PROJECT DESCRIPTION REPORT (PDR) for SCOPING

1.0 Basic Project Information and Background

Table PD-1. Project Fact Sheet/PD Summary

ITEM	Project Information
Name of Project	**Proposed 3 x 135 MW Circulating Fluidized Bed Coal-Fired Power Plant Expansion Project**
Project Location	Barangays Balacanas and Tambobong, Municipality of Villanueva, Province of Misamis Oriental, Region 10.
Nature of Project	Coal Power Plant
Project Size	Additional 3 x 135 MW

Table PD-2. Project Proponent/EIA Preparer

ITEM	Project Information
Project Proponent	**FDC MISAMIS POWER CORPORATION**
Proponent Address and Contact Details	Unit D, 11th Floor, Cyber Sigma, Lawton Avenue, McKinley West, Fort Bonifacio, Taguig City 1630 +632.575.1600 / +632.819.6131
Responsible Officer	**Mr. Roderick Fernandez**
EIA Preparer	**Technotrix Consultancy Services Inc. (TCSI)**
Preparer Contact Persons	**Edgardo G. Alabastro Ph.D.**
Preparer Address and Contact Details	Unit 305 FMSG Building, #9 Balete Dr. Cor. 3rd St. QC 1101 Telephone No.: (02) 416-4625 Mobile No.: 09178255203 E-mail address: technotrixinc@gmail.com

2.0 PROJECT DESCRIPTION

Project Location, Area and Description

FDC Misamis will construct the proposed expansion project within the vicinity of the existing power plant. The location is inside the PHIVIDEC industrial area. The power plant and ancillary sites are within the political jurisdiction of Barangays Balacanas and Tambobong, Municipality of Villanueva, Province of Misamis Oriental.

The political boundary will extend to Barangay Sta. Cruz in the Municipality of Tagoloan since the powerplant will still source its raw water requirements from Tagoloan River. The water obtained from Tagotloan River will be used as boiler feedwater.

The area for the existing and expanded power plant and auxiliaries is 84.4 hectares, excluding the pier and the pumping station in Tagoloan River. The project will acquire an additional area of 3 hectares for a new conveyor system.

Geographical Coordinates (In WGS 84)

The geographical coordinates of the project site/land and of the ash repository pond and river pumping station are given in **Table PD-3, Figures PD-1 and PD-2.**

Table PD-3 Geographical Coordinates of Project Site

Point	Coordinates
POWERPLANT	
1	8°33'39.32"N 124°44'40.93"E
2	8°33'39.47"N 124°44'40.97"E
3	8°33'40.41"N 124°44'42.14"E
4	8°33'43.81"N 124°44'41.82"E
5	8°33'50.44"N 124°44'43.67"E
6	8°33'55.34"N 124°44'48.16"E
7	8°33'56.10"N 124°44'45.92"E
8	8°33'48.09"N 124°44'52.71"E
9	8°33'40.52"N 124°44'59.00"E
10	8°33'33.02"N 124°45'5.30"E
11	8°33'25.39"N 124°45'11.45"E
12	8°33'17.46"N 124°45'18.31"E
13	8°33'13.91"N 124°45'13.94"E
21	8°33'9.30"N 124°45'8.07"E
22	8°33'16.83"N 124°45'59.77"E
23	8°33'24.32"N 124°44'53.21"E
24	8°33'31.82"N 124°44'47.21"E
RAW WATER PUMPHOUSE	
1	8°32'23.51"N 124°46'8.10"E

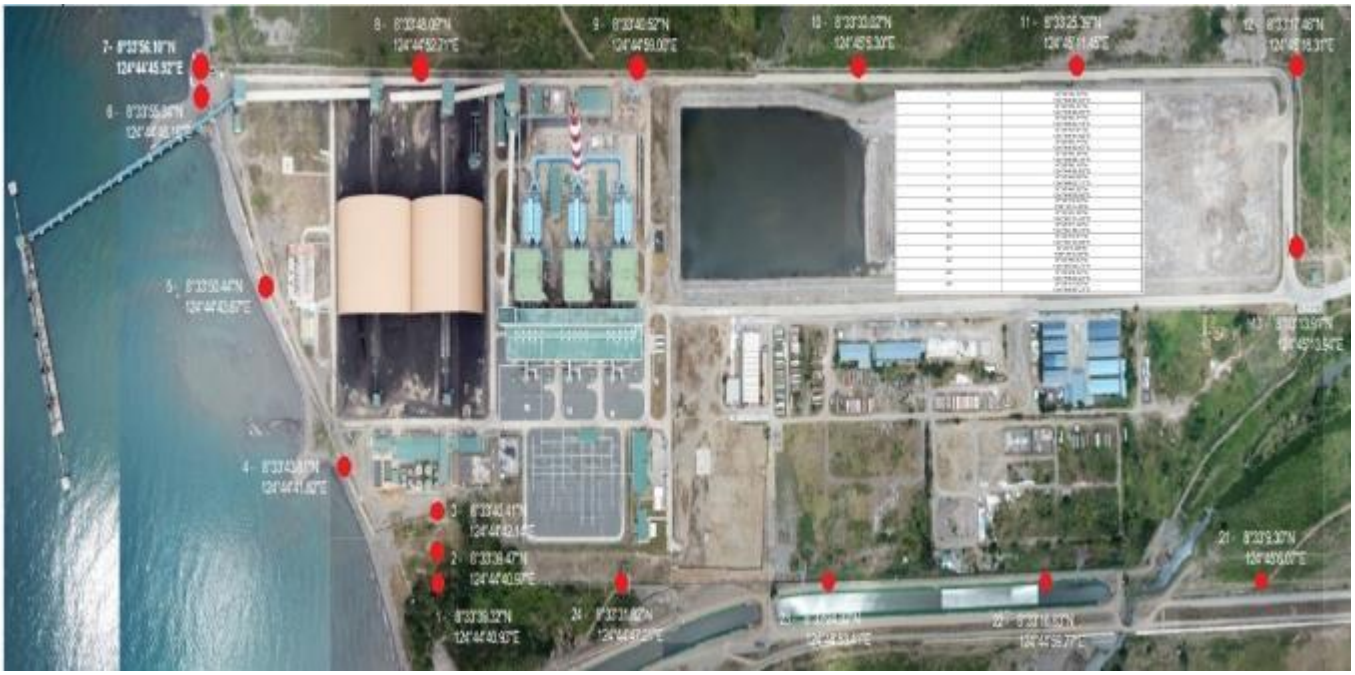


Figure PD-1. The power plant facility indicating therein the geographical coordinates

Figure PD-2. Location of the Raw Water Pumphouse indicating therein the geographical coordinates

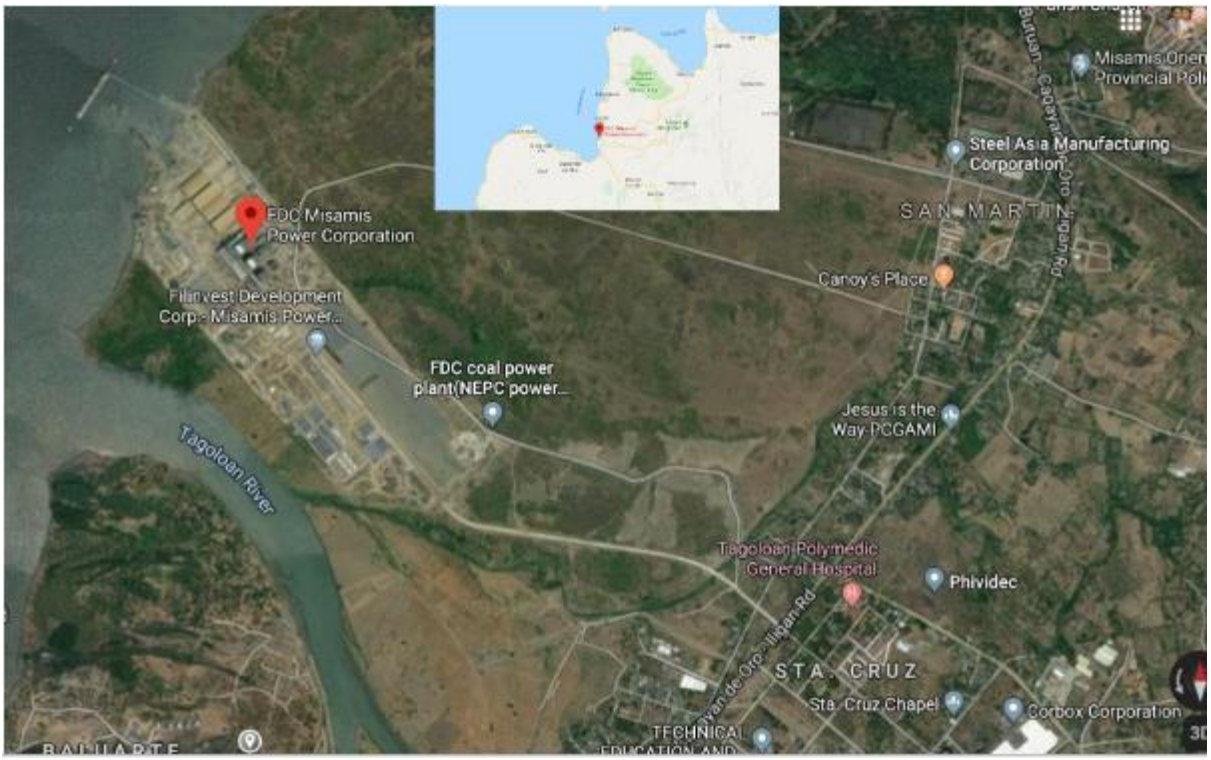


Figure PD-3 The Site of the Project in a Google Earth Map

Maps showing sitio, barangay, municipality, province, region boundaries surrounding the area

