% higher than the 14,782 MW in 2018. The Luzon grid contributed 11,344 MW or 72.8% of the total demand while Visayas and Mindanao contributed 14.3% (2,224 MW) and 12.9% (2,013 MW), respectively. Compared to year 2018, the peak demand of Luzon increased by 468 MW or 4.3% while Visayas and Mindanao grew by 8.3% and 8.6%, respectively.

In terms of installed capacity, the total power supply grew by 7.2% from 23,815 MW in 2018 to 25,531 MW in 2019. A total of 1,674 MW new capacities were added to the country's supply in 2019 which include coal-fired (1,559 MW), oil-based (8 MW), hydropower (31 MW), biomass (52 MW), and solar (25 MW) power plants. In terms of share by grid, Luzon contributed additional capacity of 700 MW or 41.8% of the newly installed capacities while Visayas contributed 371 MW or 22.3% and Mindanao 602 MW or 35.9%.

Given the country's rapidly growing economy, demand for power will outpace supply in the Philippines in the coming years. The CLPPC plant will help augment the demand for reliable and affordable baseload power supply. The proposed power plant will not only supply enough electricity to Filipino households and businesses but will also contribute to national development.

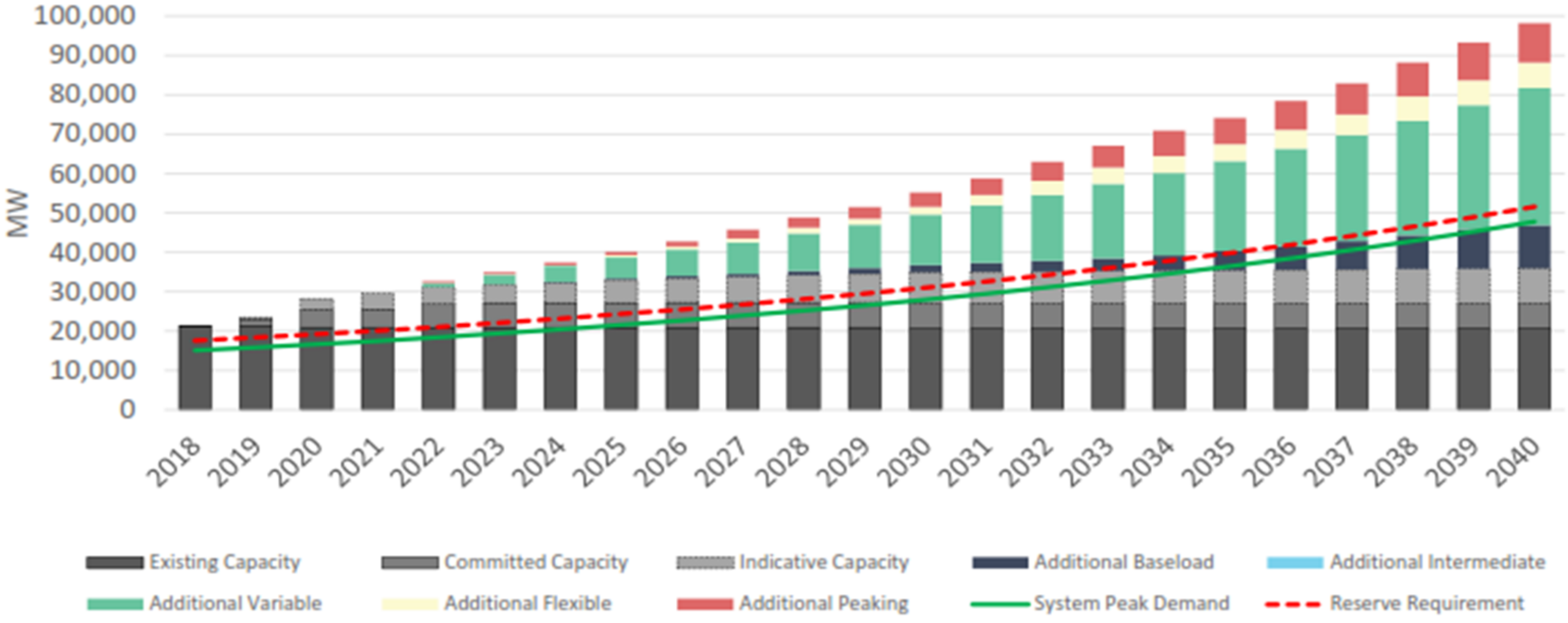
3.2 PROJECT NEED AT THE REGIONAL LEVEL

Along with supply security, the DOE also embarks on increasing the reliability and resiliency of the system. In 2019, Luzon grid experienced a couple of yellow and red alerts that were mainly attributed to the high demand along with the occurrence of mild El Niño, which further increased the demand and brought down the available capacity of hydroelectric power plants in the grid during the summer months. Moreover, expected capacity from committed power projects were not able to ease the power situation due to their delayed commissioning and commercial operation.

The capacity expansion for Luzon in 2018 is provided in **Figure PD-8** wherein Luzon will need an additional capacity of 43,123 MW by 2040. The CLPPC plant will contribute to increased reliability and resiliency of the Luzon grid by providing, in part, the requirements of the grid as a baseload plant.

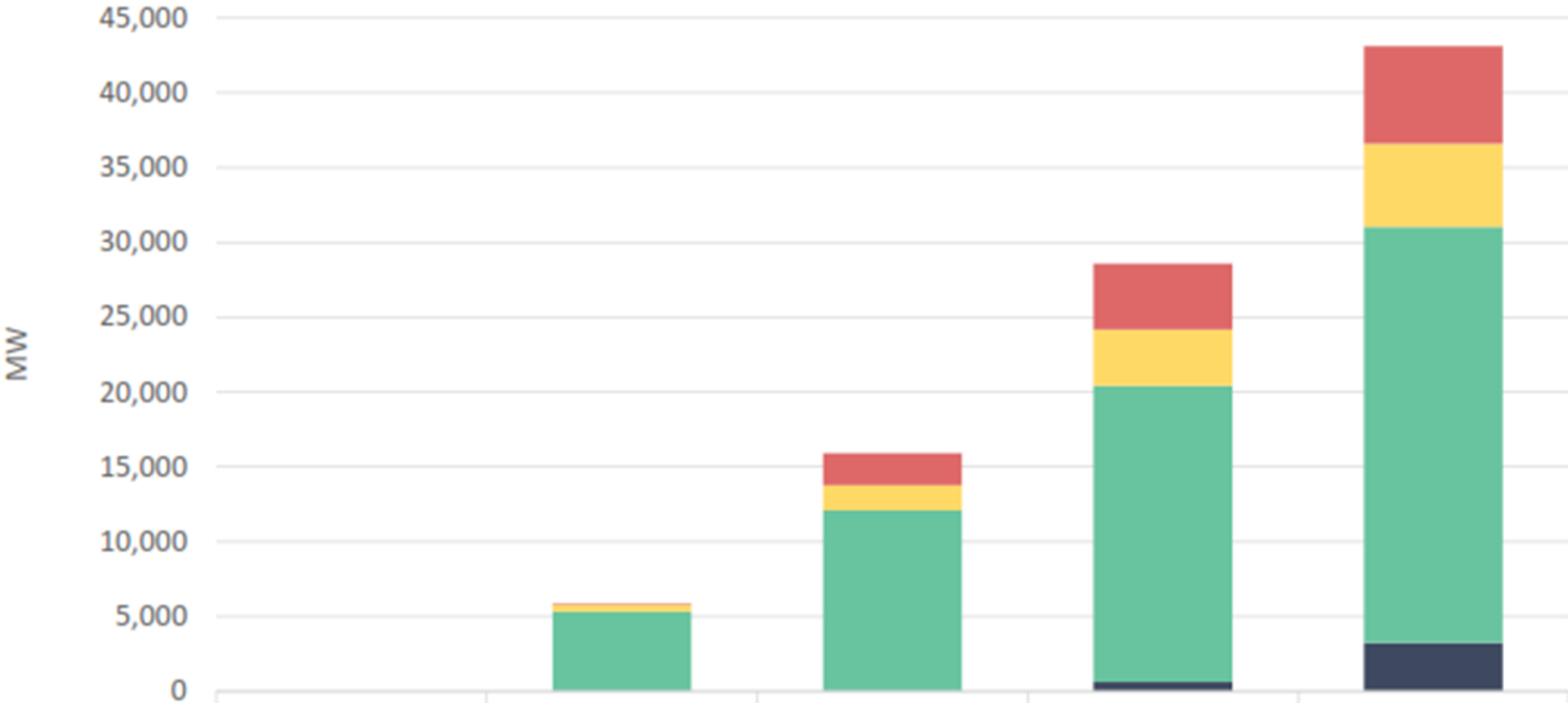
The proposed power plant will also help to stimulate the local and provincial economy. It will provide employment opportunities to the working-age population of Pagbilao and neighboring localities during the construction period and during the plant's commercial operation. In addition to employment opportunities, other benefits, such as revenue share (as mandated by the Law) and local taxes will be made available to the community. The plant may also encourage other businesses to the area, both related and unrelated.

[1] 2019 DOE Power Situation Report



Total Installed Capacity	• 22,262 MW
Total Indicative Capacity	• 8,997 MW
Total Committed Capacity	• 6,323 MW
Total Capacity Addition	• 62,248 MW

Figure PD-7. Philippines capacity expansion (2018-2040)	LEGEND: As above	DATA INFORMATION/SOURCE: **Source:** Department of Energy: Power Demand and Supply Outlook 2018-2040	PAGE 11
ENVIRONMENTAL IMPACT STATEMENT 4X355MW PAGBILAO POWER PLANT PROJECT			*Central Luzon Premiere Power Corp.* aperçu CONSULTANTS INC.



	2020	2025	2030	2035	2040
Peaking	0	85	2,140	4,395	6,525
Flexible	0	465	1,685	3,760	5,560
Variable	0	5,324	12,093	19,819	27,798
Intermediate	0	0	0	0	0
Baseload	0	0	0	610	3,240

Figure PD-8. Luzon capacity addition 2018-2040

LEGEND:

As above

DATA INFORMATION/SOURCE:

Source: Department of Energy: Power Demand and Supply Outlook 2018-2040

3.3 Project Social and Economic Benefits

CLPPC will ensure that Barangay Ibabang Polo and the municipality of Pagbilao in general will be benefited by the project. Socio-economic benefits shall include:

- Local project funding, paid for by funds generated by the DOE's ER1-94 fund, where 1 centavo for each kWh of power generated by the power plant is deposited with the DOE for use by the host communities for local projects that meet the criteria set out by the DOE for those ER 1-94 funds.
- Increased opportunity for employment of qualified residents during the construction stage and long-term employment to qualified residents during the operation phase.
- Additional income to the host LGU and the province through the increased share in the Internal Revenue Allocation, as a result of the added collection of business and property taxes fees from permits and clearances as well as corporate income tax.
- The establishment of major industries, not just power plants, is expected to have a multiplier effect that will stimulate the local economy and generate substantial indirect employment.
- Social assistance and generation of livelihood programs as part of CLPPC's Corporate Social Responsibility (CSR) programs.

4.0 Project Alternatives

4.1 Site Selection

The municipality of Pagbilao, Quezon, particularly Barangay Ibabang Polo, where the proposed power plant facility will be built, is considered a suitable site due to the following inherent characteristics, to wit:

- There are no tenurial / land issues, such as CARP and CADC concerns in the site.
- The national highway passing through the entrance to Pagbilao Grande island provides easy access.
- The proposed location is along the coast of Pagbilao Bay, providing a receiving body for discharges and a possible source of cooling water supply. It also offers a location for a jetty, which is required for coal delivery. Additionally, the length of the jetty to reach berthing depth is not too long at 1.7 km.
- The existing power plant in the same host barangay has been operational for over a decade and the local government representatives have been receptive to the project.

A site in Barangay Castanas, Sariaya, also in Quezon Province was considered but the property owners were unwilling to sell (**Figure PD-6**).

The project location was evaluated for its susceptibility/vulnerability to the various hazards and the resulting assessments are tabulated below (**Table PD-2**).

Table PD-2
Assessment of Natural Hazards at the Project Site

Hazard	Assessment
Rain Induced Landslide	Low susceptibility due to relatively flat to gently rolling terrain
Earthquake induced landslides and mass movement	Not prone to landslides and other mass movement hazards
Liquefaction	Pagbilao Grande Island, in general, is not susceptible to liquefaction. However, areas along the beach are prone to liquefaction due to the unconsolidated sediments in the coastal zone.
Ground Shaking	Not prone to ground shaking and is rarely hit by earthquakes
Ground Rupture	Closest Earthquake generators are Casiguran Fault and Philippine Fault Zone but has low susceptibility due to relatively flat terrain.

Hazard	Assessment
Rain induced Flooding	The eastern side of Pagbilao Grande Island has low susceptibility to flooding while the rest of the island is not prone to flooding.
Tsunami	No recorded historical tsunami events on the coast of Pagbilao Bay
Storm surges	The project site is sheltered from possible storm surges.

4.2 TECHNOLOGY SELECTION

Coal is a preferred source of energy worldwide because it is cheap and plentiful. Forty percent (40%) of the electricity generation in the world today is supplied by coal. With a broad range of available clean coal technologies, gaseous emissions from coal combustion can now be mitigated, allowing coal power plants to operate within environmental standards. Two types of technology are available for high power generation coal-fired power plants. These are the pulverized-coal (PC) technology and the circulating fluidized bed (CFB) technology and may use sub-critical, supercritical or ultra-supercritical steam.

4.2.1 High Efficiency Low Emission Technologies

According to the World Coal Association, a keen advocate of high efficiency low emission (HELE) technologies, the average efficiency of coal-fired power plants around the world today is 33 percent. Modern state-of-the-art plants can achieve rates of 45 percent, while "off-the-shelf" rates are around 40 percent. Increasing the efficiency of coal-fired power plants by just 1 percent reduces CO_2 emissions by between 2-3 percent.

These technologies make up a diverse group that is improving combustion rates while reducing emissions. Techniques include supercritical and ultracritical technology, integrated gasification combined cycle (IGCC), and fluidized bed combustion. By reducing the volume of CO_2 produced, the integration of HELE technologies is an important step on the road toward carbon capture and sequestration (CCS), which will be a key technology if global climate change objectives are to be achieved.

New pulverized coal combustion systems—utilizing supercritical and ultrasupercritical technology—operate at increasingly higher temperatures and pressures, achieve higher efficiencies than conventional units and offer significant CO_2 reductions.

4.2.2 Supercritical Technology

4.2.2.1 Higher Plant Efficiency

A supercritical plant differs from traditional coal power plants because the water running through it works as a supercritical fluid, meaning it is neither a liquid nor a gas. This occurs when water reaches its critical point under high pressures and temperatures, specifically at 22 MPa and 374^{o}C.

As a liquid approaches its critical point, its latent heat of vaporization begins to decrease until it reaches zero at the critical point. This means that the amount of energy needed to change the water into steam becomes less and less, and eventually the water's vaporization phase change is instant. This reduces the amount of heat transfer to the water that is normally needed in a conventional coal plant, therefore, less coal is used to heat the same amount of water. This increases the plant's thermal efficiency by a considerable amount.

