Consultation Draft

TRANSMISSION DEVELOPMENT PLAN 2019-2040

Consultation Draft

DISCLAIMER

The Transmission Development Plan (TDP) is prepared and published solely for information purposes. While NGCP, to the best of its knowledge, has used the most accurate data available, and has used utmost prudence in the use of those information, nothing in this document can be or should be taken as a recommendation in respect of any possible investment or business decision. This document does not claim to contain all the information that a prospective investor or grid user or potential participant to the electricity market, or any other person or interested parties may require for making decisions. In preparing this document, it is not possible nor is it intended for NGCP to have considered the investment objectives, financial situation and particular needs of each person who uses this document.

In all cases, anyone proposing to rely on or use the information in this document should independently verify and check the accuracy, completeness, reliability and suitability of that information and the reports and other information relied on by NGCP in preparing this document, and should obtain independent and specific advice from appropriate experts.

In the same manner, NGCP does not make representations or warranty as to the accuracy, reliability, completeness or suitability for particular purposes of the information in this document. Persons reading or using this document acknowledge that NGCP and/or its employees shall have no liability (including liability to any person by reason of negligence or negligent misstatement) for any statements, opinions, information or matter (expressed or implied) arising out of, contained in or derived from, or for any omissions from, the information in this document, except insofar as liability under any statute of the Republic of the Philippines cannot be excluded.

FOREWORD

NGCP is pleased to present its Transmission Development Plan 2019-2040, the 22-year roadmap for the expansion of the Philippine power grid. TDP 2019-2040 contains the status of ERC-approved ongoing projects for the 4th Regulatory Period (2016-2020), proposed transmission projects to be implemented within the 4th Regulatory Period, and projects for implementation in the 5th Regulatory Period (2021-2025). Beyond 2025 are indicative transmission projects for the succeeding five-year intervals until 2040.

In Luzon, grid development is driven by incoming large capacity coal-fired and natural gas power plants that are mainly concentrated in Batangas, Quezon, Bataan, and Zambales. The establishment of the first 500 kV transmission system for bulk power delivery within Metro Manila and the development of three additional 230 kV drawdown substations will be implemented to improve power quality and supply reliability. There is also a need for looping configuration development for the 230 kV and 500 kV system, as well as the installation of reactive power compensating equipment at various substations. Part of the long-term plan is the development of a 500 kV backbone extension both in the western and eastern side of northern Luzon to serve as power generation highway.

In Visayas, the reinforcement of the existing 138 kV Cebu-Negros-Panay submarine cable interconnection, the development of 230 kV transmission backbone from Cebu up to Panay Island (Cebu-Negros-Panay 230 kV Backbone), and the development of the new 230 kV backbone up to Bohol are intended to accommodate conventional and renewable energy-based generation projects. Similarly, as a complement to the development of 230 kV Visayas Backbone, gradual establishment of a looping configuration for the 138 kV transmission system to improve system reliability will also be implemented.

In Mindanao, the entry of several coal-fired power plants with potential large capacity expansion and the forecasted load growth require the development of various 230 kV transmission lines— including the 230 kV Mindanao Backbone which will serve as the island's bulk power highway from north to south Mindanao, upgrading and extension of 138 kV lines, and looping of 69 kV lines. The implementation of the Mindanao-Visayas Interconnection Project (MVIP) will also allow export of power to the other major grids. In the long-term, additional drawdown transformers for bulk power delivery in various substations and the interconnection of various Islands of the country to the main grid are envisioned.

NGCP is also implementing resiliency planning to improve the ability of the power system to withstand the effects of adverse environmental conditions, man-made power interruptions, and other system disturbances. The increasing frequency of hazards requires the transmission system to build its preventive and risk reduction measures, adopt the “build back better” principle after disasters, and build better from the start.

Interface activities shall be undertaken with the DOE, energy industry stakeholders, local government units, and the public, among others, during the transmission planning stage. This development strategy is geared towards possible co-location of portions of the proposed transmission lines to facilitate right-of-way acquisitions and minimize its effect on human settlements.

With the support and inputs of stakeholders in the development of this document, NGCP is ensured of the smooth implementation of its comprehensive, responsive TDP towards "Bridging Power and Progress.”

Table of Contents

1.1 NGCP as a Regulated Entity

With the enactment of the EPIRA into a law in June 2001, the Philippine Electricity Industry was subdivided into four sectors: generation, transmission, distribution and supply. Each sector is distinguished as different business activity. The transmission and distribution sectors exhibit natural monopoly characteristics; hence these are regulated. Generation and supply or the aggregators for the sale of electricity, on the other hand, operate under a competitive environment.

As the transmission service provider, NGCP is regulated under the performance-based regulation (PBR). The PBR is a form of utility regulation that strengthens the financial incentives to provide efficient service. The PBR methodology is outlined in the Rules for Setting Transmission Wheeling Rates or RTWR.

In its continuing effort to provide quality and efficient service, NGCP received its Integrated Management System (IMS) recertification on May 2016 from British Standards Institute, a third-party auditing firm specializing in international standards accreditation. The country's sole Transmission Network Provider (TNP) and power System Operator was certified in three management systems: Quality Management System – ISO 9001:2015, Occupational Health and Safety Management System – OHSAS 18001:2007 and Environmental Management System – ISO 14001:2015.

1.2 Introduction to **NGCP's Transmission System Network**

NGCP's transmission system network consists of 500 kV, 350 kV HVDC, 230 kV, 138 kV, 115 kV and 69 kV high voltage lines and cables. As the sole transmission service provider, NGCP plays a vital role in the safe and reliable transmission of electricity in response to system requirements and market demands. It continues to improve the reliability, adequacy, security and stability of the grid in the three major regions of the Philippines, namely: Luzon, the Visayas and Mindanao.

As the System Operator of the Philippine power grid, NGCP balances the supply and demand of electricity to efficiently serve all of its customers–power generators, private distribution utilities, electric cooperatives, government-owned utilities, eco-zones, and directly-connected customers. It is responsible in dispatching the power plants and transmitting the generated power to the various distribution utilities which, in turn, deliver the electricity at a lower voltage to households and other end-users. NGCP also operates and maintains metering facilities and provides technical services, particularly system studies, and operation and maintenance of customer facilities.

This Transmission Development Plan (TDP) outlines the planned projects which are required to address the system needs for the period 2019 to 2040. This will be the counterpart TDP to the Power Development Plan (PDP) 2019-2040 of the Department of Energy (DOE).

The TDP 2019-2040 consists of three volumes. Volume I contains the proposed grid expansion and upgrades, which are generally based on the results of system studies. The other volumes outline the capital expenditure programs of Operations and Maintenance (Volume II–Part 1) and System Operations (Volume III). Those for metering services have been integrated into Volume II but in a separate report (Volume II-Part 2).

Volume I consists of twelve chapters summarized as follows:

Chapter 1 provides an overview of NGCP organization and operation as a transmission service provider and a regulated entity;

Chapter 2 discusses the steps in the TDP Volume 1 Preparation Process;

Chapter 3 discusses the profile of each grid and the features of the existing transmission facilities;

Chapter 4 presents the latest demand projection as input to the simulation studies to identify future transmission needs and transmission expansions in each grid;

Chapter 5 presents the latest generation capacity addition including Renewable Energy (RE), potential resource areas and recommended connection points of power plants as inputs to the simulation studies to determine the required transmission reinforcements/expansions in each grid;

Chapter 6 presents the power system reliability/security measures through climate change adaptation for transmission facilities, including discussion on strategies to meet the challenges on right-of-way (ROW) acquisition;

Chapter 7 enumerates the ERC-approved projects in Luzon, the Visayas and Mindanao Grids that are in various stages of implementation;

Chapters 8-10 discuss the transmission outlook for 2019-2040 including discussion on project components and drivers of the proposed transmission projects for Luzon, the Visayas and Mindanao Grids;

Chapter 11 presents the major island interconnections, such as the Mindanao-Visayas Interconnection Project, and transmission backbone projects for the period 2019-2040. Also includes information on small islands for potential interconnections to the main grids; and

Chapter 12 contains different appendices that include discussions on relevant topics such as the Prospective Plants, ASEAN Power Grid (APG), other RE potential, and comparison of transmission projects, i.e., TDP 2016-2040 vs. TDP 2019-2040.

2.1 TDP Process Flow

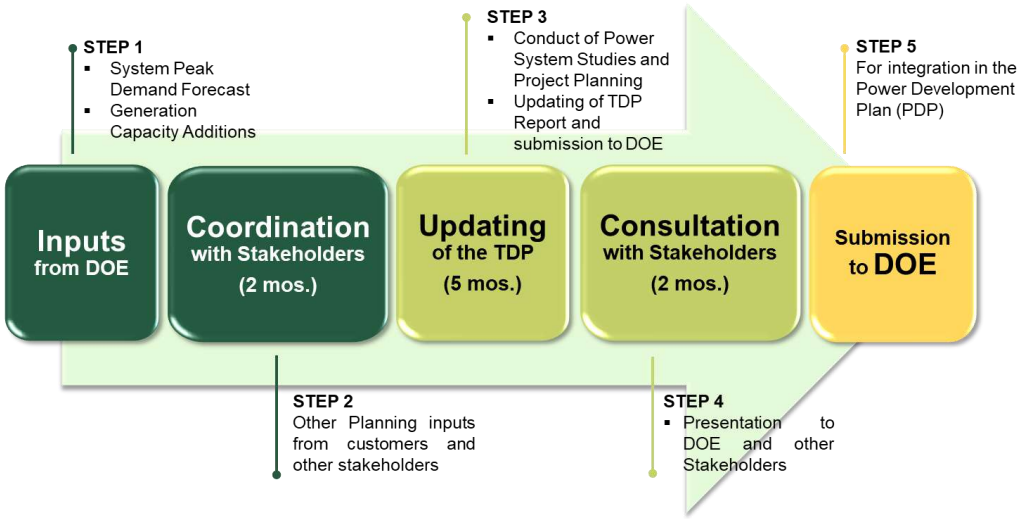


Figure 2.1 - TDP Preparation Process

2.2 Description of Each Steps

Step 1: Inputs from DOE

The System Peak Demand Forecast and the Generation Capacity Addition Line-up from the DOE, which are updated annually, are the two major inputs in the TDP. For use in the transmission network analysis, the system peak demand forecast shall be broken down and forecasted into individual transformer loads. For determination of load-end substation expansion requirements, on the other hand, NGCP's own non-coincident substation peak loading forecasts are used.

Step 2: Coordination with Stakeholders

One of the requirements of EPIRA with regard to the preparation of the TDP is the conduct of consultation with the electric power industry participants. NGCP regularly conducts Customers Interface Meetings to gather inputs from the Distribution Development Plans (DDP) of Distribution Utilities, expansion programs of Generator Companies and other directly connected customers. In addition, coordination meetings with other stakeholders are also conducted.

Step 3: Updating of the TDP

The identification of system requirements for the next 22 years involves the conduct of load flow, short-circuit, and transient stability studies using special software in power system simulation. These assessments are made with reference to the planning criteria and limits prescribed in the Philippine Grid Code (PGC).

The system assessment takes off from the model of the existing transmission network. By referring to the recent list of generation capacity additions and using the updated system peak load forecast, which is disaggregated into per substation transformer level, the network model for the planning horizon as covered by the TDP will be developed.

In conducting the simulation studies, different dispatch scenarios are considered. For Luzon Grid, the bulk generations are located in the northern and southern part of the island. Thus, the Maximum North, Maximum South, Typical Generation and Other Generation scenarios are considered. On the other hand, Maximum Leyte and Maximum Panay scenarios are considered for the Visayas Grid, while Maximum North and Dry Season scenarios are considered for the Mindanao Grid.

These scenarios are primarily premised on the determination of bulk power transfer capability of the grid. To also evaluate the market impact, NGCP is already developing the market model using a newly acquired program which is part of the enhancements in long-term transmission planning. As there are many uncertainties in the future, the market simulation will aim to establish a range of plausible future scenarios both for load and generation development.

Table 2.1 – Dispatch Scenarios for each Grid

LUZON DISPATCH SCENARIOS	
Maximum North Wet Season	All generation facility outputs in the northern part of the grid are set to their maximum capacities
Maximum South Dry Season	All generation facility outputs in the southern part of the grid are set to their maximum capacities;
Typical Generation Scenario	Power generation are based on the typical output levels of power plants during system peak load;
Other Generation Scenario	Particular study areas, e.g., Bataan, Batangas, etc. where varying dispatch of concentrated power generation could result in additional transmission constraints.
VISAYAS DISPATCH SCENARIOS	
Maximum Leyte Scenario	The geothermal generation facilities in Leyte are maximized, while the generation facilities in Panay serve as regulating plants and the power plants in Cebu, Negros and Bohol are also maximized
Maximum Panay Scenario	The generation facilities in Panay are maximized, while the geothermal generation facilities in Leyte serve as regulating reserve; the generation facilities in Cebu, Negros and Bohol are also maximized.
MINDANAO DISPATCH SCENARIOS	
Maximum North Dispatch Scenario	Generation from the north, especially those coming from hydro plants are maximized thereby causing the highest load to the transmission lines, which transmit power to the load centers in the south, e.g., Davao and Gen. Santos areas
Dry Season Dispatch Scenario	The significant decrease in power generation from hydro plants from the north is considered, thus all available power plants, particularly peaking plants are assumed to be dispatched to augment the power requirement;
Other Future Scenarios	1) Development of thermal generation in Southeastern Mindanao; and 2) Linking of the Visayas and Mindanao Grids, through the implementation of the proposed Mindanao-Visayas Interconnection Project.

Resulting transmission line loading, grid transformer loading, fault level at the substations, voltage profile and system response to disturbance can be evaluated. The next step is the assessment of the various solutions to the identified network problem which may be in the form of a new transmission line, transmission line upgrading, new substation or substation expansion, PCB replacement, installation of reactive power compensation equipment, and/or transmission network reconfiguration project. One important consideration in the identification of projects is the overall long-term transmission backbone development for

each grid. Some projects may have to be implemented by stages or may be initially energized at lower voltage level but will remain consistent with the target end-state of the grid. The selected solution from the network analysis will form part of the documentation of the TDP.

In the case of expansion plans for load-end substations, a direct comparison of the existing substation capacity and the load forecast would already result in the determination of capacity addition projects to meet load growth both during normal and single-outage contingency conditions of the transformers. The transformer addition projects, however, would also consider the sizing and age of the existing units, optimization and the space limitation issues in a substation. Moreover, development of a separate new substation is also an option in lieu of further expanding the transformer capacity at the existing locations. Under this case, system simulation studies will be required to fully assess the need and impact of load transfer or load reallocation to the new substation nodes in the grid.

Step 4: Consultation with the Stakeholders

This step is still part of the consultation process with the stakeholders as required by the EPIRA. Stakeholders are given the opportunity to raise comments and suggestions on the proposed transmission network developments as contained in the TDP.

Step 5: Submission to DOE

As provided in the EPIRA, the TDP shall be submitted to the DOE for approval and for integration in the Power Development Program (PDP) and the Philippine Energy Plan (PEP). Moreover, the EPIRA also provides that prior to project implementation, approval by the Energy Regulatory Commission (ERC) is required. This is being undertaken by individual/batch of projects application or included in the capital expenditures (CAPEX) application during the regulatory reset process.

2.3 Use of the TDP 2019-2040 in the Regulatory Reset Application

The TDP 2019-2040 will serve as the reference plan in the Fourth Regulatory Period (2016-2020) reset application of NGCP. While the TDP already provides a long list of projects needed by the network, project prioritization and project ranking would be another important process and a separate exercise during the capital expenditure (CAPEX) application. This will involve further assessment on the probability of contingency events, assessment of the impact if a project is not implemented yet and economic analyses.

The proposed major transmission projects for the period 2019-2040 under the TDP 2019-2040 Volume 1, with components shown in Chapters 7, 8, 9 and 10, were based on the selected implementation scheme after considering all the technically feasible alternatives. The identification of project components would involve line routes, substation sites evaluation and selection, and other initial field investigations. A least-cost development approach was also applied consistent with various NGCP Planning and Design Standards utilizing the cost estimate database derived from recently completed projects and/or prices of materials and equipment obtained through canvass from suppliers.

Similar to the 2005 and 2009 TDPs which were used as references in the Regulatory Reset applications for 2nd and 3rd Regulatory Periods, respectively, the capital expenditures of NGCP for Major Network Development were included in the documentation of the TDP 2019-2040 Volume 1. However, a more detailed five-year CAPEX Program will be included in the 4th

regulatory reset application together with other relevant information necessary for a more extensive review and evaluation by the ERC following the transparency provision for a prudent CAPEX in the RTWR.

Project prioritization is generally based on the ranking of the project drivers as follows:

Load Growth – this pertains to ensuring transmission facility adequacy and given top most priority are projects to address the projected overloading, which will occur even during normal condition or no outage condition.

Generation Entry – this pertains to accommodation of new power plant connections to the grid and bulk generation capacity additions, which usually drive new transmission backbone development.

Power Quality – this involves the installation of equipment that will aid in operating the grid within the grid code prescribed limits.

System Reliability – this pertains to projects that will provide N-1 contingency and projects that will upgrade aging facilities or replace defective equipment.

Island Interconnection - this refers to new interconnection facilities to link isolated island grid. These are special projects that include the Mindanao-Visayas Interconnection Project and Batangas-Mindoro Interconnection Project (BMIP).

Project drivers are highly interrelated that project benefits will not be limited to addressing the main driver only. Projects addressing load growth, generation entry and system reliability, for instance, are same projects that will address system congestions.

2.4 Project Impact to Customers

As the transmission projects are aimed at ensuring the adequacy, reliability and security of the power grid, these will have direct impact to the quality and level of reliability of transmission services to customers. Projects should be able to support load growth and entry of generation capacity additions in the long-term while maintaining the reliability criterion prescribed in the Philippine Grid Code.

The increase or decrease of transmission rates is determined by the ERC during the regulatory reset, which is based on the building block approach to derive the revenue path of NGCP for the regulatory period. The revenue path to be decided by the ERC may be in the form of increasing or decreasing trend. Thus, the cost of a single transmission project or a group of transmission projects can only provide an indicative rate impact, which does not necessarily be the same with that of the ERC regulatory reset determination. NGCP's fourth regulatory period is from 2016 to 2020 and the regulatory reset process for the fourth and the succeeding or fifth regulatory period is being considered to commence sometime in August 2018.

3.1 Grid Profile

As of June 2018, a total of 33,485 MVA substation capacities and 21,181 circuit-km are accounted in the transmission assets being managed by NGCP. Table 3.1 shows the summary of existing facilities.

Table 3.1: Summary of Existing Facilities

	SUBSTATION CAPACITY (IN MVA)						
	2012	2013	2014	2015	2016	2017	2018
PHILIPPINES	27,726	27,931	30,607	31,038	33,701	34,007	33,485
Luzon	21,170	21,110	23,395	23,785	25,900	25,887	25,687
Visayas	3,414	3,504	3,734	3,926	3,899	4,474	4,178
Mindanao	3,142	3,318	3,478	3,327	3,902	3,646	3,621
	TRANSMISSION LINE LENGTH (IN CKT-KM)						
	2012*	2013	2014	2015	2016	2017	2018
PHILIPPINES	19,490	19,425	19,463	20,073	20,159	20,849	21,181
Luzon	9,374	9,439	9,370	9,428	9,602	9,795	9,912
Visayas	4,971	4,840	4,821	4,813	4,476	4,973	5,027
Mindanao	5,145	5,146	5,272	5,832	6,081	6,081	6,241

There was a decrease in total substation capacity in 2018 due to decommissioning of transformers in line with NGCP's transformer replacement program.

To ensure that voltages across the network are within the levels prescribed in the Philippine Grid Code, capacitor banks and shunt reactors have been installed in appropriate locations in different parts of the grid. The summary is shown below:

Table 3.2: Summary of Installed Capacitor Banks and Shunt Reactors

	CAPACITOR BANK (in MVAR)*	SHUNT REACTOR (in MVAR)
PHILIPPINES	2,759.60	1,472.5
Luzon	2,258.50	875.00
Visayas	238.60	575.00
Mindanao	262.50	22.50

*These exclude the capacitor banks at the Naga and Ormoc Converter Stations

3.2 Dependable Capacity Mix

The dependable capacity indicated in the following sections is based from the DOE's Dependable Capacity Mix (Grid-connected) as of 30 June 2018

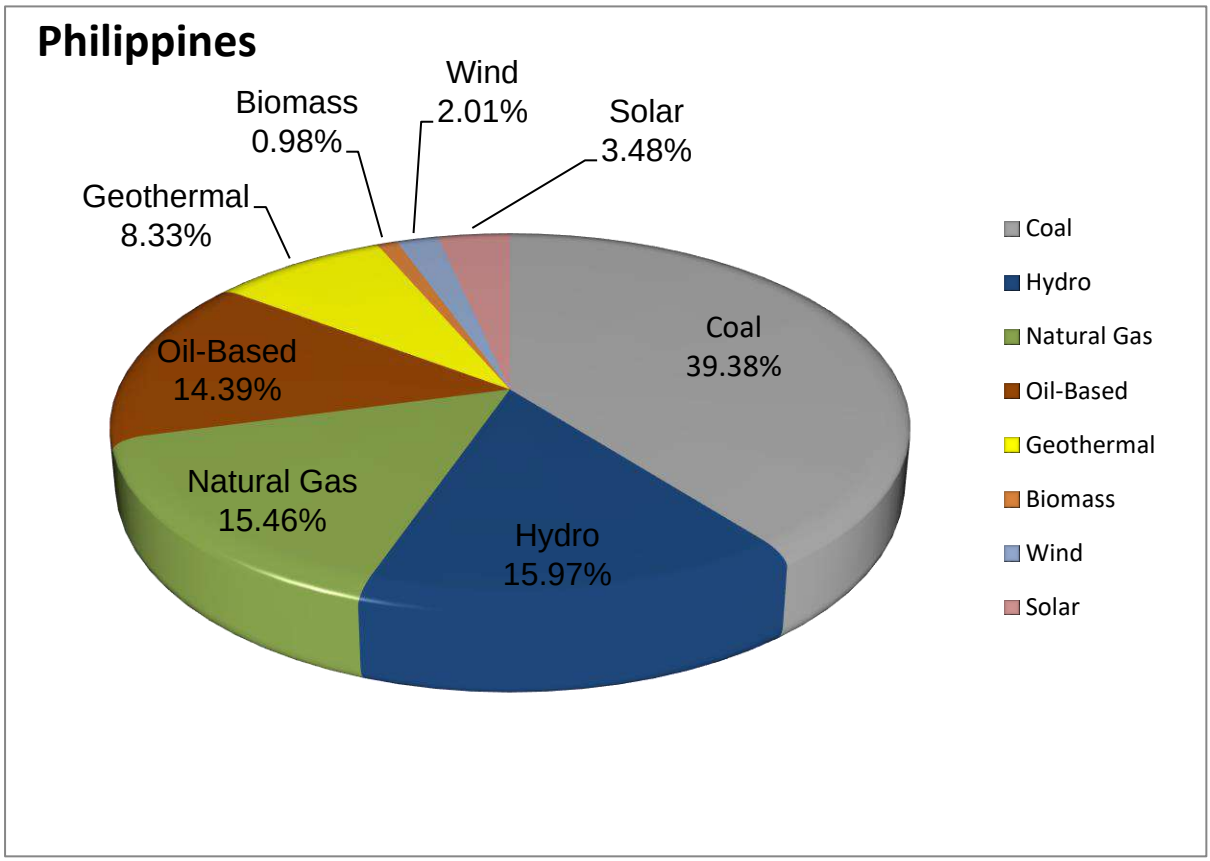


Figure 3.1 – Dependable Capacity Mix

The Philippines has a total dependable capacity of 21,253 MW including embedded generation. Of this, 8,370 MW of the capacity comes from coal-fired power plants (CFPP) and 3,393 MW comes from the hydroelectric power plants (HEPP). Natural gas, oil based and geothermal power plants accounts for 3,286 MW, 3,058 MW and 1,770 MW, respectively. The share from all other RE-based plants, on the other hand, is still relatively small with a total dependable capacity of 1,375 MW only.

Figure 3.2 and Table 3.3 show the distribution of dependable capacity for Luzon, Visayas and Mindanao.

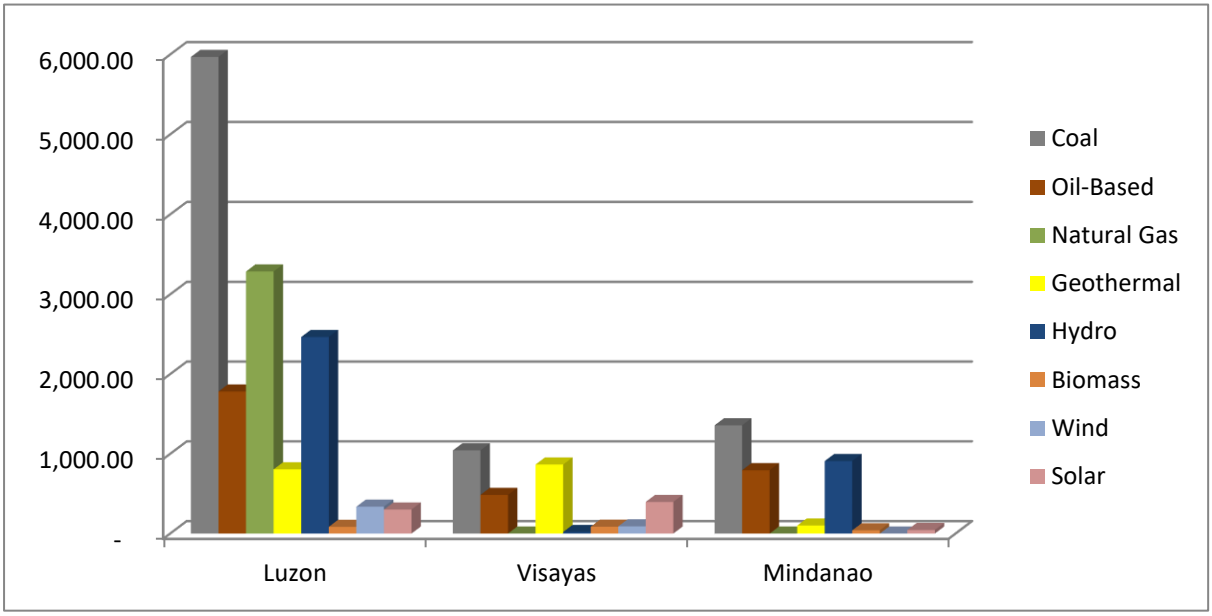


Figure 3.2: Dependable Capacity Mix for Luzon, the Visayas and Mindanao

Table 3.3: Existing Dependable Capacity

Power Plant Type / Fuel Source / RE Source	LUZON		VISAYAS		MINDANAO	
	MW	%	MW	%	MW	%
Conventional Power Plants	11,037	73.44%	1,527	51.21%	2,151	66.31%
▪ Coal	5,970	39.73%	1,043	34.98%	1,357	41.83%
▪ Oil-based	1,781	11.85%	484	16.23%	794	24.48%
▪ Natural Gas	3,286	21.87%	-	-	-	-
RE-Based Power Plants	3,991	26.56%	1,455	48.79%	1,093	33.69%
▪ Wind	337	2.24%	90	3.02%	-	-
▪ Solar PV	301	2.00%	396	13.28%	44	1.36%
▪ Biomass	84	0.56%	85	2.85%	40	1.23%
▪ Geothermal	805	5.36%	865	29.01%	100	3.08%
▪ Hydro	2,464	16.40%	19	0.64%	909	28.02%
TOTAL	15,028		2,982		3,244	

3.3 Luzon Transmission Network

Figure 3.3: Luzon Transmission Network

The bulk generation sources in the Luzon Grid are located in the northern and southern parts of the Luzon Island while the load center is in Metro Manila area. About 53% of the total demand in Luzon is drawn in Metro Manila. Because of this system configuration, NGCP's transmission backbone must have the capability to transfer bulk power from both northern and southern parts of Luzon to the Metro Manila area.

Northern Transmission Corridor

The transmission corridor consists of several flow paths for transferring power from the generation sources located in Northern Luzon to Metro Manila. The 500 kV double-circuit Bolo-Nagsaag-San Jose is rated at 2,850 MVA per circuit and is capable of transferring more than 1,800 MW generation from Masinloc and Sual CFPP to Metro Manila.

Figure 3.4 – North Luzon Transmission Corridor

The Bolo and Nagsaag 500 kV Substations are the receiving ends of generation from the north. The power is then delivered to Metro Manila mainly via Mexico and San Jose Substations.

Other underlying paths are the 230 kV transmission lines:

a. Labrador to Hermosa single circuit line;
b. San Manuel – Concepcion - Mexico double-circuit line; and
c. San Manuel – Pantabangan – Cabanatuan – Mexico single-circuit line.

The San Manuel-Concepcion-Mexico 230 kV Line is an alternate corridor, which also caters the generation capacity of the HEPP delivering power to San Manuel 230 kV Substation.

Metro Manila

As the center of commerce and trade, further increase in demand within Metro Manila is expected, thus requiring the expansion of existing substations and building of new ones. The National Capital Region (NCR) accounts to more than half of the total load in Luzon but only relies on the import of power coming from the north and south Luzon.

One unique geographical feature of Metro Manila is its narrow land area between Manila Bay and Laguna Lake, which is only about 10 km wide.

The development of Antipolo, Navotas, Pasay, and Taguig 230 kV Substation Projects will cater to the demand increase in Metro Manila.

Presently, there are three main load sectors within Metro Manila:

a. Sector 1 is served through Quezon, Paco and Marilao (Duhat) Substations. Both Paco and Marilao (Duhat) Substations are MERALCO-owned;
b. Sector 2 is served through Taytay and Doña Imelda 230 kV Substations; and
c. Sector 3 is served through Muntinlupa and Las Piñas 230 kV Substations.

The major supply lines for both Quezon and Taytay are the double-circuit 230 kV line from San Jose as these substations rely heavily on the supply from San Jose 500 kV Substation.

In the south, the power requirements are being drawn from Dasmariñas 500 kV Substation and from power plants directly connected to the 230 kV system. Las Piñas is connected through a double circuit 230 kV radial line from Dasmariñas, while Muntinlupa has four-circuit supply line from Biñan.

Southern Transmission Corridor

The southern portion of the 500 kV transmission backbone stretches from Naga Substation in Bicol Region to Tayabas, Quezon. Tayabas is also connected to San Jose thereby completing the link between the north and south 500 kV transmission corridors.

Figure 3.5 – South Luzon Transmission Corridor

The 500 kV backbone segment from Tayabas to Naga Substation is currently energized at 230 kV. The Naga Substation is also the termination point for the HVDC Interconnection System (commissioned in 1998) that could allow the exchange of power for up to 440 MW between Luzon and the Visayas Grids.

The 500 kV backbone in the south facilitates the transfer of about 2,400 MW from Ilijan Natural Gas, Pagbilao and QPPL CFPP. The 230 kV transmission system in Batangas and Laguna area caters more than 2,500 MW total generation capacity of Calaca CFPP, new coal-fired power plants and the other Natural Gas Plants (San Lorenzo and Sta. Rita).

From Tayabas Substation, the 500 kV backbone also stretches to Dasmariñas Substation which serves as a drawdown substation for the loads in the south of Metro Manila.

3.4 Visayas Transmission Network

The Visayas transmission system is divided into five different sub-system or sub-grids: Panay, Negros, Cebu, Bohol and Leyte-Samar. The sub-grids are interconnected by AC submarine cables with effective transfer capacity as follows: Leyte-Cebu (2x200 MW), Cebu-Negros (2x90 MW), Negros-Panay (1x180 MW) and Leyte-Bohol (1x90 MW). These submarine cables provide the capability of sharing excess generation between islands to accommodate the Visayas' growing demand.

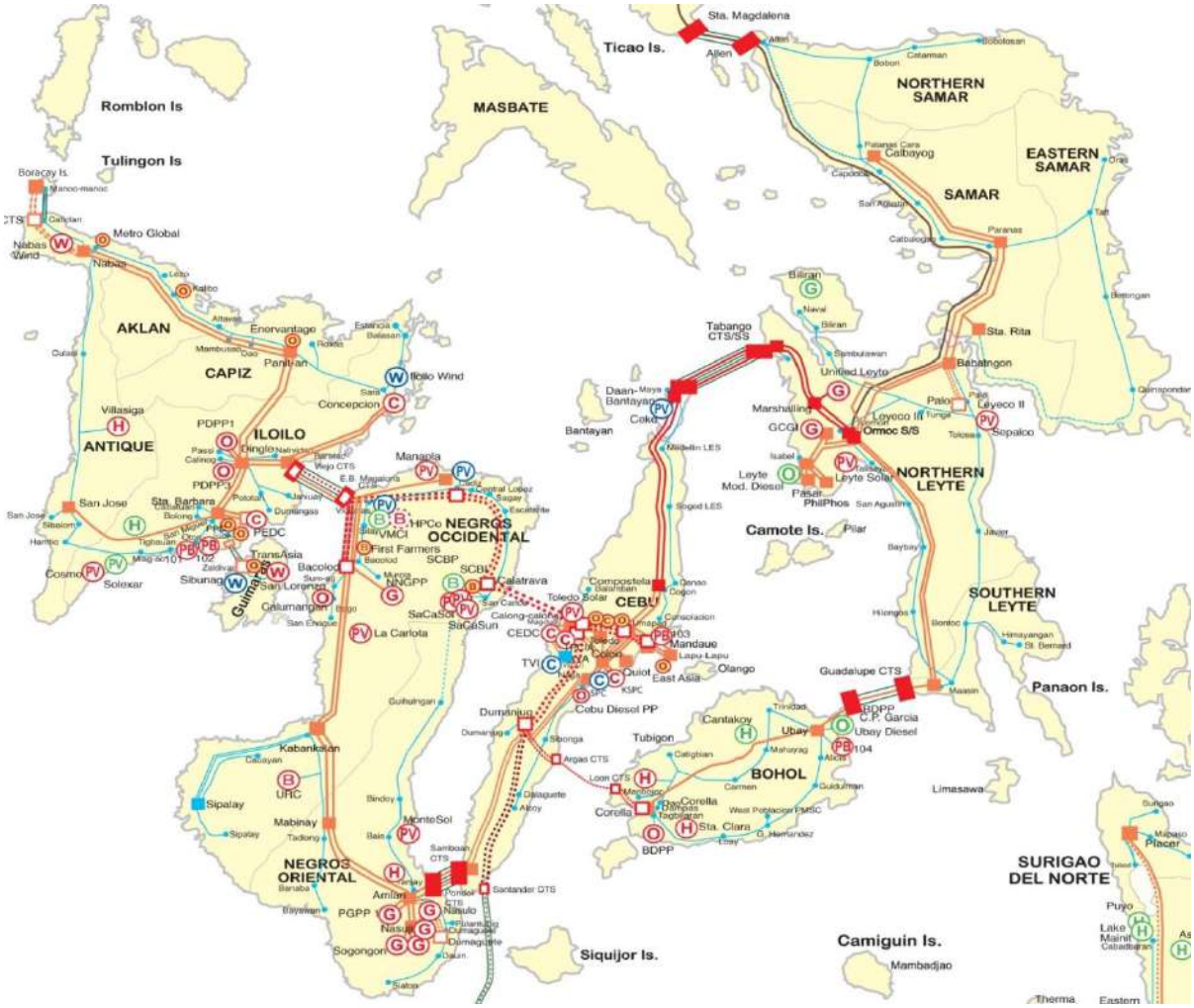


Figure 3.6 – Visayas Transmission Network

The transmission backbone of the Visayas Grid extends from Allen Cable Terminal Station in Samar, all the way to Nabas Substation in Panay. This power delivery system comprises approximately 895 kilometers of transmission lines.

Eastern Visayas (District 1) is composed of Leyte and Samar Islands. Leyte remains the power supplier to Samar and Bohol Islands through the Ormoc-Babatngon and Ormoc-Maasin 138 kV lines, respectively. Also, Leyte has a 230 kV interconnection to Cebu enabling the other islands to source power from cheaper geothermal resources. Leyte is the site of 645 MW geothermal resources that comprise about 25% of the total dependable capacity in the Visayas.

Figure 3.7: Eastern Visayas Transmission Network

Central Visayas (District 2) is composed of Cebu and Bohol. Cebu can be well considered as the major load center of the Visayas Grid. In 2018, it has a peak load of 989 MW which accounted for 48.22% of the grid's total demand. Bohol has the lowest peak load among sub-grids at 84 MW (4.09%) in 2018.

Fig 3.8: Central Visayas Transmission Network

In the Island of Negros (District 3), the load center is located in Bacolod City in the northern part, while the bulk of generation, composed mostly of geothermal power plants, is in the

southern part. There are also many generation power plants in Northern Negros which is composed mostly of Solar and Biomass power plants. There is a total of 277.8 MW solar generation capacity in Negros Island which accounted for 80.21% of the grid's total solar generation capacity.

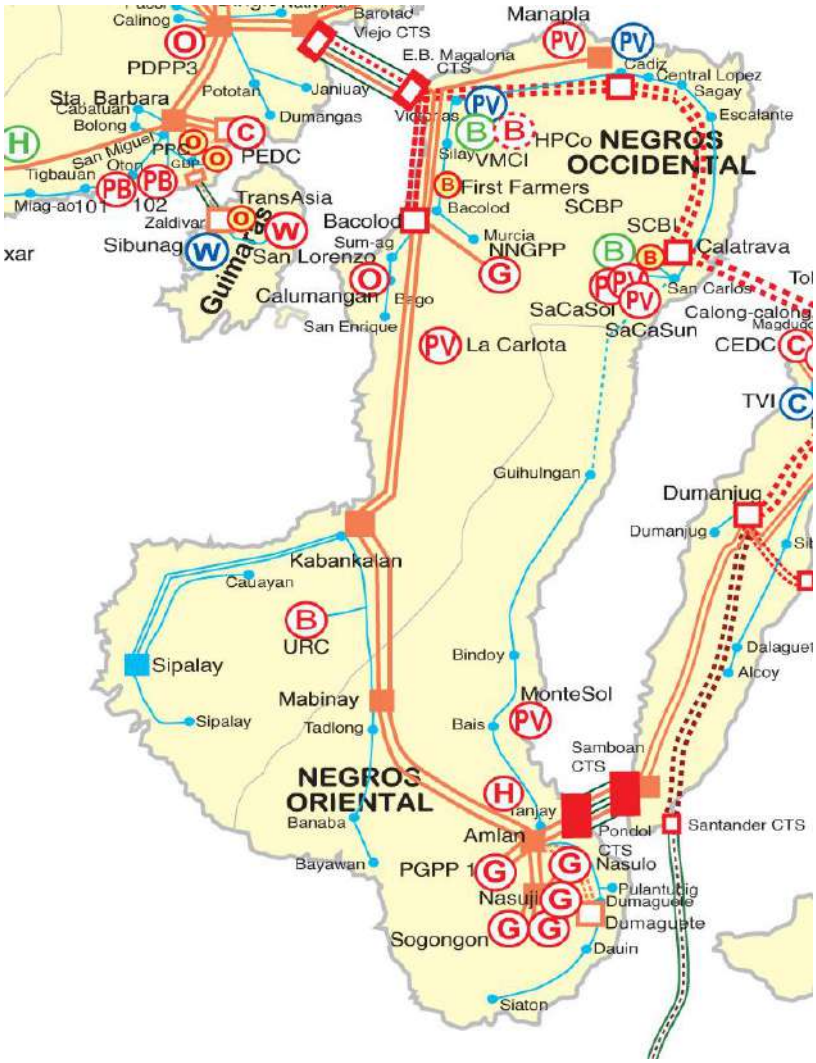


Fig 3.9: Negros Island Transmission Network

Panay Island (District 4) has many large coal power plants; PEDC (317.4 MW) in the southern part while PCPC (135 MW) in the southeastern part. Panay became less reliant on power import from other islands via the 138 kV Negros-Panay Interconnection System and, most of the time, exports power to Negros.

Figure 3.10: Panay Island Transmission Network

3.5 Mindanao Transmission Network

The Mindanao transmission system is composed of six Districts:

1. North Western Mindanao Area (District 1 - NWMA) covers Zamboanga area and Misamis Occidental,
2. Lanao Area (District 2 - LA) includes Lanao del Norte and Lanao del Sur,
3. North Central Mindanao Area (District 3 - NCMA) includes the provinces of Bukidnon and Misamis Oriental,
4. North Eastern Mindanao Area (District 4 - NEMA) is comprised of Agusan and Surigao provinces,
5. South Eastern Mindanao Area (District 5 - SEMA) is the Davao Region, and
6. South Western Mindanao Area (District 6 - SWMA) consists of South Cotabato, Cotabato, Sultan Kudarat, Saranggani and Gen. Santos (SOCCSKSARGEN) and Maguindanao.

The bulk of energy sources is through a combination of renewable and conventional power plants which are generated in Lanao Area and Misamis Oriental for Northern Mindanao and Davao Area in Southern Mindanao as shown in the figure below.

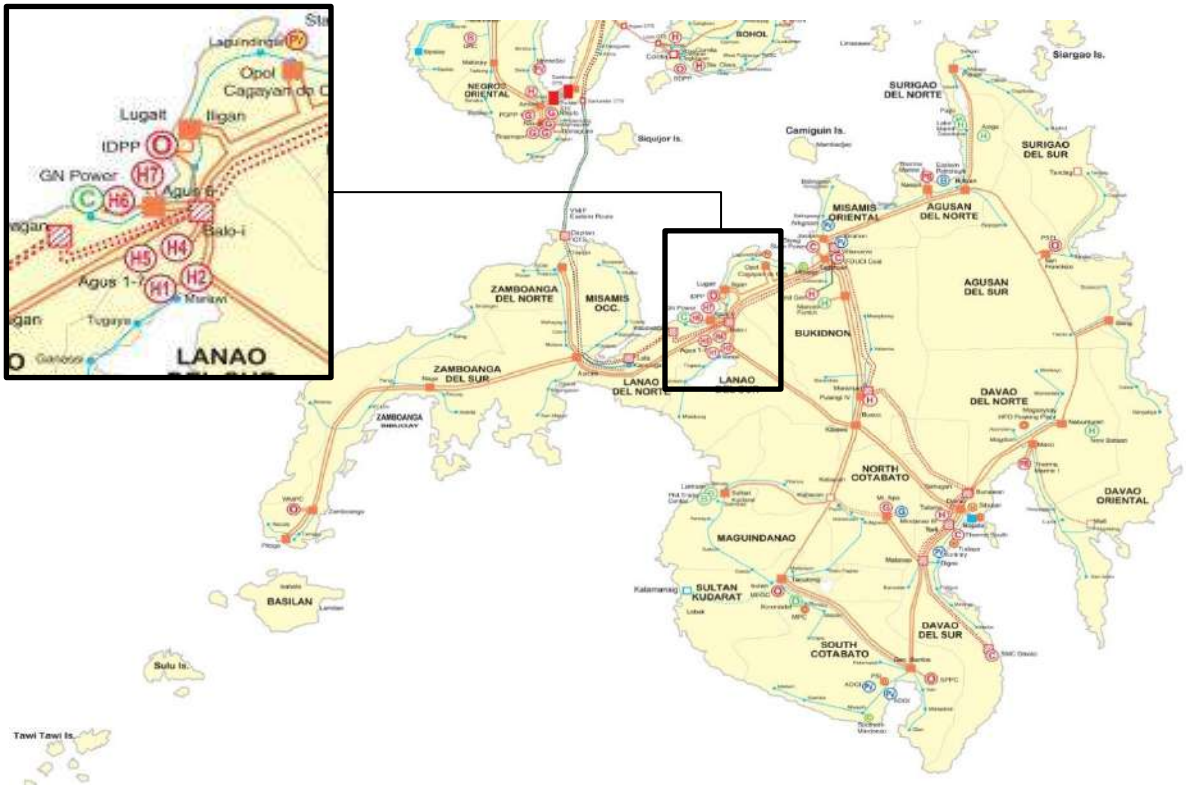


Figure 3.11 – Mindanao Transmission Network

The load centers are Cagayan De Oro City, Davao City and General Santos City which are being supplied by a looped transmission lines through the Balo-i-Tagoloan-Maramag-Kibawe-Davao 138 kV transmission corridor and the Balo-i-Villanueva-Maramag-Bunawan backbone which is designed at 230 kV but initially and currently energized at 138 kV. Aside from the new 230 kV-designed transmission backbone, Mindanao Grid comprises mostly of 138 kV transmission corridors, with 69 kV radial lines that traverse from the main substations to load-end substations. Three 138 kV transmission corridors emanate from the Lanao Area, where the biggest chunk of power supply for Mindanao is generated.

The two important input parameters in the preparation of the TDP are the updated annual peak demand forecast and generation capacity addition listed in the DOE List of Private Sector Initiated Power Projects (PSIPP).

4.1 TDP Power Demand Projection

4.1.1 Basis of the Transmission-level Forecast

The demand forecast for the TDP 2019-2040 adopted the peak demand projections of the Department of Energy (DOE) based on high GDP-to-elasticity approach with 7%-8% assumed annual GDP growth rate.

4.1.2 Historical and Projected Demand for Electricity

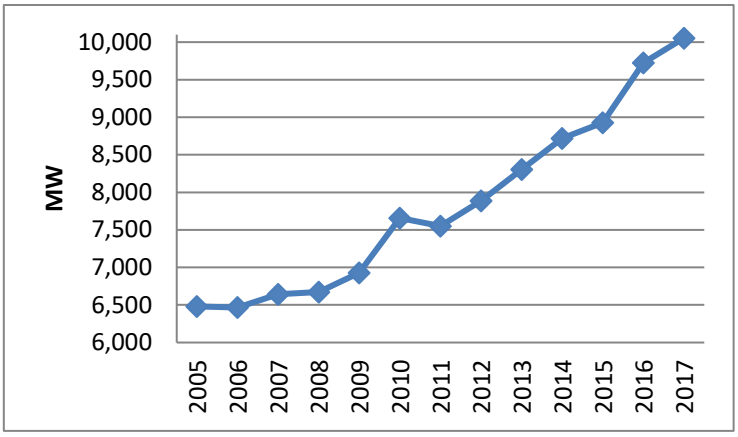
Total peak demand (in MW, non-coincident sum) of the Philippines shows consistent upward trend from 2005 to 2017 with an Average Annual Compounded Growth Rate (AACGR) of 4.02%. Total demand growth was at its highest in 2010 (at 9.53%) while it was at its most sluggish in 2011 (at 0.04%).

Table 4.1: Summary of Historical Demand per Grid (2005-2017), in MW

Actual	Luzon	Visayas	Mindanao	Philippines
2005	6,479	967	1,149	8,595
2006	6,466	997	1,228	8,691
2007	6,643	1,102	1,241	8,987
2008	6,674	1,176	1,204	9,054
2009	6,928	1,241	1,303	9,472
2010	7,656	1,431	1,288	10,375
2011	7,552	1,481	1,346	10,379
2012	7,889	1,551	1,321	10,761
2013	8,305	1,572	1,428	11,305
2014	8,717	1,636	1,469	11,822
2015	8,928	1,768	1,518	12,215
2016	9,726	1,893	1,653	13,272
2017	10,054	1,975	1,760	13,789
%AACGR (2006-2016)	3.73%	6.13%	3.62%	4.02%

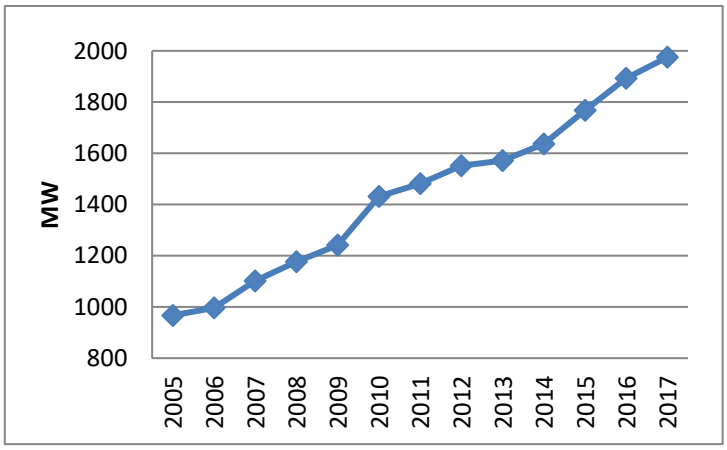
*Includes embedded generation monitored by NGCP

4.1.2.1 Luzon



The Luzon Grid has posted an AACGR of 3.73% for the period 2006-2017. Consistent steady growth has been recorded for the Luzon Grid except for the decrease in demand observed in 2006 and 2011. This was due to the reduction in the power consumption of MERALCO for the two periods brought about by the effect of the global financial crisis in 2006 and the effect of La Niña phenomenon experienced in 2011. MERALCO's demand accounts for at least 70% of the total system peak demand (SPD) in Luzon. Further, demand growth in 2010 has been unprecedented (10.51%) – similar double-digit growth was also observed in MERALCO's franchise area. This was attributed to increased economic activity brought about by election spending and the higher-than-average growth in GDP for the year. Also, the prolonged hot temperature experienced during the summer months brought about by El Niño has contributed to the unusual upsurge in the Luzon SPD. Note, however, that this demand growth has not been sustained in 2011. In fact, SPD has fallen by 1.36%. Demand was quick to recover though, registering a 4.46% growth in 2012. From 2013 to 2017, Luzon posted an average annual growth of 4.92% or by 437 MW.

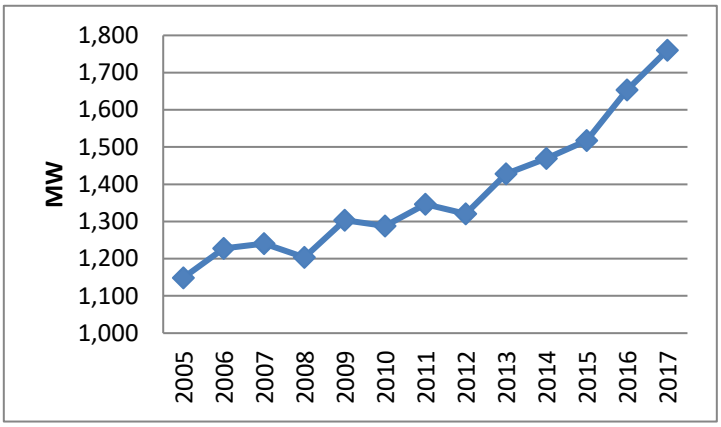
4.1.2.2 Visayas



The aggregate demand in Visayas Grid has posted an AACGR of 6.13% for the period 2006-2017. The year 2010 brought significant increase in the demand for electricity in the Visayas. Compared with the SPD recorded in 2009, Visayas Grid grew by a record high of 15.31% in 2010. This was due to the improved economic activities and increased reliance on power supply from the Grid of existing large customers with self-generation. In addition, the realization of 346 MW increase in generation capacity coming from CEDC, KEPCO and PEDC helped boost the supply-demand situation in 2010. However, this growth was not sustained as the system grew only at an average rate of 4.11% for the next 2 years (2011-2012). In 2013, the total demand in Visayas posted a meager increase of only 1.35%. This is due to the effect of Typhoon Yolanda that hit the region in November and caused significant decrease in power consumption. Visayas demand grew by 4.07% year after the Typhoon Yolanda and the demand continued to rise by 8.07% and 7.07% in 2015 and 2016, respectively. In the last two years, 207 MW load was added to the demand of Visayas.

4.1.2.3 Mindanao

Mindanao Grid has posted an AACGR of 3.62% for the period 2006-2017. After recording high annual growth rtes from 2002 to 2004 (an annual average of 7.36%), demand growth has been sluggish from 2005 to 2010 due to the overall reduced power requirement from large non-utility customers. From 2005 onwards, the historical growth in the Mindanao Grid has been volatile with alternating periods of rise and decline.



Drop in demand occurred in years 2005, 2008, 2010 and 2012. The year 2005 was characterized by reduced demand from distribution utilities while 2008 was characterized by the large decrease in the demand of non-utility customers, possibly a direct effect of the global financial crisis which adversely affected exporting industries. On the other hand, suppressed generation impeded demand growth in 2010 and 2012. This was due to the El Niño phenomenon that hampered hydropower generation, which comprised about half of the Grid's installed capacity. Mindanao power demand recovered in the recent years and grew by 8.10% in 2013 then maintained at around 3.10% growth rate in the next two years. In 2016, a record high 8.98% demand growth was registered in Mindanao Grid. More than 800 MW additional generation capacity was added to Mindanao in 2016.

4.2 Forecast for TDP 2019-2040

Power demand for the country is expected to grow at an AACGR of 5.94% for the period 2018-2022, 5.38% for 2023-2030 and 5.49% for 2031-2040. It is projected that Mindanao will have the highest AACGR compared with the two other Grids. Mindanao is forecasted to reach an AACGR of 7.16% for 2018-2040 while the Luzon and Visayas Grids at 4.92% and 6.70%, respectively. The peak demand used for Luzon in 2017 is the actual year-to-date peak demand of 10,876 MW (based on generation level) which occurred in May. Table 4.2 shows the projected demand disaggregated per district based on the transformer peak demand coincident with the System Peak. It was derived from the DOE Forecast as of 09 August 2018 based on the generation level. Applicable system losses were applied to the generation level to disaggregate the forecast down to the NGCP transformers.

A comparison of the projected load and generation capacity per area per grid is also available in Appendix 3.

Table 4.2: Summary of Projected Demand per District (MW)

District	Area	2018	2019	2020	2021	2022	2023	2024	2025	2030	2035	2040
Luzon		10,876	11,403	11,959	12,508	13,087	13,695	14,336	15,009	18,940	23,965	30,360
MERALCO		8,058	8,305	8,645	9,005	9,343	9,718	10,106	10,503	12,767	15,529	18,901
1	NCR	5,653	5,826	6,065	6,317	6,555	6,818	7,090	7,368	8,956	10,894	13,260
2	North	350	361	376	391	406	422	439	456	555	675	821
3	South	2,055	2,118	2,204	2,296	2,383	2,478	2,577	2,678	3,256	3,960	4,820
North Luzon		2,183	2,396	2,556	2,706	2,892	3,079	3,282	3,504	4,863	6,739	9,288
1	Ilocos	272	290	298	306	319	332	346	361	446	541	639
2	Mt. Province	120	122	124	127	130	135	141	148	185	223	256
3	North Central	207	222	250	281	296	316	337	360	497	669	870
4	Cagayan Valley	220	232	247	257	273	295	317	343	501	737	1053
5	West Central	425	474	500	532	570	618	671	730	1134	1795	2904
6	South Central	863	982	1061	1127	1227	1305	1389	1479	2001	2659	3431
7	North Tagalog	75	75	75	76	78	80	82	84	99	116	135
South Luzon		635	702	758	797	852	898	948	1,002	1,311	1,697	2,171
1	Batangas/Cavite	301	326	351	368	395	418	443	471	634	846	1118
2	Laguna/ Quezon	94	98	104	110	115	119	124	128	150	173	198
3	Bicol	241	277	303	318	342	360	380	403	527	678	855
Visayas		2,155	2,299	2,447	2,606	2,777	2,968	3,175	3,397	4,627	6,344	8,773
1	Panay	399	426	453	483	514	550	588	629	857	1175	1625
2a	Cebu	1042	1111	1183	1260	1343	1435	1535	1642	2237	3067	4241
2b	Bohol	84	89	95	101	108	115	124	132	180	247	341
3	Leyte-Samar	268	286	305	324	346	370	395	423	576	790	1092
4	Negros	362	386	411	438	466	498	533	571	777	1065	1473
Mindanao		2,064	2,130	2,226	2,359	2,539	2,732	2,941	3,165	4,416	6,171	8,632
1	North Western	253	263	277	289	316	346	374	406	575	827	1198
2	Lanao Area	145	145	146	150	160	170	182	194	249	325	428
3	North Central	438	481	516	543	575	609	648	689	1033	1434	1898
4	North Eastern	177	184	189	197	215	234	254	276	381	538	767
5	South Eastern	595	590	622	686	746	809	879	953	1325	1881	2716
6	South Western	457	467	477	494	527	563	603	646	853	1165	1626
Philippines		15,095	15,832	16,632	17,473	18,403	19,395	20,452	21,571	27,983	36,480	47,765

[3]Based on aggregate transformer peak demand coincident with DOE SPD forecast excluding applicable losses

4.2.1 Demand Projections for Substation Capacity Addition

The demand projections for substation expansion take off from the per meter forecast undertaken by NGCP. Forecast energy deliveries per metering point are derived from historical trends and/or information as to the potential expansion or contraction of demand of Grid-connected customers. Inputs are sought from customers in this bottom-up process to incorporate their expansion plans.

Projected monthly energy deliveries (in MWh) to metering points connected to a given transformer are then summed up. Accounting adjustments for technical losses and substation use to this sum, the monthly per transformer energy delivery forecast (in MWh) is derived. The forecast transformer peak (in MW) is then calculated by applying the appropriate load factor to these energy delivery projections. This transformer peak becomes the basis for adding transformer capacities at the substations.

4.2.2 Demand Projections for Transmission Expansions

The SPD projections for each Grid are used in determining the necessary transmission expansion projects. However, for these figures to be usable in the power system analysis software, it has to be broken down into individual transformer loads. First, the embedded generation during system peak is subtracted from the SPD to come up with the non-embedded peak. Then, the individual transformer maximum demand projections during the month when the system peak usually occurs (as determined in the previous section) are used to establish the percent share to arrive at the non-embedded peak that will be assumed for a specific transformer.

4.3 Identified Sites for Bulk Load Growth

Load growth rate is generally considered as an indication of economic development in an area. The development of economic zones and entry of industrial loads are among the key drivers to significant load increase over a short period of time. Aside from the economic benefits to the provinces, the power grid can also benefit if bulk load growth will take place in areas with huge excess generation capacity since grid reinforcements can be avoided or can be deferred. A significant increase in the local load absorption can help stabilize the grid as it can help address the heavily loaded transmission facilities as a result of huge excess power that needs to be exported to the other parts of the grid. Bulk load growth can help maintain a supply-demand balance in an area. The identified areas are:

Table 4.3: Identified Area for Bulk Load Growth

Grid	Areas where bulk load growth is recommended to absorb excess generation
Luzon	Ilocos Norte (250 MW), Ilocos Sur (30 MW), La Union (100 MW), Benguet (70 MW), Cagayan Valley (100 MW), Isabela (150 MW), Nueva Vizcaya (50 MW), Quirino (20 MW), Pangasinan (100 MW), Bataan (100 MW), Zambales (40 MW), SBMA (50 MW), Tarlac (100 MW), Nueva Ecija (50 MW), Batangas (150 MW), Laguna (200 MW), Quezon Province (250 MW) and Bicol Region (Camarines Norte to Sorsogon) (170 MW)
Visayas	Panay Island (130 MW), Negros Island (225 MW), Cebu Island (85 MW), Leyte (150 MW)
Mindanao	Zamboanga del Sur (170 MW), Zamboanga del Norte (25 MW), Lanao del Norte (8 MW), Misamis Oriental (60 MW), Bukidnon (8 MW), Surigao del Norte (60MW), Surigao del Sur (2 MW), Agusan del Sur (30 MW), Agusan del Norte (55 MW), Davao del Sur (20 MW), Compostela Valley (50 MW), Cotabato (40 MW), South Cotabato (65 MW), Sultan Kudarat (75 MW)

5.1 Generation Capacity Addition

This section shows the additional capacities and proposed generating plants in Luzon, the Visayas, and Mindanao Grids.

The DOE has also provided the list of generating plants that already have clearance to undertake System Impact Study (SIS) but are not yet included in the DOE's List of Private Sector Initiated Power Projects since the reports on the status of their development are not yet submitted. This list will fall under the new classification named as the Prospective Projects. Thus, there will be three generation project classifications, as follows:

a. Committed – These are projects that have service contracts in place, are in the development/commercial stage and have reached financial closure already and have been declared as "committed" by the DOE.
b. Indicative – Projects with service contracts, in the development/commercial stage but with no financing yet.
c. Prospective – Projects with DOE clearance to undertake SIS and service contracts and on the predevelopment stage. These projects are not included in the official list of DOE's Private Sector Initiated Power Projects. (Refer to Appendix 1 for the generation list).

It is worth noting that the proponents should regularly update the DOE on their plans and updates regarding the status of their projects for monitoring and inclusion in the official list of DOE's PDP Generation Projects. Proponents are advised to regularly coordinate with the DOE's Electric Power Industry Management Bureau (EPIMB).

Table 5.1 shows the additional capacities as of 30 June 2018.

Table 5.1: List of Additional Capacities as of 30 June 2018

Power Plant	Location	Installed Capacity (MW)	Dependable Capacity (MW)	Connection Point
LUZON				
ACNC Biogas	Tarlac City, Tarlac	2	0.6	Embedded to TEI
BBEC Rice Husk-fired Cogeneration Plant	Pili, Camarines Sur	5	4	Naga–Lagonoy 69 kV Line
CW HOME DEPOT SOLAR	CW Home Depot, Barangay Pulong, Sta. Rosa City, Laguna	1.7	1.2	Embedded to MERALCO
MORONG SOLAR	Morong, Bataan	5	3.5	Embedded to PENELCO
SAN RAFAEL SOLAR	San Rafael, Bulacan	3.8	2.7	Embedded to MERALCO
SARRAT SOLAR	Sarrat, Ilocos Norte	1	0.7	Embedded to INEC
MAIBARARA U2	Sto. Tomas, Batangas	12	12	Embedded to MERALCO
MARIS 1 MAIN CANAL	Ramon, Isabela	8.5	8	Alfonso Lista 69 kV Line
MARIVELES SOLAR	Freeport Areaof Bataan(FAB), Mariveles, Bataaan	18	12.6	Limay–Mariveles 69 kV Line 1
PAGBILAO U3	Pagbilao, Quezon	420	420	Tayabas 230 kV Substation

Power Plant	Location	Installed Capacity (MW)	Dependable Capacity (MW)	Connection Point
SAN LUIS	San Luis, Aurora	0.8	0.8	Embedded to AURELCO
SCPC U1	Limay, Bataan	150	150	Lamao 230 kV Substation
SCPC U2	Limay, Bataan	150	150	Lamao 230 kV Substation
SCPC U3	Limay, Bataan	150	135	Lamao 230 kV Substation
SLPGC U3	Calaca, Batangas	25.0	23	SLPGC 230 kV Marshalling Station
SLPGC U4	Calaca, Batangas	25	23	SLPGC 230 kV Marshalling Station
SJC IPOWER Phase II Rice Husk-fired Cogeneration Plant	San Jose City, Nueva Ecija	12.0	10.8	Cabanatuan–Fatima 69 kV Line
UPPC	Calumpit, Bulacan	30	24	Mexico–Calumpit 69 kV Line
STA. RITA SOLAR	Mt. Sta. Rita, Subic Bay Freeport Zone	32.3	29.3	Subic 230 kV Substation
Sub-total (Luzon)		1052.1	1011.2	
VISAYAS				
PB 104	Ubay, Bohol	32	26	Ubay Substation
FIRST TOLEDO SOLAR	Hacienda Baltao, Talavera, Toledo, Cebu	60	49	Calungcalung Substation
Sub-total (Visayas)		92	75	
MINDANAO				
FDC MISAMIS U3	PHIVIDEC, Villanueva, Misamis Oriental	135	120	Villanueva Substation
KEGI - JIMENEZ	Brgy. San Isidro, Jimenez	7.8	7.5	Aurora-Calamba 69kV transmission line
LAMSAN POWER CORPORATION	Lamsan Industrial Complex, Brgy. Crossing Simuay, Sultan Kudarat, Maguindanao	15	13.5	Sultan Kudarat Substation
MPC Balingasag Power Station U1	Brgy. Mandangoa, Balingasag, Misamis Oriental	55	5	Kirahon Substation of CEPALCO
MPC Balingasag Power Station U2	Brgy. Mandangoa, Balingasag, Misamis Oriental	55	50	Kirahon Substation of CEPALCO
MPC Balingasag Power Station U3	Brgy. Mandangoa, Balingasag, Misamis Oriental	55	50	Kirahon Substation of CEPALCO
NAC DPP	Km. 10, Brgy Quezon, Surigao City, Surigao del Norte	10.9	8.2	Placer–Surigao 69 kV Line of SURNECO
New Bataan HEPP	New Bataan, Compostela Valley	3	3	Compostela Substation of DANECO
SMC MALITA U2	Brgy. Culaman, Malita, Davao Occidental	150	135	Culaman Substation
PACERM-1	El Salvador City, Misamis Oriental	10.5	10.5	El Salvador Substation of MORESCO I
PBI	Bukidnon	10.4	10.4	Lunocan Substation of BUSECO
PSFI 2	San Francisco, Agusan del Sur	5.2	5.2	San Francisco-Alegria 69kV line of ASELCO
PSI 2	Brgy.Apopong, General Santos City, South Cotabato	13.9	13.9	New Society Substation of SOCOTECO II

Power Plant	Location	Installed Capacity (MW)	Dependable Capacity (MW)	Connection Point
ZAMCELCO DPP	Zamboanga City	16	16	Several Modular Gensets scattered on various substations of ZAMCELCO
Sub-Total (Mindanao)		542.7	448.2	
TOTAL		1686.8	1534.4	

Based on the DOE's List of Existing Plants as of 30 June 2018

The following tables show the DOE's List of Private Sector Initiated Power Projects as of 31 August 2018 for Luzon, Visayas and Mindanao.

Table 5.2: Summary of Generation Capacity Addition

	Total Committed Capacity (MW)	Total Indicative Capacity (MW)
Luzon	4,774.8	24,916.4
Visayas	765.8	3,995.6
Mindanao	868.0	2,629.9
PHILIPPINES	6,408.6	31,541.9

It can be noted that the list includes small capacity plants which may not actually connect directly to NGCP. For relatively small capacity power plants connecting to the distribution system, the main impact is a slight reduction in the power being drawn by the Distribution Utility from NGCP substations and would not generally require reinforcement in the transmission network.

Also, there are power plant projects in the DOE's list that have not yet applied for a connection application to NGCP or undertook SIS.

Table 5.3(a): List of Luzon Generation Capacity Addition

Proposed Generation Facility / Name of the Project	Capacity (MW)	Location	Comm. Year
COMMITTED POWER PLANTS			
COAL			
Limay Power Plant Project Phase II	150	Limay, Bataan	2018
San Buenaventura Power Ltd. Co. (SBPL) Project	500	Mauban, Quezon	2018
RPEI Coal-Fired Power Plant	600	Cawag, Subic Bay Freeport Zone	2018
Masinloc Expansion Project	300	Zambales	2019
GNPower Dinginin 2 x 660 MW Supercritical Coal-Fired Power Plant	1200	Mariveles, Bataan	2019
AOE Coal-Fired Power Plant	600	Atimonan, Quezon	2021
Sub-Total Coal	3,950		
NATURAL GAS			
Pagbilao Combined Cycle*	650	Brgy. Ibabang Polo, Pagbilao, Quezon	2018
Sub-Total Natural Gas	650		
HYDRO			
Tubao	1.5	Tubao, La Union	2018
Majayjay	3	Majayjay, Laguna	2018
Labayat River (Upper Cascade)	3	Real, Quezon	2018
Colasi	1	Mercedes, Camarines Norte	2019
Man-Asok	3	Buguias, Benguet	2019
Rangas	1.5	Goa & Tigaon, Camarines Sur	2021
Laguio Malaki 1	1.6	Mauban, Quezon	2021
Matuno 1	8.0	Ambaguio, Nueva Vizcaya	2021
Sub-Total Hydro	22.6		

Proposed Generation Facility / Name of the Project	Capacity (MW)	Location	Comm. Year
SOLAR			
Concepcion 1 Solar Power Project	115	Concepcion, Tarlac	2018
Sub-Total Solar	115		
GEOTHERMAL			
Bacman 3 (Tanawon)	31	Guinlajon, Sorsogon	2025
Sub-Total Geothermal	31		
BIOMASS			
FQBC Biogas Power Plant Project	1.2	Quezon	2018
Isabela La Suerte Rice Husk-Fired	5	Camarines Sur	2018
Sub-Total Biomass	6.2		
BATTERY			
AES Battery Storage	10	Masinloc, Zambales	2018
Sub-Total Battery	10		
TOTAL COMMITTED	4,784.8		
TOTAL COMMITTED W/O BATTERY	4,774.8		
INDICATIVE POWER PLANTS			
COAL			
Global Luzon Coal-Fired Power Plant	670	Brgys. Carisquis and Nalvo Sur, Luna, La Union	2021
H & WB PCB Supercritical Coal-Fired Power Plant Unit 1	350	Jose Panganiban, Camarines Norte	2022
H & WB PCB Supercritical Coal-Fired Power Plant Unit 2	350	Jose Panganiban, Camarines Norte	2023
SRPGC 2x350MW Coal-Fired Power Plant*	700	Brgy. San Rafael, Calaca, Batangas	2022
Merbau Coal Fired Thermal Power Plant	600	Brgy. Pinamukan Ibaba, Batangas City	TBD
Masinloc Expansion Project	300	Zambales	TBD
SMC Circulating Fluidized Bed Coal-Fired Power Plant	600	Brgy. Ibabang Polo, Pagbilao, Quezon	TBD
SMC Circulating Fluidized Bed Coal-Fired Power Plant	600	Sariaya, Quezon	TBD
Quezon Coal Fired Thermal Plant Project	1,200	Tagkawayan, Quezon	TBD
Zestpower Coal Thermal Plant	660	Mariveles, Bataan	TBD
2x500 MW KEPCO Pangasinan Coal-Fired Power Plant	1000	Sual, Pangasinan	TBD
Sub-Total Coal	7,030		
OIL-BASED			
Aero Derivative Combined Cycle	150	Calamba, Laguna	TBD
AC Energy Modular Genset	300	Pililia, Rizal	TBD
SPC - Tarlac Bunker Fired Power Plant	11.04	Capas, Tarlac	TBD
Isla del Fuego Bunker Fired Diesel Power Generating Facility	35.0	Redondo Peninsula, Subic, Zambales	TBD
Sub-Total Oil-Based	496.04		
NATURAL GAS			
Sta. Maria Power Plant (Phase 2)*	450	Santa Rita, Batangas	TBD
Batangas CCGT Plant Unit 1	300	Brgy. Libjo, Batangas City	TBD
Batangas CCGT Plant Unit 2	400	Brgy. Libjo, Batangas City	TBD
Batangas CCGT Plant Unit 3	400	Brgy. Libjo, Batangas City	TBD
Sta. Ana CCGT Power Plant	383	Port Irene, Sta. Ana, Cagayan	TBD
Sual CCGT Power Plant	383	Brgy. Baquioen, Sual, Pangasinan	TBD
VIRES LNG-Fired Power Barge*	500	Batangas Bay area, Batangas	TBD
Lucidum Liquefied Natural Gas Power Plant	300	Silanguin Bay, Zambales	TBD
Limay LNG - Combined Cycle Gas Turbine	1,100	Limay, Bataan	TBD

Proposed Generation Facility / Name of the Project	Capacity (MW)	Location	Comm. Year
Sub-Total Natural Gas	4,216		
GEOTHERMAL			
Bacman 4 Botong-Rangas Geothermal*	20	Bacon District, Sorsogon, Sorsogon City	TBD
Kayabon Geothermal*	30	Manito, Albay	TBD
Bacon-Manito Geothermal*	80	Bacon-Manito, Sorsogon	TBD
Sub-Total Geothermal	130		
SOLAR			
Sta. Rita Solar Power Project - Phase II	67.86	Mt. Sta. Rita, Morong and Hermosa, Bataan	2018
Botolan Solar Power Project	39.27	Brgy. San Juan, Botolan, Zambales	2018
Macabud Solar Photovoltaic Power Project	30	Brgy. Macabud, Rodriguez, Rizal	2018
Concepcion Solar Power Project	50.55	Brgy. Sta. Rosa, Concepcion Tarlac	2018
Cavite Solar Power Project	3	Cavite Economic Zone, Rosario Cavite	2018
Cordon Solar PV Power Project	50	Cordon, Isabela	2019
Earthenergy Solar Power Plant	30	Balayan, Batangas	2019
Clark Solar Power Project	35	Northern Runway Approach of Clark International Airport, Clark Pampanga	2019
V-Mars Solar Power Project	10	San Jose/Lupao, Nueva Ecija	2019
SJC Solar Power Project	10	San Jose City, Nueva Ecija	2019
RGEC Solar Power Project	30	Nasugbu and Tuy, Province of Batangas	2019
Calabanga Solar Power Project	50	Calabanga, Camarines Sur	2019
FPI Solar PV Power Project	50	Tarlac City, Tarlac	2019
Nueva Ecija Solar Power Project	100	Pantabangan, Nueva Ecija	2019
Sta. Maria Solar PV Power Project	125	Sta. Maria, Isabela	2019
Solana Solar Photovoltaic (PV) Plant Phase I	24	Hermosa, Bataan	2019
Solana Solar Photovoltaic (PV) Plant Phase II	14	Hermosa, Bataan	2019
Sta. Maria Solar Power Project	30	Sta. Maria, Isabela	2020
Santa Solar Power Project	20	Brgy. Nagpanaoan, Santa, Ilocos Sur	2020
Talugtug Solar PV Power Project	125	Talugtug, Nueva Ecija	2020
Greenergy Capas Solar Power Project	50	Capas, Tarlac	2020
Ilagan II Solar PV Power Project	100	Ilagan City, Isabela	2020
Cabanatuan Solar Power Plant	6.25	Cabanatuan, Nueva Ecija	2020
Bongabon Solar Power Plant	18.75	Bongabon, Nueva Ecija	2022
Magsingal Solar Power Plant	100	Magsingal, Ilocos Sur	TBD
Calamba and Tanauan Solar Power Project	100	Tanauan, Batangas	TBD
Capas Solar PV Power Project	22	Capas, Tarlac	TBD
San Manuel 1 Solar Power Project	70	San Manuel, Pangasinan	TBD
San Manuel 2 Solar Power Project	70	San Manuel, Pangasinan	TBD
Horus Solar Power Plant Project	45	Morong, Bataan	TBD
Tanauan Batangas Solar I Power Project	100	Tanauan, Batangas	TBD
Bugallon Solar Power Plant	45	Brgy. Salomague North. Bugallon, Pangasinan	TBD
Laguna Lake Bangyas Solar Power Plant	25	Calacan and Victoria, Laguna	TBD
Lumban Solar Power Plant	37	Lumban, Laguna	TBD
San Miguel Solar Power Plant	50	San Miguel, Bulacan	TBD
Bawi Solar Power Plant	45	Lipa City & Padre Garcia, Batangas	TBD
Iba Palauig 1 Solar Power Project	1200	Iba, Zambales	TBD
Iba Palauig 2 Solar Power Project	1200	Iba, Zambales	TBD
Balayan Solar Power Project	600	Balayan & Calaca, Batangas	TBD
Sta. Rosa Nueva Ecija 2 Solar	1200	Sta. Rosa, Peñaranda, San Leonardo, Nueva Ecija	TBD
Concepcion Tarlac 2 Solar	200	Concepcion City, Tarlac	TBD
Laguna Lake-Balibago SPP	126	Laguna de Bay and Santa Rosa, Laguna	TBD
Laguna Lake-Bay SPP	126	Bay-Calauan and Victoria, Laguna and Laguna de Bay	TBD

Proposed Generation Facility / Name of the Project	Capacity (MW)	Location	Comm. Year
Laguna Lake-Cabuyao SPP	100.8	Cabuyao, Sta. Rosa and Calamba Laguna and Laguna de Bay	TBD
Laguna Lake-Calamba SPP	100.8	Calamba City, Laguna and Laguna de Bay	TBD
Laguna Lake-Los Baños SPP	100.8	Los Baños, Laguna	TBD
Laguna Lake-Lumban SPP	65.52	Cabuyao, Laguna	TBD
Laguna Lake-UPLB SPP	30	UPLB, Los Baños, Laguna	TBD
Gamu Solar Power Project	100	Gamu, Isabela	TBD
San Rafael Solar Power Project	421.2	San Rafael, Bulacan	TBD
San Ildefonso Solar Power Project	421.2	San Ildefonso, Bulacan	TBD
Tarlac Solar Power Project	150	Tarlac City, Tarlac	TBD
San Jose Del Monte SPP	80	San Jose Del Monte, Bulacan	TBD
Maragondon-Naic-Tanza 2 Solar Power Project	200	Maragondon-Naic-Tanza, Cavite	TBD
Sunray Tarlac Solar Power Project	100	Capas and Bamban, Tarlac	TBD
Sub-Total Solar	8300		
HYDRO			
Ibulao Hydroelectric Power Project	4.5	Lagawe, Ifugao	2020
Ibulao 1	6.75	Kiangan, Ifugao	2020
Dupinga Hydroelectric Power Project	3	Gabaldon, Nueva Ecija	2022
Gened - 1 Hydroelectric Power Project	150	Pudtol, Apayaw	2022
Didipio 1	2.1	Kasibu, Nueva Vizcaya	2024
Kabayan 2 (Natalang HEP)	38	Kabayan, Benguet	2024
Matuno 2	7.9	Bambang, Nueva Ecija	2024
Ilaguen 3	11	Echague, Isabela	2024
Kapangan	60	Kapangan & Kibungan, Benguet	2025
Tumauini (Lower Cascade)	7.8	Tumauini, Isabela	2025
Abdao HEP	2	Tabaan Sur, Tuba, Benguet	2025
Barit (Irrigation Discharge) Hydroelectric Power Project	0.4	Buhi, Camarines Sur	2025
Talubin Hydropower Project	4.9	Bontoc, Mountain Province	2025
Ilaguen 4	10	Echague	2025
Matuno 1	7.4	Ambaguio, Nueva Vizcaya	2025
Hungduan	4.04	Kiangan, Ifugao	2025
Asin	7.04	Kiangan, Ifugao	2025
Ilaguen	19	San Mariano & San Guillermo	2025
Piapi	3.30	Mauban, Quezon	2025
Lower Labayat	1.40	Real, Quezon	2026
Ilaguen 2	14	Dinapique, Isabela	2026
Lalawinan Mini-Hydro Power Project	3	Real, Quezon	TBD
Pinacanauan	6	Peñablanca, Cagayan	TBD
Matibuey	16	Matibuey, Ilocos Sur	TBD
Tibag	4.40	Real, Quezon	TBD
Tignoan River (Upper Cascade) HEP	1.5	Real, Quezon	TBD
Ibulao 2	7.40	Municipalities of Kiangan, Lamut and Lagawe , Province of Ifugao	TBD
Tinoc 1	4.1	Tinoc, Ifugao	TBD
Tinoc 4	5	Tinoc, Ifugao	TBD
Tinoc 2	11	Tinoc, Ifugao	TBD
Tinoc 3	8	Tinoc, Ifugao	TBD
Tumauini (Upper Cascade)	14	Tumauini, Isabela	TBD
Kabayan 1	20	Kabayan, Benguet	TBD
Kabayan 3	27	Kabayan, Benguet	TBD
Bineng 1-2b Combination HEPP	19	La Trinidad, Benguet	TBD
Tignoan HEP	20	Real, Quezon	TBD
Biyao	0.8	Balbalan, Kalinga	TBD
Ibulao I Hydroelectric Power Project	6	Kiangan, Ifugao	TBD
Maris Main Canal2 HEP	1.75	Alfonso Lista, Ifugao	TBD
100 MW Alimit	100	Lagawe, Ifugao	TBD
240 MW Alimit	240	Lagawe, Ifugao	TBD

Proposed Generation Facility / Name of the Project	Capacity (MW)	Location	Comm. Year
Olilicon HEPP	10	Lagawe, Ifugao	TBD
Cervantes-Mankayan-Bakun HEPP	27	Benguet	TBD
Chico Hydroelectric Power Project	150	Tabuk, Kalinga	TBD
Kibungan Pumped-Storage HEPP	500	Kibungan, Benguet	TBD
Ilaguen 4 Hydropower Project	10	Echague, Isabela	TBD
Wawa Pumped Storage 1 HEP	500	San Mateo, Antipolo, and Rodriguez, Rizal	TBD
Wawa Pumped Storage 2 HEP	100	San Mateo, Antipolo, and Rodriguez, Rizal	TBD
Wawa Pumped Storage 3 HEP	50	San Mateo, Antipolo, and Rodriguez, Rizal	TBD
Nabuangan Run-of-River HEP	10	Apayao	TBD
Dingalan Pumped Storage HEP	500	Dingalan, Aurora	TBD
San Roque Lower East Pumped Storage	400	Pangasinan	TBD
Ilaguen HEPP	19	San Mariano and San Guillermo, Isabela	TBD
Ibulao 2 Hydroelectric Power Project	7.4	Kiangan, Ifugao	TBD
Matuno 2 HEPP	7.9	Bambang, Nueva Vizcaya	TBD
Sablan 1 Hydroelectric Power Project	20	Sablan, Benguet	TBD
Sablan 2 Hydroelectric Power Project	30	Sablan, Benguet	TBD
Kibungan Hydroelectric Power Project	40	Kibungan, Benguet	TBD
Santol-Sugpon Hydroelectric Power Project	52	Sugpon, Ilocos Sur / Kibungan Benguet	TBD
Pasil B Hydroelectric Power Project	15.684	Pasil, Kalinga	TBD
Pasil C Hydroelectric Power Project	9.754	Pasil, Kalinga	TBD
Sub-Total Hydro	3338.2		
WIND			
Sembrano Wind*	80.40	Mt. Sembrano, Mabitac, Laguna	2019
Pagudpud Wind Power	84	Brgy. Balaoi and Caunayan, Pagudpud, Ilocos Norte	2019
Burgos 2 Wind Power	183	Burgos, Ilocos Norte	2019
Matnog 1 Wind Power	153	Matnog, Sorsogon	2020
Matnog 2 Wind Power	206	Matnog, Sorsogon	2020
Matnog 3 Wind Power	206	Matnog, Sorsogon	2020
Pasuquin East Wind Phase 1 *	48	Pasuquin, Ilocos Norte	TBD
Balaoi Wind Power	45	Brgy. Balaoi, Pagudpud, Ilocos Norte	TBD
Talisay Wind Power	50	Camarines Norte	TBD
Talim Wind Power	140	Rizal	TBD
Calatagan Wind Power	80	Batangas	TBD
Sub-Total Wind	1,275.40		
BIOMASS			
NREDC Biomass Power Plant	24	Cagayan	2019
Santa Biomass Power*	10	Brgy. Nagpanaoan, Santa, Ilocos Sur	2019
EcoMarket Solutions Coconut Waste-Fired Biomass Power	2.5	Aurora	2019
CJ Global Waste-to-Energy Power	20	Camarines Sur	2020
Napier Grass-Fired Biomass Power Plant	12	Nueva Ecija	2020
FQBC Biogas Power Plant	1.2	Quezon	2020
HEC Rice Husk-Fired Biomass Power Plant	12	Bulacan	2020
VSGPC Multi-Feedstock Biomass Power Plant	6	Nueva Ecija	2020
Bataan 2020 Multi-Feedstock Cogeneration Power Plant	25	Mariveles, Bataan	TBD
Green Atom Pampanga Waste to Energy	6	Mabalacat City, Pampanga	TBD
Green Atom Pangasinan Waste to Energy	6	Laoac, Pangasinan	TBD
Green Atom Batangas Waste to Energy	6	Brgy. Aya, San Jose, Batangas	TBD
Sub-Total Biomass	131		

Proposed Generation Facility / Name of the Project	Capacity (MW)	Location	Comm. Year
BATTERY			
AES Battery Storage - Laoag	40	Laoag, Ilocos Norte	TBD
AES Battery Storage - Bantay	40	Bantay, Ilocos Norte	TBD
AES Battery Storage - Masinloc Unit 2	10	Masinloc, Zambales	TBD
AES Battery Storage - Masinloc Unit 3	10	Masinloc, Zambales	TBD
AES Battery Storage - Masinloc Unit 4	10	Masinloc, Zambales	TBD
Enerhiya Central Battery Energy Storage	40	Concepcion, Tarlac	TBD
Enerhiya Sur I Battery Energy Storage	40	Lemery and Tuy, Calaca, Batangas	TBD
Enerhiya Sur II Battery Energy Storage	40	Lumban, Laguna	TBD
Bauang Energy Storage - Lumban	40	Lumban, Laguna	TBD
Mexico Battery Energy Project	40	Mexico, Pampanga	TBD
Sub-Total Battery	270		
TOTAL INDICATIVE	25,226.4		
TOTAL INDICATIVE W/O BATTERY	24,916.4		

* - with SIS

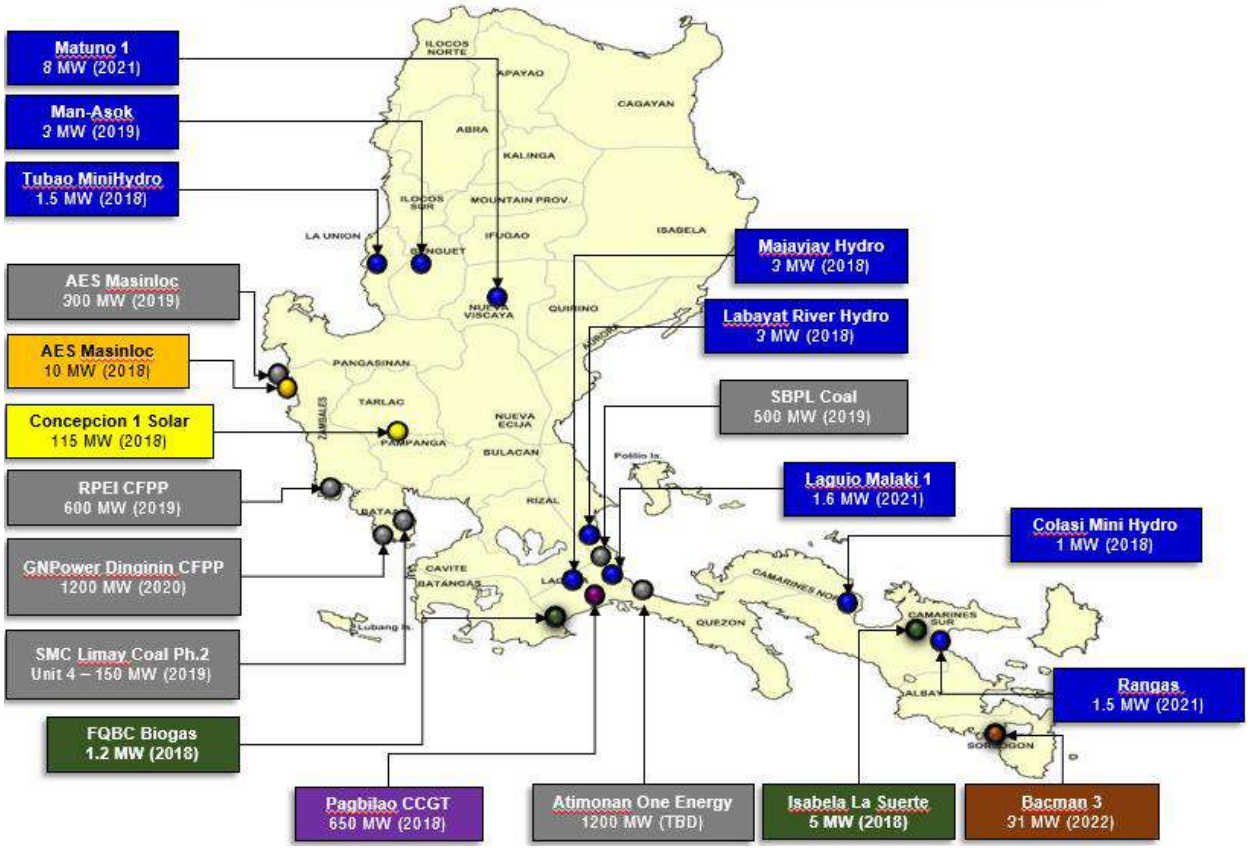


Figure 5.1: Luzon Generation Capacity Addition (Committed Conventional Power Plants)

The table below shows the list of major committed plants in the Luzon Grid and the associated transmission projects that will accommodate their entry.

