

6 x 135 MW CIRCULATING FLUIDIZED BED COAL-FIRED POWER PLANT EXPANSION PROJECT

Barangays Tambobong and Bacalanas, Villanueva, Misamis Oriental



EPRMP Summary for the Public

June 2021



EPRMP SUMMARY for the PUBLIC

1.0 SUMMARY OF PROJECT INFORMATION

Table 1. Project Title and Basic Project Information

Name of Project	PROPOSED 6 x 135 MW CIRCULATING FLUIDIZED BED COAL FIRED POWER PLANT EXPANSION PROJECT	
Existing ECC	ECC No.: ECC-CO-1304-0012	
Project Location	Phividec Industrial Estate, Barangays Tambobong and Balacanas, Municipality of Villanueva, Misamis Oriental	
Project Category per EMB	"Category A-2 Existing and to be expanded, modified and/or rehaliilitated": Environmentally Critical Project (ECP) / MC 2014-005	
Memorandum Circular 2014-005	Power Plant Project \geq 30 MW	
Project Classification per EMB Memorandum Circular 2014-005	3.2.4 Other Thermal Power Plants (e.g. Coal, diesel, bunker)	
Project Size	Total gross plant capacity (existing and expansion) = 6 X 135 MW = 810 MW	
Existing Capacity	3 x 135 MW	
To be installed Capacity	Additional 3 x 135 MW	
	Existing Facilities	Additional Facilities
Project Area	84.4 has (including foreshore area)	Existing project site with foreshore area Additional 3 has for coal conveyor Additional 12 has for coal yard Total 99.4 has
Summary of Major Components	3 x Circulating Fluidized Bed (CFB) Boilers Steam conditions at turbine inlet \geq 240 bar, @ 593°C Three (3) sets steam turbines and electric generators Reheating, regenerating, condensing type. Speed 3600 rpm Capacity 158.8 MVA Power factor (lag) 0.85 Voltage [20-29] kV Frequency 60 Hz 138 kV AIS (Air Insulated Switchyard)	Additional 3 x 135 MW Circulating Fluidized Bed (CFB) Boiler Total 6 x 135 MW Same steam conditions Additional 3 Steam Turbines and Electric Generators Reheating, regenerating, condensing type Speed 3600 rpm Capacity 158.8 MVA Power factor (lag) 0.85 Voltage [20-29] kV Frequency 60 Hz 138 kV AIS (Air Insulated Switchyard)



	Covered Coal Storage Yard (19 hectares active area)	Same storage yard active area
	In-plant coal distribution system i.e.. covered conveyors, capacity of 167,500 MT for 30 days	additional covered conveyors for total capacity (existing and additional) of 204,800 MT for 19 days
	15 has. Ash Repository	Additional 9 has. Ash Repository Total: 24 has
	Jetty (For 55,000 DWT Vessel) Pier-resisting concrete deck, 180m platform with mooring dolphins, berth 278m, trestle 315m	Same jetty (55,000 DWT Vessel) Additional slipway or mooring dock of 100-150m length.
	Switchyard w capacity of 476.5 MVA	Total capacity of 794.1 MVA for existing and expansion projects.
	Air Pollution Control Devices (APCDs) 3 X Electrostatic Precipitators (ESPs) with Capacity of 1 set each unit or total of 3 sets	Air Pollution Control Devices Additional 3 sets ESPs for total capacity of 6 sets for original and expansion projects
	Wastewater Treatment Plant (WWTP) Capacity of 30 tph	Same type of WWTP with additional capacity of 33 tph for a total of 63 tph
	River Water Pumping Station with capacity of 2x120 tph	Same facility, pumps will be upgraded to 2x190 tph
	Raw water treatment plant with capacity of 2x100 tph	Same raw water treatment plant with additional of 3x80 tph Total capacity for original and expansion plant of 440 tph
	Access Road 1250 meter long and 12m average width	Additional plant roads with added 810 m long and 6m average width
Others staff house 2000 sq. m) and warehouse & workshop (2000 sq.m.)	Additional Dormitory 1,400 sqm and expansion of warehouse & workshop to a total area of 3000 sqm	
Project Cost	within the range of P 20 Billion to P 30 Billion pesos	
Construction Period	Thee (3) year time frame through plant acceptance from the EPC.	
Proponent Name	FDC MISAMIS POWER CORPORATION Contact Person: Mr. Roderick Fernandez Unit D, 11th Floor, Cyber Sigma, Lawton Avenue, McKinley West, Fort Bonifacio, Taguig City 1630 Telephone No.: +632.575.1600 / +632.819.6131	
EIA Preparer / Consultant	TECHNOTRIX INTEGRATED SERVICESS CORP (TISC) Contact Person: Hazel A. Victoriano , Managing Director Unit 1206 Trade and Financial Tower, 7 th Ave. corner 32 nd St. Bonifacio Global City, Taguig City Telephone No.: (02) 7373 1456 Mobile No.: 0917 178 0865 E-mail address: technotrix.tisc@gmail.com	