4.2.2.2 Low Emission Rates

Due to lower coal consumption rate, quantities of combustion products and wastes such as carbon dioxides (CO_2), carbon monoxide (CO), sulphur oxides (SOx), nitrogen oxides (NOx), and particulate matter also decrease, resulting in net reduction of air emissions and ash generation. When SOx and NOx emissions are controlled, consumptions of reagents for SOx control (limestone, lime or seawater) and reagent for NOx control (ammonia or urea) are also reduced due to reduction of SOx and NOx production.

4.2.2.3 Lower Operating Cost

Since supercritical plants consume less coal than sub-critical plants, this results in significant fuel cost saving. This also results in lower amount of combustion wastes such as ash. Therefore, annual cost for handling of solid wastes like ash also decreases.

4.2.3 Pulverized Coal Technology

The pulverized-coal (PC) combustion is the most widely used technology in coal-fired power plants globally. The technology's developments in the past decades have primarily involved increasing plant thermal efficiencies by raising the steam pressure and temperature. Based on the differences in temperature and pressure, the technology is categorized into three tiers: sub-critical, supercritical (SC) and ultra-supercritical (USC).

The supercritical technology yields higher thermal efficiency compared to sub-critical types; hence the environmental impact would be lessened in comparison to less efficient sub-critical unit of the same output. The Supercritical pulverized-coal (SPC) technology uses supercritical pressure of 24 MPa and higher main steam temperature which mostly ranges from 538 to 566°C.

The ultra-supercritical technology works within a range higher than supercritical condition of about 25 MPa and 600°C. This technology has even higher efficiencies than supercritical but is relatively being less deployed because of the limited commercial availability of the special steels for boiler tubes and turbine blades.

The NOx formation in the furnace of a PC boiler is controlled using Low NOx burners or a combination of combustion optimization systems (Low NOx burners, flue gas recirculation, and overfire air) depending on the target furnace concentration. Sulfur dioxide is efficiently removed using a post combustion standalone flue gas desulfurization (FGD) system.

It is likely that the PC will continue to be strongly considered when looking at today's plant requirements in the supercritical class and HELE technologies and will continue to be favored when the supply of steam-quality coal is readily available in long-term contracts within the defined limits of heating values, ash content, moisture content, sulfur content, and especially ash fusion temperatures.

4.2.4 Circulating Fluidized Bed Technology

The circulating fluidized bed (CFB) technology generates lower emissions and improves performance while minimizing maintenance cost. It is also capable of burning a wide range of fuels from biomass, low grade coal, and high-grade coals.

CFB is available in the market in subcritical class but boiler units larger than 300 MW, however, are in the demonstration stage or limited commercial basis. The advantage of CFB boiler technology is that it has pollution controls built right into the combustion process, reducing or eliminating the need to use equipment (e.g. scrubbers) that typical coal plants require to capture criteria pollutants. In comparison with typical coal plants, CFB boilers produce 90% less emissions by combining limestone with coal, resulting in the removal of sulfur oxides (SOx) in the boiler. Also, the formation of nitrous oxides (NOx) is minimized because of low fuel burning temperature in the boiler.

4.2.5 Pulverized Coal Supercritical Boiler

Pulverized-coal (PC) supercritical boiler with variable pressure has a once-through, spirally wound tube wall, and vertical tube wall furnace with steam separators, superheater, reheater, attemperator, economizer, coal pulverizer, Low NOx burners and overfire air, outdoor type components.

The steam generator design proposed is of supercritical pressure, single reheat, once-through, balanced draft, designed for firing the specified pulverized coal as main fuel to achieve the required steam flow capacities and parameters. The firing system will employ a direct feed pulverized coal system, with burners arranged on opposed furnace walls. The furnace dimensions are designed to provide a generous volume and plan area considering slagging and fouling properties of the specified coals.

The furnace walls are of completely water-cooled membrane construction with spirally wound tubes used in the high heat absorption zones. The superheater consists of pendant type secondary and final superheaters in the high temperature zones, and a horizontal type primary superheater in the low temperature zone. The reheater consists of a pendant section and a horizontal section. The superheated steam temperature is controlled by feed water / fuel ratio and multi-stage spray type attemperators. The reheat steam temperature is controlled by parallel flow gas biasing dampers. Combustion air is distributed by the primary and secondary air system. Secondary air is preheated in the air heater, and then routed to the burners through the secondary air ducts. Primary air is pressurized by the primary air fan to obtain sufficient pressure required for passing through the air preheaters, pulverizers and pulverized coal piping to the burners. Flue gas from the boiler outlet is directed to the air heater by way of connecting ductwork. Raw coal from the coal bunkers is discharged through coal feeders to the pulverizers. Pulverized coal is transported by primary air to the burners through the pulverized coal piping.

4.3 RESOURCE ALTERNATIVES

4.3.1 Wind

For the wind resource potential of the site, NREL's Philippine Wind Energy Resource Atlas (**Figure PD-9**) classifies it as moderate with wind speeds ranging from 5.6-6.4m/s. Wind turbines used in wind utility-scale power plants will require wind speeds of at least 10 to 15m/s to operate.

4.3.2 Solar

The project site's solar irradiation or the radiant energy from the sun averages annually at 4.5 to 5kWh/m^2/day (**Figure PD-10**). The solar resource map shows that Quezon Province is not among the best sites for solar power plants. Moreover, it would take around 1 hectare for solar panels to produce 1 MW of power, while coal, in the case of this project, can produce 1420 MW in just about 132 hectares.

4.3.3 Hydro

The nearest river, Palsabangon river, is approximately 13 kilometers away from the project site with a streamflow of 715 L/s. After considering the one water permit granted for the Irrigators Association in Palsabangon river, the remaining streamflow of the river is around 508.5L/s with equivalent power generating capacity of 5.72 MW compared to the 1420 MW generating capacity of the proposed project using coal. The river is also of considerable distance from the project site.

4.4 SUMMARY OF ENVIRONMENTAL ASSESSMENT OF ALTERNATIVES

Table PD-3
Summary of Environmental Assessment of Alternatives

Technology Selection	The impacts of a supercritical PC technology are less than a conventional PC technology or sub-critical CFB technology. Higher efficiencies result to a lower coal consumption per kWh of electricity generation, resulting to less ash production and air emissions. Although SOx removal and Low NOx are inherent in the CFB combustion technology, the PC technology with the installation of flue gas desulfurizer (FGD) and use of Low NOx burners and overfire air results to comparable emissions which are better than the CAA regulations.

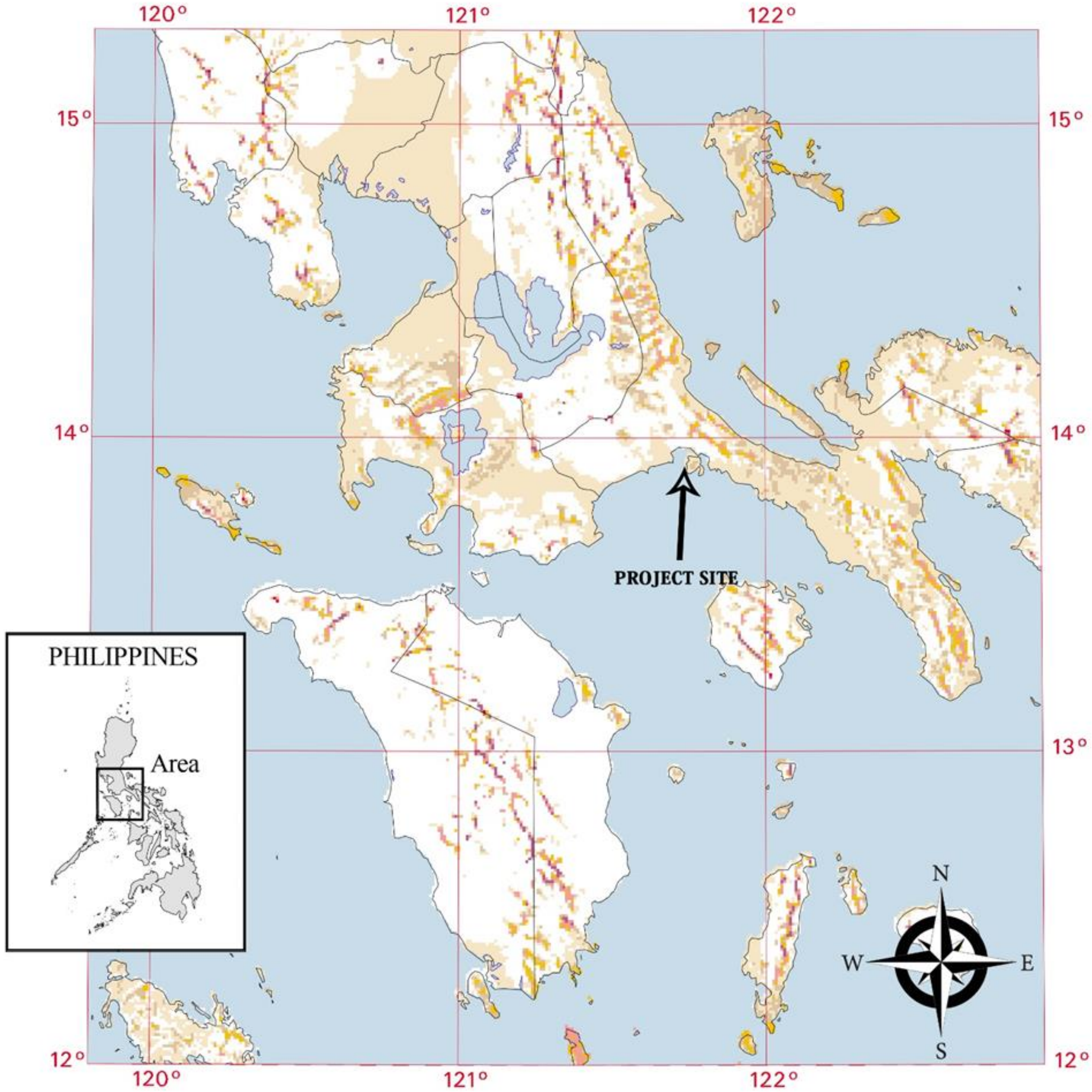
	Because of its high efficiency and low air emissions, it is likely that the PC will continue to be strongly considered when looking at today's plant requirements in the supercritical class and high efficiency low emission (HELE) technologies.
Resource Selection	The physical footprint of a coal-fired power plant is less than that of a wind, solar, or hydropower plant. Thus, overall potential impacts on land and terrestrial ecology would be less with a coal-fired power plant. Although impacts on air quality are considered less for wind, solar and hydropower plants, emissions from coal fired-power plants are efficiently managed with the use of FGD's electrostatic precipitator (ESP) and Low NOx burners. In this case, the footprint of the proposed power plant will be limited to an approximately 140-hectare area and a foreshore area. Potential environmental impacts on water and air environs will be managed to meet DENR standards with the use of pollution control devices. The proposed project will have a generating capacity of 4X355MW to be developed in an approximately 140-hectare property. Because of its high generating capacity, the project site can be efficiently used, avoiding unnecessary conversion of agricultural lands. In comparison, the development of solar projects (e.g. Negros Island and Batangas) have resulted in the conversion of prime agricultural lands.
Site Selection	One of the main concerns in the site selection process was the unwillingness of the property owner from alternative sites to sell or lease the property to CLPPC. In this case, Dewsweeper Industrial Park, Inc. has agreed to lease the property to CLPPC and take care of relocating the households within the property. The environmental hazards assessment of the site also indicates suitability due to low susceptibility to landslides, mass movements, flooding, tsunami events and storm surges.

4.5 NO PROJECT OPTION

As presented in the 2018-2040 Philippine Energy Plan from DOE, the Luzon grid will require an additional 62,248 MW capacity by 2040 stemming from an expected annual 5.88% increase in electric power demand. This increase comes from the industrial, residential and commercial sectors together with the scheduled expansion of electrified mass transport system and increasing use of electric vehicles. If a No Project Option is taken, the outcome of this scenario is for an even more unreliable power supply that will affect the Philippines projected economic growth. The addition of new base load power plants is a must to attract more investments to the Philippine economy.

Without the project, opportunity for additional 2,500 to 3,000 (peak) jobs for three (3) years of construction, about 200 to 250 permanent jobs during operation and indirect jobs and business opportunities that will be created by this proposed power plant project would be lost. The substantial increase in local taxes and revenues including the direct and indirect local benefits for the local economic stimulus would also be foregone.

Within Brgy. Ibabang Polo, the project benefits afforded by TeaM Energy will continue but will be limited to street lighting and quarterly medical missions. The benefits that barangay Ibabang Polo stands to gain will not be realized.



Wind Power Classification

Resource Potential Utility	Resource Potential Rural	Wind Power Density at 30 m W/m2	Wind Speed[a] at 30 m m/s
Marginal	Moderate	100 - 200	4.4 - 5.6
Moderate	Good	200 - 300	5.6 - 6.4
Good	Excellent	300 - 400	6.4 - 7.0
Excellent		400 - 600	7.0 - 8.0
		600 - 800	8.0 - 8.8
		800 - 1200	8.8 - 10.1

[a] Wind speeds are based on a Weibull k value of 2.0

The wind resource classification is specific for both utility scale and rural applications and applies to areas with low surface roughness.