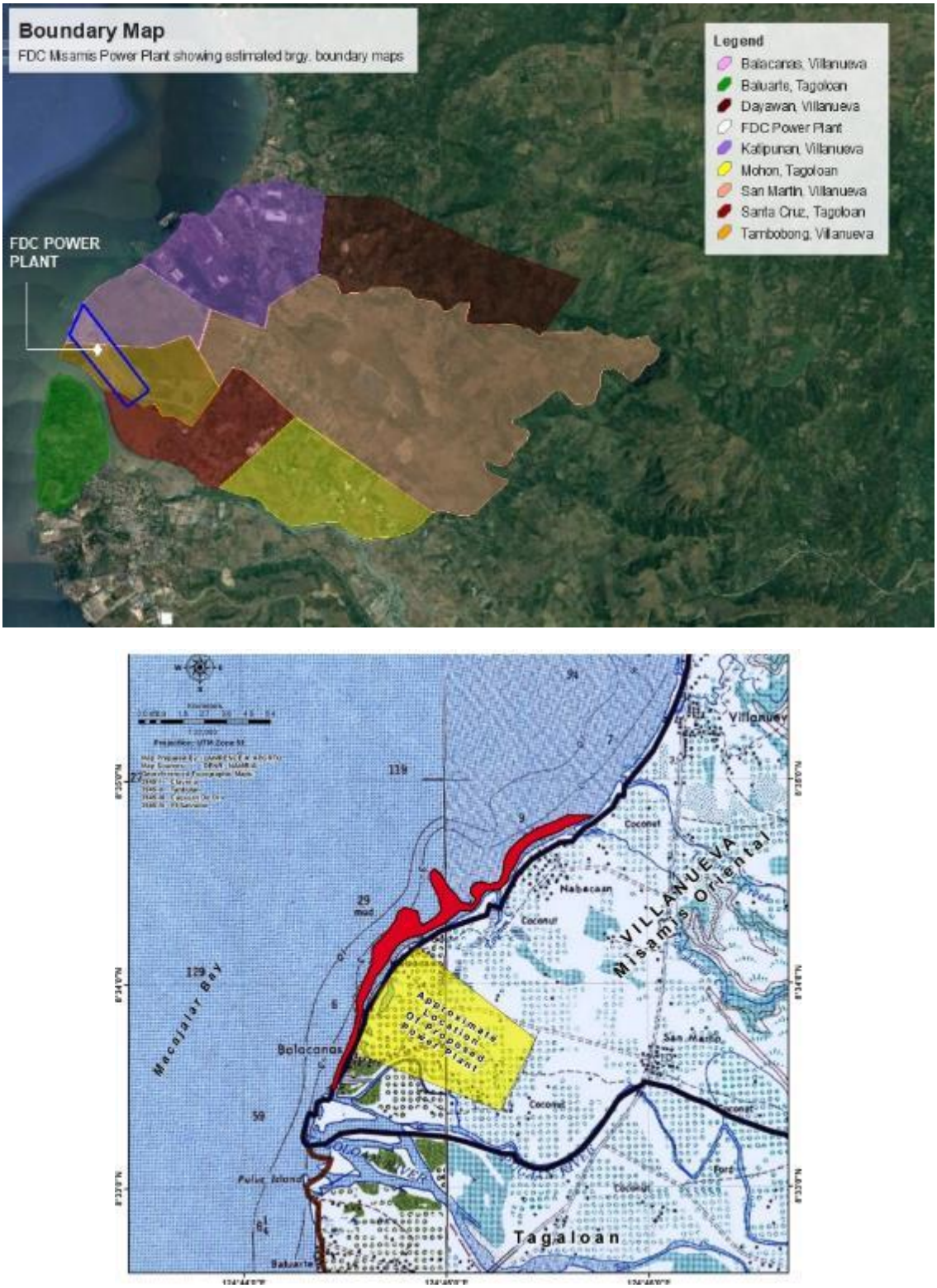


Figure PD-4. The political boundaries of the Project Site

Accessibility

The site is accessible by road through the main highway and an access road, which is owned by the Phividec Industrial Estate and located within its premises.

Figure PD-5 shows the waypoints by road to the project site

Figure PD-5. Map Showing the Access Waypoints to the Project Site

Aerial Photographs of the Project Site (Taken within the last 3 months)

Plate PD-1. Aerial photograph showing the facilities and the covered coal yard

Plate PD-2. Photograph showing the stack, covered coal yard, image of the pier and the Macajalar Bay

Plate PD-3 Photographs of the River Pumping Station

Primary & Secondary Impact Areas (Pre-EIA)

Rationale for selection of primary & secondary impact areas

As indicated in the Revised Procedural Manual, the guidelines to delineate a project's direct impact area (DIA) and indirect impact area (IIA) are as follows:

a) The direct impact area is *the area where **all** project facilities are proposed to be constructed/situated and where **all** operations are proposed to be undertaken. For most projects, the DIA is equivalent to the total area applied for an ECC.*

b) The IIA *can only be assumed or qualitatively estimated but may be guided by secondary data and information from key interviews from reliable local authorities. An IIA can be the stretch of the river/s **outside** the project area but draining the project site which can potentially transport. Total Suspended Solids and other discharges from the project towards downstream communities.*

c) Further, the interphase/overlap of the biophysical DIA with socio-cultural environment shall define the socio-cultural DIA after the EIA is completed.

Direct Impact Area (DIA)

- The project site itself

- Portions of the Macajalar Bay where the project will locate the cooling water intake and outfall structures and the pier

Figure PD-7 is the Map Showing the Coral Reef Areas fronting Proposed Power Plant

- Part of the Tagoloan River where the project will build the river water intake and piping structures
- The plume of air pollution discharges from the plant's boilers, wherein the ground level concentrations (GLCs) exceed the Clean Air Act guidelines.

The Indirect Impact Area (IIA)

- The population and social centers which are outside the air dispersion plume, i.e. the Environmentally Sensitive Receptors (ESRs)

- The access road leading to the project site, which is owned by PHIVIDEC

Figure PD-6 shows the DIA and IIA of the project.

DIA : The areas inside the yellow contour
IIA: The areas outside the yellow contour and inside the blue box

Figure PD-6. The Pre-EIA Impact Areas

The Impact Areas Per DAO 2017-15

The above delineation of the Impact Areas is consistent with the guidelines of DAO 2017-15, Revisions may be made based on the result of the Public Scoping acitivity,

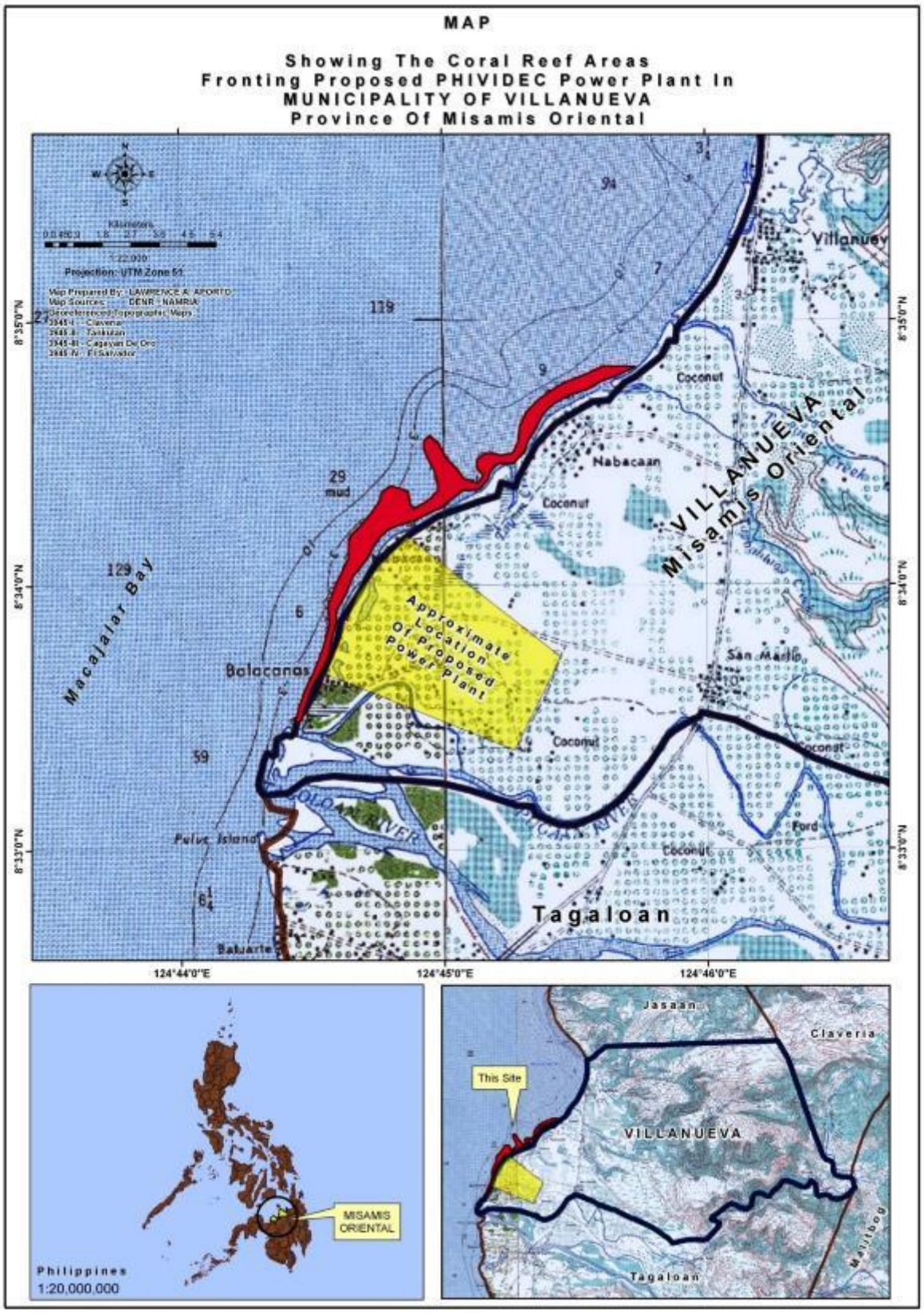


Figure PD-7. Map Showing the Coral Reef Areas fronting Proposed Power Plant

2.1 Project Rationale

The prospects for the robust economic and social development of Mindanao will continue in the medium-term and long-term forecasts. Considerable investments

Power is crucial in supporting the infrastructure to such development. The primary rationale for this project is to ensure the reliable and cost-friendly supply of power to the Island in response to the supply-demand outlook projections of the DOE as may be seen in **Figures PD-8** and **PD-9**.

- The FDC Misamis Power Corporation is planning to expand its current operations to address the need for additional power in Mindanao. The proposed expansion will contribute to increasing the electric power supply in the region.
- The need for additional supply is because of economic development in the region. Gross regional domestic product in Mindanao has been above 7% in 2017 and 2018. For the past three years, the average growth in peak demand in the Mindanao is the highest among the three island grids with a consumption growth rate at 8%.
- Mindanao posted a 6.91% average growth in peak demand while Luzon is at 6.83% and Visayas at 5.12%.