2.0 BASIC PROJECT INFORMATION AND BACKGROUND

The FDC Misamis Power Corporation (FDCMPC) currently owns and operates a 3 x 135 MW circulating fluidized bed (CFB) coal-fired power plant in Villanueva, Misamis Oriental and granted by the DENR Central Office an **Environmental Compliance Certificate ECC No. ECC-CO-1304-0012**. Since its commercial operation in 2016, Mindanao has shown strong economic growth, faster than the national average, and with this comes increased energy requirements necessary to sustain this growth. To contribute to the region's continued development, FDCMPC is proposing to expand its current facility with another 3 x 135 MW power generating units.

The Proposed Expansion Project involves the construction and operation of additional 3 x 135 MW units of Circulating Fluidized Bed (CFB) Coal Fired Power Plant. FDC Misamis Power Corporation (FDCMP) the Proponent and Owner of the Project has been operating since 2016 the same capacity in the same project site.

A basic rationale for the expansion project is to contribute to the sustained and robust development of Mindanao which requires electricity as a major infrastructure support.

2.1 Project Location and Area

The proposed expansion project will be cited within the existing power plant located inside the PHIVIDEC industrial area. The power plant and ancillary sites are within the political jurisdiction of Barangays Bacalanas, Municipality of Villanueva, Province of Misamis Oriental.

Inasmuch as the raw water requirement for process use (principally as Boiler Feed Water) will be sourced from the Tagoloan River, the political boundary will extend to Barangay Sta. Cruz, in the Municipality of Tagoloan.

The area for the existing and expanded power plant and auxiliaries is 99.4 hectares. The Project will acquire an additional area of 3 hectares for the conveyor system and 12 hectares for the coal yard. These areas are exclusive of that for the pier and the pumping station at Tagoloan River.

The geographical coordinates of the project site/land and of the ash repository pond and river pumping station are given in Table below:

Table 2 The geographical coordinates of the power plant

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



Point	Coordinates
RAW WATER PUMPHOUSE	
1	8°32'23.51"N; 124°46'8.10"E



Figure 1. Location of the Proposed Project (source: Agusan River Basin Task Force)

The maps showing the political (barangay, municipality) boundaries of the project site are presented in