Table 5.3(b): List of Luzon Major Committed Plants and Associated Transmission Projects

Based on DOE List of Private Sector Initiated Power Projects as of August 2018			Based on Transmission Development Plan 2019-2040		
Proposed Major Power Plants	Capacity (MW)	Comm. Year	Connection Point	Associated Transmission Project	ETC
COAL					
SMC Limay Coal Phase 2 Unit 4*	150	2018	Lamao 230 kV Substation	Bataan 230 kV Grid Reinforcement Project	Aug 2019
San Buenaventura (SBPL) Coal*	500	2018	QPPL 230 kV Substation	Pagbilao 500 kV Substation	Nov 2019
AES Masinloc Expansion*	300	2019	Masinloc 230 kV Substation	None	N/A
RPEI Coal-Fired Power Plant	600	2018			
GNPower Dinginin Coal-Fired Power Plant	1200	2019	Limay 500 kV Substation	Mariveles–Hermosa 500 kV Transmission Line Project / Hermosa–San Jose 500 kV Transmission Line Project	Sep 2019/ Dec 2019
AOE Coal-Fired Power Plant	1200	TBD	Pagbilao 500 kV Substation	Pagbilao 500 kV Substation/ Pagbilao–Tayabas 500 kV Transmission Line Project	Nov 2019/ Dec 2024
NATURAL GAS					
Pagbilao CCGT Power Plant*	650	2018	Pagbilao 230 kV Substation	Pagbilao 500 kV Substation	Nov 2019
HYDRO					
Kabayan 2 (Natalang HEP)*	38	2020	Ambuklao 230 kV Substation	Ambuklao–Binga 230 kV Transmission Line Upgrading Project / Binga–San Manuel Transmission Line Project	Dec 2021 / Dec 2021
SOLAR					
Concepcion 1 Solar Power Project	115	2018		None	N/A
GEOTHERMAL					
Bacman 3 (Tanawon)	31	2022	Bacman 230 kV Substation	None	N/A

Note: Commissioning year for each power plant is still subject to update.
* - with SIS

Table 5.3(c): List of Visayas Generation Capacity Addition

Proposed Generation Facility / Name of the Project	Capacity (MW)	Location	Comm. Year
COMMITTED POWER PLANTS			
COAL			
Therma Visayas Incorporated*	300	Brgy. Bato, Toledo City, Cebu	2018
Palm Concepcion Coal-Fired Power Plant Unit 2*	135	Brgy. Nipa, Concepcion, Iloilo	2018
Sub-Total Coal	435		
OIL-BASED			
CENPRI Diesel Power Plant Unit 5*	8	Brgy. Calumangan,Bago City, Negros Occidental	2018
Modular Diesel Ancillary Service Power Plant*	70	Isabel, Leyte	2019
Sub-Total Oil-Based	78		
HYDRO			
Igbulo (Bais) Hydroelectric*	5.1	Igbaras, Iloilo	2018
Timbaban*	18.0	Madalag, Aklan	2019
Sub-Total Hydro	23.1		
BIOMASS			
SCBI Multi-Feedstock Biomass Power Plant*	20	Negros Occidental	2018
HPC Cogeneration Power Plant*	20.58	Negros Occidental	2018

Proposed Generation Facility / Name of the Project	Capacity (MW)	Location	Comm. Year
VMC Cogeneration Power Plant*	40	Victoria, Negros Occidental	2018
BISCOM Cogeneration Power Plant*	48	Binalbagan, Negros Occidental	2018
Bais Bagasse-Fired Cogeneration Power Plant*	25	Calasagan, Bais City, Negros Occidental	2018
SNBI Cane trash-Fired Biomass Power Plant *	25	Negros Occidental	2019
Sub-Total Biomass	178.58		
GEOTHERMAL			
Biliran Geothermal Plant*	50	Biliran, Biliran	2018
Sub-Total Geothermal	50		
SOLAR			
Kalibo Solar	0.22	Kalibo, Aklan	2018
Kabankalan Solar	0.61	Kabankalan City , Negros Occidental	2018
Boracay Solar	0.36	Malay , Aklan	2018
Sub-Total Solar	1.19		
TOTAL COMMITTED	765.8		
INDICATIVE POWER PLANTS			
COAL			
SPC Expansion Coal Power Plant	300	Brgy. Colon, Naga City, Cebu	TBD
SMC Global Combined Cycle Gas Turbine Project	300	San Carlos, Negros Occidental	TBD
Sub-Total Coal	600		
OIL			
Datem Energy Northern Samar Diesel Power Plant Project	10	Northern Samar	TBD
SPC Ubay Diesel Power Plant Project*	7.20	Ubay, Bohol	TBD
Sulzer Diesel Power Plant*	5.50	GMC Complex, Lapu-Lapu City, Cebu	TBD
Caterpillar Diesel Power Plant*	2	GMC Complex, Lapu-Lapu City, Cebu	TBD
Cummins Diesel Power Plant*	1	GMC Complex, Lapu-Lapu City, Cebu	TBD
Diesel Fired Power Barge	32	Tapal Wharf, Ubay, Bohol	TBD
Sub-Total Oil	57.7		
NATURAL GAS			
Argao Floating CCGT Power Plant	138	Brgy. Bulasa, Argao, Cebu	TBD
Sub-Total Natural Gas	138		
GEOTHERMAL			
Dauin Geothermal	40	Dauin, Negros Oriental	2025
Sub-Total Geothermal	40		
SOLAR			
Grid Tied Solar Farm	25	Biliran, Biliran	2018
Tigbauan Solar	34.30	Brgy. Cordova Norte and Bantud, Tigbauan, Iloilo	2018
Victorias Solar	30.63	Brgy. XII, Victorias City, Negros Occidental	2018
Ceko Solar PV*	100	Brgy. Tominjao, Daan Bantayan, Cebu	2019
Silay Phase II Solar	10	Silay City, Negros Occidental	2019
Mabinay Solar	90	Mabinay, Negros Oriental	2019
Bogo V Solar	16.70	Bogo , Cebu	2020
Bogo 3 Solar	15	Bogo , Cebu	2020
Sanpalo Solar*	100	San Miguel, Leyte	2020
Medellin Solar	300	Medellin, Cebu	TBD
Puente Al Sol Solar	70	Cadiz City, Negros Occidental	TBD
Roxas City Solar	0.70	Roxas City , Capiz	TBD
Bacolod City Solar II	50	Bacolod City , Negros Occidental	TBD
Dumaguete Solar	0.30	Dumaguete City , Negros Oriental	TBD
Gaisano Iloilo Solar	1.03	Iloilo City , Iloilo	TBD
Sub-Total Solar	843.66		
WIND			
Bronzeoak Wind	100	Calatrava, Salvador Benedicto and San Carlos, Negros Occidental	2020

Proposed Generation Facility / Name of the Project	Capacity (MW)	Location	Comm. Year
Iloilo 1 Wind	213	Batad & San Dionisio, Iloilo	2020
Iloilo 2 Wind	500	Concepcion, Iloilo	2020
Negros Wind	262	Manapla & Cadiz, Negros Occidental	2020
Nabas Wind Phase II	14	Brgy. Pawa, Nabas, Aklan	2021
Montesol Wind	54	Bais City, Manjuyod and Mabinay, Negros Oriental	2022
Pulupandan Wind	50	Pulupandan, Negros Occidental	TBD
Aklan I Wind Phase 1-3	75	Nabas-Malay, Aklan	TBD
Anda Wind	50	Anda, Candijay & Guindalman, Bohol	TBD
Ivisan Wind	50	Ivisan, Capiz	TBD
Bohol I (Ubay) Wind	100	Ubay, Alicia, Mabini, Bohol	TBD
Batan Wind	50	Batan, Aklan	TBD
Tanjay Wind*	50	Bais, Negros Oriental	TBD
Sub-Total Wind	1,568		
HYDRO			
Loboc Hydroelectric Power Project	1.2	Loboc, Bohol	2020
Aklan Pumped-Storage Hydropower	300	Malay, Aklan	2024
Amlan (Plant A)	3.2	Amlan, Negros Oriental	2025
Malago	6	Silay City, Negros	2025
Amlan (Plant C)	0.8	Amlan, Negros Oriental	2026
Main Aklan River Hydroelectric Power Project	15	Libacao, Aklan	2026
Lower Himogaan	4	Sagay, Negros Occidental	2026
Amlan (Plant B)	1.5	Amlan, Negros Oriental	2026
Cantakoy	8	Danao, Bohol	TBD
Hilabangan (Lower Cascade)	3	Kabankalan, Negros Occidental	TBD
Hilabangan (Upper Cascade)	4.8	Kabankalan, Negros Occidental	TBD
Maninila (Lower Cascade)	4.5	San Remigio, Antique	TBD
Maninila (Upper Cascade)	3.1	San Remigio, Antique	TBD
Sibalom (Upper Cascade)	4.2	San Remigio, Antique	TBD
Sibalom (Middle Cascade)	4	San Remigio, Antique	TBD
Sibalom (Lower Cascade)	3.3	San Remigio, Antique	TBD
Bolusao Pumped Storage	300	Lawaan, Eastern Samar	TBD
Ilog Hydroelectric Power Plant	21.6	Mabinay, Negros Occidental	TBD
Sub-Total Hydro	688.2		
BIOMASS			
Biomass Power Plant Project	3	Himamaylan City, Negros Occidental	2019
MCEI Multi-Feedstock Biomass Power Plant*	12	Negros Occidental	2020
UGEP Rice Husk-Fired Biomass Power Plant	2.50	Leyte	2020
Biomass Power Plant Project	25	Manapla, Negros Occidental	2021
Biomass Power Plant Project	17.5	Mina, Iloilo	2022
Sub-total Biomass	60.0		
BATTERY			
AES Battery Storage - Kabankalan*	40	Kabankalan, Negros Occidental	2018
Enerhiya Delas Islas I	15	Amlan, Negros Oriental	TBD
Enerhiya Delas Islas II	15	Ormoc, Leyte	TBD
Enerhiya Delas Islas III	15	Compostela, Cebu	TBD
Cadiz Energy Storage	15	Cadiz City, Negros Occidental	TBD
Silay Battery Energy Storage	30	Silay, Negros Occidental	TBD
Sub-Total Battery	130		
TOTAL INDICATIVE	4,125.6		
TOTAL INDICATIVE W/O BATTERY	3,995.6		

* - with SIS

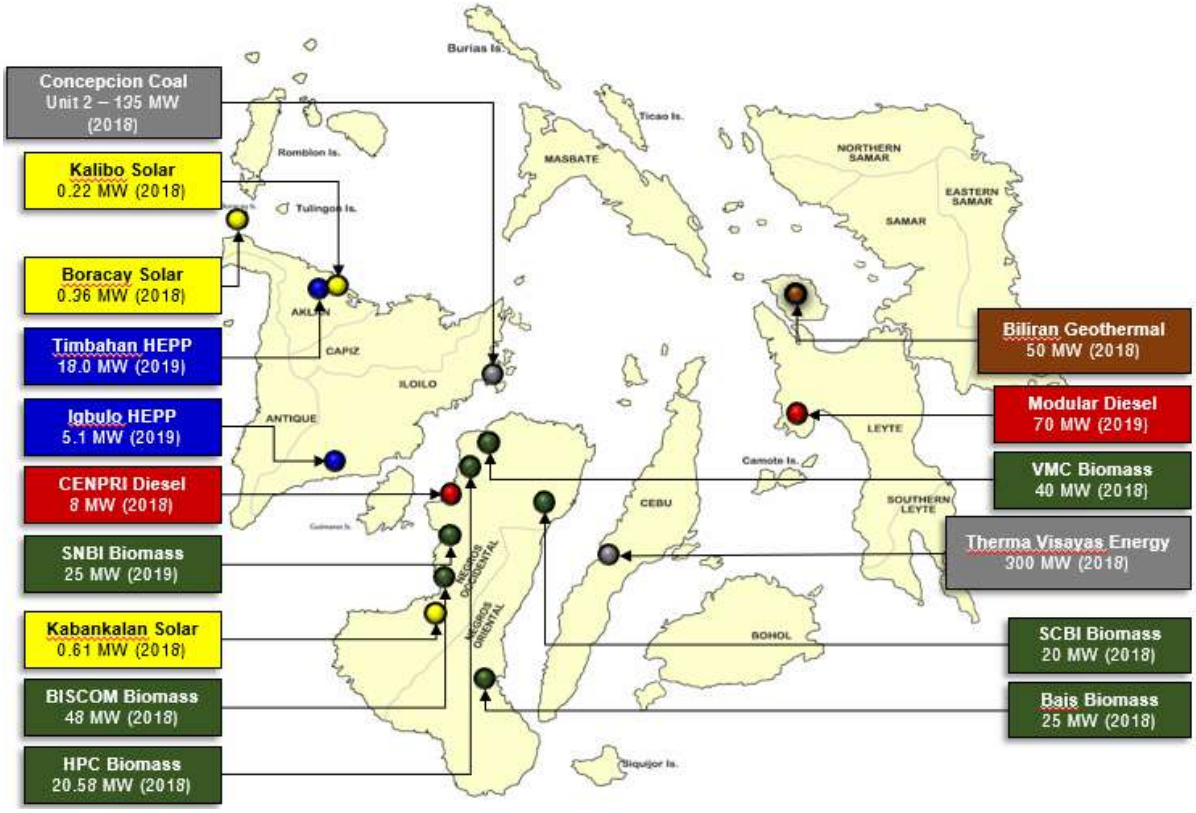


Figure 5.2: Visayas Generation Capacity Addition (Committed Power Plants)

The table below shows the list of major committed plants in the Visayas Grid and the associated transmission projects that will accommodate their entry.

Table 5.3(d): List of Visayas Committed Plants and Associated Transmission Projects

Based on DOE List of Private Sector Initiated Power Projects as of August 2018			Based on Transmission Development Plan 2019-2040		
Proposed Major Power Plants	Capacity (MW)	Comm. Year	Connection Point	Associated Transmission Project	ETC
COAL					
Therma Visayas Energy*	300	2018	Direct connection to Magdugo 230 kV Substation	CNP 230 kV Backbone Stage 3 • Magdugo – Cebu 230 kV line • Magdugo Substation 230 kV Substation • Reconductoring of the Cut-in Line from Quiot S/S CNP 230 kV Backbone Stage 2 (Cebu 230 kV SS)	Dec 2020 July 2019
Palm Concepcion Coal-Fired Power Plant Unit 2*	135	2018	Direct connection to Concepcion Substation	Eastern Panay Transmission Line Project	Mar 2018

Based on DOE List of Private Sector Initiated Power Projects as of August 2018			Based on Transmission Development Plan 2019-2040		
Proposed Major Power Plants	Capacity (MW)	Comm. Year	Connection Point	Associated Transmission Project	ETC
OIL-BASED					
CENPRI Diesel Power Plant Unit 5*	8	2018	Tap connection along Bacolod–San Enrique 69 kV line	CNP 230 kV Backbone Stage 3	Dec 2020
Modular Diesel Ancillary Service Power Plant*	70	2019	N/A	None	N/A
HYDRO					
Igbulo (Bais) Hydro*	5.10	2018	Tap connection along Sta. Barbara–Miagao 69 kV line	CNP 230 kV Backbone Stage 3	Dec 2020
Timbalan*	18	2019	Tap connection along Panitan–Nabas 69 kV line	CNP 230 kV Backbone Stage 3	Dec 2020
Cantakoy HEP*	8	2020	Tap connection along Ubay–Carmen 69 kV line	None	N/A
Malugo*	6	2020	Tap connection along Bacolod–Silay 69 kV	CNP 230 kV Backbone Stage 3	Dec 2020
Main Aklan River Hydro	15	2021	N/A	None	N/A
Ilaguen 4	10	2021	N/A	None	N/A
BIOMASS					
SCBI Multi-Feedstock Biomass Power Plant*	20	2018	Tap connection along Cadiz–San Carlos 69 kV line	CNP 230 kV Backbone Stage 3	Dec 2020
HPC Cogeneration Power Plant*	20.58	2018	Tap along Cadiz–Victorias 69 kV line	CNP 230 kV Backbone Stage 3	Dec 2020
VMC Cogeneration Power Plant*	40	2018	Tap along Cadiz–Victorias 69 kV line	CNP 230 kV Backbone Stage 3	Dec 2020
BISCOM Cogeneration Power Plant*	48	2018	Tap connection along Kabankalan–La Castellana 69 kV line	CNP 230 kV Backbone Stage 3	Dec 2020
Bais Bagasse-Fired Cogeneration Power Plant*	25	2018	Tap connection along Amlan–Guihulngan 69 kV line	CNP 230 kV Backbone Stage 3	Dec 2020
SNBI Cane trash-Fired Biomass Power Plant *	25	2019	Tap connection along Bacolod–San Enrique 69 kV line	CNP 230 kV Backbone Stage 3	Dec 2020
GEOTHERMAL					
Biliran Geothermal Plant*	50	2018	Tap connection along Ormoc–Biliran 69 kV line	None	N/A

Note: Commissioning year for each power plant is still subject to update.
* - with SIS

Table 5.3(e): List of Mindanao Generation Capacity Addition

Proposed Generation Facility / Name of the Project	Capacity (MW)	Location	Comm. Year
COMMITTED POWER PLANTS			
COAL			
GNPower Kauswagan Clean Coal-Fired Power Plant*	600	Kauswagan, Lanao del Norte	2018
Southern Mindanao Coal Fired Power Station Phase 2	100	Brgy. Kamanga, Maasim, Sarangani	2018
Sub-Total Coal	700		
OIL			
Nickel Asia Diesel Power Project	10.9	Surigao City, Surigao del Norte	2018
Sub-Total Coal	10.9		
HYDRO			
Manolo Fortich 1	43.4	Santiago, Bukidnon	2018
Manolo Fortich 2*	25.4	Santiago, Bukidnon	2018
Lake Mainit*	25	Jabonga, Agusan del Norte	2018
Asiga	8	Pangaylan, Santiago, Agusan del Norte	2019
Sub-Total Natural Hydro	101.8		
SOLAR			
GenSan Solar Power Project	24.96	General Santos City, South Cotabato	2018
Sub-Total Solar	24.96		
BIOMASS			
GEEC Biomass Cogeneration System	3.5	Maguindanao	2017 (On-going Testing and Commissioning)
PTCI Rice Husk-Fired Biomass Cogeneration Facility	3	Sultan Kudarat, Maguindanao	2017 (On-going Testing and Commissioning)
LPC Rice Husk-Fired Biomass	5.5	Sultan Kudarat, Maguindanao	2018
Biogas Power Plant Project	12.4	Banga, South Cotabato	2018
Biomass Power Plant Project	6	Tantangan, South Cotabato	2018
Sub-Total Biomass	30.4		
TOTAL COMMITTED	868.0		
INDICATIVE POWER PLANTS			
COAL			
Ozamis Coal Fired Power Plant (Phase 1- 1 x 150 MW; Phase 2 - 1 x 150 MW)*	300	Brgy. Pulot, Ozamiz City, Misamis Occidental	Phase 1 - 2021 Phase 2 - 2022
SMC Davao Power Plant Phase II*	300	Brgy. Culaman, Malita, Davao Occidental	TBD
ZAM 100 MW Circulating Fluidized Bed (CFB) Coal-Fired Power Station*	100	Sitio San Ramon, Bgry. Talisayan, Zamboanga City	TBD
SMC Global Power (4 x 82 MW)*	328	Brgy. Darong, Santa Cruz, Davao del Sur	TBD
Balingasag Coal-Fired Power Plant*	110	Brgy. Mandangoa, Balingasag, Misamis Oriental	TBD
Sub-Total Coal	1,138		
OIL-BASED			
TPI Diesel Power Plant*	5.883	Mati, Davao Oriental	TBD
Panasia Malita Diesel Power Plant	20	Malita, Davao	TBD
MOPP 4 Diesel Power Plant*	8.433	Brgy. San Isidro, Jimenez, Misamis Oriental	TBD
Sub-Total Oil-Based	34.316		

Proposed Generation Facility / Name of the Project	Capacity (MW)	Location	Comm. Year
GEOTHERMAL			
Mindanao 3 Geothermal Power Plant*	30	Kidapawan, North Cotabato	2021
Sub-Total Geothermal	30		
HYDRO			
Bubunawan Hydroelectric Power Project	23	Baungon and Libona, Bukidnon	2021
Pulanai	10.6	Valencia, Bukidnon	2022
Tagum	2.60	Maco, Compostela Valley	2024
Tagoloan	39	Impasugong & Sumilao, Bukidnon	2025
Culaman Hydroelectric Power Project	10	Manolo Fortich, Bukidnon	2025
Katipunan River Mini Hydro Power Project	6.2	Cabanglasan, Bukidnon	2025
Cabadbaran Hydroelectric Power Project	9.75	Cabadbaran, Agusan del Norte	2025
Lower Maladugao River Mini-Hydropower Project	15.7	Kalilangan and Wao, Bukidnon	2025
Maladugao (Upper Cascade) Hydroelectric Power Project	8.4	Kalilangan, Bukidnon	2026
Sawaga River Mini Hydro Power Project	4.5	Malaybalay, Bukidnon	2026
Liangan Hydropower Project	11.9	Bacolod, Lanao del Norte	2026
Malitbog	3.4	Malitbog, Bukidnon	TBD
Clarin	5	Clarin, Misamis Occidental	TBD
Mat-i-I	4.85	Claveria, Cagayan de Oro	TBD
Silo-o	3.29	Malitbog, Bukidnon	TBD
Agus III	225	Pantar & Balo-I, Lanao del Sur & Lanao del Norte	TBD
Kitaotao 1	70	Bukidnon	TBD
10 MW Cabulig-2 Hydroelectric Power Plant Project	10	Jasaan, Misamis Oriental	TBD
Davao Hydroelectric Power Project	140	Davao City	TBD
Sub-Total Hydro	603.2		
SOLAR			
Tagum Solar Power Projct	1	Tagum City , Davao del Norte	2018
Sumilao Solar Power Project	2	San Vicente, Sumilao, Bukidnon	2018
GenSan Solar Power Project Phase I*	48	Brgy. Conel, General Santos City, South Cotabato	2018
GenSan Solar Power Project Phase II*	48	Brgy. Tambler, General Santos City, South Cotabato	2018
60 MW General Santos City Solar Power Project	60	General Santos City, South Cotabato	2018
San Francisco Solar Power Project	10	San Francisco, Agusan del Sur	2018
Jasaan Solar Power Project	60	Jasaan, Misamis Oriental	2019
Greenlight Solar Power Project	50	Datu Odin, Sinsuat, Maguindanao	2019
Mabuhay Solar Power Project	44	General Santos City, South Cotabato	2019
Conel Solar Power Project	16	General Santos City, South Cotabato	TBD
Lal-lo Solar PV Power Plant	100	Maasim, Sarangani	TBD
Solar Power Plant	30	Zamboanga City Special Economic Zone	TBD
Hayes Solar Power Project*	27	Villanueva, Misamis Oriental	TBD
Opol Solar Power Project	25	Brgy. Patag, Opol, Misamis Oriental	TBD
Tantangan Solar Power Project	65	Tantangan, South Cotabato	TBD
Laguindingan Solar Power Project	20	Laguindingan, Misamis Oriental	TBD
Claveria Solar Power Project	60	Claveria, Misamis Oriental	TBD
Banale Solar Power Project	14	Brgy. Banale, Pagadian	TBD
South Cotabato Solar Power Project	24.96	Lanado del Norte/Lanao del Sur	TBD
Sub-Total Solar	704.96		
BIOMASS			
Biomass Power Plant Project	6	Surallah, South Cotabato	2019
12 MW Napier Grass-Fired Biomass Power Plant	12	Bukidnon	2020

Proposed Generation Facility / Name of the Project	Capacity (MW)	Location	Comm. Year
10MW Malay-balay Bio-Energy Corporation Multi Feedstock Generating Facility	10	Bukidnon	2020
23.5 MW Woody Biomass Power Plant	23.5	Agusan del Norte	2020
NAREDCO Biogas Power Plant	24	Lal-lo, Cagayan	2020
Napier Grass-Fired Biomass Power Plant	5	Bukidnon	2020
Biogas Power Plant Project	24	Maasim, Sarangani	2020
Bagasse-Fired Co-generation Power Plant	14.9	Maramag, Bukidnon	TBD
Sub-Total Biomass	119.4		
TOTAL INDICATIVE	2,629.9		

* - with SIS

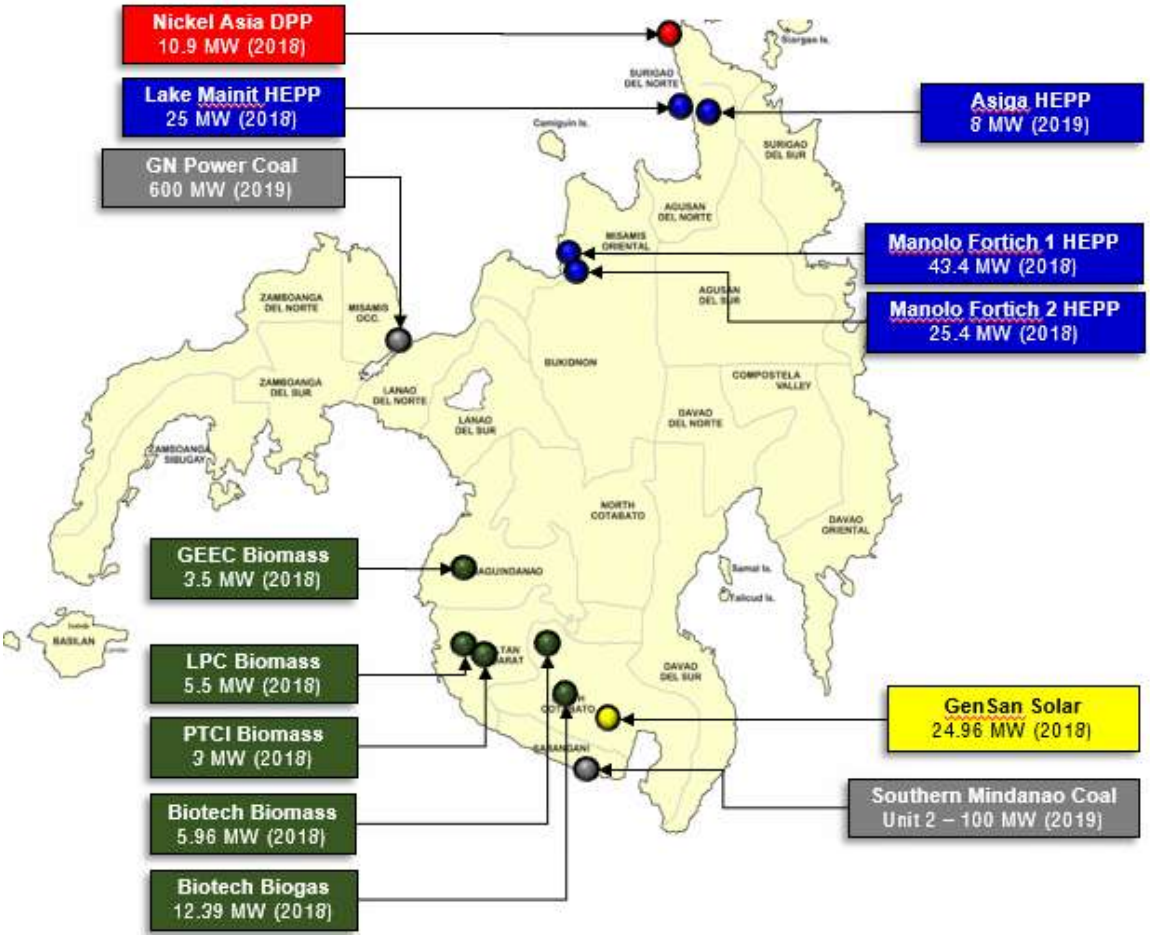


Figure 5.3: Mindanao Generation Capacity Addition (Committed Power Plants)

The table below shows the list of major committed plants in the Mindanao Grid and the associated transmission projects that will accommodate their entry

Table 5.3(f): List of Mindanao Committed Plants and Associated Transmission Projects

Based on DOE List of Private Sector Initiated Power Projects as of August 2018			Based on Transmission Development Plan 2019-2040		
Proposed Major Power Plants	Capacity (MW)	Comm. Year	Connection Point	Associated Transmission Project	ETC
COAL					
GNPower Kauswagan Clean Coal-Fired Power Plant	600	2018	Kauswagan Substation	Balo-I – Kauswagan 230 kV Transmission Line Project	Sept 2018
Southern Mindanao Coal Fired Power Station Phase 2	100	2018	General Santos Substation	PCB included in Kabacan Substation Project	Dec 2021
HYDRO					
Manolo Fortich 2	25.4	2018	Manolo Fortich Switchyard	Manolo Fortich 138 kV Switching Station Project	Completed
Lake Mainit	25	2018	ANECO's Santiago Substation	None	N/A
Asiga	8	2019	ANECO's 69 kV Transmission System	None	N/A
Bubunawan Hydroelectric	23	2021	Manolo Fortich Switchyard	Manolo Fortich 138 kV Switching Station Project	Completed
Culaman Hydroelectric	10	2021	Manolo Fortich Switchyard	Manolo Fortich 138 kV Switching Station Project	Completed
Katipunan River Mini Hydro	6.20	2021	BSTC's 69 kV Transmission System	None	N/A
Mangima Hydroelectric	10	2022	Manolo Fortich Swithcyard	Manolo Fortich 138 kV Switching Station Project	Completed
Lower Maladugao River Mini-Hydropower Project	15.70	2022	FIBECO's 69 kV Transmission System	None	N/A
Maladugao (Upper Cascade) Hydroelectric Power Project	8.4	2022	FIBECO's 69 kV Transmission System	None	N/A
Pulanai	10.60	2022	BSTC's 69 kV Transmission System	None	N/A
Polandoc	5.70	2022	Sindangan Substation	Siom – Sindangan – Salug 69 kV Transmission Line Project	2030
Bayug	17.81	2022	N/A	None	N/A
Kalaong 1	7.40	2022	SOCOTECO II's 69 kV Transmission System	None	N/A
Puyo Hydroelectric Power Project	30	2023	Butuan Substation	None	N/A
Cabadbaran Hydroelectric Power Project	9.75	2024	Butuan – Cabadbaran – Santiago 69 kV Transmission Line	None	N/A
Tagoloan	39	2025	Manolo Fortich Swithcyard	Manolo Fortich 138 kV Switching Station Project	Completed

Based on DOE List of Private Sector Initiated Power Projects as of August 2018			Based on Transmission Development Plan 2019-2040		
Proposed Major Power Plants	Capacity (MW)	Comm. Year	Connection Point	Associated Transmission Project	ETC
Clarin	5	2025	Aurora – Ozamis – Oroqueta 69 kV Transmission Line	None	N/A
Lanon (Lam-alu)	9.50	2025	Tacurong Substation	None	N/A
Agus III	225	2025	Balo-I Substation	None	N/A
SOLAR					
GenSan Solar Power Project	24.96	2018	N/A	None	N/A
BIOMASS					
LPC Rice Husk-Fired Biomass	5.5	2018	Sultan Kudarat Substation	None	N/A

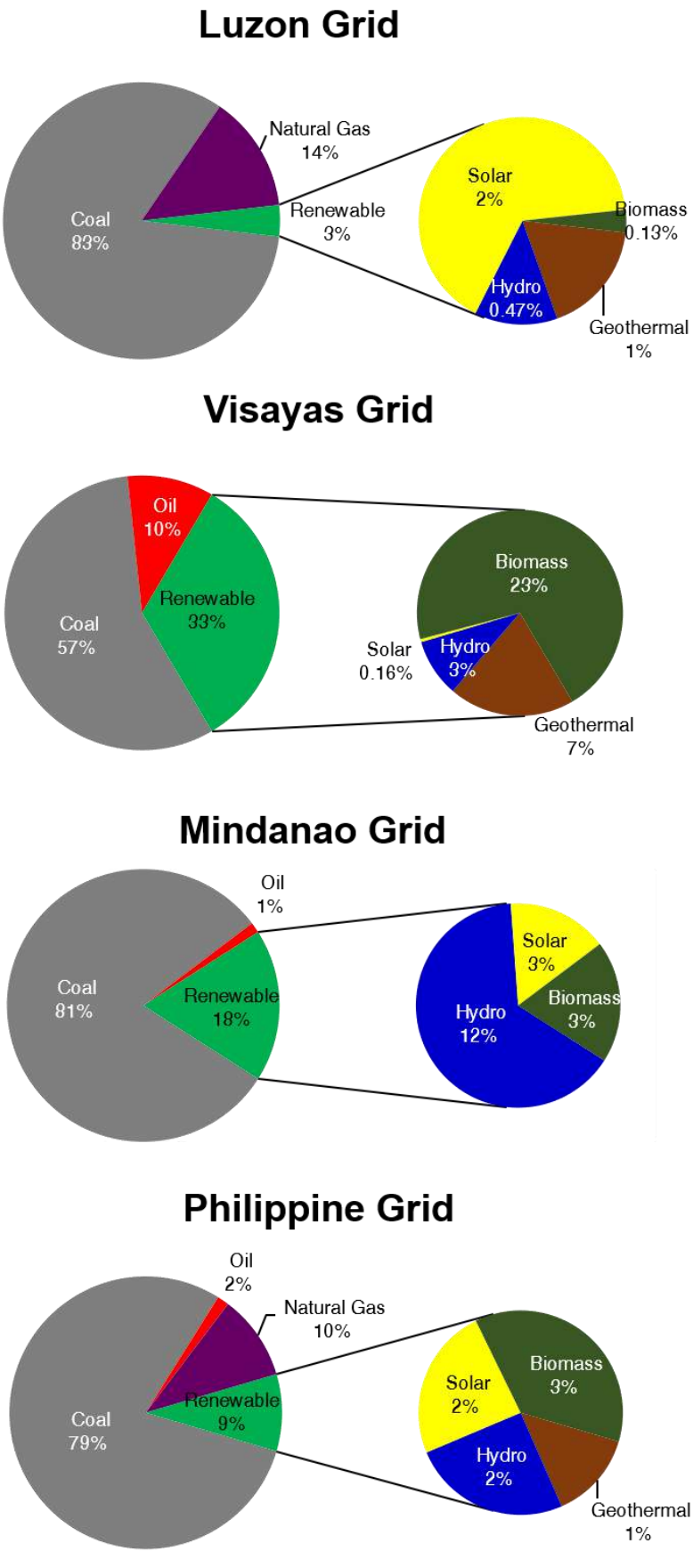


Figure 5.4: Generation Capacity Mix of Committed Power Plants

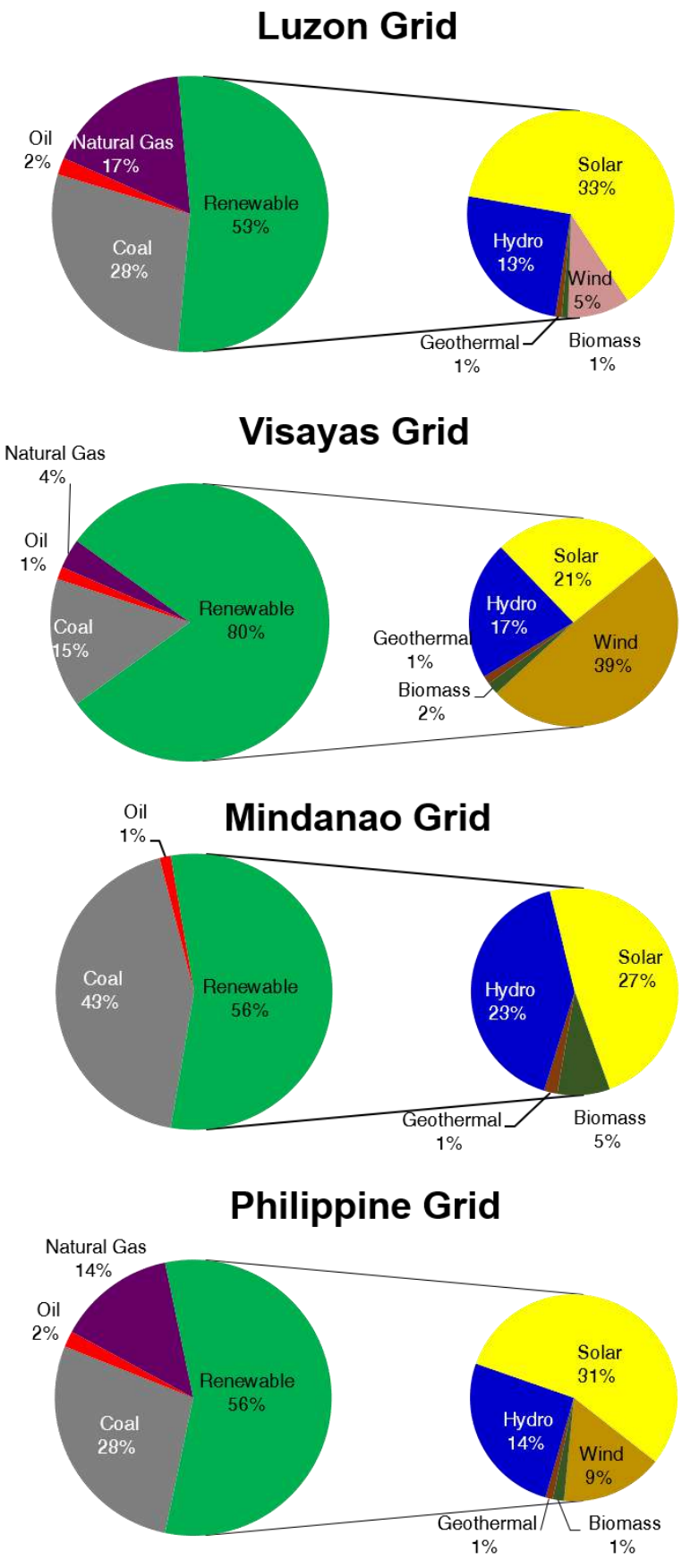


Figure 5.5: Generation Capacity Mix of Indicative Power Plants

5.2 Transmission Planning in Support to Renewable Energy

NGCP allocates this section for renewable energy resources, particularly for the development of variable RE (VRE), wind and solar PV. Discussed here are the transmission planning and current initiatives of NGCP in support to Variable Renewable Energy (VRE).

5.2.1 Transmission Planning for Renewable Energy

The RE Act of 2008 mandates NGCP to include the required connection facilities for RE-based power facilities in TDP. The Feed-in-Tariff (FIT) rules strengthens this mandate by giving eligible RE plants priority connection to the transmission or distribution system, subject to standards and ERC rules governing such connection.

In developing the expansion plans in the TDP, the grid is evaluated to meet the following objectives:

a. Demand requirements are met by available supply
b. Ensure the adequacy and security of the grid
c. Minimize the cost of transmission investments; and
d. Minimize the cost of energy by enhancing competition through the mitigation of network congestions.

Fundamentally, the grid is planned to be able to transmit and deliver the produced energy to electricity consumers in the most economic manner while having an acceptable level of reliability. The same objectives are applied with the addition of VRE resources. However, VRE introduces some challenges that require improvements in the transmission planning methodology.

Site-specific VRE, particularly wind, is mostly located far from load centers. The challenge is the site's proximity to transmission facilities and available transfer capacity. Though there are some areas that are near transmission facilities, these are not designed to accommodate the potential capacity of VRE. Hence, new transmission corridors are needed to be proposed. Example of this is the proposed Northern Luzon 230 kV Loop that will serve the wind potential in north Luzon.

Construction timeline of VRE is much shorter compared to transmission expansion projects. Actual construction of VRE projects has proven that it can be completed faster compared to transmission projects. Consequently, the transmission expansion projects need to catch-up with the completion of VRE projects. This was the driver to advance the implementation of Cebu-Negros-Panay Stage 3 to increase the interconnection capacity among the islands. The fast development of Solar PVs in Negros island has accelerated the need date of the project.

Added challenge from the limitation of existing transmission facilities is the operation of VRE, particularly their reactive power requirements. Although there are reactive power capability and voltage support requirements for VRE, there are still some voltage issues. In the case of north Luzon, voltage problems were initially experienced due to untuned voltage controls settings of the wind farms. Voltage stability issues were also experienced whenever there is an N-1 outage of two adjacent circuits. Furthermore, overvoltage was experienced when the wind farms are not generating, and the local load is at the minimum. Thus, additional reactive compensation devices (capacitors and reactors) were needed to solve the different operating scenarios.

5.2.2 Current Initiatives by NGCP

Previously, NGCP intended to conduct a geographic grid adequacy study to determine the maximum amount of VRE in potential areas that can be connected without violating thermal, voltage and stability limits and the required transmission expansion projects to increase the capacity. However, this would become meaningless without considering the potential sites of conventional power plants that would also need grid reinforcements. Considering VRE and conventional generation independently may lead to the sub-optimal expansion of the grid.

Thus, NGCP is currently adapting a market-based planning methodology that will consider the design of the WESM on how VREs and conventional power plants are being scheduled. NGCP will include in the model the variability of VRE and the dynamics of the WESM, i.e., generation production cost, demand variability and outages of network elements. This is to identify the possible transmission congestions, which will provide a more realistic impact of generation projects to the transmission network. The generation projects to be assessed consider the targeted generation mix, renewable portfolio standards and demand forecast. The output shall provide which areas are recommendable for generation projects and in-support transmission projects.

This planning methodology will also answer the required congestion analysis in the 2016 Grid Code. This also complements the resolution of the National Renewable Energy Board (NREB) that recommends DOE to apply geographic installation targets, thus put a cap generation capacity of VREs.

The reference methodology is from the project called "Greening the Grid Project" by the United States Agency for International Development (USAID) and National Renewable Energy Laboratory (NREL) that conducted an RE Integration Study for the DOE. The project observed the effects of integrating high levels VRE on system operations using a production cost model that simulates the dispatch scheduling of the WESM. Furthermore, the project developed a siting algorithm for VREs and compared different siting scenarios that is, high potential areas versus minimized transmission upgrades. The advantage of such methodology is that it can show the benefits of maximizing the capability of the transmission system by optimally siting the new power plants.

The system inertia and frequency response study will be conducted as an advance study from the results of the simulations of the market-based model.

5.2.3 Renewable Energy Developments with Certificate of Confirmation of Commerciality

Among the concerns for the renewable energy development, especially the large capacity plants, is the adequacy of the transmission line capacity especially for cases where several renewable energy plant projects are concentrated in one area only. While transmission projects are already being proposed, the completion of transmission projects would take longer time, about 3 to 5 years, compared with the duration of power plant construction.

In the table below, the major RE projects with Certificate of Confirmation of Commerciality[1] are summarized together with the required grid reinforcement and its timing.

[1]From DOE: List of Major RE Projects with Certificate of Confirmation of Commerciality

Table 5.4(a) Major RE projects with Certificate of Confirmation of Commerciality in Luzon

Region	Location	Project Name	Target Date of Commercial Operation	Declared Capacity (MW)	Required Grid Reinforcement	ETC
Solar Projects				212.68		
III	Botolan, Zambales	Botolan Solar Power Project	2018	39.27	None	
III	Botolan, Zambales	Sta. Rita Solar Power Project	2018	92.86	None	
III	Concepcion , Tarlac	Concepcion Solar Power Project	2018	50.55	None	
IV-A	Rodriguez, Rizal	Macabud Solar Power Project	2018	30	None	
Wind Projects				209.40		
I	Pasuquin, Ilocos Norte	Pasuquin East Wind Power Project	2018	48 132	San Manuel-Nagsaag 500 kV Transmission Line (initially energized at 230 kV) and Northern Luzon 230 kV Loop	Dec 2021 Jun 2024
I	Pagudpud, Ilocos Norte	Pagudpud Wind Power Project	2018	84		
I	Pagudpud, Ilocos Norte	Balaoi Wind Power Project	2018	45		
IV-A	Pililia, Rizal	Mt. Sembrano Wind Power Project	2018	80.4	North Luzon Substation Upgrading Project Stage 1 - Malaya 300 MVA Transformer	Dec 2018
Hydro Projects				146.40		
CAR	Kabayan, Benguet	Natalang B Hydroelectric Power Project	June 2020	38	Ambuklao - Binga & Binga - San Manuel	Dec 2019
CAR	Kapangan, Benguet	Kapangan Hydroelectric Power Project	February 2019	60	None	
I	Alilem, Ilocos Sur	Alilem Hydroelectric Power Project	December 2019	16.2	None	
I	Sugpon, Ilocos Sur	Danac Hydroelectric Power Project	June 2020	13.2	None	
II	San Mariano, Isabela	Ilaguen	February 2020	19.00	North Luzon Substation Upgrading Project Stage 1 - Gamu 100 MVA Transformer	Dec 2018

Table 5.4b Major RE projects with Certificate of Confirmation of Commerciality in the Visayas

Region	Location	Project Name	Target Date of Commercial Operation	Declared Capacity (MW)	Required Grid Reinforcement	ETC
Solar Projects				89.93		
VI	Victorias City, Negros Occidental	Victorias Solar Power Project	2018	30.63	CNP Stage 3	2020
VI	Tigbauan , Iloilo	Tigbauan Solar Power Project	2018	34.3	CNP Stage 3	2020
VIII	Biliran, Biliran	Biliran Solar Power Project	2018	25	None	
Wind Projects				74.75		
VI	Pulupandan, Negros Occidental	Pulupandan Wind Power Project	2018	50	CNP Stage 3	2020
VI	Nabas, Malay, Aklan	Aklan I Wind Power Project Phase I	2018	24.75	CNP Stage 3 / Panitan-Nabas Line 2	2020/ 2018
Hydro Projects				33		
VI	Libacao , Aklan	Main Aklan River Hydroelectric Power Project	September 2018	15	CNP Stage 3	2020
VI	Madalag , Aklan	Timbaban Hydroelectric Power Project	May 2018	18	CNP Stage 3	2020
Geothermal Projects				50.00		
VIII	Biliran	Biliran Geothermal Project	4th Qtr. 2018	50	None	

Table 5.4c Major RE projects with Certificate of Confirmation of Commerciality in Mindanao

Region	Location	Project Name	Target Date of Commercial Operation	Declared Capacity (MW)	Required Grid Reinforcement	ETC
Biomass Projects				34.18		
CARAGA	Buenavista, Agusan del Norte	23.5 MW EPC Woody Biomass Power Plant Project	2019	20.68	None	
ARMM	Sultan Kudarat, Maguindanao	15 MW LPC Rice Husk-Fired Biomass Power Plant Project	2017	13.5	None	
Solar Projects				96.00		
XII	General Santos City, South Cotabato	GenSan Solar Power Project Phase I	2018	48	None	
XII	General Santos City, South Cotabato	GenSan Solar Power Project Phase II	2018	48	None	
Hydro Projects				219.31		
X	Baungon and Libona, Bukidnon	Bubunawan Hydroelectric Power Project	2021	23	None	
X	Impasugong and Sumilao, Bukidnon	Tagoloan Hydroelectric Power Project	June 2018	39	None	
X	Kalilangan & Wao, Bukidnon	Maladugao River (Lower Cascade) Hydroelectric Power Project	April 2020	15.7	None	
X	Santiago, Bukidnon	Manolo Fortich 1 Hydroelectric Power Project	October 2019	43.4	Manolo Fortich S/Y	2017
X	Santiago, Bukidnon	Manolo Fortich 2 Hydroelectric Power Project	October 2019	25.4	Manolo Fortich S/Y	2017
X	Iligan City, Lanao del Norte	Bayug Hydroelectric Power Project	2022	17.81	None	
XIII	Jabonga, Agusan del Norte	Lake Mainit	March 2016	25	None	
XIII	Jabonga , Agusan del Norte	Puyo Hydroelectric Power Project	July 2018	30	None	

The other renewable energy potentials are shown in Appendix 4.

5.3 Potential Resource Areas

5.3.1 Coal

The Philippines is largely a coal dependent country with coal having the highest contribution to the power generation mix at 38% in 2017. The Philippines has a vast potential for coal resources just awaiting full exploration and development to contribute to the attainment of the country's energy self-sufficiency program. Based on the latest available data from DOE, our coal reserves amount to 470 million metric tons or 19.7% of the country's total coal resource potential of 2.39 billion metric tons as 2015[2].

Table 5.5 Potential Coal Resource Areas in the Philippines

	AREA	MUNICIPALITIES		
1	Cagayan Valley	Benito Soliven	Cauyan	Gattaran
		Iguig		
2	Cebu	Asturias	Catmon	Naga
		Balamban	Compostela	Oslob
		Boljoon	Dalaguete	Pinamungahan
		Carmen	Danao	Toledo City
3	Davao	Manay	Tarragona	
4	Masbate	Cataingan	Palanas	
5	Mindoro	Bulalacao	San Jose	
6	Negros	Bayawan City	Calatrava	
7	Bicol	Bacon	Gubat	Rapu-Rapu
8	Catanduanes	Bagamanoc	Caramoran	Panganiban
	AREA	MUNICIPALITIES		
9	Quezon	Bordeos	Polillo	
10	Antique	Caluya		
11	Surigao	Alegria	Guigaquit	San Miguel
		Bacuag	Kicharao	Tago
		Bislig City	Lingig	Tandag
		Cagwait	Marihatag	
12	Zamboanga	Buug	Ipil	Payao
		Diplahan	Kabasalan	Siay
		Godod	Malangas	
		Imelda	Naga	
13	Sarangani	Maitum		
14	South Cotabato	Lake Sebu		
15	Sultan Kudarat	Bagumabayan	Palimbang	Senator Ninoy Aquino
16	Agusan	Bunawan	Butuan City	Trento

[2] As discussed in the DOE website. Data in Tables 5.5 and 5.6 are provided by DOE.

5.3.2 Oil

Oil-based power generation contributed to 15% of the power generation mix in 2017. The Philippines has 2.8 to 3.9 trillion cubic feet of proven natural gas reserves. The largest natural gas development project in the country, Malampaya, fires three power plants with a combined 2,700 megawatts (MW) capacity with remaining reserves for an additional 300 MW of power. Other than the Malampaya gas discovery, there are still no new significant discoveries that have been found in the country.

Table 5.6 Potential Oil Resource Areas in the Philippines

BASIN	AREA (sq km)	TOTAL RESOURCES		
		OIL (million bbl)	CONDENSATE (million bbl)	GAS (billion cubic ft)
North West Palawan	36,000	547.5	156.1	14,285
South West Palawan	44,000	549	9.7	4,529
Central Luzon	16,500	0	0	5,063
Visayan	46,500	903	0	1,998
Mindoro-Cuyo	58,000	771	0	342
Cagayan	24,000	30.5	0	2,063
East Palawan	92,000	317	0	703
SE Luzon	66,000	258	7	242
Reed Bank	71,000	34	0.05	2,228
BASIN	AREA (sq km)	TOTAL RESOURCES		
		OIL (million bbl)	CONDENSATE (million bbl)	GAS (billion cubic ft)
Cotabato	14,000	84	0	418
Agusan-Davao	33,000	59	1	768
Sulu Sea	115,000	130	0	405
West Luzon	16,000	0	0	129
Ilocos	19,500	0	0	106
Bicol Shelf	32,500	0	0	247
Iloilo-West Masbate	25,000	1	0	21
TOTAL		3684	173.85	33,547

Out of the total resources, 93.96% of oil resources remain undiscovered. 31.72% of condensate and 73.61% of gas resources have yet to be discovered as well.

5.4 Potential Power Plant Connection Points

To serve as a guide for generation investors, this section identifies the substations where new power plants may connect without the need for any significant transmission reinforcement. These recommended connection points, however, should be viewed from a transmission planning perspective and are based on the capability of the existing grid and already considering the completion of ERC-approved projects and without consideration on the following other requirements in generation location siting, particularly for the non-site specific plants: (a) fuel supply/transport; (b) topology/geology of site; (c) accessibility; (d) availability

of area; (e) availability of cooling water; (f) fresh water supply; (g) security; and (h) environmental/social concerns.

It can be noted, however, that the existing transmission facilities in some generation potential areas barely have excess capacity to cater bulk generation addition. Thus, new transmission backbone developments are usually required first for the entry of new large capacity plants.

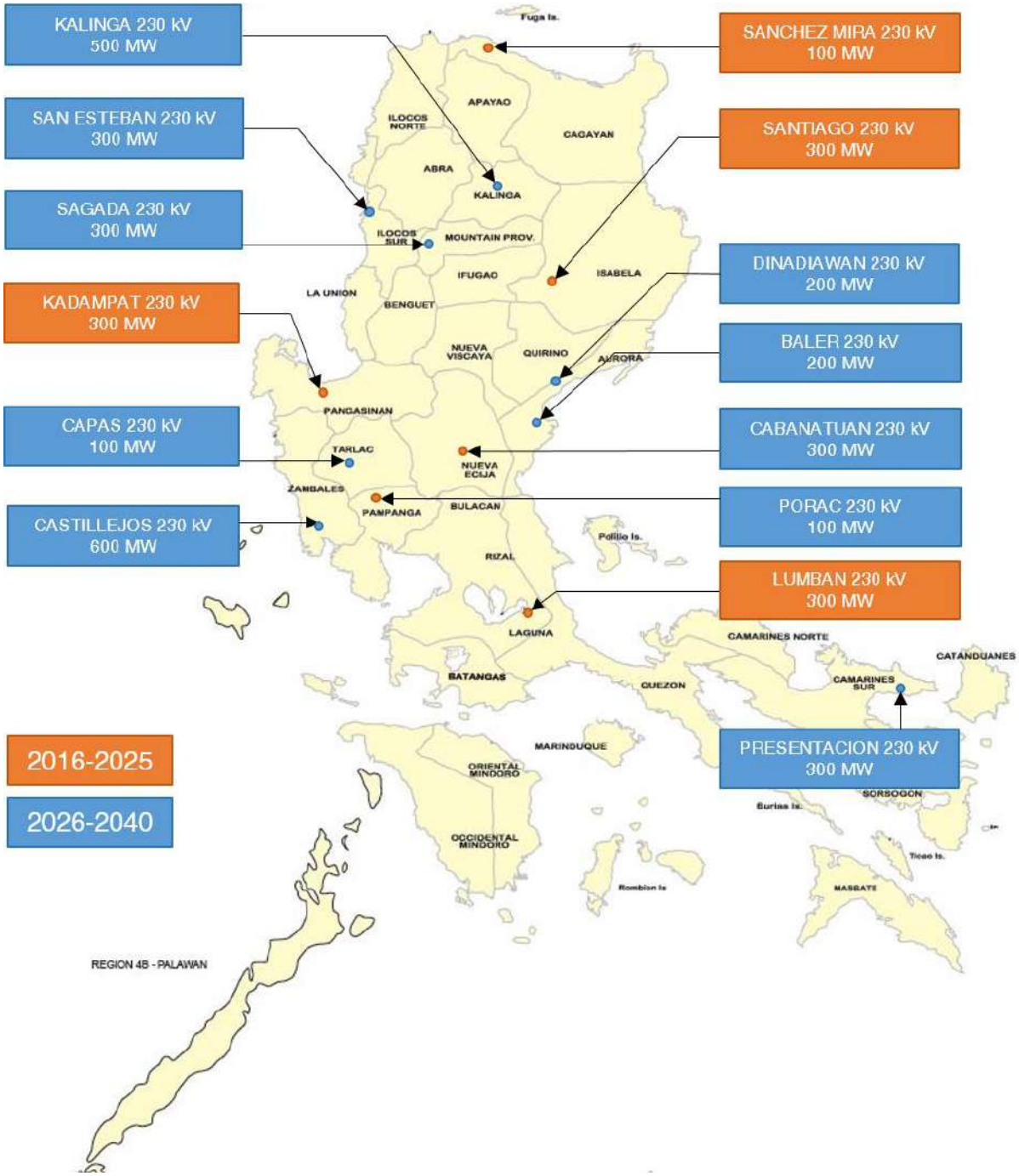


Figure 5.6: Recommended Power Plant Connection Points (Luzon)

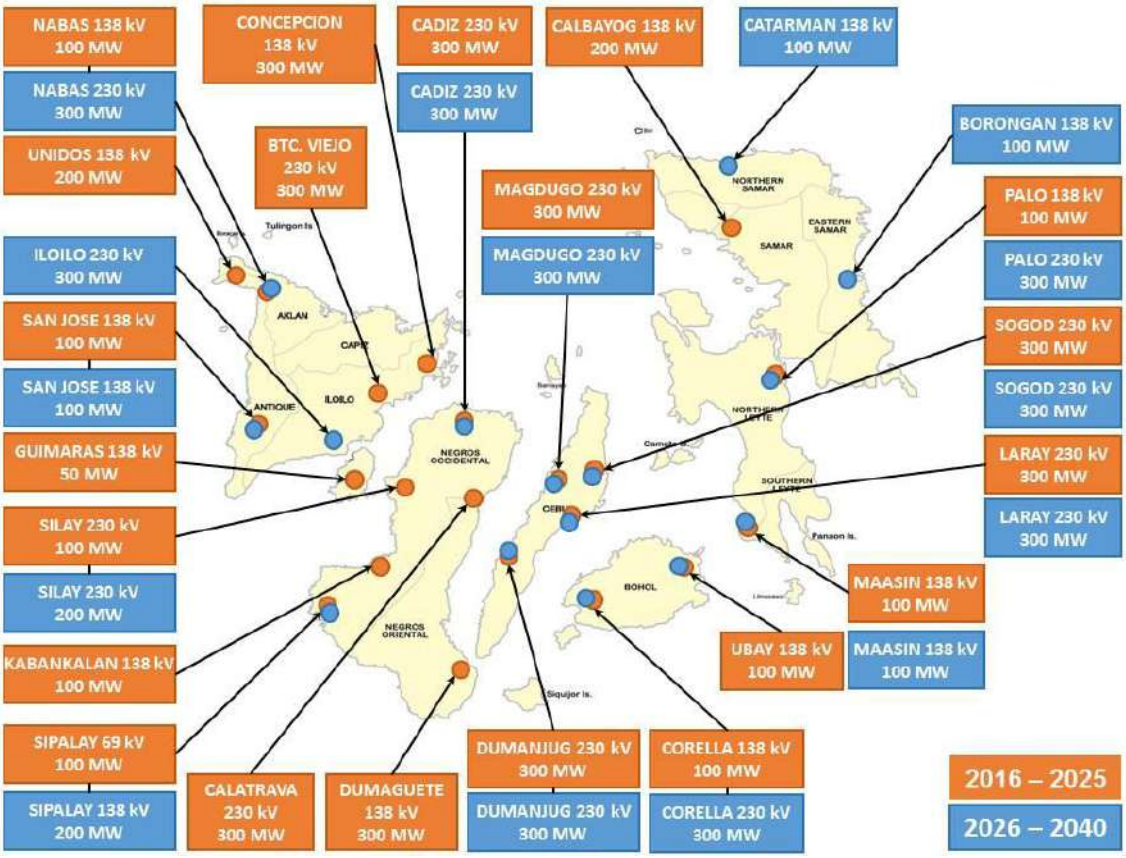


Figure 5.7: Recommended Power Plant Connection Points (Visayas)

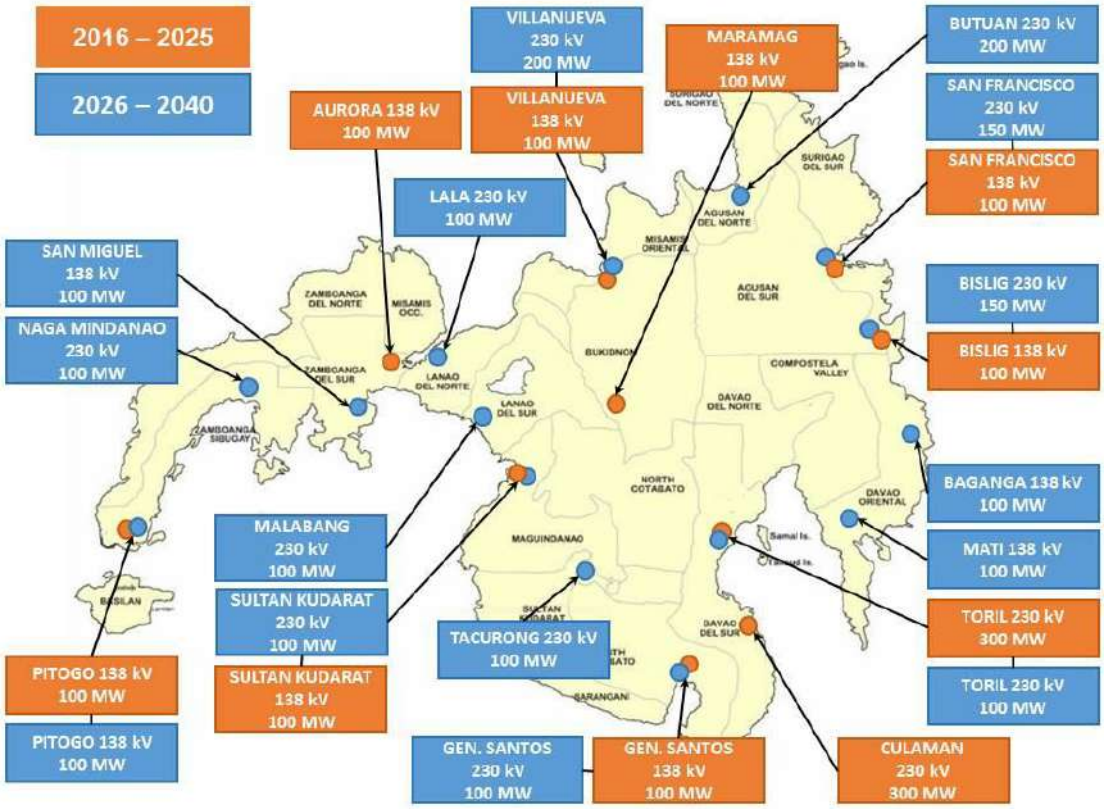


Figure 5.8: Recommended Power Plant Connection Points (Mindanao)

To improve the ability of the power system to withstand the effects of adverse environmental conditions, natural or man-made power interruptions and other disturbances, there is a need to further reduce the technical and human risks to minimize disruption of power delivery service to the electricity end users. A high degree of power system reliability is equivalent to a high availability of the electricity supply service, while an excellent system security gives robustness to the power system to withstand unexpected events that have severe consequences[3].

6.1 Climate Change Adaptation Measures

NGCP supports the 2011 to 2028 Strategic Action Plans under the National Climate Change Action Plan (NCCAP) formulated by the Climate Change Commission (CCC).

The NCCAP further emphasized that "in addition to the challenges of energy security and environmental sustainability, the energy sector has to respond to significant changes in demand due to fluctuation in temperature and weather condition to ensure that energy systems are able to adapt to the impacts of climate change". Climate-proofing and rehabilitation of energy systems infrastructures are some of the priorities identified to address the climate change issues of the energy sector.

6.1.1 Resiliency Policy

The Philippines, considering its geographical location and being an archipelago with one of the world's longest coastlines, is vulnerable to the impacts of climates change. In line with this, the DOE has introduced the Resiliency Policy, which is the adoption of resiliency planning and program in the energy industry to mitigate the adverse effects brought about by disasters. This contains adaptation measures that include both engineering and non-engineering options, to gauge infrastructure and human resource preparedness during and after the disruptive events.

6.1.2 Resiliency Planning for Transmission System

In anticipation for increasing frequency of super typhoons, earthquakes, and other natural or man-made hazards, the challenge for the transmission system is to keep improving the preventive measures and risk reduction, adopt the "build back better" principle after disasters or build better from the start. This could be done by making disaster risk assessment a prerequisite for transmission infrastructure investment[4]. As way forward, NGCP will be using hazard maps, i.e., probabilistic maps produced under Project NOAH or Nationwide Operational Assessment of Hazards, in the transmission line route and substation site selection process.

6.1.3 Enhancement of Transmission Line and Substation Site Selection

a) In the transmission line route selection process, careful evaluation is undertaken to avoid areas prone to flood, with steep slopes prone to soil erosions, and with sufficient distance from fishponds, rivers, lakes, swamps and seashores;

[3] CIGREE-IEEE joint task force on stability terms and definitions
[4] Global Platform for Disaster Risk Reduction.

b) For substation sites, the risk of flood or flash flood is carefully assessed, while avoiding areas that are considered possible sources of pollutions, e.g., industrial plant/buildings that generate polluted gases, storage areas for explosive or inflammable materials, bulk oil storage tanks and oil/gas pipelines. If necessary, close proximity to seashores are also avoided to prevent or minimize corrosions and depletion or failure of insulations of substation equipment;

c) For existing overhead transmission lines that exhibit critical function to the grid and are located in areas vulnerable to typhoon and storm surges, the use of HV underground cables will be thoroughly considered; and

d) Furthermore, NGCP selects overhead transmission line routes and substation sites that have minimal effect on human settlement or as much as possible, minimize the removal of vegetation or cutting of trees.

6.1.4 Increase of Transmission Towers Strength and Capacity

The maximum wind velocity design of overhead transmission lines' (OHTL) support structures is based on three wind zones: Zone 1 (270 kph), Zone 2 (240 kph) and Zone 3 (160 kph). In view of the increasing frequency of super typhoons that hit various areas in the country in the past decade, NGCP will be increasing the maximum velocity design of support structures. As a way forward[5], the following recommendations are being considered:

a) OHTLs to be erected in Luzon are recommended to be upgraded to withstand wind speed of 300 kph to be able to meet the effects of super typhoon occurring due to climate change;

b) Existing transmission towers which are designed at 3-second gust wind speed 270 kph should be upgraded or retrofitted to carry higher wind speeds; and

c) Anti-pilferage bolts are being specified to be used (instead of regular connection bolts) in all towers up to 9m from the ground for 138 kV lines and 12m for 230 kV and up lines to prevent the pilferage of tower parts which can cause the toppling of steel towers/piles.

Other ways to increase strength of support structures:

a) Transmission towers to be erected near meandering rivers with powerful river currents are required to be on board piles with enough length so that said towers will still be standing despite soil erosion reaching the tower location; and

b) Anti-pilferage bolts are being specified to be used (instead of regular connection bolts) in all towers up to 9m from the ground for 138 kV lines and 12m for 230 kV and up lines to prevent the pilferage of tower parts which can cause the toppling of steel towers/piles.

[5] Memorandum CEDD-2018-10-941: Technical Assessment Report on the Six (6) Transmission Steel Towers Toppled by Typhoon "Ompong" on 15 September 2018 in Northern Luzon.

6.1.5 Security of Transmission Assets

In areas with security issues, each proposed transmission project is subjected to security assessment as part of transmission line route or substation site selection process. All security threats are thoroughly identified to determine the level of risk and the corresponding mitigation measures that will be implemented during construction and its eventual operation.

6.2 Transmission Line Looping Configuration

To further improve the system reliability, enhance the operational flexibility during events of natural calamities, and to support the connection of various incoming power plants, particularly RE, the long-term transmission planning involves the various transmission looping configurations. Various backbone transmission system involving 138kV, 230kV and 500kV lines will be implemented by stages, but part of several segments that will eventually form a transmission loop as the end state.

6.3 Use of HV Underground Cables

Power system could be made more resilient through underground cable installations as these are less susceptible to outages during extreme weather conditions, such as super typhoons and strong wind thunderstorms. However, because of the excessive cost of underground cable installation, initial applications are limited or confined only in highly urbanized areas, wherein land is a valuable resource. Securing of ROW is a great challenge and aesthetics is a paramount consideration.