US Dept. of Energy - National Renewable Energy Laboratory

NREL contacts:
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NREL

SR Haymes 01-MAR-1999 4.2

Figure PD-9. Wind resource map	**Legend:** As Above	**Source:** As above **Modified by:** APERCU CONSULTANTS, INC., 2020	Central Luzon Premiere Power Corp. apercu CONSULTANTS INC.
ENVIRONMENTAL IMPACT STATEMENT 4X355MW PAGBILAO POWER PLANT PROJECT	**Scale:** As Above		**PAGE 18**

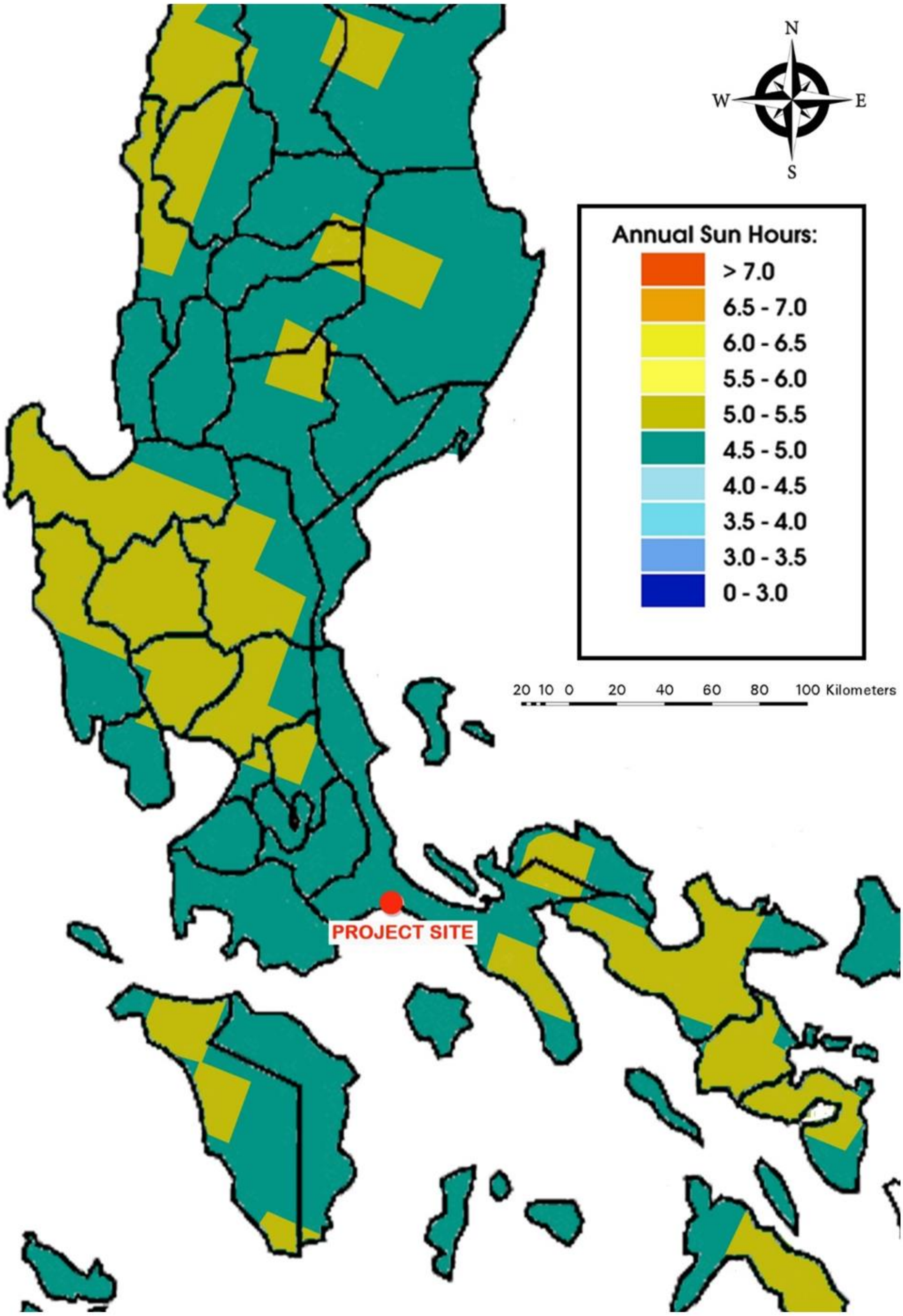


Figure PD-10. Solar irradiation map	**Legend:** As Above	**Source:** NREL **Modified by:** APERCU CONSULTANTS, INC., 2020	Central Luzon Premiere Power Corp. aperçu CONSULTANTS INC.
ENVIRONMENTAL IMPACT STATEMENT 4X355MW PAGBILAO POWER PLANT PROJECT	**Scale:** As Above		**PAGE 19**

5.0 PROJECT COMPONENTS

5.1 PROJECT DESCRIPTION

The project is designed with state-of-the-art supercritical pulverized-coal technology for burning lignite coal and subbituminous coal as the main fuel.

The entire proposed plant will have 4x355MW pulverized-coal supercritical outdoor type boiler with the following components: once-through, spirally wound tube wall and vertical tube wall furnace, steam separators, superheater, reheater, attemperator, economizer, air preheater, coal feeder, coal pulverizer, Low NOx burners and overfire air (OFA), and combustion fans. The plant will also have a coal storage, handling and feeding system as well as a crushing and screening facility.

The turbine unit will consist of two cylinders, tandem-compound, two exhausts, condensing reheat turbine, forced-lubricated designed for high operating efficiencies and maximum reliability, and a generator that is totally enclosed type, self-ventilated, cylindrical rotor type, and synchronous alternator.

The post combustion system consists of electrostatic precipitator (ESP), flue gas desulfurizer (FGD), optional selective catalytic reduction (SCR), and exhaust stack.

5.2 MAIN PROJECT COMPONENTS

The project will utilize the supercritical PC boiler technology, with the following major components: the boiler, turbine and generation system; the coal handling and storage system; the seawater cooling system; the water supply system; the water pollution control facilities; the air pollution control facilities; and the ash handling and disposal area. **Table PD-4** provides a complete list that indicates the specifications of the various components and **Table PD-5** presents the general land allocation for various components of the power plant.

Table PD-4
Main Project Components

Components	Specifications
PC Boiler, Steam Turbine and Generator System	• 4x355MW supercritical PC Boilers • 4x355MW steam turbine generators
Coal Handling and Storage System	• Coal storage area with 500,000 tons capacity good for 30 days inventory level • Coal unloading system • Covered conveyor system • Crushing and screening facility
Seawater Cooling System	• Seawater for cooling – 285,000m^3/h • Sea water intake structure • Electro-chlorination system • Sea water cooling condenser • Sea water discharge structure
Water Supply System	• Raw water reservoir – 4x2,000m^3 • Raw water treatment system – 3 x 3,000m^3/day • Demineralization plant – 3x 1,000m^3/day

Water Pollution Control Facilities	• Industrial wastewater treatment plant
	• Individual sanitary wastewater facilities per area:
	  ○ Turbine generator building
	  ○ Water treatment
	  ○ Coal yard
	  ○ Admin building
	• Oily water treatment facility

Components	Specifications
Air Pollution Control Equipment	• Electrostatic precipitator (99.5% efficiency) when burning maximum ash content and lowest calorific value • Flue gas desulfurizer • Combustion technology (Low NOx burner + Overfire air)
Stacks	• 2 stacks with 2 flues each stack at 150 m height
Ash Handling and Disposal Area	• Estimated 30-hectare ash disposal area (ADA) with Leachate treatment facility

Auxiliaries and Support Facilities include:

- Cooling Water System
- Emergency Diesel Generators
- Air Compressors
- Diesel Fuel Tanks
- Central Control Room
- Warehouse
- Maintenance Workshops
- Administration Building
- Dormitory or Staff House

Table PD-5
Summary of Project Site Allocation

	Project Component	Area Allocation (in ha.)
1	Ash Pond	30
2	Coal Yard Area	18
3	Power Plant Area	14
4	Water Treatment and Auxiliaries	10
5	Buffer Zone	3
6	Admin Building and Warehouse	2
7	CLPPC Transmission Line	2
8	TeaM Energy Transmission Line	2
9	Unused Areas	51
	TOTAL	**132**

The 4x355MW units of CLPPC will be co-located with the 2x355MW units of LETI (Lumiere Energy Technologies Inc., a sister company, within the Dewsweeper leased property. CLPPC will occupy approximately 132 hectares while the LETI power block will cover approximately 8 hectares. CLPPC will essentially manage the property being leased from Dewsweeper. CLPPC will the share the following facilities with LETI: coal handling and storage system; water supply system; and ash handling and disposal area.

The area allocated for the ash disposal facility is approximately 33 hectares which includes the vegetated buffer zone area. The actual area where ash will be stored is approximately 30 hectares. **Figure PD-11** shows the details for the actual area allocated for the ash disposal area and the buffer zone.

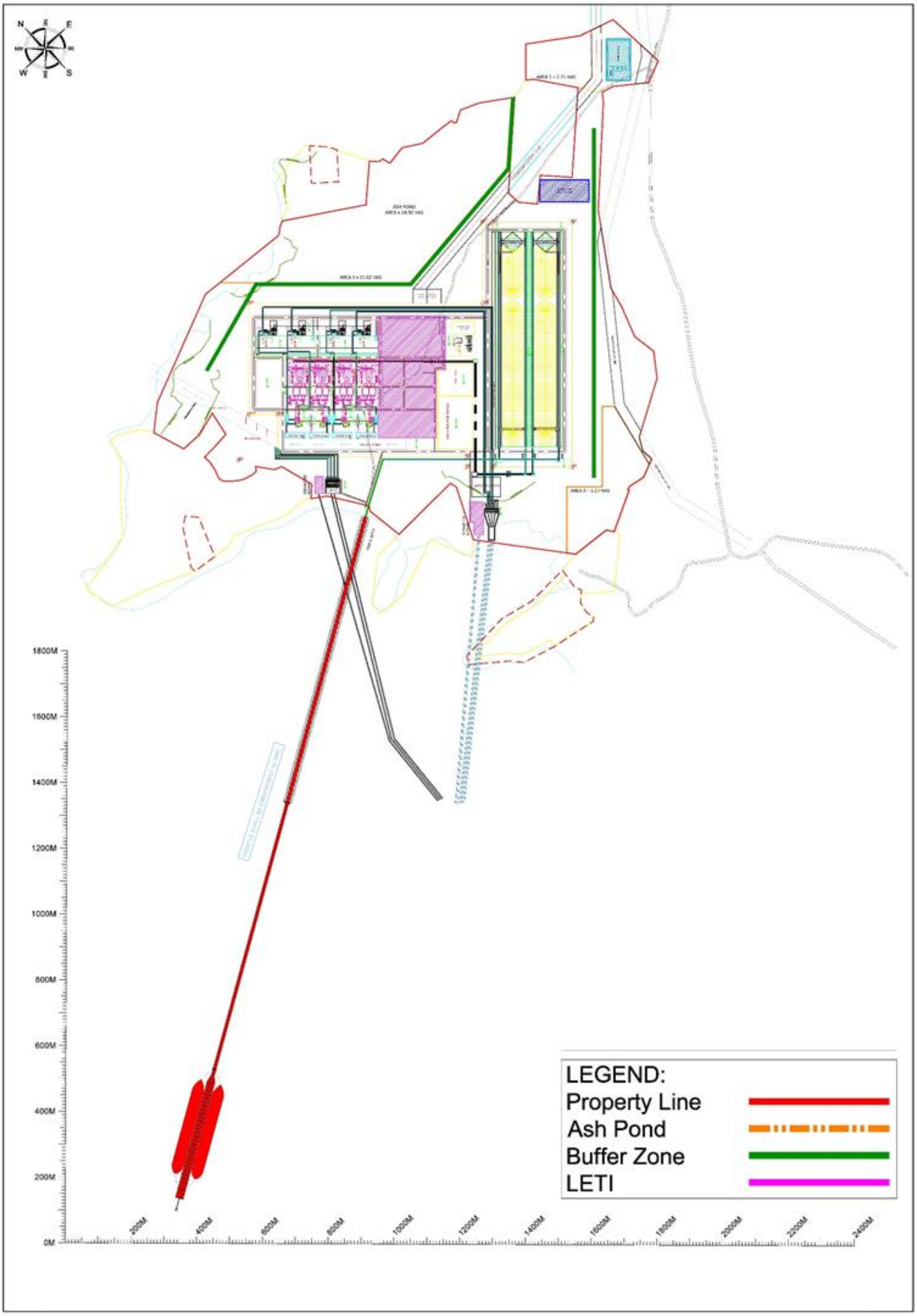


Figure PD-11. Project components	Legend: As Above	Source: SMC GLOBAL POWER HOLDINGS CORP. Modified by: APERCU CONSULTANTS, INC., 2020	Central Luzon Premiere Power Corp.
ENVIRONMENTAL IMPACT STATEMENT 4X355MW PAGBILAO POWER PLANT PROJECT	Scale: As Above		PAGE 22

5.3 POLLUTION CONTROL DEVICES

CLPPC is committed to ensuring that the proposed project will operate in an environmentally responsible manner. Pollution control devices and processes will be installed to meet the Department of Environment and Natural Resources (DENR) standards. **Table PD-6** lists the pollution control devices that will be used in this project.

As part of the prevention and mitigation measures of the power plant, coal-carrying ships will be made to comply with the plant's policy and procedures, such as prohibiting them from discharging oily wastes and bilge water directly into the bay (nearshore and offshore) while unloading coal at the jetty.

Table PD-6
Pollution Control Devices

Pollution Control Device/ Process	Facility Being Served	Purpose
Unloaders	Pier	Fitted with eco-hopper design and enclosed clamshell to prevent coal dust emissions during unloading
Covered Conveyor Belts	Coal Handling System	Prevent coal dust emissions and spillages during conveying
Covered Coal Storage Area	Fuel Storage Area	Prevent coal dust emissions; manage spontaneous combustion of coal; manage runoff from storage area
Combustion Technology (Low NOx Burner + Overfire Air)	Boilers	Reduce NOx emission during combustion to comply with CAA
Electrostatic Precipitator	Flue Gas	Removal of particulate matter from the combustion of flue gas to comply with CAA
Flue Gas Desulfurizer	Flue Gas	Removal of SOx to comply with CAA
Stack of sufficient height	Boilers	Better dispersion of emissions resulting in lower ambient concentration of pollutants
Leachate Treatment Facility	Ash Disposal Area	Leachate treatment before effluent discharge
Dedusting / Defogging System	Ash Disposal Area	Prevent fugitive dust emissions
Wastewater Treatment Facility (WWTF)	Entire Facility	Treatment of effluents to comply with DENR standards prior to discharge
Sewage Treatment Plant	Entire Facility	Treatment of effluents to comply with DENR standards prior to discharge

5.4 GENERAL LAYOUT OF FACILITIES

A general layout of the facilities is presented as **Figure PD-12.**

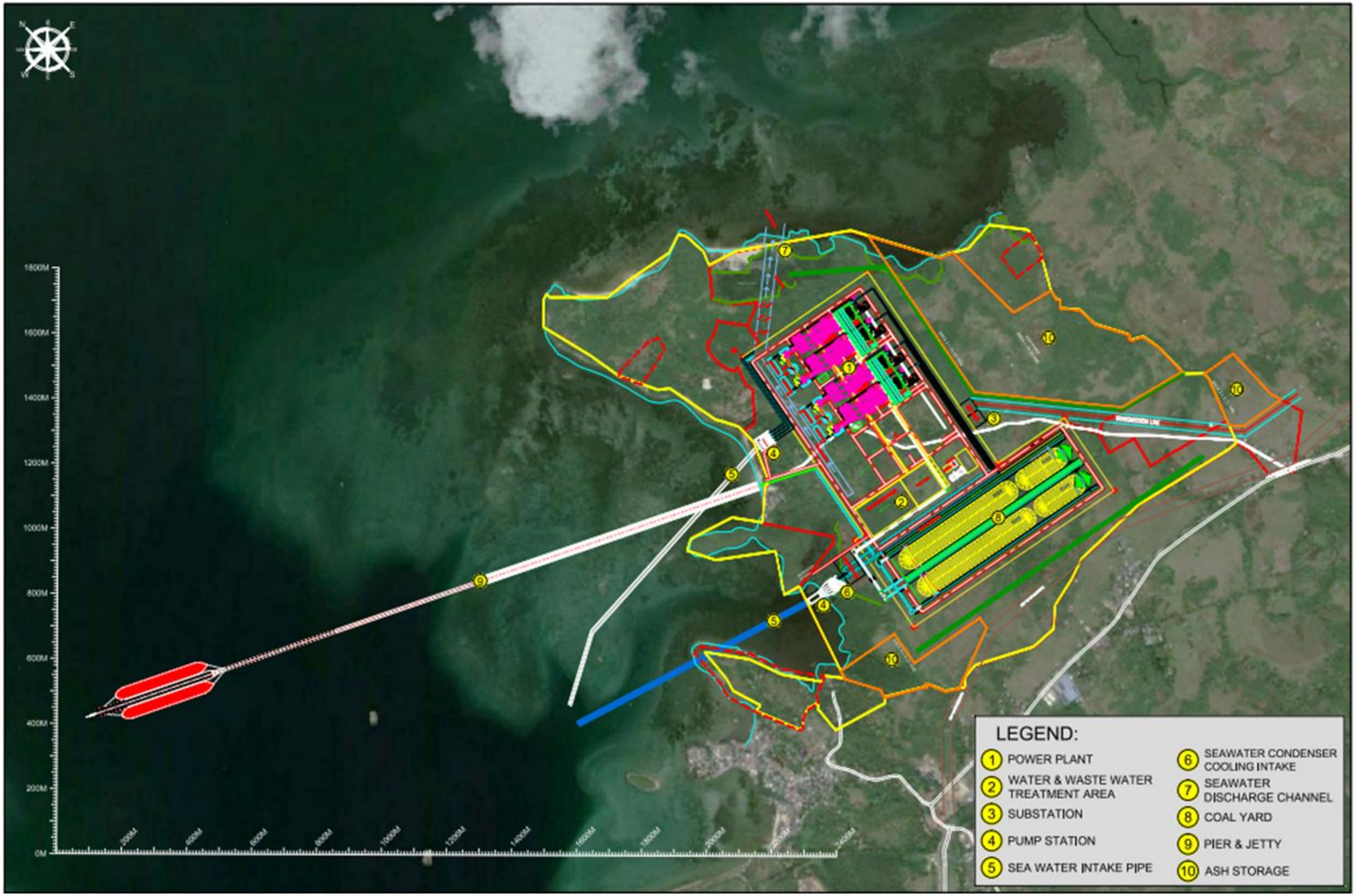


Figure PD-12. General layout of facilities	LEGEND: As above	DATA INFORMATION/SOURCE: **Source:** SMCGPHC, 2020	PAGE 24
ENVIRONMENTAL IMPACT STATEMENT 4X355MW PAGBILAO POWER PLANT PROJECT			Central Luzon Premiere Power Corp. aperçu CONSULTANTS INC.