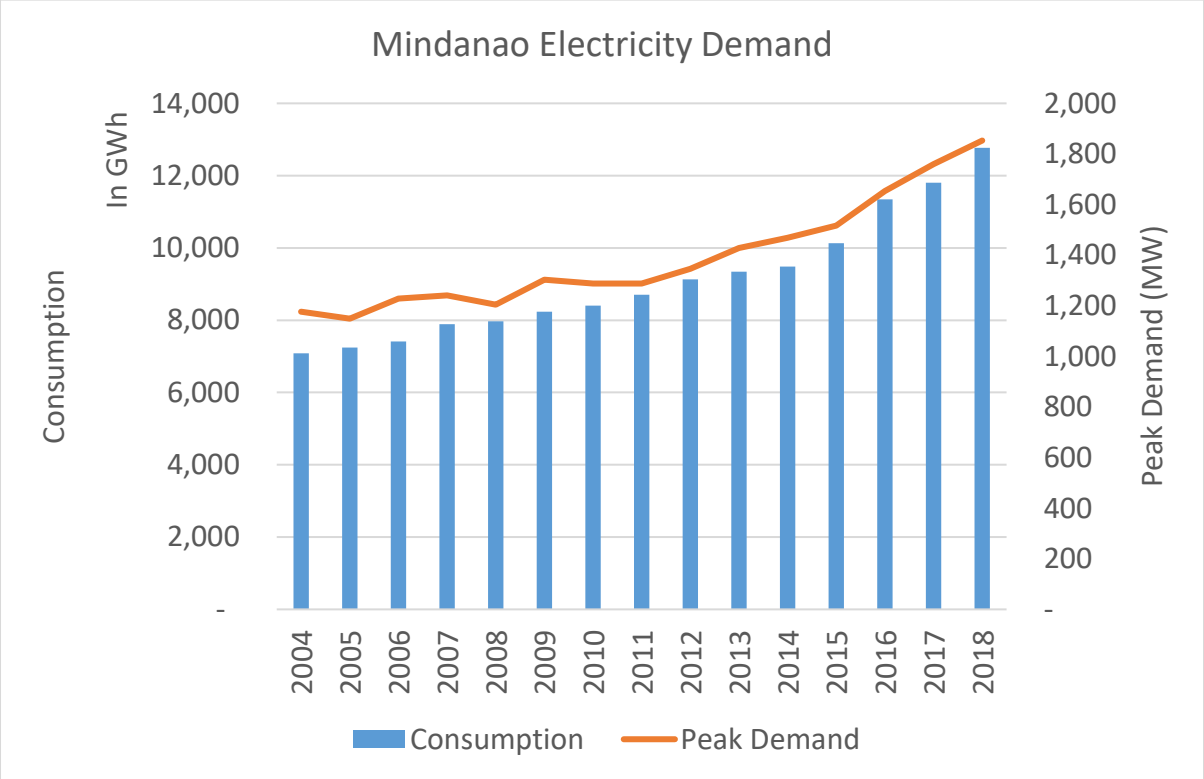
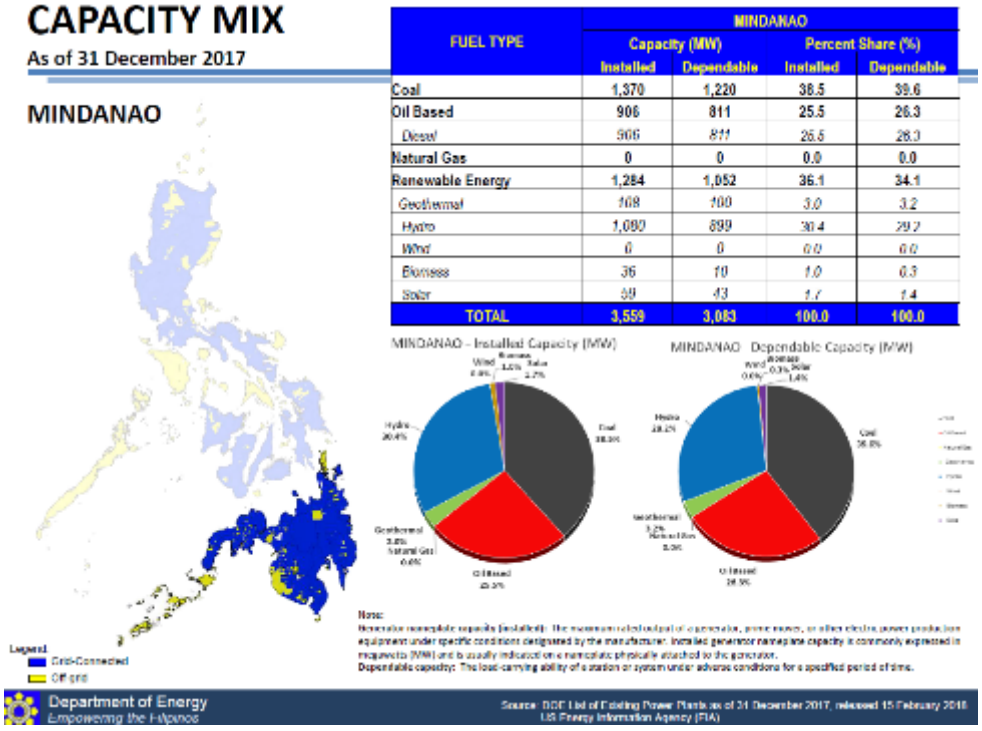


Figure PD- 8. The Mindanao Power Demand and Consumption (Source: DOE)



FUEL TYPE	MINDANAO			
	Capacity (MW)		Percent Share (%)	
	Installed	Dependable	Installed	Dependable
Coal	1,370	1,220	38.5	39.6
Oil Based	906	811	25.5	26.3
Diesel	*906*	*811*	*25.5*	*26.3*
Natural Gas	0	0	0.0	0.0
Renewable Energy	1,284	1,052	36.1	34.1
Geothermal	*108*	*100*	*3.0*	*3.2*
Hydro	*1,080*	*899*	*30.4*	*29.2*
Wind	*0*	*0*	*0.0*	*0.0*
Biomass	*36*	*10*	*1.0*	*0.3*
Solar	*59*	*43*	*1.7*	*1.4*
TOTAL	3,559	3,083	100.0	100.0

Figure PD-9. Projected Capacity Mix for Mindanao (Source: DOE)

As seen in Figure PD-9 Coal is the dominant source of energy for the Mindanao Power Plants.

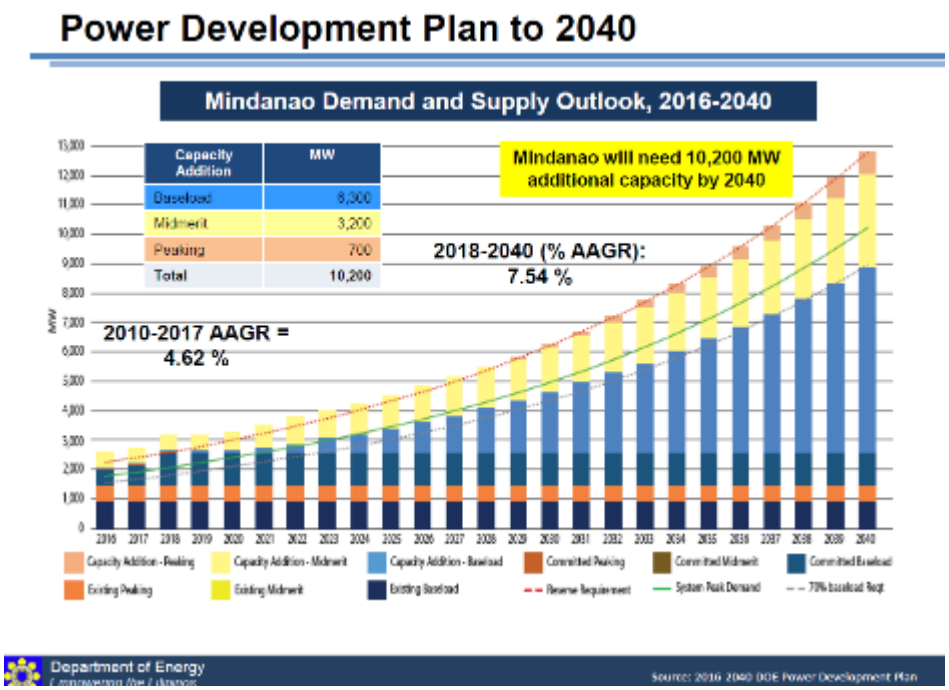


Figure PD-10. The Power Development Plan for Mindanao (Source: DOE)

The global research firm, Fitch Solutions, released their assessment of the electric power market in the country. They see that coal will continue to dominate the energy sector as it "remains the most practical base for affordable electricity generation at the scale needed to support economic activity."

Fitch unit: Coal to remain dominant as renewable energy faces headwinds

55 SHARES 0 1

Danessa Rivera (The Philippine Star) - August 22, 2019 - 12:00am

MANILA, Philippines — Coal-fired power plants are seen to dominate the Philippine power sector in the next decade as it remains to be the cheapest power source, while renewable energy development in the country continues to face headwinds, Fitch Solutions Macro Research said.

In its latest industry trend analysis, Fitch Solutions sees coal making up 59.1 percent of the total power mix by 2028 from 52 percent in 2018, as the resource continues to be the key source for the country's power expansion plan.

The Socio-Economic Benefits from ER 1-94.
The project will present several benefits to its host communities as mandated by the DOE through Energy Regulation No. 1 series of 1994 or ER 1-94. Power generation companies are required to set aside P 0.01 per kWh to fund community projects. Allocation for the different types of projects is different for rural and urban communities, as illustrated in **Figure PD-11**.

For generation facility or energy resource located in non-highly urbanized city

- Electrification Fund (EF) at 50% of one centavo per kWh (P0.005/kWh)
- Development and Livelihood Fund (DLF) at 25% of one centavo per kWh (P0.0025/kWh)
- Reforestation, Watershed Management, Health and Environment Enhancement Fund (RWMHEEF) at 25% of one centavo per kWh (P0.0025/kWh)

For a generation facility or energy resource located in highly urbanized city

- Electrification Fund (EF) at 75% of one centavo per kWh (P0.0075/kWh)
- Development and Livelihood Fund (DLF) at 12.5% of one centavo per kWh (P0.00125/kWh)
- Reforestation, Watershed Management, Health and Environment Enhancement Fund (RWMHEEF) at 12.5% of one centavo per kWh (P0.00125/kWh)

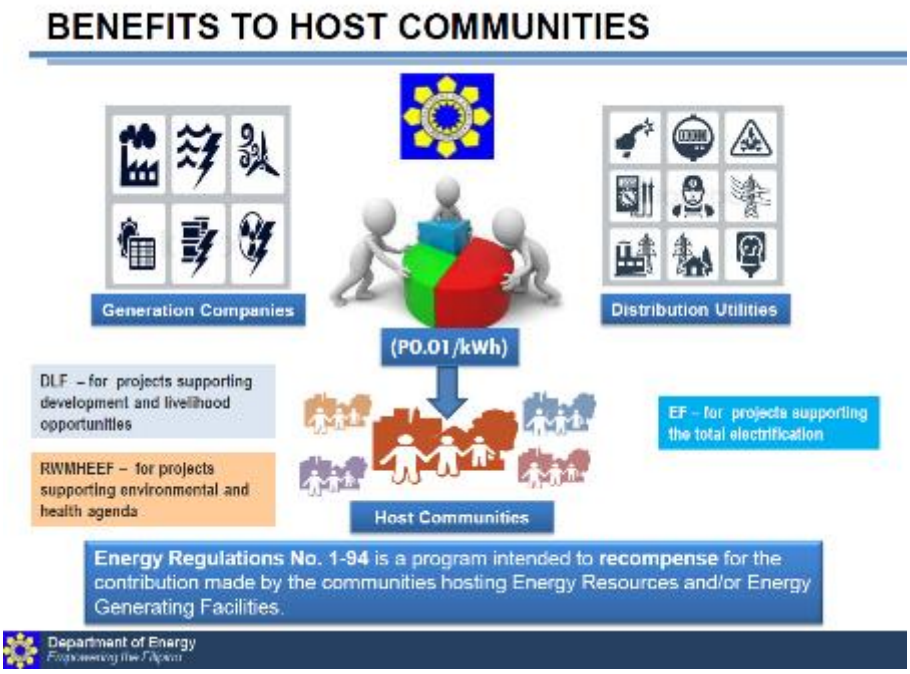


Figure PD-11. Benefits to the Host Communities Through ER 1-94

Regional/Local economic development in terms of contribution to sustainable development agenda or current development thrusts

The government's "Build, Build, Build" program renewed confidence from investors in establishing their businesses in the country, especially in Mindanao.