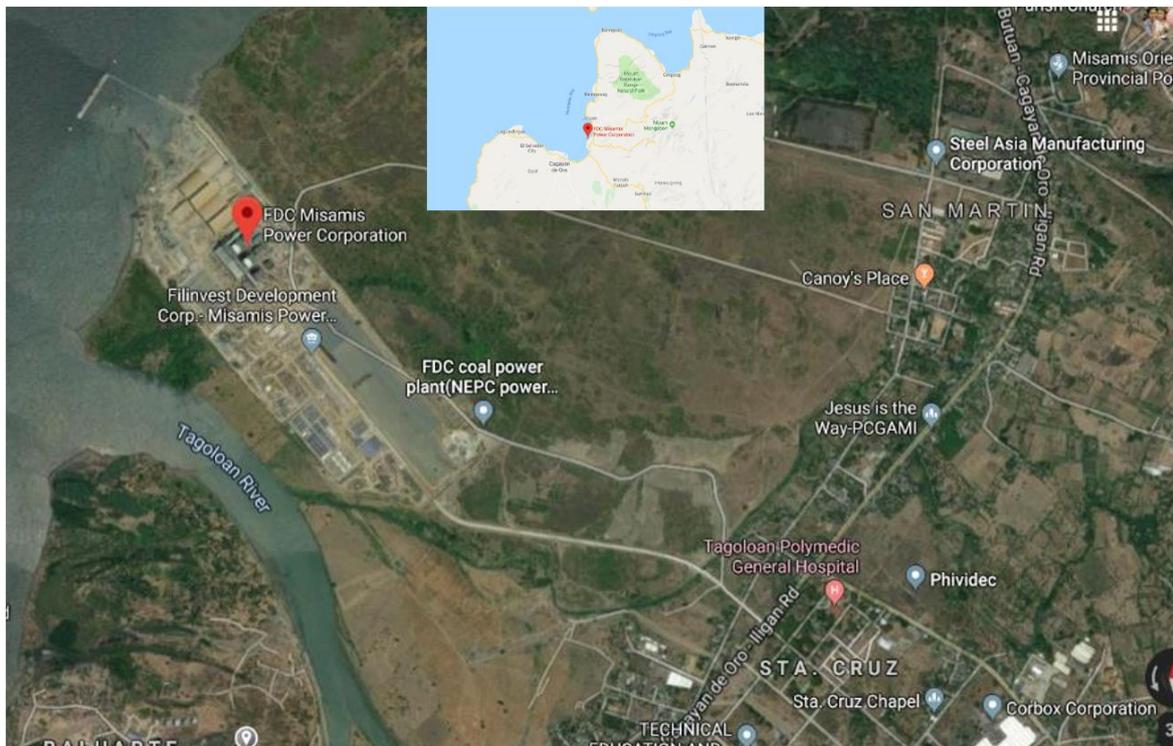


Figure 2. Map Showing the Vicinity of the Project Site (source: Goggle Earth)



2.2 The vicinity and the accessibility of the project site/area

The site is easily accessible by road through the main highway thence through the access road within and owned by PHIVIDEC Estate.



Figure 3. Map Showing the Access Waypoints to the Project Site

3.0 EIA Process Documentation

3.1 The EIA Team (Proponent & Preparer Team members, module of involvement, expertise)

The composition of the EIA Team in compliance with EMB MC 2011-005 is shown in **Table ES-2**. Resource Persons/Expert Companies were also engaged and are also listed hereunder

Table 3. Team of EIA Preparers

Team Member	Module	EMB Registry No.	Company
Edgardo G. Alabastro, Ph.D.*	Team Leader; Air & Water	PCO-257	Technotrix Integrated Services Corp (TISC)
Hazel A. Victoriano	Asst. Team Leader		Technotrix Integrated Services, Corp. (TISC)
Lorelie A. Bueza	Project and Sociology Coordinator		Technotrix Integrated Services, Corp. (TISC)
Benjamin Francisco	Marine and Fresh Water Ecology (Team Leader)	PCO-038	TISC Resource Person
Jean Ravelo	Geology	-	TISC
Virgilio Pantaleon	Coral Reef, Seagrass	-	TISC Resource Person
Jose Rene Villegas	Marine Team	-	TISC Resource Person
Ernie Fontamillas	Marine Team	-	TISC Resource Person
Michael Francisco	Fisheries	IPCO-040	TISC Resource Person



Team Member	Module	EMB Registry No.	Company
Engr. Emerson Darroles	Oceanography	-	TISC Resource Person
Nazario Sabello	Air Quality	-	TISC Resource Person
Rachel V. Dinglasan	Technical/Research	-	Technotrix Integrated Services, Corp. (TISC)
Proponent's External Expertise			
Design and Engineering Consultants			

3.2 EIA Study Schedule & Area

The delineation of the EIA Study Areas is based on the Direct Impact Area (DIA) and the Indirect Impact Area (IIA). These study areas are identified in the discussions of the specific modules, i.e. Land, Water, Air and People.

The guidelines provided by the Revised Procedural Manual are used for the delineation of the DIA and IIA, to wit:

- a) Direct impact area (DIA) 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) Indirect Impact Area (IIA) ...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 wherein the existing and additional cooling water intake and outfall structures and the pier are located;
- Portion of the Tagoloan River where in the river water intake and piping structures are located
- The plume of air pollution discharges from the plant's boilers wherein the Ground Level Concentrations (GLCs) exceeds 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)
- PHIVIDEC-owned access road leading to the project site

The guidelines provided by DAO 2017-15 are as follows:

DIA for Air Quality Impacts

- Areas with project Ground Level Concentration (GLCs) of emissions higher than the ambient standard based on air dispersion/transport modeling studies (worst case scenario)
- The air dispersion modeling does not reveal emissions higher than the ambient standard at worst case scenario of all of the 6 x 135 MW units operating at the same time at maximum capacity. Although a failure in the operation of the Electrostatic Precipitator (ESP) , the main APCD may occur, the ESP will be either automatically shutdown or immediately by manual mode so this is



deemed not the scenario referred to for consideration of the DIA, inasmuch as DIA is reckoned from sustained and long term operations.