6.0 PROCESS DESCRIPTION

Coal will be delivered by cape size/ panamax cargo vessels and will be received onsite at the coal unloading jetty. Once unloaded, the coal will be conveyed via a fully covered belt conveyor equipped with a dust suppression system and stored in the enclosed type coal yard equipped with stacker-reclaimers.

Coals from the coal yard goes to a crushing and screening facilities where it will go to a process to ensure the particles are within a restricted range of sizes and particle size distribution before storing to a boiler bunker.

Raw coal enters through a center feed pipe onto the rotating grinding table and coal drying takes place with the air sweep principle of uniform air distribution around the table. The pulverized coal is carried upward and carried into the separator, where the particles impinges against the separator vanes, and only fine particles enter the inside, whereas the course are ejected away towards the outside. Each pulverizer will also be equipped with a steam inerting and cleaning system.

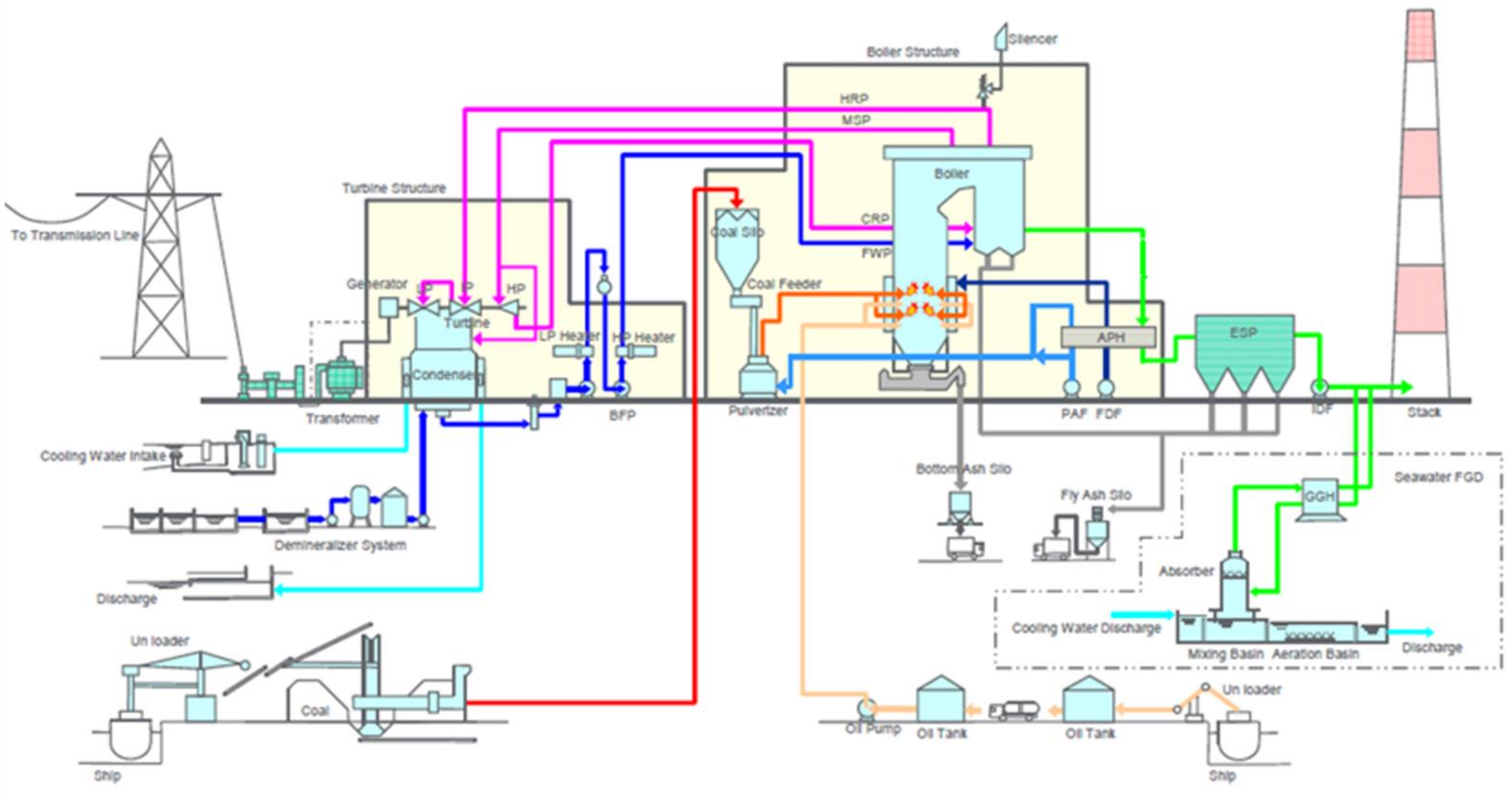
Combustion takes place where the fuel-air mixture is then fed to the furnace. At a specified temperature and pressure, the boiler generates steam which expands first to the high-pressure (HP) side of the turbine. HP steam from the governing valves enters the HP casing through two inlet pipes. The steam flows through the reaction stages in the HP turbine and exhausts to the reheater through the exhaust opening in the outer casing. The reheated steam returns to the intermediate-pressure (IP) element through two combined reheat valves, which are located on front side of the turbine. Combined reheat valves are connected by flexible steam inlet pipes with IP cylinder for reducing the thermal stress of each part. Steam flows through the intermediate reaction blading and expands thereby decreasing the pressure and temperature.

The steam, which has expanded in the intermediate reaction group, will leave the IP turbine through the crossover pipe, and flows into the low pressure turbine and must be condensed in once-through open loop heat exchange system so that the resulting condensate can be recirculated back to the boiler to complete the water-steam cycle.

The warm flue gas exiting the boiler will be handled accordingly to meet the CAA environmental safety standards. In the electrostatic precipitator (ESP), most of the very fine ash particles in the flue gas will be removed. This ash is collected and hauled, pumped, or conveyed to ash storage sites either within the site boundary, or located adjacent to the site. Where there is a market, ash will also be sold for use in manufacturing cement or other industrial purposes.

SOx compounds will be removed at the flue gas desulfurizer (FGD). The flue gas will exit via the stack where it is dispersed high in the atmosphere. NOx reduction is accomplished through the use of Low NOx burners and overfire air.

Figure PD-13 presents the schematic diagram of the pulverized-coal-fired power plant process.



SCHEMATIC DIAGRAM OF TYPICAL COAL-FIRED BOILER PLANT

Figure PD-13. PC supercritical boiler components and process flow	**LEGEND:** As above	**DATA INFORMATION/SOURCE:** **Source: Jampoo, Undated**	**PAGE 26**
ENVIRONMENTAL IMPACT STATEMENT **4X355MW PAGBILAO POWER PLANT PROJECT**			*Central Luzon Premiere Power Corp.* aperçu CONSULTANTS INC.

6.1 FUEL

6.1.1 Coal Specifications

For this project, the main fuel will be lignite A coal and sub-bituminous coal that will be sourced from other countries such as Australia and Indonesia. Each boiler unit (355 MW) will consume approximately 173 tons of coal per hour at full load, amounting to about 1.09 million tons of coal used per year at 80% capacity factor. At 1,420 MW, approximately 692 tons of coal per hour or 4.3 million tons per year at 80% capacity factor will be consumed.

Table PD-7 provides the coal specifications as received.

Table PD-7
Coal Specification

Item	Coal Range
Gross calorific value (HHV), kcal/kg	4,158 ~5,164
Net calorific value (LHV), kcal/kg	3,662
Volatile matter, %	31.20~34.70
Fixed Carbon, %	29.80~37.30
Surface Moisture (recommended)	≤ 14%
Total water, %	33.96
Ash, %	2.60~6.00
Carbon, %	64.85~71.07
Hydrogen, %	4.89~5.44
Nitrogen, %	0.60~1.44
Sulfur, %	0.11~0.82
Oxygen, %	17.16~22.18

6.1.2 Coal Handling System

Coal will be delivered by ships of Capesize/ Panamax size of about 170,000/ 70,000 DWT from supply points such as Australia, Indonesia and other countries. One (1) Capesize/ Panamax-sized vessel will deliver the coal to the power plant monthly to supply the coal requirement of a 355-megawatt unit. Once the power plant operates at 1,420-megawatt capacity, four (4) Capesize or seven (7) Panamax vessels will be berthing and unloading coal to the pier and jetty every month. The receiving facility will include two (2) ship unloaders with an unloading capacity of 1,500 tons per hour (TPH) each. A designated area with sufficient draft for berthing will be provided for the ship anchorage. The unloading of coal, which normally takes 5 to 7 days to complete, will be done by a ship unloader. Coal is then transferred by conveyors and stored in the enclosed type coal yard equipped with stacker-reclaimers.

A dust suppression system will be provided to spray an optimized amount of water. Suitable systems will be adopted to reduce problems like choking or jamming of the moving parts. Closed-Circuit Television camera (CCTV) monitoring will also be provided for the conveyor system.

The following measures will be considered in the design of the belt conveyor:

- Dust Cover – The belt conveyor from the pier head to the transfer tower and from the transfer tower to the coal storage area is equipped with a hood cover. The conveyor segments are fully covered, and the covers are hinged with a retaining bar to allow the cover to be held in an open position to permit inspection and repairs, simplifying maintenance.

- Belt Loading – The amount of dust generated at the belt conveyor transfer points depends on the way the material is loaded onto the belt. To reduce dust generation, the material will be loaded onto the center of the belt. The material and the belt will travel in the same direction at the same speed, whenever possible.

- Impact at Loading Point – A momentary deflection of the belt between two adjacent idlers may result when the coal strikes the belt during unloading. As a result, a puff of dust may leak out under the skirting rubber seal. To prevent dust emissions at the loading point, adequately spaced impact idlers will be located at transfer points. These will absorb the force of impact and prevent deflection of the belt between the idlers, thus preventing dust leakage under the rubber seal.
- Dust collectors will be installed on the pier head and transfer tower to control dust at the receiving and transfer points. Dust-collection systems capture fugitive dust that would otherwise escape from the perimeter of equipment areas.

6.1.3 Coal Storage, Preparation and Feeding System

The coal storage area will have an initial storage capacity of 500,000 tons to supply the coal requirements of the 4x355MW units of CLPPC and the 2x355MW units of LETI. This coal yard can sustain a maximum operation of 30 days.

The coal yard will be divided into active and passive sections. The active section will be where coal will be taken from on a daily basis while the passive section will be used mainly for reserves and emergency requirements. Both sections will be formed and compacted by a stacker and will be provided with equipment for moistening the coal to prevent self-ignition and dust dispersion.

The coal stockyard will be covered to prevent coal from being washed away during rain events. Accumulated dust will be removed or swept regularly, and the area will be watered after sweeping. For the coal yard, roadways will be cemented and will be provided with clearly marked entry and exit points.

From the coal stockpile, the coal will be reclaimed and moved through the conveyor belt to the crushing and screening room within the boiler building. A dust suppression system and dust collectors will likewise be provided at the coal crusher structure.

6.1.4 Crushing and Screening Facility

Coal sufficient for twelve (12) hours of operation for worst coal will be stored in the coal silo. After crushing, the coal will pass through the screens to ensure particles are within a restricted range of sizes and particle size distribution before entering the boiler. In this process, a vacuum system and a fully enclosed crushing facility are used to ensure recovery of coal and reduction in particulate emissions.

The coal handling system includes a 500,000-ton storage yard with stackers, bridge and full portal reclaimers, crusher system, and a 2-conveyor system to transfer coal to the day-silo inside the boiler island. The crushing plant reduces the coal to ~50 mm size before being transported to the pulverizer. The coal crusher system is fitted with de-dusting accessories i.e. exhaust fan, bag filter at the transfer towers to minimize dust dispersion.

The coal handling system is controlled from its own control room adjacent to the transfer house. The overall control is programmable by a logic controller system. The control board including the controls, graphic display, and annunciator sections enables remote operation of the coal handling system.

6.1.5 Start-up Fuel

Initial commissioning and start-up of the boiler of the plant requires industrial diesel fuel oil. **Table PD-8** shows the specifications of the diesel fuel to be used. The power plant will have 30 days of maintenance per year and at least 1 cold start per year. Two (2) tanks having a capacity of 500,000 liters each will be constructed to store diesel oil.

Table PD-8
Fuel Oil Analysis

Type		No. 1 Fuel Oil	No. 2 Fuel Oil
Gravity API at 15.5ºC		32	40
Density at 15.5˚C, kg/L		0.82-880	0.86
Kinematic Viscocity at 37.8⁰C, cSt		1.6	2.68
Flash Point, ºC		55	-
Pour Point, ºC		-	10
Cloud Point, ºC		-	10
Ash		Max. 0.01%	100 ppm
Sulfur, %wt		0.3	0.5
Bottom sediment and water, %vol		0.1	0.1
Water content (by distillation), %vol		-	0.1
Calorific Value (HHV)	Btu/lb	19,600	
	kcal/kg	10,889	
Calorific Value (LHV)	Btu/lb	18,400	
	kcal/kg	10,221	

6.2 WATER SUPPLY

Figure PD-14 and **Figure PD-15** shows the theoretical freshwater and seawater balance diagrams of the power plant's operation.

6.2.1 Freshwater Requirements

The freshwater requirement of CLPPC will be primarily used during the construction and operation phases. Requirement during the construction phase is estimated at 104 cubic meters per day, including requirements by construction personnel.