6.4 Asset Replacement

As stated in the Age Profile of Transmission Assets in TDP 2016-2040 Volume 2, 27.12% of power transformers and 40.82% protective relays have already reached 100% of their asset lives. For the transmission and sub-transmission lines, 24% are 40 years and older and 9% are 50 years and older. Hence, the need for an asset replacement program. This shall be done considering that the asset life cycle in a transmission utility contains several phases: Acquire/Install, Operate, Maintain and Dispose/Retire.

6.4.1 Standard Asset Lives and Asset Database

As an initial step in the creation of an asset refresh program, NGCP considered the standard asset lives adopted in the 2008 re-valuation of transmission assets for the 3rd Regulatory Period (2011-2015)[6]. Appendix 7 shows Table A6.1 – Summary of Asset Lives. The existing asset database was obtained from Enterprise Asset Management (EAM) and the two major transmission assets were initially considered for the program, i.e., power transformers and overhead transmission lines in Luzon, the Visayas and Mindanao Grids. Later this year, a system-based tool capable of performing data analytics may be used to facilitate a corporate-wide prioritization of old transmission assets that will be programmed to be replaced.

[6] Undertaken by Sinclair Knight Merz (SKM), which was commissioned by TransCo.

6.4.2 Asset Refresh Program for Power Transformers and Transmission Lines

Although there is a plan to work towards the establishment of a corporate-wide Asset Management System leading towards ISO 55000 Certification, the asset refresh program will initially be a combination of time-based and condition-based approaches. Eventually, the risk-based Asset Management System shall be included in the formulation of asset refresh program in the succeeding TDP updates. Further evaluation will be needed in support of the justifications for the replacement of these power transformers and transmission lines once these are included in future CAPEX application for ERC-approval

6.5 Adoption of SMART Grid technologies/ Smart Grid Developments

There have been continuing research and development over the years toward commercial realization of the Smart Grid. Nowadays, the adoption of Smart Grid technologies and the development of Smart Grid roadmaps and pilot projects have become global trend for power utilities.

In the Philippines, with the goal to develop Smart Grid Policy and Roadmap for the country, the DOE issued on 11 March 2013 the Department Circular No. DC2013-03-0003 – Creating an Inter-Agency Steering Committee for the Development and Formulation of a Comprehensive and Holistic Smart Grid Policy Framework and Roadmap for the Philippine Electric Power Industry. This also aims to promote technological innovation, business growth and job creation thereby enhancing the regional and global competitiveness of the Philippines.

Smart Grid is the concept of modernizing the electric grid. The Smart Grid comprises everything related to the electric system in between any point of generation and any point of consumption. Through the addition of Smart Grid technologies, the grid becomes more flexible, interactive and can provide real time feedback.[7]

The power flow will change from a unidirectional power flow (from centralized generation via the transmission grids and distribution grids to the customers) to a bidirectional power flow. Furthermore, the way a power system is operated changes from the hierarchical top-down approach to a distributed control. One of the main points about Smart Grid is an increased level of observability and controllability of a complex power system. This can only be achieved by an increased level of information sharing between the individual component and subsystem of the power system. Standardization plays a key role in providing the ability of information sharing which will be required to enable the development of new applications for a future power system.[8]

Over the past 8 years, NGCP has implemented several smart grid initiatives including the upgrade of SCADA-EMS (Supervisory Control and Data Acquisition-Energy Management System), establishment of the Overall Command Center, implementation of MBSC (Microprocessor-Based Substation Control), time synchronization devices, transient fault recorders in major substations, as well as holistic cyber-security enhancement program.

In general, the smart grid strategies for the power transmission in the Philippines under the operation of NGCP can be classified into three (3) broad areas: transformation, consolidation, and standardization.

[7] From IEC Definition of Smart Grid
[8] From IEC Smart Grid Standardization Roadmap

Transformation pertains to transmission backbone developments which include the MVIP and other island interconnections, 500 kV backbone extension, and backbone looping configuration to make the grid more flexible and resilient.

Consolidation pertains to the application of advance information and communication technology to consolidate existing automatic systems and forward to nationwide level of integration.

Standardization is about the establishment of multidimensional Smart Grid framework suitable to the unique geological environment of the country. Establishment of Smart Grid technical standards are crucial to ensure interoperability with all the players in the electric power industry. This is also expected to become a vital component of the Smart Grid Roadmap and Policy to be developed for the country.

Moreover, for an increased level of observability and controllability for the power grid, NGCP has continuing program for further implementation of time synchronization devices, fiber optics to increase bandwidth to support the big data exchange that will be needed by the Smart Grid, SCADA-EMS enhancement, network protection enhancements, establishment of National Control Center and the integration of all monitoring systems of the grid.

The projects already approved by the ERC are in various stages of implementation. The approvals for the projects were obtained either during the regulatory reset process for the Third Regulatory Period or through a separate application to the ERC. For the Fourth Regulatory Period, which is from 2016 to 2020, another regulatory reset process is expected for the ERC's review and final approval of the capital expenditure.

7.1 Recently Completed Projects

Summarized below are the projects completed or energized from October 2017 to September 2018. In this period, NGCP completed a total of 324.2 circuit-km of overhead transmission lines and installed 251 MVA additional substation.

Table 7.1: Recently Completed Projects

Project Name / Components	Purpose	MVA	MVAR	CKT-KM	Date of Completion / Energization
LUZON					
Eastern Albay 69 kV T/L, Stage 1 - Daraga – Sto. Domingo T/L - Daraga S/S - Sto. Domingo LES	To provide a more reliable transmission corridor in the eastern coast of Albay	10	-	21	20 Dec 2017 20 Dec 2017 20 Dec 2017
Bataan 230 kV Reinforcement - Reconductoring of Mexico – Hermosa T/L & Mexico – Cabanatuan "Cut in" Cruz na Daan Line 1 & 2 - Reconductoring of Hermosa – Limay T/L Line 1 & 2	To accommodate the connection of the committed 300 MW SMC CPC CFPP project to the Luzon Grid	-	-	36 38	31 Mar 2018 22 Jun 2018
Luzon S/S Reliability Project 1 - Labo S/S	To add substation capacity that will provide N-1 contingency.	50	-	-	28 Jun 2018
VISAYAS					
Visayas S/S Reliability Project 1 - Amlan S/S	To provide N-1 contingency transformers at various substations.	50	-	-	13 Dec 2017
Eastern Panay Transmission Line Project - Concepcion – Barotac Viejo 138 kV T/L 1 - Concepcion – Tapping pt. near Sara 69 kV OHTL	To provide a more reliable transmission service to Eastern Panay and accommodate entry of PCPC's 270 MW CFPP.			42 14.2	Nov 2017 Sept 2018
MINDANAO					
Aurora – Polanco 138 kV T/L - Aurora – Polanco T/L Line 1 & 2 - Polanco S/S (New)	To serve the growing demand of Dipolog City and neighboring load centers as well as ensure continuous and reliable power supply in the Zamboanga Del Norte area.	75	-	158	20 Jun 2018 22 Jul 2018 20 Jun 2018

Project Name / Components	Purpose	MVA	MVAR	CKT-KM	Date of Completion / Energization
Manolo Fortich Switchyard 138 kV Switchyard Project - HBI Hydro Power Plant – Manolo Fortich Switchyard T/L - Manolo Fortich S/S	To enable the full capacity dispatch of the 68.8 MW Manolo Fortich Hydroelectric Power Plant	66		15	28 May 2018
TOTAL		251	-	324.2	

7.2 Projects for Implementation

The list below summarized the updates on the ERC approved projects with ETC by 2018 onwards.

Table 7.2: Projects for Implementation

Project Name	Driver	Purpose and Components	ETC
LUZON			
Bataan–Cavite Transmission Line FS	GE	To conduct hydrographic survey and other survey works for the submarine cable project that will support the delivery of bulk generation from Bataan area to the load center in an alternate route.	Dec 2018
		Study Components: ▪ Power System Study; ▪ Feasibility Study. Bulk Cost Estimate: 194 Million Pesos	
Hermosa–Floridablanca 69 kV Transmission Line	L	To relieve the overloading of the existing Hermosa–Guagua line and address the low voltage issues in the area.	Dec 2018
		Transmission Components: ▪ Hermosa–Floridablanca 69 kV Transmission Line, 1-795 MCM ACSR/AS, SP/ST-SC, 17.7 km; Substation Components: ▪ Hermosa Substation, 3-69 kV PCBs and associated equipment. Bulk Cost Estimate: 283 Million Pesos	
Bataan 230 kV Grid Reinforcement	GE	To fully optimize the transmission capacities of the existing 230 kV transmission lines in Bataan and to accommodate the generation capacity addition	Dec 2018
		Substation Components: ▪ Limay Substation (Replacement), 10-230 kV PCBs and associated equipment; ▪ BCCPP A and B Switchyard (Replacement/Expansion), 9-230 kV PCBs and associated equipment; ▪ Lamao Switchyard (New), 12-230 kV PCBs and associated equipment; ▪ San Rafael 230 kV Substation (Expansion), 4-230 kV PCBs and associated equipment. Transmission Components: ▪ Limay–Hermosa Reconductoring (single circuit termination), 230 kV, ST-DC, 1-410 mm^2 TACSR/AS, 38.01 km; ▪ Hermosa-Mexico Reconductoring, 230 kV, ST-DC, 1-410 mm^2 TACSR/AS, 35.0 km; ▪ Lamao (Limay) bus-in to the existing Mariveles–BCCPPB 230 kV lines, 230 kV, SP/ST-DC, 4-795 MCM ACSR/AS, 2-1 km. ▪ Limay–BCCPP A Line Extension, 230 kV, SP-SC, 2-410 mm^2 TACSR/AS, 1.0 km ▪ Mexico–Cabanatuan 230 kV Line bus-in to San Rafael Substation, SP-DC, 1-795 MCM ACSR, 1.0 km. Bulk Cost Estimate: 3,266 Million Pesos	

Project Name	Driver	Purpose and Components	ETC
San Jose–Angat 115 kV Line Upgrading	SR	To address the old age condition and reliability issues in the existing line serving the Angat Hydroelectric Power Plant.	Jun 2019
		Substation Components: ▪ San Jose 115 kV Substation, 2-115 kV PCBs and associated equipment. Transmission Components: ▪ San Jose-Angat 115 kV Transmission Line, ST-DC, 2-795 MCM ACSR, 18 km. Bulk Cost Estimate: 307 Million Pesos.	
Relocation of Steel Poles along Hermosa–Duhat 230 kV Transmission Line	SR	To ensure public safety in the Jose Abad Santos Avenue and to also protect the steel poles.	Aug 2019
		Transmission Components: Hermosa–Duhat 230 kV Transmission Line, 230 kV, SP-SC, 2-795 MCM, 20 steel poles. Bulk Cost Estimate: 222 Million Pesos	
Luzon PCB Replacement	SR	To replace old power circuit breakers and improve the substation reliability of San Jose, Labo, Malaya and Gumaca Substation.	Oct 2019
		Substation Components: ▪ San Jose Substation, 9-115 kV PCBs and associated equipment. ▪ Labo Substation, 3-230 kV PCBs and associated equipment. ▪ Malaya Substation, 4-230 kV PCBs and associated equipment. ▪ Gumaca Substation, 2-230 kV PCBs and associated equipment. Bulk Cost Estimate: 30 Million Pesos	
Tuguegarao– Lal-lo 230 kV Transmission Line	PQ, LG	To improve the power quality and reliability of supply in the province of Cagayan and this will form part of the development of the Northern Luzon 230 kV Loop that will cater the wind power generation potential in the region.	Oct 2019
		Substation Components: ▪ Lal-lo 230 kV Substation, 2x100 MVA 230/69-13.8 kV Power Transformers and accessories, 6-230 kV PCBs and associated equipment, 8-69 kV PCBs and associated equipment; ▪ Tuguegarao 230 kV Substation, 3-230 kV PCBs and associated equipment. Transmission Components: ▪ Tuguegarao–Lal-lo 230 kV Transmission Line, ST-DC, 1-795 MCM ACSR, 64 km. Bulk Cost Estimate: 2,082 Million Pesos	
Balsik (Hermosa)–San Jose 500 kV Transmission Line	GE	To develop new 500 kV corridor that will accommodate the bulk generation in Bataan and Zambales area and to improve the overall reliability, security and stability of the 500 kV system.	Oct 2019
		Substation Components: ▪ New Hermosa 500 kV Substation, 2x1000 MVA, 500/230-13.8 kV Power Transformers and accessories, 10-500 kV PCBs and associated equipment, and 12-230 kV PCBs and associated equipment; 2x60 MVAR 500 kV Shunt Reactors and accessories, 1x90 MVAR 500 kV Line Reactor and accessories; and 2x100 MVAR, 230 kV Capacitor Banks and accessories; Transmission Components: ▪ Hermosa-San Jose 500 kV Transmission Line, ST-DC, 4-410 mm^2 TACSR/AS, 82.41 km; ▪ New Hermosa–Old Hermosa Tie Line, SP-DC, 4-795 MCM ACSR, 0.5 km. Bulk Cost Estimate: 10,348 Million Pesos	
Eastern Albay 69 kV Line Stage 2	SR	To provide the looping configuration for the 69 kV line in eastern Albay.	Nov 2019
		Substation Components: ▪ Sto. Domingo Substation, 1-69 kV PCBs and associated equipment; Transmission Components: ▪ Sto. Domingo–Tabaco 69 kV Transmission Line, ST-SC, 1-336.4 MCM ACSR, 18 km. Bulk Cost Estimate: 382 Million Pesos	

Project Name	Driver	Purpose and Components	ETC
Clark–Mabiga 69 kV Transmission Line	LG	To relieve the heavy loading of the existing Mexico-Clark Lines and address the low voltage issues in the area.	Nov 2019
		Substation Components: ▪ Clark 230 kV Substation (Expansion), 1x300 MVA 230/69-13.8 kV Power Transformer and accessories, 1-230 kV PCB and associated equipment and 3-69 kV PCBs and associated equipment. Transmission Components: ▪ Clark-Mabiga 69 kV Transmission Line, 1-410mm^2 TACSR/AS, SP-DC, 6 km. Bulk Cost Estimate: 549 Million Pesos	
San Jose-Quezon 230 kV Line 3	SR	To increase transfer capacity of the existing corridor and maintain the N-1 contingency provision.	Dec 2019
		Substation Components: ▪ San Jose 230 kV Substation, 5-230 kV PCBs and associated equipment; ▪ Quezon 230 kV Substation, Line Protection and Communication System. Transmission Components: ▪ San Jose-Quezon 230 kV Transmission Line, ST/SP-SC, 2-610 mm^2 TACSR, 19 km. Bulk Cost Estimate: 965 Million Pesos	
Antipolo 230 kV Substation	LG	To accommodate the demand increase in Metro Manila and maintain the N-1 contingency provision for Taytay Substation.	May 2020
		Substation Components: ▪ Antipolo 230 kV Substation, 12-230 kV PCBs and associated equipment, 2x100 MVAR 230 kV Capacitor Banks and accessories. Transmission Components: ▪ Bus-in point along San Jose–Taytay 230 kV Transmission Line, ST-DC, 4-795 MCM ACSR, 2-0.75 km. Bulk Cost Estimate: 1,153 Million Pesos	
Mariveles–Balsik (Hermosa) 500 kV Transmission Line	GE	To accommodate the connection of incoming generations in Bataan Peninsula by developing a common collector switching station for power generation in Mariveles and a new 500 kV transmission backbone from Mariveles going to Hermosa.	Jun 2020
		Substation Components: ▪ Mariveles 500 kV Switching Station (New), 12-500 kV PCBs and associated equipment. ▪ Balsik (Hermosa) 500 kV Substation, 2-500 kV PCBs and associated equipment. Transmission Components: ▪ Mariveles–Hermosa 500 kV Transmission Line, ST-DC, 4-410 mm^2 TACSR/AS, 49.2 km; Mariveles–Mariveles (GN Power): Power Supply 13.8 kV Transmission Line, SP-DC, 1-2/0 MCM ACSR, 3.28 km; Bulk Cost Estimate: 6,057 Million Pesos	
Western 500 kV Backbone (Stage 1)	GE	To develop a 500 kV western corridor that will accommodate the bulk generation in Zambales area and to improve the overall reliability, security and stability of the 500 kV system upon completion of the Stage 2.	Jun 2020
		Substation Components: ▪ New Hermosa 230 kV Substation, 4-230 kV PCBs and associated equipment. Transmission Components: ▪ Castillejos–Hermosa 500 kV Transmission Line, ST-DC, 4-795 MCM ACSR/AS, 34 km. Bulk Cost Estimate: 2,631 Million Pesos	

Project Name	Driver	Purpose and Components	ETC
Tiwi Substation Upgrading	SR	To improve the reliability of Tiwi A and C Substations, augment the power requirement of Malinao/Ligao Load-End Substation and establish clear asset boundaries within the Tiwi Geothermal Power Plant Complex.	Jul 2020
		Substation Components: ▪ Tiwi A 230 kV Substation, 4-230 kV PCBs and associated equipment; ▪ Tiwi C 230 kV Substation, 1x50 MVA, 230/69-13.8 kV Power Transformer and accessories, 12-230 kV PCBs and associated equipment and 3-69 kV PCBs and associated equipment. Transmission Components: ▪ Daraga/Naga–Tiwi C Line Extension 230 kV Transmission Line, ST-DC, 1-795 MCM ACSR/AS, 0.7 km; ▪ Tiwi A–Tiwi C Line Extension 230 kV Transmission Line, ST-DC, 1-795 MCM ACSR/AS, 0.3 km; ▪ Malinao/Ligao–Tiwi C Line Extension 69 kV, SP-SC, 1-336.4 MCM ACSR/AS, 1.5 km Bulk Cost Estimate: 1,467 Million Pesos	
North Luzon Substation Upgrading Project	SR	To cater the load growth and provide N-1 contingency to various substations in the North Luzon Region.	Jul 2019/ Sep 2020
		Stage 1: Substation Components: ▪ Bauang 230 kV Substation (Replacement), 1x100 MVA 230/115/69-13.8 kV Power Transformer and accessories, 7-230 kV PCBs and associated equipment; ▪ Gamu 230 kV Substation, 1x100 MVA Power Transformer and accessories,10-230 kV PCBs and associated equipment, 2-69 kV PCBs and associated equipment; ▪ Bayombong 230 kV Substation, 1x100 MVA Power Transformer and accessories, 5-230 kV PCBs and associated equipment, 3-69 kV PCBs and associated equipment; ▪ Hermosa 69 kV Substation, 10-69 kV PCBs and associated equipment; ▪ Malaya 230 kV Substation (Expansion), 1x300 MVA, 230/115-13.8 kV Power Transformer and accessories, 9-230 kV PCBs and associated equipment, 1-115 kV PCB and associated equipment; ▪ Quezon 230 kV Substation (Expansion), 3-230 kV PCBs and associated equipment ▪ San Jose 230 kV Substation (Expansion), 1x300 MVA, 230/115-13.8 kV Power Transformer and accessories and accessories, 1-230 kV PCBs and associated equipment, 7-115 kV PCBs and associated equipment. ▪ Doña Imelda Substation, 1-115 kV PCBs and associated equipment and neutral grounding transformer and accessories; ▪ Concepcion 69 kV Substation, 22-69 kV PCBs and associated equipment Stage 2: Substation Components: ▪ Bacnotan 230 kV Substation (Expansion), 1x100 MVA 230/69-13.8 kV Power Transformer and accessories, 1-230 kV PCB and associated equipment, 6-69 kV PCBs and associated equipment; ▪ Balingueo 230 kV Substation (Expansion), 1x100 MVA 230/69-13.8 kV Power Transformer and accessories, 5-230 kV PCBs and associated equipment, 4-69 kV PCBs and associated equipment; ▪ Labrador 230 kV Substation (Replacement), 1x100 MVA 230/69-13.8 kV Power Transformer and accessories, 5-230 kV PCBs and associated equipment, 2-69 kV PCBs and associated equipment; ▪ San Rafael 230 kV Substation (Expansion), 1x300 MVA 230/69-13.8 kV Power Transformer and accessories, 1-230 kV PCB and associated equipment, 2-69 kV PCBs and associated equipment ▪ Pantabangan Substation, 4-230 kV PCBs and associated equipment; ▪ Subic 230 kV Substation, 3-230 kV PCBs and associated equipment; Bulk Cost Estimate: 5,778 Million Pesos	

Project Name	Driver	Purpose and Components	ETC
Pagbilao 500 kV Substation	GE	To develop new 500 kV substation that aims to accommodate the connection of incoming power plants in Quezon Province	Dec 2020
		Substation Components: ▪ Pagbilao 500 kV Substation, 3x1,000 MVA, 500/230 kV Power Transformers and accessories, 8-500 kV PCBs and associated equipment, and 11-230 kV PCBs and associated equipment; ▪ Tayabas 500 kV Substation Expansion, 3-500 kV PCBs and 1-230 kV PCB and associated equipment. Transmission Components: ▪ Swinging of Naga–Tayabas EHV Line at Tayabas 500 kV Substation ST/SP-DC, 4-795 MCM ACSR, 0.5 km; ▪ Naga–Tayabas Line Extension to Pagbilao 500 kV Substation, 500 kV, ST-DC, 4-795 MCM ACSR, 0.5 km; ▪ Pagbilao–Tayabas Line Extension to Pagbilao 500 kV Substation, 230 kV, ST-DC, 4-795 MCM ACSR, 2.75 km; Pagbilao–Tayabas connection to Naga-Tayabas, 230 kV, ST-DC, 4-795 MCM ACSR, 2.75 km. Bulk Cost Estimate: 4,016 Million Pesos	
Navotas (Manila) 230 kV Substation	LG	To provide additional substation capacity in Metro Manila to maintain the N-1 contingency provision for the transformers in Quezon, Marilao and Paco Substation.	Feb 2021
		Substation Components: ▪ Navotas 230 kV Substation, 2x300 MVA, 230/115-13.8 kV Power Transformers and accessories, 9-230 kV PCBs (GIS) and 15-115 kV PCBs (GIS) and associated equipment. Transmission Components: ▪ From Marilao–Quezon cut-in point to Navotas Substation, 230 kV, ST/SP-DC, 4-795 MCM ACSR/AS, 20 km. Bulk Cost Estimate: 3,486 Million Pesos	
Ambuklao–Binga 230 kV Transmission Line Upgrading	SR	To address the old age condition of the line and accommodate the generation capacity addition in Cagayan Valley area.	May 2021
		Substation Components: ▪ Ambuklao 230 kV Substation, 6-230 kV PCBs and associated equipment. Transmission Components: ▪ Ambuklao–Binga 230 kV Transmission Line, ST/SP-DC, 2-410mm^2 TACSR, 11 km. Bulk Cost Estimate: 373 Million Pesos	
Binga–San Manuel 230 kV Transmission Line Stage 1 & 2	SR	To address the old age condition of the line and provide N-1 contingency during maximum dispatch of the generating power plants in North Luzon.	May 2021
		Substation Components: ▪ San Manuel 230 kV Substation, 2-230 kV PCBs and associated equipment. Transmission Components: ▪ Binga–San Manuel 230 kV Transmission Line, ST-DC, 2-410 mm^2 TACSR, 40 km. Bulk Cost Estimate: 1,620 Million Pesos	
Tuy 500/230 kV Substation Project (Stage 1)	GE	To allow the connection of the 2x350 MW Coal-Fired Power Plant (CFPP) Project of St. Raphael Power Generation Corporation (SRPGC) and allow full dispatch of all generating plants injecting at Calaca Substation.	Dec 2021
		Substation Components: ▪ Tuy Substation, 1x100 MVA,500/230-69 kV Power Transformer and accessories,12-230 kV PCBs and associated equipment, 3-69 kV PCBs and associated equipment, ▪ Dasmariñas Substation Expansion, 2-230 kV PCBs and associated equipment ▪ Sta. Rita Switchyard Expansion, Line Protection and Communication System	

Project Name	Driver	Purpose and Components	ETC
		▪ Calaca (new) Substation, Replacement of Current Transformers and Busworks <u>Transmission Components:</u> ▪ Tuy–Silang (initially 230 kV-energized), 500 kV, ST-DC, 4-410 mm^2 TACSR, 40 km, ▪ Silang–Dasmariñas, 230 kV, ST-DC, 4-410 mm^2 TACSR/AS, 8.6 km ▪ Sta. Rita 230 kV Line Extension, 230 kV, ST-DC, 4-795 MCM ACSR/AS, 10 km. ▪ Calatagan/Nasugbu Line Extension, 69 kV, SP-DC, 1-795 MCM ACSR/AS, 3.5 km. Bulk Cost Estimate: 8,454 Million Pesos	
Luzon Voltage Improvement Project – 3	SR	To address the anticipated undervoltage problem during peak load conditions and overvoltage problem during off peak load conditions at various substations in the Luzon Grid.	Aug 2020 /Jun 2022
		Stage 1: <u>Substation Components:</u> ▪ Cabanatuan 230 kV Substation, 2x50 MVAR, 230 kV Capacitor Banks and accessories, 1-230 kV PCB and associated equipment, 1-69 kV PCB and associated equipment; ▪ Nagsaag 500 kV Substation, 1x90 MVAR, 500 kV Shunt Reactor and accessories, 1-500 kV PCB and associated equipment; ▪ Tuguegarao 230 kV Substation, 1x25 MVAR Capacitor Bank and accessories and 1x25 MVAR, 230 kV Shunt Reactor and accessories, 2-230 kV PCBs and associated equipment, 2-69 kV PCBs and associated equipment; ▪ Baler Load-End 69 kV Substation, 3x2.5 MVAR, 69 kV Capacitor Banks and accessories, 4-69 kV PCBs and associated equipment; ▪ Pantabangan Load-end 69 kV Substation, 1x5 MVAR, 69 kV Capacitor Bank and accessories, 1-69 kV PCBs and associated equipment; ▪ Umingan Load-end 69 kV Substation, 3x5 MVAR 69 kV Capacitor Banks and accessories, 4-69 kV PCBs and associated equipment; ▪ Camiling Load-end 69 kV Substation, 3x5 MVAR 69 kV Capacitor Banks and accessories, 4-69 kV PCBs and associated equipment; ▪ Bantay 115 kV Substation, 1x7.5 MVAR, 115 kV Capacitor Bank and accessories, 1-115 kV PCBs and associated equipment; ▪ Mexico 230 kV Substation, 1x100 MVAR 230 kV Capacitor Bank and accessories, 12-230 kV PCBs and associated equipment; ▪ San Jose 230 kV Substation, 1x100 MVAR 230 kV Capacitor Bank and accessories, 3-230 kV PCBs and associated equipment; ▪ Laoag 230 kV Substation, 1x35 MVAR & 1x25 MVAR 230 kV Shunt Reactors and accessories, 2x25 MVAR 230 kV Capacitor Banks and accessories, 4-230 kV PCBs and associated equipment; Stage 2: <u>Substation Components:</u> ▪ San Esteban 230 kV Substation, 2x25 MVAR, 230 kV Capacitor Banks and accessories, 2-230 kV PCBs and associated equipment; ▪ Botolan 230 kV Substation, 1x25 MVAR 230 kV Shunt Reactor and accessories 6-230 kV PCBs and associated equipment, 3-69 kV PCBs and associated equipment; ▪ Itogon Load-end 69 kV Substation,	

Project Name	Driver	Purpose and Components	ETC
		1x7.5 MVAR, 69 kV Capacitor Bank and accessories, 1-69 kV PCBs and associated equipment; ▪ Antipolo 230 kV Substation, 2x100 MVAR, 230 kV Capacitor Banks and accessories, 2-230 kV PCBs and associated equipment; ▪ Bautista Load-end 69 kV Substation, 3x5 MVAR 69 kV Capacitor Banks and accessories, 4-69 kV PCBs and associated equipment; Bulk Cost Estimate: 3,383 Million Pesos	
Luzon Voltage Improvement Project – 4	SR	To address the anticipated undervoltage problem during peak condition at various substations in the Luzon Grid.	Jul 2020/ Jun 2022
		Stage 1: <u>Substation Components:</u> ▪ Ligao Switching Station, 3x5 MVAR, 69 kV Capacitor Banks and accessories, 4-69 kV PCBs and associated equipment; ▪ Iriga Load-end 69 kV Substation, 2x5 MVAR, 69 kV Capacitor Banks and accessories, -5-69 kV PCBs and associated equipment; ▪ Sorsogon 69 kV Switching Station, 3x5 MVAR, 69 kV Capacitor Banks and accessories, 4-69 kV PCBs and associated equipment. Stage 2: <u>Substation Components:</u> ▪ Dasmariñas 230 kV Substation, 2x100 MVAR, 230kV Capacitor Banks and accessories, 2-230 kV PCBs and associated equipment; ▪ Biñan 230 kV Substation, 2x100 MVAR, 230 kV Capacitor Banks and accessories, 2-230 kV PCBs and associated equipment; ▪ Mabini Load-end 69 kV Substation, 3x7.5 MVAR, 69 kV Capacitor Banks and accessories, 4-69 kV PCBs and associated equipment; ▪ Cuenca Load-end 69 kV Substation, 3x7.5 MVAR, 69 kV Capacitor Banks and accessories, 5-69 kV PCBs and associated equipment; ▪ Taysan Load-end 69 kV Substation, 3x7.5 MVAR, 69 kV Capacitor Banks and accessories, 4-69 kV PCBs and associated equipment; ▪ San Juan Load-end 69 kV Substation, 3x5 MVAR, 69 kV Capacitor Banks and accessories, 5-69 kV PCBs and associated equipment; ▪ Lagonoy Load-end 69 kV Substation, 3x5 MVAR, 69 kV Capacitor Banks and accessories, 4-69 kV PCBs and associated equipment. Bulk Cost Estimate: 3,122 Million Pesos	
South Luzon Substation Upgrading Project	LG/SR	To cater load growth, provide N-1 contingency and ensure reliability and flexibility to various substations in NGCP's South Luzon Region	Jul2021/ Jun 2022
		Stage 1: <u>Substation Components:</u> ▪ Las Piñas 230 kV Substation (Expansion), 1x300 MVA, 230/115-13.8 kV Power Transformer and accessories; ▪ Lumban 230 kV Substation (Expansion), 1x100 MVA, 230/69-13.8 kV Power Transformer and accessories, 1-230 kV PCB and associated equipment; 2-69 kV PCB and associated equipment. ▪ San Juan (Kalayaan) S/Y, 8-230 kV PCBs and associated equipment; ▪ Naga 230 kV Substation (Replacement), 1x300 MVA, 230/69-13.8 kV Power Transformer and accessories, 1-69 kV PCB and associated equipment. Stage 2: <u>Substation Components:</u> ▪ Daraga 230 kV Substation, 1x100 MVA 230/69-13.8 kV Power Transformer and accessories, 4-230 kV PCB and associated equipment, 2-69 kV PCBs and associated equipment; ▪ Gumaca 230 kV Substation (Replacement), 1x100 MVA 230/69-13.8 kV Power Transformer and accessories, 1-230 kV PCB and associated equipment, 2-69 kV PCBs and associated equipment; ▪ Labo 230 kV Substation, Line terminations reconfiguration. Bulk Cost Estimate: 2,175 Million Pesos	

Project Name	Driver	Purpose and Components	ETC
VISAYAS			
Sta. Rita–Quinapondan 69 kV Transmission Line	SR	To provide a more reliable and quality transmission service to Eastern Samar.	Nov 2018
		Substation Components: ▪ Sta. Rita S/S Expansion, 2-69 kV PCBs and associated equipment; ▪ Quinapondan S/S Expansion, 2-69 kV Air break switches. Transmission Components: ▪ Sta. Rita–Quinapondan 69 kV T/L, ST-SC, 1-336.4 MCM, 97 km. Bulk Cost Estimate: 363 million Pesos	
Visayas Substation Reliability Project I	SR	To add substation capacity and provide N-1 contingency in various substations in the Visayas Grid.	Dec 2018
		Substation Components: ▪ Maasin S/S Expansion, 1x50 MVA 138/69-13.8 kV Power Transformer and accessories. Bulk Cost Estimate: 1,190 million Pesos	
Ormoc–Babatngon 138 kV Transmission Line	SR	To provide N-1 contingency for the existing corridor by installing a second circuit.	Dec 2018
		Substation Components: ▪ Ormoc S/S Expansion, 1-138 kV PCB and associated equipment; ▪ Babatngon S/S Expansion, 2-138 kV PCB and associated equipment. Transmission Components: ▪ Ormoc–Babatngon 138 kV T/L, ST-DC1, 1-795 MCM ACSR, 78.54 km. Bulk Cost Estimate: 962 million Pesos	
Visayas Substation Reliability Project II	SR	To add substation capacity to provide N-1 contingency in various substations in the Visayas Grid.	Dec 2018
		Substation Components: ▪ Mandaue 138 kV S/S Expansion, 1x100 MVA 138/69-13.8 kV Power Transformer and accessories, 1-138 kV GIS Switch Bay, 1-69 kV GIS Switch Bay; ▪ Lapu-lapu 138 kV S/S Expansion, 1x100 MVA 138/69-13.8 kV Power Transformer and accessories, 1-138 kV GIS Switch Bay, 1-69 kV GIS Switch Bay; ▪ Bacolod 138 kV S/S Expansion, 1-69 kV PCBs and associated equipment; ▪ Sta. Barbara 69 kV S/S Expansion, 2-69 kV PCBs and associated equipment. Bulk Cost Estimate: 532 million Pesos	
San Carlos–Guihulngan 69 kV Transmission Line	LG	This project is intended to boost the power delivery service to accommodate increasing power demand in the Northeastern part of Negros Island by building a 69 kV loop between Cadiz and Amlan.	Jun 2019
		Transmission Components: ▪ San Carlos–Guihulngan 69 kV T/L, ST-SC, 1-336.4 MCM ACSR, 58 km. Bulk Cost Estimate: 467 million Pesos	
Cebu–Negros–Panay 230 kV Backbone Project - Stage 1	GE, SR	To increase transfer capacity of the existing corridor and maintain the N-1 contingency provision.	July 2019
		Substation Components: ▪ Bacolod S/S Expansion, 2-138 kV PCBs and associated equipment. Transmission Line Components: ▪ Bacolod–E. B. Magalona, 230 kV T/L (initially energized at 138 kV), ST-DC, 2-795 MCM ACSR, 39 km. Bulk Cost Estimate: 6,104 million Pesos	
New Naga (Colon) Substation Project (Remaining Works)	LG	To upgrade existing substation to meet load growth	Sep 2019
		Substation Components: ▪ Colon 138 kV S/S, 1x100 MVA 138/69-13.8 kV Power Transformer and accessories, 2-138 kV PCBs and associated equipment, 2-69 kV PCBs and associated equipment.	

Project Name	Driver	Purpose and Components	ETC
		Transmission Components: ▪ Transfer of Sibonga and VECO Naga 69 kV Feeder from Naga S/S to Colon S/S, SP-DC, 1-795 MCM ACSR, 1.5 km. Bulk Cost Estimate: 313 million Pesos	
Naga (Visayas) Substation Upgrading Project	SR	To replace and upgrade the existing antiquated and aging primary and secondary equipment and device in Naga Substation.	Oct 2019
		Substation Components: ▪ Naga 138 kV S/S, 6-138 kV PCBs and associated equipment; ▪ Construction of New Control Room; ▪ Dismantling of Primary and Secondary Equipment at Naga Substation. Bulk Cost Estimate: 481 million Pesos	
Panitan–Nabas 138 kV Transmission Line 2 Project	SR	To provide N-1 contingency along the Panitan-Nabas 138 kV Transmission Line, thus, improving the reliability of power transmission towards the northwestern part of Panay.	Mar 2020
		Substation Components: ▪ Panitan 138 kV S/S, 1-138 kV PCB and associated equipment; ▪ Nabas 138 kV S/S, 3-138 kV PCBs and associated equipment. Transmission Components: ▪ Panitan–Nabas 138 kV T/L, ST-DC (2nd circuit stringing), 1-795 MCM ACSR, 95 km. Bulk Cost Estimate: 634 million Pesos	
Tagbilaran 69 kV Substation Project	SR, GE	To directly connect the Sta. Clara Power Corporation (SCPC) Hydro Power Plant and BEI to NGCP's substation, accommodate SCPC's expansion and provide reliability during maintenance shutdown of BDPP's transformer.	Mar 2020
		Substation Components: ▪ Tagbilaran 69 kV S/S (New), 1x10 MVA 69/13.8 kV Power Transformer and accessories and 1-69 kV PCBs and associated equipment; ▪ Construction of New Control Room. Bulk Cost Estimate: 534 million Pesos	
Cebu–Lapulapu 230 kV Transmission Line Project	SR	To increase transfer capacity of the existing corridor and maintain the N-1 contingency provision.	Nov 2020
		Substation Components: ▪ Lapulapu 138 kV S/S, 1-138 kV GIS Switchbay. Transmission Components: ▪ Cebu–Umapad 230 kV T/L (initially energized at 138 kV), ST/SP-DC, 2-410 mm^2 STACIR, 9 km. Submarine Cable Components: ▪ Umapad–Lapu-lapu, SC, 2-3C 500 mm^2 XLPE Submarine Cables, 1.1 km; ▪ Umapad CTS, Cable Sealing End Structures, 3-138 kV Disconnect Switches. Bulk Cost Estimate: 1,884 million Pesos	
Cebu–Negros–Panay 230 kV Backbone Project - Stage 3	GE	To accommodate the transmission of excess power from Panay and Negros Islands towards the rest of the Visayas Grid and possibly Luzon Grid.	Dec 2020
		Substation Components: ▪ Magdugo 230 kV S/S, 3x300 MVA 230/138 kV Power Transformer and accessories, 2x70 MVAR 230 kV Reactor, 15-230 kV PCBs, 15-138 kV PCBs and associated equipment; ▪ Calatrava 230 kV S/S, 2x100 MVA 230/69 kV Power Transformer and accessories, 2x70 MVAR 230 kV Reactor, 14-230 kV PCBs, 14-69 kV PCBs; ▪ Cadiz 230 kV S/S, 2x150 MVA 230/138 kV Power Transformer and accessories, 10-230 kV PCBs, 7-138 kV PCBs and associated equipment;	

Project Name	Driver	Purpose and Components	ETC
		▪ E. B. Magalona Switching Station, 1x70 MVAR 230 kV Reactor 9-230 kV PCBs and associated equipment; ▪ Barotac Viejo 230 kV S/S, 3x300 MVA 230/138 kV Power Transformer and accessories, 1x70 MVAR 230 kV Reactor, 8-230 kV PCBs, 6-138 kV PCBs and associated equipment; ▪ Bacolod 230 kV S/S, 2x300 MVA 230/138 kV Power Transformer and accessories, 6-230 kV PCBs, 1-138 kV PCB and associated equipment; ▪ Colon 138 kV S/S, 2-138 kV PCBs and associated equipment. <u>Transmission Components:</u> ▪ Magdugo–Cebu 230 kV T/L, ST-DC, 4-795 MCM ACSR, 35 km; ▪ Talavera–Magdugo 230 kV T/L, ST-DC, 4-795 MCM ACSR, 6 km; ▪ Cadiz–Calatrava 230 kV T/L, ST-DC, 4-795 MCM ACSR, 80 km; ▪ E. B. Magalona–Cadiz 230 kV T/L, ST-DC, 4-795 MCM ACSR, 45 km; ▪ Transfer of the CEDC 138 kV Line from AYA S/S to Colon S/S; ▪ Calatrava CTS–Calatrava S/S, ST-DC, 4-795 MCM ACSR, 1.5 km; ▪ Reconductoring of the Cebu–Quiot–Colon 138 kV Transmission Corridor; ▪ Bundling of termination at Cebu–Quiot–Colon 138 kV Transmission Corridor; ▪ Calatrava–San Carlos 69 kV T/L, ST-DC, 2-795 MCM ACSR, 5 km. <u>Submarine Cable Components:</u> ▪ Calatrava–Talavera 230 kV Submarine Cable, Double Circuit, 6-1,600 mm^2 XLPE, 29 km; ▪ Talavera SWS, 8-230 kV PCBs; ▪ Calatrava CTS, Cable Sealing End. Bulk Cost Estimate: 44,563 million Pesos	
Visayas Voltage Improvement Project	PQ	To address the projected low voltage problems in Northern Samar, eastern part of Leyte and Southern Leyte due to long 69 kV transmission lines serving them coupled with the growth in demand, and in the western part of Bohol and Central Cebu due to load growth.	Jan 2022
		<u>Substation Components:</u> Stage 1 (Oct 2019) ▪ Compostela 138 kV S/S, 2x20 MVAR, 138 kV Capacitor Banks and accessories, 2-138 kV PCBs and associated equipment; ▪ Cebu 138 kV S/S, 2x20 MVAR, 138 kV Capacitor Banks and accessories, 2-138 kV PCBs and associated equipment; ▪ Corella 138 kV S/S, 3x5 MVAR, 69 kV Capacitor Banks and accessories, 3-69 kV PCBs and associated equipment. Stage 2 (Jan 2022) ▪ Himayangan LES, 1x5 MVAR, 69 kV Capacitor Bank and accessories, 1-69 kV PCB and associated equipment; ▪ Bobolosan LES, 1x5 MVAR, 69 kV Capacitor Bank and accessories, 1-69 kV PCB and associated equipment; ▪ Tolosa LES, 1-5 MVAR, 69 kV Capacitor Bank and accessories, 1-69 kV PCB and associated equipment. Bulk Cost Estimate: 805 million Pesos	

Project Name	Driver	Purpose and Components	ETC
MINDANAO			
Sultan Kudarat (Nuling) Capacitor Project	SR	To mitigate the projected low voltage problems in Maguindanao area.	Sept 2018
		<u>Substation Components:</u> ▪ Sultan Kudarat 138 kV Substation, 2x7.5 MVAR, 69 kV Capacitor Banks and accessories. Bulk Cost Estimate: 54 Million Pesos	
Agus 6 Switchyard Upgrading / Rehabilitation Project	SR	To upgrade the existing obsolete and aging primary and secondary equipment and devices in Agus 6 Switchyard.	Oct 2018
		<u>Substation Components:</u> ▪ Agus 6 Switchyard, 5-138 kV PCBs and associated equipment, 14-69 kV PCBs and associated equipment. Bulk Cost Estimate: 794 Million Pesos	

Project Name	Driver	Purpose and Components	ETC
Balo-i-Kauswagan 230 kV Transmission Line (Formerly Balo-i-Kauswagan-Aurora 230 kV Transmission Line (Phase 1))	GE	To accommodate the grid connection of GNPK's 600 MW CFPP.	Feb 2019
		Substation Components: ▪ Kauswagan 230 kV Substation, 12-230 kV PCBs and associated equipment; ▪ Balo-i Substation, 2x300 MVA 230/138 kV Transformers and accessories, 8-230 kV PCBs and associated equipment, and 4-138 kV PCBs and associated equipment. Transmission Components: ▪ Balo-i-Kauswagan 230 kV Transmission Line, ST-DC, 2-410 mm^2 TACSR, 12.1 km. Bulk Cost Estimate: 2,455 Million Pesos	
Butuan–Placer 138 kV Transmission Line	SR	To provide N-1 contingency to the existing corridor by installing a second circuit.	Jun 2019
		Transmission Components: ▪ Butuan-Placer 138 kV, ST-SC, 1-795 MCM, 96.36 km. Substation Components: ▪ Placer 138 kV Substation, 2-138 kV PCBs and associated equipment; ▪ Butuan 138 kV Substation, 2-138 kV PCBs and associated equipment. Bulk Cost Estimate: 1,108 Million Pesos	
Toril 138 kV Substation Phase 2	LG	To add substation capacity to provide N-1 contingency	Jun 2019
		Substation Components: ▪ Toril 138 kV Substation, 1x50 MVA 138/69-13.8 kV Power Transformer and accessories, 2-138 kV PCBs and associated equipment, 3-69 kV PCBs and associated equipment. Bulk Cost Estimate: 897 Million Pesos	
Mindanao 230 kV Transmission Backbone	GE	To increase transfer capacity of the existing corridor and maintain the N-1 contingency provision.	Jun 2019
		Substation Components: ▪ Malita 230 kV Substation, 1x50 MVA 230/69 kV Power Transformer and accessories; ▪ Matanao 230 kV Substation, 2-230 kV PCBs and associated equipment; ▪ Toril 230 kV Substation, 2x300 MVA 230/138 kV Power Transformers and accessories,10-230 kV PCBs and associated equipment, and 6-138 kV PCBs and associated equipment; ▪ Bunawan 230 kV Substation, 2x300 MVA 230/138 kV Power Transformers and accessories, 10-230 kV PCBs and associated equipment; ▪ Balo-i 230 kV Substation, 2-230 kV PCBs and associated equipment; ▪ Villanueva 230 kV Substation, 2x300 MVA 230/138 kV Power Transformers and accessories, 2x35 MVAR Shunt Reactors and accessories, and 12-230 kV PCBs and associated equipment; ▪ Maramag 230 kV Substation, 4-230 kV PCBs and associated equipment. Transmission Components: ▪ Matanao–Toril 230 kV Transmission Line, ST-DC, 4-795 MCM ACSR, 37.8 km; ▪ Toril–Bunawan 230 kV Transmission Line, ST-DC, 4-795 MCM ACSR, 41.8 km. Bulk Cost Estimate: 7,090 Million Pesos	
Agus 2 Switchyard Upgrading Project	SR	To upgrade the existing antiquated and aging primary and secondary equipment and devices in Agus 2 Switchyard	Sep 2019
		Substation Components: Agus 2 Switchyard, 10-138 kV PCBs and other old or defective equipment and expansion of the existing Control Building Flood Control System. Bulk Cost Estimate: 741 Million Pesos	

Project Name	Driver	Purpose and Components	ETC
Kauswagan–Lala 230 kV Transmission Line (Formerly Balo-i–Kauswagan–Aurora 230 kV Transmission Line (Phase 2)	GE, SR	To enhance reliability of power delivery towards Zamboanga Peninsula. This will also complement the transmission of excess power from Mindanao Grid towards the Visayas Grid and vice versa.	Aug 2020
		<u>Substation Components:</u> ▪ Lala 230 kV Substation: 2x150 MVA 230/138-13.8 kV Power Transformer and accessories, 6-230 kV PCBs, 6-138 kV PCB and associated equipment; ▪ Aurora 138 kV Substation: 3-138 kV PCBs and associated equipment. <u>Transmission Components:</u> ▪ Kauswagan-Lala 230 kV Transmission Line: ST-DC, 4-795 MCM ACSR, 56 km; ▪ Lala-Aurora 138 kV Transmission Line: ST-DC, 2-795 MCM ACSR, 27.17 km. Bulk Cost Estimate: 5,040 Million Pesos	
Tacurong–Kalamansig 69 kV Transmission Line	SR	To connect the currently off-grid part of southwestern area in Sultan Kudarat to the Mindanao Grid.	Feb 2022
		<u>Substation Components:</u> ▪ Tacurong 69 kV Substation, 1-69 kV PCB and associated equipment; ▪ Kalamansig 69 kV Switching Station, 1x7.5 MVAR 69 kV Capacitor Banks and accessories, and 3-69 kV PCBs and associated equipment. <u>Transmission Components:</u> ▪ Tacurong-Kalamansig 69 kV Transmission Line, ST-SC, 1-336.4 MCM ACSR, 100 km. Bulk Cost Estimate: 1,320 Million Pesos	
Mindanao Substation Rehabilitation Project (MSRP)	SR	To upgrade the existing obsolete and aging primary and secondary equipment and devices in various Mindanao Substations	Dec 2022
		<u>Substation Components:</u> ▪ Aurora 138 kV Substation, 1-138 kV and 3-69 kV PCBs and associated equipment; ▪ Zamboanga 138 kV Substation, 3-138 kV and 2-69 kV PCBs and associated equipment; ▪ Agus 5 Substation, 4-138 kV PCBs and associated equipment; ▪ Balo-I 138 kV Substation, 13-138 kV PCBs and associated equipment; ▪ Lugait 138 kV Substation, 5-138 kV PCBs and associated equipment; ▪ Tagoloan 138 kV Substation, 4-138 kV and 1-69 kV PCBs and associated equipment; ▪ Pulangi 4 Substation, 10-138 kV and 3-69 kV PCBs and associated equipment; ▪ Nasipit* 138 kV Substation, 4-138 kV PCB and associated equipment; ▪ Davao* 138 kV Substation, 4-138 kV and 6-69 kV PCBs and associated equipment; ▪ Maco* 69 kV Substation, 2-69 kV PCBs and associated equipment; ▪ Bunawan* 138 kV Substation, 6-138 kV PCBs and associated equipment; ▪ Nabunturan* 138 kV Substation, 3-138 kV and 5-69 kV PCBs, and associated equipment; ▪ Sultan Kudarat* 69 kV Substation, 4-69 kV PCBs and associated equipment. Bulk Cost Estimate: 3,418 Million Pesos * Substations that are included in the Stage 1 of MSRP with Estimated Time of Completion on October 2020	
Mindanao Substation Upgrading Project (MSUP)	LG	To add substation capacity to provide N-1 contingency	Dec 2022
		<u>Substation Components:</u> ▪ Polanco 138 kV Substation, 1x75 MVA 138/69 kV Power Transformer and accessories, 3-138 kV PCB, 1-69 kV PCB and associated equipment;	

Project Name	Driver	Purpose and Components	ETC
		▪ Naga 138 kV Substation, 1x100 MVA 138/69 kV Power Transformer and accessories, 2-69 kV PCBs and associated equipment; ▪ Pitogo* 138 kV Substation, 1x100 MVA 138/69 kV Power Transformer and accessories, 1-138 kV PCB, 1-69 kV PCB and associated equipment; ▪ Agus 6 138 kV Substation, 1x100 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCBs and associated equipment; ▪ Maramag 138 kV Substation, 1x75 MVA 138/69 kV Power Transformer and accessories, 1-138 kV PCB, 1-69 kV PCB and associated equipment; ▪ Opol 138 kV Substation, 1x75 MVA 138/69 kV Power Transformer and accessories, 4-138 kV PCBs, 5-69 kV PCBs and associated equipment; ▪ Butuan* 138 kV Substation, 2x7.5 MVAR Shunt Capacitor, 5-138 kV PCBs, 5-69 kV PCBs and associated equipment; ▪ Placer* 138 kV Substation, 1x100 MVA 138/69 kV Power Transformer and accessories, 1x7.5 MVAR Shunt Capacitor, 3-138 kV PCBs, 5-69 kV PCBs and associated equipment; ▪ Bislig* 138 kV Substation, 1x50 MVA 138/69 kV Power Transformer and accessories, 4-138 kV PCBs, 5-69 kV PCBs and associated equipment; ▪ San Francisco* 138 kV Substation, 1x50 MVA 138/69 kV Power Transformer and accessories, 2x7.5 MVAR Shunt Capacitor, 4-138 kV PCBs, 3-69 kV PCBs and associated equipment; ▪ Kidapawan* 138 kV Substation, 1x50 MVA 138/69 kV Power Transformer and accessories (from Culaman Substation), 1-138 kV PCB, 2-69 kV PCBs and associated equipment; ▪ Gen. Santos* 138 kV Substation, 1x100 MVA 138/69 kV Power Transformer and accessories, 1x7.5 MVAR Shunt Capacitor**, 1-138 kV PCB, 8-69 kV PCBs and associated equipment; ▪ Tacurong* 138 kV Substation, 1x7.5 MVAR Shunt Capacitor**, 1-138 kV PCB, 10-69 kV PCBs and associated equipment. Bulk Cost Estimate: 5,016 Million Pesos * Substations that are included in the Stage 1 of MSUP with Estimated Time of Completion on October 2020 ** Shunt capacitors of General Santos and Tacurong 138 kV substations will be installed in Pitogo Substation.	

GE – Generation Entry
SR – System Reliability
LG – Load Growth
PQ – Power Quality

7.2.1 Luzon Grid

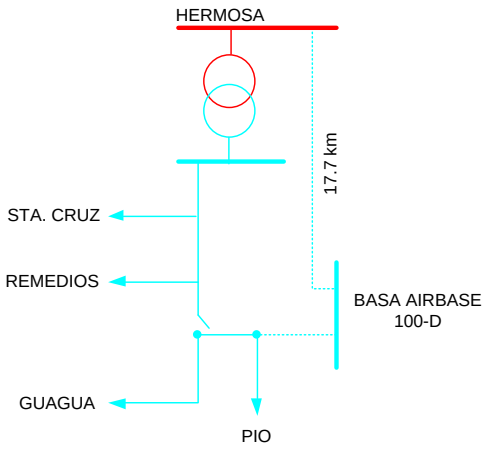
7.2.1.1 Bataan–Cavite Transmission Line (Feasibility Study)

The feasibility study for Bataan–Cavite Transmission line aims to establish the most feasible submarine cable link between Bataan and Cavite as part of the long-term plan to form a backbone loop system. This undertaking is in relation to several power plant projects being proposed in the Luzon Grid particularly in the province of Bataan.

The project involves system studies for the establishment of the appropriate cable capacity based on the available technologies and conduct of surveys for both submarine and overhead portion of the Bataan–Cavite Transmission Line.

7.2.1.2 Hermosa–Floridablanca 69 kV Transmission Line

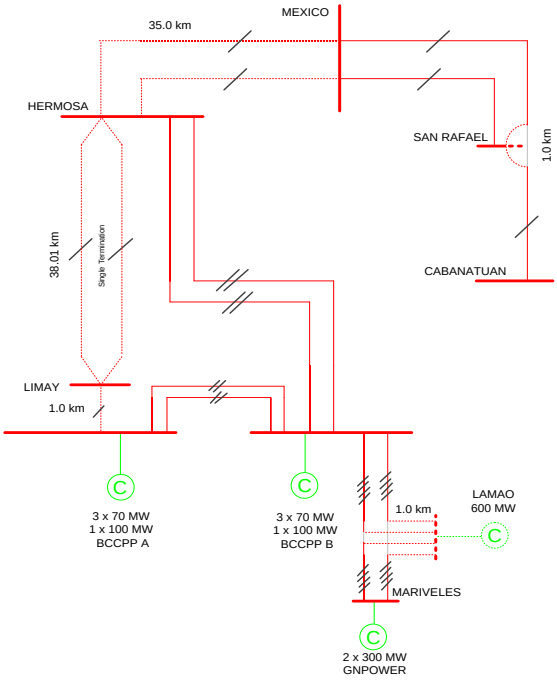
The Hermosa–Floridablanca 69 kV Transmission Line Project aims to relieve the imminent overloading of the existing Hermosa-Guagua 69 kV single-circuit line and address the undervoltage issues on its delivery points; to address the line reliability issue due to old age; and to adequately supply the increasing load in the areas being served.



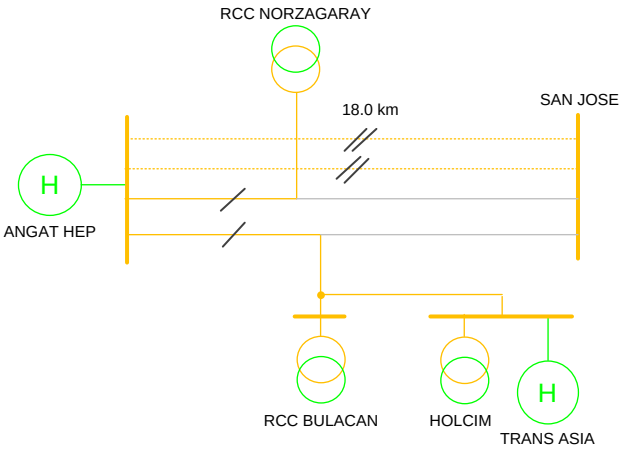
The Hermosa–Floridablanca 69 kV Transmission Line Project involves the construction of a 16.86 kilometer, single-circuit 69 kV transmission line from Hermosa to Floridablanca. Upon implementation of the Hermosa–Floridablanca 69 kV line, PELCO II Sta. Cruz and Remedios will be the only two loads left to the old Hermosa-Guagua line.

7.2.1.3 Bataan 230 kV Grid Reinforcement Project

The Bataan 230 kV Grid Reinforcement Project aims to accommodate the connection of a committed power plant, the 600 MW SMC Consolidated Power Corporation Coal-Fired Power Plant (SMC CPC CFPP) Project. The power plant will be connected through bus-in scheme to the Luzon Grid through the existing Mariveles–BCCPP-B 230 kV transmission line. The Project involves the development of Lamao 230 kV Substation, reconductoring of Limay-Hermosa and Hermosa-Mexico 230 kV Lines, replacement of underrated power circuit breakers at Limay Substation and BCCPP Block A & B Switchyard, and the reconfiguration of the Mexico-Cabanatuan 230 kV corridor to fully dispatch the generation capacity of the existing and the proposed power plants.

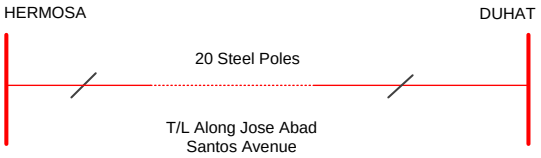


7.2.1.4 San Jose–Angat 115 kV Line Upgrading



The San Jose–Angat 115 kV Line Upgrading Project aims to ensure the reliability of the existing 115 kV transmission lines connecting Angat HEPP to the Luzon Grid. The San Jose-Angat Lines 1 and 2 were built in 1967 while Line 3 (wood pole) was built in 1960. The 300 MVA capacity per circuit of the project would be sufficient to provide N-1 contingency during maximum dispatch of the 246 MW Angat HEPP. If not implemented, transmission constraints could be experienced when there is an outage in Line 3. Furthermore, this project will eliminate the T-connection of existing industrial customers along the existing San Jose–Angat 115 kV Lines. The project involves the construction of a new 18 km 115 kV double-circuit line with higher ampacity. It will utilize the existing right-of-way of San Jose–Angat Line 3. The existing industrial customers that were previously T-connected will utilize the existing Lines 1 and 2 and will radially source its power requirement to San Jose 115 kV Substation.

7.2.1.5 Relocation of Steel Poles along Hermosa–Duhat 230 kV Transmission Line



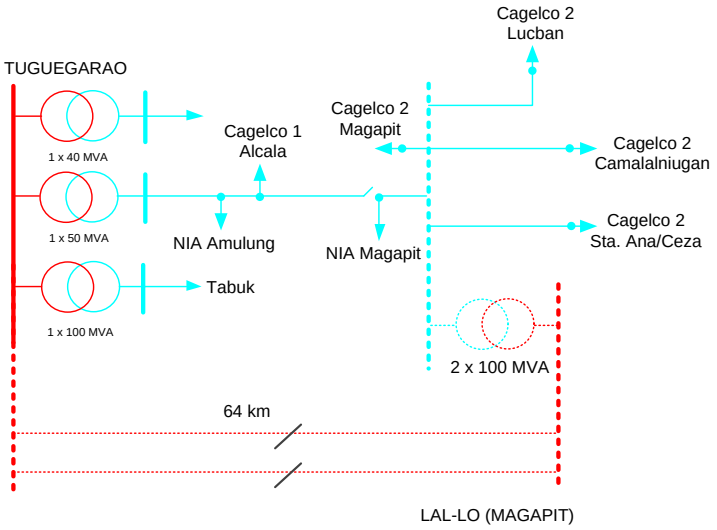
This undertaking is in connection to the road widening project along Jose Abad Santos Avenue in San Fernando, Pampanga which left some 18 steel poles at the middle of the road. The proposed relocation will eliminate the danger brought about by the remaining steel pole structures as well as to prevent accidents that will cause power interruption to the Hermosa-Duhat 230 kV Line. The project involves the relocation of 18 steel pole structures along the road Right-of-Way (ROW) limit of the DPWH in San Fernando–Gapan–Olongapo National Road, San Fernando City. This will be implemented through re-routing of the affected line using new steel pole structures.

7.2.1.6 Luzon PCB Replacement

The Luzon PCB Replacement Project aims to improve the system reliability in San Jose, Gumaca, Malaya and Labo Substations in the Luzon Grid. The Project involves the replacement of old and underrated power circuit breakers (PCB). The PCBs with insufficient interrupting capacities pose risk in efficiently responding to any system disturbances in the power network.

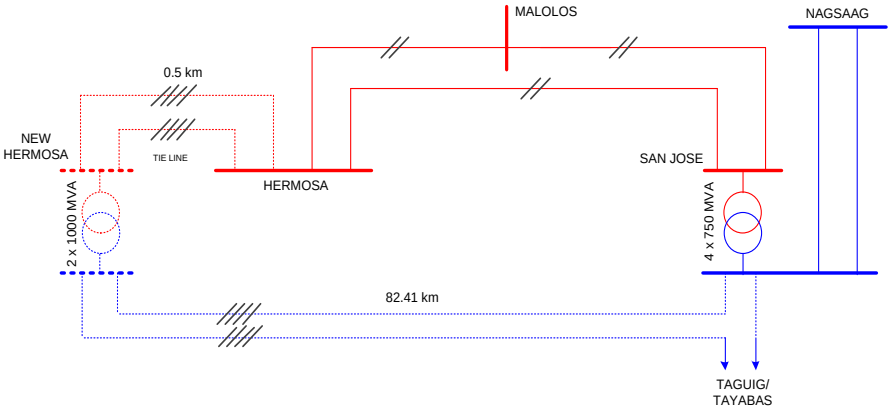
7.2.1.7 Tuguegarao–Lal-lo (Magapit) 230 kV Transmission Line

The Tuguegarao–Lal-lo (Magapit) 230 kV Transmission Line project aims to address the imminent overloading of the Tuguegerao–Magapit 69 kV Line due to the forecasted load growth in the northern part of Cagayan Province. It also aims to improve the power quality and reliability of supply in the area which is presently being served by a very long 69 kV line. This project will also become an integral part of the development of the Northern Luzon 230 kV loop which will link the north-western and north-eastern 230 kV backbone. The project involves the construction of a 64 double-circuit 230 kV transmission line from Tuguegarao to Lal-lo and the development of Lal-lo 230/69 kV Substation with a capacity of 2x100 MVA.

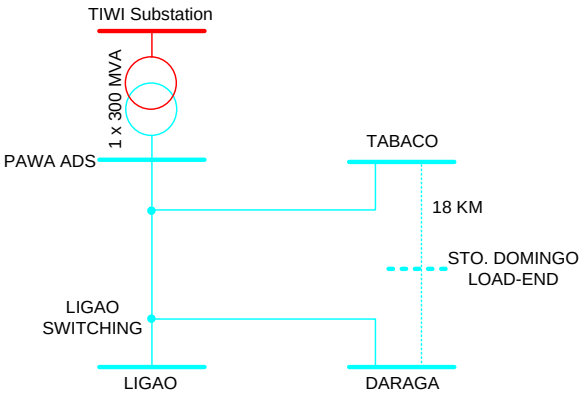


7.2.1.8 Hermosa–San Jose 500 kV Transmission Line

The Hermosa–San Jose 500 kV Transmission Line Project aims to accommodate the generation capacity additions in Bataan and Zambales area. The Project will serve as a new 500 kV corridor for the bulk power generation coming from the existing Limay CCPP, Petron RSFF, Subic Enron DPP, Mariveles CFPP and the programmed generation capacity additions which include RP Energy CFPP and SMC CFPP. The Project involves the development of new Hermosa 500 kV Substation and construction of a 500 kV transmission line from new Hermosa 500 kV Substation up to San Jose 500 kV Substation. The old Hermosa 230 kV Substation will transfer power through construction of a 230 kV Tie Line to the new Hermosa 500 kV Substation. Shunt Reactors, Line Reactor and Capacitor Banks will also be installed for system voltage regulation during off-peak and peak conditions.

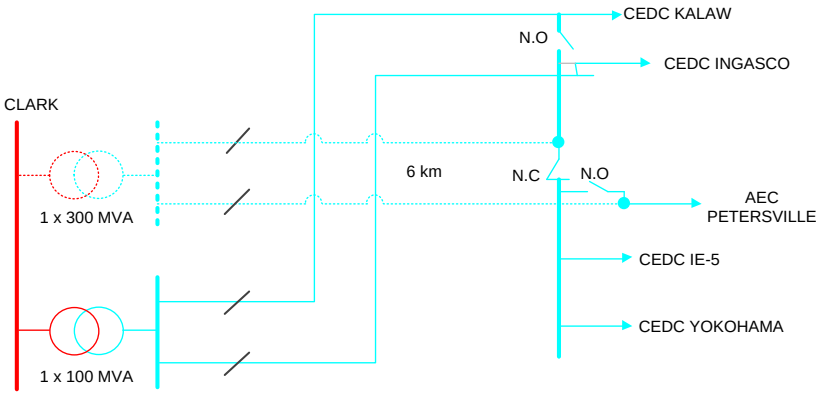


7.2.1.9 Eastern Albay 69 kV Transmission Line Stage 2



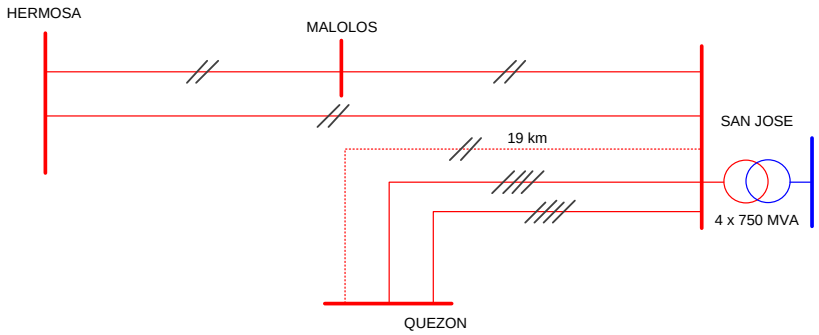
The Eastern Albay 69 kV Line Project aims to provide a more reliable transmission corridor in the eastern coast of Albay to serve the increasing eco-tourism developments in the area which include the Misibis Resort, Estate and Spa in Cagraray Island. The Eastern Albay 69 kV Line Project is divided into two stages. Stage 1 includes the development of the Sto. Domingo Load-End Substation with a 10 MVA, 69/13.8 kV transformer and the single-circuit Daraga–Sto. Domingo 69 kV Transmission Line which will be 21 km long and composed of a single-bundle of 336.4 MCM ACSR/AS conductors. Stage 2 meanwhile includes the development of the single-circuit Sto. Domingo-Tabaco 69 kV Line which will be 18 km long and composed of a single-bundle of 336.4 MCM ACSR/AS conductors.

7.2.1.10 Clark–Mabiga 69 kV Transmission Line



The Clark-Mabiga 69 kV Line Project aims to reinforce the Mexico–Clark 69 kV Line which is serving PRESCO, PELCO I, PELCO II, Angeles Electric Corporation (AEC), Quanta Paper Corporation and Clark Electric Development Corporation (CEDC). This will address the load growth in the area of Angeles and Mabalacat together with the new industries in Clark Freeport Zone and improve the power quality of supply in the area. The project involves the installation of a new transformer at Clark 230 Substation and the construction of a 69 kV line from the Clark Substation up to the area of Mabiga in Pampanga.

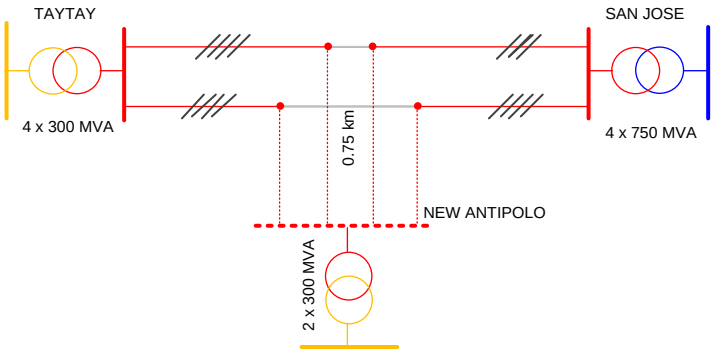
7.2.1.11 San Jose–Quezon 230 kV Line 3



The San Jose–Quezon 230 kV Line 3 project aims to address the projected overloading problem during an outage of one of the San Jose–Quezon circuits at peak load condition. Without this project, the dispatch of the power plants delivering power to the 500 kV system will have to be limited to maintain the N-1 contingency for the line and this may result in supply adequacy

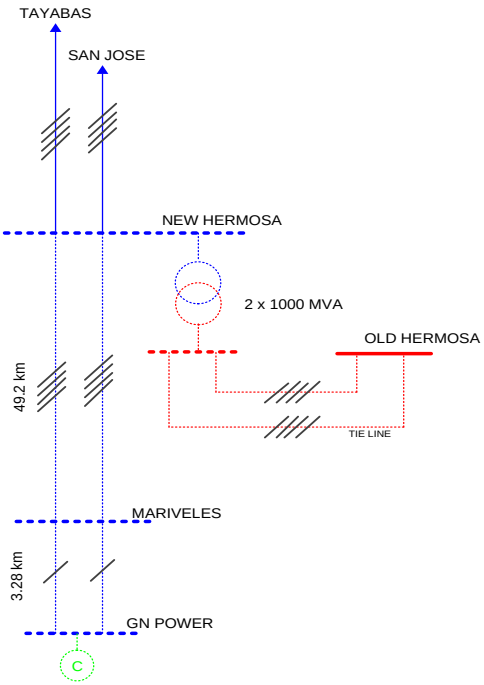
issue and load dropping. The project involves the construction of the third circuit in the San Jose-Quezon 230 kV transmission corridor. Due to the difficulty in implementing the transmission line approaching the Quezon 230 kV Substation, the proposed line will utilize the ROW of the existing San Rafael–Quezon 230 kV line up to Quezon 230 kV Substation. The proposed scheme requires the transfer of termination of the San Rafael 230 kV line from Quezon Substation to San Jose Substation utilizing the idle San Jose–Caysio, ST-DC, 1-795 MCM ACSR, 230 kV line.

7.2.1.12 Antipolo 230 kV Substation



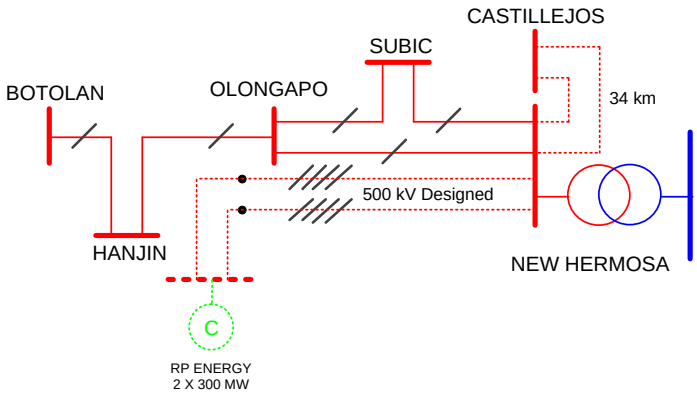
The Antipolo 230 kV Substation aims to cater the load growth in the Sector 2 of MERALCO. With the further increase in load, the existing 230/115 kV substations in Taytay and Doña Imelda become heavily loaded and have been losing already the provision for N-1 contingency and have space constraints for further expansion. This will expose the Metro Manila loads to supply reliability risk as well as power quality concerns during system peak load condition. The project involves the new 230 kV substation that will bus-in along the existing ST-DC San Jose-Taytay 230 kV line with 4-794 MCM ACSR conductors. Initially, the substation will also be installed with capacitor banks for voltage support. To draw supply from Antipolo, MERALCO will be installing 2x300 MVA 230/115 kV transformers and 115 kV Substation. MERALCO will also put up line connections to their existing 115 kV network in the area.

7.2.1.13 Mariveles–Hermosa 500 kV Transmission Line



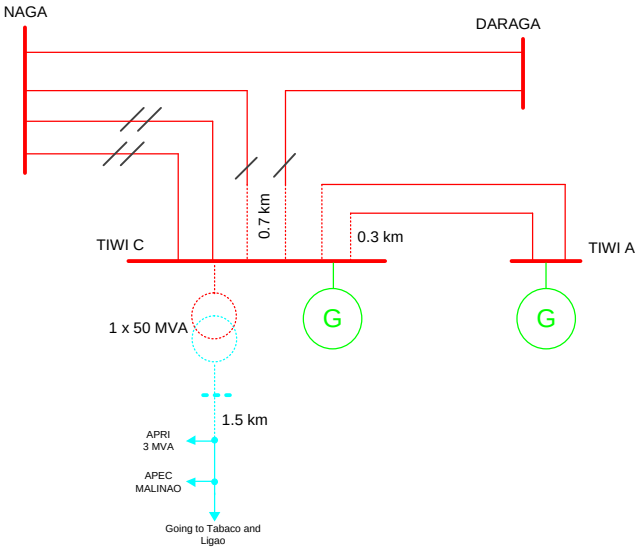
The Mariveles–Hermosa 500 kV Transmission Line Project aims to allow the connection of incoming generations in Bataan Peninsula which include 2x668 MW GN Power Dinginin CFPP, 8x150 MW SMC Consolidated Power Corporation CFPP and 2x150 MW KEPCO-HHIC CFPP Power Plant Project. While the Bataan 230 kV Grid Reinforcement Project can increase the capacity of the existing 230 kV corridor in the area, the huge generation capacity addition of 2,536 MW cannot be accommodated unless a new transmission highway is developed. The Project involves the development of new Mariveles 500 kV Substation and construction of 500 kV transmission line backbone from new Mariveles 500 kV Substation to Hermosa 500 kV Substation. This new backbone will form part of the loop from Hermosa to Mariveles then to Cavite/Metro Manila upon completion of the future submarine cable.

7.2.1.14 Western 500 kV Backbone (Stage 1)



The Western Luzon Backbone (Stage 1: Castillejos–Hermosa 500 kV Transmission Line Project) aims to provide a transmission facility to connect the 2x300 MW RP Energy CFPP to the Luzon Grid through Hermosa Substation.The project involves the implementation of a 32 km double circuit 500 kV designed transmission line from Castillejos to Hermosa. This line will be initially energized at 230 kV and will be connected to the RP Energy Coal Plant–Castillejos 230 kV line. This Castillejos–Hermosa 500 kV Line segment is part of the proposed long term plan for 500 kV backbone loop development from Bolo (Kadampat) down to Hermosa Substation.

7.2.1.15 Tiwi Substation Upgrading

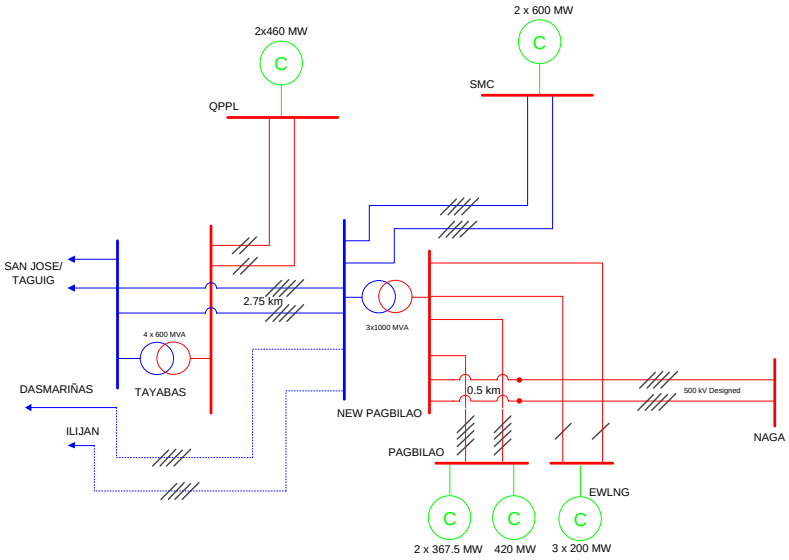


The project aims to upgrade the old and deteriorated substation equipment at Tiwi A and C Substations to improve the reliability of the system. It will also augment the power requirement of Malinao/Ligao LES by installation of additional power transformer at Tiwi C Substation and will clearly identify asset boundaries within the Tiwi Geothermal Power Plant Complex through construction of NGCP's own control facilities. The project involves the upgrading of equipment at Tiwi A and C Substations and installation of 50 MVA, 230/69-13.8 kV Power Transformer at Tiwi C Substation. It also involves the diversion of the Daraga/Naga 230 kV Line to Tiwi C Substation and extension of the Malinao/Ligao 69 kV Line from Tiwi A to Tiwi C Substation.

7.2.1.16 North Luzon 230 kV Substation Upgrading Project

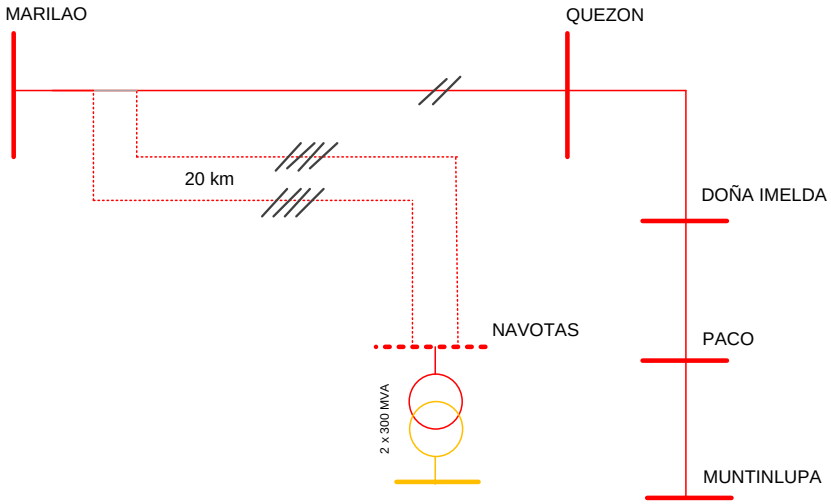
The North Luzon Substation Upgrading Project aims to cater the load growth and provide N-1 contingency to various substations in NGCP's North Luzon Region, Bauang, Gamu, Bayombong, Hermosa, Doña Imelda, Malaya, San Jose, Quezon, Balingueo, Bacnotan, Labrador, and San Rafael Substations. The Project involves transformer installations, and replacement and rearrangements of power circuit breakers to ensure reliability and flexibility of operations on the concerned substations.