The project will contribute to the continuing growth of Mindanao considering the projected robust economic and social development. The investments/existing projects in the Misamis Oriental corridor and Mindanao, in general, cannot be sustained without power supply.

On the national level

The growth of Mindanao is critical in the country's overall economic agenda. As reported by the Mindanao Development Authority, Mindanao produces eight of the country's ten agricultural export commodities, including fresh and processed fruits, coconut products, aquaculture products, and rubber. The region has seen growth that has surpassed the country's GDP of 6.2% in 2018. The gross regional domestic product of Davao was one of the highest at 8.6 percent in 2018. The economies of Northern Mindanao and Zamboanga Peninsula were also one of the fastest-growing posting a GRDP of 7.0% and 6.3%, respectively.

Project Alternatives

Inasmuch as the project involves capacity expansion in the same project sites and uses the same technology and energy source as in the current successful operations, it is deemed that there are no other viable project alternatives.

The "Without Project" Scenario

Under this case:

- Lack of energy (power) supply to support the robust economic development will be experienced.

- There will be no replacement power during El Nino events or during preventive maintenance of existing plants. Mindanao is reliant on hydropower resources.
- Reliable electricity supply will be compromised.

3.0 Project Components

Table PD-4 indicates the different project components comparing existing with the proposed facilities that will be built for the expansion.

Table PD-4. Existing and Additional Major Project Components

Existing Facilities	Additional Facilities
3 x Circulating Fluidized Bed (CFB) Boilers	Additional 3 x 135 MW Circulating Fluidized Bed (CFB) Boilers
Three (3) sets steam turbines and electric generators	Additional 3 Steam Turbines and Electric Generators
Covered Coal Storage Yard (active area) / In-plant distribution system e.g. conveyors	Same storage yard with expansion area / additional covered conveyors
15 has. Ash Repository	Additional 12 has. Ash Repository
Jetty (For 55,000 DWT Vessel)	Same jetty
Switchyard	Expansion for the additional units
Air Pollution Control Devices (APCDs)	Additional APCDs
Waste Water Treatment Plant (WWTP)	Expansion for the additional inputs
River Water Pumping Station	Same facility with upgraded pumps
Raw water treatment plant	Same raw water treatment plant
Access Road	Same access with additional plant roads
Others	Dormitory, warehouse

3.1 Criteria for Process/Technology Selection

The project will adopt the same process and technology in its operations since the project is an expansion of the existing power plant. The project considers the circulating fluidized bed as the best option offering the most advantageous option for the projects and its customers.

Preliminary identified environmental aspects for each alternative of site and process technology/options.

Considering the same sites and process technology are involved for the original and the expansion projects, the environmental impacts for each alternatives are not only the same but deemed compliant with environmental rules noting the current compliances to the ECC conditions and to the EMB and MMT monitoring.

Criteria for Resource Utilization

The project is an expansion of the existing coal power plant. Therefore, the criteria in choosing the most appropriate process or technology to be selected relies on compatibility with the existing structure.

More importantly, the current operation has been undertaken successfully both in terms of technical and environmental performances.

Support Facilities (i.e. energy/power generating facility, water supply system)

The expansion will still use existing support facilities, particularly the coal storage facility, jetty, river water pumping station and raw water treatment plant. Raw water will still be sourced from Tagoloan River. Increase(s) in capacities may be involved; these (the increase(s) however, do not have environmental impacts.

For the other facilities, these will be upgraded to meet the needs of the additional capacity as reflected in **Table PD-4.**

Pollution control devices and corresponding facilities being served or connected

Additional air pollution control devices will be installed to cater to the increased requirement brought about by the expansion.

Footprint of proposed layout of project facilities.

Figure PD-12. Proposed Layout/Footprints of Project Facilities

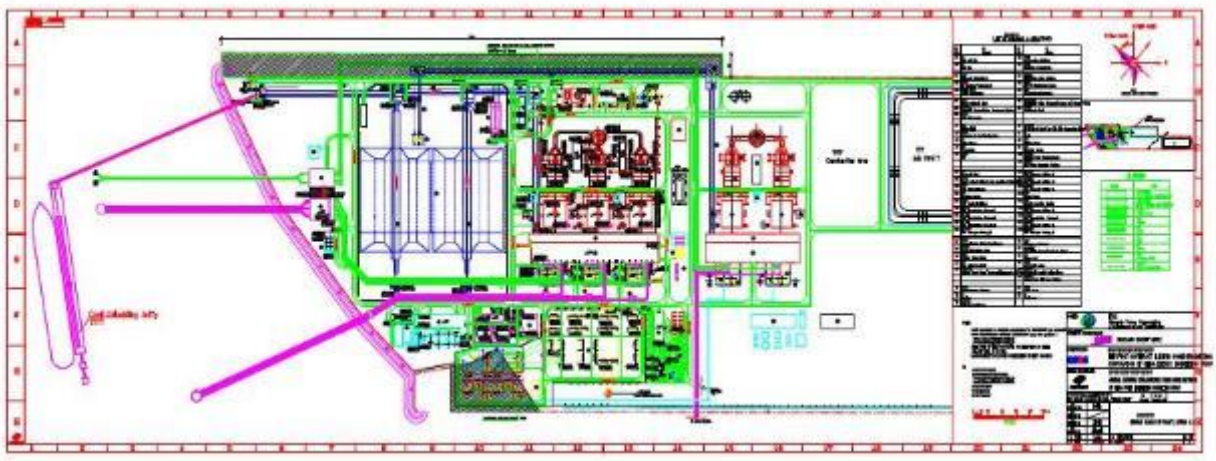


Figure PD-13. The detailed layout of the project facilities

4.0 Process and Technology

Being capacity expansion in nature, the criteria for process/technology selection and resource utilization are limited to the same as the existing project plant configuration and design.

The main feature of the process/technology is the combustion process in which coal as fuel is fired in a Circulating Fluidized Bed (CFB) furnace. CFB technology utilizes the fluidized bed principle in which crushed fuel and limestone are injected into the furnace or combustor.

The general operating principle of fluidized bed combustion involves the feeding of crushed coal into the boiler and burning it utilizing a bed that consists of inert material such as sand. The bed has high heat capacity and is suitable for burning fuels with high moisture content, eliminating the

need for separate fuel drying before the boiler. Given the temperature of the bed material, the quality of the fuel can vary more than in other boiler types.

Before feeding the boiler with the primary fuel, the bed is heated to a temperature which guarantees safe auto-ignition. Preheating will be accomplished using diesel oil fuel.

The air velocity of the bed which is about 4.5-5 m/s causes the circulating action and the effect of fluidization. The combustion air is introduced to the boiler on several levels. The primary air flows upwards and fluidized the bed while the secondary air is injected above the bed. The combustion temperature in fluidized bed boiler is lower than in grate or pulverized firing, typically at 800 – 900 ^{0}C. At this relatively low combustion temperature, NOx which is invariably generated as a result of the mixture of Nitrogen and Oxygen in the air is maintained at lower emission levels.

Sulfur dioxide will be removed in the combustion process by adding limestone or dolomite to the bed, (if necessary) thus eliminating the need for an external desulphurization process and the problem of eventual disposal of sulfur. The calcium oxide formed from the calcination of limestone reacts with the SO_2 to form calcium sulfate, which is removed from the flue gases together with fly ash. The low combustion temperature in fluidized bed systems is optimal for limestone requirements because the required calcium to sulfur ratio for a given SO_2 removal efficiency is low in this temperature range. The CFB has, therefore, built-air pollution control features.

The conceptual diagrams for a CFB process is shown in **Figures PD-14**.

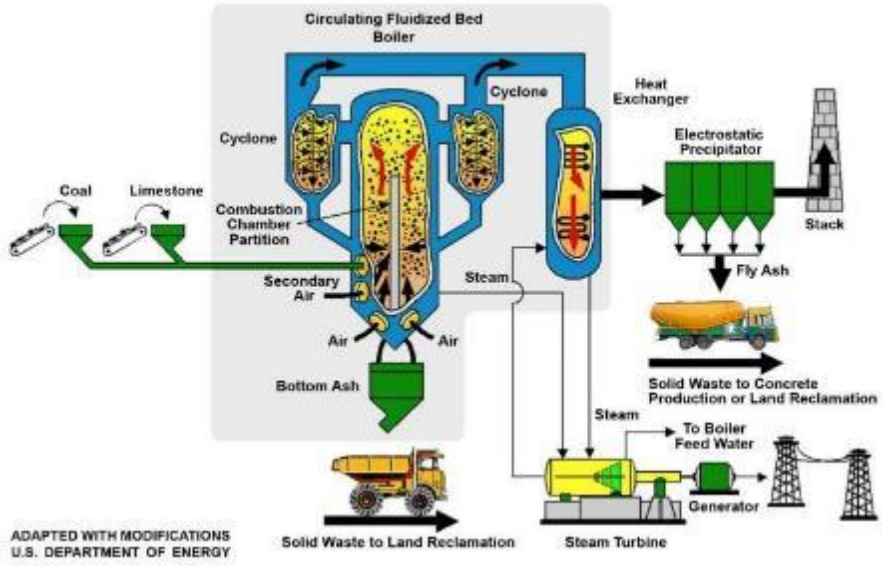


Figure PD-14. The Circulating Fluidized Bed Combustion Process

For the particulate matter (PM), the project will employ the Electrostatic Precipitator System (ESP), shown diagrammatically in **Figure PD-15.**

Principle of Operation

The electrostatic precipitator removes the particulate matters which are carried in the flue gas stream as fly ash. The flue gas stream, after leaving the steam generator heat recovery zone, will pass through the electrostatic precipitator through the parallel openings.