Meanwhile, the freshwater requirements during operation phase varies. It should be noted that project phase is planned such that one (1) generation unit will be initially installed, then the succeeding three (3) will be operational one after the other after every four months. The freshwater requirement for each phase is estimated at about 75 cubic meters per hour or 1,800 cubic meters per day. Once all the generating units are operation, the daily freshwater requirement will be 7,200 cubic meters per day. This will include the water requirements for domestic use and industrial use such heating, ventilating, air conditioning, make-up feed water for cooling and additional water to the reuse water tank.

Daily freshwater requirements will be drawn from the Palsabangon River or produced by a desalination facility. It should be noted, however, that a separate company will be commissioned if water will be sourced from the Palsabangon River, and thus, a separate permitting process will be undertaken.

6.2.1.1 Raw Water Treatment System

Raw water will come from an external water utility company and will be stored in 4x2000-m^3 raw water reservoir (tank type). The raw water treatment system will produce industrial water at 375 cubic meters per hour and will be stored to 4x2000 m^3 industrial water tanks. The industrial water will be provided to supply both closed circuit cooling water as plant service water and demineralized makeup water for boiler cycle.

6.2.1.2 Demineralization Plant

Water for the demineralization plant will come from the industrial water stored in industrial water tanks. Water will pass through a mixed bed exchanger and the demineralized water will then be stored in demineralize water tanks and also serves as the condensate storage tanks for all units. The demineralizer is semiautomatic and has remote manual control from demineralized plant control panel.

6.2.1.3 Rainwater Collection System

Rainwater collection system will be designed and installed as part of SMC corporate guidelines of water conservation.

6.2.2 Desalination Facility

A desalination facility will be the source of the raw water supply if water from Palsabangon River will not be available. After the desalination, water will be delivered to the water treatment plant for further processing.

The desalination facility starts with a pretreatment system consisting of a clarifier and ultrafiltration system to correct the incoming high turbidity of seawater from the Pagbilao Bay. The filtered water will pass through the sea water reverse osmosis (SWRO) system and brackish water reverse osmosis (BWRO) system in order to achieve the desired inlet water quality. Both dissolved organic and salt are removed using cross flow membrane filtration to achieve the desired water quality at the permeate line. The reverse osmosis (RO) permeate water will be stored in the industrial water tank.

6.2.3 Seawater Cooling System

The function of the seawater cooling system is to supply seawater as cooling water to the condenser and from the ancillary requirements. The system is comprised of the intake, the discharge and the electro-chlorination system.

The cooling water shall be drawn from Pagbilao Bay. The seawater, filtered by bar screens and band screens, will supply both the circulating and cooling water systems independently. The auxiliary seawater header, wash water pumps and lubricating skid can be primed by service water. The sodium hypochlorite generated by electro-chlorination system will be injected at intake. The equipment, except for the sodium hypochlorite generators will be installed outdoors.

6.2.3.1 Intake Structure

The cooling water intake structure will be designed with a "head" (pipe) section. Necessary precautions such as, the installation of screens at the water intake structures and the siphoning of water at low velocity, will be implemented to prevent fish and other aquatic species from entering the intake. The 3.26 m outside diameter cooling water intake pipe will be 0.85 km long and will be submerged to -7 m in Pagbilao Bay.

The water intake pipes will convey the cooling water from the water intake structures to the pump house. The water intake pipes will be designed according to all internal and external loads. Normal intake flow rate for a 4x355 MW boiler is estimated at 570,000 cubic meters per hour. Cooling water requirement of each boiler unit is at 142,500 cubic meters per hour.

6.2.3.2 Discharge / Outfall Structure

The cooling seawater will exit the turbine's steam condenser and the SWFGD aeration chamber with a combined temperature of approximately 7.1^{o}C above ambient. This discharged water will pass through a diffusion pool which combines it with fresh seawater and further lowers the temperature of the effluent. Temperatures at the mixing zone are not expected to exceed the DENR standard of no more than 3^{0}C from its ambient temperature. The effluent is then conveyed to Pagbilao Bay through an open channel. The discharge pipes will extend 414 m offshore at -1 m. Discharge rate is the same as seawater intake rate of 142,500 cubic meters per hour per boiler unit or 570,000 cubic meters per hour for the four boiler units of CLPPC.

6.2.3.3 Water Treatment of Cooling Water System

Electro-chlorination will be done to prevent slime and marine growth in the seawater piping systems. Marine growth, if not prevented, will reduce the heat transfer capability in the condensing plant and reduce the transmission capacity of the sea water piping.

Chlorination is performed by injection of hypochlorite solution produced by seawater electrolysis into the cooling water inlet. The injection is performed by continuous/shock chlorination of a maximum of 1.5 / 5 mg/L active chlorine. Residual chlorine concentration will conform to the World Bank standard of 0.2 mg/L.

6.3 Power Supply System

During construction, the project is expected to use more than 5,000 kVA of power either from portable generator units or from a temporary line from the local electricity distribution arm.

From the power plant, the power generated by the power plant will be stepped up to 500 kV level for direct connection into a 500 kV NGCP Pagbilao substation via a double circuit overhead transmission line. The length of the transmission line is about 11 km from the plant site.

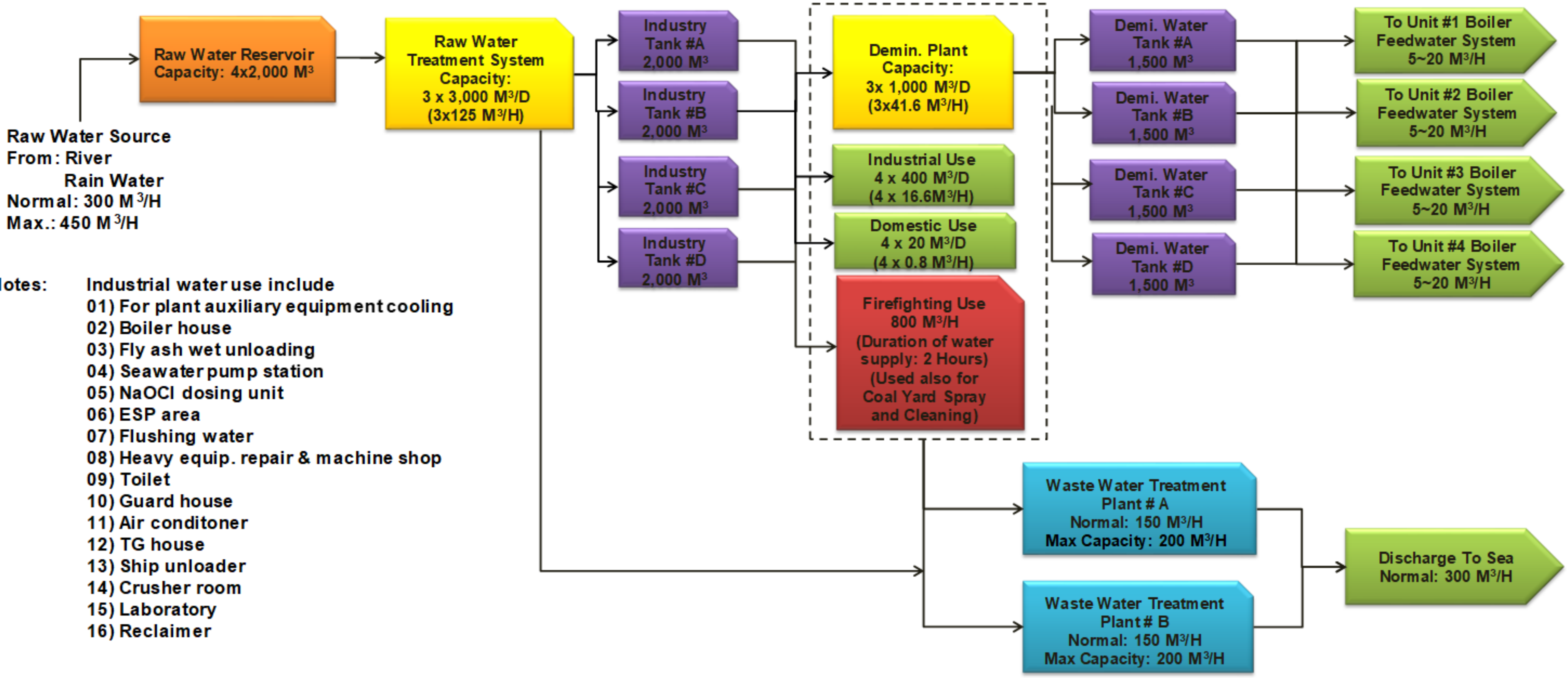
6.4 Ash Disposal System

Ash is a major waste product from the combustion of coal and requires the setting-up of a designated disposal area and method. The expected total ash generated for each boiler is about 216 tons per day. Once the final configuration (4x355 MW) is made operational, the combined amount of ash generated will be at 864 tons per day.

Figure PD-16 presents the material balance.

RAW WATER BALANCE DIAGRAM (PRELIMINARY ONLY)

4 x 335 MW PC [Below Data Base on Four (4) Units]



Notes: Industrial water use include

01) For plant auxiliary equipment cooling
02) Boiler house
03) Fly ash wet unloading
04) Seawater pump station
05) NaOCl dosing unit
06) ESP area
07) Flushing water
08) Heavy equip. repair & machine shop
09) Toilet
10) Guard house
11) Air conditoner
12) TG house
13) Ship unloader
14) Crusher room
15) Laboratory
16) Reclaimer

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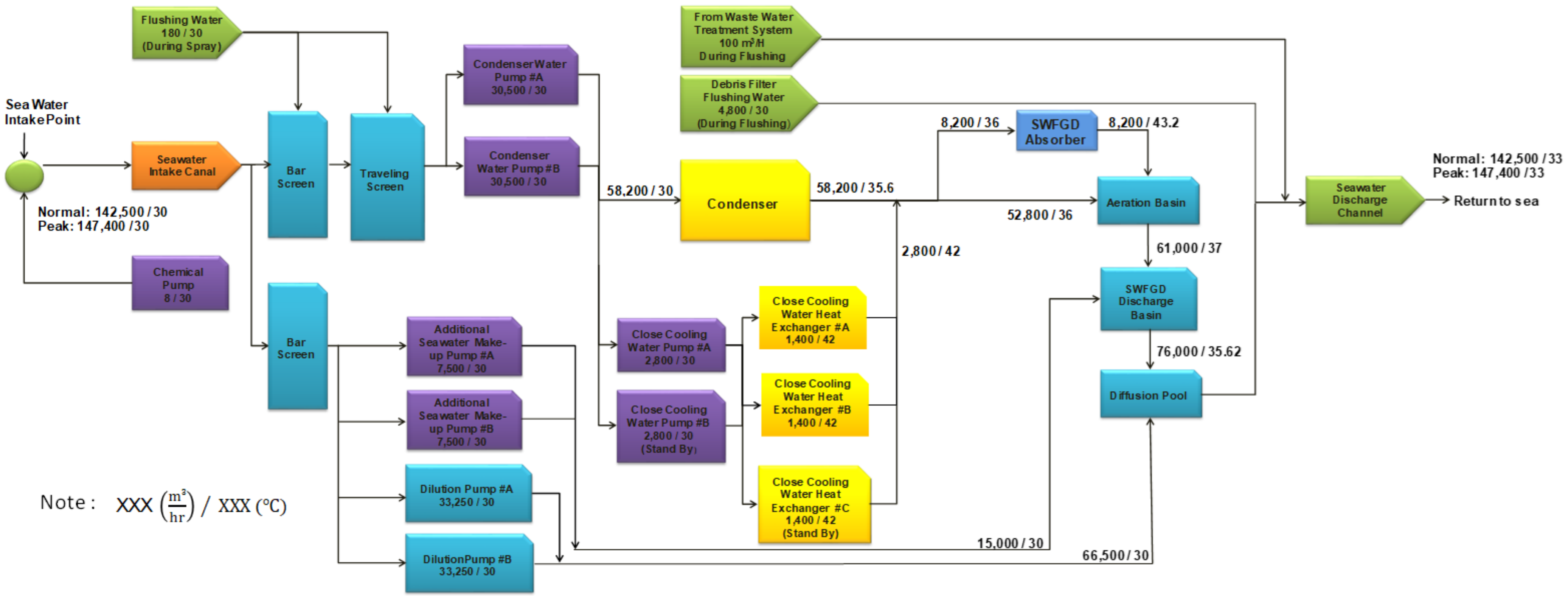
2020.04.13 Update

Figure PD-14. Raw water balance diagram

SEAWATER BALANCE DIAGRAM (PRELIMINARY ONLY)
4 x 355 MW PC (Below Data Base on One Unit)



Note : $XXX \left(\frac{m^3}{hr}\right) / XXX\ (^\circ C)$

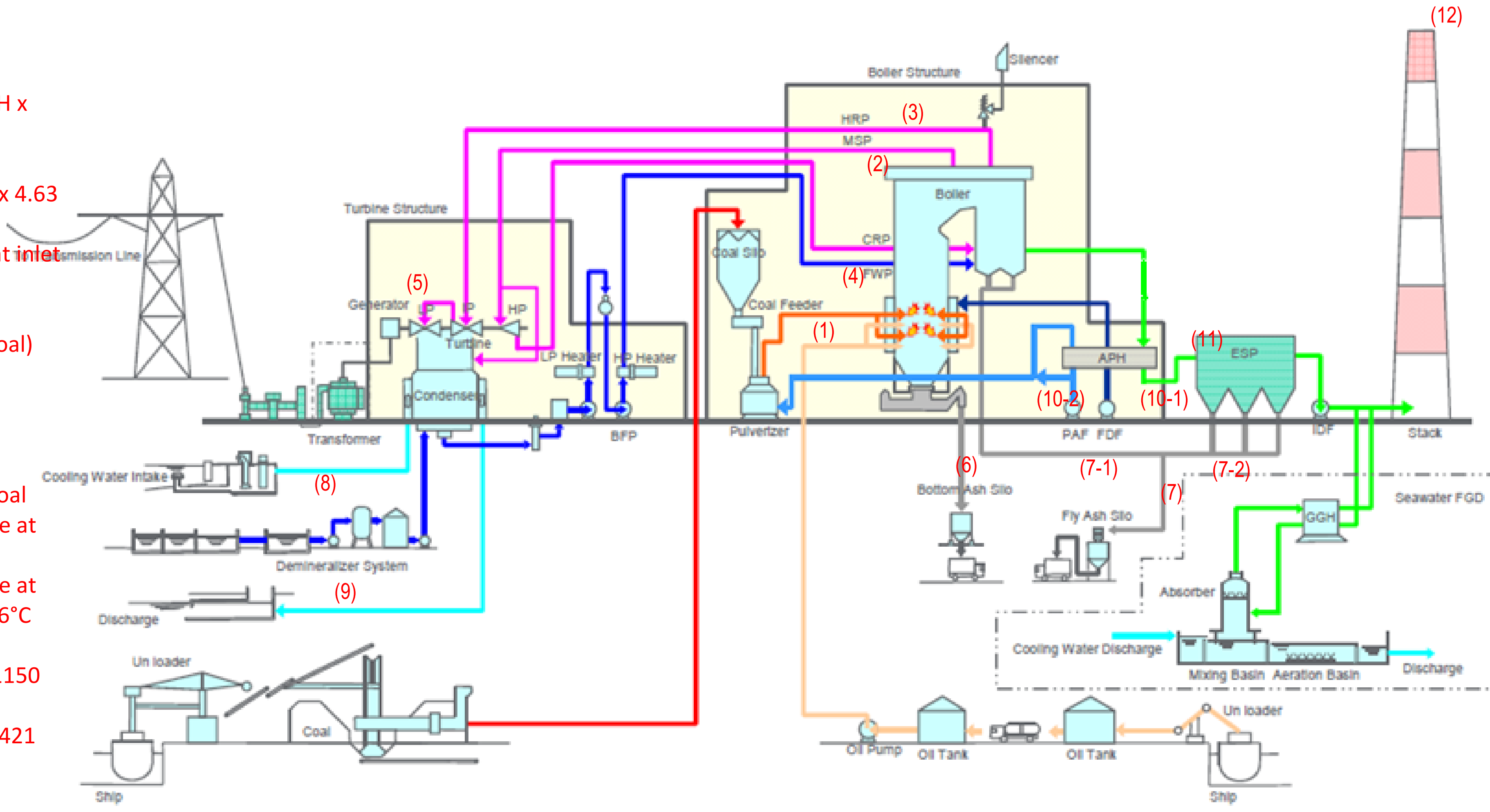
Notes:
Sea Water Intake for 4 Units
Normal: 570,000 / 30
Peak: 589,600 / 30

Formosa Heavy Industries

2020.1.15

Figure PD-15. Seawater balance diagram	LEGEND: As above	DATA INFORMATION/SOURCE: **Source:** As Above	PAGE 33
ENVIRONMENTAL IMPACT STATEMENT 4X355MW PAGBILAO POWER PLANT PROJECT			*Central Luzon Premiere Power Corp.* aperçu CONSULTANTS INC.