7.2.1.17 Pagbilao 500 kV Substation



The Pagbilao 500 kV Substation Project will accommodate the connection of incoming power plants in Quezon Province which include the 420 MW Pagbilao Coal-Fired Power Plant (CFPP) Expansion, 500 MW San Buenaventura Power Ltd. Co. (SBPL) Coal-Fired Power Plant and 600 MW Energy World Corporation (EWC) Combined-Cycle Power Plant. The Pagbilao EHV Substation Project will address the overloading of Tayabas 500/230 kV transformers and the fault level issue at Tayabas 230 kV Substation. The Project involves the development of Pagbilao 500 kV substation and expansion of the Tayabas 500 kV Substation. It will be connected bus-in to the grid through Naga-Tayabas 230 kV Line. The 17 km segment of the Naga–Tayabas 230 kV Line will be energized at 500 kV level to accommodate the connection of the Project.

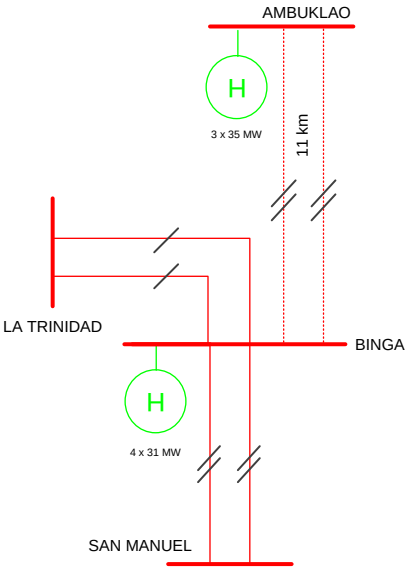
7.2.1.18 Navotas (Manila) 230 kV Substation



The Navotas (Manila) 230 kV Substation aims to cater the load growth in the Sector 1 of MERALCO and serve as a connection point for power plants in the area such as the TMO and Millennium Power Plants. With the further increase in load, the existing 230/115 kV substations in Metro Manila become heavily loaded and have been losing already the provision for N-1 contingency. This will expose the Metro Manila loads to supply reliability risk as well as power quality concerns during system peak load condition. The proposed Navotas 230 kV Substation will be initially linked to the grid through cut-in connection along the existing Marilao–Quezon 230 kV Transmission Line and will ultimately terminate in the future Marilao 500 kV Substation. The Project will be a Gas Insulated Switchgear (GIS) substation due to the space constraints for an outdoor substation.

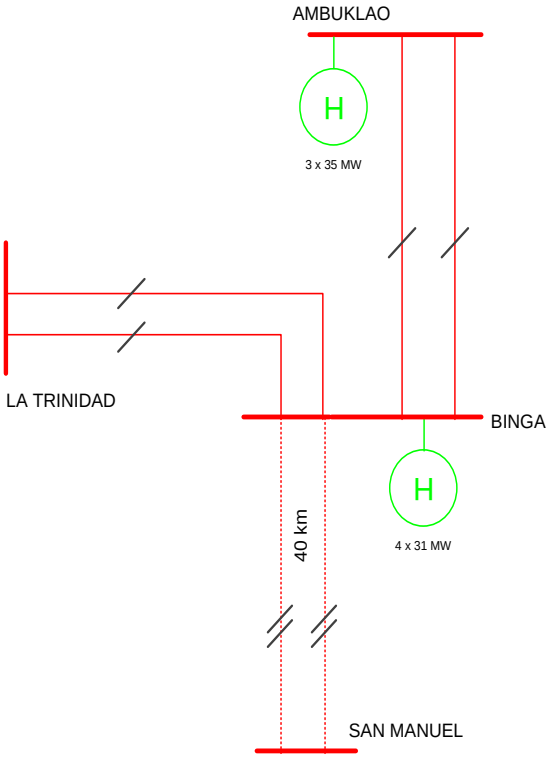
7.2.1.19 Ambuklao–Binga 230 kV Transmission Line Upgrading

The Ambuklao–Binga 230 kV Transmission Line Upgrading project aims to upgrade the existing line in order to address its old age condition and also to maintain the N-1 contingency provision taking into consideration the repowering of Ambuklao HEPP and the proposed generation capacity additions in the Cagayan Valley area. Thus, during maximum generation of the power plants, this project will prevent the overloading under N-1 contingency condition, i.e, outage of one 230 kV circuit. The project involves the construction of 11 km, 230 kV, double circuit, steel tower-steel pole transmission line to replace the old Ambuklao-Binga 230 kV line which presently conveys the generated power of Ambuklao and Magat HEPPs to the transmission backbone of the Luzon Grid.



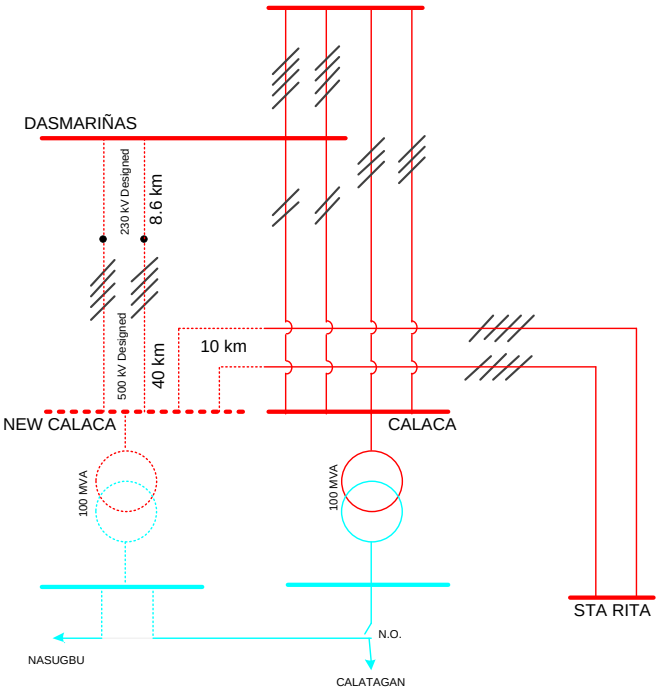
7.2.1.20 Binga–San Manuel 230 kV Transmission Line

The Binga–San Manuel 230 kV Transmission Line upgrading project aims to provide N-1 contingency during maximum dispatch of the generating plants, particularly HEPPs, in north Luzon. The existing line, as well as the power circuit breakers at Binga Substation, which were constructed/installed in 1956 have already surpassed the economic life. Moreover, there are developments in the power plants affecting the power flow at Binga–San Manuel 230 kV line. These include the repowering of Ambuklao HEPP to a new capacity of 105 MW (previously at 75 MW capacity) and the completion of Binga HEPP expansion to an additional capacity of 25 MW, and the other generation developments in Cagayan Valley area. This project involves the construction of a new 40 km double circuit Binga–San Manuel 230 kV transmission line using new right-of-way, including the installation of switching facilities at Binga and San Manuel Substations.



7.2.1.21 Tuy 500 kV Substation (Stage 1)

The Tuy 500 kV Substation (Stage 1) aims to accommodate the connection of the 2x350 MW SRPGC Coal Plant and allow full dispatch of bulk generation capacity additions in Batangas. The generation capacity additions will turn Calaca Substation into a merging point of more than 2,000 MW of power generation. The existing outgoing 230 kV lines going to Dasmariñas and Biñan would not be enough to accommodate the full dispatch of the plants considering the single outage contingency criterion.



The Tuy 500 kV Substation (Stage 1) Project will involve the development of Tuy 500 kV Substation which will be initially energized at 230 kV voltage level. The project will also invove the development of Tuy–Dasmariñas 500 kV designed transmission line but will also be initially energized at 230 kV. Furthermore, a new 100 MVA, 230/69-13.8 kV Power Transformer will be installed to provide N-1 contingency to the existing 100 MVA Power Transformer at Calaca Substation.

7.2.1.22 Luzon Voltage Improvement Project 3

The Luzon Voltage Improvement Project 3 aims to address the anticipated undervoltage problem during peak load condition and overvoltage problem during off peak load condition at various 500 kV, 230 kV and 69 kV load-end substations in the North Luzon Grid. The Luzon Voltage Improvement Project 3 involves the installation of capacitors and reactors to substations in the North Luzon Region, Laoag, Cabanatuan, Nagsaag, Tuguegarao, Baler, Pantabangan, Umingan, Paniqui, Bantay, San Esteban, Botolan, Mexico, San Jose, Itogon, Antipolo and Bayambang Substations.

7.2.1.23 Luzon Voltage Improvement Project 4

The Luzon Voltage Improvement Project 4 aims to address the anticipated undervoltage problem during peak load condition at various 230 kV and 69 kV load-end substations in the South Luzon Grid. The Luzon Voltage Improvement Project 4 involves the installation of capacitors to substations in the South Luzon Region. These include the Biñan and Dasmariñas 230 kV Substation In addition, capacitor installation will also be implemented in Ligao, Iriga, Mabini, Cuenca, Taysan, Juan, Lagonoy, Bulan and Malvar 69 kV Load End Substations.

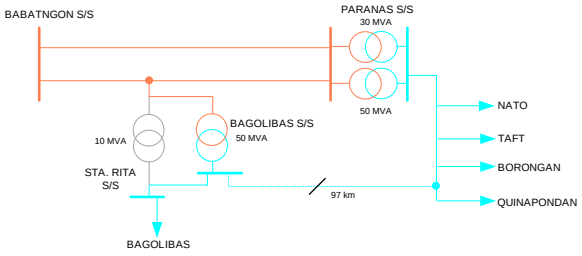
7.2.1.24 South Luzon 230 kV Substation Upgrading Project

The South Luzon Substation Upgrading Project aims to cater the load growth and provide N-1 contingency to various substations in NGCP's South Luzon Region which include Las Piñas, Lumban, Labo, Naga, Gumaca and Daraga Substations. The Project involves transformer installations, and replacement and rearrangements of power circuit breakers to ensure reliability and flexibility of operations on the concerned substations.

7.2.2 Visayas Grid

7.2.2.1 Sta. Rita–Quinapondan 69 kV Transmission Line

The Paranas–Taft–Borongan–Quinapondan 69 kV Line is a single circuit, 190.5 km line utilizing 336.4 MCM ACSR conductor. This is a radial line serving ESAMELCO, particularly the Taft, Borongan and Quinapondan Substations. Considering the 190.5 km length of the line, the Eastern Samar Area has been prone to trippings, high system loss and low voltage problems.



This project involves the construction of a 97 km 69 kV line connecting Sta. Rita and Quinapondan Substations.

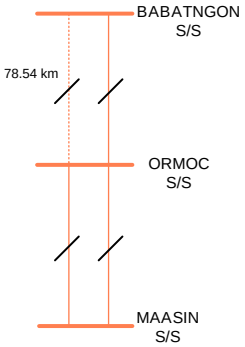
7.2.2.2 Visayas Substation Reliability Project I

This project is intended to provide capacity additions in various substations to address the overloading during N-1 condition or outage of one transformer. This will ensure the reliability of the substations and comply with the N-1 provision of the Philippine Grid Code.

The substations under this project are Ormoc (230 kV), Bacolod (138 kV), Cadiz (138 kV), Amlan (138 kV) and Samboan (138 kV) which are already completed, while Maasin (138 kV) is still ongoing.

7.2.2.3 Ormoc–Babatngon 138 kV Transmission Line

The Ormoc–Babatngon 138 kV line is one of the two 138 kV lines that compose the Leyte–Samar transmission corridor, the Babatngon–Paranas 138 kV line being the other one. The Babatngon–Paranas 138 kV line is a double circuit line while the Ormoc–Babatngon 138 kV line is only single circuit. Thus, the outage of this line will result to a loss of supply for Samar.



This project involves the construction of a 78.54 km of 138 kV steel tower overhead transmission line utilizing 1-795 MCM ACSR conductor as second circuit of the existing Ormoc–Babatngon 138 kV Line. This project also involves the expansion of Ormoc and Babatngon Substations.

7.2.2.4 Visayas Substation Reliability Project II

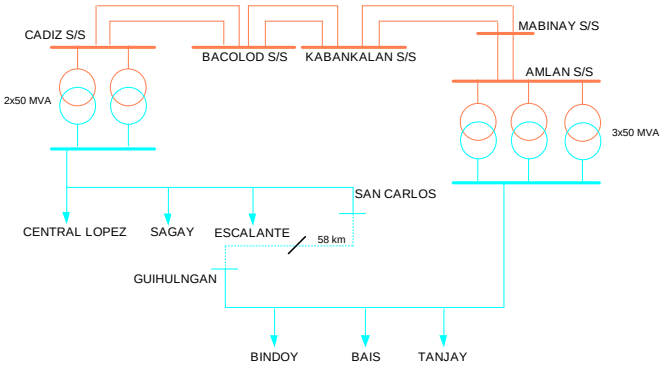
Various substations in the Visayas Grid have limited transformation capacity to provide continuous power delivery towards the load customers during single transformer outages, which will result in power curtailment.

The project aims to cater the load growth and provide N-1 contingency and accommodate additional generation capacity to various substations in Panay, Leyte and Cebu. The project will involve upgrading of Ormoc, Babatngon, Sta. Barbara, Mandaue, Bacolod and Lapulapu Substations. Expansions in Lapulapu, Bacolod, Sta. Barbara and Mandaue are still ongoing while the expansions on the other substations are already completed.

The project involves the installation of power transformer and power circuit breakers, including the associated substation expansion required to ensure reliability and flexibility of operations on the substations.

7.2.2.5 San Carlos–Guihulngan 69 kV Transmission Line

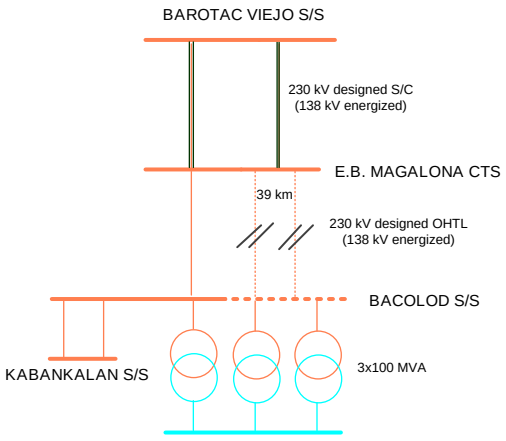
This project is intended to accommodate power demand in the northeastern part of Negros island by building a 69 kV transmission loop from Cadiz to Amlan. This loop will ensure the security and reliability of power supply to eastern Negros.



This project involves the construction of a 58 km 69 kV line utilizing a 1-336.4 MCM ACSR conductor from San Carlos to Guihulngan.

7.2.2.6 Cebu–Negros–Panay 230 kV Backbone Project - Stage 1

The development of new power plants, particularly in Panay and Negros Islands will result in the increase in power exchange between the islands of Panay, Negros and Cebu. However, the existing Negros-Panay interconnection system has limited capacity to cater the excess power generation from Panay towards Negros which could result in power curtailment.

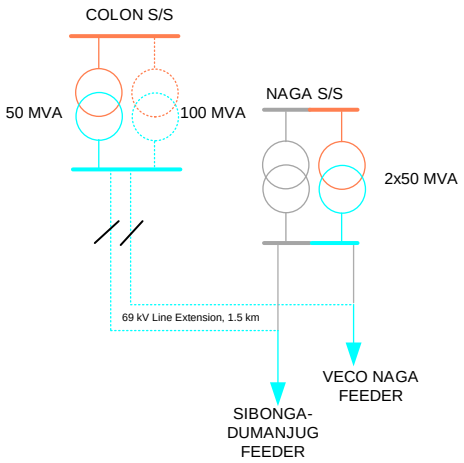


In order to ensure the effective transmission of excess power generation from Panay towards Negros, a high capacity transmission corridor is being proposed. Strategically, the project will be designed consistent with the long-term transmission master plan of having a 230 kV transmission backbone in the Visayas by establishing a 230 kV interconnection from Panay to Cebu.

The project involves the development of transmission corridor from Barotac Viejo S/S to Bacolod S/S and will be composed of submarine cable system and overhead transmission lines. It is designed at 230 kV voltage level but will be initially energized and operated at 138 kV. The submarine cable component was already completed in October 2016. The project will also involve associated expansion works at Barotac Viejo and Bacolod Substations.

7.2.2.7 New Naga (Colon) Substation Project (Remaining Works)

The Naga Substation was commissioned in 1977, hence, most of the equipment are already antiquated and are difficult to maintain. In line with the plan to improve the reliability of the power delivery in the area, the Naga–Sibonga–Dumanjug and VECO Naga 69 kV feeders which draws power from Naga S/S are proposed to be transferred to Colon S/S. However, the existing Colon S/S does not have sufficient capacity to cater the projected power demand upon the connection of new loads. Hence, there will be power curtailment.



To accommodate the projected demand of Colon S/S, there is a need to increase the substation capacity. The project involves the installation of 100 MVA transformer at Colon S/S and the transfer of the Naga–Sibonga–Dumanjug and VECO Naga 69 kV feeders from Naga S/S to Colon S/S, which were originally part of the formerly known and ERC-approved New Naga (Cebu) Substation Project, however, were not implemented as proposed during the 3rd Regulatory Period since the projected load to be catered by the transformer did not materialize.

The implementation of the remaining works under the New Naga (Colon) Substation Project will be pursued in the 4th Regulatory Period in consideration of the renewed need to address, among others, the increase in power demand along the Naga–Sibonga–Dumanjug and VECO Naga 69 kV feeders.

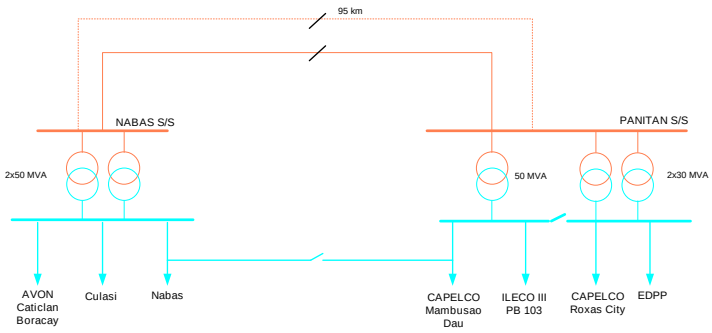
7.2.2.8 Naga (Visayas) Substation Upgrading Project

The equipment at Naga Substation, which was commissioned in 1977, is already antiquated and is difficult to maintain. Thus, outages due to equipment failure, maintenance and repair works are expected to occur more frequently and at longer duration. Accordingly, these outages may result in power curtailment.

In order to improve the reliability of the substation, equipment shall be replaced. The project involves the construction of new steel tower structures and installation of associated overhead line component. It also involves the use of steel tower structures with higher wind design capability. This project was formerly named as Naga Substation Rehabilitation Project.

7.2.2.9 Panitan–Nabas 138 kV Transmission Line 2 Project

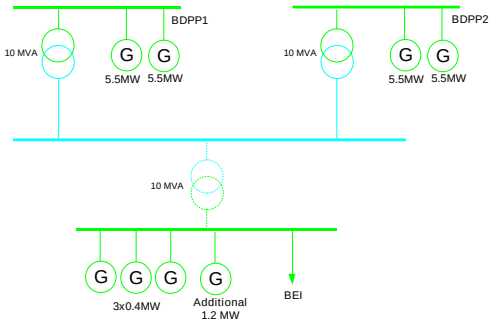
The northwestern part of Panay, which includes the Boracay Island, is served by Nabas S/S which normally draws power from the grid through the existing Panitan–Nabas 138 kV Transmission Line. The Nabas S/S is also linked to Nabas S/S and San Jose S/S by 69 kV transmission lines. However, during the outage of the 138 kV line, the 69 kV line will have limited transmission capacity to cater the entire load of the area, hence, will result in power curtailment.



In order to cater the entire power requirement of Nabas S/S even during N-1 condition, a new 138 kV circuit will be installed from Panitan S/S and Nabas S/S. The project will involve the second circuit stringing of the existing Panitan–Nabas 138 kV Line, which is already designed to support two circuits. It will also include associated substation expansion works.

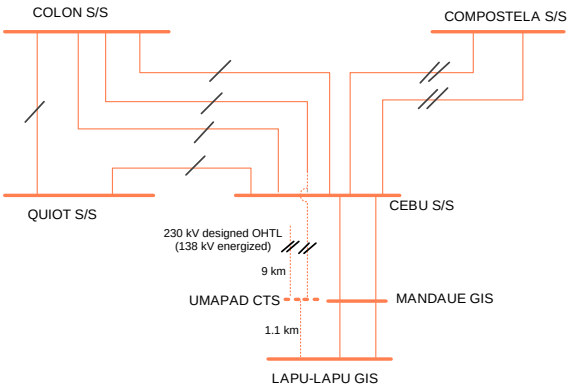
7.2.2.10 Tagbilaran 69 kV Substation Project

This project involves the installation of a 10 MVA transformer for Tagbilaran Substation that will allow continuous reliable supply of power for Bohol Electric Incorporated (BEI) and for the Loboc Hydroelectric Power Plant (LHEP). Presently, these customers are just relying on the 2x10 MVA transformers at Bohol Diesel Power Plant (BDPP) Switchyard, thus, any outage or maintenance works in the BDPP-owned transformers, the grid connection of BEI and LHEP is being disrupted. With the project, BEI and LHEP will have dedicated connection to Tagbilaran Substation.



7.2.2.11 Cebu–Lapulapu 230 kV Transmission Line Project

The existing transmission corridors serving the major load centers in Mandaue and Mactan in Cebu do not have N-1 contingency provision. During outage of one of the two 138 kV circuits of the Cebu–Mandaue–Lapulapu Transmission Corridor, the remaining circuit will be overloaded, therefore, to prevent damage to the equipment, power will be curtailed.



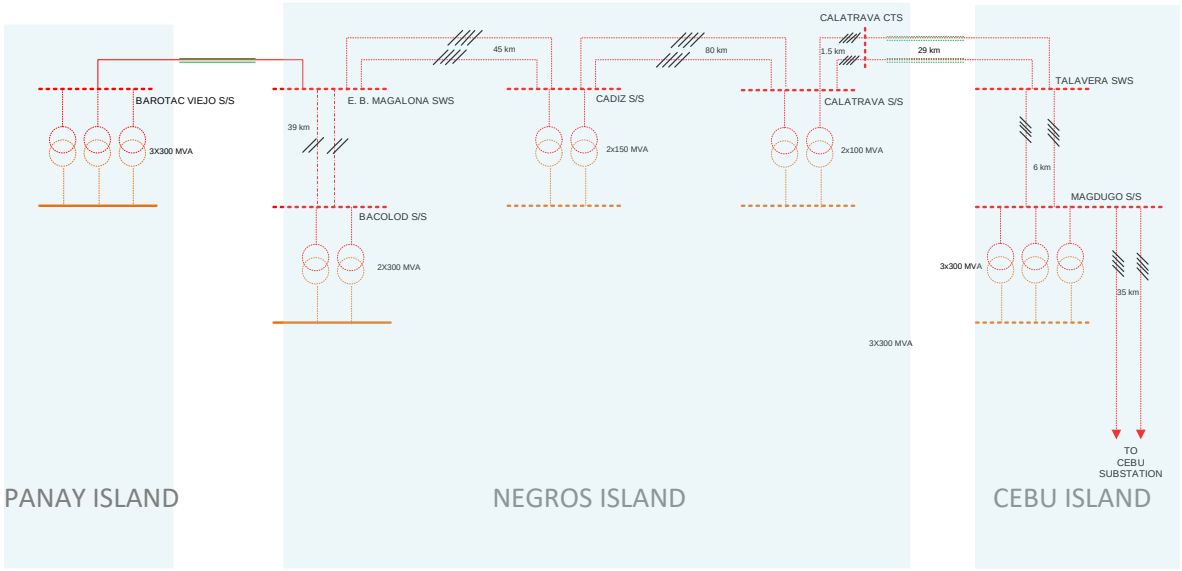
In order to maintain the continuous transmission of power towards the major loads centers in Mandaue and Mactan even during N-1 condition, a new transmission corridor, composed of overhead transmission line and submarine/underground cable system, is proposed between Cebu S/S and Lapulapu S/S.

The project will be designed consistent with the long-term transmission master plan of developing a 230 kV transmission backbone in the Visayas, therefore, portion of transmission corridor will be designed at 230 kV voltage level but will be initially energized at 138 kV.

7.2.2.12 Cebu–Negros–Panay 230 kV Backbone Project - Stage 3

The development of new power plants, including baseload and renewable, in Panay and Negros Islands will result in the increase in power exchange between the islands of Panay, Negros and Cebu. Currently, the existing Negros–Panay interconnection system has limited capacity to accommodate the transmission of excess power from Panay towards Negros. Similarly, the existing Cebu–Negros interconnection system has limited capacity to cater the excess power generation from Panay and Negros towards Cebu. Hence, there will be power curtailment.

In order to ensure the effective transmission of excess power generation from Panay and Negros towards Cebu, a high capacity transmission corridor is being proposed and this will serve as the stage 3 or the final stage for the Cebu–Negros–Panay 230 kV Backbone Project. The project involves the construction of 230 kV facilities that will extend from Barotac Viejo Substation in Panay to a new Magdugo Substation in Cebu. It will be primarily composed of overhead transmission lines, submarine cable interconnections and corresponding new substation facilities.



7.2.2.13 Visayas Voltage Improvement Project

Various areas in Samar and Leyte are experiencing low voltage occurrences due to long 69 kV transmission lines. Likewise, areas in Cebu and Bohol are also experiencing low voltage occurrences due to high concentration of load. These low voltages may result in power curtailment.

In order to address the low voltage problems in these areas, capacitor banks are proposed to be strategically installed at identified substations and load-ends.

7.2.3 Mindanao Grid

7.2.3.1 Sultan Kudarat (Nuling) Capacitor Project

The proposed 138 kV single circuit Tacurong-Sultan Kudarat Transmission Line Project will complete the 138 kV network in South Western Mindanao Area (SWMA). The envisioned General Santos-Tacurong-Sultan Kudarat-Kibawe link will provide strong transmission backbone that will ensure reliable power delivery. However, the implementation of the project was deferred due to security concerns in the areas that will be traversed by the proposed line.

As a remedial solution to improve the low voltage that will occur in the area during outage of the Kibawe-Sultan Kudarat 138 kV line, 2x7.5 MVAR, 69 kV capacitor banks will be installed at the Sultan Kudarat Substation. Maguindanao Electric Cooperative and Cotabato Light and Power Company Inc. are the beneficiaries of this project.

7.2.3.2 Agus 6 Switchyard Upgrading / Rehabilitation Project

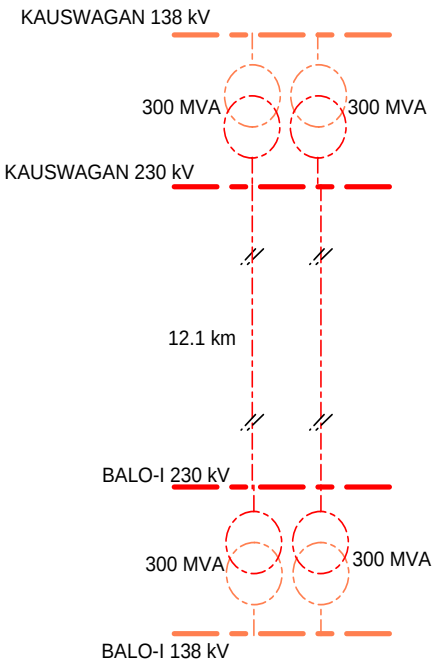
Considering the age and the deteriorating condition of various switchyards in Mindanao, most facilities and equipment are already due for rehabilitation and replacement. This project was tagged with the highest priority amongst other switchyards, and is intended to address the critical situation of the primary and secondary equipment in Agus 6 Switchyard. Additionally, in order to accommodate all the secondary devices previously housed in Agus 6‘s control room, construction of a new control house is needed.

7.2.3.3 Balo-i-Kauswagan 230 kV Transmission Line (Formerly Balo-i-Kauswagan-Aurora 230 kV Transmission Line Phase 1)

The existing transmission facility is insufficient to cater the entry of GNPower Kauswagan Ltd. Co.’s 600 MW coal power plant. Development of the transmission network is needed in the area to accommodate the new power plant and effectively distribute the generated power.

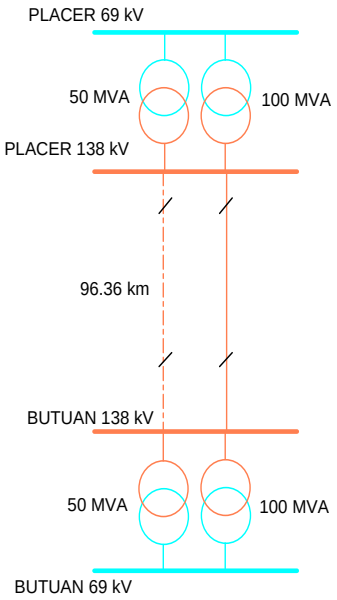
The project extends the 230 kV backbone to North Western Mindanao Area which will provide power transmission reliability in Zamboanga Peninsula.

The construction of the new Kauswagan Substation and expansion of the Balo-i 230 kV Substation will be linked by 12.1 kilometers, 230 kV, double circuit line using 2-410 mm^2 TACSR conductors.



7.2.3.4 Butuan-Placer 138 kV Transmission Line

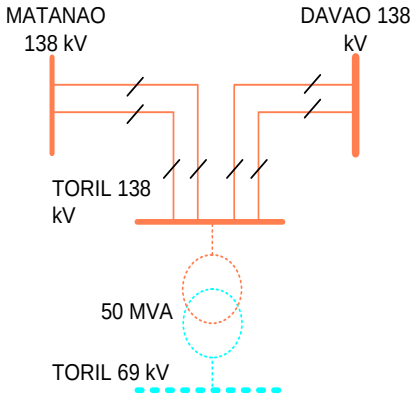
This project was part of the Reliability Compliance Project I - Mindanao. It involves the installation of the second circuit for the existing Butuan-Placer 138 kV transmission corridor by using 96.36 kilometers, single circuit, 795 MCM conductor and 4-138 kV power circuit breakers.



Currently, the Butuan and Placer Substations are only connected by a single circuit transmission line, where power delivery to northeastern Mindanao is in critical condition. An outage of this segment will result to significant load dropping in the area due to lack of alternate line. The Butuan-Placer 138 kV Transmission Line Project will provide the line reinforcement to achieve reliable and continuous power supply. This project will satisfy the compliance of the transmission line facility to the single-outage contingency criterion of the PGC. In addition, the project will also reduce transmission losses and will improve voltage level in the served area.

7.2.3.5 Toril 138 kV Substation (Phase 2)

The Toril 138 kV Project (Phase I) was implemented to accommodate the entry of the 300 MW Therma South Inc. (TSI) power plant. Phase 2 of this project will provide necessary facility to allow the connection of load customers - DLPC and DASURECO. This involves installation of a 50 MVA, 138/69 kV power transformer using 2-138 kV and 3-69 kV power circuit breakers. This also includes the required feeder and breaker failure protection systems as well as control, metering and communication systems.



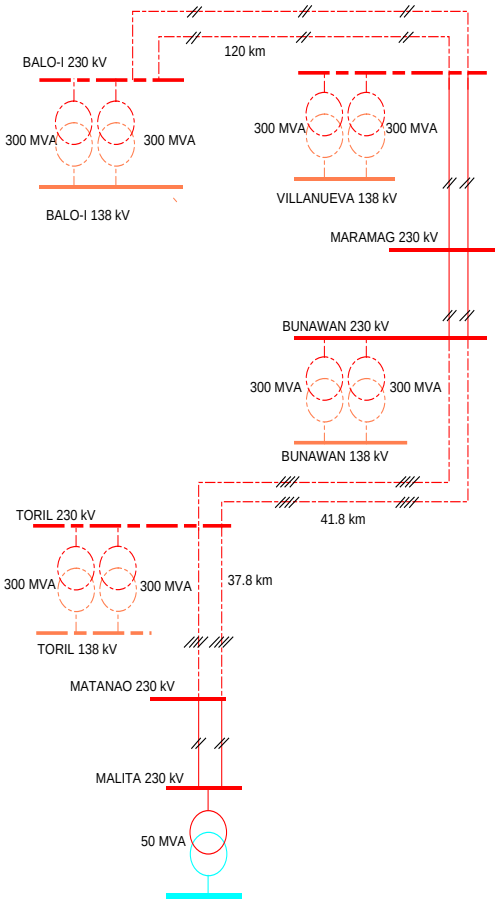
The Toril 138 kV Substation is located in Barangay Binugao, Toril District, Davao City which is between the substations of Matanao and Davao 138 kV.

7.2.3.6 Mindanao 230 kV Transmission Backbone

The project will upgrade the thermal capacity of the existing transmission backbone. It will also extend the transmission line towards Matanao Substation in Davao del Sur. The full capacity dispatch from SMCCI, TSI and other power plants will be made possible by these additional grid facilities.

It entails two major activities: One is the construction of the Matanao-Toril-Bunawan 230 kV Line. Another is the energization of the existing Balo-i-Villanueva-Maramag-Bunawan Line to 230 kV voltage level.

The transmission line portion of the project will utilize the existing 230 kV PCB in Matanao Substation and the installation of transformers in Toril and Bunawan Substations. However, the energization of the whole stretch of the backbone to 230 kV level will require the installation of additional transformers in Malita, Toril, Bunawan, and Villanueva Substations.



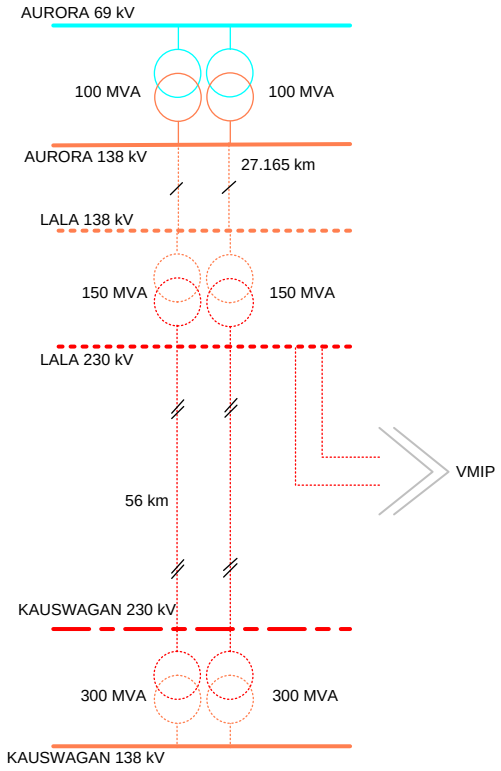
7.2.3.7 Agus 2 Switchyard Upgrading Project

The development of the Agus 2 Switchyard will improve operational capability to efficiently respond on any system disturbance. The project will enhance operation stability which ensures the continuity of service of the power plant's transmission corridor. It will provide clear demarcation of asset boundaries between NGCP and the power plant. The Agus 2 Switchyard is an old transmission facility experiencing difficulties in operation and maintenance. The obsolete equipment in the switchyard struggles in maintenance due to scarcity of spare parts in the market.

The project implementation involves the replacement of obsolete power circuit breakers, capacitive potential transformers, telecom equipment and other secondary devices. The switchyard facility upgrading includes expansion and renovation of the control building with the installation of new monitoring, switching, metering, annunciation and control equipment to have full control of the switchyard.

7.2.3.8 Kauswagan-Lala 230 kV Transmission Line (Formerly Balo-i -Kauswagan-Aurora 230 kV Transmission Line Phase 2)

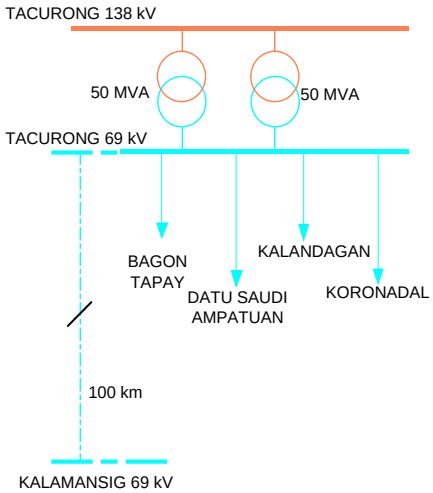
The project will be implemented by connecting Kauswagan Substation and the proposed Lala Substation utilizing a double-circuit tower in a bundle-of-two power conductor configuration in 230 kV voltage level. The project will also include the installation of two power transformers in Lala Substation which will be linked to the existing Aurora Substation thru a 138 kV transmission line. To complete the project, the installation of 6-230 kV and 9-138 kV power circuit breakers will be needed in the involved substations.



Majority of the power consumption in Zamboanga Peninsula is supplied through Balo-i-Aurora and Balo-i-Agus 5-Aurora 138 kV lines. These transmission lines are critically loaded during N-1 contingency condition. The project will provide reliable transmission network for Zamboanga Peninsula to achieve continuous normal grid operation in the area. It is the extension of the planned Mindanao 230 kV transmission backbone facility which will complement the Mindanao – Visayas Interconnection Project.

7.2.3.9 Tacurong-Kalamansig 69kV Transmission Line

This project will allow the towns of Lebak, Kalamansig, Bagumbayan and Senator Ninoy Aquino to enjoy the cheaper electricity from the grid. These areas located in the Province of Sultan Kudarat in SOCCSKSARGEN Region are considered off-grid loads being served by limited and costly power supply.



The required facilities for the project is the 69 kV single circuit steel tower, expansion of the Tacurong Substation and the construction of the switching station in Kalamansig. Once the project is completed, the power consumers will end their dependence from SPUG and will start to benefit reliable power supply.

7.2.3.10 Mindanao Substation Rehabilitation Project

The efficiency and accuracy of power circuit breakers (PCBs) greatly contribute to the performance quality of the transmission system. On the other hand, unreliability of these equipment impose tremendous risk and danger not only on the system operation but also on personnel safety.

Mindanao Substation Rehabilitation Project (MSRP) will replace power circuit breakers (PCBs) in various substations in Mindanao due to defectiveness, old age, obsolescence and low fault level capacity. Implementation of the project will increase the reliability of the network, reduce/prevent unserved energy, avoid costly maintenance expenses, improve personnel safety and decrease incidents of breaker failures. MSRP involves the replacement of fifty-one (51)-138 kV PCBs and twenty-four (24)-69 kV PCBs in twelve NGCP substations in Mindanao. Also included in the project is the additional six (6)-138 kV PCBs and two (2)-69 kV definite purpose type PCBs in Bunawan Substation.

7.2.3.11 Mindanao Substation Upgrading Project

The existing transformer capacities in various substations in Mindanao will be insufficient to accommodate the projected load growth while some substations do not comply yet with the single-outage (N-1) contingency requirements of the Philippine Grid Code. Additionally, voltage violation and breaker failures frequently occur in some areas in the Mindanao Grid.

Mindanao Substation Upgrading Project (MSUP) will provide additional transformers, install capacitor banks, and replace defective, old, obsolete and underrated power circuit breakers (PCBs) to ensure adequate, reliable, and high-quality power transmission system in Mindanao. MSUP involves the installation of a total of 875 MVA power transformers, 52.5 MVAR capacitor banks, nineteen (19)-138 kV PCBs and twenty one (21)-69 kV PCBs. Also included in this project is the replacement of eleven (11)-138 kV and twenty seven (27)-69 kV PCBs in various substations in the grid.

The DOE list shows that there are many committed and indicative power plant projects in Luzon Grid, which can well support the increasing demand for the next 10 years. The incoming large capacity coal-fired power plants as well as natural gas-fired power plants are mainly concentrated in four provinces namely: Batangas, Quezon, Bataan and Zambales, which would result in huge excess power in these areas. Since the remaining transmission capacity of the existing facilities is also very limited for the grid integration of new bulk generation additions, the development of the Luzon Grid is geared towards the implementation of new 500 kV transmission facilities that would allow power export from bulk generation sites going to the load center.

With the increasing delivery of bulk power to the 500 kV system, the two existing 500 kV substations located at San Jose del Monte City in Bulacan and Dasmariñas in Cavite that serve as the only Extra High Voltage (EHV) drawdown facilities supporting the Metro Manila loads, will become critical nodes in the grid. The capacity expansion and space limitations in these substations could result in grid congestion unless new 500 kV drawdown substations will be developed. In the TDP, new 500 kV substations are being proposed with Taguig as the priority site. Being close to the load center, Taguig is a strategic location. But it has major challenges in the construction of its associated 500 kV transmission line that traverses portion of Laguna Lake.

Along with the support given to grid integration of new power plants, NGCP is paying special attention in strengthening the transmission facilities in Metro Manila, which is the country's load center. The existing 230 kV transmission line traversing from Quezon City to Muntinlupa City is a very critical line given its heavy loading condition and single-circuit configuration. Such conditions also pose great risk both on power quality and supply reliability in the area. In addition, the existing 230/115 kV substations in Metro Manila are heavily loaded already and mostly with capacity expansion limitations, thus, the development of new substations is also very important in supporting load growth in the long term.

Being the center of nation's economy, the grid reinforcement projects that ensure the long-term adequacy, reliability and security of power supply in Metro Manila can be regarded as "projects of national significance". As can already be expected in a highly urbanized area, securing right-of-way for new transmission facilities is increasingly becoming difficult. It is therefore important to immediately start its implementation to realize these important transmission development plans and it should be coupled with support from the local and national government. Aside from Taguig EHV, the proposed new facilities include Antipolo, Pasay and Navotas Substations which would also involve the implementation of associated 230 kV transmission lines.

After Metro Manila, together with the industrialized areas of Cavite and Laguna, the province of Pampanga is expected as the next major load growth area. In the long-term, new 230 kV backbone and new 230/69 kV substations would be needed for Porac and Clark in order to support the load increase in the coming years. Other provinces, on the other hand, will be supported by installation of additional transformers at existing substations or development of new substations and reinforcements on the 69 kV transmission lines.

To help improve system reliability and to maintain the power quality within the grid code-prescribed standards, included in the development plans are the implementation of transmission looping configurations even for the 500 kV system, upgrading of old transmission

lines and substations as well as installation of reactive power compensation equipment at various substations.

8.1 Proposed Transmission Projects up to 2025

The major transmission projects covering the year 2018-2025 aim to support the adequacy and reliability of power supply to Metro Manila, which is the country's center of commerce and trade. These can be attained by the seamless delivery of existing and new generation capacities from the identified generation hubs going to Metro Manila through adequate and reliable transmission facilities.

The identified generation hubs in Luzon Grid are the Provinces of Batangas, Quezon, Bataan Peninsula and Zambales. In Batangas, the development of the Tuy 500 kV Substation (Stage 1) and Pinamukan 500 kV Substation will accommodate around 3,000 MW from coal and LNG generation capacities. Meanwhile the Pagbilao–Tayabas 500 kV Transmission Line Project will accommodate an additional 1,200 MW from coal generation capacity in Quezon Province.

To meet the forecasted load growth in Metro Manila, three (3) major 500/230 kV drawdown substations will be developed around Metro Manila. These will be located in Taguig City, Marilao in Bulacan, and Silang in Cavite. These will be also complemented by the development of additional 230/115 kV drawdown substations in Antipolo, Navotas and in Pasay.

The reliability of power transmission delivery to Metro Manila will be addressed through the development of new transmission corridors in Metro Manila such as the Silang–Taguig 500 kV Transmission Line, Taguig–Taytay 230 kV Transmission Line, Navotas–Pasay 230 kV Transmission Line and Navotas–Doña Imelda 230 kV Transmission Line.

Outside Metro Manila, several drawdown substations will also be developed to address the forecasted load growth. These are the Pinili 230 kV Substation in Ilocos Norte, San Simon and Porac 230 kV Substations in Pampanga, Plaridel 230 kV Substation in Bulacan, Liberty 230 kV Substation in Nueva Ecija, Castillejos 230 kV Substation in Zambales, Calamba 230 kV Substation in Laguna, Tanauan 230 kV Substation in Batangas and Abuyog 230 kV Substation in Sorsogon.

For renewable energy developments particularly in northern part of Luzon, the implementation of the Northern Luzon 230 kV Loop will provide the needed transmission capacity augmentation. In the long-term, however, considering the full wind power generation potential in North Luzon as well as the hydro power generation potential in Cagayan Valley, Abra and Benguet, a new backbone called Santiago–Nagsaag 500 kV Transmission Line from San Manuel, Pangasinan going up north would also be needed. Solar plants and other new small-scale Variable Renewable Energy-based plants (VRE-based plants), on the other hand, are well-dispersed in the grid and generally will not require major grid reinforcements. In addition, the development of Bolo–Balaoan–Laoag 500 kV Transmission Line will address the generation entry of the proposed coal, hydro, and wind generating plants in the northeastern part of the grid.

Shown in Table 8.1 is the list of transmission projects proposed in the period 2016-2025 in addition to the ERC approved projects for Luzon Grid as discussed in Chapter 7.

Table 8.1: Proposed Transmission Projects for Luzon

Project Name/Driver(s)	Province(s) and Components	ETC
Generation Entry		
Pagbilao–Tayabas 500 kV Transmission Line	Quezon	Dec 2023
	Substation Components: ▪ Pagbilao 500 kV Substation, 4-500 kV PCBs and associated equipment 4-230 kV PCBs and associated equipment. Transmission Components: ▪ Pagbilao–Tayabas 500 kV Transmission Line, ST-DC, 4-795 MCM ACSR/AS, 21 km; ▪ Naga Line Extension 230 kV Transmission Line, ST-DC, 4-795 MCM ACSR/AS, 1.5 km. Bulk Cost Estimate: 3,934 Million Pesos	
Santiago–Nagsaag 500 kV Transmission Line	Isabela, Pangasinan	Jan 2024
	Substation Components: ▪ New Santiago 500 kV Substation, 2x750 MVA 500/230-13.8 kV Power Transformers and accessories, 6-500 kV PCBs and 6-230 kV PCBs and associated equipment, 2x90 MVAR, 500 kV Shunt Reactor and accessories, 2x60 MVAR, 500 kV Line Reactor and accessories; ▪ Santiago 230 kV Substation, 4-230 kV PCBs and associated equipment; ▪ Nagsaag 500 kV Substation, 4-500 kV PCBs and accessories. Transmission Components: ▪ Santiago–Nagsaag 500 kV Transmission Line, ST-DC, 4-795 MCM ACSR/AS, 140.0 km; ▪ Old and New Santiago Substation 230 kV tie-line, ST-DC, 4-795 MCM ACSR/AS, 1.0 km. Bulk Cost Estimate: 10,645 Million Pesos	
Northern Luzon 230 kV Loop	Ilocos Norte, Apayao, Cagayan	Jan 2024
	Substation Components: ▪ Laoag 230 kV Substation (Expansion), 4-230 kV PCBs and associated equipment; ▪ Bangui 230 kV Substation (New), 2x300 MVA, 230/115-13.8 kV Power Transformer and accessories, 10-230 kV PCBs, 11-115 kV PCBs and associated equipment; ▪ Sanchez Mira 230 kV Substation (New), 2x300 MVA, 230/69-13.8 kV Power Transformers and accessories, 10-230 kV PCBs and associated equipment, 4-69 kV PCB's and associated equipment; ▪ Pudtol 230 kV Substation (New), 10-230 kV PCBs and associated equipment; ▪ Lal-lo (Magapit) 230 kV Substation (Expansion), 4-230 kV PCBs and associated equipment. Transmission Components: ▪ Laoag–Bangui 230 kV Transmission Line, ST-DC, 2-795 MCM, ACSR, 50 km; ▪ Bangui–Sanchez Mira 230 kV Transmission Line, ST-DC, 2-795 MCM, ACSR, 70 km; ▪ Sanchez Mira–Pudtol 230 kV Transmission Line, ST-DC, 2-795 MCM, ACSR, 57 km; ▪ Pudtol–Lal-lo (Magapit) 230 kV Transmission Line, ST-DC, 2-795 MCM, ACSR, 38 km. Bulk Cost Estimate: 14,450 Million Pesos	
Pinamukan 500 kV Substation	Batangas	Dec 2024
	Substation Components: ▪ Pinamukan 500 kV Substation, 2x1,000 MVA, 500/230 kV Power Transformers and accessories, 12-500 kV PCBs and associated equipment; ▪ Pinamukan 230 kV Substation, 2x100 MVA 230/69 kV Power Transformers and accessories, 6-230 kV PCBs and associated equipment, 6-69 kV PCBs and associated equipment. Transmission Components: ▪ Pinamukan 500 kV bus-in Transmission Line, ST-DC, 4-795 MCM ACSR, 1 km;	

Project Name/Driver(s)	Province(s) and Components	ETC
	▪ Pinamukan–Taysan 69 kV Transmission Line, SP-DC, 1-795 MCM ACSR, 10 km. Bulk Cost Estimate: 4,233 Million Pesos	
Bolo–Balaoan 500 kV Transmission Line	La Union, Pangansinan	Jul 2025
	Substation Components: ▪ Balaoan 500 kV Substation, 2x750 MVA, 500/230-13.8 kV Power Transformers and accessories, 6-500 kV PCBs and associated equipment, 10-230 kV PCBs and associated equipment 2x90 MVAR, 500 kV Shunt Reactor and accessories, 2x60 MVAR, 500 kV Line Reactor and accessories. ▪ Bolo 500 kV Substation, 4-500 kV PCBs and associated equipment. Transmission Components: ▪ Bolo–Balaoan 500 kV Transmission Line, ST-DC, 4-410 mm^2 TACSR/AS, 130 km; ▪ San Esteban/Bakun and Bacnotan/Bauang 230 kV Line Extension, ST-DC, 1-795 MCM ACSR/AS, 1 km. Bulk Cost Estimate: 24,620 Million Pesos	
Balaoan–Laoag 500 kV Transmission Line	La Union, Ilocos Norte	Jul 2025
	Substation Components: ▪ Laoag 500 kV Substation (new), 2x750 MVA, 500/230-13.8 kV Power Transformers and accessories, 6-500 kV PCBs and associated equipment, 6-230 kV PCBs and associated equipment, 2x90 MVAR, 500 kV Shunt Reactor and accessories, 2x60 MVAR, 500 kV Line Reactor and accessories; ▪ Laoag 230 kV Substation, 6-230 kV PCBs and associated equipment. Transmission Components: ▪ Balaoan–Laoag 500 kV Transmission Line, ST-DC, 4-410 mm^2 TACSR/AS, 175 km; ▪ Laoag 230 kV Tie Line, ST-DC, 4-795 MCM ACSR/AS, 1 km. Bulk Cost Estimate: 31,021 Million Pesos	
Bolo 5th Bank	Pangasinan	Dec 2025
	Substation Components: ▪ Bolo 500 kV Substation (Expansion), 1x600 MVA, 500/230 kV Power Transformer and accessories, 3-500 kV PCBs and associated equipment. Bulk Cost Estimate: 2,521 Million Pesos	
Tagkawayan 500 kV Substation	Tagkawayan, Quezon Province	Dec 2025
	Substation Components: ▪ Tagkawayan 500 kV Substation, 2x1,000 MVA, 500/230-13.8 kV Power Transformer and Accessories, 10-500 kV PCBs, 6-230 kV PCBs and associated equipment. Transmission Components: ▪ Tagkawayan Bus-in to Tayabas–Naga 500 kV Line, ST-DC, 4-795 MCM ACSR/AS, 1 km. Bulk Cost Estimate: 4,764 Million Pesos	
Load Growth		
San Jose 500 kV Substation Expansion	Bulacan	March 2019
	Substation Components: ▪ San Jose 500 kV Substation (Expansion), 1x750 MVA, 500/230 kV Power Transformer and accessories. Bulk Cost Estimates: 735 Million Pesos	
Calamba 230 kV Substation	Laguna	Jul 2019
	Substation Components: ▪ Calamba 230 kV Substation, 2x300 MVA, 230/115-13.8 kV Power Transformers and accessories to be implemented by MERALCO, 10-230 kV PCBs and associated equipment. Transmission Components: ▪ Bus-in Lines, 230 kV Transmission Line, SP-DC, 2-610 mm^2 TACSR/AS, 1.5km. Bulk Cost Estimate: 1,069 Million Pesos	

Project Name/Driver(s)	Province(s) and Components	ETC
Taguig 500 kV Substation	Rizal, Metro Manila	Dec 2020
	Substation Components: ▪ Taguig 500 kV Substation, 2x1,000 MVA, 500/230-13.8 kV Power Transformers and accessories, 1x90 MVAR, 500 kV Shunt Reactor and accessories, 3x100 MVAR, 230 kV Capacitor Banks and accessories, 8-500 kV PCBs (GIS) and associated equipment, 10-230 kV PCBs (GIS) and associated equipment. Transmission Components: ▪ Taguig Cut-in to San Jose–Tayabas 500 kV Transmission Line, 500 kV, ST-DC, 4-795 MCM ACSR/AS, 37 km; ▪ Taguig bus-in to Muntinlupa–Paco 230 kV Transmission Line, 230 kV, SP-DC1, 2-410 mm^2 TACSR/AS, 2x2.4 km. Bulk Cost Estimate: 9,529 Million Pesos	
Luzon Voltage Improvement Project V	North Luzon	Apr 2021
	Substation Components: ▪ Solana Load-end Substation, 3x7.5 MVAR, 69 kV Capacitor Banks and accessories; ▪ Paniqui Load-end Substation, 3x5 MVAR, 69 kV Capacitor Banks and accessories; ▪ Sta. Ignacia Load-end Substation, 1x2.5 MVAR, 69 kV Capacitor Banks and accessories; ▪ Bongabon Load-end Substation, 2x5 MVAR, 69 kV Capacitor Banks and accessories; ▪ Floridablanca Load-end Substation, 1x5 MVAR, 69 kV Capacitor Banks and accessories; ▪ Pio Load-end Substation, 1x5 MVAR, 69 kV Capacitor Banks and accessories; ▪ Manibaug Load-end Substation, 1x5 MVAR, 69 kV Capacitor Banks and accessories; ▪ Guagua Load-end Substation, 1x7.5 MVAR, 69 kV Capacitor Banks and accessories; ▪ Candelaria Load-end Substation, 2x2.5 MVAR, 69 kV Capacitor Banks and accessories; ▪ Bani Load-end Substation, 4x5 MVAR, 69 kV Capacitor Banks and accessories; ▪ San Fabian Load-end Substation, 3x5 MVAR, 69 kV Capacitor Banks and accessories; ▪ Rosario Load-end Substation, 3x7.5 MVAR, 69 kV Capacitor Banks and accessories; ▪ Aglipay Load-end Substation, 3x5 MVAR, 69 kV Capacitor Banks and accessories; ▪ San Jacinto Load-end Substation, 2x5 MVAR, 69 kV Capacitor Banks and accessories; ▪ Cauayan Load-end Substation, 6x3.5 MVAR, 69 kV Capacitor Banks and accessories; ▪ Urdaneta Load-end Substation, 3x5 MVAR, 69 kV Capacitor Banks and accessories; ▪ Sison Load-end Substation, 2x5 MVAR, 69 kV Capacitor Banks and accessories; ▪ Malasiqui Load-end Substation, 3x5 MVAR, 69 kV Capacitor Banks and accessories; ▪ Alaminos Load-end Substation, 3x5 MVAR, 69 kV Capacitor Banks and accessories; ▪ Binmaley Load-end Substation, 3x2.5 MVAR, 69 kV Capacitor Banks and accessories; ▪ San Miguel Load-end Substation, 2x5 MVAR, 69 kV Capacitor Banks and accessories; ▪ San Rafael Load-end Substation, 3x2.5 MVAR, 69 kV Capacitor Banks and accessories; ▪ Ilagan Load-end Substation, 3x2.5 MVAR, 69 kV Capacitor Banks and accessories;	

Project Name/Driver(s)	Province(s) and Components	ETC
	▪ Naguilian Load-end Substation, 1x2.5 MVAR, 69 kV Capacitor Banks and accessories; ▪ Pot-tot Load-end Substation, 3x2.5 MVAR, 69 kV Capacitor Banks and accessories; ▪ Solano Load-end Substation, 3x5 MVAR, 69 kV Capacitor Banks and accessories; ▪ Bambang Load-end Substation, 1x2.5 MVAR, 69 kV Capacitor Banks and accessories; ▪ Philex Load-end Substation, 3x5 MVAR, 69 kV Capacitor Banks and accessories; ▪ Lepanto Load-end Substation, 1x2.5 MVAR, 69 kV Capacitor Banks and accessories; ▪ PEZA Load-end Substation, 3x2.5 MVAR, 69 kV Capacitor Banks and accessories; ▪ Itogon Load-end Substation, 3x2.5 MVAR, 69 kV Capacitor Banks and accessories; ▪ Castillejos Load-end Substation, 3x2.5 MVAR, 69 kV Capacitor Banks and accessories; ▪ Subic Load-end Substation, 3x2.5 MVAR, 69 kV Capacitor Banks and accessories; ▪ OEDC Load-end Substation, 3x2.5 MVAR, 69 kV Capacitor Banks and accessories;	
Concepcion–Sta. Ignacia 69 kV Transmission Line	Tarlac	Dec 2021
	Transmission Components: ▪ Concepcion–Sta. Ignacia 69 kV Transmission Line, 69 kV, SP-DC1, 1-795 MCM ACSR, 27 km. Bulk Cost Estimate: 672 Million Pesos	
Nagsaag–Tumana 69 kV Transmission Line	Pangasinan	Dec 2021
	Transmission Components: ▪ Nagsaag–Tumana 69 kV Transmission Line, 69 kV, ST/SP-DC1, 1-795 MCM ACSR, 23 km. Bulk Cost Estimate: 711 Million Pesos	
Tuguegarao–Enrile 69 kV Line	Tuguegarao	Dec 2021
	Substation Components: ▪ Tuguegarao 69 kV Substation, 1-69 kV PCBs and associated equipment. Transmission Components: ▪ Tuguegarao–Enrile 69 kV Transmission Line, 1-795 MCM ACSR, SP-DC, 30 km. Bulk Cost Estimate: 720 Million Pesos	
Pasay 230 kV Substation	Metro Manila	Jan 2022
	Substation Components: ▪ Pasay 230 kV Substation, 11-230 kV PCBs (GIS) and associated equipment. Transmission Components: ▪ Las Piñas–Pasay 230 kV Transmission Line, 230 kV Double Circuit Underground Cable, 2-2,500 mm^2 XLPE (1-core), 9.0 km. Bulk Cost Estimate: 13,018 Million Pesos	
Tanauan 230 kV Substation	Batangas	Nov 2022
	Substation Components: ▪ Tanauan 230 kV Substation, 2x100 MVA, 230/69 kV Power Transformers and accessories, 8-230 kV PCBs and associated equipment; 5-69 PCBs and associated equipment; ▪ Calamba 230 kV Substation, 2-230 kV PCBs and associated equipment; ▪ FITUI Malvar Load-end 69 kV Substation, 2x5 MVAR, 69 kV Capacitor Banks and accessories, 3-69 kV PCBs and associated equipment.	

Project Name/Driver(s)	Province(s) and Components	ETC
	Transmission Components: ▪ Calamba–Tanauan 230 kV Transmission Line, ST/SP-DC, 1-795 MCM ACSR/AS, 12 km. Bulk Cost Estimate: 2,493 Million Pesos	
San Simon 230 kV Substation	Pampanga	May 2022
	Substation Components: ▪ San Simon 230 kV Substation, 2x300 MVA 230/69 kV Power Transformer and accessories, 3x100 MVAR 230 kV capacitor, 8-230 kV PCBs, 4-69 kV PCBs and associated equipment; ▪ Mexico 230 kV Substation, 6-69 kV PCBs and associated equipment. Transmission Components: ▪ 230 kV Transmission Line Extension, 2-795 MCM ACSR/AS, SP-DC, 1.5 km. from the cut-in point along Hermosa–Duhat Line; ▪ Mexico–STR 120D (Calumpit Line Segment) 69 kV Line, SP-SC, 1-410 mm^2 TACSR/AS, 12.3 km; ▪ STR 120D–PELCO 3 (Apalit Tap) 69 kV Line, SP-SC, 1-410 mm^2 TACSR/AS, 2.52 km; ▪ San Simon–Real Steel 69 kV Line, SP-SC, 1-410 mm^2 TACSR/AS, 3.27 km; ▪ San Simon–Melters 69 kV Line, SP-SC, 1-410 mm^2 TACSR/AS, 6.10 km. Bulk Cost Estimate: 2,318 Million Pesos	
Daraga–Washington 69 kV Line	Albay	Dec 2022
	Substation Components: ▪ Daraga 69 kV Substation, 1-69 kV PCBs and associated equipment. Transmission Components: ▪ Daraga–Bitano 69 kV Transmission Line, SP-DC, 1-795 MCM ACSR, 6 km; ▪ Daraga–Washington 69 kV Transmission Line Upgrading, SP-DC, 1-795 MCM ACSR, 4 km. Bulk Estimate: 238 Million Pesos	
Batangas–Taysan 69 kV Transmission Line Extension	Batangas	Dec 2022
	Transmission Components: ▪ Batangas–Taysan 69 kV Transmission Line extension, 69 kV, SP-DC, 1-795 MCM ACSR, 6 km. Bulk Cost Estimate: 144 Million Pesos	
Pinili 230 kV Substation	Ilocos Norte	Jan 2023
	Substation Components: ▪ Pinili 230 kV Substation (New), 1x100 MVA 230/69-13.8 kV Power Transformer and accessories, 10-230 kV PCBs and associated equipment, 5-69 kV PCBs and associated equipment. Transmission Components: ▪ Pinili Bus-in to San Esteban–Laoag 230 kV Transmission Line, ST-DC, 1-795 MCM ACSR/AS, 2x1.0 km; ▪ Pinili–Currimao 69 kV Transmission Line, ST-DC, 1-795 MCM ACSR/AS, 7.0 km; Bulk Cost Estimate: 1,632 Million Pesos	
Marilao 500 kV Substation	Bulacan	Jun 2023
	Substation Components: ▪ Marilao 500 kV Substation, 2x1,000 MVA, 500/230-13.8 kV Power Transformers and accessories, 16-500 kV PCBs and associated equipment, 12-230 kV PCBs and associated equipment, 2x90 MVAR, 500 kV Line Reactor and accessories, 2x100 MVAR Shunt Capacitor and accessories. Transmission Components: ▪ Nagsaag–San Jose 500 kV Line Extension to Marilao 500 kV Substation, ST-DC, 4-795 MCM ACSR/AS, 8.7 km; ▪ Marilao Bus-in to Hermosa–San Jose 500 kV Line, ST-DC, 4-410mm^2 TACSR/AS, 1.5 km; ▪ Marilao–Duhat 230 kV Transmission Line, SP-DC, 2-795 MCM ACSR/AS, 3.2 km;	

Project Name/Driver(s)	Province(s) and Components	ETC
	▪ Navotas Line Extension to Marilao 230 kV Transmission Line, SP-DC, 4-795 MCM ACSR/AS, 3.6 km. Bulk Cost Estimate: 7,393 Million Pesos	
Plaridel 230 kV Substation	Bulacan	Jul 2023
	<u>Substation Components:</u> ▪ Plaridel 230 kV Substation, 10-230 kV PCBs and associated equipment. <u>Transmission Components:</u> ▪ Plaridel 230 kV bus-in Transmission Line, ST-DC, 2-795 MCM ACSR, 1 km. Bulk Cost Estimate: 1,353 Million Pesos	
Capas 230 kV Substation	Tarlac	Sep 2023
	<u>Substation Components:</u> ▪ Capas 230 kV Substation, 2x300 MVA 230/69-13.8 kV Power Transformers and accessories, 3x100 MVAR 230 kV Shunt Capacitor and accessories; 7-230 kV PCBs and associated equipment, 6-69 kV PCBs and associated equipment; ▪ Concepcion 230 kV Substation (Expansion), 4-230 kV PCBs and associated equipment. <u>Transmission Components:</u> ▪ Concepcion–Capas 230 kV Transmission Line, ST-DC, 4-795 MCM ACSR, 15 km. Bulk Cost Estimate: 1,573 Million Pesos	
Porac 230 kV Substation	Pampanga	Oct 2023
	<u>Substation Components:</u> ▪ Porac 230 kV Substation, 2x300 MVA 230/69 kV Power Transformers and accessories, 3x100 MVAR, 230 kV Shunt Capacitor and accessories, 7-230 kV PCBs and associated equipment, 6-69 kV PCBs and associated equipment; ▪ Hermosa 230 kV Substation (Expansion), 4-230 kV PCBs and associated equipment; ▪ Clark 230 kV Substation (Expansion), 4-230 kV PCBs and associated equipment; ▪ Capas 230 kV Substation (Expansion), 4-230 kV PCBs and associated equipment. <u>Transmission Components:</u> ▪ Hermosa–Porac–Capas 230 kV Transmission Line, ST-DC, 4-795 MCM ACSR, 64 km. ▪ Clark 230 kV Transmission Line Extension, ST-DC, 4-795 MCM ACSR, 5 km. Bulk Cost Estimate: 3,823 Million Pesos	
Abuyog 230 kV Substation	Sorsogon	Nov 2023
	<u>Substation Components:</u> ▪ Abuyog 230 kV Substation, 1x50 MVA 230/69-13.8 kV Power Transformer and accessories, 2x25 MVAR, 230 kV Capacitor Banks and accessories, 2x25 MVAR, 230 kV Shunt Reactor and accessories, 6-230 kV PCBs and associated equipment, 5-69 kV PCBs and associated equipment. ▪ Bacman 230 kV Substation, 6-230 kV PCBs and associated equipment. <u>Transmission Components:</u> ▪ Bacman-Abuyog 230 kV Transmission Line, 1-795 MCM ACSR/AS, ST-DC, 25 km. Bulk Cost Estimate: 3,541 Million Pesos	
Liberty 230 kV Substation	Nueva Ecija	Nov 2023
	<u>Substation Components:</u> ▪ Liberty 230 kV Substation, 1x100 MVA 230/69 kV Power Transformer and accessories, Control Room, 6-230 kV PCBs and associated equipment, 6-69 kV PCBs and associated equipment.	