The flue gases are introduced to the plate-formed positively charged electrodes. Electrically isolated spray electrodes are suspended on which a negative voltage is applied. Under the influence of the electrical field, the particles adhere to the positive plate electrodes, which are then shaken by an automatic, periodic vibration of a hammer mechanism from the plates. It then falls into the dust funnel and is pneumatically conveyed to the fly ash silo.

From the silo, fly ash is transported for further use as building material in the cement industry or to the ash repository. The efficiency of the electrostatic precipitator is nearly 99.5%. The fly ash collected in the separators or discharge funnels is fine, dry and abrasive with a typical temperature of 140°C.

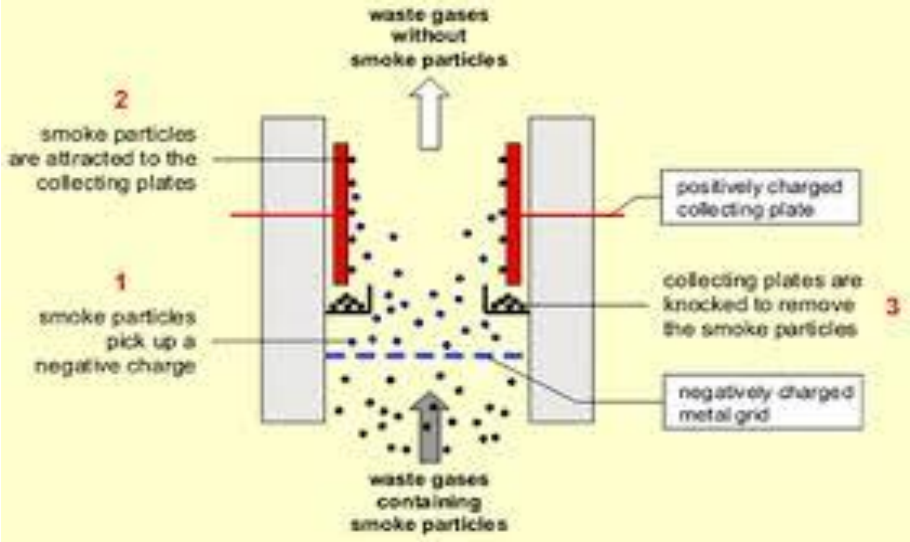


Figure PD-15. Principles of Operation of an Electrostatic Precipitator

Waste Management System

Ash Management System

Although the residue ashes (bottom and fly ash) are not classified as hazardous wastes, the management of such will be judiciously planned in consideration of potential perceptions by communities on ash from coal power plants.

As of now, Holcim, Republic and a local cement plant are getting ash from the plant. Thus no extraordinary ash management is needed for the fly ash.

Bottom Ash Management System

The base design of permanent ash disposal repositories shall be compliant with the environmental regulatory framework of the Philippines government and local authorities. The ash repository capacity shall be based on a life span of 30 years

An impermeable layer of HDPE liner shall be applied on the compacted ground and another approximately 100mm layer of sand before placing the gravel layer of approximately 300mm.

The area shall be designed with sufficient drainage system to drain out the water collected above the impervious HDPE membrane. The wastewater shall be directed to a coal dust settlement basin before discharging them into natural watercourse to ensure compliance to the of permissible level of Total Suspended Solid TSS in accordance to the Philippines Environmental Code and Standard.

The ash repositories shall be raised above grade with a robust working surface that facilitates running on and off of trucks and front end loaders. These shall be designed to take account of any long term settlement expected.

Air Pollution Control Devices/Systems

The Clean Technology Features of the Plant

The expansion project will ensure that the power plant complies with the emission standards of the Philippine Clean Air Act. The coal feed will, therefore, be of acceptable quality, especially for metallic elements.

The boiler will operate at a temperature lower than the value that would cause formation of NOx.

Sulfur capture by limestone will be built in the Circulating Bed System.

The use of CFB renders greater operating efficiencies, thus lesser fuel usage and lower emission rates of potential pollutants.

The Boiler Stacks

Boiler stacks will be engineered such that the resulting emission plume will meet the ambient air concentration standards, and the GLCs will not reach the population center.

Aqueous Effluents/Wastes

Septic tanks will be installed at strategic places to manage domestic liquid wastes.

Different effluents and wastes which could include (a) accidental oil spills (b) chemical drains (c) spent chemicals from the Demineralizer System will be collected and piped to a central waste treatment unit. One option for separating the oil is by gravity process from which recovered oil or sludge will be drummed and disposed through a third-party accredited disposal company. The treated will be discharged to the receiving basin, the Macajalar Bay.

Toxic chemicals that will be used or produced that may be released to the environment

Chemicals used are for raw water trreatment and pass the MDS criteria on toxicity.

There are no HAPs (Hazardous Air Pollutants) released to the environment.

Ash generated is either confined in the Ash Repository pond or sold to third parties, thus there are no releases to the environment.

It is noted that the current power plant operation complies with the monitoring requirements of the EMB and of the MMT.

Resource utilization (water, energy, etc) that may create competition especially with the communities.

Water

There will be no underground water extraction that will compete with the needs of the communities.

Likewise, there will be no competition with the communities on the abstraction of water from the Tagoloan River. The permit of the NWRB has been secured; noting that the NWRB duly considers competition in its processing of water permits.

Energy
The project itself is an energy producer, hence obviously there will be no competition with the communities.

5.0 Project Size

The expansion project size is 3 x 135 MW Coal Fired Power Plant.

The total leased area is 84.4 hectares, which is the same area occupied by the existing power plant. An additional 3 hectares will be acquired for the installation of a new conveyor system. A new ash repository area of 12 to 15 hectares will be constructed inside the leased area.

6.0 Development Plan, Description of Project Phases and Corresponding Timeframes

A description of the activities during the various project phase will provide inputs for impact Identification, environmental management plan and social impacts/appropriate socially-oriented program.

Pre-construction/ Pre-operational phase

This involves the exploration stage, project planning, the securing of appropriate Clearance(s) and permit(s) from the DENR / EMB principally the ECC Feasibility studies which include economics evaluation are integral part of this phase.

Construction/Development phase

Phases to be described in terms identifying specific activities (with special attention on those with significant environmental impacts as well as climate change adaptation options relevant to the project and project activities) and corresponding projected implementation timeframes:

Site Preparation Works

This phase will involve earthworks, vegetative clearing, possibly the disturbance of standing trees, inland transport of construction equipment

The potential impacts include minor change in landform, erosion potential, generation of fugitive dust, disturbance of trees, clearing of vegetation, generation of construction scraps and debris, discharge of domestic wastewater.

This phase will also require installation of additional structures related to water intake at the Tagoloan River and Macajalar Bay.

Water Abstraction and Treatment Plant
Power cycle make-up, auxiliary cooling heat exchanger, fire-fighting system, plant service, and potable water requirements will use raw water.

Under this option, the raw water system of the plant will source water from the Tagoloan River at a location which is upstream of the tidal limit. The estimated distance (straight line) between the source and the power plant is about 3 kilometers.

- *Pre-treatment System*

The pumping station with a redundant pump near to the river, a complete raw water supply infrastructure and delivery pipework from the River to the power plant are already in place. The water extracted from the river shall be stored in a reservoir that has a minimum storage capacity of 24 hrs. The water will then be pumped to a water pre-treatment system which utilizes fully automatic gravity sand filters with provision for backwash mechanism. The filtered water shall be stored in a clear well which shall include pumps that will supply filtered water to the potable water system, demineralized water treatment plant, domestic water supply and firefighting system.

A typical layout of a river pump station is shown below:

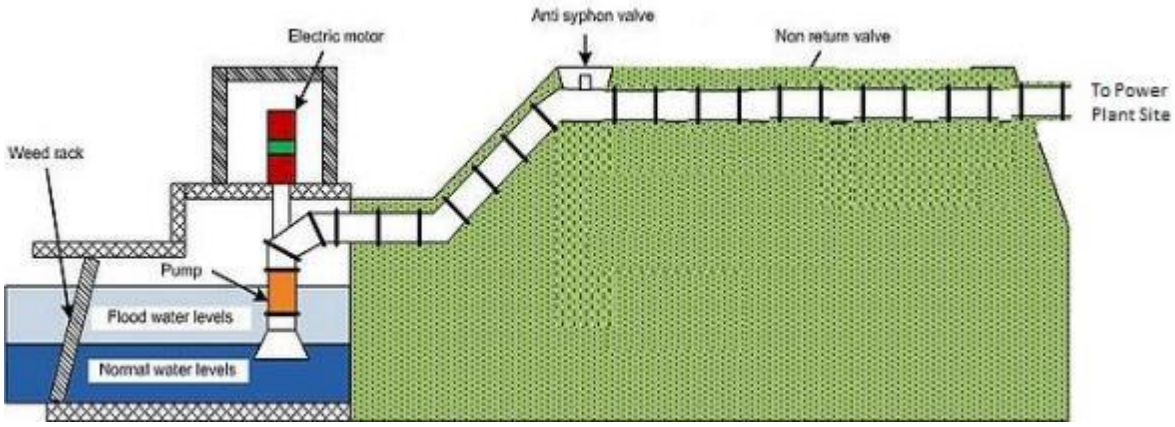


Figure PD-16. Typical layout of a river pump station

The estimated storage capacity of the system is 3,000 cubic meters.

- Demineralized Water Treatment Plant

Demineralization shall be achieved by cation-anion units, in series, with cation-anion mixed bed units. The flow rate shall be based on a twenty-hour service run per train with not more than four hours of regeneration downtime per train.

The cation exchangers are supplied complete with strong acid cation resin. Degasifiers complete with blowers and degasified water tanks located between the cation exchangers and anion exchangers are installed for the removal of gaseous carbon dioxide. The anion exchangers are complete with strong anion resin. The mixed bed exchangers are complete with a strong acid macroporous resin and a strong base quaternary ammonium macroporous Type I anion resin.

- Regeneration System

Facilities for the regeneration of exhausted resin inside each of the ion exchange units are provided

Acid and Caustic Storage Tanks

Acid storage tanks and caustic storage tanks are provided. They shall have a total capacity of two weeks' supply of acid or caustic for the regeneration requirement. The chemical storage tanks are situated at ground level in bunds which shall be lined with appropriate chemical resistant coating. Provision is made for filling the acid and caustic bulk storage tanks from a road tanker and includes quick connect or disconnect couplings, a standpipe rising vertically from the loading point and then falling gently to the storage tank. The filling connection points are contained within the bund. An emergency shower near filling point is provided.