DIA for Water & Quantity Impacts

- The extent of water body/ies where the water quality are projected to exceed the ambient standards based on relevant worst case scenario discharge modeling studies (sediment and pollutant discharges)
- Areas using the groundwater that could possibly be contaminated by project activities involving the use and disposal of toxic chemicals and hazardous wastes or construction of underground facilities.
- Areas where there are existing users of the same source of natural resources (e.g. water) that the proposed project will be using
- The ambient standards for water are not exceeded as discussed in Section 2.2.
- Groundwater will not be used in the project.
- The Tagoloan river is the area where there are existing users of the same source of water that the project will be using. Thus Tagoloan river is a DIA.

DIA for impacts on Land

- Areas directly vulnerable to potential flooding or inundation that may be cause by the project.
- Areas where there will be disturbance of habitat.

The project will not cause flooding.

The habitat for the expansion project which are few standing trees are in the project site, which is already defined as a DIA under DAO 2003-30.

DIA for impacts on People

- Directly affected areas based on the results of the socio-economic impact assessment studies conducted including ancestral domain of indigenous communities that may be affected, if any
- There are no ancestral domains of indigenous communities.
- The socio economic impact is reckoned from the benefits arising from ER 1-94 which is likewise the same IIA delineated in DAO 2017-15.
- The IIA shall be delineated for impacts on people and shall include those in the vicinity of the DIA who will either benefit or be affected indirectly by the project.
- The communities that will benefit from ER 1-94 and thus the IIA. However, the DIA from “People” perspective is the same as the IIA reckoned from socio economic benefits.
- The municipalities, barangays and LGU areas that will benefit from ER 1-94 are considered to be IIA.

The map of the DIA and IIA is shown below:



Figure 4. Direct and Indirect Impact Areas of the Project site in Google Earth Map

The following are the activities that were conducted for this study. Continuing activities will be based on the results of the Technical Review.

Table 4 EIA Study Schedule

ACTIVITY	DATE	AREAS COVERED
Bathymetric Survey	On-going	Proposed project site and immediate vicinities
Marine Study	On-going	Proposed project site and immediate vicinities
Secondary Data Research		DIA communities at Villanueva
Air Dispersion Modelling	February 2020	Proposed project site and immediate vicinities
SOCIAL PREPARATION UNDERTAKEN		
Initial Perception Survey	July 16, 2019	Barangay Tambobong, Balacanas and San Martin
Information, Education and Communication (IEC)	July 16, 2019	All impact Barangays, Municipality and General Public invited to the IEC meeting
Public Scoping	October 4, 2019	Villanueva Multipurpose Gym
Technical Scoping	December 6, 2019	EIA Conference Room, EMB Central Office
Perception Survey	October 4 to 6, 2019	Provided in Annex 11 . Public Participation Activities

3.3 EIA Methodologies

The EIS Methodology is adopted in the EPRMP screening form. The EPRMP screening form is the signed Formal Checklist with the EMB and the Environmental Impact Assessment Review Committee (EIARC) Members, the Proponent and EIA Consultant indicating therein the requirements and the content of the EPRMP report.



Table 5 EIA Methodology

Module / Section	Baseline	Methodology
LAND		
Land Use Classification	Secondary data: Municipality of Villanueva, Misamis Oriental Comprehensive Land Use Plan (CLUP).	Assessment of the compatibility of the proposed project vis-à-vis actual land use and approved Comprehensive Land Use Plan / Zoning Classification. Site is in PHIVIDEC Industrial Estate. Delineation of Protected Areas classified under the NIPAS
Geology	Secondary data: Geologic, seismic, liquefaction, slope hazard maps and evaluation based on government data and maps. Primary data: Soil investigation report	Identify and assess project impact in terms of the changed in topography including existing hazard as maybe aggravated Conduct of EGGAR./ MGB Methodology
Pedology	Primary data: Soil quality sampling and testing Parameters Considered <ul style="list-style-type: none"> • Nitrogen • Phosphorus • Potassium • pH • Organic Matter • Micronutrients • Trace metals e.g. Pb, Hg, As, Cd, Cr hexavalent, etc. 	Sampling and tests for the physical and chemical properties and erodibility potential of the soil, ongoing erosion processes and assesses the erosional impacts of the project.
Terrestrial Ecology	Not Applicable	
WATER		
Hydrology / Hydrogeology	Secondary data: Existing drainage system. Historical flooding occurrences	Identification and assessment of project impact on the change in drainage morphology, local drainage and resulting effects of flooding