Project Name/Driver(s)	Province(s) and Components	ETC
	Transmission Components: ▪ Liberty Cut-in to Pantabangan–Nagsaag 230 kV Transmission Line, ST-DC, 1-795 MCM ACSR/AS, 2 km; ▪ Pantabangan Load End–Liberty Substation 69 kV Transmission Line, SP-DC, 1-410 mm^2 TACSR/AS, 2 km; ▪ Liberty–SAJELCO 69 kV Transmission Line, SP-SC, 1-410 mm^2 TACSR/AS, 12 km. Bulk Cost Estimate: 2,822 Million Pesos	
Silang 500 kV Substation	Cavite	Nov 2023
	Substation Components: ▪ Silang 500 kV Substation, 2x1,000 MVA, 500/230 kV Power Transformers and accessories, 10-500 kV PCBs and associated equipment, 14-230 kV PCBs and associated equipment. Transmission Components: ▪ Silang 500 kV Bus-in Transmission Line, 500 kV, ST-DC, 4-795 MCM ACSR, 1 km; ▪ Tuy 500 kV Line diversion (initially energized at 230 kV), 500 kV Transmission Line, ST-DC, 4-410 mm^2 TACSR/AS, 11 km; ▪ Las-Piñas 230 kV Transmission Line diversion, ST-DC, 4-795 MCM ACSR, 10 km. Bulk Cost Estimate: 8,256 Million Pesos	
Castillejos 230 kV Substation	Zambales	Aug 2024
	Substation Components: ▪ Castillejos 230 kV Substation, 12-230 kV PCBs and associated equipment, 9-69 kV PCBs and associated equipment. Transmission Components: Castillejos 69 kV Line, 1-795 MCM ACSR, SP/ST-DC, 1km. Bulk Cost Estimate: 4,253 Million Pesos	
Kawit 230 kV Substation		Nov 2024
	Substation Components: ▪ Kawit 230 kV Substation, 10-230 kV PCBs and associated equipment; ▪ Las Piñas 230 kV Substation (Expansion), 4-230 kV PCBs GIS and associated equipment; ▪ Silang 230 kV Substation, 4-230 kV PCBs GIS and associated equipment. Transmission Components: Silang–Kawit–Las Piñas 230 kV Transmission Line, 4-795 MCM ACSR, SP-DC, 38 km; Kawit–Rosario 115 kV Transmission Line, 2-795 MCM ACSR, SP/ST-DC, 9 km; Bulk Cost Estimate: 3,244 Million Pesos	
Eguia 230 kV Substation	Zambales	Dec 2025
	Substation Components: ▪ Eguia 230 kV Substation, 1x100 MVA, 230/69-13.8 kV Power Transformer and accessories, 9-230 kV PCBs and 3-69 kV PCBs and associated equipment. Transmission Components: ▪ Eguia Bus-in to Masinloc–Kadampat 230 kV Transmission Line, ST-DC, 4-795 MCM ACSR/AS, 2 km; Bulk Cost Estimate: 1,465 Million Pesos	
Marilao 500 kV Substation Expansion	Bulacan	Dec 2025
	Substation Components: ▪ Marilao 500 kV Substation, 1x1,000 MVA, 500/230 kV Power Transformer and accessories, 1-500 kV PCB and associated equipment, 1-230 kV PCB and associated equipment. Bulk Cost Estimate: 1,376 Million Pesos	

Project Name/Driver(s)	Province(s) and Components	ETC
System Reliability		
Tower Structure Upgrading of Bicol Transmission Facilities	Albay	Jun 2019
	Transmission Components: ▪ Naga–Daraga–Tiwi A 230 kV Transmission Line, ST-DC, 2-795 MCM ACSR/AS, 42 Steel Tower Structures; ▪ Naga–Tiwi C 230 kV Transmission Line, ST-DC, 2-795 MCM ACSR/AS; 40 Steel Tower Structures. Bulk Cost Estimate: 963 Million Pesos	
La Trinidad–Calot 69 kV Transmission Line	Benguet	Jun 2019
	Substation Components: ▪ La Trinidad 69 kV S/Y Expansion, 1-69 kV PCB and associated equipment. Transmission Components: ▪ La Trinidad–Calot 69 kV Transmission Line, ST/SP-DC, 1-795 MCM ACSR/AS, 21 km; ▪ 69 kV Line Tapping Points, 5-72.5 kV, 3-way Air Break Switch. Bulk Cost Estimate: 410 Million Pesos	
San Manuel–Nagsaag 230 kV Transmission Line	Pangasinan	Dec 2021
	Substation Components: ▪ Nagsaag 500 kV Substation (Expansion), 3x200 MVA, 500/230-13.8 kV Power Transformers and accessories, 2-500 kV PCBs and associated equipment and 8-230 kV PCBs and associated equipment; ▪ San Manuel 230 kV Substation (Expansion), 3-230 kV PCBs and associated equipment. Transmission Components: ▪ San Manuel–Nagsaag 230 kV Tie-Line Upgrading, SP-DC, 2-410 mm^2 TACSR/AS, 0.6 km; ▪ Binga 230 kV Transmission Line Extension, SP-DC, 2-795 MCM ACSR/AS, 0.8 km. Bulk Cost Estimate: 1,874 Million Pesos	
Taguig–Taytay 230 kV Transmission Line	Rizal, Metro Manila	Sep 2022
	Substation Components: ▪ Taytay 230 kV Substation Expansion, 6-230 kV PCBs and associated equipment. Transmission Components: ▪ Taguig–Taytay 230 kV Transmission Line, SP-DC, 2-610 mm^2 TACSR/AS, 10 km. Bulk Cost Estimate: 3,823 Million Pesos	
Navotas (Manila)–Dona Imelda 230 kV Transmission Line	Metro Manila	Dec 2023
	Transmission Components: ▪ Manila/Navotas–Dona Imelda 230 kV Transmission Line, SP-DC, 2-610 mm^2 TACSR, 4.6 km, 2-2,500 mm^2 XLPE (1-core), 4.7 km. Bulk Cost Estimate: 3,514 Million Pesos	
Minuyan 115 kV Switching Station	Bulacan	Aug 2023
	Substation Components: ▪ Minuyan Switching Station, 11-115 kV PCBs and associated equipment. Bulk Cost Estimate: 944 Million Pesos	
Olongapo 230 kV Substation Upgrading	Zambales	Dec 2023
	Substation Components: ▪ Olongapo 230 kV Substation, 8-230 kV PCB and associated equipment. Bulk Cost Estimate: 1,321 Million Pesos	
Western 500 kV Backbone – Stage 2	Pangasinan, Zambales	Aug 2024
	Substation Components: ▪ Castillejos 500 kV Substation, 2x1,000 MVA, 500/230-13.8 kV Power Transformers and accessories, 1x90 MVAR, 500 kV Shunt Reactor and accessories, 11-500 kV PCBs and associated equipment; ▪ Bolo 500 kV Substation, 4-500 kV PCBs and associated equipment;	

Project Name/Driver(s)	Province(s) and Components	ETC
	▪ Hermosa 500 kV Substation, 4-500 kV PCBs and associated equipment. Transmission Components: ▪ Castillejos–Bolo 500 kV Transmission Line, ST-DC, 4-410 mm^2 TACSR, Castillejos–Masinloc: 84 km, Masinloc–Bolo: 90 km. Bulk Cost Estimate: 8,525 Million Pesos	
Nasugbu 69 kV Switching Station	Batangas	Dec 2024
	Substation Components: ▪ Nasugbu Switching Station, 8-69 kV PCBs and associated equipment. Transmission Components: ▪ Nasugbu 69 kV Line extension, SP/CP-SC, 1-336.4 MCM ACSR 1.0 km. Bulk Cost Estimate: 983 Million Pesos	
Balayan 69 kV Switching Station	Batangas	Dec 2024
	Substation Components: ▪ Balayan Switching Station, 6-69 kV PCBs and associated equipment. Transmission Components: ▪ Balayan–Calatagan 69 kV Transmission Line extension, SP/CP-SC, 1-336.4 MCM ACSR 0.7 km. Bulk Cost Estimate: 850 Million Pesos	
Mexico–Marilao 230 kV Transmission Line	Pampanga, Bulacan	Dec 2024
	Substation Components: ▪ Marilao 230 kV Substation, 4-230 kV PCBs and associated equipment. Transmission Components: ▪ Mexico–Marilao 230 kV Transmission Line, ST-DC, 4-795 MCM ACSR, 42 km. Bulk Cost Estimate: 1,932 Million Pesos	
Calaca–Salong 230 kV Transmission Line 2	Batangas	Jul 2025
	Substation Components: ▪ Salong 230 kV Substation, 2-230 kV PCBs and associated equipment. Transmission Components: ▪ Calaca-Salong 230 kV Transmission Line, SP-SC, 1-795 MCM ACSR, 6 km. Bulk Cost Estimate: 249 Million Pesos	
Navotas–Pasay 230 kV Transmission Line	Metro Manila	Dec 2025
	Transmission Components: ▪ Navotas–Pasay (Submarine Cable Portion) 230 kV Transmission Line, SC-DC, 2-200 mm^{2}XLPE, 14 km. ▪ Navotas–Pasay (Overhead Line Portion) 230 kV Transmission Line, SP-DC, 2-410 mm^2 TACSR/AS, 1.3 km. Bulk Cost Estimate: 24,313 Million Pesos	
Daraga–Ligao 69 kV Transmission Line Upgrading	Albay	Dec 2025
	Substation Components: ▪ Daraga 69 kV Substation Expansion, 1-69 kV PCB and associated equipment; ▪ Ligao Switching Station, 1-69 kV PCB and associated equipment. Transmission Components: ▪ Daraga–Ligao 69 kV Transmission Line, ST-SC, 1-795 MCM ACSR/AS, 22 km. Bulk Cost Estimate: 550 Million Pesos	
Naga–Pili 69 kV Transmission Line Upgrading	Camarines Sur	Dec 2025
	Transmission Components: ▪ Naga–Pili 69 kV Transmission Line, SP-DC, 1-795 MCM ACSR/AS, 10.5 km. Bulk Cost Estimate: 250 Million Pesos	

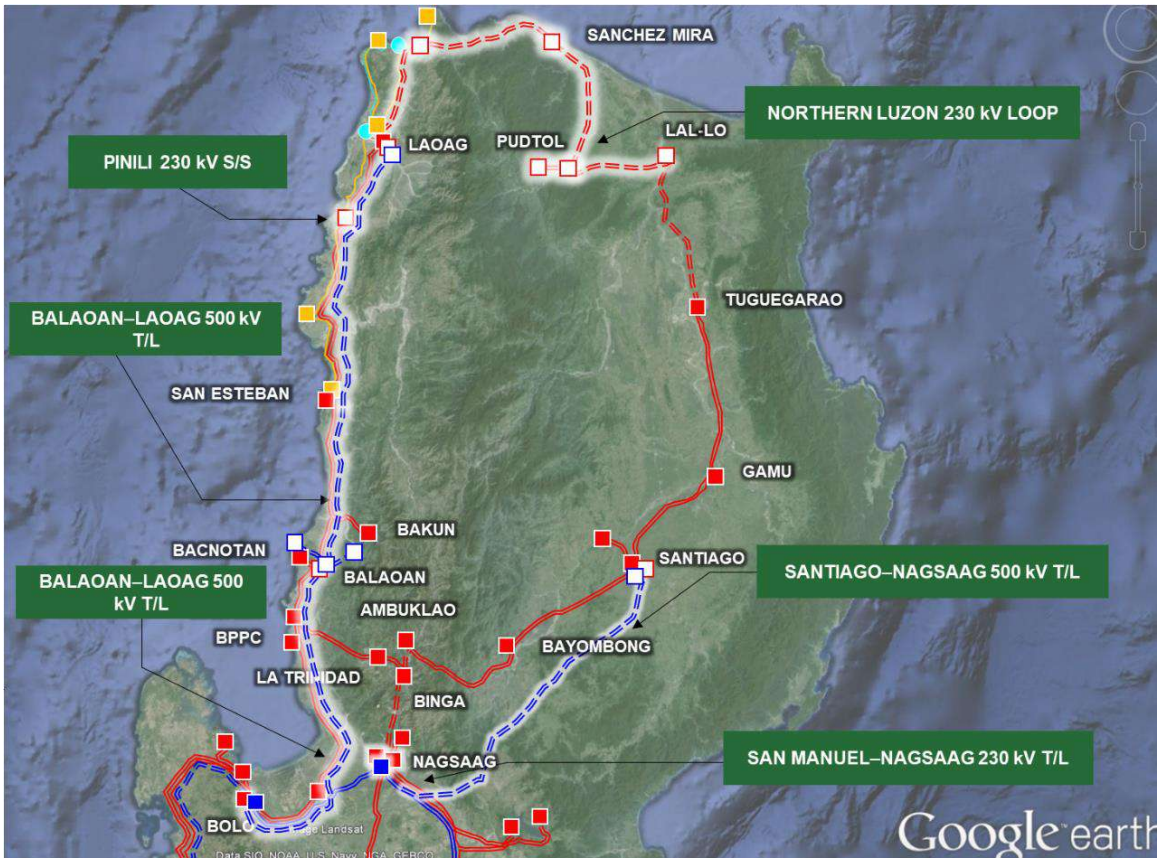


Figure 8.1.1: Proposed North Luzon Transmission Outlook for 2025

Figure 8.1.2: Proposed Central Luzon Transmission Outlook for 2025

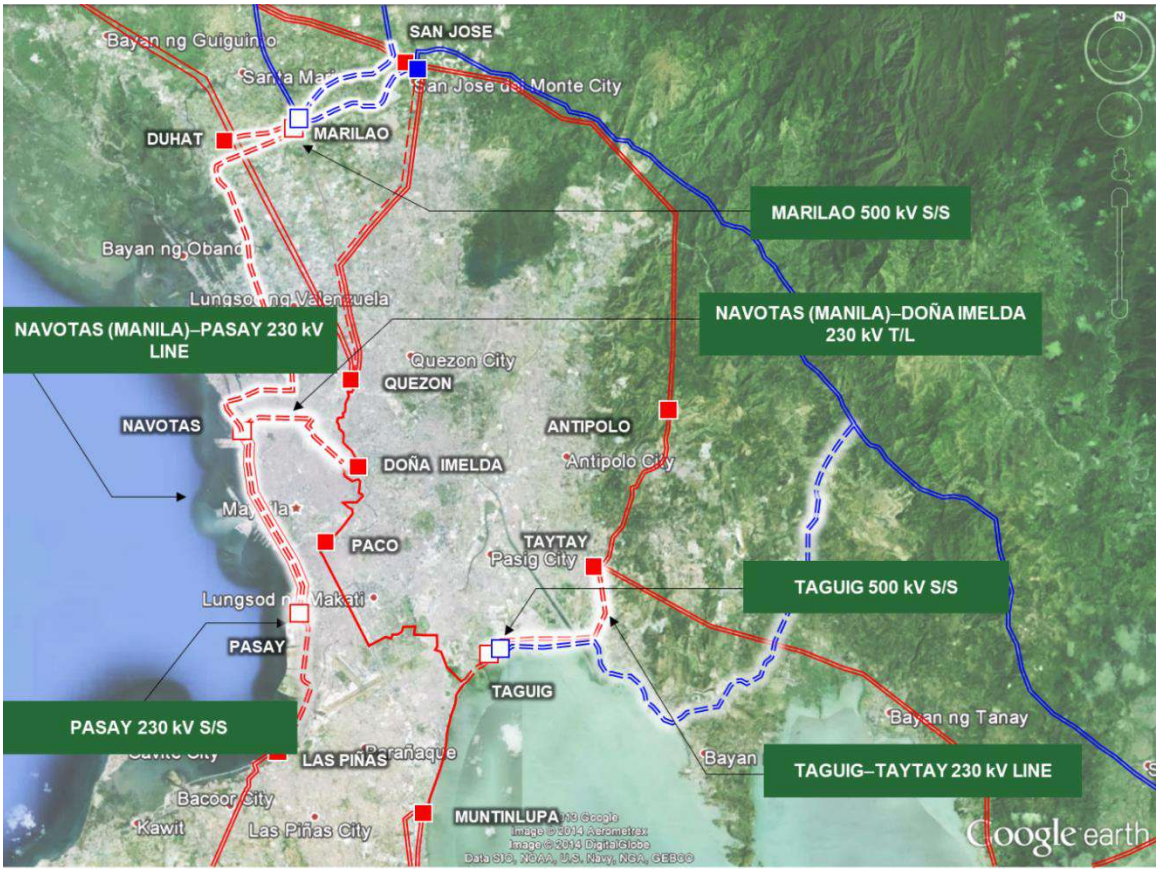


Figure 8.1.3: Proposed Metro Manila Transmission Outlook for 2025

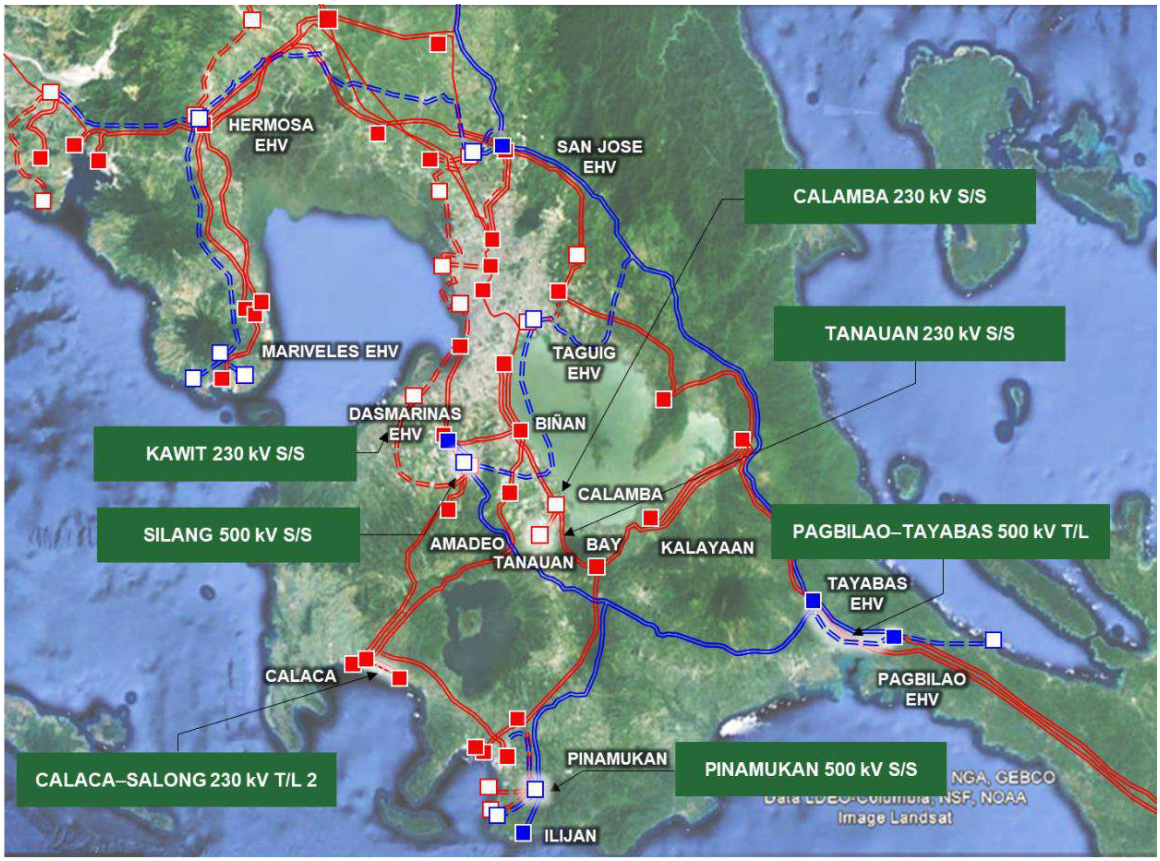


Figure 8.1.4: Proposed South Luzon Transmission Outlook for 2025

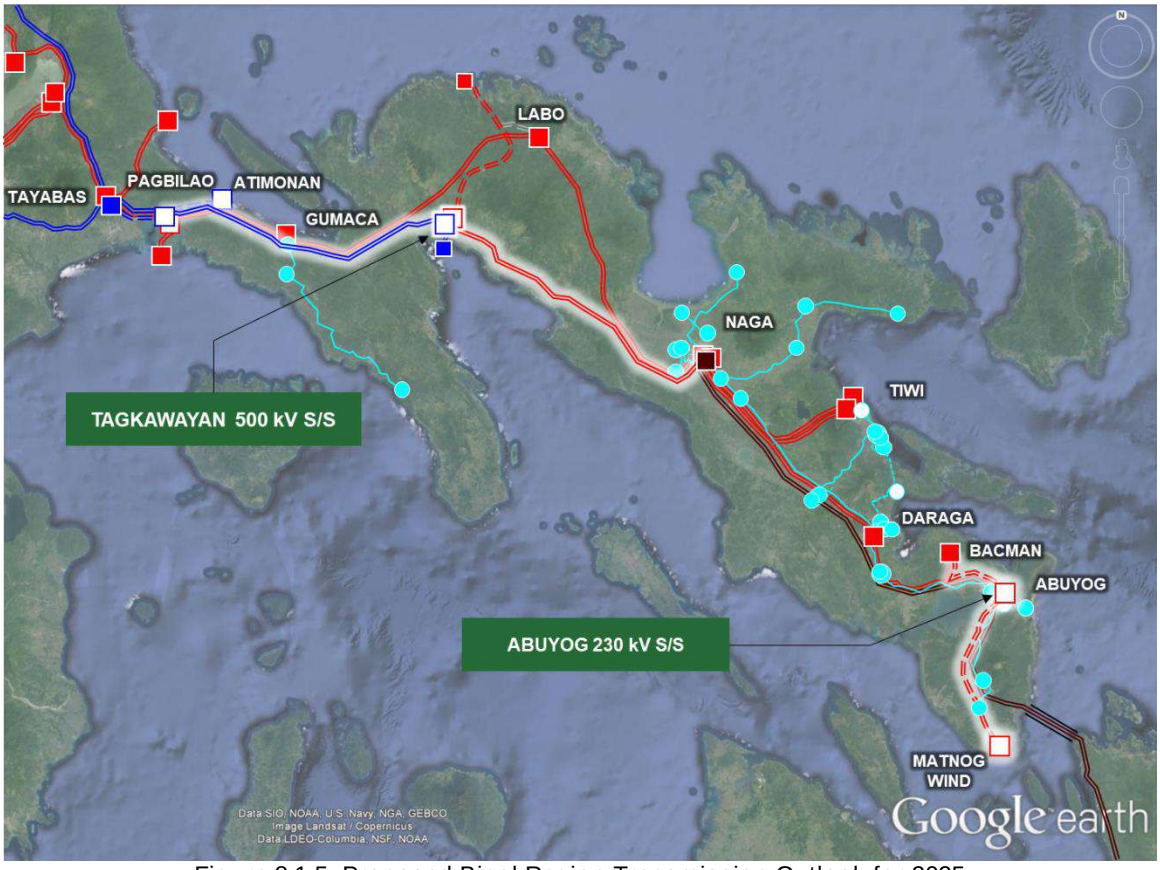
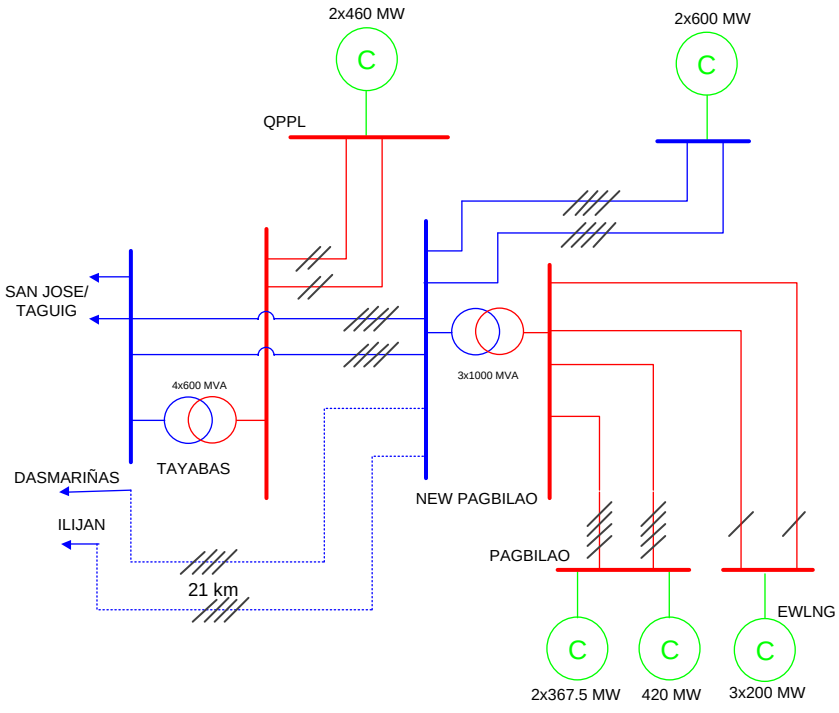


Figure 8.1.5: Proposed Bicol Region Transmission Outlook for 2025

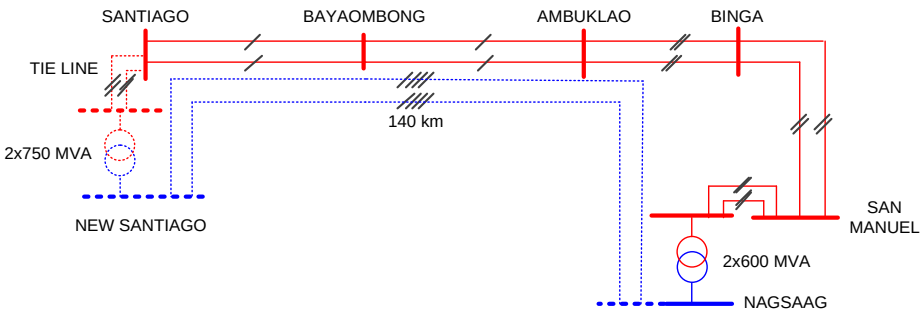
8.1.1 Pagbilao–Tayabas 500 kV Transmission Line



The Pagbilao–Tayabas 500 kV Transmission Line Project aims to accommodate further generation capacity additions in the Quezon province and will provide additional reliability in the Luzon 500 kV Grid. The proposed 1,200 MW Atimonan CFPP will connect to the Tayabas Substation making the substation a critical node which merges more than 3,500 MW generation. The project is needed to establish a by-pass line to Tayabas Substation such that the Pagbilao 500 kV Substation will already become part of the backbone loop. This will avoid the critical concentration of more than 3,500 MW power generation and will lessen the fault level issue at Tayabas 230 kV Substation. The

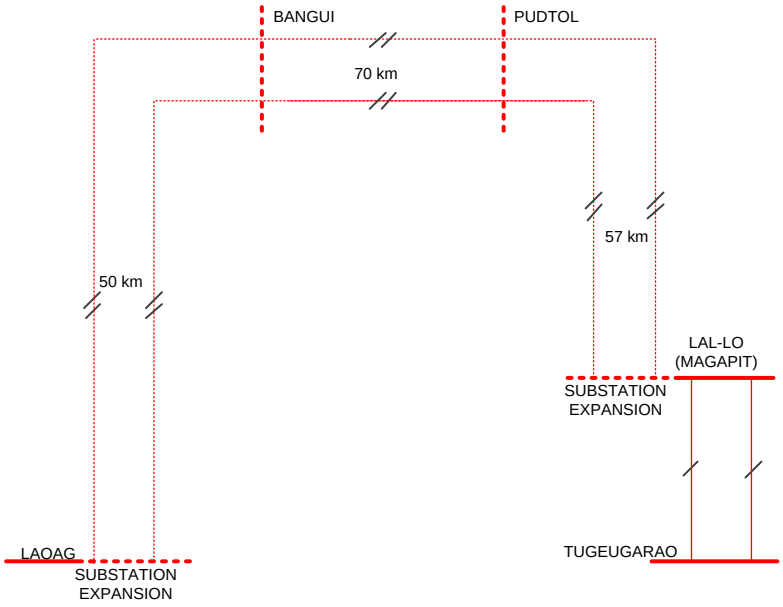
project involves the expansion of the Pagbilao 500 kV Substation and construction of the 500 kV Line from Pagbilao Substation to Tayabas Substation.

8.1.2 Santiago–Nagsaag 500 kV Transmission Line



The Santiago–Nagsaag 500 kV Transmission Line Project aims to serve as a new transmission backbone to support the generation developments in Cagayan Valley and Cordillera, which includes hydro power plants, wind farms and other conventional power plants. It will relieve the overloading that will be experienced during N-1 condition of the Santiago–Bayombong and Bayombong–Ambuklao 230 kV Lines. The Project involves the development of a New Santiago 500/230 kV Substation and 140 km 500 transmission line from New Santiago going to Nagsaag 500 kV Substation.

8.1.3 Northern Luzon 230 kV Loop

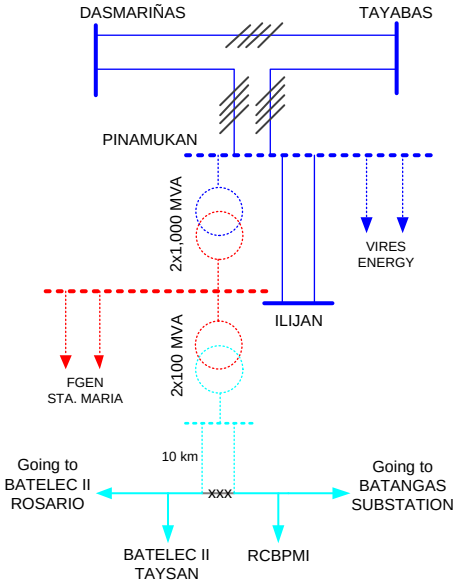


The Northern Luzon 230 kV Loop aims to provide a new corridor to accommodate renewable energy and other power plants in the Northern part of Luzon. The Ilocos Region has been identified as among the areas with huge wind power generation potential. Meanwhile, Hydro generation potential is also identified in the Provinces of Kalinga, Apayao and Ifugao. The Project will also ensure the system reliability and operational flexibility in the Ilocos Region and Cagayan Valley through the 230 kV looping. The loads can continuously be served due to supply line redundancy and will ensure that any available generation capacity in the area can be delivered to the rest of the grid. The Project involves the development of three 230 kV substations. These substations are Bangui in Ilocos Norte, Sanchez Mira in Cagayan and Pudtol in Apayao. The project will also include expansion of Laoag and Lal-lo (Magapit) 230 kV Substation for the termination of the new 230 kV lines. Additional 230 kV lines, such as the Laoag-Bangui, Bangui-Sanchez Mira, Sanchez Mira-Pudtol and the Pudtol-Lal-lo 230 kV Line, will be constructed to complete the 230 kV Loop.

8.1.4 Pinamukan 500 kV Substation

The Pinamukan 500 kV Substation Project aims to allow the connection of incoming bulk generation capacities in Batangas City Area which are mostly LNG-Fired power plants. This substation will also serve as a new drawdown 230/69 kV drawdown substation for MERALCO and BATELEC II loads. The proposed 500 kV Substation will connect to the 500 kV system through bus-in along the Ilijan–Dasmariñas and Ilijan–Tayabas 500 kV Lines.

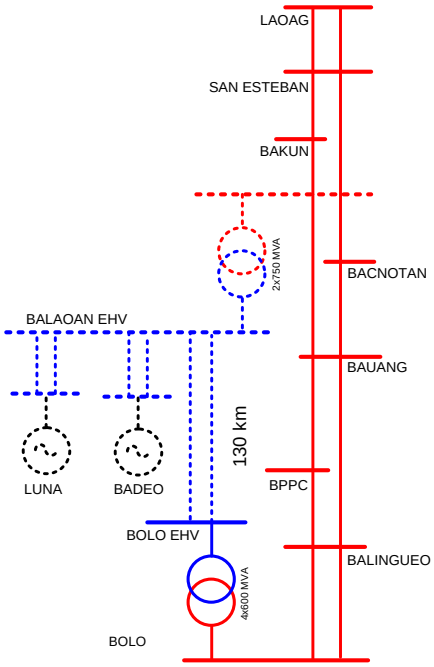
In the long-term, this should be followed by the development of a new 500 kV backbone to Tuy 500 kV to increase the transmission capacity for the outgoing circuits and to form the southern 500 kV loop configuration.



8.1.5 Bolo–Balaoan 500 kV Transmission Line

Bolo–Balaoan 500 kV Transmission Line project aims to support the entry of large generation capacity in La Union and Mountain Province. This project will enable to accommodate the proposed 4x335 MW Luna Coal Plant in La Union and proposed 500 MW Pumped-Storage Hydro Power Plant in Benguet. The project will also address the anticipated overloading of Bolo–Balingueo – Bauang/BPPC 230 kV transmission during single outage contingency under the minimum generation condition in Ilocos Region.

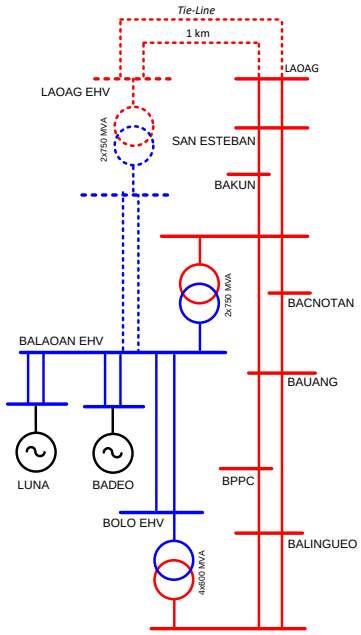
The project involves the development of a new Balaoan 500 kV Substation in Balaoan, La Union with a 2x750 MVA 500/230 kV transformer capacity. The bulk generation will be delivered to the 500 kV backbone through the 130 km double circuit Bolo–Balaoan 500 kV transmission line.



8.1.6 Balaoan–Laoag 500 kV Transmission Line

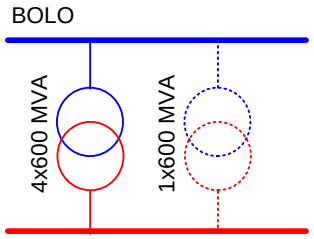
The Balaoan–Laoag 500 kV Transmission Line project aims to accommodate the additional wind farm project in Ilocos Area. The project will address the overloading of the San Esteban – Laoag 230 kV Line during N-1 contingency.

The project involves the development of a new Laoag 500 kV Substation in Laoag, Ilocos Norte with a 2x750 MVA 500/230 kV transformer capacity. The bulk generation will be delivered to the 500 kV backbone through the 175 km double circuit Balaoan–Laoag 500 kV transmission line.



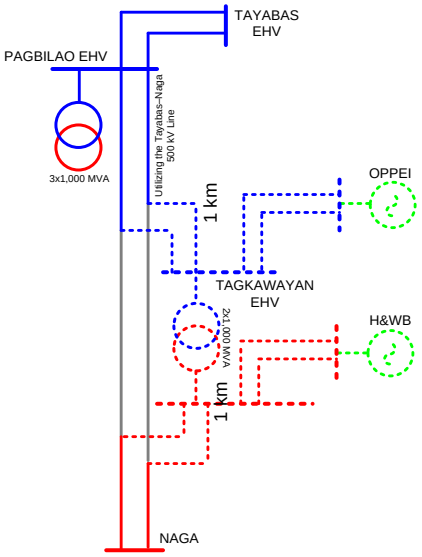
8.1.7 Bolo 5th Bank

The Bolo 5th Bank Project aims to maintain the N-1 contingency provision of Bolo 500 kV Substation. Bolo 500 kV Substation collects the generation from the major coal-fired power plants in the area, namely: Sual and Masinloc. The power flow in the transformers at this substation is also being influenced by the dispatch of the hydro power plants and other generators in north Luzon. With the proposed 600 MW expansion of Masinloc CFPP and the generation developments in North Luzon, the substation capacity would no longer be adequate to maintain the N-1 contingency provision, thus the need for the Bolo 5th Bank. The project involves the installation of the 5th Bank Transformer and expansion of the 500 kV switchyard to accommodate the termination of the transformer.



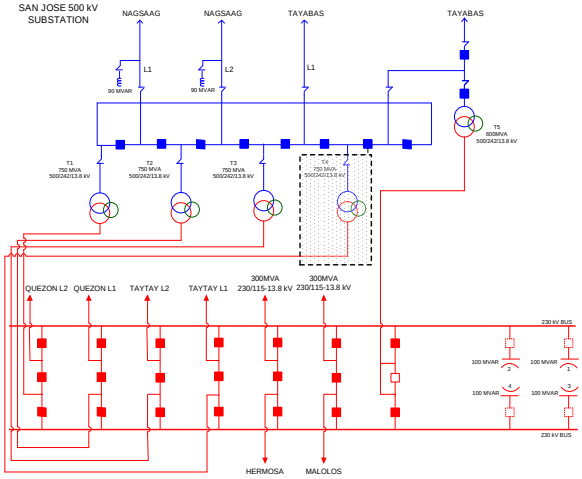
8.1.8 Tagkawayan 500 kV Substation

The Tagkawayan 500 kV Substation Project will accommodate the connection of incoming power plants in Quezon Province and Camarines Norte which include the 1,200 MW Tagkawayan Coal-Fired Power Plant (CFPP) and Jose Panganiban CFPP. The Project involves the development of Tagkawayan 500 kV substation with 2x1,000 MVA 500/230 kV transformer capacity. The proposed substation will bus-in along the 500 kV designed Naga–Pagbilao 230 kV Transmission Line. This scheme will necessitate the energization of the Tagkawayan–Pagbilao segment into 500 kV voltage level



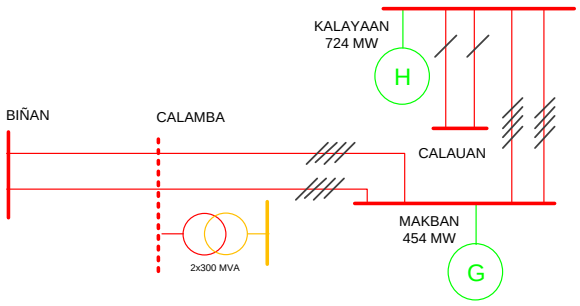
8.1.9 San Jose 500 kV Substation Expansion

The San Jose EHV Substation Expansion Project involves the installation of additional 1x750 MVA 500/230 kV transformer bank at San Jose EHV Substation to address the unprecedented load growth in the Luzon Grid specifically in Metro Manila. The project aims to decongest the existing 4x750 MVA 500/230 kV transformers at San Jose EHV Substation which is one of the major 500/230 kV drawdown substations serving Metro Manila.

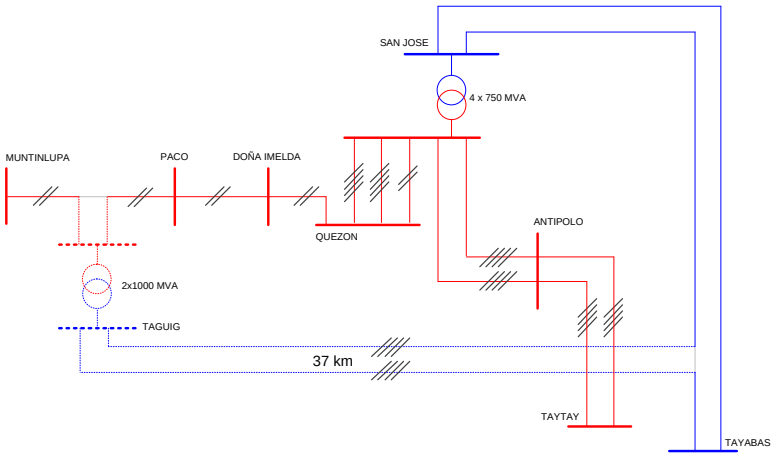


8.1.10 Calamba 230 kV Substation

The Calamba 230 kV Substation Project aims to cater the load growth in the Laguna Sector of MERALCO. This will address the single-outage contingency overloading in other adjacent 230 kV drawdown substations such as the Sta. Rosa and Calauan Substation, and the Calauan–Los Baños 115 kV distribution line. The Project will be located near the industrial parks in Laguna and Batangas and midway of Sta. Rosa and Calauan Substations for higher level of transmission reliability and flexibility of operation. The Project will be connected through bus-in scheme along Biñan–Bay (Makban) 230 kV Line.



8.1.11 Taguig 500 kV Substation



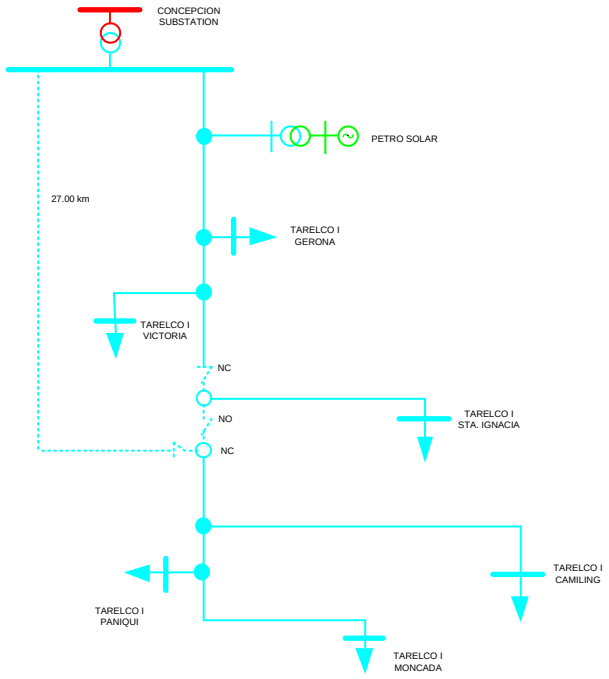
The Taguig 500 kV Substation aims to provide another 500/230 kV drawdown substation to decongest San Jose EHV Substation and provide higher level of reliability to the 500 kV system of the Luzon Grid. The Project will also address the criticality of the existing 230 kV single-circuit line from Quezon to Muntinlupa during N-1 contingency and will address the severe low voltage of the Metro Manila 230 kV Substations due to the single-circuit configuration and heavy loading condition of the Quezon–Muntinlupa 230 kV Line. This is one of NGCP's major transmission network developments for Metro Manila to ensure that the power requirements of the country's load center will be adequately and reliably served in the long term. The implementation of the Taguig 500 kV Substation will improve the reliability of the transmission network by providing direct power injection within Metro Manila through the Muntinlupa–Paco 230 kV Transmission Line segment. The Project also involves the construction of 500 kV supply line that will be connected through cut-in along the existing San Jose–Tayabas 500 kV Line. A 230 kV Line will also be constructed from Taguig Substation and will be connected through bus-in scheme along Muntinlupa–Paco 230 kV Line.

8.1.12 Luzon Voltage Improvement Project V

The Luzon Voltage Improvement Project V aims to address the anticipated overvoltage problem during peak load condition at various load-end substations in Cagayan, Tarlac, Nueva Ecija, Pampanga, Zambales, Pangasinan, Batangas, Quirino, Isabela, Nueva Viscaya, and Benguet.

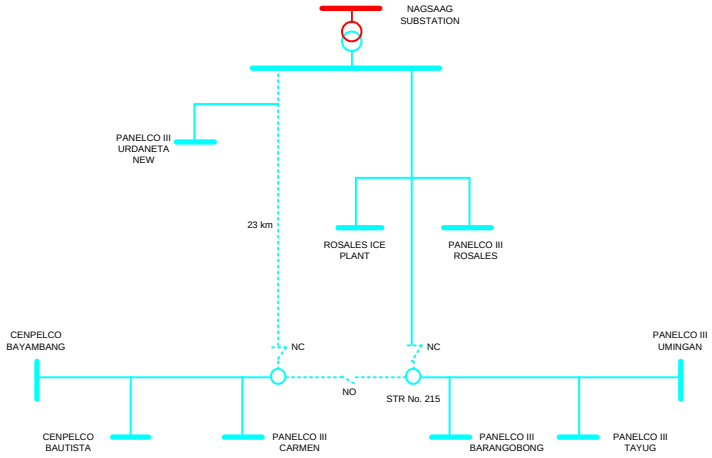
8.1.13 Concepcion–Sta. Ignacia 69 kV Transmission Line

The Concepcion–Sta. Ignacia 69 kV Transmission Line Project aims to cater the growing demand in Tarlac Area. The existing Concepcion–Camiling 69 kV Transmission Line which delivers power to the loads of Tarlac I Electric Cooperative, Inc. (TARELCO I) already be overloaded. The Concepcion–Sta. Ignacia 69 kV Transmission Line Project involves the construction of a new 69 kV transmission line from Concepcion Substation up to Sta. Ignacia, Tarlac. It will unload the existing Concepcion–Paniqui 69 kV transmission line by catering the loads of TARELCO Camiling, Paniqui and Moncada.



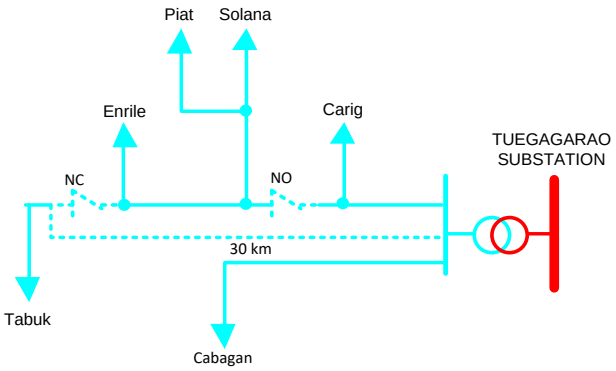
8.1.14 Nagsaag–Tumana 69 kV Transmission Line

The Nagsaag–Tumana 69 kV Transmission Line Project aims to cater the growing demand in Pangasinan. The existing Nagsaag–Umingan 69 kV Transmission Line which delivers power to the loads of Pangasinan III Electric Cooperative (PANELCO III) and Central Pangasinan Electric Cooperative (CENPELCO) will already be overloaded. The Nagsaag–Tumana 69 kV Transmission Line Project involves the construction of a new 69 kV transmission line from Nagsaag Substation going to the area of Tumana in Rosales, Pangasinan. The new transmission line will unload the Nagsaag–Umingan 69 kV Transmission Line by catering the loads of Pangasinan III Electric Cooperative, Inc. (PANELCO III) Urdaneta and Carmen, and Central Pangasinan Electric Cooperative, Inc. (CENPELCO) Bautista and Bayambang.



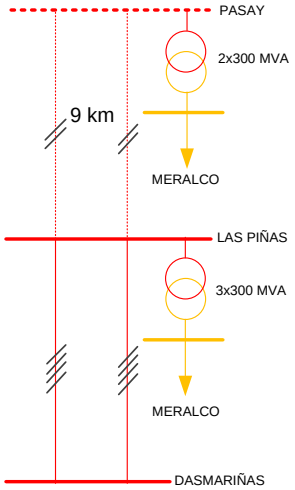
8.1.15 Tuguegarao–Enrile 69 kV Transmission Line

The Tuguegarao–Enrile 69 kV Transmission Line Project aims to cater the load growth of CAGELCO I and KAELCO. The project will relieve the anticipated overloading of the existing Tuguegarao–Tabuk 69 kV Line. The project will involve the development of a new single circuit, 16 km 1-795 MCM ACSR 69 kV transmission line that will initially tap to the Tuguegarao–Cabagan 69 kV line. Ultimately, this will be terminated to Tuguegarao 69 kV Substation through the development of additional 16 km 1-795 MCM ACSR 69 kV transmission line.



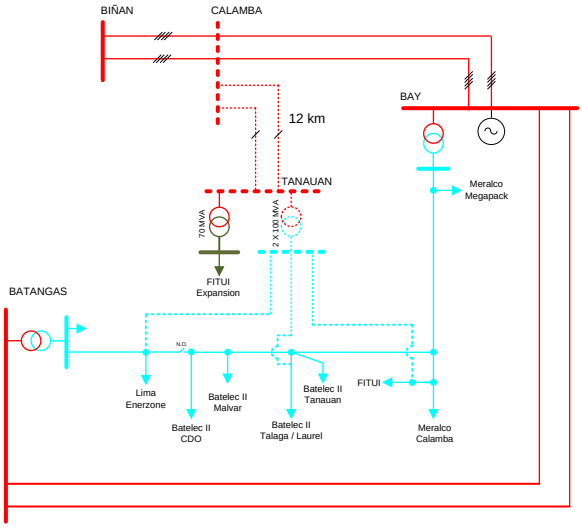
8.1.16 Pasay 230 kV Substation

The Pasay 230 kV Substation Project aims to cater the load growth of MERALCO's load sector 3 which is presently being served by Las Piñas and Muntinlupa Substations. The Las Piñas and Muntinlupa Substation have a space limitation for expansion, thus the need for a new drawdown substation to cater load growth and provide adequate space for future expansion. The Project will be developed close to the load growth area in the Entertainment City in Pasay and will also support the loads in Makati City. It will be connected radially to the Las Piñas 230 kV Substation and eventually will form a 230 kV loop connection with Navotas 230 kV Substation.

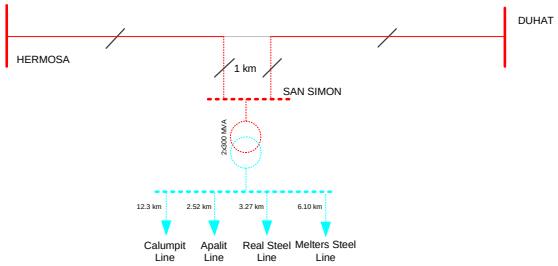


8.1.17 Tanauan 230 kV Substation

The Tanauan 230 kV Substation Project aims to cater the load growth of Batangas and Laguna Area particularly loads of MERALCO Calamba, BATELEC II and the industrial loads in Batangas. The project will relieve the overloading along the Bay–Calamba 69 kV Line and the Bay 2x100 MVA 230/69 kV transformer. This will also improve the power quality of the aforementioned loads. The Project involves the development of Tanauan 230 kV Substation and will be radially connected to the Calamba 230 kV Substation.

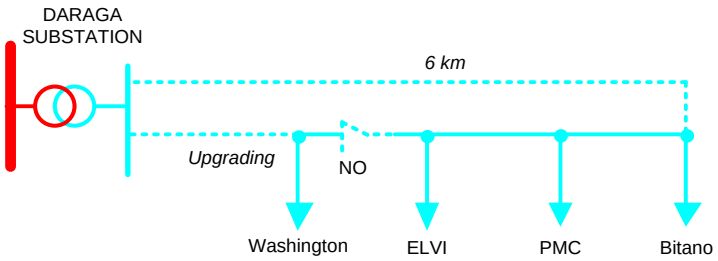


8.1.18 San Simon 230 kV Substation



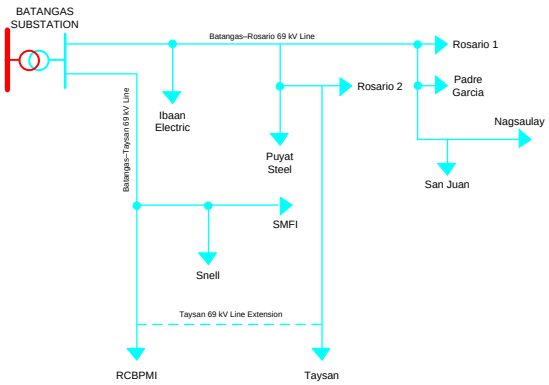
The San Simon 230 kV Substation Project will accommodate the further load growth of the steel plants and will also support the entry of other new industrial loads in the southeastern part of the province of Pampanga which is presently served by the existing Mexico 230 kV Substation and underlying 69 kV facilities. This will also serve as an alternate source substation for the loads connected at Mexico Substation. The San Simon 230 kV Substation will bus-in along the existing Hermosa–Duhat 230 kV Line and will involve the installation of 2x300 MVA 230/69 kV transformers. A 69 kV switchyard and 69 kV transmission facilities will also be implemented for the connection of the 69 kV loads. This new project development harmonizes the project scheme of Mexico–San Simon 69 kV Transmission Line Project and San Simon 230 kV Substation Project under the previous 2014-2015 TDP.

8.1.19 Daraga–Washington 69 kV Transmission Line Upgrading



The Daraga–Washington 69 kV Transmission Line Upgrading Project aims to cater the load growth of APEC and other industrial and commercial loads in Legaspi, Albay. The project will relieve the anticipated overloading of the existing Daraga–Washington 69 kV Line. The project will involve the development of a new single circuit, 6 km 1-795 MCM ACSR 69 kV transmission line from Daraga to Bitano Load End of APEC. To further address the reliability of supply in Legaspi, the Daraga–Washington 69 kV Line segment will also be upgraded from 1-336.4 MCM ACSR to 1-795 MCM ACSR.

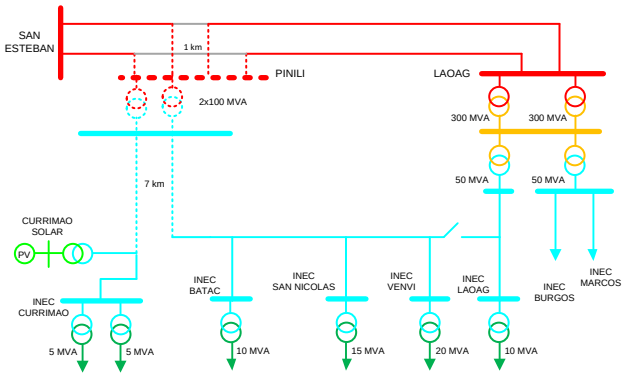
8.1.20 Batangas–Taysan 69 kV Transmission Line Extension



The Batangas–Taysan 69 kV Transmission Line Extension aims to address the anticipated overloading of the Batangas–Rosario 69 kV Transmission Line. This project will enable to transfer portion of loads connected from Batangas–Rosario 69 kV Transmission Line to Batangas–Taysan 69 kV Transmission Line. In the long term, this segment of the 69 kV line extension project will eventually be connected to the proposed Pinamukan 230 kV Substation. The Taysan 69 kV line extension project involves the construction of a new single circuit, 6 km 1-795 MCM ACSR 69 kV transmission line.

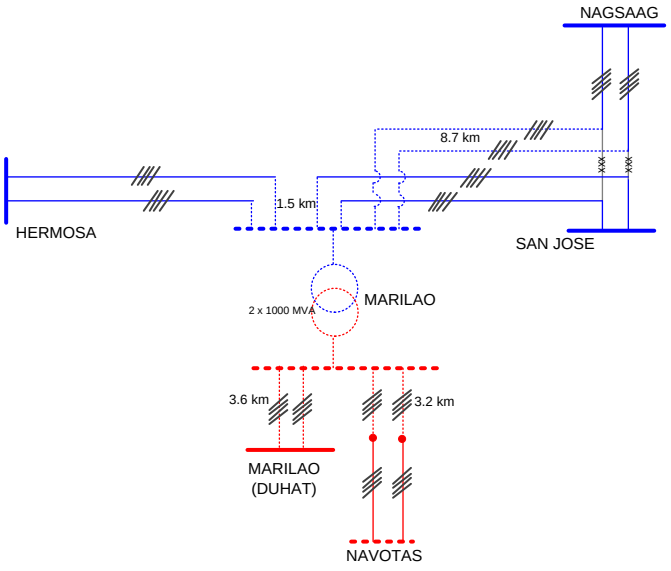
6 km

8.1.21 Pinili 230kV Substation



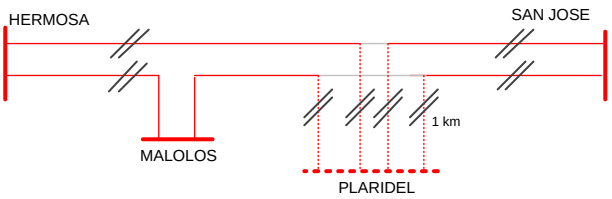
This Pinili 230 kV Substation will replace the existing Currimao 115 kV Substation as it can no longer be expanded due to space constraints. This project will accommodate the load growth and provide N-1 contingency for the loads of Ilocos Norte Electric Cooperative (INEC), Ilocos Sur Electric Cooperative (ISECO) and Abra Electric Cooperative (ABRECO). It can also be an alternate source of connection for the Ilocos Sur and Abra area as well as connection point for new renewable energy plants. The Pinili 115 kV Substation Project involves the construction a new 230/69 kV substation and it will be connected 'bus-in' to the San Esteban–Laoag 230 kV line and will be arranged in a breaker and a half scheme. It involves the installation of 100 MVA, 230/69-13.8 kV Power Transformer, 10-230 kV PCBs, 5-69 kV PCBs and its associated equipment.

8.1.22 Marilao 500 kV Substation



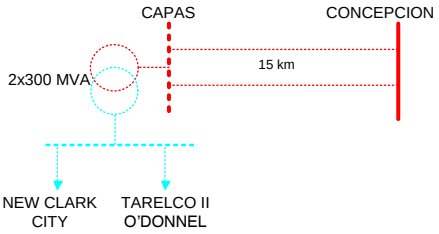
The Marilao 500 kV Substation aims to provide another drawdown substation to support the increasing demand in Metro Manila and will also address the further increase in bulk power injection to the 500 kV system coming from the new power plants in the grid. The project will also address the initial line by-pass scheme at San Jose Substation under the project Hermosa–San Jose 500 kV Transmission Line which is brought about by the GIS expansion limitation at San Jose 500 kV Substation. The Project will reduce the criticality of ring-bus configured San Jose 500 kV Substation as the Marilao Substation will now serve as the main node in the grid. The project involves the construction of Marilao 500 kV Substation to serve as new corridor of generation supply in the northern region. It includes the bus-in of the new substation along the Hermosa-San Jose 500 kV transmission line, transfer of Nagsaag 500 kV line from San Jose EHV substation to the new substation, and termination of 230 kV lines going to Duhat, Marilao, Navotas, Quezon and Hermosa Substations.

8.1.23 Plaridel 230 kV Substation



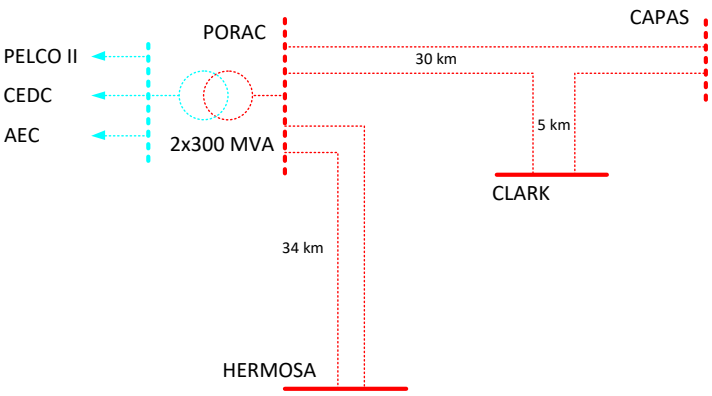
The Plaridel 230 kV Substation will serve as an additional drawdown substation to address the continuous load growth in MERALCO's Bulacan Sector. This project will provide N-1 contingency provision to the 230/69 kV transformers at San Rafael and Malolos Substations. The Plaridel 230 kV Substation will bus-in along the Hermosa–Malolos/San Jose 230 kV Line. Installation of 230/69 kV transformers and 69 kV switchyard will be implemented by MERALCO.

8.1.24 Capas 230 kV Substation



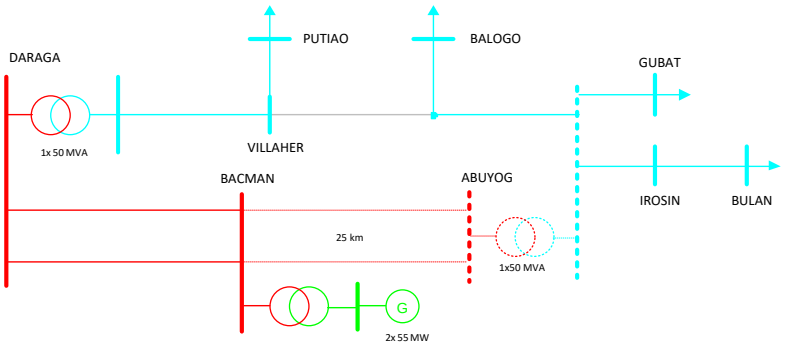
The Capas 230 kV Substation Project aims to support the load growth in Tarlac specifically the development of major loads such as Clark Green City. The Capas 230 kV Substation will draw its power from the Concepcion 230 kV Substation through the proposed Concepcion–Capas 230 kV Line. The project involves the installation of 2x300 MVA 230/69 kV transformer and 15 km double circuit 230 kV transmission line from Concepcion to Capas 230 kV Substation.

8.1.25 Porac 230 kV Substation



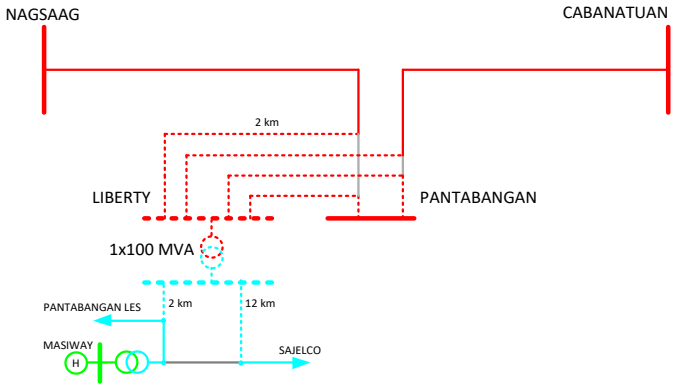
The Porac 230 kV Substation Project aims to support the load growth in Pampanga specifically the development of major loads such as Alviera. This project also aims to establish the 230 kV backbone loop from Hermosa in Bataan to Concepcion in Tarlac. This will provide a more direct access to the generation hub in Bataan. The Porac 230 kV Substation will draw its power from the Hermosa and Capas 230 kV Substations through the proposed Hermosa–Porac–Capas 230 kV Lines. The project includes the installation of a 230/69 kV switchyard with a transformer capacity of 2x300 MVA. The 230 kV backbone loop from Bataan to Tarlac will be completed with the implementation of the 64 km double circuit Hermosa– Porac–Capas 230 kV Line.

8.1.26 Abuyog 230 kV Substation



The Abuyog 230 kV Substation Project aims to establish a 230 kV drawdown substation closer to the loads in Sorsogon which will address the supply reliability issues, meet the long term projected demand and address the power quality issues at the load-end substations. Presently, the whole province of Sorsogon is solely relying on a single-circuit 69 kV line being supplied from Daraga Substation which is located in Albay. The 230 kV backbone is extended up to Bacman Geothermal Plant in Sorsogon and will be used as part of the supply facilities for the proposed Abuyog Substation. The Project involves the development of Abuyog Substation with 1x50 MVA transformer capacity, expansion of Bacman 230 kV Substation and construction of 230 kV line from Bacman going to Abuyog Substation. As an additional capacity, the refurbished 2x50 MVA transformer units from Daraga will also be deployed at Abuyog 230 kV Substation.

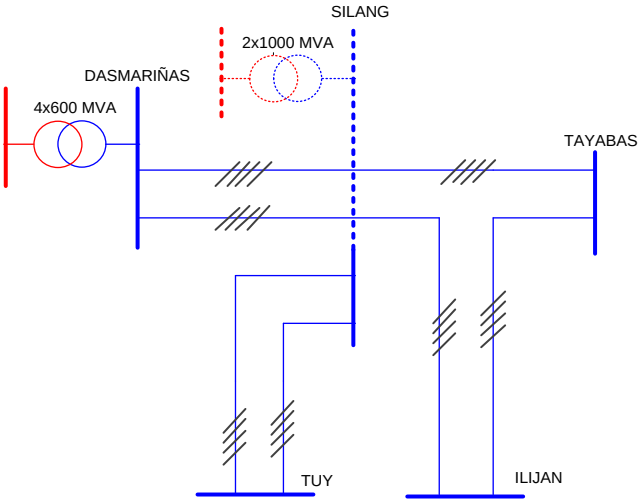
8.1.27 Liberty 230 kV Substation



The Liberty 230 kV Substation Project aims to establish an additional 230 kV drawdown substation in Nueva Ecija. This 230 kV drawdown will relieve the heavy loading of the existing 69 kV line from Cabanatuan going to Pantabangan Load End. This project will address the supply reliability issues, meet the long term projected demand and address the power quality issues at the load-end substations. The Liberty 230 kV Substation will bus-in along the Nagsaag–Pantabangan 230 kV Line and the Cabanatuan–Pantabangan 230 kV line with 1x100 MVA transformer capacity. As an additional capacity, the refurbished 100 MVA transformer unit from Cabanatuan will also be deployed at Liberty 230 kV Substation. Ultimately, this substation will be linked to Nagsaag 230 kV Substation through a new double circuit Liberty–Nagsaag 230 kV Transmission Line.

8.1.28 Silang 500 kV Substation

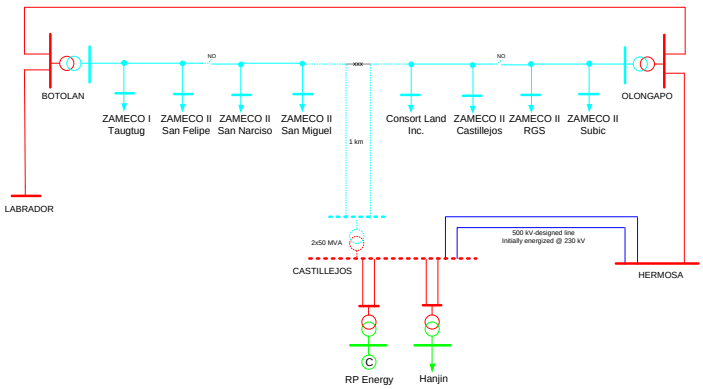
The Silang 500 kV Substation aims to complement the development of the Tuy 500 kV Substation which will support the entry additional generation capacities in Batangas Area. Due to space limitation at Dasmariñas 500 kV Substation, the Silang 500 kV Substation will be developed to terminate the 500 kV line emanating from Tuy 500 kV Substation. Furthermore, the project will address the anticipated overloading of the Dasmariñas 500/230 kV transformers.



The project involves the installation of of 2x1000 MVA 500/230 transformers and the development of a new 500 kV Substation that will be bus-in along Dasmariñas–Ilijan and Dasmariñas–Tayabas 500 kV Lines. In addition, to further decongest the Dasmariñas 500/230 kV Substation, the Las Piñas 230 kV line going to Dasmariñas will be diverted to Silang 500/230 kV Substation.

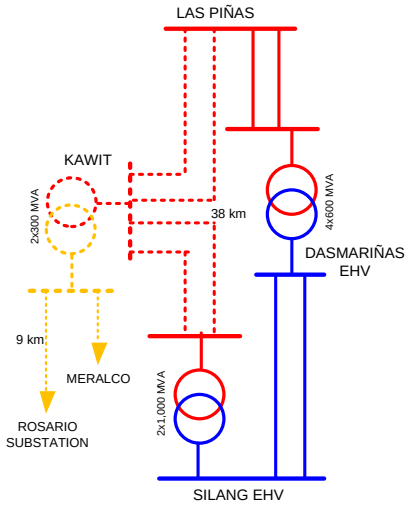
8.1.29 Castillejos 230 kV Substation

The Castillejos 230 kV Substation Project aims to cater the load growth in Zambales. The substation will have a 2x50 MVA transformer capacity which will be sourced from the refurbished transformer units at Labrador and Botolan Substation. The Castillejos substation will serve as an alternative source to loads of Botolan and Olongapo 230 kV Substations. The Castillejos 230 kV drawdown substation will also serve as the connection point of RP Energy CFPP and any other future bulk generation development in the area. The new substation will connect to the Hermosa 230 kV Substation thru the Castillejos–Hermosa 500 kV Transmission Line (initially energized at 230 kV) and will be connected to the Bolo 500 kV Substation after the implementation of the Western Luzon 500 kV Backbone – Stage 2, creating the Bolo–Castillejos–Hermosa 500 kV transmission line backbone in Western Luzon.



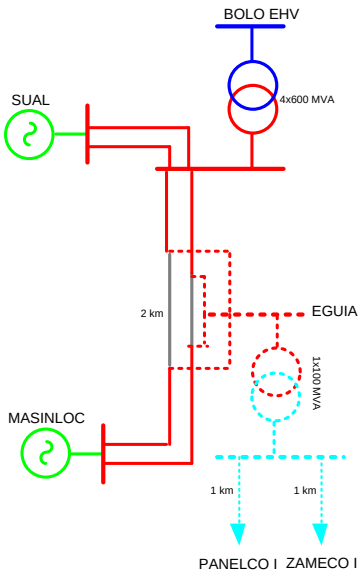
8.1.30 Kawit 230 kV Substation

The Kawit 230 kV Substation Project aims to cater the load growth in the Cavite Sector of MERALCO. The project will relieve the overloading of Dasmariñas 3x300 MVA 230/115 kV transformers. It can be noted that the Dasmariñas 230/115 kV Substation has no longer space for expansion. The Project will involve the construction of double circuit 230 kV Line from Las Piñas to Silang, and the substation will bus-in through along the Las Piñas–Silang 230 kV Line.



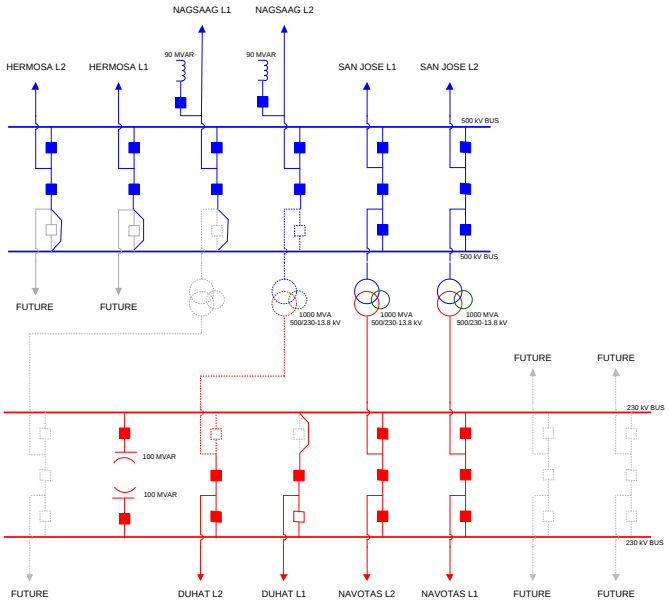
8.1.31 Eguia 230 kV Substation

The Eguia 230 kV Substation Project aims to cater the load growth of Pangasinan and Zambales Area particularly loads of PANELCO I in Dasol, Pangasinan and ZAMECO I prospective mining loads in Sta. Cruz, Zambales. The project will relieve the projected overloading along the Labrador–Bani 69 kV Line and the Botolan–Candelaria 69 kV Line. It will also improve the power quality to the aforementioned loads. The Project involves the development of Eguia 230 kV Substation that will be connected bus-in along Masinloc–Kadampat 230 kV Transmission Line. In addition, this new 230 kV substation will address the stability issue during delayed fault clearing along Masinloc–Kadampat 230 kV Transmission Line.



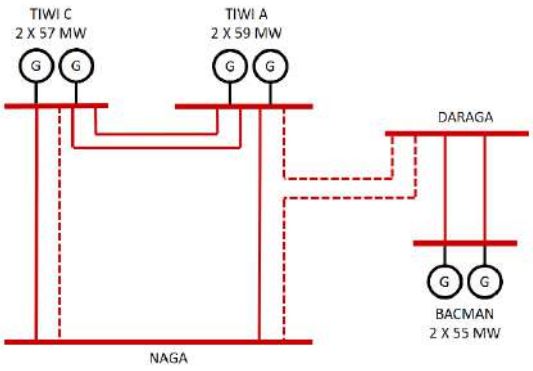
8.1.32 Marilao 500 kV Substation Expansion

The Marilao EHV Substation Expansion Project involves the installation of additional 1x1,000 MVA 500/230 kV transformer bank at Marilao 500 kV Substation to address the load growth in the Luzon Grid specifically in Metro Manila. The project aims to relieve the loading of the 2x1,000 MVA 500/230 kV transformers at Marilao 500 kV Substation which is one of the major 500/230 kV drawdown substations serving Metro Manila.



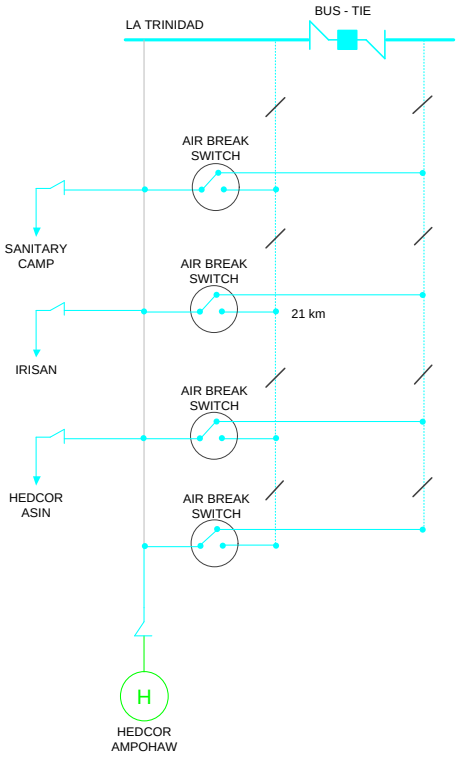
8.1.33 Tower Structure Upgrading of Bicol Transmission Facilities

The restoration project of Bicol transmission facilities offers the reconstruction of the affected transmission lines marred by Typhoon Nina, namely the Naga–Daraga–Tiwi A and Naga–Tiwi C 230 kV Transmission Lines. The project provides permanent solution to address the limitations of the emergency restoration that made use of provisional light-weight modular tower and steel pole structures. The project will involve the erection of 82 new steel tower structure, which are in conformity with the required design standards considering higher wind design criteria replacing the old and toppled structures.



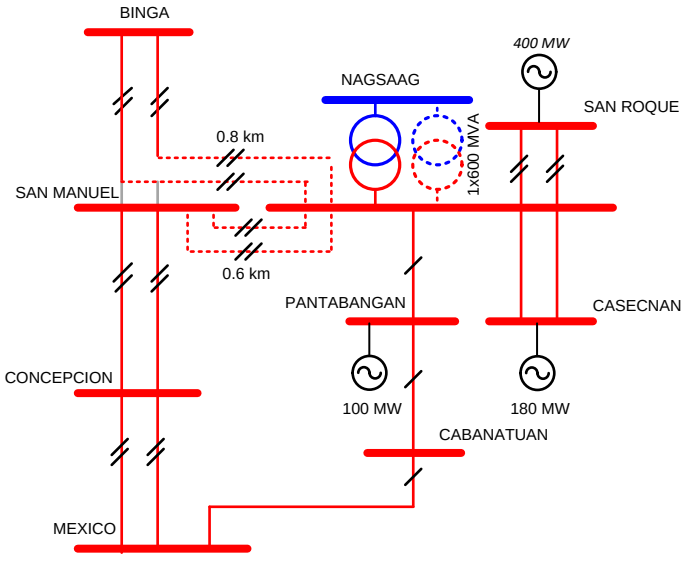
8.1.34 La Trinidad–Calot 69 kV Transmission Line

The La Trinidad–Calot 69 kV Transmission Line Project aims to improve the reliability and increase the transfer capacity of the 69 kV transmission line serving the loads of BENECO Lamut, BENECO Sanitary Camp, BENECO Irisan and power generations from HEDCOR Asin and HEDCOR Ampohaw. The project involves the construction of a 21 km, 69 kV, double circuit, steel tower/steel pole transmission line from La Trinidad Substation to Calot, Sablan, Benguet. It also involves the expansion of the 69 kV switchyard for the termination of the new La Trinidad-Calot 69 kV transmission line.

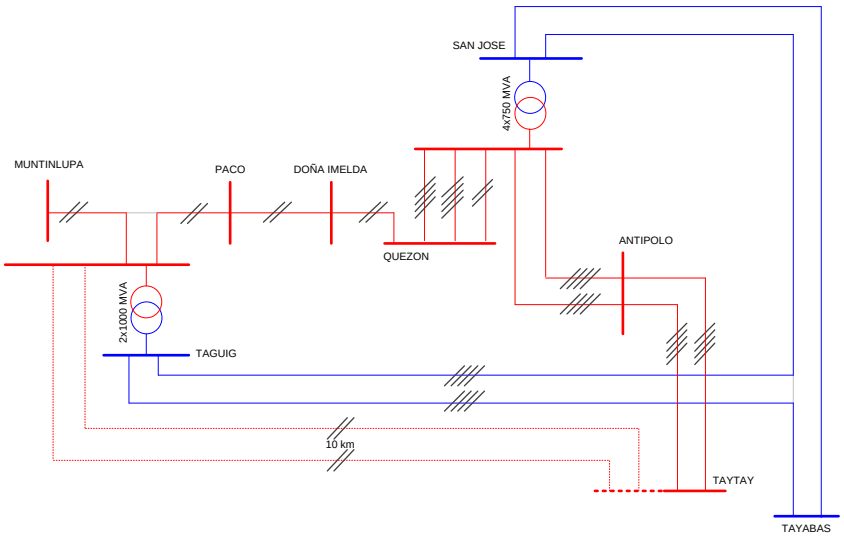


8.1.35 San Manuel–Nagsaag 230 kV Transmission Line

The project aims to address the overloading of the San Manuel–Nagsaag 230 kV tie line, Pantabangan–Cabanatuan 230 kV Line, and the Nagsaag 500/230 kV transformer. During Maximum North condition and the hydro plants are maximized, outage of the San Manuel–Nagsaag 230 kV tie line will result in the overloading of the single circuit Pantabangan–Cabanatuan 230 kV line. Conversely, the outage of Pantabangan–Cabanatuan 230 kV line will result in overloading of the San Manuel–Nagsaag 230 kV tie line. Furthermore, during Maximum South condition and the hydro plants are minimized or completely not operating, the San Manuel 500/230 kV transformer will serve as a drawdown substation in the Central Luzon. The outage of one circuit of Nagsaag–San Jose 500 kV line will result in overloading of the 1x600 Nagsaag 500/230 kV transformer. The project involves the installation of additional 600 MVA 500/230-13.8 kV transformer at Nagsaag EHV Substation and construction of new San Manuel–Nagsaag 230 kV Tie-Line.

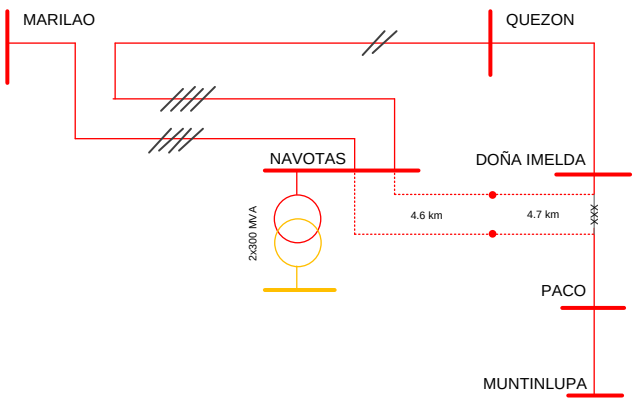


8.1.36 Taguig–Taytay 230 kV Line



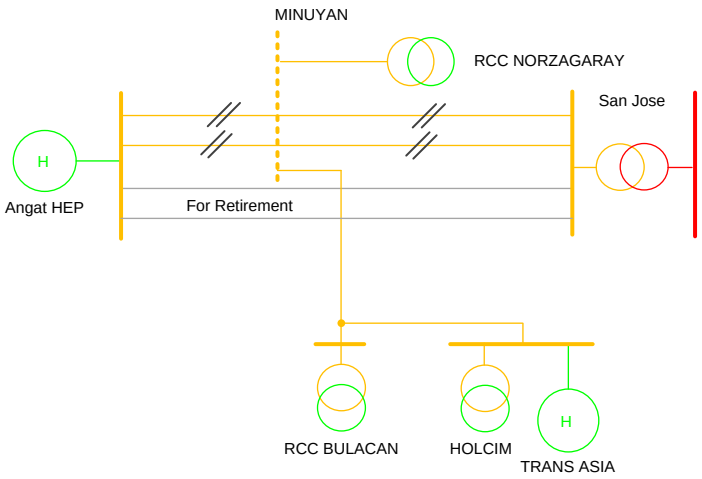
The project will address the overloading of the Taguig–Paco 230 kV Line segment during N-1 contingency event and under maximum south generation condition specifically with the incoming generating plants in the provinces of Batangas and Quezon. This project will provide additional outgoing circuits from the new Taguig 500/230 kV Substation. With the link from Taguig to Taytay, the decongestion of San Jose EHV Substation will become more effective and the utilization of the new substation in Taguig will be optimized. It can be observed also that this project will form part of the 230 kV transmission loop surrounding the Laguna Lake. The project involves the construction of a 10 km double circuit 230 kV line from Taguig to Taytay Substation. The Taytay Substation will be expanded for up to two bays to allow the termination of the Taguig–Taytay 230 kV Line.

8.1.37 Navotas–Doña Imelda 230 kV Transmission Line



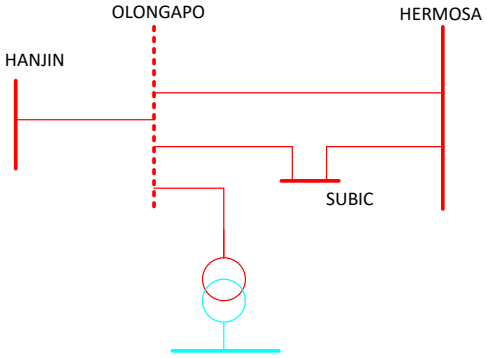
This project aims to provide additional transmission corridor that will complement the existing single circuit Quezon–Doña–Paco–Muntinlupa 230 kV line and will help address its criticality. Effectively, the Marilao–Navotas 230 kV Line and the Navotas–Doña Imelda 230 kV Line together with the existing Marilao–Quezon–Doña Imelda 230 kV Line will form a loop configuration thus creating a more resilient transmission corridor to serve the Metro Manila loads. The project involves the construction of a 4.7 km, 230 kV XLPE cable and a 4.6 km, 230 kV steel pole, double-circuit line using 2-610 mm² TACSR/AS from the NGCP proposed Navotas 230 kV Substation going to the existing Doña Imelda 230 kV Substation. With its present configuration and space limitation, Doña Imelda Substation can accommodate only one additional 230 kV circuit termination while maintaining three units of 300 MVA online transformers. In this case, only one circuit from the proposed project will be terminated to Doña Imelda while the other circuit will be directly connected to the existing 230 kV line going to Paco Substation thereby by-passing Doña Imelda 230 kV Substation.

8.1.38 Minuyan 115 kV Switching Station



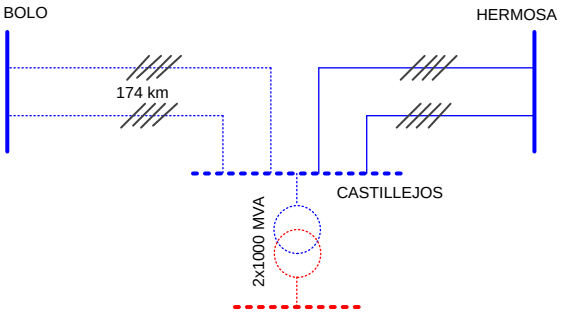
The Minuyan 115 kV Switching Station aims to provide reliable connection of the industrial loads (cement plants) in the area. Upon completion of the new double-circuit San Jose–Angat 115 kV Line using the right-of-way of Line 3, the industrial loads (cement plants) in the area will continue to use the old San Jose–Angat Lines 1&2. However, as Lines 1&2 are also for later retirement, a new connection point for the load customers is required to provide continuous reliable supply. This will be addressed by this new 115 kV switching station which will bus-in along the new double circuit San Jose–Angat 230 kV Line and will involve installation of eight 115 kV PCBs.

8.1.39 Olongapo 230 kV Substation Upgrading



The Olongapo 230 kV Substation Upgrading aims to improve the reliability of the substation by upgrading it from a single-bus configuration to a double-bus configuration using Gas Insulated Switchgear (GIS). The double-bus configuration would allow continuous source of power to its loads even with the failure of one of its breakers. The project also includes revamping of substation secondary equipment to prevent power interruption due to equipment aging and flood control program that would prevent flooding from occurring inside the substation that could lead to equipment failure and power interruption in Zambales Area.

8.1.40 Western 500 kV Backbone – Stage 2

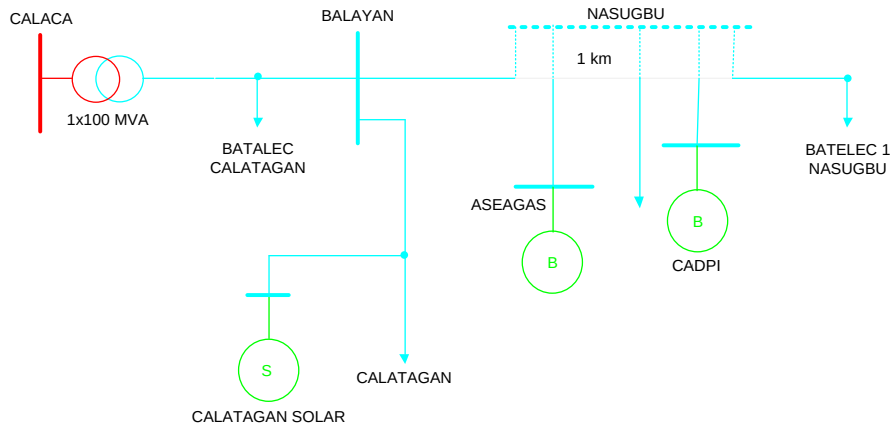


This Western 500 kV Backbone – Stage 2 Project will complete the reinforcement of the capacity of the western corridor presently consisting of a single-circuit line from Labrador down to Botolan to Hanjin then to Olongapo. The long-term development plan considers providing higher level of reliability up to N-2 contingency for the 500 kV backbone system of the Luzon grid. It should be noted that the existing double-circuit 500 kV transmission line from Bolo to Nagsaag to San Jose is on common tower structures and that toppling of a tower (e.g. due to typhoon) would result in simultaneous outage of two circuits which will completely disrupt the power flow in the 500 kV transmission corridor. Such scenario can be expected to result in grid congestion due to the required curtailment to the base load coal-fired power

plants in the north. The capacity expansion of Masinloc Plant and entry of other new plants in the area would further highlight the critical role of the existing 500 kV backbone in ensuring security of supply, thus, the need to reinforce the transmission network by developing the Western 500 kV backbone corridor. This project will involve the construction of a 174 km double circuit 500 kV line from Bolo 500 kV Substation to Castillejos. It will also involve the implementation of the Castillejos 500 kV Substation which will serve as the new connection point for RP Energy CFPP. This could also help support any future bulk generation development in the area. This Stage 2 project involving very long transmission lines may still be divided into further staging during implementation.

8.1.41 Nasugbu 69 kV Switching Station

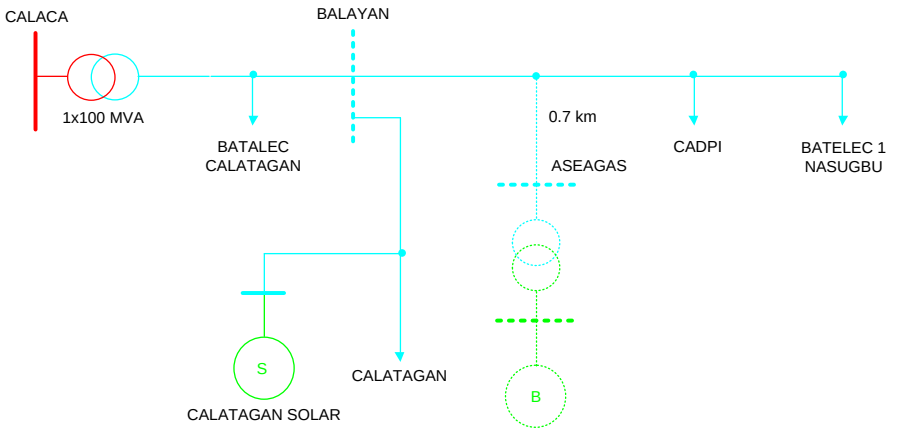
The Nasugbu 69 kV Switching Station aims to provide reliable connection to the existing loads and generator customers, including additional generation capacity in Nasugbu Area. The switching station will allow continuous transmission service even in case of fault in either one of the line segments.



The project involves the installation of 8-69 kV PCBs that will enable isolation of one 69 kV line segments without interrupting the other segments.