Effluents and Drains

All chemical waste shall be discharged to the neutralization sump. A neutralization system is designed to neutralize chemical wastewater to achieve a pH value in the range of 6.0 to 9.0 to produce a relatively non-corrosive wastewater. All necessary equipment to automatically maintain this effluent range are provided. The sump is with internal / external water proofing with appropriate lining.

Demineralized water treatment plant building

The Demineralized water treatment plant building is sized for 3 x 135 MW units. The building is steel framed with sheet metal roofing, with insulation. Walls arev brick, lined and painted internally. Floors are reinforced concrete with acid resistant coating. Acid resistant paint or tiles are provided on areas handling chemicals.

It is noted that the major facilities, e.g. the river water pumping station/system, the raw water treatment plant, the pier the external access roads, etc. are already in place. Thus no additional construction works, which may cause impacts, are needed.

Structures at the frontage of the Macajalar Bay

The cooling water intake structure and piping

The cooling water outfall structure and piping

The Pier

The existing pier will be adequate for the handling of coal deliveries and is not planned for upgrading at this time.

The pier columns are trestle type; thus, avoiding water circulation impacts; shown in the photograph below.

Plate PD-4. The Existing Pier

To support the pier's structure, there had been individual structural elements such as piles, which had been embedded at specific points in the sea bed.

The construction activities at the Macajalar Bay and Tagoloan River will necessarily involve the use of barges or boats to transport equipment, materials, and personnel to the specific construction areas.

The intake to be constructed at the Macajalar Bay will be designed such that there will be no damage to the existing coral system. The outfall will be located on the side of the Tagoloan river flowing to the mouth of the said river.

Construction at the Power Plant facilities

The specific activities during this phase are:

Construction of Work area, Dormitory and Temporary Facilities for the construction workers will be among the first construction activities.

Site preparation works which will involve:

- Clearing and grubbing. The site is partly developed and is not forested. Disturbance to trees may be involved.

- Earthworks. The expansion project will conduct excavation for foundation works and the underground cables and piping as well as for the drainage system. The size of footings shall be determined such that working soil pressure or pile stress shall not exceed the allowable soil bearing pressure or allowable pile bearing capacity. The relevant factors of safety shall be applied. Foundations for structures are expected to comprise of shallow footings and deep piles. Once the site is prepared, the project will construct the facilities and install the equipment.

Other significant activities and their potential impacts are:

- Movement of construction vehicles - This will result in air emission discharges

- Activities of workers such as the use of toilet facilities, cooking of meals and other household chores. These will result in domestic waste and solid waste generation

The Operations Phase

The significant activities which may have environmental impacts are:

- **Operation at the pier**

    - Transport of coal by conveyor systems from the pier to the storage and thence to the boiler. This activity may have the potential of an accidental oil spill, which could not be ignored.

- **Uptake of seawater and discharge of cooling water return**

    - The uptake of seawater may create some turbulence of the sea bed depending on the volumetric rate of uptake and distance from the sea bed.
    - Impacts include the potential for entrainment of marine species, e.g. abundance of shellfish during hot months.
    - The possibility of entrainment of sea bed silts exists considering the already turbid and silty conditions of the marine waters.
    - Discharge of cooling water return will carry with it thermal effects. The elevated temperature will eventually cool down in a “mixing zone.”

- **Process water treatment**

    - Uptake of raw river water from the Tagoloan River
    - Carry over of mud or silt from the already murky river water is a possibility.

- **Operation of the boiler system, steam generation and balance of plant**

  Following are the major components of the project that will operate at this phase

    - **The Fluidized Bed Steam Generation System**

The Steam Generator receives coal from the Material Handling System, fuel oil from the Fuel Oil Supply System, combustion air from the Combustion Air and Flue Gas System, and feedwater from the Boiler Feed System to produce steam at the operating conditions required by the steam turbine.

The combustion process necessarily generates gaseous by-products which are regarded as pollutants, depending on their concentration levels. These are

- SOx
- PM
- NOx
- CO

Volatile harmful elements/substances if present in significant concentrations in the coal feed may also be released to the atmosphere. Among these, which must be carefully monitored and managed through appropriate selection of coal, is Mercury which has a low volatilization temperature.

- **Auxiliary equipment/systems**

The following briefly describes the auxiliary equipment and process for each unit.

Fuel Oil Supply

The Fuel Oil Supply System provides fuel oil to the steam generator for the startup burner and to aid in heating the fluidized bed.

Boiler Feed System

The Boiler Feed System provides feedwater from the deaerator storage tank to the economizer inlet, raises the feedwater temperature through regenerative heating, and provides the flow path for spray water to various de-superheating stations.

Main Steam System

The Main Steam System conveys superheated steam from the steam generator superheater outlet to the steam turbine stop valves.

Steam Turbine Generator

Thermal energy contained in the steam is transformed into kinetic energy and thence into electric power by the generator. A portion of the thermal energy generated in the turbine cycle is used for feedwater preheating.

The Cooling System

The cooling system uses recirculating seawater to cool the various hot streams such as the turbine exhaust steam in condensers.

After passing through the condensers, the cooling water passes through a piping system to allow natural cooling from the ambient air before ultimate discharge to the Bay.

Combustion Air System

The Combustion Air System includes primary air, secondary air, and flue gases. The primary and secondary air systems provide combustion air to the furnace section of the steam generator.

Distributed Control System

The Distributed Control System (DCS) provides the heart of the instrumentation process, which is vital not only for operational control but also to ensure that the built-in facilities to mitigate pollution will operate adequately. The DCS provides modulating and digital control, monitoring, alarming, logging, data archiving and indicating functions for the plant systems.

Coal Handling System

From the coal unloader, coal is conveyed into the covered coal storage, thence into the coal crushers, coal silo and finally into the boiler chamber.

Coal will be received at the pier from PANAMAX or SUPRAMAX vessels.

Electrical auxiliaries with potential impacts

Transformers
Avoidance of Polychlorinated Benzene (PCB) will be planned so that accidental oil spills will not create pollution hazards/risks from these toxic substances

Operation of Support Facilities

As described in the previous sections, chemicals will be used in the treatment of raw water or marine water to produce Demineralized Water for the Boiler. Wastewater treatment units will necessarily be constructed for the treatment of such.

The Decommissioning Phase

Decommissioning refers to the permanent stoppage of the power plant operations. The relevant aspects, waste generation, issues, and built-in measures during this phase will be dependent on the decommissioning plan. The decommissioning plan necessarily starts with an Environmental Site Assessment (ESA) taking note of any residual toxic substances, especially in the soil.

As a matter of procedure, the Decommissioning shall be subject to submittal of a plan and approval thereof by the Environmental Management Bureau. The MMT and the EMB may monitor the decommissioning activities. Unless the Proponent is given clearance after the decommissioning works shall have been completed, it shall remain legally responsible for any residual impacts on the environmental resources.

The proponent will sell any coal in stock to a third-party user.

7.0 Manpower

Pre-Construction/ Construction

Operation

The project will employ at least 136 workers on the plant site consisting of 64% technical, 28% administrative, and 8% management level.

Below is the partial listing of essential workforce requirements and the Table of Organization of a 3 X 135 MW CFB power Plant as shown in **Figure PD-17.**

Table PD-5. Tentative Schedule of Plant Organizational Personnel

Item No	Position	Qualification	Function	No.
1	Plant Manager	Management	Overall Plant Management	1
2	Operations Manager	Management	Overall lead in the operation of major plant components	1
3	Operations Superintendent	Management	Shift managers	4

The environmental personnel are the

- Pollution Control Officer/Engineer
- Safety Engineer

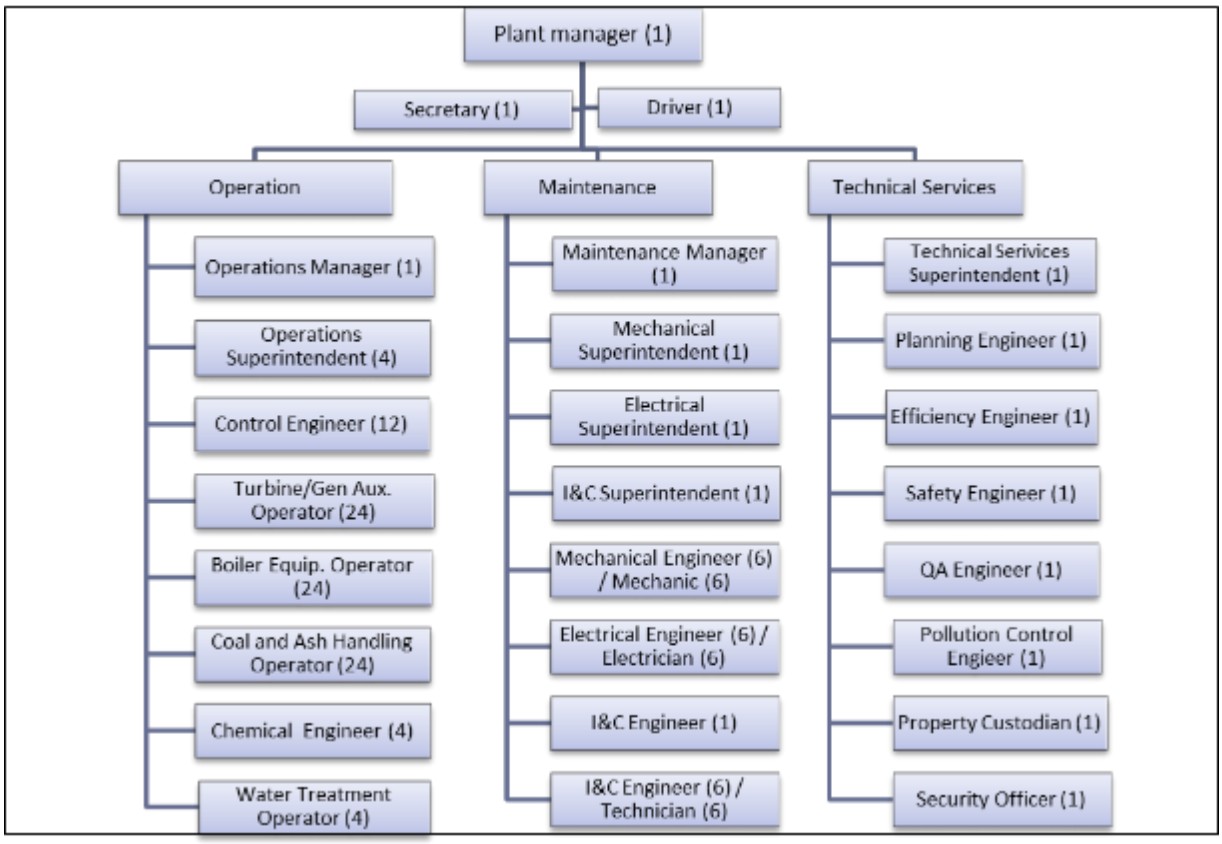
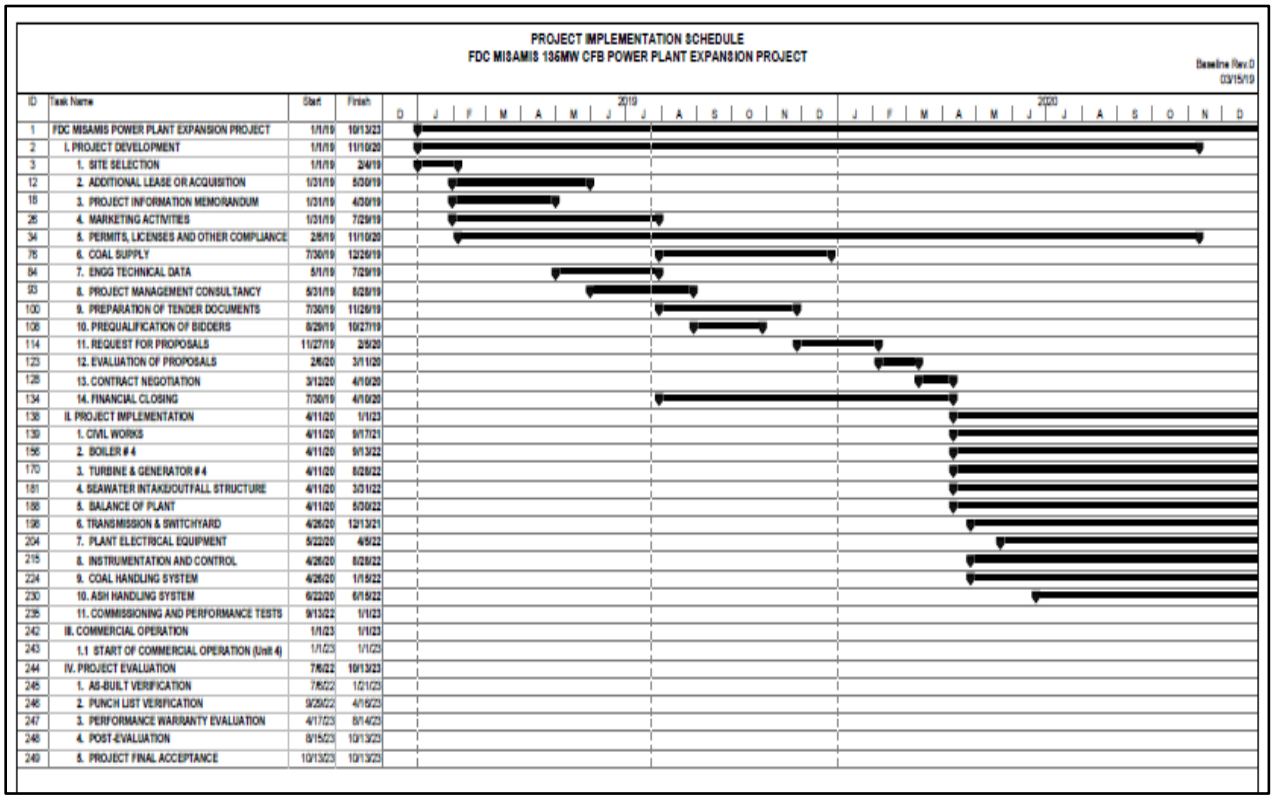