Module / Section	Baseline	Methodology															
Marine Water Quality	<p>Primary data: Standard Methods for Water Quality Sampling and Monitoring.</p> <p>Water Body Classification: DENR Class SC</p> <p>Parameters Considered</p> <ul style="list-style-type: none"> • pH • temperature • BOD₅ • COD • DO • Oil and grease • TSS • Heavy Metals: Hg, Cd, As, Cr, Pb, • Fecal / Total Coliform 	<p>Assess impacts on siltation of surface and coastal marine waters</p> <p>DAO 2016-08</p> <p>Analytical Methods: by DENR recognized laboratory</p> <p>Metals : Spectrophometry AAS Cold Vapour AAS for Hg Coliform : Multiple Tube Fermentation BOD : Azide Modification Winkler O & G: Gravimetry (n-Hexane extraction) DO : Winkler/Titrimetric pH : Electrometry TSS : Gravimetry</p> <p>Based on SMR</p>															
Oceanography	<p>Primary data:</p> <p>Bathymetry Water Current Analysis of available proximate tides data Hydrodynamic modeling Particle dispersion modeling and map Storm surge hazard, exposure, vulnerability, risk maps.</p> <p>Update thermal plume model</p>	<p>Tidal Stations</p> <p>Echo sounder or equivalent</p>															
Marine	<p>Primary data: Abundance / density / distribution of ecologically and economically important species, mangroves, benthism planktons, coral reefs, algae, seaweeds, sea grasses</p> <p>Presence of pollution indicators</p>	<p>Transect, manta tow and spot dives surveys, marine resource characterization (e.g. city/municipal and commercial fisheries data), Key informant interview. Microscopic Examination</p>															
AIR																	
Ambient Air Quality	<p>Primary data: Ambient air quality sampling and testing.</p> <p>DENR Classification Ambient Air and Noise Classification: Class A</p> <p>Parameters Considered:</p> <ul style="list-style-type: none"> • TSP • PM₁₀ • SO₂ • NO₂ • CO • Trace Metals: Hg, Pb, Cd, Cr, As, 	<p>Methodology: Standard Methods for Ambient Air Quality Sampling by Volume Sampler</p> <table border="1"> <tr> <td>TSP</td> <td>Graseby High Volume Sampler</td> <td>Gravimetric</td> </tr> <tr> <td>PM10</td> <td>Graseby High Volume Sampler</td> <td>Gravimetric</td> </tr> <tr> <td>SO₂</td> <td>Gas Bubbler Sampler</td> <td>Pararosaniline</td> </tr> <tr> <td>NO₂</td> <td>Gas Bubbler Sampler</td> <td>Griess Saltzman</td> </tr> <tr> <td>Noise</td> <td>Type 2 – Sound Level Meter</td> <td>Instantaneous reading</td> </tr> </table> <p>Based on SMR.</p>	TSP	Graseby High Volume Sampler	Gravimetric	PM10	Graseby High Volume Sampler	Gravimetric	SO ₂	Gas Bubbler Sampler	Pararosaniline	NO ₂	Gas Bubbler Sampler	Griess Saltzman	Noise	Type 2 – Sound Level Meter	Instantaneous reading
TSP	Graseby High Volume Sampler	Gravimetric															
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SO ₂	Gas Bubbler Sampler	Pararosaniline															
NO ₂	Gas Bubbler Sampler	Griess Saltzman															
Noise	Type 2 – Sound Level Meter	Instantaneous reading															
Ambient Noise Quality	Primary data: Noise Meter																
Contribution in terms of GHG	Data on Greenhouse Gases	Estimation of projected greenhouse gasses (GHG)															



Module / Section	Baseline	Methodology
		Based on International Convention
PEOPLE		
<ul style="list-style-type: none"> Demographic Profile / Baseline 	Primary data: Conduct of Public Perception Survey, Public Scoping Secondary data: Comprehensive Land Use Plan (CLUP) of Municipality of Villanueva	

3.4 Public Participation

3.4.1 IEC WITH THE CONCERNED STAKEHOLDRES

The Information Education and Communication (IEC) activity was conducted last 16 July 2019 at Paula's Hotel, Tagoloan Misamis Oriental. The IEC was conducted with the objective of preparing for the public scoping process by providing information about the project, the proponent and the scoping process.