(1) Fuel
Coal: 173.4 T/H@TNCR
(2) Main steam flow rate, pressure, temperature (boiler outlet): 1,003 T/H x 25.25 MPa(g) x 569 °C
(3) Reheat steam flow rate, pressure, temperature (boiler outlet): 776 T/H x 4.63 MPa(g) x 598 °C
(4) Feed water flow rate, temperature at inlet of economizer: 1,003 T/H x 300°C
(5) Generator output: 365 MW (Gross)
(6) Bottom Ash: 0.9 T/H (Spring Snow Coal)
(7)Fly Ash: (7-1) 0.3 T/H Economizer + (7-2) 7.8 T/H ESP = 8.1 T/H
Unburned carbon:
≤ 3%@ Spring Snow Coal
≤ 1%@ Masinloc Unit#3 guarantee Coal
(8) Cooling water flow rate, temperature at condenser inlet: 58,200 m^3/hr x 30°C
(9) Cooling water flow rate, temperature at condenser outlet: 58,200 m^3/hr x 35.6°C
(10) Combustion air flow to furnace: (10-1)+(10-2) = 736 T/H + 414 T/H = 1150 T/H@TNCR
(11) Flue gas flow at air heater outlet: 1421 T/H@TNCR
(12) Stack outlet
NOx : ≤450 mg/Nm^3 (219 ppm)
SOx : ≤200 mg/Nm^3 (70 ppm) (by SWFGD)
Particulate: ≤50 mg/Nm^3 (by ESP)
CO: ≤500 mg/Nm^3



SCHEMATIC DIAGRAM OF TYPICAL COAL-FIRED BOILER PLANT

FIGURE PD-16. Material balance diagram	**Legend** As Above	**Source:** SMC GLOBAL POWER HOLDINGS CORP.	*Central Luzon Premiere Power Corp.* aperçu CONSULTANTS INC.	**PAGE 34**
ENVIRONMENTAL IMPACT STATEMENT SMC 4x355MW PAGBILAO POWER PLANT PROJECT	**Not Drawn to Scale**			

6.4.1 Ash Handling System

The combustion process will generate two types of ash: fly ash and bottom ash. Fly ash can range from 80 to 90 percent of the total ash and comprise the fine particulates that rise with the flue gases. The fly ash generated will be hauled out from the plant and sold to the cement firms and brick makers. Bottom ash makes up the balance of the total ash and is taken from the furnace bottom and cooled in an ash cooler, before being sent to the bottom ash silo, which has a 5-10 days storage capacity. From the ash silo, ash shall be delivered by truck to the ash disposal area. The ash disposal area for this facility will occupy a 30-hectare area at the northeast and south area of the property.

6.4.2 Ash Pond Linear System

The plant's ash disposal area will have a double lining system consisting of a compacted layer of silty sand topped with a geo-membrane (HDPE liner) or in-situ clay material. It is almost comparable to the USEPA standard for ash treatment (**Figure PD-17**) but compacted silty sand will be applied instead of compacted clay. Two (2) groundwater monitoring wells representing the upstream and downstream sections will be installed to detect if leaks are present in the ash disposal area which will be built to handle a storage capacity of 25 years.

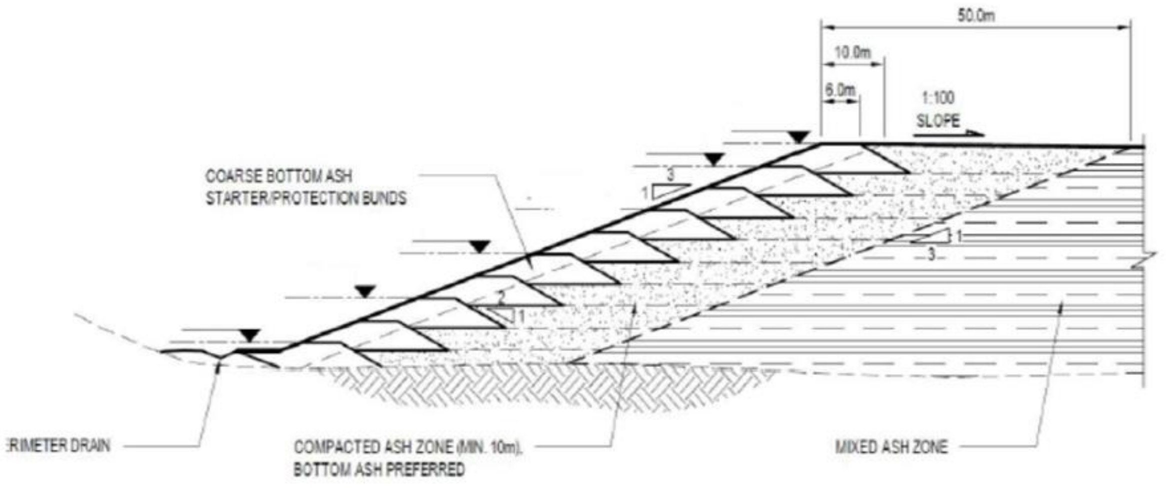


Figure PD-17. Coal ash treatment/ design

6.4.3 Ash Disposal Facility Lifespan

The ash disposal facility will be shared by the CLPPC 4x355MW Power Plant and the LETI 2x355MW Power Plant. Each unit will be producing 9 tons per hour of ash which is equivalent to 38,016 cubic meters of ash per year. Hence, CLPPC will be producing 152,064 cubic meters of ash per year. LETI, on the other hand, will be producing 76,032 cubic meters of ash per year. The 30-hectare ash storage area identified can accommodate about 5,530,554 cubic meters of ash for about 24 years. It should be noted that about 10-20% of the total ash is bottom ash while 80-90% is fly ash which will be sold to cement industries.

6.4.4 Reutilization of Ash

CLPPC will dispose of the reusable components of the ash to reduce the amount of ash disposed at the ADA. The fly ash waste from the power plant can be used in a variety of structural and low strength fill applications. It can be used as mineral filler for paints, shingles, carpet backing and other products. It can also be used in manufacturing bricks, blocks, mortars and stuccos. Other possible uses of fly ash are in the neutralization and processing of human sludge waste into fertilizer and in the stabilization of sewage and toxic sludge.

The largest application of fly ash, however, is in the production of concrete. Concrete is the most common building material and is primarily a mixture of gravel, sand, cement and water. Compounds in the cement react with water to form glue that binds the sand and rock into a hardened mass. When fly ash is added to the concrete mix, some of the cement can be eliminated. Mechanically, fly ash particles are small and spherical – allowing them to fill voids and provide a "ball-bearing" effect that allows less water to be used. Chemically, fly ash reacts with excess lime that is created when cement is mixed with water, creating more of the durable binder that holds concrete together. The result is concrete that is more durable and stronger over time, than concrete made with cement alone.

Other benefits of using fly ash in concrete include: 1) decreased permeability, 2) reduced damage from heat of hydration, and 3) increased resistance to sulfate and other chemical attack. Thus, using fly ash in concrete and other building products eliminates the need to dispose them in landfills (Pring, 2011).

The bottom ash normally has limited reuse potential and is usually used as grading material and filling material. It is thus mainly bottom ash that will be stored at the ash disposal area since the fly ash component will be sold.

6.4.5 Leachate Collection and Treatment

The ash disposal area will be equipped with perforated pipes for leachate collection and to prevent overflow. The collected leachate shall be pumped to the leachate treatment facility for neutralization and treatment.

6.4.6 Water Spray System

During summer, it is expected that dust will be generated from the ADA when the heap is dry and there is wind blowing. To prevent this, the ADA will be sprayed with recycled final effluent coming from the leachate treatment plant, with the water sprayed intermittently and applied as needed. The dust control water spray, which shall be manually operated, will utilize portable firewater monitors set at fog mode to maximize wetting over wide areas. During the rainy season, dust suppression will not be necessary, and the firewater monitor equipment can be removed and stored. The sprinkler system will use fog cannons or dust suppression sprayer for effective ash control system. The fog cannons are suited for dusty environment and uses high-pressure water fogging which creates an ultra-fine fog consisting of very fine (less than 10 microns) water droplets. These tiny droplets absorb even the smallest dust particles in the air, yet fall to the ground without wetness.

6.4.7 Maintenance of Ash Disposal Facility

Regular maintenance of the ash disposal facility is largely aimed at minimizing potential problems by dealing with them before they cause major problems. Some aspects of the maintenance program can be integrated with the monitoring program. Where minor problems are detected, they may be corrected as generally described within the ash disposal facility manual or is to be noted within a maintenance register to be addressed later as part of a dedicated work program.

Major or complex problems will be immediately notified to the ash dump facility designer. The designer may address directly or escalate appropriately based upon an assessment of the conditions and situations involved.

The urgency of all maintenance at the facility should be based on the potential for the problem to affect the operation or integrity of the facility or cause damage to the environment. General details are discussed in **Table PD-9**.

Table PD-9
Maintenance of Ash Disposal Facility

Maintenance	There is no fixed period for maintenance of the ash dump facility. General maintenance of the dump facility will be undertaken in conjunction with construction operations and as required following events such as typhoons or earthquakes. Dump maintenance may include, but not be limited to; • Locally trimming eroded batters; • Re-grading surfaces to provide drainage; • Trimming of vegetation growth of the downstream face; • Filling of low points to avoid water ponding; and • Locally excavating and re-compacted areas of extensive erosion. Maintenance of the dump should generally be as directed by the ash dump designer.
Leachate Pond	Similar to the ash disposal facility, there is no fixed period for maintenance of the leachate pond. General maintenance of the pond will be on an as required basis. Maintenance may include, but not be limited to; • Locally trimming eroded batters; • Replacing slumped rip-rap; • Trimming of vegetation growth of the downstream face; • Clearing the spillway of any blockages; and • De-silting by vacuum truck, dredge, or excavator. Maintenance of the pond should generally be as directed by the ash dump designer.
Drains	The perimeter drains shall be routinely inspected and de-silted on no more than a monthly basis. Should low points develop within a drain due to settlement that results in significant water ponding or impairment of flows, then the low point shall be filled with either thick cement grout or mass concrete to a level such that water flows away. Major cracking or other damage to drains should be treated as directed by the designer.
Access Roads	Access and perimeter road maintenance shall generally be on an 'as required' basis. Maintenance shall generally compromise of treating of ruts, potholes, or any damage that may be created by extreme rainfall events and maintaining appropriate grades and surfaces to facilitate drainage. Small ruts and potholes may be treated by locally filling with select granular base course materials and compacting using a tamping plate. Larger ruts or potholes may require locally excavating, shaping, and removal of unsatisfactory materials prior to the placement of base course materials. The access and perimeter road should be re-graded initially every 6 months; however, the frequency may be varied to suit the pavement condition as required.
Routine Surveillance	The operation of the ash dump facility may pose a significant hazard to personnel on the site, members of the public, the environment, and the operation and credibility of CLPPC. To assist in the management of the hazards, regular and routine surveillance of the dump is to be undertaken to monitor and assess the performance of the dump. This shall assist in identifying potential problems, addressing them early, and developing plans to improve efficiency. Routine surveillance should be undertaken of the ash dump and appurtenant structures to assess their condition, to identify items that require maintenance, and to provide information on the long-term performance. Generally, routine visual inspections should be undertaken between a daily to a tri-weekly basis. Additional inspections may be required after large or extreme weather or geo-hazard events, such as typhoons or earthquakes. The following section lists some of the items that may be inspected during routine surveillance of the ash dump facility: • General dumping operations and ash zoning; • Erosion or riling of the ash dump;

	• Low points in the dump; • Ponding water and or wet/soft areas; • Seepage from the dump; • Slumping or movement of the downstream face; • Condition of vegetation on the downstream face; • General effectiveness of dust suppression activities; and • Checking for presence of foreign material within the dump (i.e. organic matter). The condition of the ash dump should be noted in a logbook, and as a minimum, it should include the date of the inspection, the name of the person undertaking the inspection, the general condition of the dump, and list any action items that may be required.
Construction and Dust Suppression Equipment	All construction and dust suppression equipment should be regularly serviced in accordance with the manufacturer's recommendations.