Figure PD-17. The Organizational Chart/Institutional Plan

9.0 Projected Timeframe

The project timeline is presented in in **Figure PD-18** and indicates a two-year development time frame from engineering, procurement and construction (EPC) to plant acceptance.



ID	Task Name	Start	Finish
1	FDC MISAMIS POWER PLANT EXPANSION PROJECT	1/1/19	10/13/23
2	I. PROJECT DEVELOPMENT	1/1/19	11/10/20
3	1. SITE SELECTION	1/1/19	2/4/19
12	2. ADDITIONAL LEASE OR ACQUISITION	1/31/19	5/30/19
18	3. PROJECT INFORMATION MEMORANDUM	1/31/19	4/30/19
26	4. MARKETING ACTIVITIES	1/31/19	7/29/19
34	5. PERMITS, LICENSES AND OTHER COMPLIANCE	2/5/19	11/10/20
76	6. COAL SUPPLY	7/30/19	12/26/19
84	7. ENGG TECHNICAL DATA	5/1/19	7/29/19
93	8. PROJECT MANAGEMENT CONSULTANCY	5/31/19	8/28/19
100	9. PREPARATION OF TENDER DOCUMENTS	7/30/19	11/26/19
108	10. PREQUALIFICATION OF BIDDERS	8/29/19	10/27/19
114	11. REQUEST FOR PROPOSALS	11/27/19	2/9/20
123	12. EVALUATION OF PROPOSALS	2/6/20	3/11/20
128	13. CONTRACT NEGOTIATION	3/12/20	4/10/20
134	14. FINANCIAL CLOSING	7/30/19	4/10/20
138	II. PROJECT IMPLEMENTATION	4/11/20	1/1/23
139	1. CIVIL WORKS	4/11/20	9/17/21
156	2. BOILER # 4	4/11/20	9/13/22
170	3. TURBINE & GENERATOR # 4	4/11/20	8/28/22
181	4. SEAWATER INTAKE/OUTFALL STRUCTURE	4/11/20	3/31/22
188	5. BALANCE OF PLANT	4/11/20	5/30/22
196	6. TRANSMISSION & SWITCHYARD	4/26/20	12/13/21
204	7. PLANT ELECTRICAL EQUIPMENT	5/22/20	4/9/22
215	8. INSTRUMENTATION AND CONTROL	4/26/20	8/28/22
224	9. COAL HANDLING SYSTEM	4/26/20	1/19/22
230	10. ASH HANDLING SYSTEM	6/22/20	6/19/22
235	11. COMMISSIONING AND PERFORMANCE TESTS	9/13/22	1/1/23
242	III. COMMERCIAL OPERATION	1/1/23	1/1/23
243	1.1 START OF COMMERCIAL OPERATION (Unit 4)	1/1/23	1/1/23
244	IV. PROJECT EVALUATION	7/6/22	10/13/23
245	1. AS-BUILT VERIFICATION	7/6/22	1/21/23
246	2. PUNCH LIST VERIFICATION	9/29/22	4/19/23
247	3. PERFORMANCE WARRANTY EVALUATION	4/17/23	8/14/23
248	4. POST-EVALUATION	8/15/23	10/13/23
249	5. PROJECT FINAL ACCEPTANCE	10/13/23	10/13/23

Figure PD-18. Estimated Project Timeline

10.0 Indicative Project Investment Cost

The estimated cost is within the range of 20 Billion to 30 Billion pesos. The project will finalize the costs before financial closing and signing of the EPC contract.

11.0 Initial Environmental Impacts and Management Plan (IMP)

The IMP notes the issues and concerns raised during the public IEC forum in **Table PD-6..**

Table PD-6 Summary of Issues and Concerns During the IEC Public Meeting

Name	Issues and Concerns Raised	Proponent's Response
Engr. Balmorea LGU Misamis Oriental	Is there a carbon sink in the Area? Regarding sa monitoring system na pinepresent kanina, im just concerned for the health of the population as part of the province. I hope you have the baseline on the illnesses. What is the effect of the coal in terms of: • Health problems	**Ms. Analiza Miso:** May initial discussion po kami sa lugar na malapit sa planta. Specially Tagoloan and Villanueva LGU's. **Ms. Jean Ravelo:** Just for the record, the FDC will be expanding, the present reforestation of the area for the carbon sink is in Salvador which is far from Tagoloan, so can it be done here or nearer the FDC plant? And our officer Ms. Ana, answered that it is being addressed and it is on consultation with the LGU's. **Mr. Krisler Pascual:** We will do the health impact study. **Dr. Edgardo Alabastro:** As an EIA preparer we can assure you that would be included in our EIS report.
BFAR Region 10	This is an expansion project, and I just would like to know if you have already send letter to the Local Government Unit because this is part of your expansion project. Because in BFAR we want to be assured that there will be no coral that will be affected for your objective. Pero as you mention kanina, only the DENR mention on the process, BFAR should be involve. Ayoko lang na mag start tayo ng mali kasi it happens na in other areas. And also, we should involve academe for the study of this corals.	**Mr. Eric Fernandez:** Thank you for your question. As presented by Dr. Ed, this is the first step for the permitting process. So we will present the project to all stakeholders and eventually we will securedall the permits with all LGU's. So wala pa po kaming sinesend dahil ito yung pinaka first step sa permitting processes. M**s. Jean Ravelo:** Kanina sinabi ko na ang purpose ng IEC na to is for us to know kung sino pa ang dapat ma involve lalo na sa susunod nating pagkikita sa Public Scoping para masala natin sila.
Renoir A. Abrea Mindanao State University	In your presentation, my understanding is this is an already an expansion and there's and existing powerplant and in operation. What is the condition of the environment before this powerplant? By this time, if you can show to us that there is no destroyed to environment, you are compliant to the DENR. • Baseline Information in corals	**Mr. Eric Fernandez:** We conducted baselines and signed several MOA. Dr. Ed is also our preparer for the existing plant. **Dr. Edgardo Alabastro:** We the preparer we've done baseline before and we will do again the baseline for confirmation of our baseline before.
Marine Biologist MFSU	Volume of water that we will draw from the sea? Effects • Planktons Meron bang chlorination na ginagamit ang planta ninyo? Kasi kung wala, possible na mag clog down yung mga pipes ninyo.	**Mr. Sam Lamorena:** We have 3400 ships in the entire ocean in the world. Plankton will never damage in our operation. The intake is located so far away in the outlet. We assured you that the proper bathymetric survey was properly identified the problems. These technologies that are applying are approved by the scientist and engineers and also knowledgeable peoples.