Among those invited were LGU Officials, Government Offices, Non-Government Organizations (NGO) / People's Organization (PO), Private Offices and Barangays. Out of 54 stakeholders invited, 25 of the invitees were able to attend the said event while 29 invitees did not attend. Out of 25 attendees, 5.36% are from various barangays of Villanueva and Tagoloan, 58.93% are from various government offices, 35.71% are from various private offices and NGOs/POs sector.

Key Issues and Concerns raised during the IEC:

- Carbon Sink in the Area
- Health and Safety of the affected communities
- Employment
- Effect in the marine ecology

3.4.2 Perception Survey

The perception survey was conducted to identify the present socio-economic profile of the predetermined social impact areas and to know the level of awareness of the different people and their acceptance to the proposed project. The survey was conducted last October 4 to 8 2019 to the communities that are to be affected by the proposed expansion project, particularly **Barangays Bacalanas and Tambobong** which is the closest to the project site.

The team selected respondents from 6 barangays who will be directly affected by the proposed project. A number representing households which will be in direct contact with the construction were given utmost priority in the survey.

The respondents were asked on their view on the possible beneficial and adverse impacts of the **Proposed Expansion of Coal-Fired Power Plant**. As far as the perceived benefits is concerned, top answers are on livelihood and business opportunities, improvement of roads and other infrastructure, additional tax, good service of the government and water services. On the other hand, perceived adverse impacts are traffic, water pollution, loss of job, tsunami, corruption, flood, death of marine species and loss of view.

3.4.3 Public Scoping

the Public Scoping conducted on 04 October 2019 at the Villanueva Multipurpose Gym was attended by participants from different sectors. The concerned stakeholders, especially those known to have opposition on coal power plant projects, as well as those located in the Impact Areas were invited to participate. The objective of the conducted Public Scoping is to ensure that the Environmental Impact



Assessment (EIA) will address the relevant issues and concerns of the stakeholders and that it will be consistent with the Philippine Environmental Impact Statement System (PEISS)

4.0 EIA Summary

4.1 Summary of alternatives considered in terms of siting technology selection/operation processes and design

Siting alternatives

There are no other feasible project site alternatives considering that the project involves only the expansion and or upgrading of the existing facilities; the existing project site is already developed, same pier will be used, same access road (with minor addition) will be utilized and major components will be located in the same project area. More importantly “ Proof of Authority Over the Project Site” is already covered by the lease Agreement with PHIVIDEC. Further discussions are provided on pages 1-16.

Technology Selection and alternatives

The Circulating Fluidized Bed (CFB) utilized for the original project is the same selection made for the expansion project because of:

- (a) successful experience and environmental performance with this technology
- (b) common facilities will be used such as ash yard, coal storage yard, warehouse, jetty, and conveyor systems
- (c) an alternative technology, e.g. pulverized bed coal power plant, may create more technical, operational and environmental complications as well as compatibility between existing and expansion aspects. The same raw material (coal) will be used and therefore an alternative technology selection is not favored.

The same raw material (coal) will be used and therefore an alternative technology selection is not favored.

Cost consideration is necessarily a selection factor also. Other systems which may be considered more updated such as supercritical or ultracritical technologies are also options. However, higher costs are involved which ultimately impacts on the economic benefits as will be reflected in power costs. Different technologies may also require new manpower skills which are already available for the original CFB technology.

4.2 Summary of baseline characterization (in relation to the results of the regular monitoring of projects impacts and environmental performance)

Table 6 Summary of Key Baseline Characterization

Resource	Parameters	Characterization
Land	Flora & Fauna	Not significant, due to site already developed and disturbed prior to implementation of the expansion project.
	Topography	Site is relatively flat and already developed.
Water	Ambient Water Quality	Based on SMR, compliant with standards.