6.5 EMISSION CONTROL DEVICES

To significantly reduce emissions, the power plant facility will be equipped with Low NOx burners, flue gas desulfurizer (FGD), and an electrostatic precipitator (ESP). Emission control facilities are designed to emit less gaseous emissions than the Clean Air Act and World Bank Standards as follows:

Table PD-10
Emission Standards

Parameter	CAA (mg/Ncm)	World Bank (mg/Ncm)	Expected CLPPC Emissions (mg/Ncm)
SOx, calculated as SO_2	700	1,000	200
NOx, calculated as NO_2	1,000	650	450
Particulates	150	50	50
CO	500	No Standard	500

6.5.1 Low NOx Burner & Over-fire Air

To achieve extremely low NOx emissions, CLPPC will adopt a two-stage combustion system with Low NOx burners and overfire air (OFA) ports. Features of the two-stage combustion are shown in **Figure PD-18.**

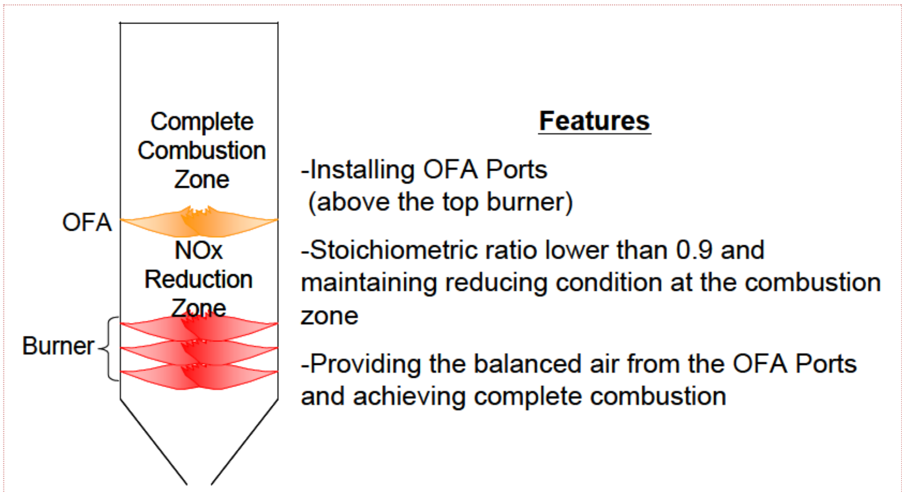


Figure PD-18. Two-stage combustion features

CLPPC will include a Low NOx burner to achieve extremely low NOx with complete combustion and with control of furnace slagging and superheater fouling. It will apply the concept of in-flame NOx reduction which has been achieving considerable NOx reduction with no adverse effects or decreased flame temperature. As a result, the trade-off of NOx reduction and increased unburned loss has been improved.

In-flame NOx reduction is achieved by control of individual flame structure by the flame stabilizing ring and the guide sleeve. This reduction method is effective in rendering coal contained organic nitrogen compounds, transformed promptly to gas phase and providing easier reaction. Also, the flame is maintained at a high temperature making it possible to prevent unnecessary delayed combustion from occurring.

6.5.2 Electrostatic Precipitator

CLPPC will install a dry horizontal flow electrostatic precipitator (ESP), capable of providing 99.5% removal of particulate emissions. An ESP is a particle control device that uses electrical forces to move the particles out of the flowing gas stream and onto collector plates using the force of an induced electrostatic charge. Electrostatic precipitators are highly efficient filtration devices that minimally impede the flow of gases through the device and can easily remove fine particulate matter such as dust and smoke from the air stream (**Figure PD-19**).

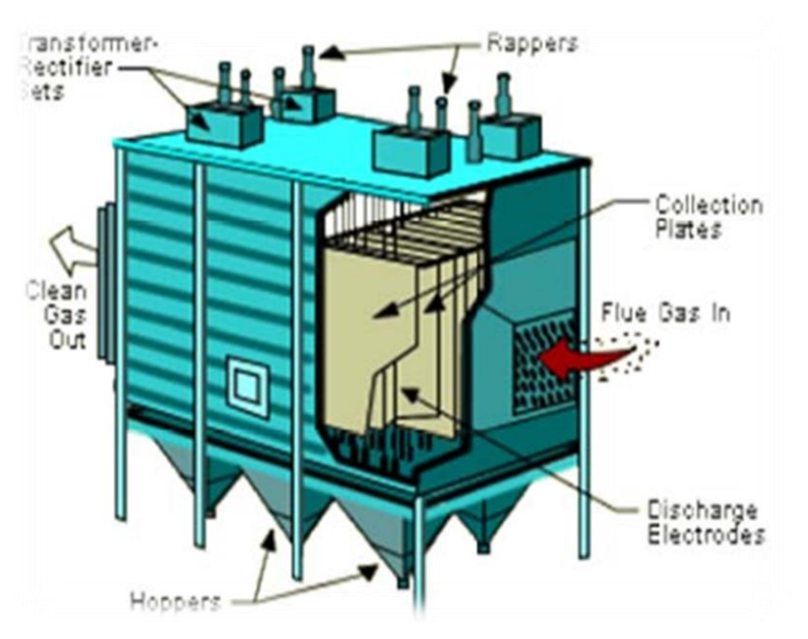


Figure PD-19. Electrostatic precipitator diagram

Several high-power discharge electrodes are placed inside the collector. The incoming gases pass by the first set of discharging electrodes (ionizing section) that give the particles a negative charge. The now ionized particles pass the next set of electrodes (the collection section) that carry a positive charge. The positively charged plates attract the negatively charged particles causing them to collect on the plates. Cleaning is accomplished by vibrating the electrodes either continuously, or at timed intervals, causing the captured dust to fall off into a hopper below. All of this can be done while the system is operating normally.

The use of ESPs has the following advantages:

- Very high efficiency, even for smaller particles
- Ability to handle very large gas flow rates with low pressure losses
- Ability to remove dry, as well as, wet particles
- Temperature flexibility in design

6.5.3 Seawater Flue Gas Desulfurizer

CLPPC will utilize seawater flue gas desulfurizer (SWFGD) technology to control SOx emissions, utilizing the ability of seawater to absorb and neutralize SOx in untreated flue gas (**Figure PD-20**).

SWFGD is an attractive technology for SO_2 removal at power stations as the medium for desulphurization is seawater which is abundant at the power stations from a condenser. The effluent seawater can also be released to the sea without affecting the oceanic environment. Flue gas treated at an absorber is released to the atmosphere through a stack installed thereafter, while spent seawater is sent to a seawater treatment system (SWTS) to oxidize HSO_3 and improve DO and pH. With no use of chemical additives, a SWFGD plant produces no by-product nor harmful wastes, and it is free from any scaling problem which can be often seen in the conventional FGD plants under limestone or caustic soda processes.

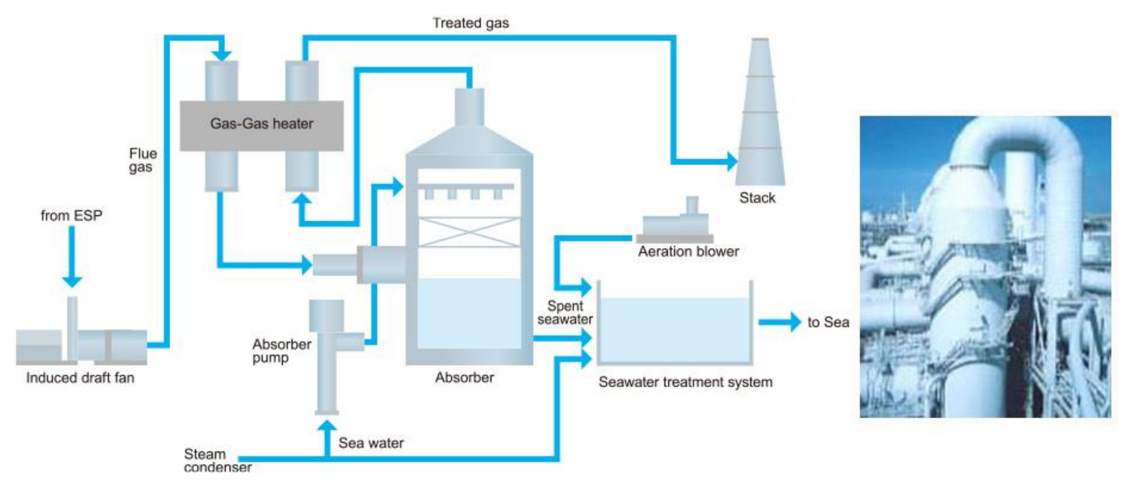


Figure PD-20. Seawater flue gas desulfurizer diagram[2]

6.6 WASTEWATER TREATMENT FACILITIES

6.6.1 Wastewater Treatment Plant

An industrial wastewater treatment plant will be constructed to treat the wastewater that will be generated from the demineralization plant. The expected amount of wastewater generated by the plant is 300 cubic meters per hour or 7,200 cubic meters per day.

Wastewater from the boiler area, firefighting and filter flushing will be discharged to a preliminary basin for temporary storage. Water from the drainage system will be discharged to a special retention basin. Water quality of the combined discharges will be analyzed and treated in the wastewater treatment plant (WWTP) to ensure compliance with Clean Water Act guidelines.

6.6.2 Sewage Treatment Plant

Sewage in the area of the power plant will be conveyed through a separate network and treated in a sewage treatment plant (STP). The STP is to be operated on the basis of the activated sludge process with common sludge stabilization. The single-basin sewage technique will be used for the biological sewage treatment. Generally, the planned sewage plant consists of the biological reactor, the sludge silo and the auxiliary plants and facilities. The expected amount of sludge generated by the treatment plant will be 360 kilograms per day. The STP is to be designed as a compact plant that aims at BOD degradation, nitrogen elimination and

[2] https://www.tsk-g.co.jp/en/tech/industry/seawater-method.html

sludge stabilization in an odorless mode of operation. The sludge will be mineralized and properly disposed of. Considering the standard effluent limits for COD (<200 mg/l) and BOD (<100 mg/l), the biological purification stage will be required, if a connection to the drainage system is not available. Treated effluents will drain into Pagbilao Bay.

6.7 SOLID WASTE MANAGEMENT

Apart from ash, solid wastes to be generated by the project shall also consist of:

- Household waste consisting of biodegradable waste materials from food and nonbiodegradable materials such as plastics, wrappers, crates or boxes used as food packaging material;
- Debris and other materials from construction activities; and
- Industrial solid wastes, such as wasted conveyor belts and barrels, damaged vehicle and equipment parts, etc.

First aid waste materials will be disposed of following the Medical Wastes Control Regulations of the Philippines.

Other wastes generated will be classified as biodegradable, nonbiodegradable and recyclable. These will then be properly disposed of based on their classification. The plant will endeavor to comply with disposal regulations stipulated in the Solid Waste Management Act.

The Solid Waste Management Plan (SWMP) of the project will employ the "3 Rs": reduce, reuse, and recycle. This is to extract maximum benefits from waste products in order to generate the minimum amount of waste.

The SWMP will involve the following:

- Provision of compost pits for biodegradable waste. Compost may be supplied to the residents for use as fertilizer for vegetable gardens.
- Recycling or recovery of solid waste materials such as papers, refuse from repair shops, tires, batteries, for other alternative uses and to be sold to prospective buyers from the nearby barangays.
- Provision of garbage disposal sites for wastes that cannot be recycled or cannot be composted.
- Hazardous wastes (hazwastes) generated during the construction and operation phases will be disposed of in compliance with RA 6969. Some of the hazwastes generated and their storage and disposal methods are provided in **Table PD-11.**

Table PD-11
Hazardous Wastes Associated with Power Plant Operations

Hazardous Wastes	Handling Method	Treatment
Oil	Above ground tank storage	Reuse as fuel for boiler
Vegetable oil	Above ground tank storage	-
Chlorobenzene	Stored in the chemical laboratory in safety cans and bottles	-
Acetone		-
Heptane		-
Karl Fisher		-
Grease trap waste	Stored in drums	Reuse as fuel for boiler
Lead compounds (lead acid batteries)	Stored in hazardous wastes storage facility	Neutralization of battery fluid in neutralization basin of WTP
Mercury compounds from busted lamps		-
Empty paint containers; thinner		-
Medical wastes; expired medicines	Stored in hazardous wastes storage facility, will be encapsulated cans; bottle containers	-

6.8 SAFETY FEATURES

6.8.1 Control of Coal Spontaneous Combustion

Spontaneous combustion has long been recognized as a fire hazard in coal storage areas. Spontaneous combustion fires usually begin as "hot spots" deep within the reserve coal pile. The hot spots appear when coal absorbs oxygen from the air. Heat generated by the oxidation then initiates the fire.

One of the best ways of controlling spontaneous combustion is by preventing it. The following general methods will be applied at the proposed power plant:

1. Proper management of coal storage inventory – Coal retention time should be just enough to dry the coal for firing but not long enough to start spontaneous combustions. Three to four weeks is the target retention time.
2. First In – First Out (FIFO) fuel inventory management shall be practiced.
3. Proper coal compacting in the storage area shall be practiced to minimize air intrusion inside the pile.
    a. Coal compacting practice shall be by horizontal layers.
    b. Layers are developed or leveled by scraping and compacted by rolling.
    c. Uncompacted coal piles shall be limited to a height of 4.5 m.
4. Smoking and other activities that can start ignition shall be banned from the area.
5. Proper clean-up practices in the area and equipment shall be in place to prevent build-up of coal dust that can lead to spontaneous combustion.
6. Temperature probes shall be strategically located within the coal storage area.
7. Firefighting equipment shall be installed and made available.
8. Fire emergency plan shall be developed and implemented.
9. Training of power plant firefighters for coal combustion control shall be conducted.

6.8.2 Chemical Storage

The power plant will require various chemicals needed for its operation. A chemical storage facility will be constructed to contain chemicals needed for a minimum of 14 days of continuous operation at full plant load. Depending on the final detailed design of the Engineering, Procurement and Construction (EPC) contractor, the chemical storage tanks may be constructed using reinforced concrete with a bund wall surrounding it to contain any leakage. For large-sized chemical storage tanks, a concrete wall and concrete covered ditch will be installed around the tanks that will be able to contain leakage. The ditches to be excavated will have a capacity equivalent to the volume of the largest tank. As an additional safety feature, emergency valves will be installed for each tank. The drainage channels of the chemical storage area will be connected with an oil retainer and through this unit, the drainage waters will be transferred to the general drainage system.

Other safety design features that will be installed in the facility are:

- Solid and liquid chemical storage silos and tanks with adequate moisture and will be fitted with CO_2 traps to prevent deterioration or contamination in storage.
- Suitable traps and scrubbers will be fitted to chemical tank vents which may release volatile or harmful vapors
- Chemical tanks will be lined with corrosion resistant materials or made of corrosion resistant materials

Chemicals normally associated with coal-fired power plants include:

1. Water Treatment
    - Coagulant - HE500ICP (ACH)
    - Polymer 100%
    - NaOCl 12%
    - HCl 32%

- NaOH 45%
- Antiscalant 100%
- SBS 15%
- H_2SO_4, 60%

2. Condensate Polisher Plant (CPP)
    - HCl 32%
    - NaOH 45%
3. Waste Water Treatment System
    - Coagulant - HE500ICP (ACH)
    - Polymer 100%
    - HCl 32%
    - NaOH 45%
    - H_2SO_4, 60%

6.8.3 Security, Safety and Fire Protection

Only authorized personnel will be allowed access to the project site, which will be fenced from the start of construction phase and during operation phase, to ensure the security.

A "SAFETY FIRST" policy will be strictly followed. Appropriate personal protective equipment (PPE) will be required to all personnel inside the construction area. Safety instructions will be given to all personnel and contractors before being allowed to work on site.

6.8.3.1 Fire Alarm System

All materials installed for the fire alarm system and its components will conform to relevant standards and regulations. Automatically activated detectors of the fire alarm system will provide early detection of fire. Push button activation will be provided for manually operated fire alarms in staircases and corridors, exits and escape routes. Fire alarm pushbuttons will also be provided in outdoor installations. Aside from a loudspeaker system, indoor and outdoor sirens will be provided as a warning system.

The alarm signal receiving units shall be of the types listed below, and contained in one fire alarm circuit:

- Flame detectors for detection of open fire;
- Smoke detectors for detection of visible smoke formation;
- Temperature indicators for the detection of fast temperature rises and, exceeding limit values; and
- Smoke-gas detectors for the identification of different gases (H_2; CO; NOx) and the early detection of fires.