Name	Issues and Concerns Raised	Proponent's Response
Jose Oliver Ello MENRO LGU Villaueva	• Small percentage of local employment We have so many graduates in Villanueva, why are 70% of your people is outside the province? The priority of your employment and the ECC condition is not followed. That was the best SDP program that will be given to the people.	**Ms. Josephine Ong Cayabyab:** Duly noted sir.
Kagawad Casino Municipality Villanueva	Concerned about Employment	**Ms. Josephine Ong Cayabyab:** Duly Noted sir and we will answer in the Public Scoping
Boboy Sabal Board Member Provincial	Timeline of implementation in expansion	**Mr. Eric Fernandez:** Noted sir.
Kawagad Leonciod Vilannueva	Kailangan ba talaga ng expansion? Kasi ang Villanueva ay may dalawa ng coal power plant. So kung mag eexpand pa, paano na yung impacts lalo nyan?	**Mr. Eric Fernandez:** Yung growth rate po ng Mindanao is napaka taas compare to Luzon and Visayas. Kailangan I support yung capacity para ma supplayan yung economic growth ng Mindanao.
Engr. Marie Jo. T. Asa DEPED	Hinihingi lang po namin na may additional pang tulong from FDC. Sana maisama nyo sa program nyo yun para po sa mga kabataan. Maybe a little bit share to the education.	**Ms. Josephine Ong Cayabyab:** We are looking for a more sustainable benefit from the community. Noted po.
NCIP	Meron bang population ng IPs malapit sa planta?	**Ms. Josephine Ong Cayabyab** Wala po.
Mun. Kagawad Edgardo A. Permi SB Villanueva Committee Chairman on Envi.	Prioritization of electrification in Villanueva. Dapat full electrification sa road and households. • ER-194	**Ms. Josephine Ong Cayabyab** Noted
Felipe C. Valdehuesa Jr. Municipal Councilor LGU Tagoloan	Kailangan ba talaga ng expansion?	**Ms. Josephine Ong Cayabyab** Noted.
Dr. Elnor Roa MSU Naawan	Requesting to increase the number of employees in Barangay Balacanas FDC should provide technical trainings	**Ms. Josephine Ong Cayabyab** Noted
Phividec	Sana hindi na maulit ung mga issues na na encounter during MMT before. Anong document ang iaaply dito EIS or EPRMP? I would like that FDC should be transparent to this expansion project. And I hope another concerned individuals should be part of the MMT.	**Dr. Edgardo Alabastro:** Ang iaapply po namin ditto ay EIS sa central office.
Not Identified	Meron ba kayong plan na mag shift ng technology? Like renewable energy?	**Mr. Eric:** Fernandez Renewable Energy is another area of planned energy projects For this particular project there will be no shift in technology

The Impact Management Plan (IMP) is provided in **Table PD-7.**

The IMP may be revised based on the results of the Public Scoping.

Table PD 7 Summary Matrix of the Key Environmental Impacts and Management Plan

Project Phase / Environmental Aspect (Project Activity Which Will Likely Impact the Environmental Component)	Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation* or Enhancement	Responsible Entity	Cost	Guarantee / Financial Arrangements
I. CONSTRUCTION PHASE						
Environmental Aspect # 1	A. The Land	Tree Disturbance	Replanting Avoidance through project footprints	Construction Contractor	Part of construction cost	EIA Conditions
		Clearing of Vegetation	Revegetation	Same	Same	
		Faunal disturbance/migration *Minimal Land for the Site essentially developed*	Same as above	Same	Same	
		Debris	Disposal or Reuse	Same 3rd party	Same By 3rd party	
		Construction scraps	Disposal or Reuse	Same	Same	
		Domestic wastes Domestic garbage	Septic Vaults Recycle/disposal	Same	Same	
		Potential damage to private road of Phividec	Traffic Management Regulation of traffic movements In coordination w Phividec	Same	Part of Construction Cost	
Environmental Aspect # 2	B. The Water	**Marine** Disturbance of corals, etc.	Footprints of structures Rehabilitation of disturbed corals	Contractor	Part of Project Cost	EIA Commitment
		Silt Dispersal Domestic wastes	Silt curtains, as applicable	Same as above	Same as above	

Project Phase / Environmental Aspect (Project Activity Which Will Likely Impact the Environmental Component)	Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation* or Enhancement	Responsible Entity	Cost	Guarantee / Financial Arrangements
		Accidental oil spills, etc. **Rivers** Disturbance of river species due to construction of intake structure **Springs and Creeks**	Temporary Toilets On-site oil spill collection Layout of the inlet structure Same None existent	As above Contractor Contractor N.A.	As above By contractor Part of the project cost	EIA Commitment Permit by NWRB EIA Commitment
Environmental Aspect # 3	C. The Air	Air pollution from equipment Noise Fugitive Dust	Temporary in nature Use of silencers and mufflers for heavy equipment Buffer zones Spray water regularly	Contractor Proponent Contractor	Part of the contract Part of design Part of contract	ECC Condition
Environmental Aspect #`4	**D. The People**	Resettlement Increase in employment Increase in economic activities	Not applicable Resolved before Proponent lease of the site Enhancement Enhancement	N.A.	N.A.	

Project Phase / Environmental Aspect (Project Activity Which Will Likely Impact the Environmental Component)	Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation* or Enhancement	Responsible Entity	Cost	Guarantee / Financial Arrangements
II. OPERATIONS PHASE						
Environmental Aspect # 1	I. The Land	Potential leachate from ash (Will be dependent on metal elements present in coal. Coal supply still to be firmed up)	Coal Quality Engineered ash repository Reuse of ash Sale of ash (fly ash) to a third party	Proponent Proponent Proponent	Part of operations cost N.A. N.A.	EIA Commitment and MMT -Ditto- Ditto
Environmental Aspect # 2	II. The Water	Marine Thermal effects from return cooling water Discharge of domestic and plant wastes, including accidental oil spills Discharge of wastes from pier operation Togoloan River Water Extraction	 Regulated volumetric flow and temperature Site-specific location of outfall support piles Septic Vaults Bund wall in oil farm Oil Spill collection Spill Boom Control at source Permit from NWRB	 Proponent Proponent Proponent Proponent	 Part of Project cost Part of design Part of operating costs Same as above	EIA Commitments EIA Commitments
Environmental Aspect # 3	III. The Air	Discharge to atmosphere of combustion products	Use of CFB ESP	Proponent-	Part of Project Cost	Ditto

Project Phase / Environmental Aspect (Project Activity Which Will Likely Impact the Environmental Component)	Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation* or Enhancement	Responsible Entity	Cost	Guarantee / Financial Arrangements
			Stack design for managed dispersion Sulfur Capture by Chemical Good Quality Coal			
		Fugitive dust from coal handling	Conveyor System Coal management	Proponent	Ditto	Ditto
		Noise	Site distant from population centers			
			Equipment enclosure e.g., buildings	Proponent	Ditto	Ditto
Environmental Aspect # 4	IV. People	Perception of Health Effects	IEC	Proponent	Part of Project Cost	ECC Conditions and commitments in the EIS
		Benefits from ER 1-94	Enhancement	Funds from DOE	Proponent assistance only	
		Benefits from Proponent's SDP	Enhancement		Not applicable	ECC commitment
		Employment	Enhancement	Proponent	Same	Hiring preference to qualified local residents
		Livelihood	Enhancement	Proponent	Same	SDP

Project Phase / Environmental Aspect (Project Activity Which Will Likely Impact the Environmental Component)	Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation* or Enhancement	Responsible Entity	Cost	Guarantee / Financial Arrangements
		Overall economic benefits to municipality, region, Mindanao	Enhancement	Same	Same	
III. ABANDONMENT PHASE	**THE PLANS SHALL BE SUBMITTED FOR APPROVAL BY THE EMB**					
Environmental Aspect # 1	A. The Land	Complete soil/land evaluation to determine residual impacts and appropriate corrective actions, if applicable				
Environmental Aspect # 2	B. The Water	Complete evaluation of the marine species and remedial actions if applicable				
Environmental Aspect # 3	C. The Air	Unlikely impacts due to dispersion to the atmosphere and dilution of pollutants				
Environmental Aspect # 4	D. People	Loss of economic benefits Loss of livelihood and employment Loss of SDPs from ER 1-94 and Proponent's program Loss of electricity supply				

Discussion on the Initial Perception Survey results at the minimum indicating baseline knowledge about the project, concerns/questions about the description of the project alternatives and concerns about the environmental impacts of the project using accepted methodology.

A Preliminary Households Perception Survey was conducted last June 2019 to assess the socio-cultural economic situation and the perception of the communities that are to be affected by the proposed reclamation, particularly **Barangays Tambobong, Mohom, Balacanas, Baluarte, San Martin, and Sta. Cruz, Misamis Oriental** which relatively the closest to the project site.

The perception survey format was adopted from the standard methodology employed in the EIS process.

Table PD-8 shows the baseline knowledge about the project.

Table PD-8. Baseline Household knowledge on the Project.

Barangay	Yes		No		No Answer		Total	
	No. of HH Surveyed	%	No. of HH Surveyed	%	No. of HH Surveyed	%	No. of HH Surveyed	%
Tambobong	12	63.16	6	31.58	1	5.26	19	100
Mohon	14	70.00	6	30.00	0	0.00	20	100
Balacanas	17	80.95	4	19.05	0	0.00	21	100
Baluarte	9	45.00	9	45.00	2	10.00	20	100
San Martin	17	85.00	3	15.00	0	0.00	20	100
Sta Cruz	18	85.71	3	14.29	0	0.00	21	100
Total	**87**	**71.90**	**31**	**25.62**	**3**	**2.48**	**121**	**100**

Out of the 121 respondents, 87 or 71.90% of them answered "Yes", while 31 or 25.62% answered "No" , and the remaining 3 or 2.48% had no responses.

On the source of information about the Project the survey result is gleaned in **Table PD-9.**

Table PD-9. Source of Information

Barangay	Neighbor		Barangay		IEC by Proponent		Media		Others		No Answer		Total	
	No. of HH Surveyed	%	No. of HH Surveyed	%	No. of HH Surveyed	%	No. of HH Surveyed	%	No. of HH Surveyed	%	No. of HH Surveyed	%	No. of HH Surveyed	%
Tambobong	0	0.00	2	10.53	10	52.63	0	0.00	1	5.26	6	31.58	19	100
Mohon	1	5.00	2	10.00	10	50.00	0	0.00	1	5.00	6	30.00	20	100
Balacanas	2	9.52	11	52.38	6	28.57	1	4.76	0	0.00	1	4.76	21	100
Baluarte	3	15.00	5	25.00	2	10.00	0	0.00	1	5.00	9	45.00	20	100
San Martin	4	20.00	12	60.00	1	5.00	0	0.00	0	0.00	3	15.00	20	100
Sta Cruz	1	4.76	14	66.67	1	4.76	2	9.52	0	0.00	3	14.29	21	100
Total	**11**	**9.09**	**46**	**38.02**	**30**	**24.79**	**3**	**2.48**	**3**	**2.48**	**28**	**23.14**	**121**	**100**

The respondents answered that their source of information was from the barangay with a frequency of 46 or 38.02% while 30 or 24.79% answered that they learned the project from IEC meeting. 11 or 0.09% answered that they heard the project from their neighbor, 3 or 2.48% answered that they also heard the project from the media, and the remaining 28 respondents or 23.14% had no response.

Concerns on Project Impacts

Posiive Impacts

Answers	1. Livelihood and business opportunities
	2. Improvement of roads and other infrastructure
	3. Land taxes
	4. Improvement of government services
	5. Improvement of water services

Adverse Impacts

Answers	1. Increased traffic
	2. Flooding
	3. Health and safety hazard
	4. Air, water and land pollution
	5. Generation of wastes
	6. Loss of plants, trees and other infrastructure
	7. Loss of existing livelihood