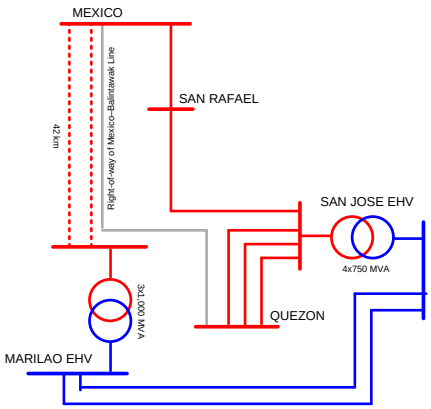
8.1.42 Balayan 69 kV Switching Station

The Balayan 69 kV Switching Station aims to provide a more reliable supply of power through continuous transmission service even in case of fault in either one of the line segments. Presently, the Calaca–Balayan–Nasugbu/Calatagan 69 kV line is serving load and generator customers. The Balayan to Nasugbu 69 kV line segment serves the BATELEC I Nasugbu and Natipuan loads together with the newly commissioned Aseagas Biomass Plant while the Balayan to Calatagan 69 kV line segment serves the BATELEC I Calatagan and the incoming Calatagan Solar Plant of Solar Philippines. The Balayan 69 kV switching station will involve installation of six 69 kV Power Circuit Breakers that will enable isolation of one 69 kV line segment without interrupting the other segments.



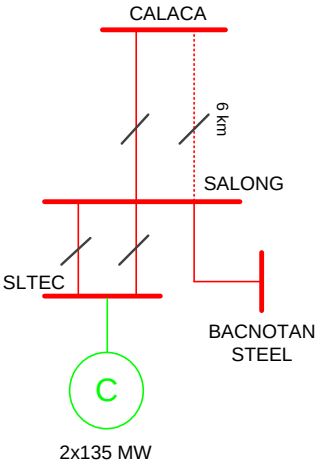
8.1.43 Mexico–Marilao 230 kV Transmission Line

The Mexico–Marilao 230 kV Transmission Line project aims to address the overloading of Mexico–Quezon 230 Line during n-1 contingency and maximum north generation dispatch. The project will also accommodate additional generation capacity to serve Metro Manila. The project involves the construction of 42 km 230 kV transmission line that will utilize the right-of-way of the existing Mexico-Quezon 230 kV Transmission Line.



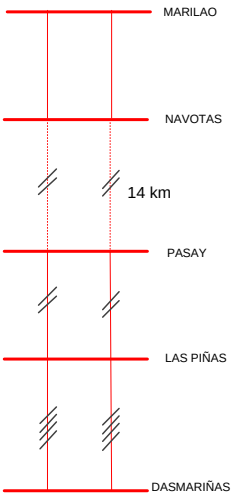
8.1.44 Calaca–Salong 230 kV Transmission Line 2

The Calaca–Salong 230 kV Transmission Line 2 Project will provide provision for single outage contingency for the existing Calaca–Salong 230 kV Transmission Line. The Salong 230 kV Switching Station serves the 2x135 MW SLTEC Coal-Fired Power Plants and the Bacnotan Steel Plant. The Project also involves the expansion of Salong 230 kV Substation for the termination of the Calaca–Salong 230 kV Line.

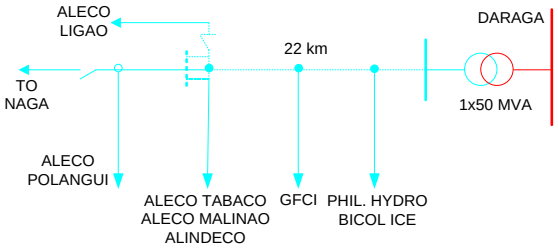


8.1.45 Navotas–Pasay 230 kV Transmission Line

The Navotas–Pasay 230 kV Line Project aims to provide additional reliability of supply in Metro Manila through a new transmission corridor. The project will be able to be serve as an additional corridor that will connect the northern and southern part of the grid. This will relieve the criticality of the Quezon–Doña Imelda–Paco-Muntinlupa 230 kV transmission corridor. The Project involves the construction of a combination of 1.3 km overhead and 14 km submarine cable 230 kV transmission line from Manila to Pasay 230 kV Substation. This Project will provide a new transmission corridor within Metro Manila by forming a new 230 kV loop.

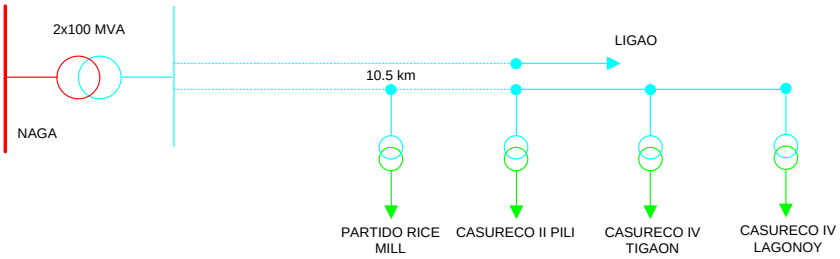


8.1.46 Daraga–Ligao 69 kV Transmission Line Upgrading



The Daraga–Ligao 69 kV Transmission Line Upgrading Project aims to cater the load growth and ensure the reliability of supply to the directly-connected and distribution utility customers in Albay. The decision on September 22, 2009 for ERC Case No. 2008-105 MC cited that the Tabaco–Ligao–Daraga 69 kV Line will already be reclassified as Network/Transmission Assets upon the closing of the Daraga–Tabaco–Ligao 69 kV loop due to the implementation of Eastern Albay 69 kV Line Project. The project involves the expansion of Daraga 69 kV Switchyard and construction of a 69 kV line from Daraga Substation up to Ligao area where a Ligao Switching Station will also be constructed.

8.1.47 Naga–Pili 69 kV Transmission Line Upgrading



The Naga-Pili 69 kV Transmission Line Upgrading Projects aims to cater the load growth of the north-eastern part of Camarines Sur. With the further increase of the loads being served and considering also the age of the existing 69 kV line, the upgrading project will be able to ensure adequate supply and reliable operation including the benefit of providing operational flexibility during contingency or maintenance in the 69 kV facility. The Project involves the construction of a 69 kV line from Naga Substation up to the area of Pili in Camarines Sur.

8.2 Proposed Transmission Outlook for 2030

From year 2026-2030, the indicative generation capacity addition will be around 8,000 MW. The province of Batangas will still be among the major bulk generation hubs in the Luzon Grid. To accommodate these generation capacities, the development of the Tuy 500 kV Substation (Stage 2) is required. This proposed project will also involve the energization of the 500 kV-designed Tuy–Silang 500 kV Transmission Line. This project will be complemented by the development of a new 500 kV transmission corridor from Pinamukan to Tuy 500 kV Substation. Further generation capacity addition is also expected in Quezon Province and Camarines Norte which will be accommodated by the proposed Tagkawayan 500 kV Substation. Meanwhile, the proposed hydro and wind farms in the Mountain Province will be addressed by the La Trinidad–Sagada 230 kV Transmission Line Project. The proposed hydro pumped-storage in Nueva Ecija will be addressed by the development of the Liberty–Nagsaag 230 kV Transmission Line Project. To accommodate additional generation, import and export to the Visayas Grid, the Luzon–Visayas HVDC Bipolar Operation will also be implemented.

To address the forecasted load growth, the development of additional new drawdown substations will still need to be developed. These include the development of Saog 230 kV Substation in Bulacan, Kawit 230 kV Substation in Cavite, Eguia 230 kV Substation in Zambales, Malvar 230 kV Substation in Batangas, Iriga 230 kV Substation in Camarines Sur,

Mamplasan 230 kV Substation in Laguna and San Agustin 230 kV Substation in Tarlac. Furthermore, additional 69 kV transmission line capacities will be implemented to address the heavy loading of the existing 69 kV transmission lines.

To maintain the reliability of transmission facilities, upgrading of old transmission facilities will be implemented. These include the upgrading of the Mexico–San Rafael–Cabanatuan–Liberty (Pantabangan) 230 kV transmission corridor and the Mexico–Clark 69 kV Transmission Line. In Metro Manila, additional transmission corridors will be implemented such as the Limay–Pasay and Pasay–Taguig. Lastly, the development of a new 230 transmission corridor from Silang to Las Piñas is required to provide N-1 contingency provision for the existing Dasmariñas–Las Piñas 230 kV Transmission Line.

Lastly, to effectively regulate the voltage in the grid, additional capacitors will be installed.

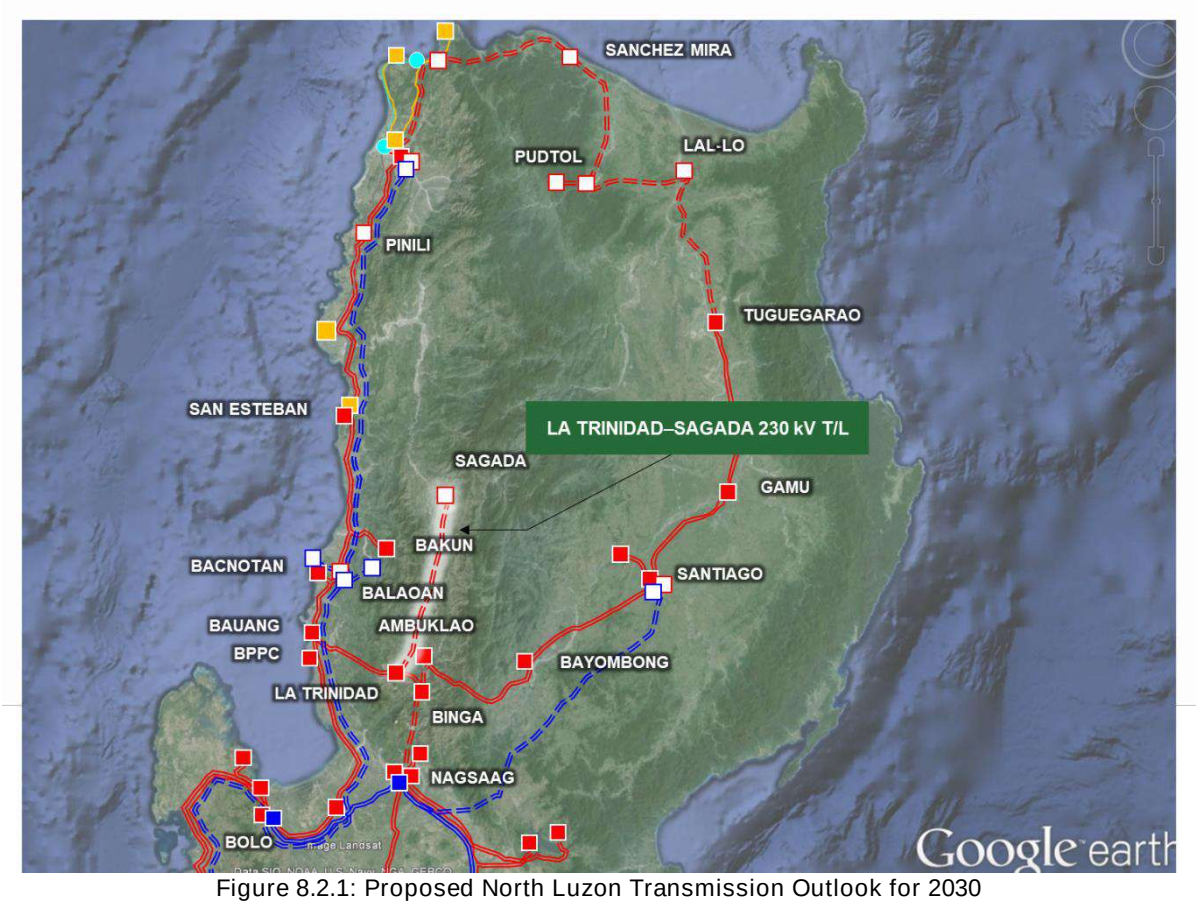


Figure 8.2.1: Proposed North Luzon Transmission Outlook for 2030

Figure 8.2.2: Proposed Central Luzon Transmission Outlook for 2030

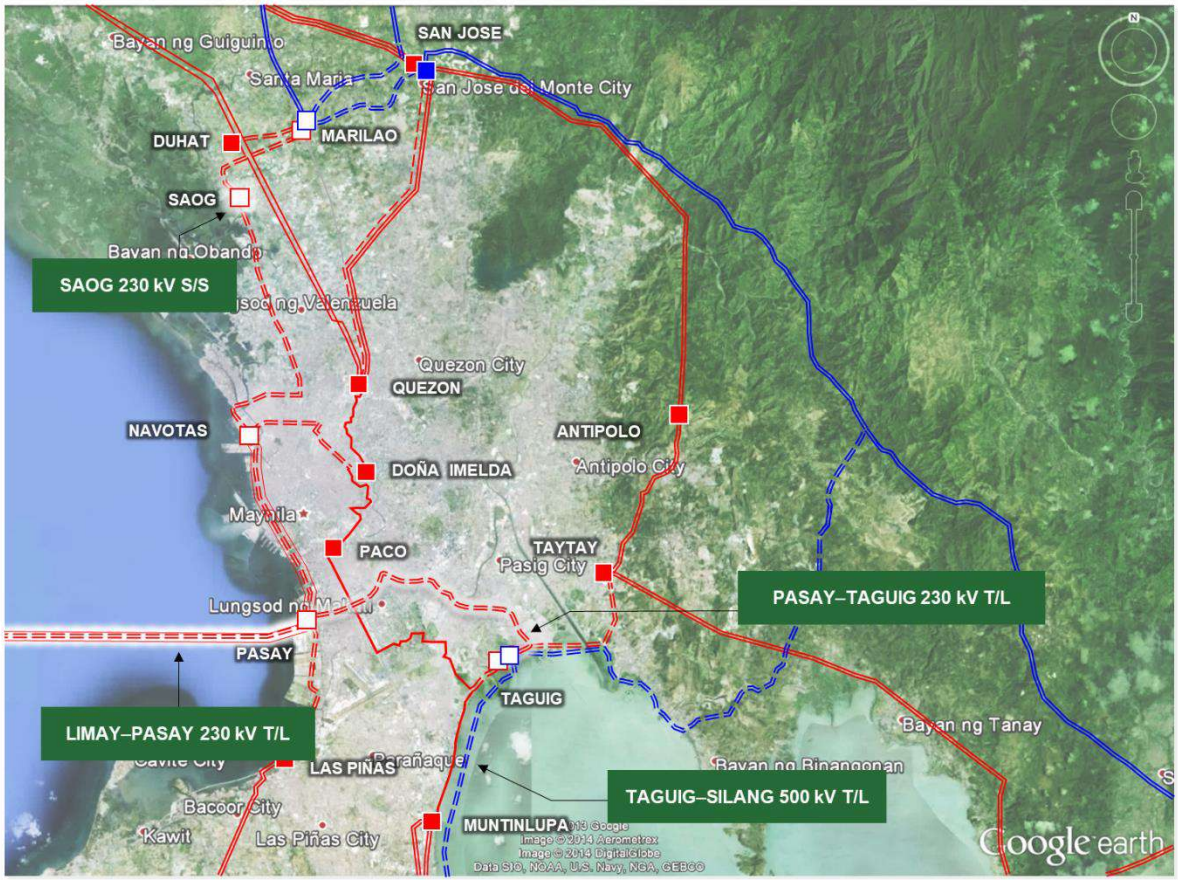


Figure 8.2.3: Proposed Metro Manila Transmission Outlook for 2030

Figure 8.2.4: Proposed South Luzon Transmission Outlook for 2030

Figure 8.2.5: Proposed Bicol Region Transmission Outlook for 2030

Table 8.2: Proposed Luzon Transmission Outlook for 2030

Project Name/Driver(s)	Province(s) and Components	ETC
Generation Entry		
La Trinidad–Sagada 230 kV Transmission Line	Benguet	Dec 2027
	Substation Components: ▪ La Trinidad 69 kV Substation Expansion, 2-69 kV PCBs and associated equipment; ▪ Sagada Switching Station, 6-69 kV PCBs and associated equipment. Transmission Components: ▪ La Trinidad–Sagada 230 kV Transmission Line (to be initially energized at 69 kV), ST/SP-DC, 1-795 MCM ACSR, 93.25 km transmission line.	
Tuy 500/230 kV Substation (Stage 2)	Batangas	Dec 2027
	Substation Components: ▪ Tuy 500/230 kV Substation, 2x1,000 MVA, 500/230 kV Power Transformers and accessories, 6-500 kV PCBs and associated equipment.	
Pinamukan–Tuy 500 kV Line	Batangas, Laguna	Oct 2029
	Substation Components: ▪ Pinamukan 500 kV Substation, 2-500 kV PCBs and associated equipment; ▪ Tuy 500 kV Substation, 4-500 kV PCBs and associated equipment. Transmission Components: ▪ Pinamukan–Tuy 500 kV Transmission Line, ST-DC, 4-795 MCM ACSR/AS, 60.0 km.	
Liberty–Nagsaag 230 kV Transmission Line	Nueva Ecija, Pangasinan	Dec 2029
	Substation Components: ▪ Liberty 230 kV Substation, 6-230 kV PCBs and associated equipment; ▪ Nagsaag 230 kV Substation Expansion, 3-230 kV PCBs and associated equipment. Transmission Components: ▪ Liberty–Nagsaag 230 kV Transmission Line, 4-795 MCM ACSR/AS, ST-DC, 68 km.	
Luzon–Visayas HVDC Bipolar Operation	Camarines Sur and Leyte	Dec 2030
	Substation Components: ▪ Naga Converter/Inverter StationUpgrading; ▪ Naga 500/230 kV Substation, 2x750 MVA, 500/230 kV Power Transformers and accessories, 4-500 kV PCBs and associated equipment; ▪ Pagbilao 500 kV Substation, 4-500 kV PCBs and associated equipment; ▪ Ormoc Converter/Inverter Station Upgrading.	
San Esteban–Laoag 115 kV Transmission Line Upgrading	Ilocos Norte, Ilocos Sur	Dec 2030
	Substation Components: ▪ San Pablo 230 kV Substation, 4-230 kV PCBs and associated equipment; ▪ New Bantay 230 kV Substation, 2x100 MVA, 230/115 kV Power Transformer and accessories, 10-230 kV PCBs and associated equipment; ▪ Laoag 230 kV Substation, 4-230 kV PCBs and associated equipment. Transmission Components: ▪ San Esteban–Laoag 230 kV Transmission Line, ST-DC, 4-795 MCM ACSR/AS, 115 km.	
Load Growth		
North Luzon Substation Upgrading II	La Union, Ilocos Norte, Nueva Vizcaya, Isabela	Dec 2026
	Substation Components: ▪ Concepcion 230 kV Substation (Replacement), 2x300 MVA 230/69-13.8 kV Power Transformer and associated equipment; ▪ Bauang 230 kV Substation (Replacement), 1x100 MVA 230/115/69-13.8 kV Power Transformer and associated equipment; ▪ Pinili 230 kV Substation, 1x100 MVA 230/69-13.8 kV Power Transformer and associated equipment; ▪ Laoag 230 kV Substation (Replacement), 1x100 MVA 115/69-13.8 kV Power Transformer and associated equipment;	

Project Name/Driver(s)	Province(s) and Components	ETC
	▪ Bayombong 230 kV Substation, 1x100 MVA 230/69-13.8 kV Power Transformer and associated equipment; ▪ Santiago 230 kV Substation, 1x100 MVA 230/69-13.8 kV Power Transformer and associated equipment; ▪ Gamu 230 kV Substation, 1x100 MVA 230/69-13.8 kV Power Transformer and associated equipment.	
South Luzon Substation Upgrading II	Batangas, Laguna, Quezon, Camarines Norte and Metro Manila	Dec 2026
	Substation Components: ▪ Lumban 230 kV Substation (Replacement), 1x100 MVA 230/69-13.8 kV Power Transformer and associated equipment; ▪ Gumaca 230 kV Substation (Replacement), 1x100 MVA 230/69-13.8 kV Power Transformer and associated equipment; ▪ Taguig 230 kV Substation, 1x100 MVA 230/115-13.8 kV Power Transformer and associated equipment.	
Taguig EHV Substation Expansion	Metro Manila	Dec 2027
	▪ Taguig 500 kV Substation, 1x1,000 MVA, 500/230 kV Power Transformer and accessories.	
Saog 230 kV Substation	Metro Manila	Dec 2027
	Substation Components: ▪ Saog 230 kV Substation, 10-230 kV PCBs and associated equipment. Transmission Components: ▪ Saog Bus-in to Marilao–Navotas 230 kV Transmission Line, ST-DC, 4-795 MCM ACSR/AS, 2 km.	
Malvar 230 kV Substation	Batangas	Dec 2028
	Substation Components: ▪ Malvar 230 kV Substation (New), 1x100 MVA, 230/69-13.8 kV Power Transformer and accessories, 9-230 kV PCBs and 9-69 kV PCBs and associated equipment. Transmission Components: ▪ Extension from the bus-in point (Batangas side) to Malvar Substation, 230 kV, ST-DC, 4-795 MCM ACSR/AS, 5.0 km; ▪ Extension from the bus-in point (Bay side) to Malvar Substation, 230 kV, ST-DC, 4-795 MCM ACSR/AS, 5.0 km.	
Iriga 230 kV Substation	Camarines Sur	Dec 2028
	Substation Components: ▪ Iriga 230 kV Substation (New), 1x100 MVA, 230/69-13.8 kV Power Transformer and accessories, 8-230 kV PCBs and associated equipment, 3-69 kV PCBs and associated equipment. Transmission Components: ▪ Iriga Bus-in to Naga–Tiwi C 230 kV Transmission Line, ST-DC, 2-795 MCM ACSR/AS, 2 km; ▪ 69 kV line extension, ST-SC, 1-336.4 MCM ACSR, 2.0 km.	
San Agustin 230 kV Substation	Tarlac	Apr 2030
	Substation Components: ▪ San Agustin Substation, 1x100 MVA 230/69 kV Power Transformer and accessories, 9-230 kV PCBs and associated equipment, 2-69 kV PCBs and associated equipment. Transmission Components: ▪ San Agustin Bus-in to San Manuel–Concepcion 230 kV Transmission Line, ST-DC, 2-410 mm^2 TACSR/AS, 2 km.	
Mamplasan 230 kV Substation	Laguna	Dec 2030
	Substation Components: ▪ Mamplasan 230 kV Substation, 10-230 kV PCBs and associated equipment. Transmission Components: Mamplasan 230 kV bus-in Transmission Line, ST-DC, 2-795, 2 km.	

Project Name/Driver(s)	Province(s) and Components	ETC
Alaminos EHV Substation	Laguna	Dec 2030
	Substation Components: ▪ Alaminos EHV Substation, 2x1,000 MVA, 500/230-13.8 kV Power Transformers and accessories, 14-500 kV PCBs and associated equipment, 10-230 kV PCBs and associated equipment. Transmission Components: ▪ Alaminos Bus-in to Dasmariñas–Ilijan–Tayabas 500 kV Line, ST-DC, 4-795 MCM, 0.15 km; ▪ Alaminos Bus-in to Makban–Lumban 230 kV Line, ST-DC, 4-795 MCM, 7 km; ▪ Mamplasan 230 kV bus-in Transmission Line, ST-DC, 2-795, 2 km.	
Liberty–Baler 230 kV Transmission Line	Nueva Ecija, Aurora	Apr 2035
	Substation Components: ▪ Baler 230 kV Substation, 1x50 MVA, 230/69-13.8 kV Power Transformer and accessories, 5-230 kV PCBs and associated equipment, 3-69 kV PCBs and associated equipment. Transmission Components: ▪ Liberty–Baler 230 kV Transmission Line, 1-795 MCM ACSR ST-DC, 56.5 km.	
System Reliability		
Pasay–Taguig 230 kV Transmission Line	Metro Manila	Dec 2026
	Transmission Components: Pasay–Taguig 230 kV Transmission Line, 2-410 mm^2 TACSR SP-DC, 16 km.	
Silang–Taguig 500 kV Transmission Line	Cavite, Metro Manila	Dec 2027
	Substation Components: ▪ Silang 500 kV Substation, 4-500 kV PCBs and associated equipment, 2x30 MVAR, 500 kV Shunt Reactor and accessories; ▪ Taguig 500 kV Substation (Expansion), 4-500 kV PCBs and associated equipment. Transmission Components: ▪ Silang–Taguig 500 kV Transmission Line, ST-DC, 4-410mm^2 TACSR, 50 km;	
Mexico–Clark 69 kV Transmission Line Upgrading	Pampanga	Apr 2028
	Transmission Components: ▪ Mexico–Clark Line 69 kV Transmission Line, ST-DC, 2-795 MCM ACSR, 18 km.	
Liberty–Cabanatuan–San Rafael–Mexico 230 kV Transmission Line Upgrading	Nueva Ecija, Pampanga, Bulacan	Apr 2030
	Transmission Components: ▪ Liberty–Cabanatuan–San Rafael–Mexico 230 kV Transmission Line, ST-DC, 4-795 MCM ACSR, 140 km.	
Naga – Presentacion 230 kV Transmission Line	Camarines Sur	Dec 2030
	Substation Components: ▪ Naga 69 kV Substation, 2-69 kV PCBs and associated equipment. Transmission Components: Naga–Presentacion 230 kV Transmission Line, 1-795 MCM ACSR ST-DC, 71 km (initially energized at 69 kV).	
Limay–Pasay 230 kV Transmission Line	Bataan, Metro Manila	Dec 2030
	Substation Components: ▪ Limay 230 kV Substation, 4-230 kV PCBs and associated equipment; ▪ Pasay 230 kV Substation, 2-230 kV PCBs GIS and associated equipment. Transmission Components: ▪ Limay–Pasay 230 kV Transmission Line, SubCable-DC, 2-2,000 mm^2 XLPE, 42 km.	
Power Quality		
Luzon Voltage Improvement Project VI	Metro Manila, Bulacan, Laguna, Pampanga	Dec 2030
	Substation Components: ▪ Taguig 230 kV Substation, 1x100 MVAR, 230 kV Capacitor Banks and accessories;	

Project Name/Driver(s)	Province(s) and Components	ETC
	▪ Marilao 230 kV Substation, 2x100 MVAR, 230 kV Capacitor Banks and accessories; ▪ Calamba 230 kV Substation, 2x100 MVAR, 230 kV Capacitor Banks and accessories; ▪ Clark 230 kV Substation, 1x100 MVAR, 230 kV Capacitor Banks and accessories;	

8.3 Proposed Transmission Outlook for 2035

For year 2031-2035, the development of Fort Bonifacio Global City (FBGC) and San Mateo 230 kV Substation is needed to meet the forecasted increase in demand in the area. In addition, the transmission corridor in Metro Manila will be further strengthened by providing redundancy for FBGC–Taguig 230 kV Transmission Line and upgrading the Taguig–Muntinlupa 230 kV Transmission Line from single circuit to double circuit.

Outside Metro Manila, new 230 kV Substations were identified to address the demand in the area. These substations are the Baler 230 kV Substation in Aurora, Magalang 230 kV Substation in Pampanga and Presentacion 230 kV Substation in Camarines Sur.

To harness the bulk hydro generation capacities in the upstream of Apayao, the development of Kabugao 500/230 kV Substation is required and it will be linked to Santiago 500 kV Substation through the Santiago–Kabugao 500 kV Transmission Line.

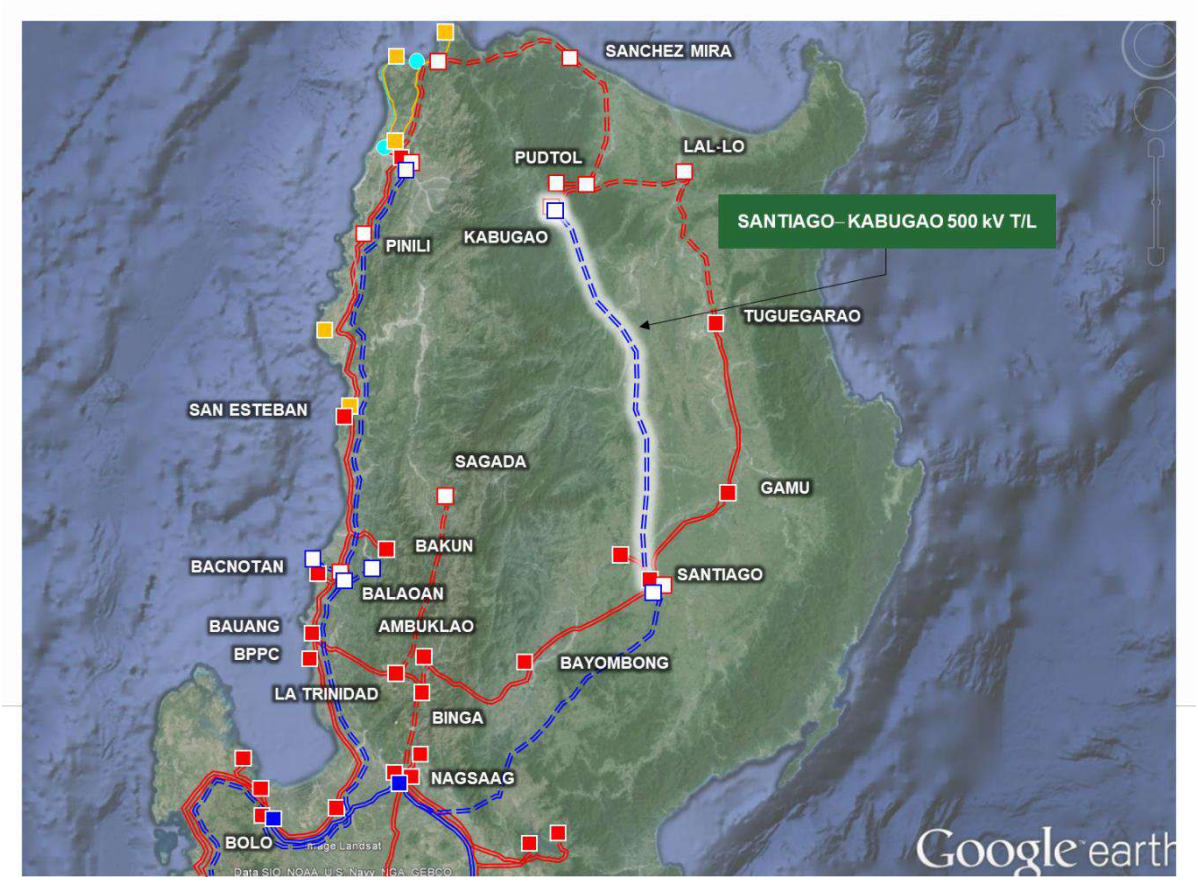


Figure 8.3.1: Proposed North Luzon Transmission Outlook for 2035

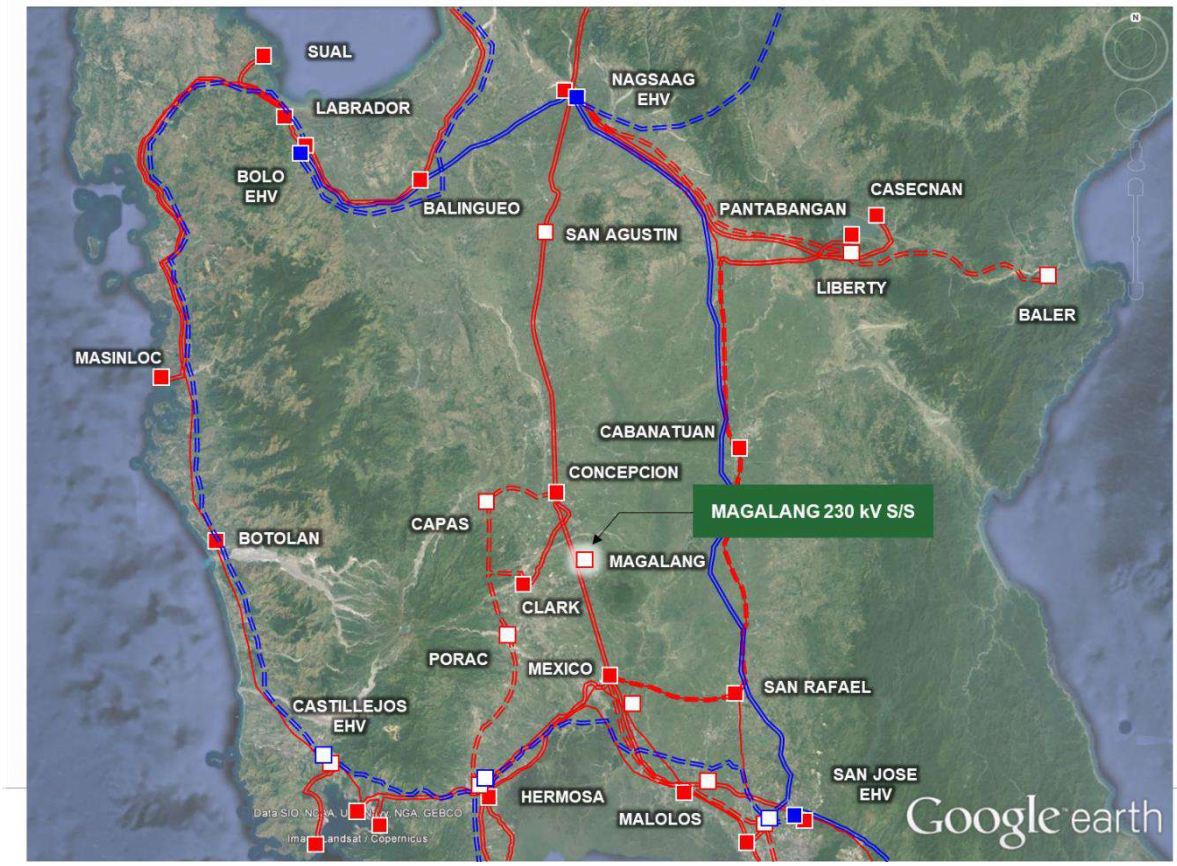


Figure 8.3.2: Proposed Central Luzon Transmission Outlook for 2035

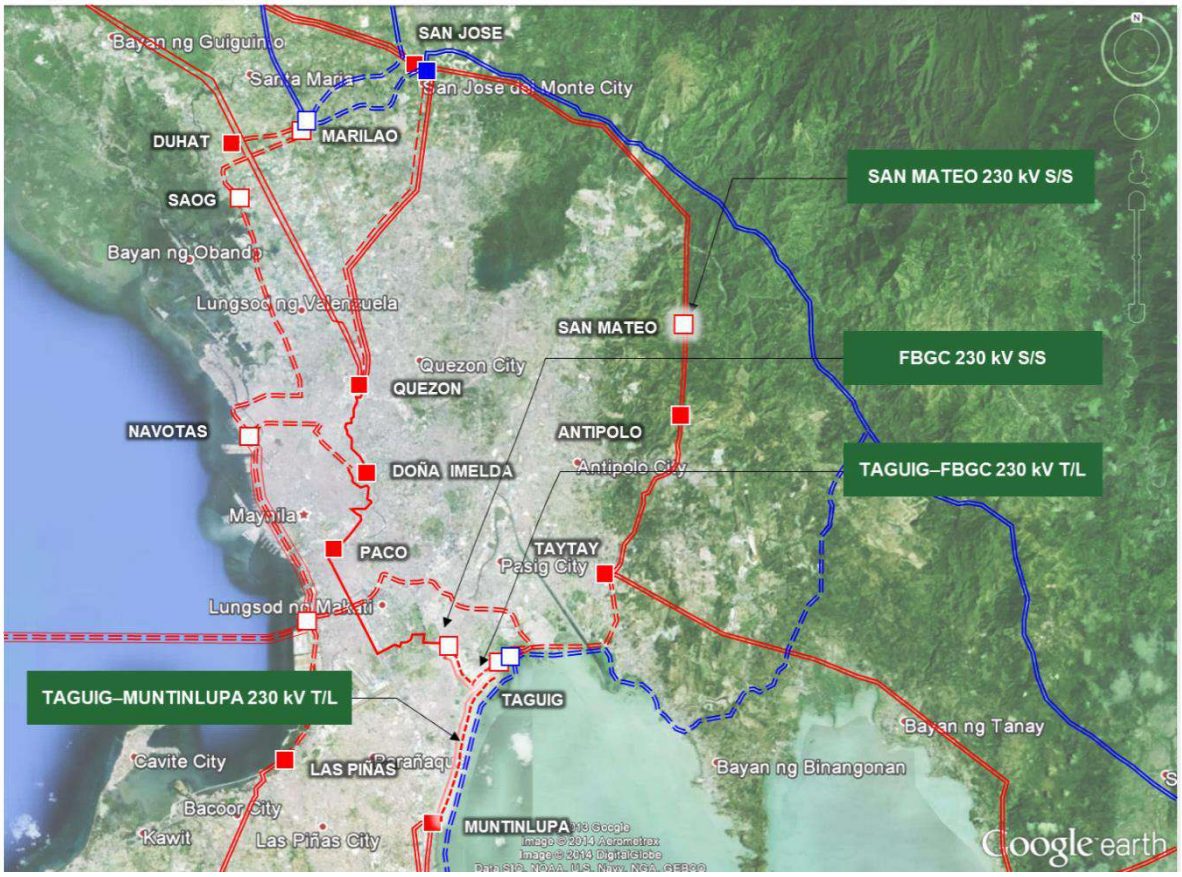


Figure 8.3.3: Proposed Metro Manila Transmission Outlook for 2035

Figure 8.3.4: Proposed Bicol Region Transmission Outlook for 2035

Table 8.3: Proposed Luzon Transmission Outlook for 2035

Project Name/Driver(s)	Province(s) and Components	ETC
Generation Entry		
Santiago–Kabugao 500 kV Transmission Line	Apayao, Isabela	Dec 2035
	Substation Components: ▪ Kabugao 500 kV Substation, 2x750 MVA, 500/230-13.8 kV Power Transformers and accessories, 6-500 kV PCBs and associated equipment, 2-230 kV PCB and associated equipment. ▪ Santiago 500 kV Substation, 4-500 kV PCBs and associated equipment. Transmission Components: ▪ Santiago–Kabugao 500 kV Transmission Line, ST-DC, 4-795 MCM ACSR, 171 km.	
Load Growth		
Magalang 230 kV Substation	Pampanga	Jun 2032
	Substation Components: ▪ Magalang 230 kV Substation, 1x300 MVA 230/69 kV Power Transformer and accessories, 8-230 kV PCBs, and associated equipment. Transmission Components: ▪ *Magalang 'bus-in' to Concepcion*–Mexico 230 kV Transmission Line, ST-DC, 2-410 mm^2 TACSR/AS, 5 km;	
FBGC 230 kV Substation	Metro Manila	Dec 2032
	Substation Components: ▪ FBGC 230 kV Substation, 8-230 kV PCBs (GIS) and associated equipment. Transmission Components: ▪ Valenzuela Cut-in to Taguig–Paco 230 kV Transmission Line, SP-SC, 2-610 mm^2 TACSR/AS, 2 km.	
San Mateo 230 kV Substation	Metro Manila	Dec 2033
	Substation Components: ▪ San Mateo 230 kV Substation, 10-230 kV PCBs and associated equipment. Transmission Components: ▪ San Mateo Cut-in to San Jose - Antipolo 230 kV Transmission Line, ST-DC, 4-795 MCM ACSR, 2 km.	
Presentacion 230 kV Substation	Camarines Sur	Dec 2035
	Substation Components: ▪ Naga 230 kV Substation, 4-230 kV PCBs and associated equipment; ▪ Presentacion 230 kV Substation, 2x50 MVA 230/69 kV Power Transformers and accessories, 6-230 kV PCBs and associated equipment, 3-69 kV PCBs and associated equipment.	
System Reliability		
Taguig–FBGC 230 kV Transmission Line	Metro Manila	Dec 2033
	Transmission Components: ▪ Taguig–FBGC 230 kV Transmission Line, SP-SC, 2-410 mm^2 TACSR/AS, 7.0 km.	
San Rafael–San Jose 230 kV Line Upgrading	Metro Manila	Dec 2035
	Substation Components: ▪ San Jose 230 kV Substation, 2-230 kV PCBs and associated equipment; ▪ San Rafael 230 kV Substation, 4-230 kV PCBs and associated equipment. Transmission Components: ▪ San Rafael–San Jose 230 kV Transmission Line, ST-DC, 4-795 MCM ACSR, 28 km.	
Taguig–Muntinlupa 230 kV Transmission Line	Metro Manila	Dec 2035
	Substation Components: ▪ Sucat 230 kV Substation, 1-230 kV PCB and associated equipment. Transmission Components: ▪ Taguig–Muntinlupa 230 kV Transmission Line, SP-SC, 2-410 mm^2 TACSR/AS, 11 km.	

8.4 Proposed Transmission Outlook for 2040

From year 2035 to 2040, the bulk of projects will be on providing reliability to the transmission network. On the 500 kV network, the Bataan–Cavite 500 kV Transmission Line and the Baras 500 kV Switching Station will be implemented. In the northern part of Luzon Grid, transmission backbone for the province of Aurora will be developed through the Santiago–Dinadiawan–Baler transmission line project. The Sagada–San Esteban 230 kV Transmission Line will provide transmission corridor in Mountain Province Area by completing the La Trinidad–Sagada San Esteban transmission loop. Another transmission corridor will also be developed through the Capas–Kadampat 230 kV Line.

To accommodate additional generation capacities, the development of the Kalinga 500 kV Substation to cater the proposed Hydro Plants in the area. In Sorsogon, the Matnog 230 kV Substation will be developed to cater the wind farm projects.

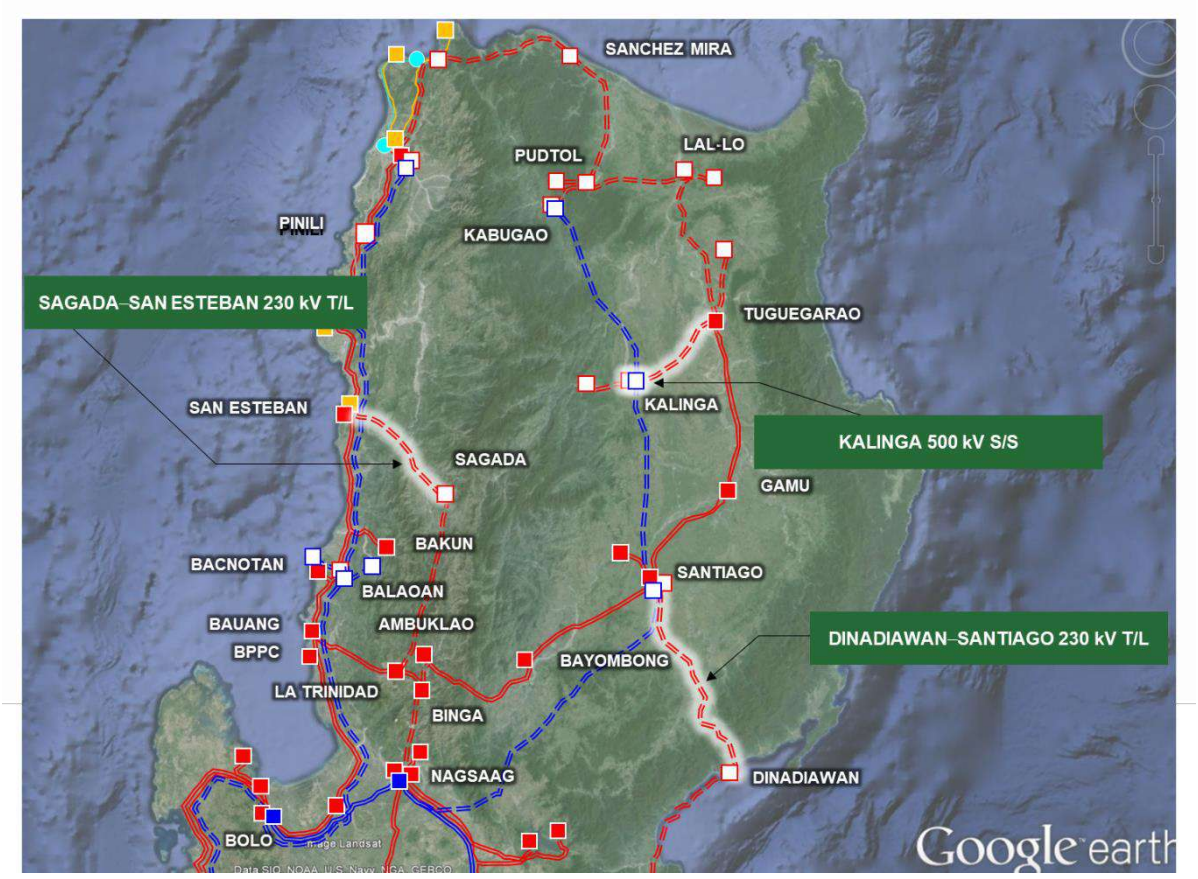


Figure 8.4.1: Proposed North Luzon Transmission Outlook for 2040

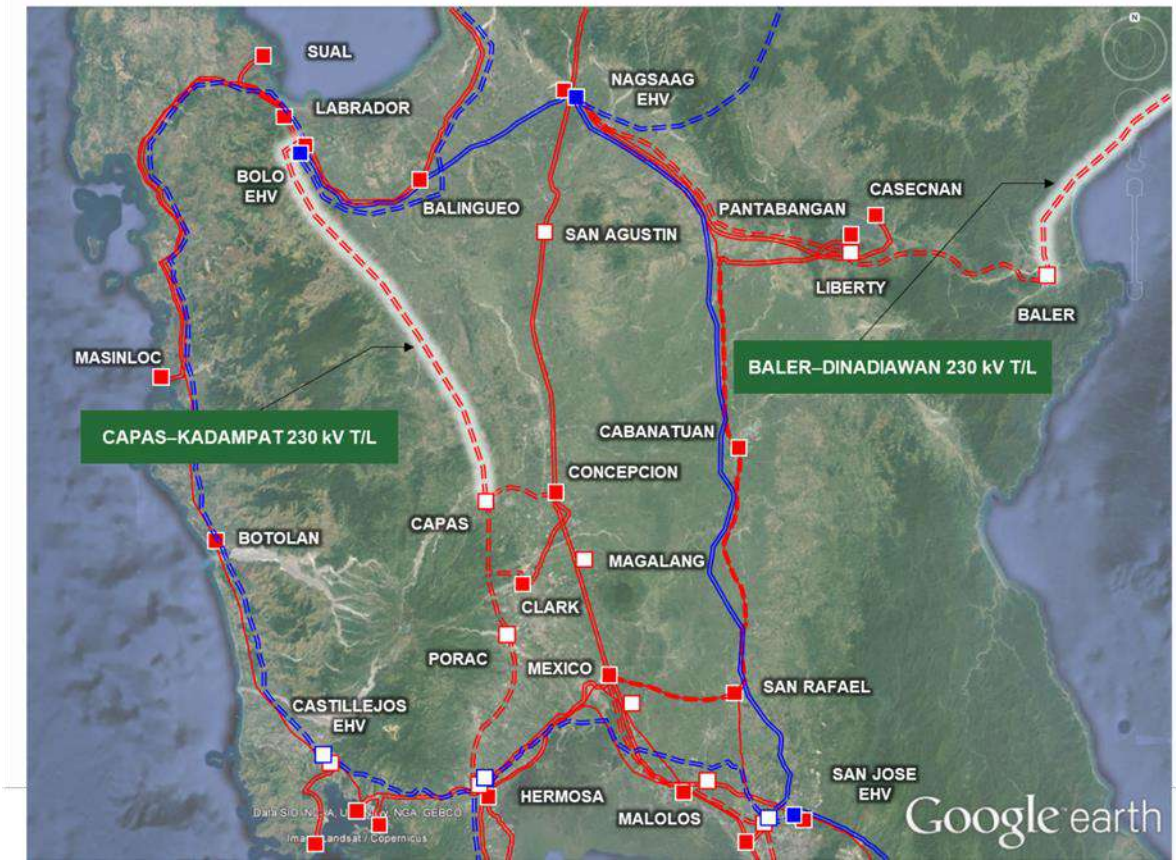


Figure 8.4.2: Proposed Central Luzon Transmission Outlook for 2040

Figure 8.4.3: Proposed Metro Manila Transmission Outlook for 2040

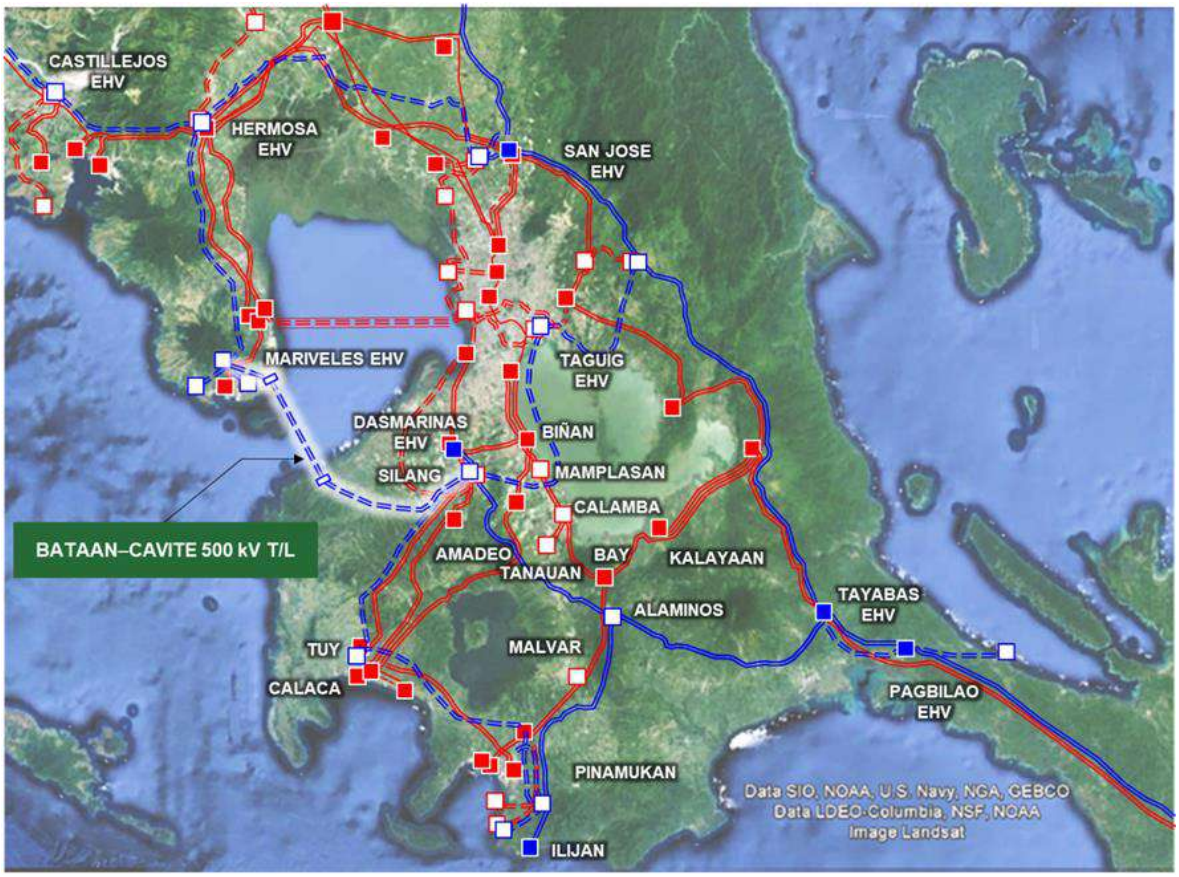


Figure 8.4.4: Proposed South Luzon Transmission Outlook for 2040

Figure 8.4.5: Proposed Bicol Region Transmission Outlook for 2040

Table 8.4: Proposed Luzon Transmission Outlook for 2040

Project Name/Driver(s)	Province(s) and Components	ETC
Generation Entry		
Matnog 230 kV Substation	Sorsogon	May 2039
	Substation Components: ▪ Matnog 230 kV Substation, 2x50 MVA, 230/69 kV Power Transformer and accessories, 6-230 kV PCBs and associated equipment; ▪ Abuyog 230 kV Substation, 4-230 kV PCB and associated equipment. Transmission Components: ▪ Abuyog–Matnog 230 kV Transmission Line, ST-DC, 2-795 MCM ACSR, 38 km.	
Kalinga 500 kV Substation	Kalinga	Dec 2040
	Substation Components: ▪ Kalinga 500 kV Substation, 2x750 MVA, 500/230 kV Power Transformer; 10-500 kV PCBs and associated equipment; 6-230 kV PCBs and associated equipment Transmission Components: ▪ Kalinga 500 kV bus-in Transmission Line, ST-DC, 4-795 MCM ACSR, 2 km.	
System Reliability		
Baras 500 kV Switching Station	Rizal	Dec 2038
	Substation Components: ▪ Baras 500 kV Substation, 10-500 kV PCBs and associated equipment.	
Sagada–San Esteban 230 kV Transmission Line	Mountain Province, Ilocos Sur	Dec 2040
	Substation Components: ▪ Sagada 230 kV Substation, 2x100 MVA, 230/69 kV Power Transformer and accessories, 6-230 kV PCBs and associated equipment, 6-69 kV PCB and associated equipment. ▪ San Esteban 230 kV Substation, 4-230 kV PCB and associated equipment. Transmission Components: ▪ Sagada–San Esteban 230 kV Transmission Line, ST-DC, 2-795 MCM ACSR, 60 km.	
Santiago–Dinadiawan 230 kV Transmission Line	Isabela, Aurora	Dec 2040
	Substation Components: ▪ New Santiago 230 kV Substation, 4-230 kV PCBs and associated equipment; ▪ Dinadiawan 230 kV Substation, 1x50 MVA 230/69-13.8 kV Power Transformer and accessories, 5-230 kV PCBs and associated equipment; 3-69 kV PCBs and associated equipment; Transmission Components: ▪ Santiago–Dinadiawan 230 kV Transmission Line, ST-DC, 1-795 MCM ACSR/AS, 100.0 km.	
Baler–Dinadiawan 230 kV Transmission Line	Isabela, Aurora	Dec 2040
	Substation Components: ▪ Baler 230 kV Substation, 4-230 kV PCBs and associated equipment. ▪ Dinadiawan 230 kV Substation, 4-230 kV PCBs and associated equipment; Transmission Components: ▪ Baler–Dinadiawan 230 kV Transmission Line, ST-DC, 1-795 MCM ACSR/AS, 52.6 km.	
Capas–Kadampat 230 kV Transmission Line	Tarlac, Pangasinan	Dec 2040
	Substation Components: ▪ Capas 230 kV Substation, 4-230 kV PCBs and associated equipment. ▪ Kadampat 230 kV Substation, 4-230 kV PCBs and associated equipment; Transmission Components: ▪ Capas–Kadampat 230 kV Transmission Line, ST-DC, 4-795 MCM ACSR/AS, 80 km.	
Bataan–Cavite 230 kV Transmission Line	Bataan, Cavite	Dec 2040
	Substation Components: ▪ Mariveles 500 kV Substation, 4-500 kV PCBs and associated equipment; 2x90 MVAR 500 kV Shunt Reactors; ▪ Silang 500 kV Substation, 4-500 kV PCBs and associated equipment. Transmission Components: ▪ Mariveles OHTL ST-DC, 4-795 MCM ACSR, 9 km; ▪ SubCable-DC, 2-2,500 mm^2 XLPE, 22 km; ▪ Cavite OHTL ST-DC, 4-795 MCM ACSR, 38 km.	

Project Name/Driver(s)	Province(s) and Components	ETC
Upgrading of Bicol Transmission Facilities	Camarines Sur, Albay, Sorsogon	Dec 2040
	Transmission Components: Naga–Daraga–BacMan 500 kV Transmission Line, ST-DC, 4-795 MCM ACSR/AS, 120 km. (initially energized at 230 kV)	

In addition to the projects presented in Chapter 7 which are on various stages of implementation, this section will provide the other identified system requirements in the Visayas Grid but are still subject to regulatory approval prior to implementation. ERC applications for some of the new projects have been made already.

With reference to the DOE list, Cebu and Panay are the main sites for large generation capacity additions specifically for coal-fired power plants. For RE-based plants, on the other hand, it can be observed that the concentration is in Negros and Panay Islands, most of which have already materialized. Such direction of generation development would further emphasize the need to reinforce the 138 kV submarine cable interconnections between Cebu, Negros and Panay.

Presently, the 230 kV facilities are in Leyte and Cebu only but the development of a 230 kV transmission backbone to reach up to Panay Island has been part of the master plan in order to support the generation developments and also to avert the criticality of island grid separations due to the present long radial line configuration of the Visayas Grid. The implementation of this project, which is called Cebu-Negros-Panay 230 kV Backbone, is divided into three stages. The first stage is the additional submarine cable between Negros and Panay. As presented in Chapter 7, this project was already energized in October 2016 and addresses the congestion and market issues being encountered due to the limited capacity of the existing single-circuit 138 kV link. Also, the existing Negros-Cebu 138 kV can only export a maximum of 180 MW of excess generation capacity. This will be insufficient just with the entry of committed power plants only. Thus, the second and third stages of the new 230 kV backbone, which will be discussed in this chapter, are the next major requirements in the Visayas Grid.

Within Cebu Island where the load center is located, the development of new 230 kV load substations and implementation of new 230 kV transmission line extensions are required to ensure adequate supply facilities in the long term. Other bulk generation additions such as the proposed coal-fired power plant of Salcon Power Corporation and Ludo Power Corporation will also require grid reinforcements. Similar with other urbanized area, securing right-of-way in Cebu is also a major challenge in transmission project implementation.

In Panay, the new developments in the tourism industry in Boracay Island would result in an increase in power supply requirements. It is projected that the existing 69 kV submarine cable serving the island would not be adequate in supporting load growth in the coming years. Thus, this is also one of the areas requiring grid reinforcements through the installation of additional submarine cable under the Nabas–Caticlan–Boracay 138 kV Transmission Line Project. Large capacities of wind and hydro are also being proposed in Panay that will trigger the installation of the second circuit 230 kV submarine cable between Negros and Panay.

Another major submarine cable project to be implemented within the next 10 years is the Cebu–Bohol 230 kV Interconnection Project. Presently, Bohol Island has power deficiency issue due to limited power sources in the island. In 2017, the maximum demand in Bohol reached 81 MW. Almost 90% of the island's supply comes from Leyte via the Leyte–Bohol submarine cable which is already equivalent to 70% of the submarine cable's capacity. By 2020, it is expected that the Leyte–Bohol Interconnection will be overloaded. The implementation of Cebu–Bohol 230 kV Interconnection Project would significantly boost the supply reliability to support the load growth in the island as will be brought about by its direct access to the bulk generations located in Cebu. It can be noted also that during the Typhoon

Yolanda and recent earthquake incident which affected the transmission facilities in Ormoc, Leyte area, the supply for Bohol Island was also interrupted because there is no alternate source for the island. Such concern will also be addressed by Cebu–Bohol 230 kV Interconnection Project.

9.1 Proposed Transmission Projects up to 2025

Shown in Table 9.1 is the list of transmission projects planned for Visayas in the period 2019-2025 in addition to the projects already approved by the ERC.

Table 9.1: Proposed Transmission Projects for Visayas

Project Name/Driver(s)	Province(s)	ETC
Generation Entry		
Cebu–Negros–Panay 230 kV Backbone Project - Stage 2	Cebu	May 2020
	Substation Components: ▪ Cebu 230 kV S/S, 3x300 MVA 230/138 kV Power Transformer and accessories, 8-230 kV PCBs (GIS) and 3-138 kV PCB and associated equipment. ▪ Construction of Warehouse Transmission Components: ▪ Extension of Magdugo–Cebu 230 kV Lines, ST/SP-DC, 2-610 mm^2 TACSR OHTL, 0.75 km; ▪ Extension of Cebu–Lapulapu 230 kV Lines, Underground Cable System, Double Circuit of 1200 MW Capacity, 0.425 km and 2-410 mm^2 STACIR, ST/SP-DC, 0.150 km; ▪ Extension of Colon–Quiot–Cebu 138 kV Lines, 138 kV Underground Cables, Double Circuit of 180 MW capacity, 0.250 km. Bulk Cost Estimate: 3,204 million Pesos	
Panay–Guimaras 138 kV Interconnection Project	Panay	Nov 2021
	Substation Components: ▪ PEDC 138 kV S/S, 1x100 MVA 138/69-13.8 kV Power Transformer and accessories, 2-138 kV PCBs, 8-69 kV PCBs and associated equipment; ▪ Zaldivar 138 kV S/S, 2x100 MVA 138/69-13.8 kV Power Transformer and accessories, 6-138 kV PCBs, 1-69 kV PCB and associated equipment. Transmission Components: ▪ Ingore–PEDC 138 kV T/L, ST-DC, 1-795 MCM ACSR, 2 km; ▪ Zaldivar CTS–Zaldivar SS 138 kV T/L, ST-DC, 2-795 MCM ACSR, 1km; ▪ Zaldivar 69 kV bypass line, ST-SC, 1-336.4 MCM ACSR, 0.7 km; ▪ PECO Baldoza 69 kV line transfer, SP-SC, 1-336.4 MCM ACSR, 0.07 km; ▪ PPC & PECO 69 kV line transfer, SP-SC, 1-336.4 MCM ACSR, 0.09 km; ▪ Banuyao 69 kV line transfer, SP-SC, 1-336.4 MCM ACSR, 0.8 km. Bulk Cost Estimate: 2,419 million Pesos	
Negros–Panay 230 kV Interconnection Line 2 Project	Negros and Panay	May 2024
	Substation Components: ▪ Barotac Viejo S/S Expansion, 1x40 MVAR, 230 kV shunt reactor, 2-230 kV PCBs and associated equipment, associated submarine cable termination equipment; ▪ E.B. Magalona S/S (Expansion), 1x40 MVAR, 230 kV shunt reactor, 3-230 kV PCB and associated equipment. Submarine Cable Components: ▪ Barotac CTS–Barotac Viejo S/S, 1-1,600 mm^2 XLPE Underground Cable, SC, 0.75 km; ▪ Barotac Viejo–E. B. Magalona, 230 kV, Single Circuit, 3-1,600 mm^2 XLPE submarine cables, SC, 22 km. Bulk Cost Estimate: 6,937 million Pesos	

Project Name/Driver(s)	Province(s)	ETC
Barotac Viejo–Nabas 230 kV Transmission Line Project	Iloilo, Aklan	Dec 2025
	Substation Components: Nabas S/S, 2x300 MVA 230/138 kV Power Transformer and accessories, 10-230 kV PCBs, 2-138 kV PCBs and associated equipment; Barotac Viejo 230 kV S/S (Expansion), 4-230 kV PCBs and associated equipment. Transmission Components: ▪ Barotac Viejo–Nabas T/L, ST-DC, 4-795 MCM ACSR, 140 km. Bulk Cost Estimate: 13,754 million Pesos	
Load Growth		
Nabas–Caticlan–Boracay Transmission Project	Aklan	Nov 2020
	Stage 1 (Mar 2020) Power Cable Components: ▪ Caticlan–Boracay Power Cable, XLPE Submarine Cable System, Double circuit of 100 MW capacity at 138 kV, 2 km; ▪ Manocmanoc–Boracay, 69 kV, SP-SC, 1-336.4 MCM ACSR, 1 km; ▪ Caticlan CTS (New), Cable Sealing End. Stage 2 (Nov 2020) Substation Components: ▪ Boracay 138 kV S/S (New), 2x100 MVA 138/69-13.2 kV Power Transformer and accessories, 7-138 kV PCB, 8-69 kV PCB and associated equipment; ▪ Nabas 138 kV S/S, 4-138 kV PCB and associated equipment. Transmission Components: ▪ Nabas–Caticlan 138 kV T/L, Combination of ST/SP-DC, 1-795 MCM ACSR, 14 km. and two circuits of Underground Cable System of 180 MW capacity at 138 kV, 8 km. Bulk Cost Estimate: 8,519 million Pesos	
Cebu–Bohol 230 kV Interconnection Project	Cebu, Bohol	Oct 2021
	Substation Components: ▪ Dumanjug 230 kV S/S, 2x40 MVAR shunt reactors, 6-230 kV PCBs and associated equipment; ▪ Corella 230 kV S/S, 2x300 MVA, 230/138kV Power Transformer and accessories, 2x40 MVAR 230 kV shunt reactors, 8-230 kV PCBs, 4-138 kV PCBs and associated equipment. Transmission Components: ▪ Dumanjug–Argao, 230 kV, ST-DC, 4-795 MCM ACSR, 25 km; ▪ Loon–Corella, 230 kV, ST-DC, 4-795 MCM ACSR, 17 km. Submarine Cable Components: ▪ Argao–Loon, Single circuit submarine cable system of 400 MW capacity at 230 kV, 30 km. Bulk Cost Estimate: 8,510 million Pesos	
Laray 230 kV Substation Project	Cebu	Apr 2022
	Substation Components: ▪ Laray 230 kV S/S (New), 3x100 MVA 138/69-13.8 kV Power Transformer and accessories, 11-230 kV PCB (GIS) (138 kV energized), 7-69 kV PCB (GIS) and associated equipment. Transmission Components: ▪ OHTL from Laray to Tapping Point along Magdugo–Colon 230 kV Lines (138 kV energized), ST/SP-DC, 2-610 mm^2 TACSR, 4-795 MCM ACSR, 23 km. Bulk Cost Estimate: 5,173 million Pesos	
Amlan–Dumaguete 138 kV Transmission Project	Negros Oriental	Dec 2021
	Substation Components: ▪ Amlan 138 kV S/S, 3-138 kV PCBs and associated equipment; ▪ Dumaguete 138 kV S/S (New), 2x50 MVA, 138/69-13.8 kV Power Transformer and accessories, 6-138 kV PCBs, 6-69 kV PCBs and associated equipment. Transmission Components: ▪ Amlan–Dumaguete 138 kV T/L, ST-DC, 1-795 MCM ACSR, 25 km. Bulk Cost Estimate: 2,483 million Pesos	

Project Name/Driver(s)	Province(s)	ETC
Babatngon–Palo 230 kV Transmission Line Project	Southern Leyte	Dec 2022
	Substation Components: ▪ Babatngon 138 kV S/S, 3-138 kV PCBs and associated equipment; ▪ Palo 138 kV S/S (New), 2x50 MVA, 138/69-13.8 kV Power Transformer and accessories, 6-230 kV PCBs, 8-69 kV PCBs and associated equipment. Transmission Components: ▪ Babatngon–Palo 230 kV T/L (138 kV energized), ST-DC, 4-795 MCM ACSR, 20 km. Bulk Cost Estimate: 3,044 million Pesos	
Silay 230 kV Substation Project	Silay, Negros Occidental	Oct 2024
	Substation Components: ▪ Silay S/S, 2x300 MVA, 230/69-13.8 kV Power Transformer and accessories, 10-230 kV PCBs and associated equipment, 6-69 kV PCBs and associated equipment. Transmission Components: ▪ Bus-in of Silay S/S to Bacolod–E.B. Magalona T/L, 230 kV T/L, ST/SP-DC, 2-795 MCM ACSR, 7 km. Bulk Cost Estimate: 2,517 million Pesos	
Unidos 138 kV Substation Project	Unidos, Panay	Dec 2024
	Substation Components: ▪ Unidos S/S, 2x100 MVA, 138/69-13.8 kV Power Transformer and accessories, 11-138 kV PCBs, 8-69 kV PCBs and associated equipment. Transmission Components: ▪ Bus-in of Unidos S/S to Nabas–Caticlan T/L, 138 kV T/L, ST/SP-DC, 1-795 MCM ACSR, 1 km. Bulk Cost Estimate: 1,420 million Pesos	
Kalibo 138 kV Substation Project	Panay	Dec 2024
	Substation Components: ▪ Kalibo S/S, 2x100 MVA, 138/69 kV Power Transformer and accessories, 10-138 kV PCBs, 6-69 kV PCBs and associated equipment. Transmission Components: ▪ Bus-in of Kalibo S/S to Panitan–Nabas T/L, 138 kV T/L, ST-DC, 1-795 MCM ACSR, 1 km. Bulk Cost Estimate: 1,412 million Pesos	
La Carlota 138 kV Substation Project	Negros	Dec 2024
	Substation Components: ▪ La Carlota S/S, 2x100 MVA, 138/69 kV Power Transformer and accessories, 10-138 kV PCBs, 6-69 kV PCBs and associated equipment. Transmission Components: ▪ Bus-in of La Carlota S/S to Bacolod–Kabankalan T/L, 138 kV T/L, ST-DC, 1-795 MCM ACSR, 1 km. Bulk Cost Estimate: 1,412 million Pesos	
Baybay 138 kV Substation Project	Leyte	Dec 2024
	Substation Components: ▪ Baybay S/S: 2x100 MVA, 138/69 kV Power Transformer and accessories, 10-138 kV PCBs, 6-69 kV PCBs and associated equipment. Transmission Components: ▪ Bus-in of Baybay S/S to Ormoc–Maasin T/L, 138 kV T/L, ST-DC, 1-795 MCM ACSR, 1 km. Bulk Cost Estimate: 1,412 million Pesos	
Tigbauan 138 kV Substation Project	Iloilo	Dec 2024
	Substation Components: ▪ Tigbauan 138 kV S/S, 2x100 MVA 138/69 kV Power Transformer and accessories, 10-138 kV PCBs, 6-69 kV PCBs and associated equipment. Transmission Components:	

Project Name/Driver(s)	Province(s)	ETC
	▪ Bus-in of Tigbauan S/S to Sta. Barbara–San Jose T/L, 138 kV T/L, ST-DC, 1-795 MCM ACSR, 1 km. Bulk Cost Estimate: 1,765 million Pesos	
Corella–Tagbilaran 138 kV Transmission Line Project (69 kV energized)	Bohol	Dec 2024
	Substation Components: ▪ Tagbilaran SWS, 6-69 kV PCBs and associated equipment; ▪ Corella S/S: 1-69 kV PCB and associated equipment. Transmission Components: ▪ Corella–Tagbilaran T/L, ST-DC, 1-795 MCM ACSR, 138 kV designed (69 kV energized), 5 km. Bulk Cost Estimate: 1,710 million Pesos	
Sogod 230 kV Substation Project	Sogod, Cebu	May 2025
	Substation Components: ▪ Sogod S/S, 2x300 MVA, 230/69-13.8 kV Power Transformer and accessories, 10-230 kV PCBs, 7-69 kV PCBs and associated equipment. Bulk Cost Estimate: 2,606 million Pesos	
Iloilo 230 kV Substation Project	Iloilo, Panay	Jun 2025
	Substation Components: ▪ Iloilo S/S, 2x300 MVA, 230/69-13.8 kV Power Transformer and accessories, 6-230 kV PCBs, 7-69 kV PCBs and associated equipment; ▪ Barotac Viejo S/S (Expansion), 4-230 kV PCBs and associated equipment. Transmission Components: ▪ Barotac Viejo–Iloilo 230 kV T/L, ST-DC, 4-795 MCM ACSR, 45 km. Bulk Cost Estimate: 5,125 million Pesos	
System Reliability		
Visayas Substation Upgrading Project - 1	Cebu, Leyte, Samar	Jul 2021
	Substation Components: Cebu: ▪ Daanbantayan S/S, 1x100 MVA 230/69-13.8 kV Power Transformer and accessories, 3-69 kV PCBs and associated equipment. Leyte: ▪ Tabango S/S, 1x50 MVA 230/69-13.8 kV Power Transformer and accessories; ▪ Maasin S/S, 1x50 MVA 138/69-13.8 kV Power Transformer and accessories. Samar: ▪ Calbayog S/S, 1x50 MVA 138/69-13.8 kV Power Transformer and accessories, 1-138 kV PCB, 2-69 kV PCBs and associated equipment. Bulk Cost Estimate: 1,187 million Pesos	
Calbayog–Allen 138 kV Transmission Line Project	Samar, Northern Samar	Apr 2022
	Substation Components: ▪ Calbayog S/S, 1-69 kV PCB and associated equipment. Transmission Components: ▪ Calbayog–Allen 138 kV T/L (69 kV energized), ST/SP-DC, 1-795 MCM ACSR, 78 km. Bulk Cost Estimate: 944 million Pesos	
Barotac Viejo–Natividad 69 kV Transmission Line Project	Iloilo	Jul 2022
	Transmission Components: ▪ Barotac Viejo–Natividad 69 kV T/L, SP-SC, 1-336.4 MCM ACSR, 7km. Bulk Cost Estimate: 58 million Pesos	
Visayas Substation Upgrading Project - 2	Cebu, Negros, Panay, Leyte	Dec 2024
	Substation Components: Leyte: ▪ Tabango S/S, 1x50 MVA 230/69-13.8 kV Power Transformer and accessories, 2-230 kV PCBs, 4-69 kV PCBs and associated equipment. Cebu:	

Project Name/Driver(s)	Province(s)	ETC
	▪ Calong-calong S/S, 1x50 MVA 138/69-13.8 kV Power Transformer and accessories, 1-138 kV PCBs, 4-69 kV PCBs and associated equipment; ▪ Colon 138 kV S/S, 2x100 MVA 138/69-13.8 kV Power Transformer and accessories; ▪ Compostela S/S, 1x50 MVA 138/69-13.8 kV Power Transformer and accessories, 1-138 kV PCB, 4-69 kV PCBs and associated equipment; ▪ Daanbantayan S/S, 1x100 MVA 230/69 kV Power Transformer and accessories, 1-230 kV PCB, 3-69 kV PCBs and associated equipment; ▪ Lapulapu S/S, 1-69 kV PCB (GIS) and associated equipment. Negros: ▪ Kabankalan S/S, 2x50 MVA 138/69-13.8 kV Power Transformer and accessories, 2-138 kV PCBs, 4-69 kV PCBs and associated equipment; ▪ Mabinay S/S, 1x50 MVA 138/69-13.8 kV Power Transformer and accessories, 2-138 kV PCBs, 2-69 kV PCBs and associated equipment; ▪ E.B. Magalona S/S, 2x30 MVA, 138/69-13.8 kV Power Transformer (transferred from Panitan S/S), 3-138 kV PCBs, 3-69 kV PCBs and associated equipment. Panay: ▪ San Jose S/S, 1x50 MVA 138/69-13.8 kV Power Transformer and accessories, 2-138 kV PCBs, 1-69 kV PCB and associated equipment; ▪ Panitan S/S, 2x100 MVA 138/69-13.8 kV Power Transformer and accessories, 12-69 kV PCBs and associated equipment. Rehabilitation of the Control Center and other facilities; ▪ Dingle S/S, 1x50 MVA 138/69-13.8 kV Power Transformer and accessories, 2-138 kV PCBs, 5-69 kV PCBs and associated equipment. Bulk Cost Estimate: 3,155 million Pesos	
Babatngon–Sta. Rita 138 kV Transmission Line Upgrading	Leyte, Samar	Jan 2025
	<u>Substation Components:</u> ▪ Sta. Rita S/S, 1x50 MVA 138/69-13.8 kV Power Transformer and accessories, 10-138 kV PCBs, 5-69 kV PCBs and associated equipment. <u>Transmission Components:</u> ▪ Babatngon–Paranas 138 kV T/L (portion along San Juanico Strait), ST-DC, 1-795 MCM ACSR, 1.8 km; ▪ Bus-in of Sta. Rita S/S to Babatngon–Paranas T/L, 138 kV T/L, ST-DC, 1-795 MCM ACSR, 0.8 km. Bulk Cost Estimate: 856 million Pesos	
Bayawan–Sipalay 138 kV Transmission Line	Negros Occidental and Negros Oriental	Jan 2025
	<u>Substation Components:</u> ▪ Bayawan 138 kV S/S (69 kV energized), 1x5 MVAR 69 kV Capacitor Bank, 2-69 kV PCBs and associated equipment; ▪ Sipalay 138 kV SWS (energized at 69 kV), 1-69 kV PCB and associated equipment. <u>Transmission Components:</u> ▪ Bayawan–Sipalay 138 kV T/L (69 kV energized), ST/SP-DC, 1-795 MCM ACSR, 74 km. Bulk Cost Estimate: 1,700 million Pesos	
Siaton–Bayawan 138 kV Transmission Line	Negros Occidental and Negros Oriental	Jan 2025
	<u>Substation Components:</u> ▪ Siaton 138 kV SWS (69 kV energized), 1x5 MVAR 69 kV Capacitor Bank, 4-69 kV PCBs and associated equipment; ▪ Bayawan 69 kV SWS, 2-69 kV PCB and associated equipment. <u>Transmission Components:</u> ▪ Siaton–Bayawan 138 kV T/L (69 kV energized), ST/SP-DC, 1-795 MCM ACSR, 52 km. Bulk Cost Estimate: 1,562 million Pesos	
Laray–Naalad 230 kV Energization Project	Cebu	Apr 2025
	<u>Substation Components:</u> ▪ Naalad 230 kV SWS, 10-230 kV PCBs and associated equipment;	

Project Name/Driver(s)	Province(s)	ETC
	▪ Energization of Laray to 230 kV, 2x300 MVA, 230/69-13.8 kV Power Transformer and accessories. Transmission Components: ▪ Extension of Laray-Naalad Switching Station 230 kV T/L, ST-DC, 4-795 MCM ACSR, 10 km. Bulk Cost Estimate: 2,474 million pesos	
Laray–Cordova 230 kV Transmission Line Project	Cebu	Apr 2025
	Substation Components: ▪ Cordova S/S, 2x300 MVA, 230/69-13.8 kV Power Transformer and accessories, 6-230 kV PCBs, 8-69 kV PCBs and associated equipment. ▪ Laray SWS, 8-230 kV PCBs and associated equipment; Transmission Components: ▪ Laray S/S–Laray SWS, ST-DC, 4-795 MCM ACSR, 5 km; ▪ Laray SWS–Cordova S/S, 230 kV submarine Cable, 600 MW capacity or higher per circuit, Double Circuit, 6.5 km. Bulk Cost Estimate: 13,794 million pesos	
Tabango–Biliran 69 kV Transmission Line Project	Leyte	Jun 2025
	Substation Components: ▪ Tabango S/S, 2-69 kV PCB and associated equipment; ▪ Biliran SWS, 2-69 kV PCB and associated equipment. Transmission Components: ▪ Tabango–Biliran 69 kV T/L, ST-DC, 1-795 MCM ACSR, 35 km. Bulk Cost Estimate: 1,235 million Pesos	
Taft–Bobolosan 138 kV Transmission Line Project	Northern and Eastern Samar	Jun 2025
	Substation Components: ▪ Bobolosan SWS, 2-69 kV PCBs and associated equipment; ▪ Taft SWS, 3-69 kV PCB and associated equipment. Transmission Components: ▪ Bobolosan–Taft 138 kV T/L (69 kV energized), ST/SP-DC, 1-795 MCM ACSR, 123 km. Bulk Cost Estimate: 1,722 million Pesos	

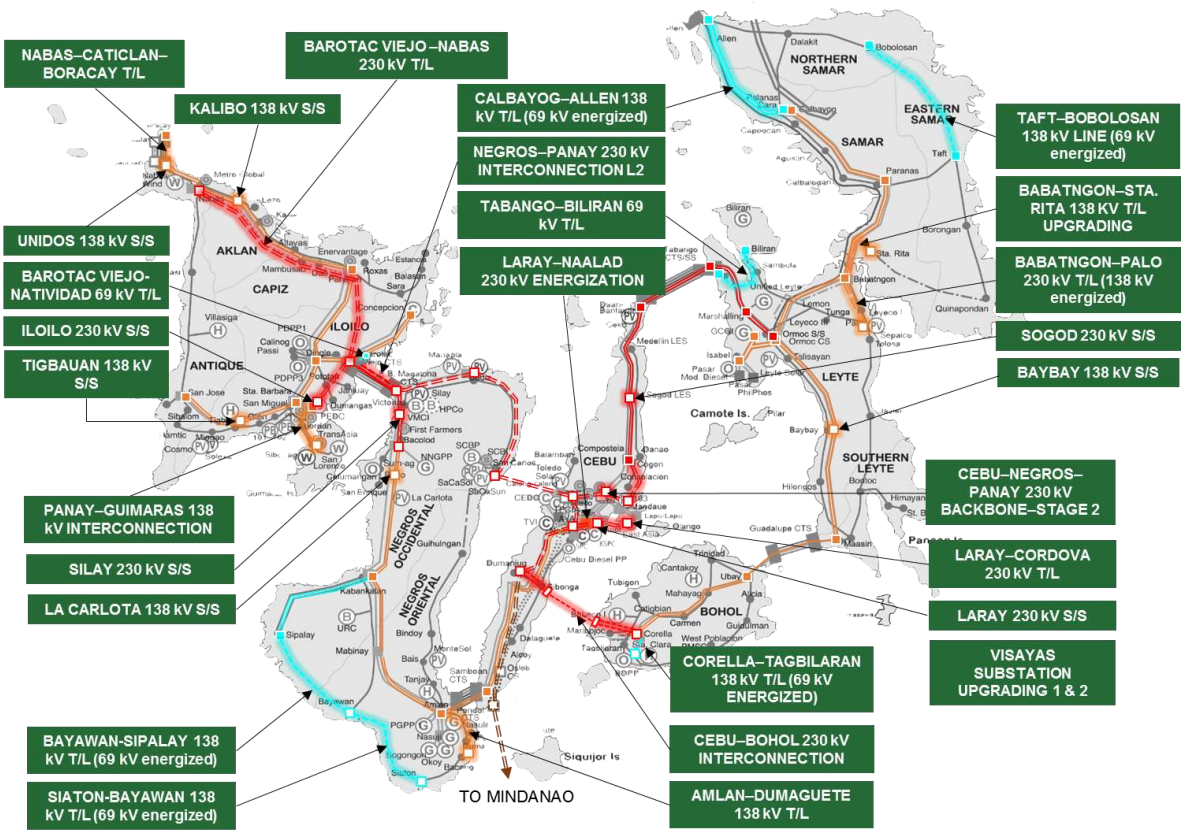
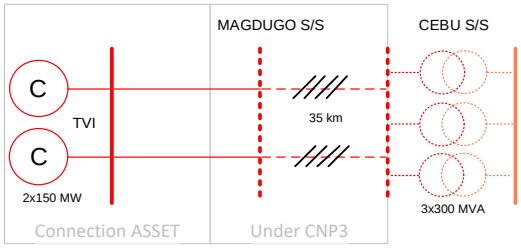


Figure 9.1: Proposed Visayas Transmission Outlook for 2025

9.1.1 Cebu–Negros–Panay 230 kV Backbone Project - Stage 2



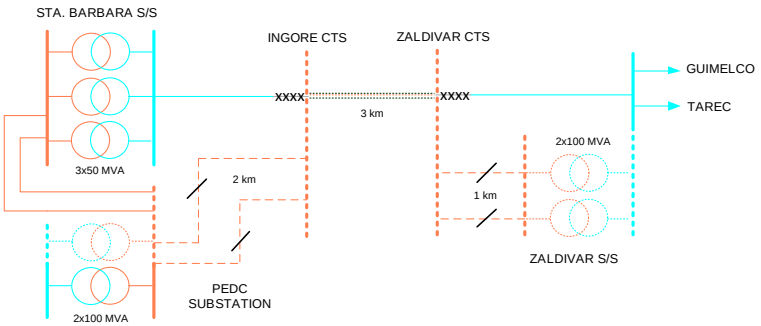
Therma Visayas, Inc. is developing a 300 MW coal-fired power plant in Toledo City, Cebu and is intended to supply additional power to the load centers in Metro Cebu. However, the existing transmission system between the area of Toledo and the major drawdown substations in Metro Cebu has limited capacity to effectively accommodate the entire generation capacity of the new power plant. Hence, there will be power curtailment.