The fire protection system will include both automatic and manual features to provide alarm, detection and suppression capability consistent with building code requirements, Fire Code and other pertinent industry practices.

6.8.3.2 Emergency, Preparedness and Response Plan

Other emergency preparedness guidelines and activities that the project will implement are discussed in the Environmental Risk Assessment Section (**Chapter III**) of this EIS report.

7.0 PROJECT SIZE

Table PD-12
Project Parameters

Parameters	Values	Details/Source
Total project area	30 hectares for the ash pond 18 hectares for the coal yard 14 hectares for the power plant area 10 hectares for the water treatment and auxiliaries 3 hectares for the buffer zone 2 hectares for the admin building and warehouses 2 hectares for the CLPCC transmission line 2 hectares for the TeaM Energy Transmission line 51 hectares of unused areas	
Gross capacity of each unit	355 MW	
Net generating capacity per unit	315 MW	
Operational Requirement		
Power Requirement per unit	40 MW	Suppliers Data
Coal Usage per unit	173.4 tons/ hr	Suppliers Data
Ash Production for 4 units	9 tons/hr	Suppliers Data
Freshwater requirement (normal condition for 4 units)	300 m^3/hr	Palsabangon River or Desalination Plant
Cooling Water Requirements per unit	142,500 m^3/hr	Pagbilao Bay

8.0 PROJECT PHASES

8.1 DEVELOPMENT PLAN AND DESCRIPTION OF PROJECT PHASES

Figure PD-21 is the project schedule.

8.1.1 Pre-Construction

Activities included for the pre-construction phase of the project will include:

1. Land Acquisition – The project site will be leased by CLPPC.
2. Preliminary Engineering Studies – This includes cadastral, topographic, hydrographic surveys and soil investigation study.
3. Access Road and Drainage Construction
4. Earthworks
5. Other activities during the pre-construction phase include:
   - Finalization of engineering designs – The final layout of the various facilities of the power plant
   - Contractor selection
   - Identification of sources for manpower and materials
   - Application of local government permits necessary for construction

8.1.2 Construction Phase

This phase will mainly see to the construction of the major as well as the ancillary facilities of the power plant. Construction activities include:

- Vegetation Clearing
- Earthworks
- Delivery of construction materials to and from the site
- Laydown of construction materials
- Pilling, foundation and other civil tasks
- Erections of steel, and all mechanical & electrical equipment
- Commissioning
- Start-up activities of installed equipment

During the construction, power requirements will be organized by the selected Engineering, Procurement and Construction (EPC) contractor through Local Power Distribution Company or Gensets. The temporary construction power line and a transformer with a switchgear will be furnished and installed to supply the power needs for construction machinery, the office and the staff barracks. The EPC contractor shall also furnish an environment management program that includes water management and waste management systems that will be approved by CLPPC and the LGU. CLPPC will also coordinate with the local water district and private water contractors for the water supply during construction phase.

In the commissioning phase, power requirement will be initially accommodated by National Grid Corporation of the Philippines (NGCP). However, after the units pass the initial single equipment commissioning stage and unit start-up tests, units can generate power to satisfy in house demand, which means no external power supply is needed most of time at this stage.

While coal is used in all generation test, diesel fuel and an auxiliary boiler is used during unit start-up attempts and steam blowing which is universal requirement to clean up all debris and deposits left inside high-pressure steam pipes during construction. Emission during test and commissioning will be managed through air pollution control device as much as technology allows. However, by nature, upset conditions will happen more often than any other operating stages due to unstable conditions, but all upset conditions will be governed by the local Environmental Management Bureau (EMB) and special emission permit shall be obtained prior to commissioning stage. Furthermore, all emission guarantee test will be certified by DENR authorized third party.

8.1.3 Operation Phase

The plant shall be designed and constructed for flexible operation. It is anticipated that the plant will operate at base load for approximately 330 days a year. The power plant will undertake planned unit overhauls during periods of lower power demand.

The main activities during the operation phase, described in detail in previous sections of the Project Description, are listed below:

a. Electricity generation – The proposed project will generate electricity in phases. A 1x355MW generation unit will be installed initially while the succeeding three (3) units will be operational one after the other after every four (4) months. The electricity generated will be transmitted to the Luzon grid.
b. Sourcing of coal – Coal will be sourced from Indonesia or Australia and will be delivered to site via coal carriers.
c. Disposal of Ash – Daily operation of the power plant for all 4 boiler units will result in ash estimated at 864 tons per day. Fly ash can be sold to cement firms or to brick makers. Unsold ash will be stored in a lined ash disposal area on site.
d. Abstraction of freshwater for domestic plant use – Daily freshwater requirements of the plant is estimated at 7,200 cubic meters per day and will be drawn from Palsabangon River or produced by a desalination facility. As discussed in the previous section, a separate company will be commissioned if water will be sourced from Palsabangon River, and thus, a separate permitting process will be undertaken.

e. Abstraction of seawater for cooling purposes – The power plant will obtain approximately 158.3 cubic meters per second of seawater from Pagbilao Bay and return this as effluent within 3°C of the seawater intake temperature.
g. Treatment of wastewater from various plant process sources – Control of effluents from the operations of the power plant are described in detail in Section 6.6 the Project Description.

8.1.4 Abandonment Phase

The CLPPC plant is expected to be operational for 25 years. A detailed decommissioning or abandonment plan will be prepared in the unlikely event that the power plant is no longer viable to operate and maintain. The plan will specify studies to be undertaken such as site assessment and remediation activity if the site is considered contaminated, the equipment to be recovered or disposed, and alternative use of the abandoned area.

9.0 MANPOWER

CLPPC will prioritize qualified residents from Barangay Ibabang Polo and Municipality of Pagbilao. The anticipated manpower requirement for the project will be as follows:

Table PD-13
Manpower Requirements

Development Phases	Manpower Requirement	Details
Construction	2,000	60% skilled 40% unskilled
Operation	250	
• Middle Management	15	Majority with engineering degrees or comparable levels with management experience Others with chemistry degrees
• Rank and file	127	Majority with mechanical or electrical engineering degrees
• Cadetship	8	PCO, CSR, HR, Safety, Security, Accounting, Firemen, Warehouse, Procurement, Training
• Indirect employees via contract or cooperatives	100	Security, Housekeeping/ Janitorial, Grounds keeping, Food preparation, Maintenance

As long as the person is qualified for a position regardless of gender, that person will be considered. For senior citizens and PWDs, the company could provide livelihood opportunities through projects with the San Miguel Foundation. Highly skilled employees are direct-hired and unskilled employees are agency hired. For agency-hired employees, the third-party provider will be evaluated prior to providing contract and availing of their services. A Human Resource representative will check with government agencies for the statutory benefits if the provider gives these.

10.0 PROJECT COST

The estimated total capital cost of the Project is Php 140 Billion.

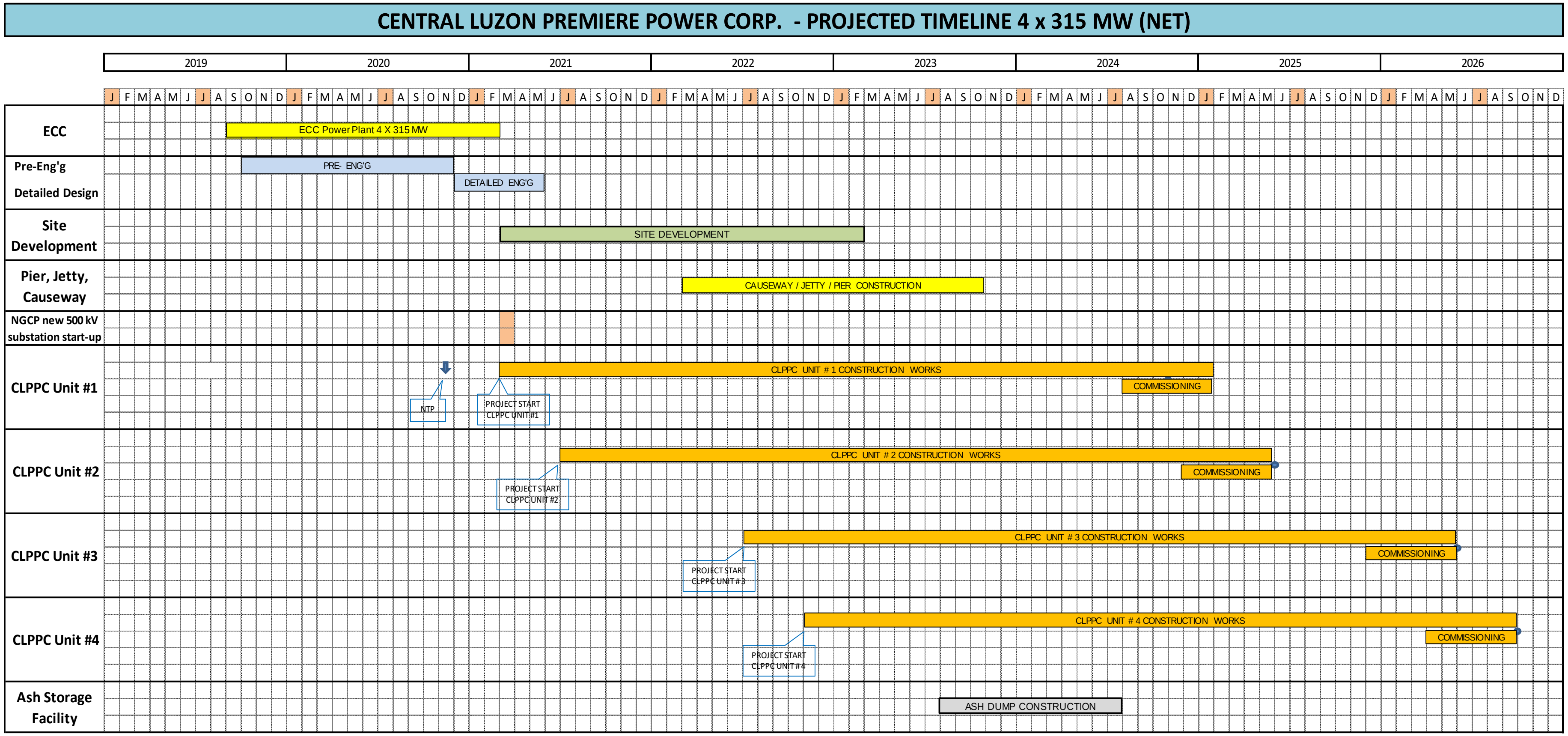


Figure PD-21. CLPPC power plant project schedule

11.0 MAJOR ENVIRONMENTAL IMPACTS AND MANAGEMENT MEASURES

The predicted impacts and corresponding mitigation measures of the Project at various stages are tabulated in **Table PDS-7**.

Table PD-14
Predicted Environmental Impacts and Management Measures

Impact	Options for Prevention or Mitigating Measures
I. CONSTRUCTION PHASE	
A. Land	
Long term commitment of land resource to a specific use	• Compatibility with the land use plan of the municipality.
Change in landform/topography	• Landscaping after Project construction. • Proper siting of the pier to minimize impacts of scouring and erosion on bottom topography.
Stripping of all unsuitable soil near-surface	• Other than disposing of unsuited excavated soil as fill material, some may be retained for landscaping the site.
Loss of vegetation. Disturbance of habitat will result to displacement of wildlife	• Trees will be balled and transferred. • Open and unused areas within the plant site will be replanted as soon as practicable. • Develop a carbon sink program and provision of a forest nursery of native and indigenous tree species. • Maintaining a buffer zone.
B. Water	
Generation of sewage and solid wastes	• Placement of regulations on proper waste disposal. • Provide proper waste disposal and toilet facilities.
C. Air	
Fugitive dust resulting from ground clearing operations and structure erection	• Regular spraying if water where earthwork activities are considered. • Replacement of vegetation in non-structure area. • Compacting of exposed soil and immediate hauling of spoils.
SOx and NOx emissions from heavy equipment	• Regular maintenance of heavy equipment and motor vehicles.
Increased sound levels from construction activities	• Regular maintenance of motor vehicle mufflers. • Proper scheduling of noisy activities during daytime. • Inform community when activities will generate excessive noise.
II. OPERATION PHASE	
A. Land	
Dumping and storage of ash and its associated impacts	• Establish properly built lined ash pond to prevent leaching and erosion. • Utilization for other purposes by prospective buyers.
B. Water	
Local ponding or flooding	• Drainage system will be established and maintained. • Silt traps along drainage-ways will be installed.
Leakage of leachate in the ash pond to the local groundwater system	• Provide linings for on-site ash and sludge landfill. • Regular groundwater monitoring will be conducted to determine any breach in the lined ash disposal area. • Coal stock yard will be provided with peripheral drain canal going to a sedimentation basin. • Lining of coal yard with an impervious material.
Effluent discharges	• Effluents treatment, if to be re-used. Effluents discharged to Pagbilao Bay will comply with DENR effluent standards.

Impact	Options for Prevention or Mitigating Measures
Disturbance of benthic, coral, and fish communities with the construction of the jetty and the outfall	• Jetty and discharge pipe foundation will be carefully designed to avoid shallow coral formations off the Project site.
Effects on the marine environment by thermal effluents and delivery of coal by cargo ships	• The cooling facility will be designed to meet the DENR standards. Updated charts will be provided to all barge captains to make them aware of the remaining coral and fish communities at the shallows. • Delivery ships will be made to comply with the code of practice for unloading.
Thermal pollution	• Release of cooling effluents offshore where water is deep and there is strong water mixing. • Conduct thermal dispersion modeling studies for different monsoonal seasons. • Locate the effluent outfall offshore, away from coral reef areas.
Coal spillage	• Provision of coal catchments and conveyor belts with skirts. • Avoid coal transfers during inclement weather. • Hire highly trained and experienced crane operators.
Impingement of marine organisms in the intake structure	• Construction of exclusion devices to prevent the entry of fauna in the intake structures. • Conduct personnel training on rescue protocol of important marine organisms.
Disturbance of dugong and marine turtle nesting area	• Establish a buffer zone around dugong and marine turtle feeding and nesting grounds and enhance nesting areas by beach nourishment and turning lights away from nesting sites. • Develop a rescue plan for important marine species.
C. Air	
Fugitive dust emissions	• Dust management measures, such as water spraying to dry areas, will be imposed. • Maintain vegetation around the area to serve as dust curtain.
Noise emissions	• Provision of noise barriers and mufflers.
SOx and NOx emissions and other greenhouse gases from coal combustion	• Installation, proper operation and maintenance of necessary pollution control devices to comply with the stipulations of the Clean Air Act and other applicable environmental laws. • Installation of Continuous Emission Monitoring System (CEMS) for real-time monitoring of plant emissions.
Particulates from operation of coal yard and ash handling	• Provision of wind barriers covers for trucks and conveyors and dust suppression system. • Closed system for transport and storage.
D. People	
Positive impacts to the local economy and on the public sector	
Possible growth of population because of employment opportunities	• Planning for this impact will be initiated by CLPPC in coordination with the LGUs.
Stimulate growth of power-dependent industrial and business activities. Help boost the local economy as well	
Financial benefits from payment of taxes	
Adverse public health impacts (if any)	• Conduct of an Environmental Risk Assessment (ERA)