	Corals and other Marine Species	Essentially the same as pre-project baseline.
Air	Ambient Air <ul style="list-style-type: none"> ● TSP ● PM₁₀ ● SO₂ ● NO₂ ● CO ● Trace Metals: Hg, Pb, Cd, Cr, As 	Compliant with Clean Air Standards based on SMR.
	Noise Level	Compliant with DENR Standards
People	Perception Survey	In the absence of clear guidelines on baseline parameters for "People" the results of the perception survey may be used to characterize these baselines. In particular <ol style="list-style-type: none"> a. Knowledge of the Project b. Perceived positive and adverse impacts.

4.3 Concise integrated summary of the main impacts and residual effects after applying mitigation (based on the results of the long term monitoring and compared with the previous baseline including assessment of the effectivity of the measures and the proposed changes to consider the expansion)

By way of clarification, based on Revised Procedural Manual 2003-30, Residual Impacts / Effects are the remaining impacts after implementation of preventive and mitigating measures. The summary of the main impacts and residual effects after applying mitigation is shown below.

Table 7 Summary of Key Major Impacts and Residual Measures

Environmental Aspects	Major Impacts	Option for Mitigation	Residual Measures
LAND	Disturbance of the existing terrestrial flora and fauna; Minimal, land is developed	Avoidance if needed	None needed
	Disturbance of the site topography/landform	Minimum	None
	Disturbance/Changes with Construction of new access roads	Not applicable	None
	Generation of Domestic and Solid Wastes From construction workers and plant operators.	Minimal, number of persons involved small. Septic Vaults Recycle/disposal	None
	Generation and Disposal of Toxic and Hazardous Wastes The SMRs indicate no significant THWs	Enhanced THW reduction programme.	None
WATER	Potential disturbance of aquifers	No underground water extraction.	None



Environmental Aspects	Major Impacts	Option for Mitigation	Residual Measures
	Abstraction of Water from Tagoloan River	Optimize Process Water Usage Choice of abstraction point Compliance to NWRB Water Permits	None
	Potential impacts on corals and other marine species	Judicious choice of inlet, outlet of cooling water	None
	Cooling Water Outfall to Macajalar Bay – Potential Thermal Effects	Choice of Outfall site Minimization of cooling water usage and outfall temperature Engineering intervention on CW return discharge system Minimize use of cooling water system	None
AIR	Degradation of air quality	Buffer zones Technology Intervention Quality Coal Feed	None
	Normal vehicle impact (noise, vibration) on properties of the households residing along the haul and access roads for the proposed project	Use of silencers and mufflers for heavy equipment	None
PEOPLE	The host barangay/municipality which will benefit from the Company's SDP ER 1-94	Enhancement	Community benefits
	Threat to public health and safety	IEC	None No proven residual effects of coal power plant on health

4.4 Risks and uncertainties relating to the findings and implications for decision making

Considering that the project is expansion in nature and to be located at the same site as the original project and moreover, there have not been experienced risks and uncertainties during the operation of the original project, there appears to be no risks and uncertainties that will affect the decision making process on project implementation!

Moreover, based on the discussions of the Environmental Risk Assessment (ERA) **Section 4**, there appears to be no risks that cannot be managed through engineering intervention.

However, the risks that provide challenges are those that are related to climate change:

- **Strong Typhoons**

Aberrations/strong typhoons may be experienced as an effect of climate change. However, these do not prevent implementation of the project because of the short-term nature of typhoons. Emergency measures such as the evacuation of personnel will be developed.

- **Earthquake and related risk**



The project and the other adjacent facilities have not been adversely affected by earthquakes that have hit Mindanao. Moreover, the design of the plant takes into consideration the probability of seismic events. Therefore, these aspects are not deemed to have any implication on whether the project will be pursued or not.

- **Storm Surges and Sea Level Rises**

Storm surges have been previously experienced in Iligan Bay during Typhoon Sendong, but the sites affected were farther out from the pier of the Project. In any event, the risks and uncertainties that may arise are not deemed vital to decision-making concerning the viability of the project.

Sea Level Rise is not expected to create adverse implications for decision making because at worst case scenario, only the pier operations will be affected.

For mitigation measures against storm surge and sea level rise, sea wall with 4.3 m elevation was installed in the shoreline area and the site is finished at 3.8m elevation above sea while the buildings floor elevation is at a minimum of 4.2m elevation. Jetty has an average of 6m. Elevation.