In order to ensure the effective full generation dispatch of the new power plant, a new transmission corridor, which includes high-capacity transmission line and new substation facilities, is being proposed towards Metro Cebu. The transmission line portion was previously classified as connection assets and will be implemented by the power plant proponent. On the other hand, the substation portion is classified as transmission asset, hence, the object of this project. It can be noted also that the transmission line which will be developed from Magdugo to Cebu will serve as an integral part of 230 kV backbone in the Visayas.

The project involves the construction of 230 kV facilities in the existing Cebu 138 kV Substation to facilitate the connection of the proposed transmission line from Toledo.

9.1.2 Panay–Guimaras 138 kV Interconnection Project

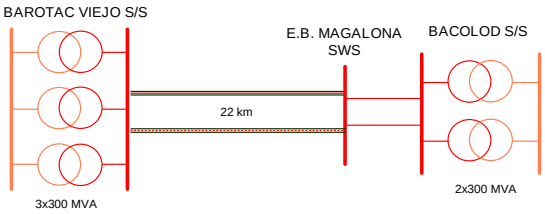
The development of new power plants in Guimaras Island will result in increased power transmission towards Panay. Currently, the existing submarine cable interconnection between Panay and Guimaras is only energized at 69 kV and has limited capacity to accommodate the transmission of excess power from Guimaras.



To ensure the full dispatch of the San Lorenzo Wind Plant and other prospective generators in the area, it is proposed to energize the Panay–Guimaras Interconnection at 138 kV. The project will also involve the construction of a 2 km overhead line from the cable terminal station in Panay towards PEDC substation, as well as the expansion and upgrading works at Zaldivar S/S and PEDC S/S.

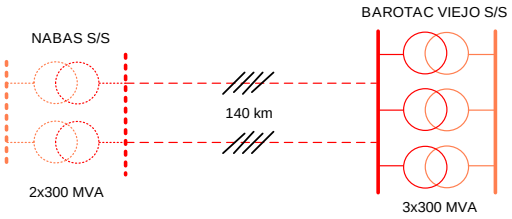
9.1.3 Negros–Panay 230 kV Interconnection Line 2 Project

The project aims to address the need to increase the interconnection capacity to cater the incoming large generators in Panay, particularly the Aklan Hydro. This entails additional circuit of 230 kV submarine cable between Negros and Panay to allow for the full dispatch of the power plants in the island of Panay.



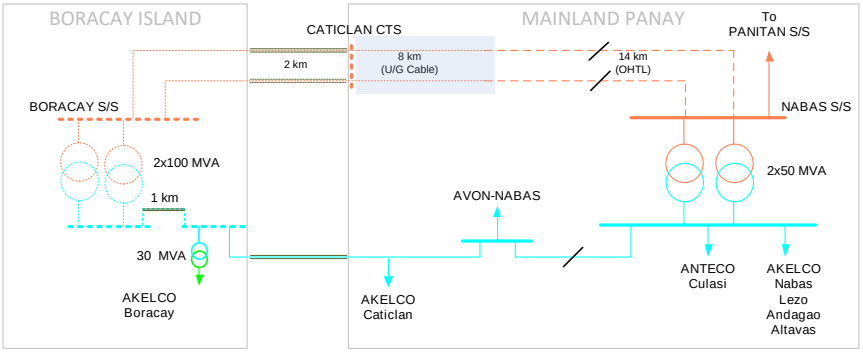
9.1.4 Barotac Viejo–Nabas 230 kV Transmission Line Project

This project is an extension of the 230 kV transmission line backbone in Panay to provide high capacity transmission corridor for expected large generation entry. The main beneficiary of this project is the indicative 300 MW Aklan Pumped-Storage Hydropower in Malay, Nabas.



9.1.5 Nabas–Caticlan–Boracay Transmission Project

In line with the developments in the tourism industry in Boracay Island, the power requirement is expected to increase. The power requirement of Caticlan and Boracay Island is supplied by Nabas S/S

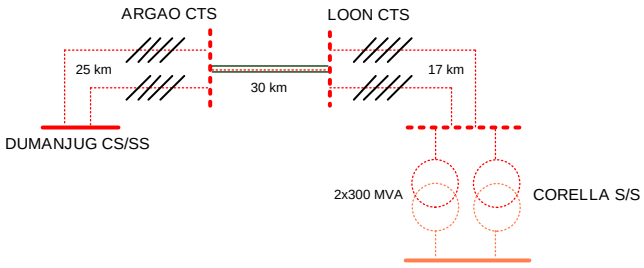


via a single circuit 69 kV overhead transmission line and submarine cable. These 69 kV transmission facilities are not enough to cater the forecasted demand.

The project aims to upgrade the existing 69 kV system into a 138 kV system that will provide the required transmission and substation capacity. The project will be implemented in two stages, stage 1 will be the construction of Boracay S/S, Manocmanoc–Boracay 69 kV overhead transmission line and laying of the new double circuit Caticlan–Boracay 138 kV submarine cable (initially energized at 69 kV) to be connected to the existing Caticlan 69 kV CTS. Stage 2 will be the construction of the Nabas–Caticlan 138 kV OHTL, underground cable in Caticlan and installation of 2x100 MVA 138/69 kV power transformer in Boracay S/S.

The submarine cable from Boracay to Caticlan was changed from single to double circuit submarine cable to comply with the N-1 provision. The 69/13.8 kV Transformers are removed from the project components since it will now be implemented by AKELCO.

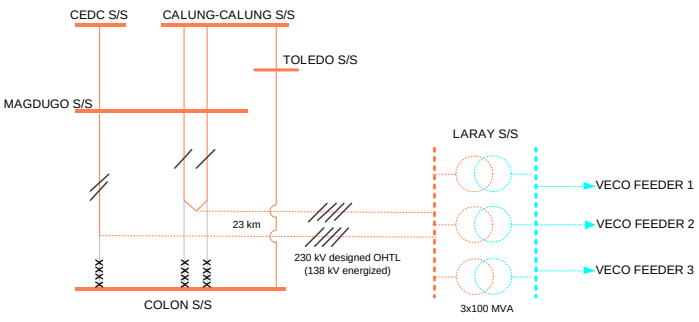
9.1.6 Cebu–Bohol 230 kV Interconnection Project



Currently, Cebu, Leyte and Bohol are connected radially which are prone to isolations. By year 2020, the Leyte–Bohol submarine cable will be overloaded which could result in load curtailment in Bohol. Outage of the 138 kV overhead lines such as Ubay–Corella, Tugas–Ubay, Maasin–Guadalupe and Ormoc–Maasin will result in system collapse. During the outage of the Leyte–Bohol 138 kV Interconnection, power delivery towards the entire Bohol Island will be interrupted. Since the existing power plants in Bohol do not have sufficient generation capacity to cater the power demand in the island during N-1 contingency condition, there is a need to provide additional transmission line towards Bohol.

Originally, Sibonga S/S was conceptualized as the termination point of 2 km overhead line going to Sibonga CTS, However, further site assessments resulted in the need to change the substation location from Sibonga to Dumanjug.

9.1.7 Laray 230 kV Substation Project



In line with the continuing economic and infrastructure developments within Metro Cebu, the power requirement in the area is projected to further increase. However, the existing substation capacity is not enough to cater the projected demand of Metro Cebu, hence, there will be power curtailment.

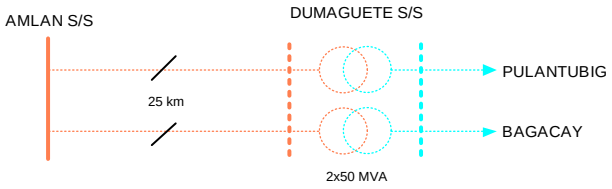
The project aims to provide alternative connection point to power consumers in Metro Cebu, thus, will accommodate the projected increase in the power demand. It will be tapped to the Magdugo–Colon 138 kV Line via 230 kV transmission lines that will be initially energized at 138 kV. The Magdugo–Colon 138 kV transmission line shall be disconnected from Colon

Substation, hence, Laray Substation will be directly linked to Magdugo Substation, bypassing Colon Substation.

The project will form part of the planned 230 kV transmission loop in Cebu, complementary to the proposed Laray–Naalad 230 kV Energization Project.

9.1.8 Amlan–Dumaguete 138 kV Transmission Project

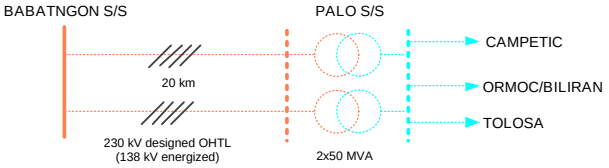
The power requirement in the southern part of Negros Oriental is being served by 69 kV line which draws power from Amlan S/S. However, the 69 kV line will not be sufficient to cater the projected increase in the power demand in the area.



To accommodate the future power requirement in the southern part of Negros Oriental, a new drawdown substation is proposed near Dumaguete City. The project will provide alternative source of power to Negros Oriental Electric Cooperative II (NORECO II), thereby, unloading Amlan Substation and the Amlan-Siaton 69 kV Line. The proposed implementation scheme will also minimize transmission loss and improve the power quality to the customers served by the 69 kV line. The new substation will be linked to Amlan S/S via 138 kV transmission line.

9.1.9 Babatngon–Palo 230 kV Transmission Line Project

Large part of the power customers in the eastern Leyte area is being served through 69 kV lines which draw power from Babatngon S/S and Ormoc S/S in the north and Maasin S/S in the south. However, due to long distances and mountainous terrain, the quality and reliability of transmitting power along the 69 kV transmission lines cannot be ensured.

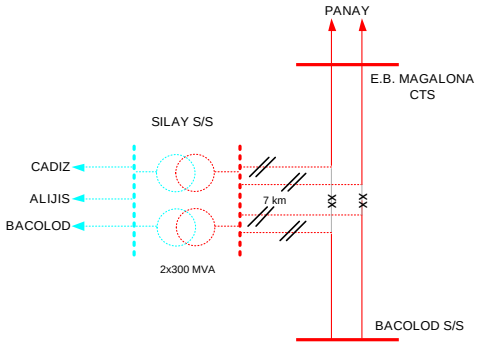


To improve the quality of power and enhance the reliability of the transmission backbone in Leyte, it is proposed to construct a transmission corridor along the eastern part of Leyte. The project will involve the construction of a new drawdown substation in Palo which will be linked to Babatngon S/S via 230 kV designed transmission lines energized at 138 kV. The proposed substation will serve Don Orestes Romualdez Electric Cooperative, Inc. (DORELCO) and LEYECO II and provide alternate power supply source during N-1 contingency event.

The project will form part of the planned 230 kV transmission loop in Leyte, complementary to the proposed Kananga–Babatngon and Palo–Javier 230 kV Transmission Lines.

9.1.10 Silay 230 kV Substation Project

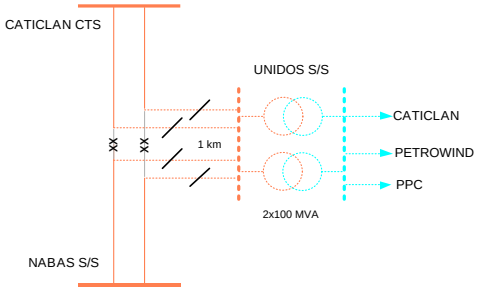
Large part of the power consumers in Northern Negros currently draws power from Bacolod and E.B. Magalona Substations. However, the existing substation capacity is not enough to cater the projected increase in demand of the area.



The project aims to provide alternative connection point to power consumers in Northern Negros, thus, will accommodate the projected increase in the power demand. The new substation will bus-in to the existing 230 kV transmission lines from E.B Magalona to Bacolod and will be located in the area of Silay.

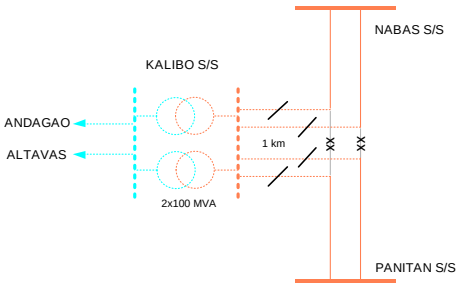
9.1.11 Unidos 138 kV Substation Project

Power consumers in northwestern part of Panay which is under AKELCO's operation currently draw power from Nabas Substation. However, the existing substation capacity is not enough to cater the projected demand of the area. This limitation will already be addressed by this project which will provide alternative connection point to power consumers in Northwestern part of Panay. The new substation will bus-in to the existing 138 kV transmission lines from Nabas to Caticlan and will be located in the area of Unidos.



9.1.12 Kalibo 138 kV Substation Project

Power consumers in Northern Panay draw power from Nabas and some from Panit-an Substation. With the continuing economic and infrastructure developments within the area, the projected power requirement will not be adequately served by the existing substation capacity.

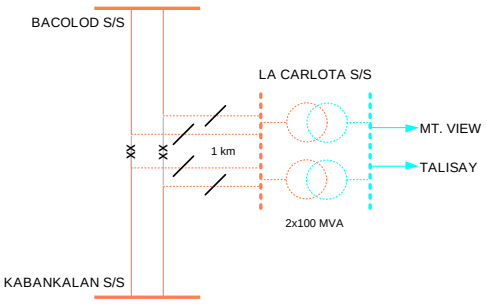


The project aims to provide alternative connection point to power consumers particularly for Northern Panay, thus, will accommodate the projected increase in the power demand.

The new substation will bus-in to the Panit-an–Nabas 138 kV Transmission Line and will be located in Kalibo, Panay.

9.1.13 La Carlota 138 kV Substation Project

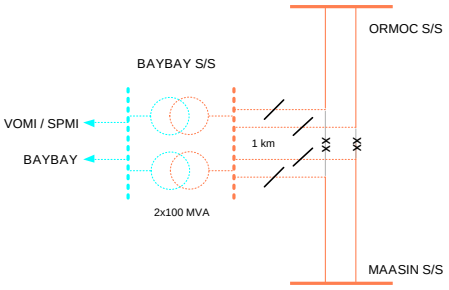
Power consumers in Southern Bacolod draws power from Bacolod Substation. With the continuing economic and infrastructure developments within the area, the projected power requirement will not be adequately served by the existing substation capacity.



The project aims to provide alternative connection point to power consumers particularly for Southern Bacolod, thus, will accommodate the projected increase in the power demand.
The new substation will bus-in to the Bacolod–Kabankalan 138 kV Transmission Line and will be located in La Carlota, Negros Occidental.

9.1.14 Baybay 138 kV Substation Project

Power consumers in Leyte in the area of Baybay draw power from Ormoc and some from Maasin Substation. With the continuing economic and infrastructure developments within the area, the projected power requirement will not be adequately served by the existing substation capacity.

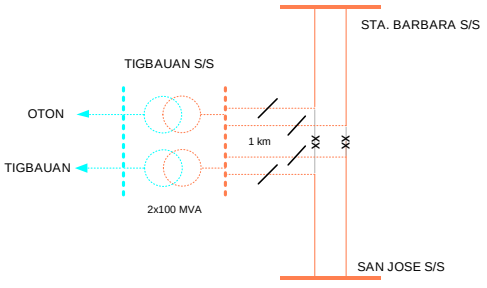


The project aims to provide alternative connection point to power consumers particularly for the area of Baybay, thus, will accommodate the projected increase in the power demand.

The new substation will bus-in to the Ormoc–Maasin 138 kV Transmission Line and will be located in Baybay, Leyte.

9.1.15 Tigbauan 138 kV Substation Project

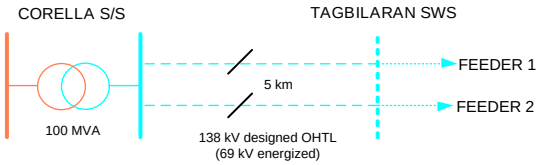
Power consumers in Southern Panay draws power from Sta. Barbara and San Jose Substation. With the continuing economic and infrastructure developments within the area, the projected power requirement will not be adequately served by the existing substation capacity.



The project aims to provide alternative connection point to power consumers particularly for Southern Panay, thus, will accommodate the projected increase in the power demand.

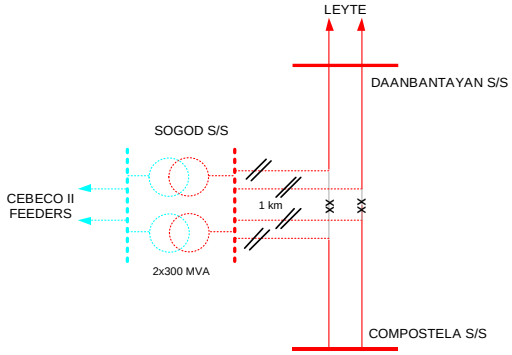
The new substation will bus-in to the Sta. Barbara–San Jose 138 kV Transmission Line and will be located in Tigbauan, Panay.

9.1.16 Corella–Tagbilaran 138 kV Transmission Line Project (69 kV energized)



Customers in southern Bohol are served by single circuit 69 kV transmission line which is projected to be overloaded due to increase in demand in the area. The project aims to provide a higher capacity transmission corridor by extending the 138 kV backbone and initially energizing it to 69 kV. Loads served by BOHECO I and II are the primary beneficiaries of the project.

9.1.17 Sogod 230 kV Substation Project

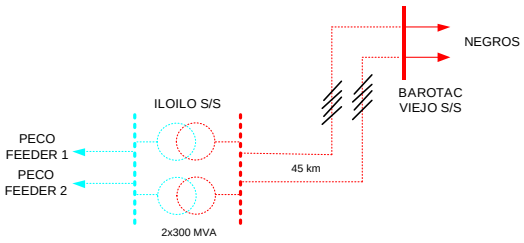


Power consumers in Northern Cebu draw power from Compostela and some from Daanbantayan Substation. With the continuing economic and infrastructure developments within the area, the projected power requirement will not be adequately served by the existing substation capacity.

The project aims to provide alternative connection point to power consumers particularly for Northern Cebu, thus, will accommodate the projected increase in the power demand.

The new substation will bus-in to the Daanbantayan–Compostela 230 kV Transmission Line and will be located in Sogod, Cebu.

9.1.18 Iloilo 230 kV Substation Project



In line with the continuing economic and infrastructure developments within Southern Panay, the power requirement in the area is projected to increase. However, the existing substation capacity is not enough to cater the projected demand of the area, hence, there will be power curtailment.

The project aims to provide alternative connection point and substation capacity to power consumers in Southern Panay, thus, providing adequate transmission capacity. The new substation will be connected to the existing Barotac Viejo Substation through 230 kV overhead transmission lines.

9.1.19 Visayas Substation Upgrading Project – 1

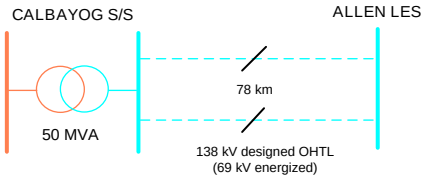
To accommodate the projected demand and avoid overloading of the transformer, there is a need to upgrade the substation capacity of Tabango Substation.

To accommodate the proposed 100 MW CEKO Solar Power Plant, there is a need to upgrade the substation capacity in Daanbantayan Substation.

To comply with the N-1 contingency criterion of the PGC, an additional 50 MVA transformer needs to be installed at Maasin and Calbayog Substations.

9.1.20 Calbayog-Allen 138 kV Transmission Line Project

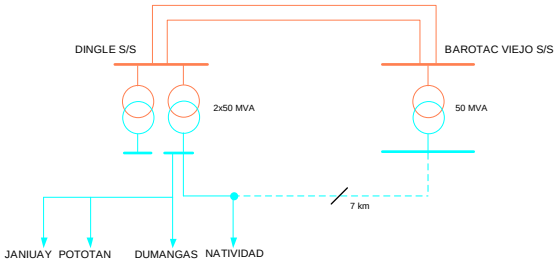
The power consumers in the northern part of Samar draws power from Calbayog substation via the existing Calbayog-Palanas Cara and Palanas Cara-Catarman-Allen-Bobolosan 69 kV transmission lines, which traverse the mountainous area of Calbayog and Catarman. Such terrain poses frequent and extended outage of the 69 kV lines in Northern Samar which result in power curtailment.



In order to improve the reliability of power delivery towards the northern part of Samar, a 138 kV transmission line (69 kV energized) is proposed which will link Calbayog S/S and the load-end substation in Allen. The project aims to form a loop, thus, will provide single outage contingency to the transmission lines serving Northern Samar.

9.1.21 Barotac Viejo-Natividad 69 kV Transmission Line Project

This project aims to extend the 69 kV line serving Natividad to Barotac Viejo and form a 69 kV loop between Dingle and Barotac Viejo Substations. This provides N-1 to the 69 kV feeder serving ILECO II and ILECO III and allows for the operational flexibility and reliability for both cooperatives.

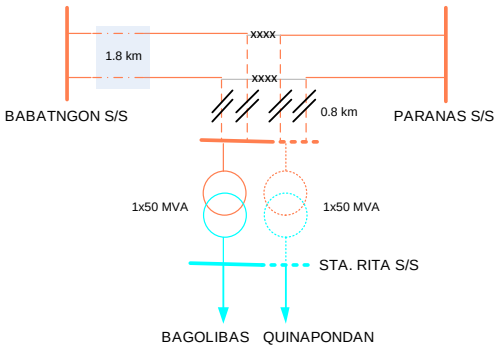


9.1.22 Visayas Substation Upgrading Project – 2

To comply with the N -1 contingency criterion of the PGC, an additional 50 MVA transformer needs to be installed at Tabango, Dingle, Mabinay, Compostela and San Jose Substations. Considering the 10-year projected demand of the distribution utilities being served by Panit-an Substation, the existing 2x30 MVA and 50 MVA, 138/69-13.8 kV transformers needs to be upgraded to 2x100 MVA 138/69/13.8kV transformer to increase the substation capacity and improve the reliability up to the substation level. The 2x30 MVA and 50 MVA, 138/69-13.8 kV transformer will be utilized in E.B. Magalona Substation. To increase substation capacity and provide reliability in Colon, Kabankalan and Calong-calong substations, additional 100 MVA power transformer in Colon Substation and additional 50 MVA transformer at Calong-calong and Kabankalan substations are needed.

9.1.23 Babatngon–Sta. Rita 138 kV Transmission Line Upgrading Project

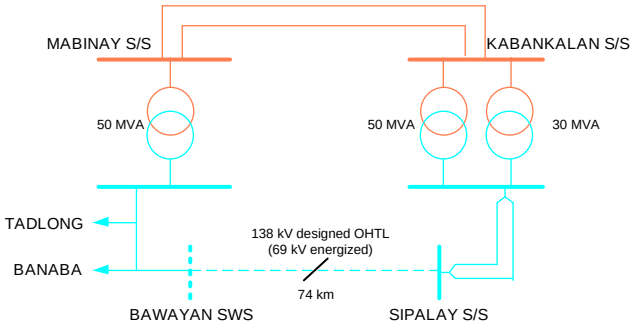
Portion of the existing Babatngon-Paranas 138 kV Transmission Line utilizes smaller conductor size which offers limited capacity of 100 MW or equivalent only to half of the capacity designed for the entire 138 kV line. As such, the capacity of the Babatngon-Paranas 138 kV Line cannot be maximized.



In order to achieve the maximum capacity, portion of the 138 kV line will be reinforced with a conductor of higher capacity. It will also involve the construction of a permanent substation at Sta. Rita which aims to improve the system reliability in the area by eliminating the 138 kV tap connection of the existing Sta. Rita Substation.

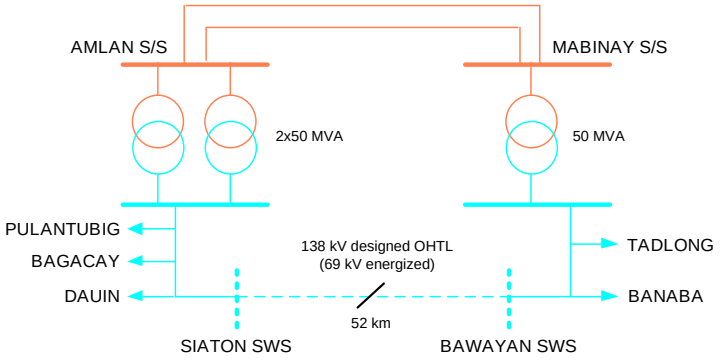
9.1.24 Bayawan–Sipalay 138 kV Transmission Line Project

This project aims to extend the 69 kV line from Sipalay to Bayawan. A 138 KV transmission line (69 kV energized) is proposed to form a 69 kV loop between the loads served by Mabinay and Kabankalan Substations. This allows for the demand to be shifted to either substation during contingency, allowing for more operational flexibility and reliability for NOCECO, NORECO I and NORECO II.



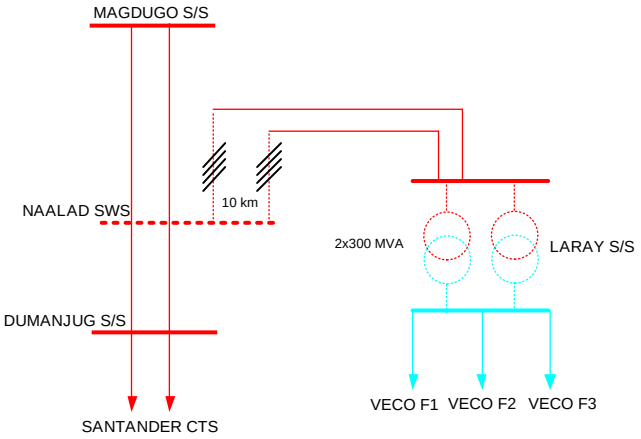
9.1.25 Siaton–Bayawan 138 kV Transmission Line Project

This project aims to extend the 69 kV line from Bayawan to Siaton. A 138 kV transmission line (69 kV energized) is proposed to form a 69 kV loop between the loads served by Mabinay and Kabankalan Substations. This is expected to improve the voltage and allow the demand of NORECO I and NORECO II to be shifted between Mabinay, Amlan and the future Dumaguete Substation.



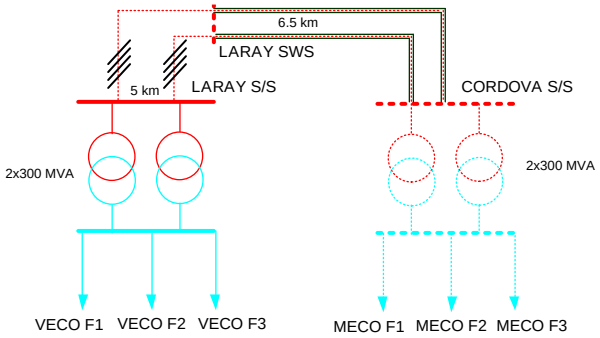
9.1.26 Laray–Naalad 230 kV Energization Project

As part of the long-term plan to establish a 230 kV transmission loop in Central Cebu, energization of Laray Substation to 230 kV is needed. Transmission lines from Laray will be extended and connected along the Dumanjug – Magdugo 230 kV Line which is part of the MVIP through the Naalad 230 kV Switching Station. Completion of the loop will improve the reliability of the power transmission line system in Metro Cebu.



9.1.27 Laray-Cordova 230 kV Transmission Line Project

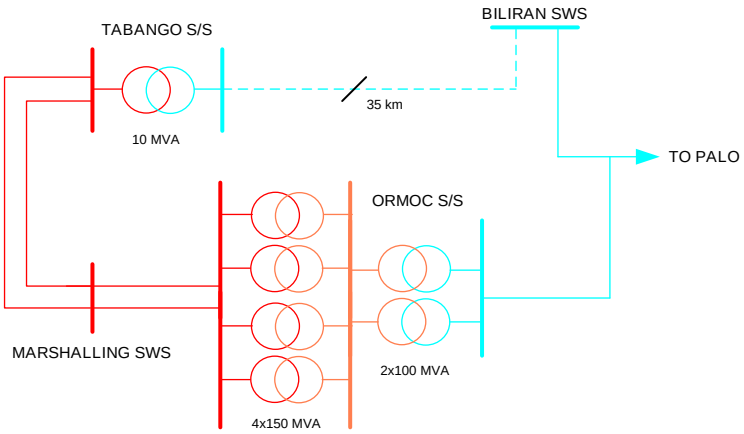
Power consumers in Mactan and Cordova are being served by 69 kV lines which draw power from Lapu-lapu Substation. Contingency on the substation will result in power curtailment in the area.



The project aims to provide alternative substation capacity to power consumers in Mactan and Cordova. This allows for the operational flexibility and reliability for MECO. Additionally, this will accommodate the projected increase in the power demand of the area and is part of the future 230 kV transmission loop in Metro Cebu. The new substation will be connected via double circuit 230 kV submarine cables.

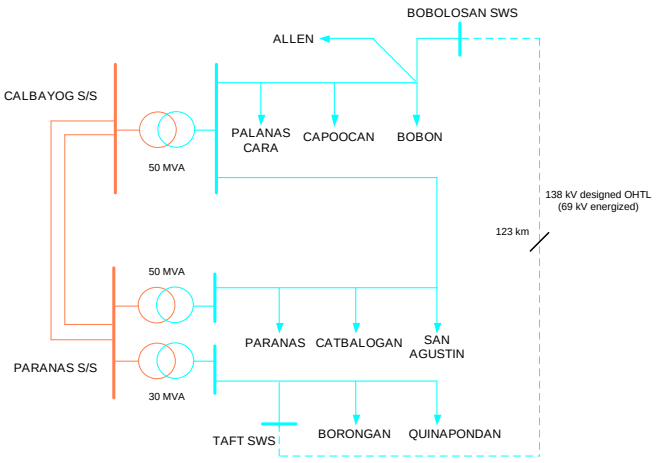
9.1.28 Tabango–Biliran 69 kV Transmission Line Project

In line with the frequent and extended outage of the 69 kV lines in the area coupled with the rugged terrain which restricts movement and prolongs fault clearance, construction of a 69 kV line from Tabango to Biliran is needed to form a loop and provide single outage contingency (N-1) capability to the transmission lines serving Northern Leyte and Biliran Island.



9.1.29 Taft–Bobolosan 138 kV Transmission Line Project

This project aims to extend the 69 kV line from Bobolosan to Taft. A 138 kV (69 kV energized) transmission line is proposed to form a 69 kV loop between Northern and Eastern Samar. This allows for the operational flexibility and reliability for NORSAMELCO and ESAMELCO.



9.2 Proposed Transmission Outlook for 2030

With the implementation of projects that will strengthen the Visayas Backbone, future developments in terms of commercial and industrial sector in Visayas that would increase the power supply requirements are being expected. To anticipate these developments, the main backbone will be extended towards Western Panay and Northern Samar. The interconnection of the 230 kV Backbone from Panay to Leyte will be unified by linking the CNP 230 kV Backbone to the Cebu–Ormoc 230 kV Line. This will be realized upon completion of the Umapad–Compostela 230 kV Transmission Line Project. More generations are expected to come in Panay that will need major reinforcements of the 230 kV lines. While Northern Samar has no proposed generation addition yet, the need to extend the 138 kV line from Calbayog to Catarman will provide reliability as the demand in the island increases.

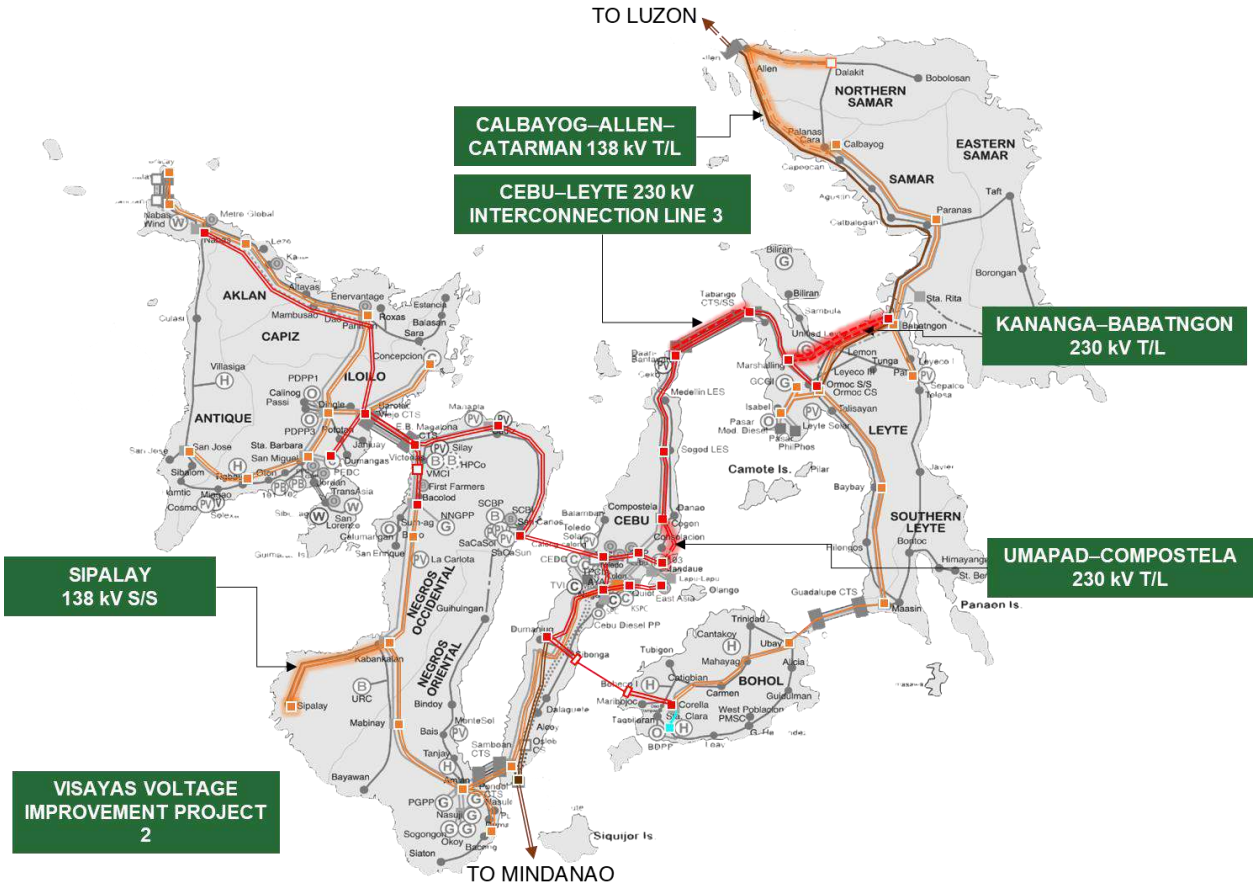


Figure 9.2: Proposed Visayas Transmission Outlook for 2030

Shown in Table 9.2 is the list of proposed transmission projects for Visayas by 2030.

Table 9.2: Proposed Transmission Outlook for 2030

Project Name/Driver(s)	Province(s) and Components	ETC
Load Growth		
Sipalay 138 kV Substation Project	Negros	Dec 2029
	<u>Substation Components:</u> Sipalay S/S, 2x100 MVA 138/69 kV Power Transformer and accessories, 1-138 kV PCB, 1-69 kV PCB and associated equipment.	
Calbayog–Allen–Catarman 138 kV Transmission Line Project	Samar	Dec 2030
	<u>Transmission Components:</u> ▪ Calbayog–Allen–Catarman T/L Extension, ST/DC, 1-795 MCM ACSR, 40 km. <u>Substation Components:</u> Catarman S/S, 2x100 MVA 138/69 kV Power Transformer and accessories, 10-138 kV PCBs, 6-69 kV PCBs and associated equipment.	
Kananga-Babatngon 230 kV Transmission Line Project	Leyte	Jul 2030
	<u>Transmission Components:</u> ▪ Kananga–Babatngon T/L, ST-DC, 4-795 MCM ACSR, 65 km. <u>Substation Components:</u> ▪ Babatngon: 2x300 MVA 230/138 kV Power Transformer and accessories, 10-230 kV PCBs, 3-138 kV PCBs and associated equipment; ▪ Kananga SWS: 10-230 kV PCBs and associated equipment.	

Project Name/Driver(s)	Province(s) and Components	ETC
Power Quality		
Visayas Voltage Improvement Project 2	Negros, Leyte, Panay	Dec 2030
	Substation Components: ▪ Bacolod 138 kV S/S, 4x50 MVAR Capacitor Bank, 4-138 kV PCBs and associated equipment; ▪ Maasin 138 kV S/S, 4x20 MVAR Capacitor Bank, 4-138 kV PCBs and associated equipment; Panit-an 138 kV S/S, 2x20 MVAR Capacitor Bank, 2-138 kV PCBs and associated equipment.	
Reliability		
Umapad-Compostela 230 kV Transmission Line Project	Cebu	Sep 2030
	Substation Components: ▪ Compostela S/S, 4-230 kV PCBs and associated equipment. Transmission Components: Umapad-Compostela T/L, ST-DC, 4-795 MCM ACSR, 20 km.	
Cebu-Leyte 230 kV Interconnection Line 3 Project	Cebu, Leyte	Sep 2030
	Substation Components: ▪ Daanbantayan S/S, 1x50 MVAR, 230 kV Shunt Reactor, 2-230 kV PCBs and associated equipment; Transmission Components: Cebu–Leyte S/C, Submarine Cable, 400 MW capacity, 32.49 km.	

9.3 Proposed Transmission Outlook for 2035

To further improve the reliability of power supply to the Visayas grid, looping projects will be constructed, the San Jose-Nabas 138 kV T/L Project aims to loop the 138 kV system in Panay, on the other hand the Cebu-Bohol 230 kV Line 2, Bohol-Leyte 230 kV Interconnection Project and the Palo-Javier 138 kV T/L Project aim to form a loop among Cebu, Bohol and Leyte sub-grids.

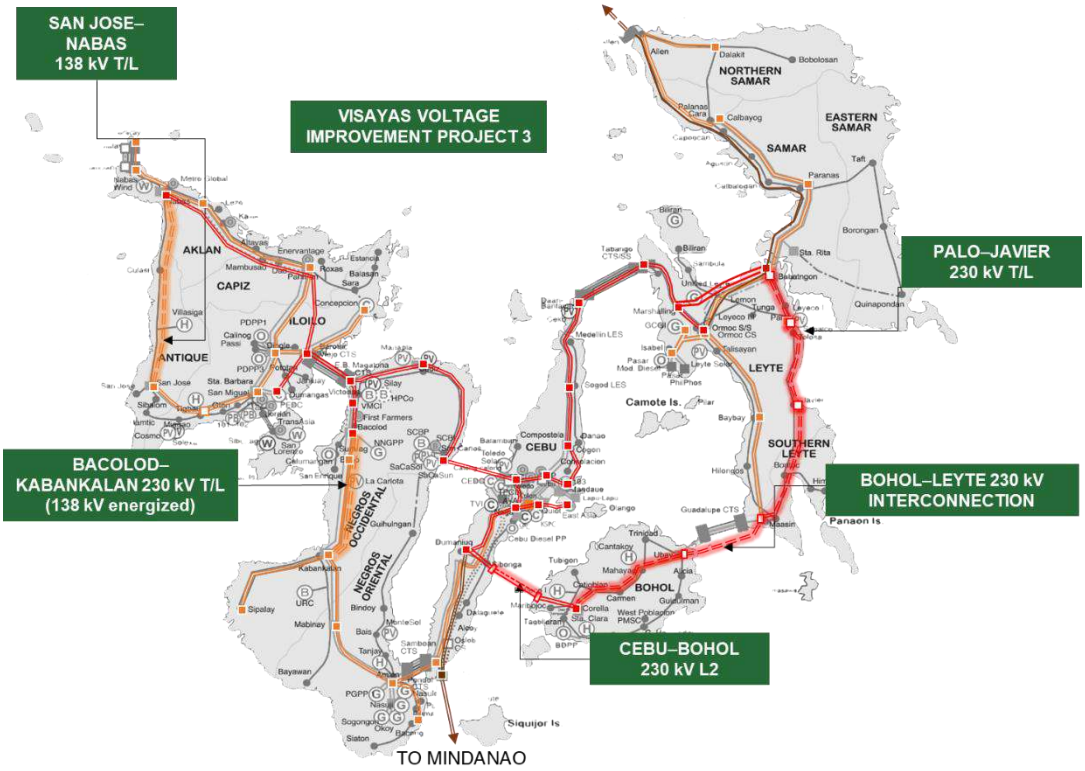


Figure 9.3: Proposed Visayas Transmission Outlook for 2035

Shown in Table 9.3 is the list of proposed transmission projects for Visayas by the 2035.

Table 9.3: Proposed Transmission Outlook for 2035

Project Name/Driver(s)	Province(s) and Components	ETC
Generation Entry		
Bacolod–Kabankalan 230 kV Transmission Line Project	Negros Occidental	Sep 2033
	Substation Components: ▪ Bacolod S/S, 2-138 kV PCBs and associated equipment; ▪ Kabankalan S/S, 2-138 kV PCBs and associated equipment. Transmission Components: ▪ Bacolod–Kabankalan T/L (138 kV energized), ST-DC, 2-795 MCM ACSR, 62 km.	
Reliability		
San Jose–Nabas 138 kV Transmission Line Project	Panay	Dec 2033
	Substation Components: ▪ San Jose S/S, 6-138 kV PCBs and associated equipment; ▪ Nabas S/S, 2-138 kV PCBs and associated equipment. Transmission Components: ▪ San Jose–Nabas T/L, ST-DC, 1-795 MCM ACSR, 125 km.	
Palo–Javier 230 kV Transmission Line Project	Leyte	Sep 2034
	Transmission Components: ▪ Palo–Javier T/L, ST-DC, 4-795 MCM ACSR, 45 km. Substation Components: ▪ Javier S/S, 2x150 MVA 230/69 kV Power Transformer and accessories, 4-230 kV PCBs and associated equipment; ▪ Energization of Babatngon–Palo to 230 kV level (Transferring of termination)	
Cebu–Bohol 230 kV Interconnection Line 2 Project	Cebu, Bohol	Dec 2035
	Submarine Cable Components: ▪ Cebu–Bohol Line 2, 1 ckt. XLPE submarine cable of 400 MW capacity at 230 kV, 30 km.	
Bohol-Leyte 230 kV Interconnection Project	Bohol, Leyte	Dec 2035
	Substation Components: ▪ Corella S/S, 4-230 kV PCBs and associated equipment; ▪ Tugas SWS, 2x70 MVAR Shunt Reactor, 8-230 kV PCBs and associated equipment, ▪ Guadalupe SWS, 2x70 MVAR Shunt Reactor, 8-230 kV PCBs and associated equipment, Transmission Components: ▪ Corella–Tugas T/L, 4-795 MCM ACSR, ST-DC, 95 km; ▪ Guadalupe–Javier T/L, 4-795 MCM ACSR, ST-DC, 120 km. Submarine Cable Components: ▪ Tugas–Guadalupe, 2 ckts XLPE submarine cable of 400 MW capacity per ckt, 17.6 km.	
Power Quality		
Visayas Voltage Improvement Project 3	Negros	Jul 2035
	Substation Components: ▪ Silay 138 kV S/S, 3x50 MVAR Capacitor Bank, 3-138 kV PCBs and associated equipment.	

9.4 Proposed Transmission Outlook for 2040

By 2040, the grid will be looking at a more secure, more robust and stronger transmission system. A looped transmission system with sufficient redundancy is the key to a more robust and resilient grid. With the gradual expansion of the 230 kV backbone in Visayas, the looping of the 230 kV system will further ensure system security and reliability of the Visayas Grid. This will also provide grid resiliency during natural calamities by providing alternative transmission corridors. Furthermore, Samar's 138 kV system will also be further extended and looped to improve supply, power quality, security and reliability.

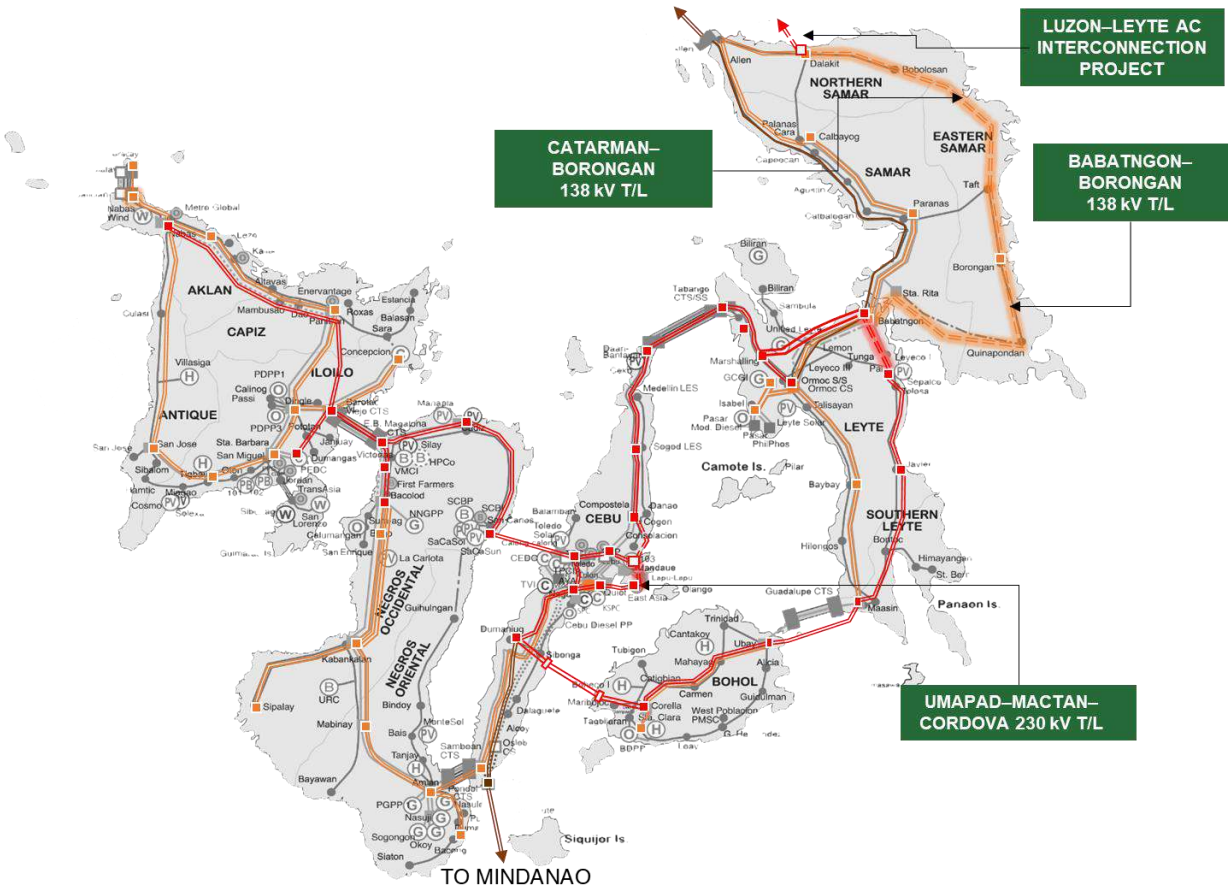


Figure 9.4: Proposed Visayas Transmission Outlook for 2040

Shown in Table 9.4 is the list of proposed transmission projects for Visayas by the 2040.

Table 9.4: Proposed Transmission Outlook for 2040

Project Name/Driver(s)	Province(s) and Components	ETC
Load Growth		
Babatngon–Borongan 138 kV Transmission Line Project	Samar	Dec 2038
	Substation Components: ▪ Babatngon S/S, 4-138 kV PCBs and associated equipment; ▪ Borongan S/S, 2x100 MVA 138/69 kV Power Transformer and accessories, 4-138 kV PCBs, 6-69 kV PCBs and associated equipment. Transmission Components: Babatngon–Borongan, ST-DC, 1-795 MCM ACSR, 185 km.	
Catarman–Borongan 138 kV Transmission Line Project	Samar	Sep 2040
	Substation Components: ▪ Catarman S/S, 3x30 MVAR Shunt Reactor; 4-138 kV PCBs, associated equipment; ▪ Borongan S/S, 2x20 MVAR Shunt Reactor, 2-138 kV PCBs and associated equipment. Transmission Components: ▪ Catarman–Borongan T/L, ST-DC, 1-795 MCM ACSR, 118 km.	
Reliability		
Umapad–Lapulapu–Cordova 230 kV Transmission Line Project	Cebu	Dec 2038
	Transmission Components: ▪ Cordova–Lapulapu, 2 ckts XLPE submarine cable of 600 MW per ckt capacity, 6 km;	

Project Name/Driver(s)	Province(s) and Components	ETC
	▪ Lapulapu–Umapad, 2 ckts XLPE submarine cable of 600 MW per ckt capacity, 1 km; ▪ Umapad S/S–Umapad CTS, ST-DC, 4-795 MCM ACSR, 2 km. <u>Substation Components:</u> ▪ Cordova S/S, 4-230 kV PCBs and associated equipment; ▪ Lapulapu S/S, 2x300 MVA, 230/69 kV Power Transformer and accessories, 10-230 kV PCBs (GIS), 6-69 kV PCBs (GIS) and associated equipment.	

The power supply deficiency being experienced in Mindanao for the past years especially during dry season had been averted by the entry of bulk generation capacity additions from several coal-fired power plant projects. In the integration of these power plant projects to the Mindanao Grid and the implementation of the interconnection between Mindanao and Visayas, new transmission backbones were developed. This major interconnection project, which is the final link to interconnect the Philippine Grid, is further discussed in Chapter 11.

Meanwhile, to cater the other requirements of the Mindanao Grid, reinforcements of the existing 138 kV substations, extension of some of the existing 138 kV transmission lines, and looping of some of the 69 kV transmission system are necessary for load growth and system reliability improvement in concerned areas.

In terms of transmission system configuration, Mindanao is relatively a robust grid. However, security issues in the island remain a serious concern, thus NGCP is still facing major challenges in implementing its operations and construction of key transmission projects. Notably, another vital issue in the Mindanao grid is the looming low voltage issue in Zamboanga City. Due to a long distance and radial configuration of transmission line supplying power to the area relative to the continuous increase in demand, there will be an impending low voltage in the area which cannot be resolved by power mitigating transmission facility. In this case, a power plant should be constructed in the area to balance the essential reactive requirement of the system.

10.1 Proposed Transmission Projects up to 2025

Shown in Table 10.1 is the list of transmission projects planned for Mindanao Grid for the period 2016-2025 in addition to the projects already approved by the ERC.

Table 10.1: Proposed Transmission Projects for Mindanao

Project Name/Driver(s)	Province(s)	ETC
Load Growth		
Mindanao Substation Expansion 3 Project	Mindanao	Oct 2023
	Substation Components: ▪ Pitogo 138 kV Substation, 1x100 MVA 138/69-13.8 kV Power Transformer and accessories, 2-138 kV PCBs, 1-69 kV PCB and associated equipment. ▪ Placer 138 kV Substation, 1x100 MVA 138/69-13.8 kV Power Transformer and accessories ▪ San Francisco 138 kV Substation, 1x100 MVA 138/69-13.8 kV Power Transformer and accessories, 2-138 kV PCBs, 1-69 kV PCB and associated equipment. ▪ Matanao 138 kV Substation, 1x100 MVA 138/69-13.8 kV Power Transformer and accessories, 2-138 kV PCBs, 1-69 kV PCB and associated equipment. Bulk Cost Estimate: 1,465 Million Pesos	
Laguindingan 230kV SS Project	Misamis Oriental, Agusan del Norte	Nov 2023
	Substation Components: ▪ Laguindingan 230 kV Substation: 2-300 MVA, 230/138-13.8 kV Power Transformer and accessories, 10-230 kV PCBs and associated equipment, 8-69 kV PCBs and associated equipment. Bulk Cost Estimate: 2,702 Million Pesos	
Maco-Apokon 69 kV Transmission Line Project	Davao Del Norte	Nov 2024
	Substation Components: ▪ Maco 138 kV Substation: 1-69 kV PCBs and associated equipment. Transmission Components:	

	▪ Maco-Apokon 69 kV Transmission Line, SP-SC, 1-336.4 MCM ACSR/AS, 12 km. Bulk Cost Estimate: 507 Million Pesos	
Villanueva–Butuan 230 kV Transmission Line	Misamis Oriental, Agusan del Norte	Jan 2025
	Substation Components: ▪ Butuan 230 kV Substation: 2-300 MVA, 230/138-69 kV Power Transformer and accessories, 4-230 kV PCBs and associated equipment; ▪ Villanueva 230 kV Substation: 4-230 kV PCBs and associated equipment. Transmission Components: ▪ Villanueva-Butuan 230 kV Transmission Line, ST-DC, 2-795 MCM ACSR/AS, 99 km. Bulk Cost Estimate: 6,539 Million Pesos	
System Reliabillity		
Nasipit Substation Bus-In (formerly Villanueva-Jasaan-Butuan 138 kV Transmission Line)	Agusan Del Norte	Apr 2022
	Substation Components: ▪ Nasipit 138 kV Substation: 1x50 MVA 138/69-13.8 kV Power Transformer and accessories, 7-138 kV PCBs and associated equipment, 1-69 kV PCBs and associated equipment. Transmission Components: ▪ Bus-In to Nasipit 138 kV Transmission Line: ST-DC, 1-795 MCM ACSR/AS, 4 km. ▪ Swinging of TM 2 138 kV Transmission Line: 1-795 MCM ACSR/AS, 0.5 km Bulk Cost Estimate: 1,282 Million Pesos	
Kabacan 138 kV Substation	North Cotabato	Dec 2022
	Substation Components: ▪ Kabacan 138 kV Substation, 1x50 MVA 138/69-13.8 kV Power Transformer and accessories, 11-138 kV PCBs, 3-69 kV PCBs and associated equipment; ▪ Kidapawan 138 kV Substation: 2-138 kV PCBs and associated equipment; ▪ Gen. Santos 138 kV Substation: 4-138 kV PCBs and associated equipment. Transmission Components: ▪ Kabacan-Kidapawan 138 kV Transmission Line, ST-DC, 1-795 MCM ACSR/AS, 53 km; ▪ Kabacan-Villarica 69 kV Transmission Line, SP-SC, 1-336.4 MCM ACSR/AS, 40 km. Bulk Cost Estimate: 4,278 Million Pesos	
San Francisco–Tandag 138 kV Transmission Line	Agusan Del Sur, Surigao Del Sur	Jul 2024
	Substation Components: ▪ San Francisco 138 kV Substation: 1-138 kV PCBs and associated equipment; ▪ Tandag 138 kV Substation: 1x50 MVA 138/69-13.8 kV Power Transformer and accessories, 3-138 kV PCBs, 3-69 kV PCBs and associated equipment; ▪ Madrid 69 kV Substation: 2-69 kV PCBs and associated equipment. Transmission Components: ▪ San Francisco–Tandag 138 kV Transmission Line: ST-DC1, 1-795 MCM ACSR/AS, 95 km; ▪ Madrid –Tandag 69 kV Transmission Line, SP-SC, 1-336.4 MCM ACSR/AS, 54 km. Bulk Cost Estimate: 3,840 Million Pesos	
Maco–Mati 138 kV Transmission Line	Compostela Valley, Davao Oriental	Jul 2024
	Substation Components: ▪ Maco 138 kV Substation: 4-138 kV PCB and associated equipment; ▪ Mati 138 kV Substation: 1x50 MVA 138/69-13.8 kV Power Transformer and accessories, 3-138 kV PCBs, 3-69 kV PCBs and associated equipment. Transmission Components: ▪ Maco–Mati 138 kV Transmission Line: ST-DC1, 1-795 MCM ACSR/AS, 20 km. Bulk Cost Estimate: 2,455 Million Pesos	
Aurora-Calamba-Polanco 69 kV Transmission Line Project	Zamboanga Del Sur, Zamboanga Del Norte, and Misamis Occidental	Dec 2024
	Substation Components: ▪ Polanco 138 kV Substation: 1-69 kV PCB and associated equipment;	

	▪ Calamba 69 kV Substation: 1-69 kV PCBs and associated equipment. Transmission Components: ▪ Polanco-Calamba 69 kV Transmission Line: SP-SC, 1-795 MCM ACSR/AS, 27 km. ▪ Aurora-Bañadero 69 kV Transmission Line: SP-SC, 1-795 MCM ACSR/AS, 45.3 km. Bulk Cost Estimate: 783.911 Million Pesos	
Sultan Kudarat – Tacurong 230 kV Transmission Line	Maguindanao, Sultan Kudarat	Jan 2025
	Substation Components: ▪ Tacurong 230 kV Substation, 4-230 kV PCBs and associated equipment; ▪ Sultan Kudarat 138 kV Substation, 4-138 kV PCBs and associated equipment; ▪ Sultan Kudarat 230 kV Substation, 6-230 kV PCBs and associated equipment. Transmission Components: • Sultan Kudarat–Tacurong 230 kV Transmission Line, ST-DC, 2-795 MCM ACSR, 101 km; • Sultan Kudarat 138 kV S/S-Sultan Kudarat 230 kV S/S (New) 138 kV Transmission Line, SP-SC, 1-795 MCM ACSR, 1 km. Bulk Cost Estimate: 4,467 Million Pesos	
Eastern Mindanao 230 kV Transmission Line Project	Agusan del Norte, Agusan del Sur, Compostela Valley	Jan 2025
	Substation Components: ▪ Butuan 230 kV Substation: 4-230 kV PCBs and associated equipment; ▪ San Francisco 230 kV Substation: 10-230 kV PCBs and associated equipment; ▪ Bislig 230 kV Substation: 10-230 kV PCBs and associated equipment; ▪ Nabunturan 230 kV Substation: 6-230 kV PCBs and associated equipment; ▪ Bislig 138 kV Substation: 4-230 kV PCBs and associated equipment. Transmission Components: ▪ Butuan-San Francisco 230 kV Transmission Line: SP/ST-DC, 2-795 MCM ACSR/AS, 92.9 km; ▪ San Francisco-Bislig 230 kV Transmission Line: SP/ST-DC, 2-795 MCM ACSR/AS, 92.9 km; ▪ Bislig-Nabunturan 230 kV Transmission Line, ST-DC: 2-795 MCM ACSR/AS, 96.8 km; ▪ Bislig 230 kV SS-Bislig 138 kV SS Tie Line, ST-DC: 2-795 MCM ACSR/AS, 3 km. Bulk Cost Estimate: 17,388 Million Pesos	
Opol Substation Bus-in (formerly Balo-i-Tagoloan-Opol 138 kV Transmission Line)	Lanao del Norte and Misamis Oriental	Dec 2025
	Substation Components: ▪ Opol 138 kV Substation: 1x75 MVA 138/69–13.8 kV Power Transformer and accessories, 3-138 kV PCBs, 3-69 kV PCBs and associated equipment. Transmission Components: ▪ Opol Substation Bus-in to Balo-i-Tagoloan 138 kV Transmission Line: ST-DC, 1-795 MCM ACSR/AS, 7 km. Bulk Cost Estimate: 1,399 Million Pesos	
Mindanao Substation Upgrading 2 Project (MSU2P)	Mindanao	Dec 2025
	▪ Substation Components: ▪ General Santos 138 kV Substation, 1x100 MVA 138/69 kV Power Transformer and accessories, 3-138 kV PCBs, 2-69 kV PCBs and associated equipment; ▪ Toril 138 kV Substation, 1x100 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCBs, 2-69 kV PCBs and associated equipment; ▪ Balo-i 138 kV Substation, 1x100 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCBs, 2-69 kV PCBs and associated equipment; ▪ Bunawan 138 kV Substation, 1x100 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCBs, 2-69 kV PCBs and associated equipment; ▪ Nasipit 138 kV Substation, 2x50 MVA 138/69 kV Power Transformer and accessories, 4-138 kV PCBs, 4-69 kV PCBs and associated equipment;	

	▪ Kibawe 138 kV Substation, 1x50 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCBs, 2-69 kV PCBs and associated equipment; Bulk Cost Estimate: 2,555 Million Pesos

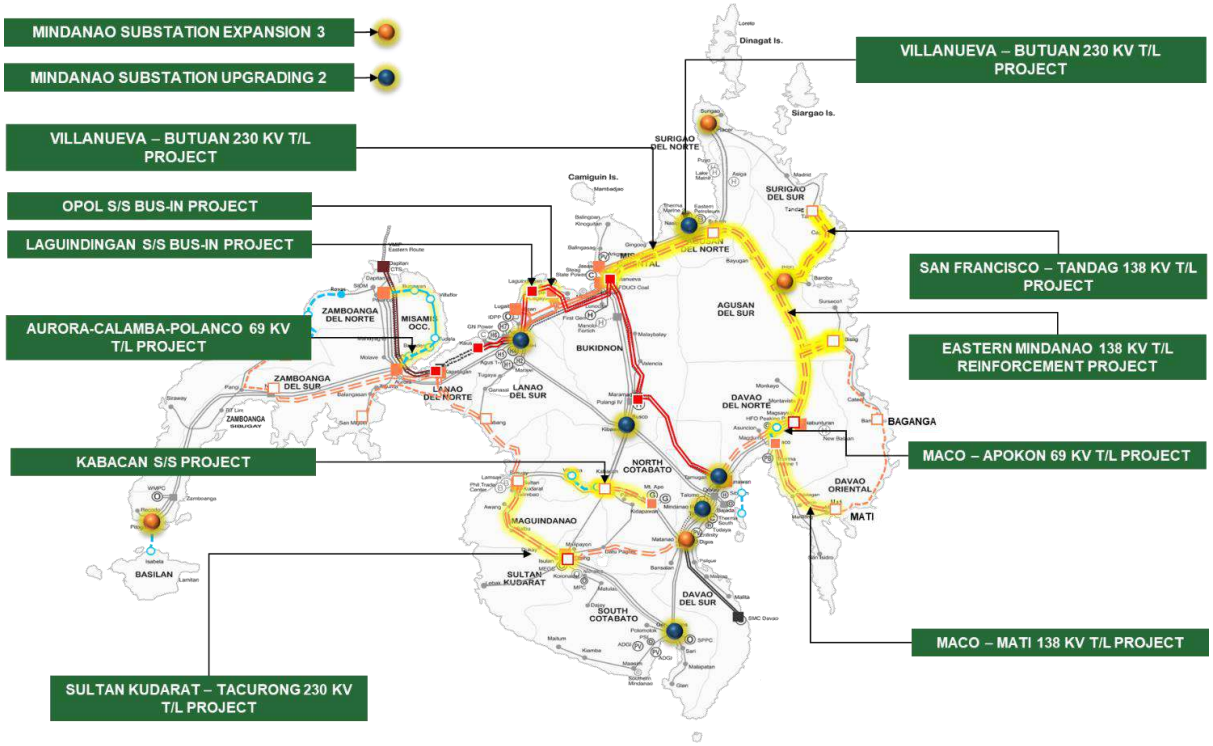


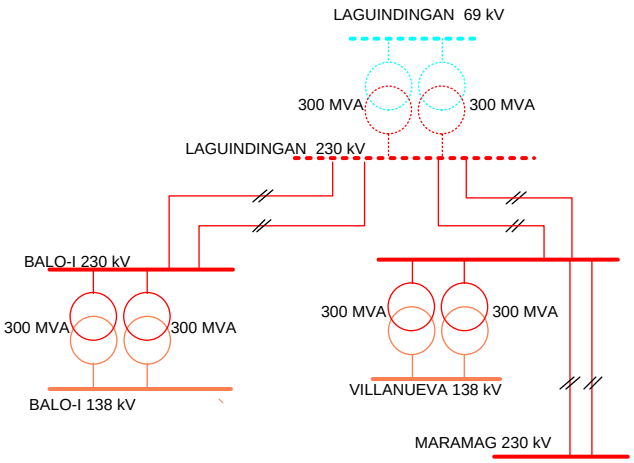
Figure 10.1: Proposed Mindanao Transmission Outlook for 2025

10.1.1 Mindanao Substation Expansion Project 3

Starting year 2023, the existing transformers in Pitogo, Placer, San Francisco and Matanao Substations will exceed their capacity during N-1 contingency condition. Installation of additional transformer in each of these substations is necessary to maintain continuous normal state operation during the outage of one of the transformers. This development will also comply with the single outage contingency criterion requirement of the Philippine Grid Code.

10.1.2 Laguindingan 230kV SS Project

This abrupt industrial and commercial development in Laguindingan area adjacent to the existing airport involves substantial power requirement which is more than the existing capacity of the local distribution utility.

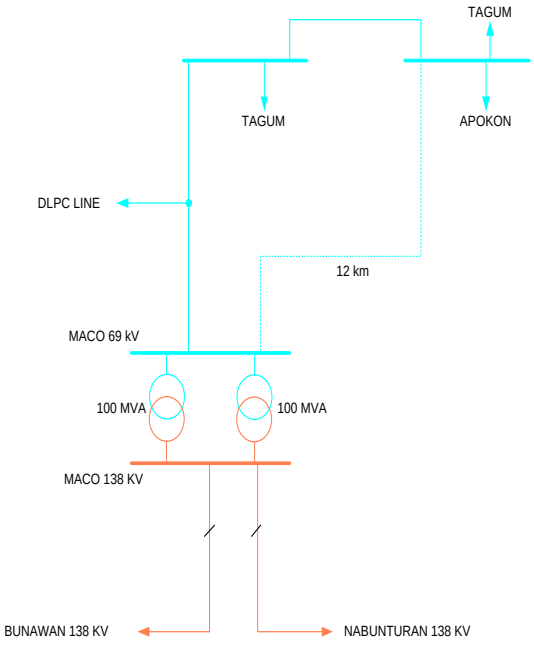


The project will provide stable supply and large capacity of power delivery which will come from the 230 kV backbone of the Mindanao Grid. This will ensure continuous and efficient supply of electricity that is essential for the operation of economic zones.

The implementation of the project includes the establishment of new 230 kV substation within Laguindingan area which will bus-in to the existing Balo-i – Villanueva 230 kV Transmission Line.

10.1.3 Maco-Apokon 69 kV Transmission Line Project

This energy requirement in Tagum City is fast-increasing due to rapid economic development in the area wherein the existing single circuit transmission facility will be insufficient to support the forecasted power demand. Likewise, the radial transmission corridor lacks alternative line reinforcement during outage which is critical for contingency planning.

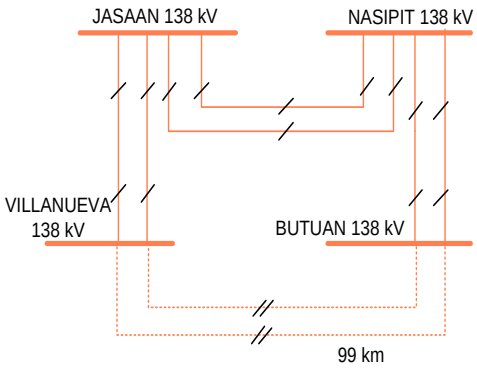


The project will strengthen the existing transmission system by adding reinforcement to the Maco-Tagum 69 kV Transmission Line. This will ensure stable, reliable and efficient power delivery in the area which will maintain continuous supply of electricity in Tagum City where the demand is highly concentrated.

The implementation of the project involves the construction of 12 km 69 kV transmission line from Maco 138 kV Substation directly to Apokon, Tagum City bypassing the existing long 69 kV line.

10.1.4 Villanueva–Butuan 230 kV Transmission Line

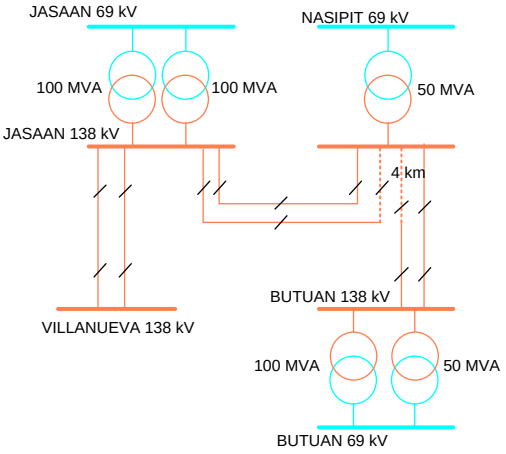
Overloading of the remaining line of the existing Villanueva-Jasaan 138 kV double circuit transmission line will occur during single-outage contingency (N-1) condition. More so, low voltage in Butuan and other nearby substations will be experienced. This is due to the increasing demand in the area.



The project involves the installation of new double-circuit, 99 kms, 230 kV Transmission Line from Villanueva Substation to Butuan Substation. This project will serve as initial step in developing higher transmission capacity corridor to meet the increasing demand in the northeastern Mindanao Area (NEMA). In addition, Villanueva-Butuan 230 kV TL Project also aims to improve the reliability of the transmission system and address the power quality problem in NEMA. This 230 kV designed transmission line will be initially energized at 138 kV.

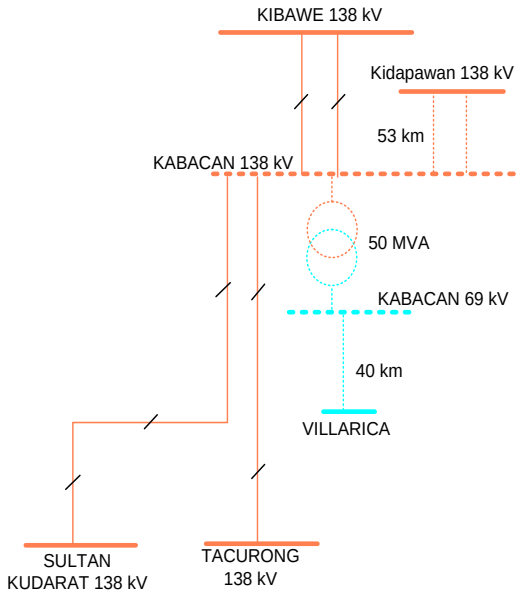
10.1.5 Nasipit Substation Bus-In

Outage of the existing Nasipit-Butuan 138 kV Single Circuit Transmission Line will result in a low voltage in the substations of Butuan, Placer and San Francisco.



The project aims to improve the reliability and power quality of the transmission system in the northeastern Mindanao Area. The project involves the bus-in of the existing Jasaan-Butuan 138 kV Single Circuit Transmission Line to Nasipit Substation, installation of a new 50 MVA power transformer and replacement of defective power circuit breakers in Nasipit Substation.

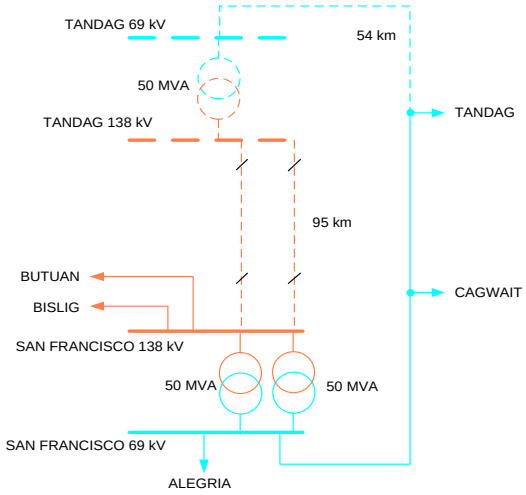
10.1.6 Kabacan 138 kV Substation



Security remains a serious concern in Mindanao. The Kibawe-Kabacan, Kabacan-Sultan Kudarat and Kabacan-Tacurong 138 kV Lines are integral parts of the Mindanao Grid. These lines traverse unrestrained regions with prevalent presence of militant groups and lawless elements. Thus, transmission facilities are exposed to a high risk of sabotage and terrorist attack. Outage of any of these line segments will result in voltage collapse and rotational power interruptions in Sultan Kudarat, Maguindanao, North Cotabato and South Cotabato provinces.

The project involves the bus-in connection of the existing lines to the proposed substation, installation of a new 50 MVA power transformer, construction of a new 53 km Kabacan-Kidapawan 138 kV Transmission Line, and construction of a new 40 km Kabacan-Villarica 69 kV Transmission Line. These new developments aim to provide flexibility and additional reliability to the transmission system to ensure the continuity of power supply in the concerned areas particularly during outage of any of the abovementioned lines. Additionally, the proposed project includes installation of four new PCB in Gen. Santos Substation which is necessary to allow the entry of the 105 MW Coal-Fired Power Plant Phase 2 of Sarangani Energy Corporation.

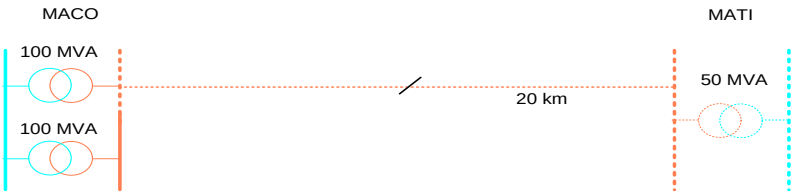
10.1.7 San Francisco–Tandag 138 kV Transmission Line



With the existing transmission line configuration, outage of the San Francisco-Tandag 69 kV Transmission Line or Placer-Madrid 69 kV Transmission Line will shut down the connected loads due to the absence of alternative transmission facility.

Solution to the problem comprises the looping of the 69 kV transmission network in Agusan del Sur area allowing switching of loads during line outages and the extension of the 138 kV transmission system from the San Francisco Substation to the new Tandag Substation. The Project will solve the power quality and reliability problems in the area.

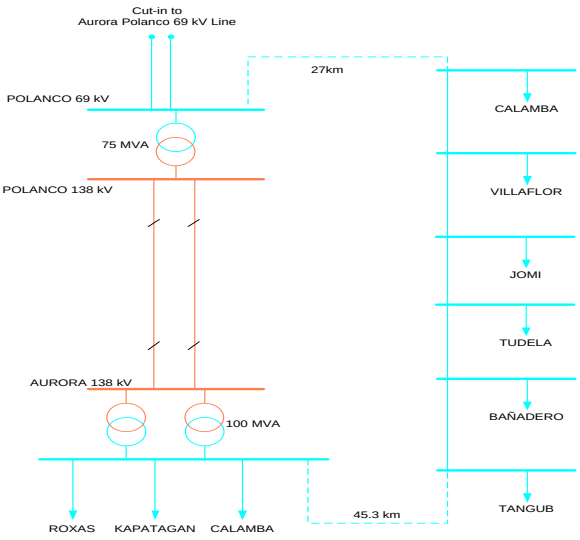
10.1.8 Maco–Mati 138 kV Transmission Line



Presently, the existing Maco-Mati 69 kV Transmission Line is in radial configuration. It has no alternate line to deliver power to customer upon its outage. Likewise, the existing Maco Substation has no N-1 capability. It has only one existing 50 MVA power transformer. Low voltage problem is also anticipated due to the rapid development and increasing power requirement of Mati City.

The project involves the extension of the 138 kV transmission system from the existing Maco Substation to the new Mati Substation and the installation of a new 50 MVA power transformer in the new substation. These developments will address the anticipated low voltage in the area and offers continuous and reliable power delivery during normal or single-outage (N-1) contingency conditions.

10.1.9 Aurora-Calamba-Polanco 69 kV Transmission Line Project



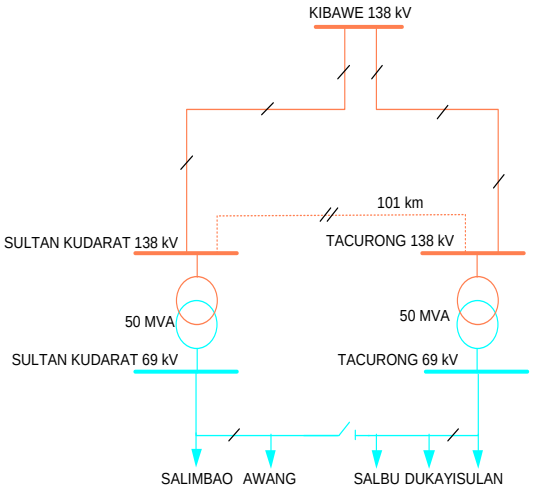
This capacity of the existing Aurora-Calamba 69 kV Line will be insufficient to transmit the power requirement of the connected costumers by year 2022 onwards. The system will be required to curtail loads to be able to maintain continuous grid operation. Moreover, due to the long length of the 69 kV line, low voltage problem is being experienced at the load end substations. The limited capacity of the line and the low voltage problem will suppress the progress on the area.

The project aims to loop the transmission facility connecting MOELCI and MOELCI II and to increase the transmission capacity of the existing 69 kV line, providing additional connection point and improving the power quality for the costumers in Misamis Occidental.

The project involves the upgrading of a section of Aurora-Calamba 69 kV Line as well as the construction of a new 27 km 69 kV transmission line from Polanco Substation to MOELCI I's Calamba Substation through the Polanco – Calamba 69 kV Line. The project also consists the installation of 7.5 MVAR Capacitor Bank at the Bañadero Switching Station to provide additional reactive power support to mitigate low voltage problems.

10.1.9 Sultan Kudarat–Tacurong 230 kV Transmission Line Project

Load end costumers connected in the substations of Tacurong and Sultan Kudarat are assured of continuous power supply even during outage of either Kibawe-Sultan Kudarat 138 kV Line or Kibawe-Tacurong 138 kV Line. The project will mitigate the voltage issue in the affected area.

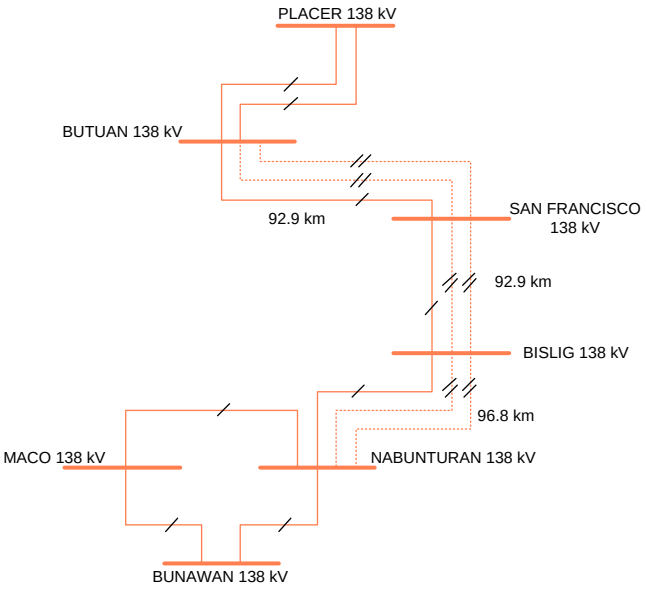


The project will ensure a reliable and flexible power transmission by providing a new corridor in the substations of Tacurong and Sultan Kudarat. It will contribute to the economic development in the area. It will also complement the Lala-Malabang-Sultan Kudarat 230 kV Transmission Line Project.

The project will initially be energized at 138 kV level. It will comprise of more than one hundred kilometers of transmission line, four power circuit breakers and associated equipment.

10.1.10 Eastern Mindanao 230 kV Transmission Line Project

The existing 138 kV single circuit transmission line serving the substations of Butuan, San Francisco, Bislig and Nabunturan in eastern Mindanao will already be lacking the single-outage contingency provision. The area will also be exposed to power quality difficulties due to the possible entry of huge mining loads in this part of the island.

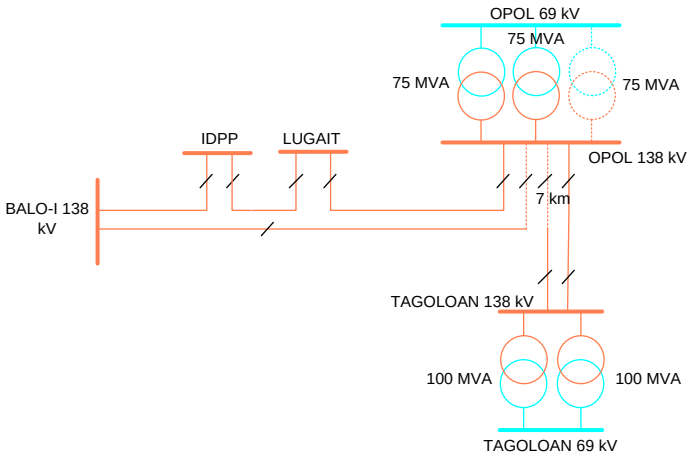


The project will strengthen the existing transmission system ensuring stability, reliability and efficient transmission of power in the area maintaining the continuous supply of power in eastern Mindanao. It will also contribute for the voltage improvement in the area. This project will serve as initial step in establishing a higher transmission corridor in the northeastern Mindanao Area, which will be initially energized at 138 kV level.

Implementation of the project will require a total of 282.68 km of new 230 kV transmission lines, required PCBs and associated equipment.

10.1.11 Opol Substation Bus-in Project

Presently, Opol Substation is in cut-in configuration scheme along the Lugait-Tagoloan 138 kV Transmission Line and currently serving the nearby loads, in which have significant increase in demand. Outage of the existing Opol-Tagoloan 138 kV Transmission Line segment will result in low voltage at Opol Substation.



Given the rapid growth in demand in succeeding years, the existing Opol Substation will no longer be complying with the standards prescribed in the PGC during single-outage contingency (N-1) condition.

The project will accommodate the increasing demand. It will also improve the reliability and power quality of the transmission system in northern Mindanao. It comprises the bus-in of the existing Balo-i-Tagoloan 138 kV Single Circuit Transmission Line to Opol Substation, installation of a new 75 MVA power transformer, setting up of associated circuit breakers and secondary equipment.

10.1.12 Mindanao Substation Upgrading 2 Project

The Mindanao Substations Upgrading 2 Project (MSU2P) aims to augment the loading capability of the existing substations in General Santos, Toril, Balo-i, Bunawan, Nasipit and Kibawe to accommodate the projected loads. This project offers continuous and reliable power delivery even during outage of a transformer and will provide additional capacity to support the fast-increasing demand.

10.2 Proposed Transmission Outlook for 2030

To further improve the reliability of power supply to the Mindanao Grid, looping projects will be constructed. The Lala–Malabang–Sultan Kudarat 230 kV Transmission Line Project will complete the loop of the 230 kV transmission system of Mindanao. Likewise, the Siom–Sindangan–Salug 69 kV Transmission Line Project will loop the 69 kV transmission system in Zamboanga Del Norte.

Moreover, installation of 230 kV drawdown transformers in Matanao Substation is required to ensure adequate supply facilities in the long term and improve the voltage profile in Davao Del Sur.

Finally, the implementation of Zamboanga–Basilan and Davao–Samal interconnection projects would significantly boost the supply reliability to support the load growth in Basilan and Samal islands, which will receive power from the grid thru Pitogo Substation in Zamboanga City and Bunawan Substation in Davao City, respectively.

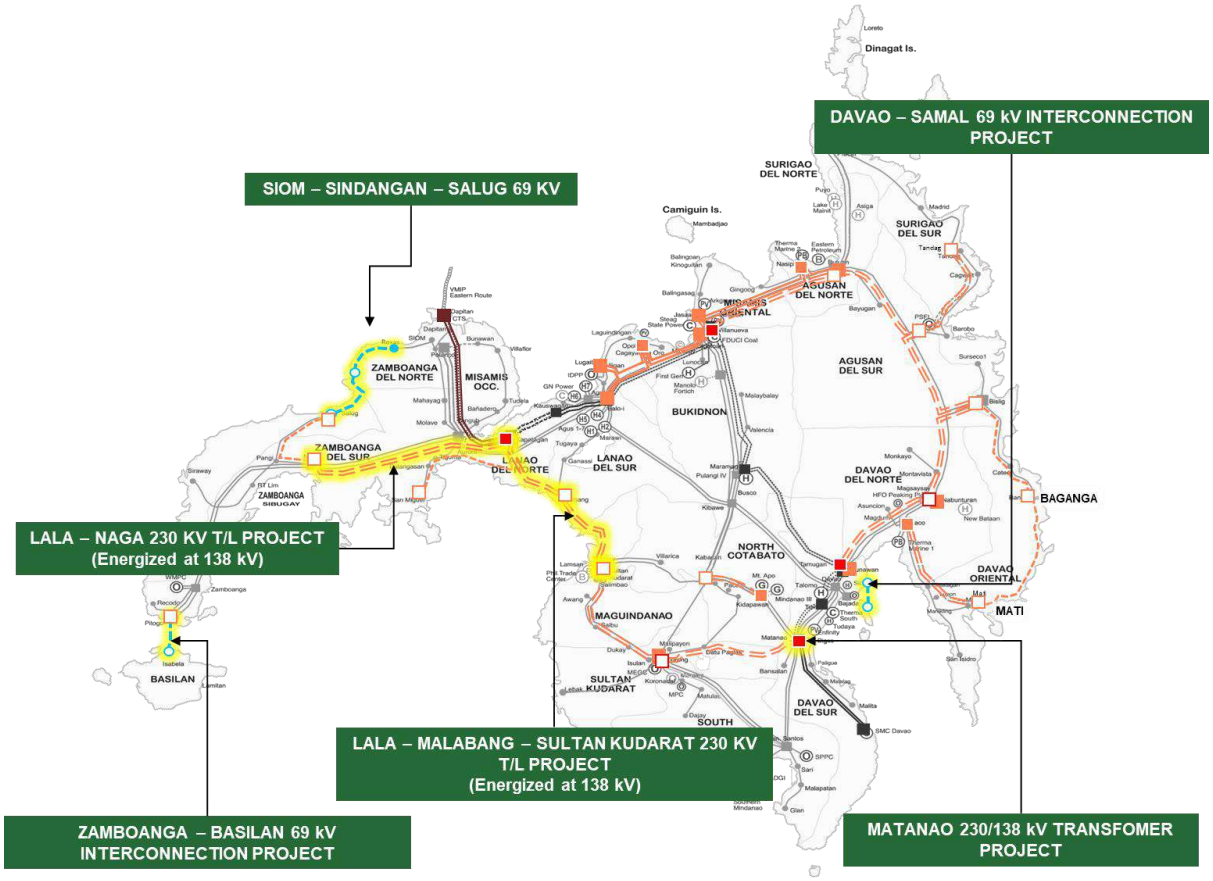


Figure 10.2: Proposed Mindanao Transmission Outlook for 2030

Table 10.2: Proposed Mindanao Transmission Outlook for 2030

Project Name/Driver(s)	Province(s) and Components	ETC
Load Growth		
Matanao 230/138 kV Transformer	Davao Del Sur	Dec 2030
	<u>Substation Components:</u> • Matanao 230 kV Substation: 2x300 MVA 230/138-13.8 kV Power Transformer and accessories, 4-230 kV PCBs, 4-138 kV PCBs and associated equipment.	
System Reliability		
Lala–Malabang–Sultan Kudarat 230 kV Transmission Line	Lanao Del Norte, Lanao del Sur, Maguindanao	Dec 2030
	<u>Substation Components:</u> ▪ Lala 230 kV Substation: 4-230 kV PCBs and associated equipment; ▪ Malabang 230 kV Substation: 1x50 MVA 138/69-13.8 kV Power Transformer and accessories, 8-230 kV PCBs, 3-69 kV PCBs and associated equipment; ▪ Sultan Kudarat 230 kV Substation: 3-230 kV PCBs and associated equipment. <u>Transmission Components:</u> ▪ Lala–Malabang–Sultan Kudarat 230 kV Transmission Line: ST-DC, 2-795 MCM ACSR	
Siom–Sindangan–Salug 69 kV Transmission Line	Zamboanga Del Norte	Dec 2030
	<u>Substation Components:</u> ▪ Siom 69 kV Substation: 2-69 kV PCBs and associated equipment; ▪ Sindangan 69 kV Substation: 2-69 kV PCBs and associated equipment; ▪ Salug 69 kV Substation: 2-69 kV PCBs and associated equipment. <u>Transmission Components:</u> • Siom-Sindangan-Salug 69 kV Transmission Line: SP-SC, 1-336.4 MCM ACSR/AS, 115 km.	
Lala–Naga 230 kV Transmission Line	Zamboanga del Sur, Lanao del Norte	Dec 2030
	<u>Transmission Components:</u> ▪ Lala-Naga 230 kV Transmission Line, ST-DC, 2-795 MCM ACSR/AS, 150 km <u>Substation Components:</u>	

Project Name/Driver(s)	Province(s) and Components	ETC
	▪ Lala 230 kV Substation, 2-230 kV PCBs and associated equipment; • Naga 230 kV Substation, 2-230 kV PCBs and associated equipment.	
Interconnection		
Davao–Samal 69 kV Interconnection	Davao del Norte	Dec 2030
	Transmission Components: ▪ Davao-Samal 69 kV Transmission Line, 3-core, 300mm^2 Submarine Cable, 8.5 km.	
Zamboanga–Basilan 69 kV Interconnection	Zamboanga del Sur, Basilan	Dec 2030
	Transmission Components: ▪ Zamboanga-Basilan 69 kV Transmission Line, 3-core, 300mm^2 Submarine Cable, 30 km.	

10.3 Proposed Transmission Outlook for 2035

The development in Eastern Mindanao, mainly in CARAGA and Davao Oriental, is expected to escalate within this period which will entail reinforcement of existing single circuit lines and extension of needed lines. The San Francisco–Tandag 138 kV Transmission Line 2 Project aims to improve the reliability of the looped network and provide adequate line capacity to sustain the growing mining loads in CARAGA. The Maco–Mati 138 kV Transmission Line 2 project intends to amplify the single circuit network and the Bislig–Baganga 138 kV Transmission Line Project will provide the necessary transmission facility extension in Davao Oriental.

The objective of the projected grid expansion in Western Mindanao for this period is to obtain power flow reliability in Maguindanao and Zamboanga del Norte. The Sultan Kudarat–Tacurong Transmission Line 2 Project aims to improve the power transfer capacity and reliability in Maguindanao Area. The Naga–Salug 138 kV Transmission Line intends to extend the 138 kV transmission network in the western coast of Zamboanga del Norte to support the expected load growth in the area and form a more reliable looped network.

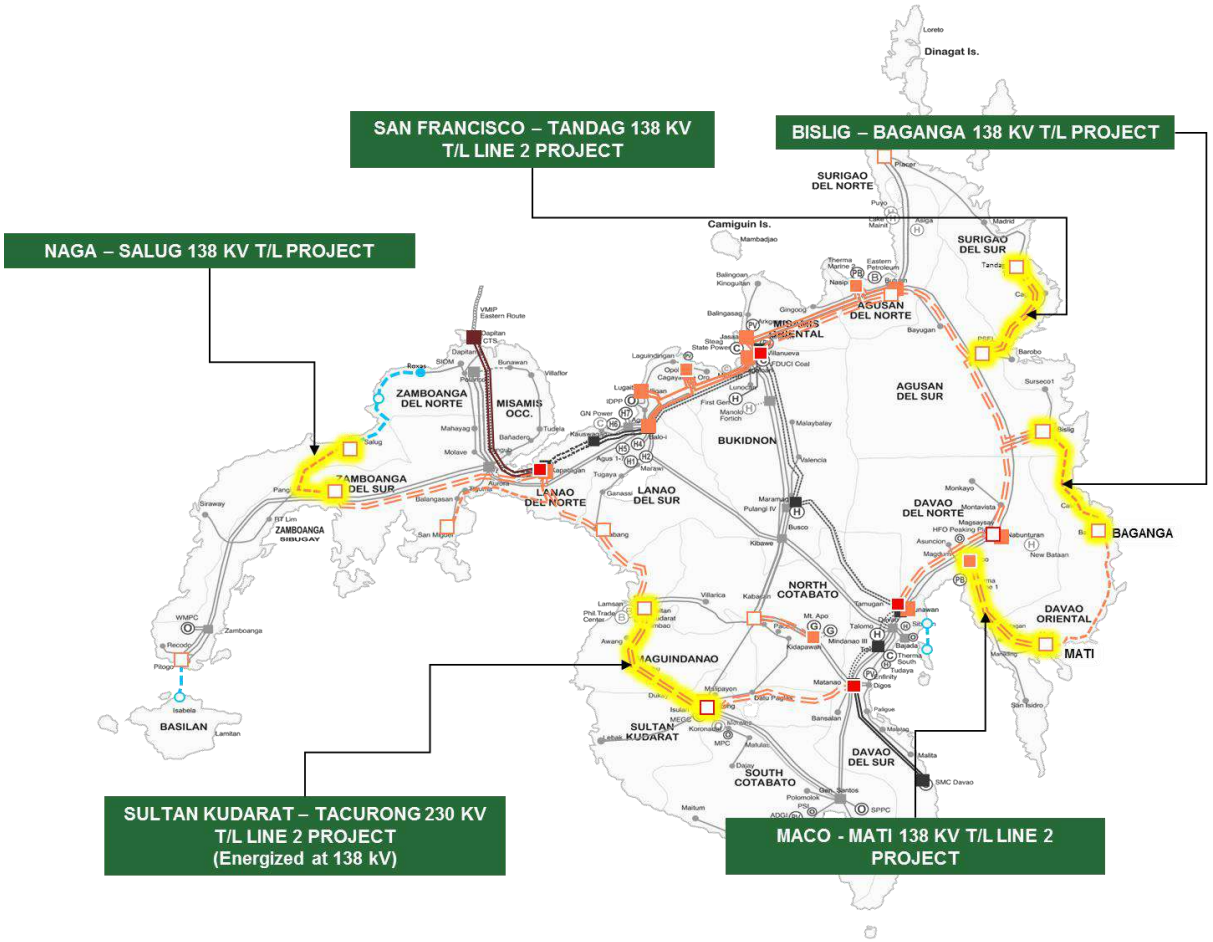


Figure 10.3: Proposed Mindanao Transmission Outlook for 2035

Table 10.3: Proposed Mindanao Transmission Outlook for 2035

Project Name/Driver(s)	Province(s) and Components	ETC
System Reliability		
Bislig-Baganga 138 kV Transmission Line	Davao Oriental, Surigao del Sur	Dec 2035
	Transmission Components: ▪ Bislig-Baganga 138 kV Transmission Line, ST-SC, 1-795 MCM ACSR, 85 km. Substation Components: ▪ Bislig 138 kV Substation, 2-138 kV PCBs and associated equipment; Baganga 138 kV Substation, 1-50 MVA 138/69-13.8 kV Power Transformer and accessories, 3-138 kV PCBs, 2-69 kV PCBs and associated equipment.	
San Francisco-Tandag 138 kV Transmission Line 2	Surigao del Sur, Agusan del Sur	Dec 2035
	Transmission Components: ▪ San Francisco-Tandag 138 kV Transmission Line, ST-DC2, 1-795 MCM ACSR, 95 km. Substation Components: ▪ San Francisco 138 kV Substation, 2-138 kV PCBs and associated equipment; • Tandag 138 kV Substation, 2-138 kV PCB and associated equipment.	
Naga-Salug 138 kV Transmission Line	Zamboanga del Sur, Zamboanga del Norte	Dec 2035
	Transmission Components: ▪ Naga-Salug 138 kV Transmission Line, ST-SC, 1-795 MCM ACSR, 60 km. Substation Components: ▪ Naga 138 kV Substation, 2-138 kV PCBs and associated equipment; • Salug 138 kV Substation, 1-50 MVA 138/69-13.8 kV Power Transformer and accessories, 3-138 kV PCBs, 3-69 kV PCBs and associated equipment.	

Project Name/Driver(s)	Province(s) and Components	ETC
Sultan Kudarat-Tacurong 230 kV Transmission Line 2	Maguindanao, Sultan Kudarat	Dec 2035
	Transmission Components: ▪ Sultan Kudarat-Tacurong 230 kV Transmission Line, ST-DC2, 2-795 MCM ACSR, 110 km. Substation Components: ▪ Sultan Kudarat 230 kV Substation, 1-230 kV PCBs and associated equipment; Tacurong 230 kV Substation, 2-230 kV PCBs and associated equipment.	
Maco-Mati 138 kV Transmission Line 2	Davao Oriental, Compostela Valley	Dec 2035
	Transmission Components: ▪ Maco-Mati 138 kV Transmission Line, ST-DC2, 1-795 MCM ACSR, 48 km. Substation Components: ▪ Maco 138 kV Substation, 2-138 kV PCBs and associated equipment; Mati 138 kV Substation, 2-138 kV PCBs and associated equipment.	

10.4 Proposed Transmission Outlook for 2040

The identified grid expansion projects in Mindanao by 2040 mainly consider the anticipated rapid load growth. The Mindanao Grid 230 kV transmission backbone network will be extended to Zamboanga Sibugay, Compostela Valley, and Southwestern areas to improve power reliability. The 230 kV network expansion consists of Nabunturan – Bunawan 230 kV Transmission Line, and Matanao – Tacurong 230 kV Transmission Line Projects.
Expected development in new areas in Mindanao is also considered which will require transmission power delivery service. Establishment of Lala – San Miguel 138 kV Transmission Line and Baganga – Mati 138 kV Transmission Line projects will provide more sustainable and reliable power supply delivery to their service areas.

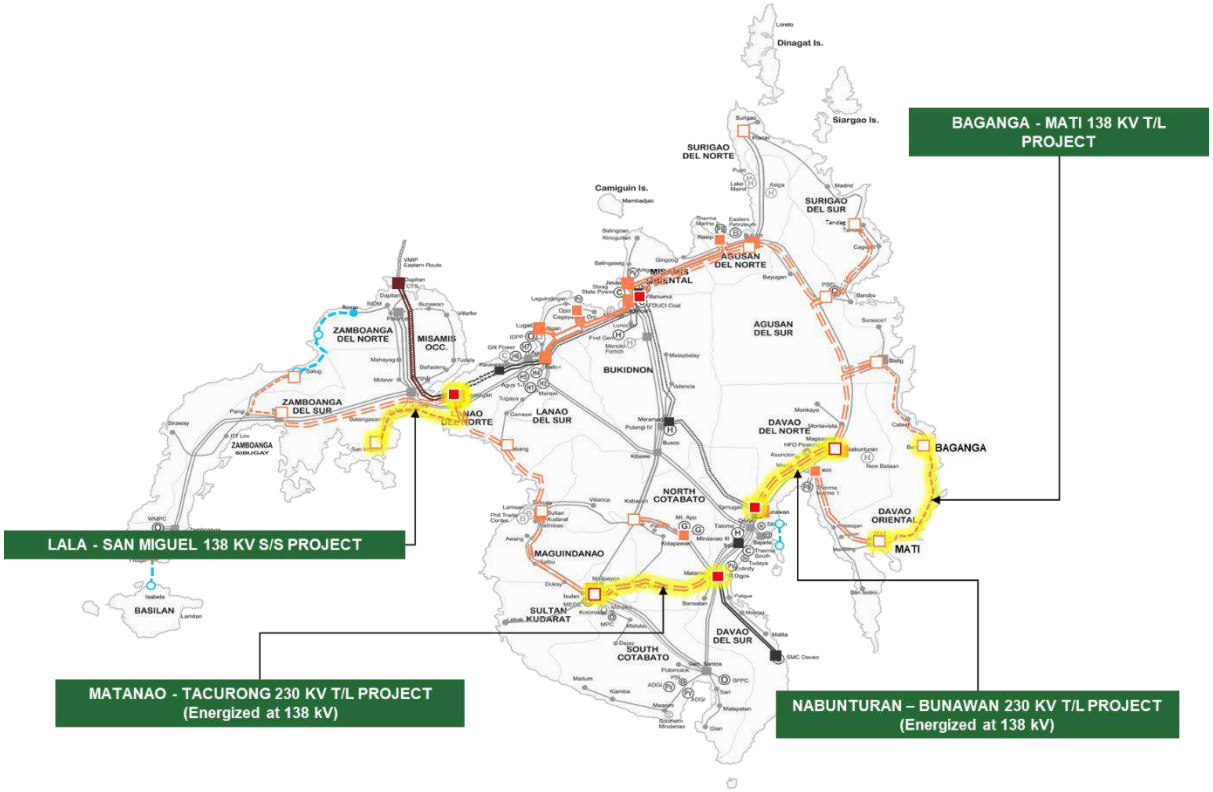


Figure 10.4: Proposed Mindanao Transmission Outlook for 2040

Table 10.4: Proposed Mindanao Transmission Outlook for 2040

Project Name/Driver(s)	Province(s) and Components	ETC
System Reliability		
Baganga–Mati 138 kV Transmission Line	Davao Oriental	Dec 2040
	Transmission Components: ▪ Baganga-Mati 138 kV Transmission Line, ST-SC, 1-795 MCM ACSR, 105 km. Substation Components: ▪ Baganga 138 kV Substation, 2-138 kV PCBs and associated equipment; Mati 138 kV Substation, 2-138 kV PCBs and associated equipment.	
Lala–San Miguel 138 kV Transmission Line	Zamboanga del Sur, Lanao del Norte	Dec 2040
	Transmission Components: ▪ Lala-San Miguel ST-SC, 1-795 MCM ACSR, 87 km. Substation Components: ▪ Lala 138 kV Substation, 2-138 kV PCBs and associated equipment; San Miguel 138 kV Substation, 1-50 MVA 138/69-13.8 kV Power Transformer and accessories, 4-138 kV PCBs, 3-69 kV PCBs and associated equipment.	
Nabunturan–Bunawan 230 kV Transmission Line	Davao del Norte	Dec 2040
	Transmission Components: ▪ Nabunturan-Bunawan 230 kV Transmission Line, ST-DC, 2-795 MCM ACSR/AS, 70 km. Substation Components: ▪ Nabunturan 230 kV Substation, 4-230 kV PCBs and associated equipment; ▪ Bunawan 230 kV Substation, 4-138 kV PCBs and associated equipment.	
Matanao–Tacurong 230 kV Transmission Line	Davao del Sur & Sultan Kudarat	Dec 2040
	Transmission Components: ▪ Matanao-Tacurong 230 kV Transmission Line, ST-DC, 2-795 MCM ACSR/AS, 93 km. Substation Components: ▪ Matanao 230 kV Substation, 4-230 kV PCBs and associated equipment; ▪ Tacurong 230 kV Substation, 4-230 kV PCBs and associated equipment.	

11.1 Island Interconnection

With the archipelagic nature of the Philippines, one of the challenges in improving the system reliability and reducing the reserve requirements without adding new generation is the interconnection of two or more islands using an undersea cable. Major considerations in the implementation of such kind of project are the required investment and the potential generation resources in the concerned island. The power cable systems have exhibited high reliability and long life of more than 20-30 years with limited maintenance.

11.1.1 Existing Island Interconnections

As of December 2016, the Philippines has seven major undersea island interconnection systems: six High Voltage Alternating Current (HVAC) and one High Voltage Direct Current (HVDC). These are the Leyte-Luzon ± 350 kV HVDC, Leyte-Cebu 230 kV, Negros-Panay 138 kV, Cebu-Negros 138 kV, Cebu-Lapu-lapu 138 kV HVAC and the Panay-Boracay 69 kV AC Interconnection facilities. The 432-km Leyte-Luzon ± 350 kV HVDC, with a 23-km connecting Leyte Island (via Samar Island) to the Luzon Grid has been in operation since 1998. Its maximum transmission capacity is 440 MW with provision for upgrade to 880 MW.

The Leyte-Cebu interconnection is a 33-km double circuit 230 kV submarine cable, with a transfer capacity of nearly 400 MW. The first and second circuits were energized in 1997 and 2005, respectively. The double circuit Cebu-Negros Interconnection enables power sharing of maximum of 180 MW between Cebu and Negros Islands. Its first circuit of 18-km, 138 kV submarine cable was energized in 1993 while its second circuit was energized in 2007. From Negros Island, connected is the 18-km 138 kV Negros-Panay Interconnection, energized in 1990 with a rated capacity of 85 MW. In 2017, additional 230 kV designed submarine cable was installed between Negros and Panay.

Connecting the island of Mactan to mainland Cebu is the 8.5-km 200 MW capacity cable that was energized in 2005. It is laid underneath the Cebu-Mactan Bridge. Another island interconnection is the Leyte-Bohol Interconnection, a submarine cable that allows a maximum power flow of 90 MW to the island of Bohol since 2004.

11.1.2 Benefits of Island Interconnection

The following are some of the salient benefits of island interconnections:

a) Generally, island interconnections can provide additional power supply similar to a generator having the ability to import power when required;
b) With island interconnections, the most efficient generator across both power systems is brought on to meet demand resulting in a more efficient dispatch;
c) Island interconnections also reduces power curtailment as it provides a means of exporting power when there is surplus from other island; and
d) Renewable and indigenous energy sources, such as wind, hydro and geothermal potential sites suitable for energy generation may also be taken into consideration. These are clean and sustainable sources of energy that may become attractive for development by generation proponents as a result of a wider market due to island interconnection.

Considering these salient and other intangible benefits, island interconnections become more economically attractive in the long run. However, detailed studies should be undertaken to quantify the overall benefits to the receiving island.

11.1.3 Major Project Development Considerations for Island Interconnections

The following major considerations shall be taken into account in the project development of island interconnections:

a) The depth of the seabed between two islands is always an issue in interconnecting islands. This is due to mechanical stress that the cable must be designed to withstand cable weight, sea current, bottom drag, etc. during installation and repairs;
b) The use of HVAC or HVDC transmission systems, the size and length of the cable, the existing situation of the grid, estimated load growth, environmental impact and public acceptance and the possibilities for the development of energy resources; and

11.2 Transmission Backbone and Island Interconnection Projects for 2016-2025

Figure 11.1 shows the development of transmission backbones and island interconnections. While some segments of the transmission backbones are already programmed for implementation within the Fourth Regulatory Period (2016-2020), as discussed in Chapters 8, 9 and 10, other segments will still be subjected to a more thorough system analyses or even Feasibility Study for some big and more complicated backbone projects.

Figure 11.2 shows the Existing and Future Philippine Network Topology of an interconnected grid.

11.2.1 Transmission Master Plan (TMP)

The formulation of the Transmission Master Plan (TMP) is guided by NGCP's vision to build the strongest power grid in Southeast Asia, to contribute to the social and economic development of the country and to satisfy its stakeholders' need. These are vital considerations to ensure that the country has a transmission network that can support growth and competitive electricity prices. This is done through a program that will significantly upgrade and expand the transmission backbone in order to meet the forecast demand, support the entry of new generating facilities and allow market competition.

The creation of an interconnected Philippine Grid will also be among the considerations. As the Luzon and the Visayas Grids are already interconnected, connecting the Visayas and Mindanao would create more open, liberalized and competitive market as Mindanao-based industry players can participate freely in Wholesale Electricity Spot Market.

Table 11.1 – Transmission Master Plan Proposed Projects for 2019-2040

Project Name	Provinces	ETC
Bolo to Laoag 500 kV Backbone	Ilocos Sur, La Union, Pangasinan	Dec 2024
Nagsaag to Kabugao 500 kV Backbone	Isabela, Pangasinan, and Apayao	Dec 2035
Western Luzon 500 kV Backbone	Pangasinan, Zambales	Jun 2025
Metro Manila 500 kV Backbone Loop	Taguig	Sept 2021
Batangas-Mindoro Interconnection Project	Batangas, Oriental Mindoro amd Occidental Mindoro	Mar 2021
Luzon–Visayas HVDC Bipolar Operation	Camarines Sur and Leyte	Dec 2030
Cebu-Negros-Panay 230 kV Backbone	Cebu, Negros Occidental, Iloilo	Aug 2020
Metro Cebu 230 kV Backbone Loop	Cebu	Dec 2040
Cebu–Bohol–Leyte 230 kV Backbone	Cebu, Bohol, and Leyte	Dec 2035
Mindanao-Visayas Interconnection Project	Cebu, Lanao del Norte, Zamboanga del Norte	Dec 2020
Mindanao 230 kV Backbone	Mindanao Island	Mar 2019
Western Mindanao 230 kV Transmission Backbone	Zamboanga del Sur, Sultan Kudarat, Maguindanao, South Contabato	Dec 2040
Eastern Mindanao 230 kV Transmission Backbone	Agusan Del Norte, Agusan Del Sur, Compostella Valley	Dec 2025

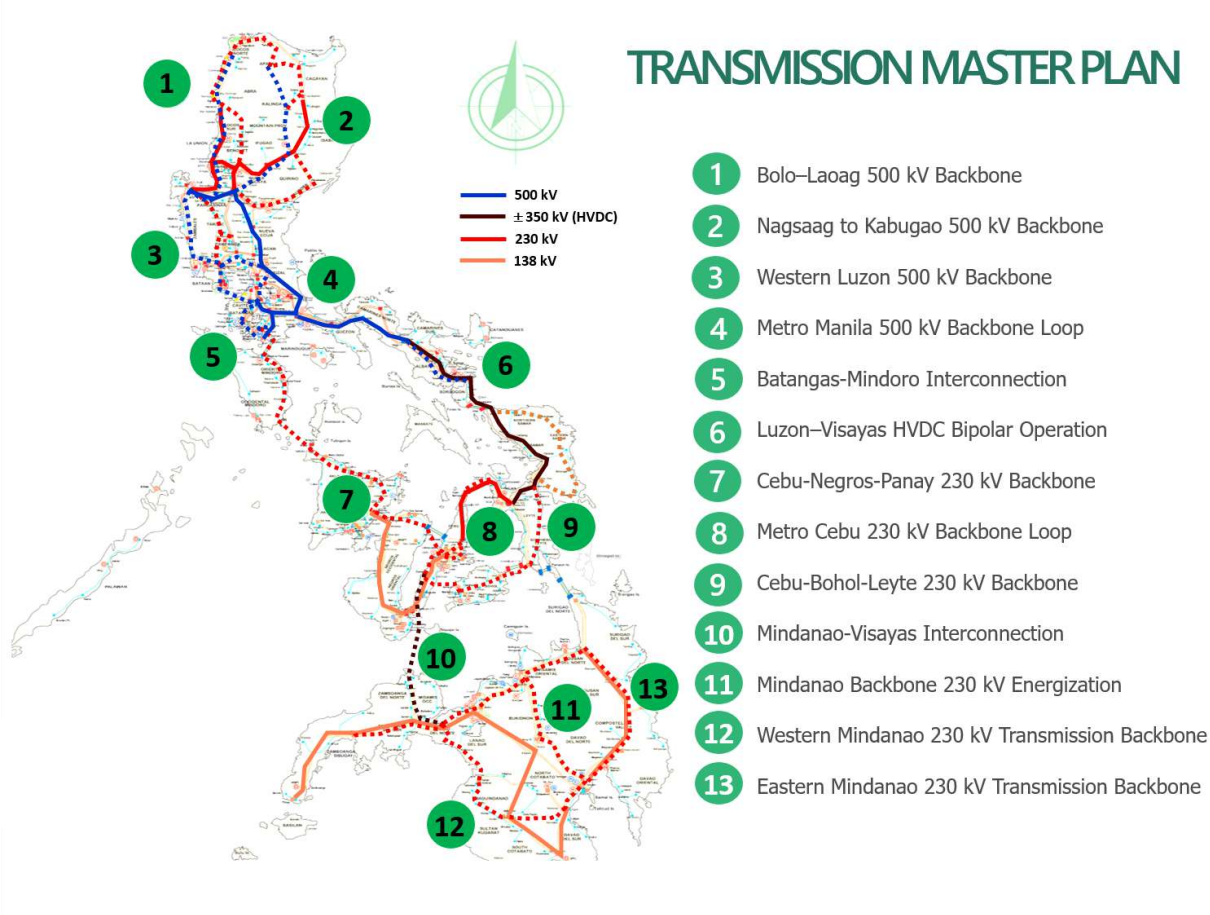


Figure 11.1 - Transmission Backbones and Island Interconnections

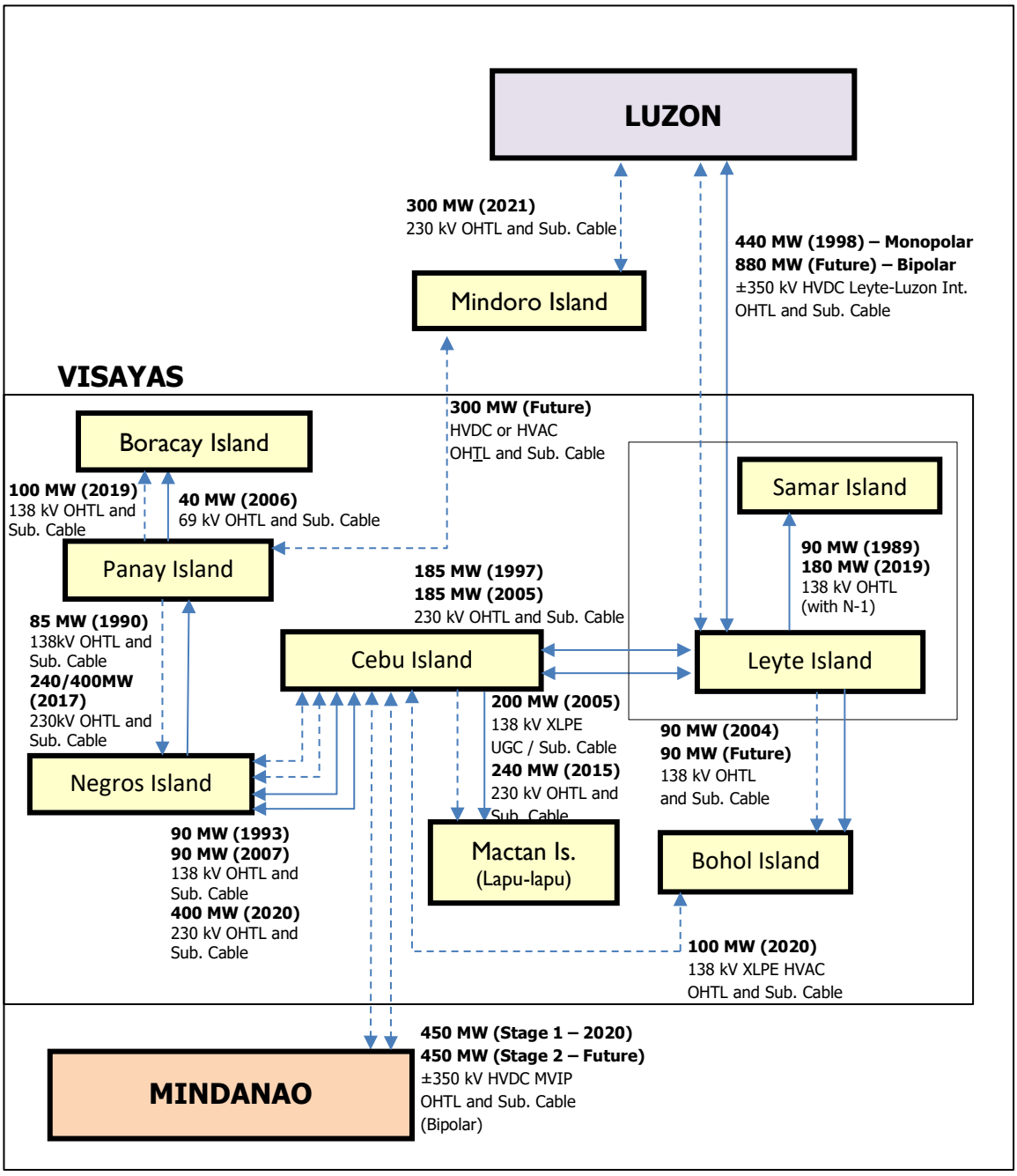


Figure 11.2 - Existing and Future Philippine Network Topology

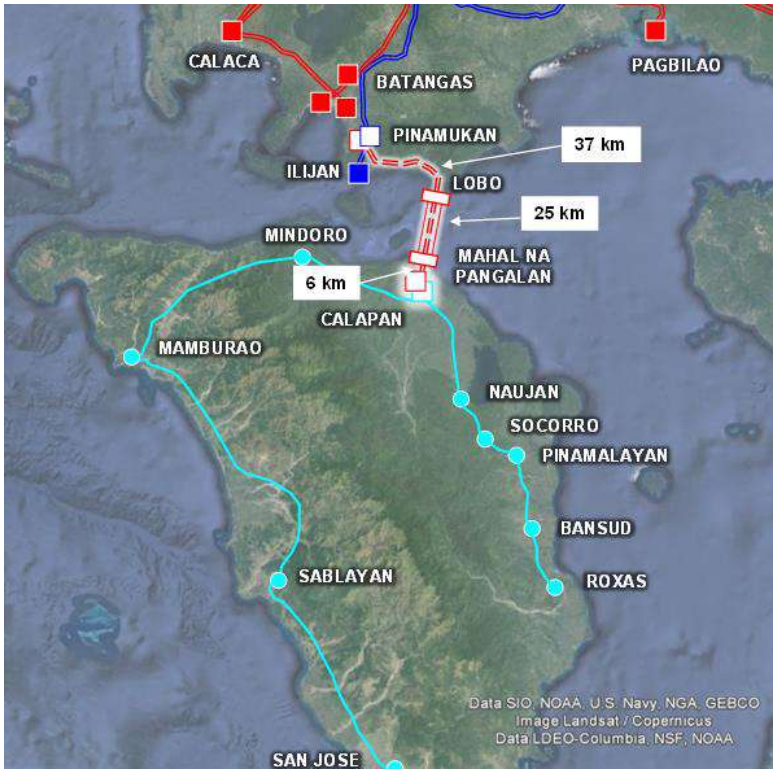
11.2.2 Batangas-Mindoro Interconnection Project (BMIP)

The power system of Mindoro Island, which is composed of 69 kV lines connected to several power plants and various load-end substations, is presently being operated by Small Power Utilities Group (SPUG) of the National Power Corporation (NPC). Power distribution to the consumers is handled by Oriental Mindoro Electric Cooperative (ORMECO) and Occidental Mindoro Electric Cooperative (OMECO). The major load center is in Calapan City in Oriental Mindoro and the total peak demand of the island in 2016 was more than 64 MW already, based on the combined total load of ORMECO and OMECO.

As the implementation of an interconnection project may take some time, further generation capacity additions within Mindoro Island would still be required to be able to sustain the short-term and medium term power supply requirements of its increasing load. The interconnection of the island with the main Luzon Grid was envisioned to provide the island the access to bulk generation sources in the main grid while at the same time providing the means to export possible excess power once the generation potentials, including RE-based plants, within the island have been developed. The improvement in reliability of supply is expected to result in better economic growth as the island could attract more investors for industrial, commercial loads and for the tourism industry.

Transmission line route investigation has been already conducted including the identification of the possible cable terminal stations (CTS) at Batangas and Mindoro side. The nearest connection substation in the Luzon Grid for the planned interconnection is the proposed Pinamukan 500 kV Substation. This new 500 kV Substation, located further down south of Batangas City, could serve as the interconnection substation of Mindoro Island aside from the generation connection hub of proposed bulk generations.

The interconnection of Mindoro would only serve as the initial stage in the development of the power system in the island. Calapan would serve as the interconnection point but given the configuration of the island involving long 69 kV lines, in-land generators will still have to operate to provide voltage regulation support. In the long term, a 230 kV backbone system within the island could be developed as well as the future establishment of a loop to Panay Island thereby providing another corridor for the Luzon and Visayas link.



Major Project Components:

- Pinamukan–Lobo CTS 230 kV T/L, ST-DC 1-795 MCM ACSR, 37 km;
- Lobo CTS-Mahal na Pangalan CTS 230 kV Submarine Cable, 6-1,600 mm^2 XLPE, 25 km;

- Mahal na Pangalan CTS–Calapan 230 kV T/L, ST-DC 1-795 MCM ACSR, 6 km;
- Pinamukan 230 kV S/S: 4-230 kV PCB and associated equipment;
- Lobo CTS: 3-230 kV PCB, 2-30 MVAR 230 kV Shunt Reactors and associated protection equipment;
- Mahal na Pangalan CTS: 3-230 kV PCB, 2-30 MVAR 230 kV Shunt Reactors and associated protection equipment; and
- Calapan 230 kV S/S: 2-100 MVA, 230/69-13.8 kV Power Transformers, 7-230 kV PCB and 4-69 kV PCB and associated equipment and a 25 MVAR 230 kV Shunt Reactor .

11.2.3 Leyte-Luzon AC Interconnection Project

Currently, Samar Island is highly dependent to Leyte due to the absence of generating power plants in the Island and since the existing Leyte-Luzon HVDC transmission system is terminated in Ormoc in Leyte. Isolation of Samar Island is possible in case of trouble occurs in Leyte thus, resulting to power interruption in the island. The Leyte-Luzon AC Interconnection Project aims to provide Samar Island an alternate power source. This will address the high dependency of Samar to Leyte. A 230 kV submarine cable with a transfer capacity of 400 MW will be laid connecting Sorsogon to Samar. Shown below are the major components of the project.

Major Project Components:

<u>Substation Portion</u>
- Catarman 230 kV S/S: 2x300 MVA, 230/138-13.8 kV Power Transformers, 6-230 kV PCB and 4-138 kV PCB and associated equipment
- Matnog 230 kV S/S (Expansion): 4-230 kV PCB and associated equipment;

<u>Transmission Line Portion</u>
- Allen CTS–Catarman 230 kV T/L, ST-SC 2-795 MCM ACSR, 27 km;
- Matnog–Sta. Magdalena CTS 230 kV T/L, ST-SC 2-795 MCM ACSR, 18 km;

<u>Submarince Cable Portion</u>
- Sta. Magdalena CTS-Allen CTS 230 kV Submarine Cable, 3-1,600 mm^2 XLPE, 23 km;
- Allen CTS: Cable Sealing End, 1x70 MVAR 230 kV Reactor;
- Sta. Magdalena CTS: Cable Sealing End, 1x70 MVAR 230 kV Reactor;

11.2.4 Mindanao-Visayas Interconnection Project (MVIP)

The Mindanao-Visayas Interconnection Project was previously known as Visayas-Mindanao Interconnection Project (VMIP). The change to MVIP aims to indicate the importance and priority given to Mindanao Grid which has long been isolated. Luzon and the Visayas Grids are already interconnected since 1998 and with electricity market in operation since 2006 and 2008, respectively. The name MVIP indicates further support to boost the development of the country's electricity market to include the Mindanao Grid.

The tangible benefits in terms of reduced investments in power generation due to the implementation of MVIP are due to the following:

a) The sharing of system reserve;
b) The lesser investment in power generation in either the Visayas or Mindanao to maintain the one day Loss of Load Probability (LOLP); and
c) The reduction of operating cost due to economic dispatch of generators.

The intangible benefits in the implementation of MVIP:

a) The benefit that is difficult to be quantified in monetary terms includes the attractiveness of MVIP to power generation investments due to the bigger market through an interconnected power network;
b) From a technical standpoint, MVIP will provide benefit to the system in terms of added supply security, improved system reliability and improvement in the quality of power supply; and
c) The optimized utilization of indigenous energy sources, such as natural gas in Luzon, geothermal in the Visayas and hydro in Mindanao. MVIP will reduce the overall generation of pollution as well as the dependency on the importation of fossils fuel, where its availability and price are sensitive to the price in the world market.

Major Project Components:

I. Land Portion

a) Overhead DC Transmission Lines:
   - Dumanjug CS-Santander CTS (Visayas Side): 73 km, ±350 kV HVDC OHTL, Bipolar, 3-795 MCM ACSR Condor; and
   - Dapitan CTS (Mindanao Side)-Lala CS: 138 km, ±350 kV HVDC OHTL, Bipolar, 3-795 MCM ACSR Condor.

b) Overhead AC Transmission Lines:
   - Dumanjug CS-Magdugo S/S: 52 km, 230 kV, ST-DC, 4-795 MCM ACSR;
   - Cebu GIS S/S-Umapad S/S Line Extension: 0.1 km, 230 kV, ST-DC, 2-410 mm^2 STACIR; and
   - Umapad CTS-Umapad S/S Line Extension: 0.1 km, 138 kV SP-SC, 2-410 mm^2 STACIR.

c) Electrode Lines/Stations:
   - Lala CS-Kolambugan ES: 20 kV OHTL (2 lines), 20 km, 2-795 MCM ACSR Condor; and
   - Dumanjug CS-Alegria ES: 20 kV OHTL (2 lines), 20 km, 2-795 MCM ACSR Condor.

d) Converter Stations (Conventional Bipolar):

Dumanjug Converter Station:
   - Thyristor Valves: 2-227.5 MW, 350 kV, 750 A, water cooled, air insulated, suspended, indoor 12-pulse single phase quadruple;
   - Converter Transformers: 2-225 MW, 230 kV AC/350 kV DC, single phase and three - winding;

- Power Transformer: 2-150 MVA, 230/138-13.8 kV Power Transformer and accessories, 1-100 MVA, 138/69 kV Power Transformer and accessories;
- Power Circuit Breakers: 14-230 kV PCB and associated equipment, 11-138 kV PCB and associated equipment, 2-69 kV PCB and associated equipment;
- Oil immersed DC Smoothing Reactor: including DC filters and AC filters;
- DC Field Equipment including DC High-Speed Switches, Metallic Return Transfer Breaker, Ground Return Transfer Switch, various DC Switches, DC Measuring equipment and wall bushings; and
- Secondary System including Operator Control, AC/DC Station Control, Pole Control, DC Protection, Station Master Clock, Fault Recording, DC Line Fault Location, AC Protection, Revenue Metering, Auxiliary System, Management Subsystems of Relay Protection and Fault Information and Telecontrol and Telecommunication Equipment.

Lala Converter Station:

- Thyristor Valves: 2-227.5 MW, 350 kV, 750 A, water cooled, air insulated, suspended, indoor 12-pulse single phase quadruple;
- Converter Transformers: 2-225 MW, 230 kV AC/350 kV DC, single phase and three-winding;
- Power Transformer: 2-150 MVA, 230/138-13.8 kV Power Transformer and accessories;
- Power Circuit Breakers: 8-230 kV PCB and associated equipment;
- Oil immersed DC Smoothing Reactor: including DC filters and AC filters;
- DC Field Equipment including DC High-Speed Switches, Metallic Return Transfer Breaker, Ground Return Transfer Switch, various DC Switches, DC Measuring equipment and wall bushings; and
- Secondary System including Operator Control, AC/DC Station Control, Pole Control, DC Protection, Station Master Clock, Fault Recording, DC Line Fault Location, AC Protection, Revenue Metering, Auxiliary System, Management Subsystems of Relay Protection and Fault Information and Telecontrol and Telecommunication Equipment.

e) Substations:

- Umapad S/S (New): 2-150 MVA, 230/138-13.8 kV Power Transformers and accessories, 2-150 MVA, 230/69-13.8 kV Power Transformers and accessories, 13-230 kV PCB and associated equipment, 4-138 kV PCB and associated equipment, 9-69 kV PCB and associated equipment;
- Magdugo S/S (Expansion): 2-230 kV PCB and associated equipment; and
- Other Equipment/Facilities identified based on the result of GIS, e.g., power compensating equipment, etc.

II. Marine Portion

Santander CTS-Dapitan CTS, 92 km, ±350 kV HVDC, Bipolar, 1,500 mm^2 HVDC Mass Impregnated (MI) submarine cable.

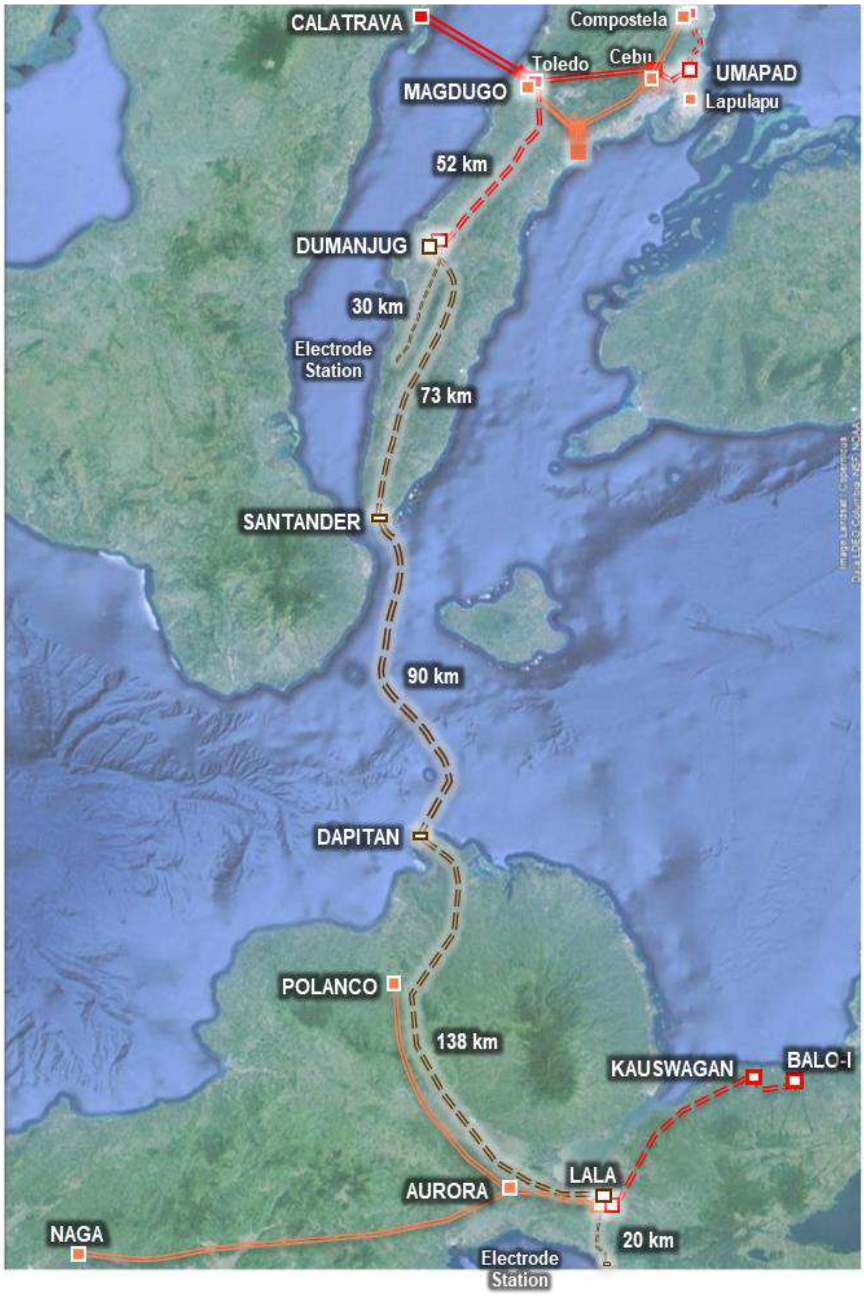


Figure 11.3 – Connection Configuration of MVIP

11.2.5 Small Island Interconnection Projects

A significant number of islands in the country remain isolated from the main grid. The power system in the island is being operated and managed by the Small Power Utilities Group (SPUG) of the National Power Corporation. Summarized in Table 11.3 below are the potential small island interconnections indicating the length of the required facilities and the peak load in the island.

Table 11.3 – Potential Small Island Interconnections

Island	Interconnection Point	Length (kms)			Population[a]	Land Area[b] (km^2)	2015 Peak Demand (MW)	2040 Peak Demand (MW)
		Submarine	Overhead	Total				
LUZON								
Mindoro	Batangas	25	43	68	1,331,473	10,104	64.48	221.34
Catanduanes	Presentacion	32	8	40	260,964	1,492	10.22	33.74
Marinduque	General Luna	23	11	34	234,521	953	8.74	23.71
Ticao	Abuyog	20	35	55	95,129	385	1.79	2.58
Masbate	San Jacinto	16	16	32	706,897	3,337	16.35	37.04
Tablas	San Jose	61	36	97	164,012	844	6.53	26.96
Lubang	Calaca	54	20	74	28,920	245	0.76	1.54
Palawan	San Jose	252	173	425	886,308	13,980	49.70	261.42
Busuanga	San Jose	84	52	136	22,046	393	4.39	16.96
VISAYAS								
Bantayan	Medellin	21	24	45	144,116	134	5.34	16.88
Siquijor	Bacong	20	24	44	95,984	337	4.65	16.58
Camotes[1]	Isabel	18	8	26	91,688	204	3.02	11.83
Semirara	San Jose	33	0	33	14,892	55		
MINDANAO								
Siargao	Cagdiano	13	7	20	116,587	623	5.13	11.28
Samal[2]	Lasang	9	21	30	95,993	272	5.99	14.81
Basilan	Pitogo	27	12	39	297.306	690	8.67	29.04
Dinagat	Canlanipa	30	15	45	127,152	1,036	3.16	13.22
Camiguin	Esperanza	30	37	67	88,478	238	4.33	8.95
Siasi	Parang	43	32	75	67,705	193	0.7	1.84
Sulu	Taberlongan	100	34	134	607,735	2,055	8.34	20.11
Tawi-Tawi	Pagatpat	84	60	144	207,595	1,636	5.66	31.93

[a] Based on 2015 Census of Population (POPCON 2015)
[b] Based on Philippine Standard Geographic Code (PSGC)
1 Ponson Island excluded
2 Talicud Island excluded, Land area of Talicud Island from choosephilippines.com

It should be noted that further project assessments are required for the small island interconnections listed above.

Appendix 1 – Prospective Power Plants

Table A1.1 – List of Prospective Power Plants as of August 2018

Proposed Generation Facility	Capacity (MW)
CFB Coal-Fired Power Plant	300
Maragondon-Naic-Tanza 2 Solar Power Project	200
Sta. Rosa Nueva Ecija 2 Solar Power Project	1,200
Iba-Palauig 2 Solar Power Project	1,200
Balayan Solar Power Project	600
Iba-Palauig 1 Solar Power Project	1,200
Tarlac Solar Power Project	150
Bunker-Fired Diesel Power Generating Facility	35
Palawan Solar Power Project	25
Tarlac Solar Power Project	100
South Cotobato Solar Power Plant	24.96
Biomass Power Project	3

Appendix 2 – ASEAN Power Grid (APG)

Realizing the importance of building a regional power grid among ASEAN member countries through cross-border transmission links, the Heads of ASEAN Power Utilities/Authorities (HAPUA) initiated the conduct of ASEAN Interconnection Master Plan Study (AIMS). It is envisioned that the establishment of the ASEAN Power Grid would allow pooling of the energy resources of the member countries and that the diversity in demand patterns and time zones would provide opportunities for power sharing and greater optimization of generation capacity. Moreover, this undertaking is also expected to promote sharing of experiences and close power cooperation in the region.

As shown in Figure A2, the Philippine Grid will form part of System C and the identified interconnection is the Philippine-Sabah Interconnection Project. The line will traverse within the islands of Palawan and Mindoro and the proposed interconnection point is at Ilijan 500 kV Substation in the Luzon Grid. In AIMS-II completed in 2010, this proposed ±500 kV HVDC interconnection is at 500 MW capacity and the identified earliest commercial operation year is 2020. It should be noted, however, that this more than 800-km interconnection project will still require further feasibility study. Also, the harmonization of the operational and regulatory framework, tariff structure, as well as mechanism for pool rules among member countries will still require further discussions.

Through Brunei Darussalam-Indonesia-Malaysia-Philippines East ASEAN Growth Area or BIMP-EAGA, which is a sub-regional economic cooperation initiative, discussions are already being undertaken to facilitate the interconnection projects for the region. A feasibility study is now ongoing to further explore the possibility of Philippine interconnection but with consideration to both via Palawan and via Mindanao (Borneo-Mindanao) options. For the interconnection via Mindanao, it is important that the Mindanao-Visayas Interconnection is in place in order to unify first the Philippine Grid and at the same time, to strengthen the Mindanao power system.
In addition to the geographical and technical challenges for the interconnection, the differences in the electric power industry structure may also pose challenges in this government-to-government cooperation. The Philippines has a restructured electric power industry already while neighboring countries have remained vertically-integrated with state-owned power generation, transmission and even including distribution sectors.

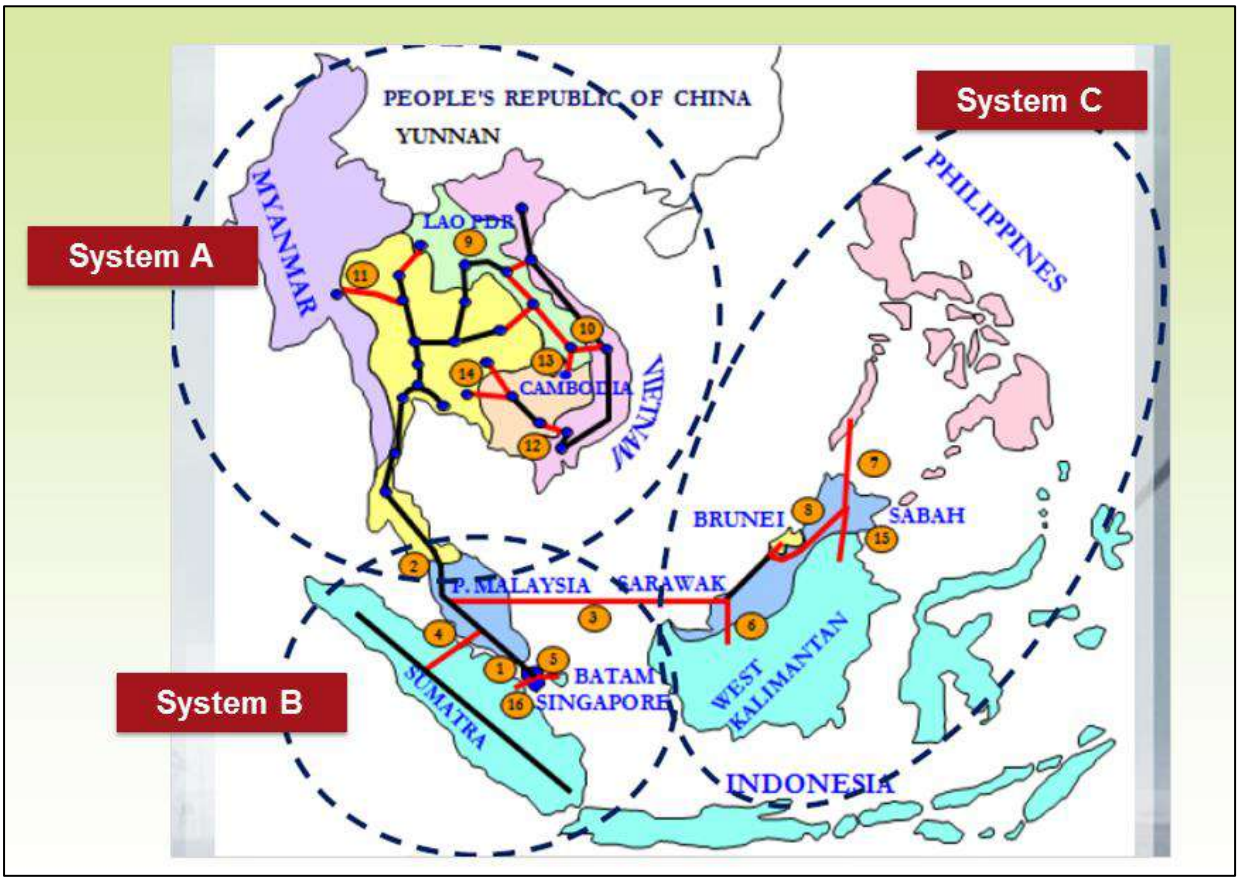


Figure A2 - The ASEAN Power Grid

Appendix 3 – Generation and Load Distribution Per Area

Generation and Load Distribution in the Luzon Grid

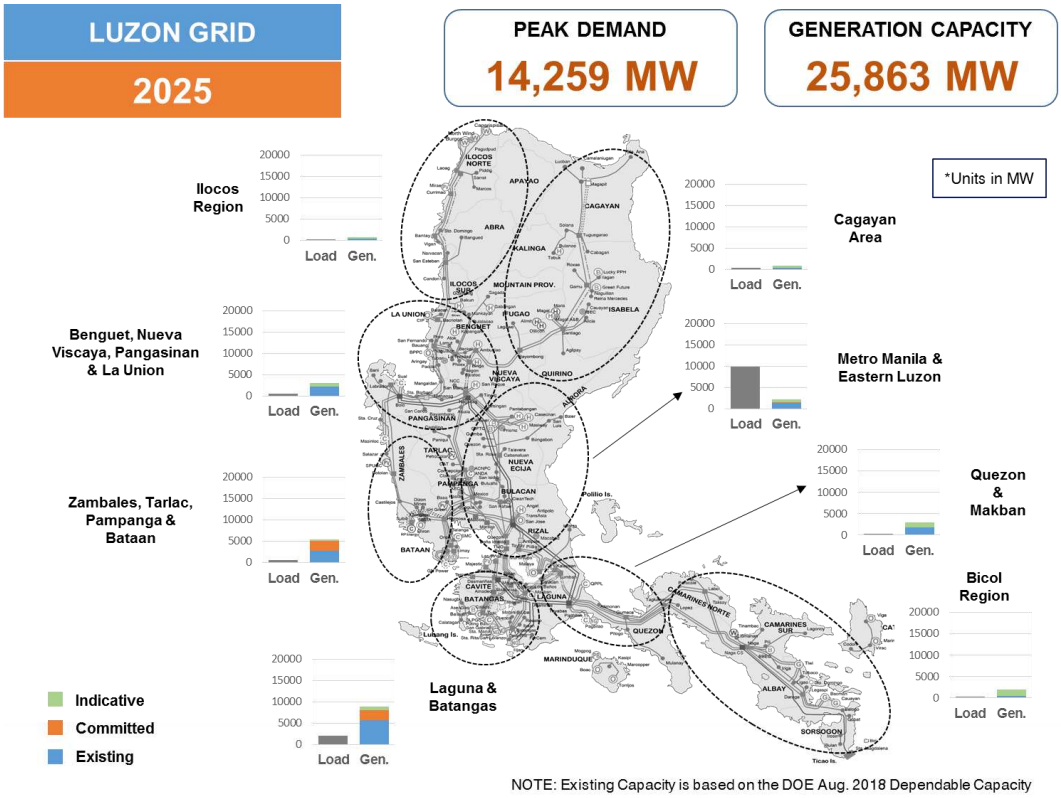


Figure A3.1 – Projected Luzon Grid Generation and Load Distribution in 2025

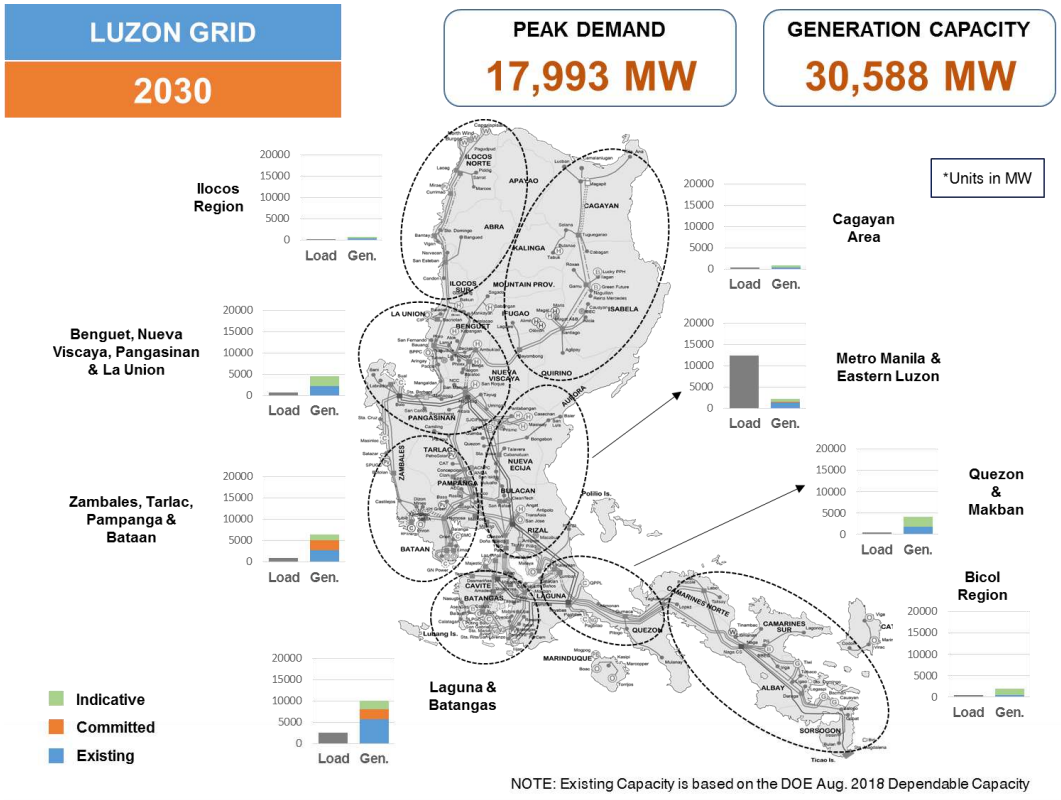


Figure A3.2 – Projected Luzon Grid Generation and Load Distribution in 2030

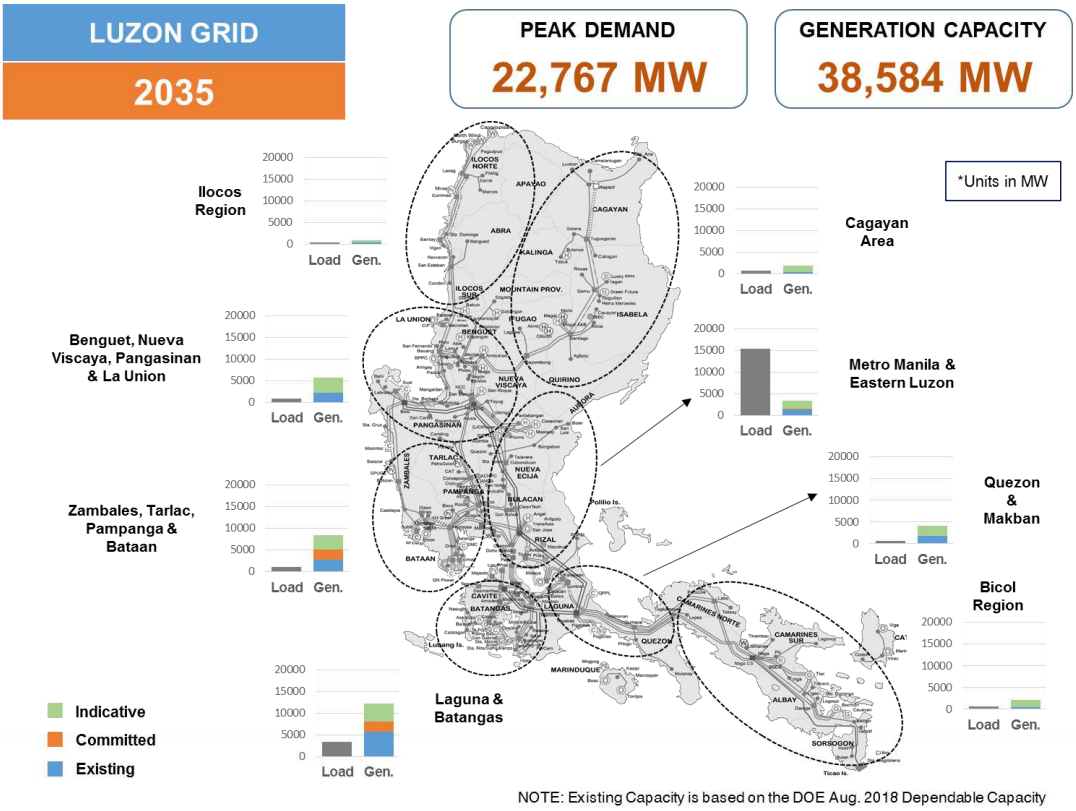


Figure A3.3 – Projected Luzon Grid Generation and Load Distribution in 2035

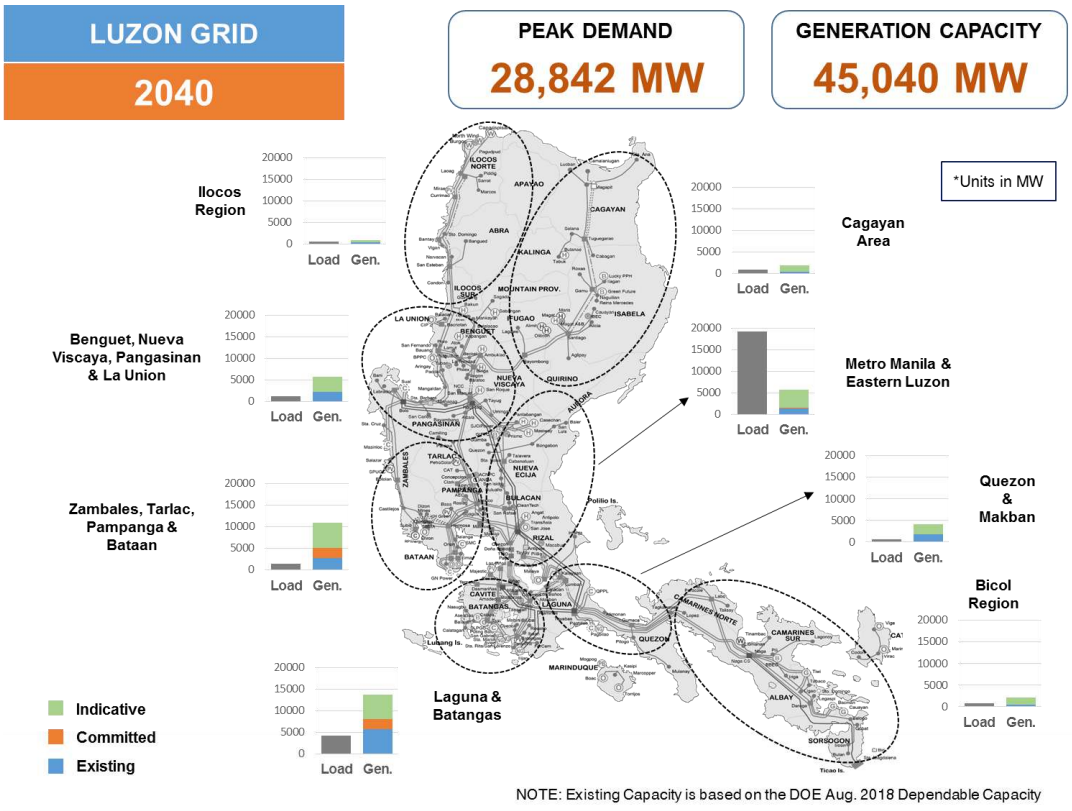


Figure A3.4 – Projected Luzon Grid Generation and Load Distribution in 2040

Generation and Load Distribution in the Visayas Grid

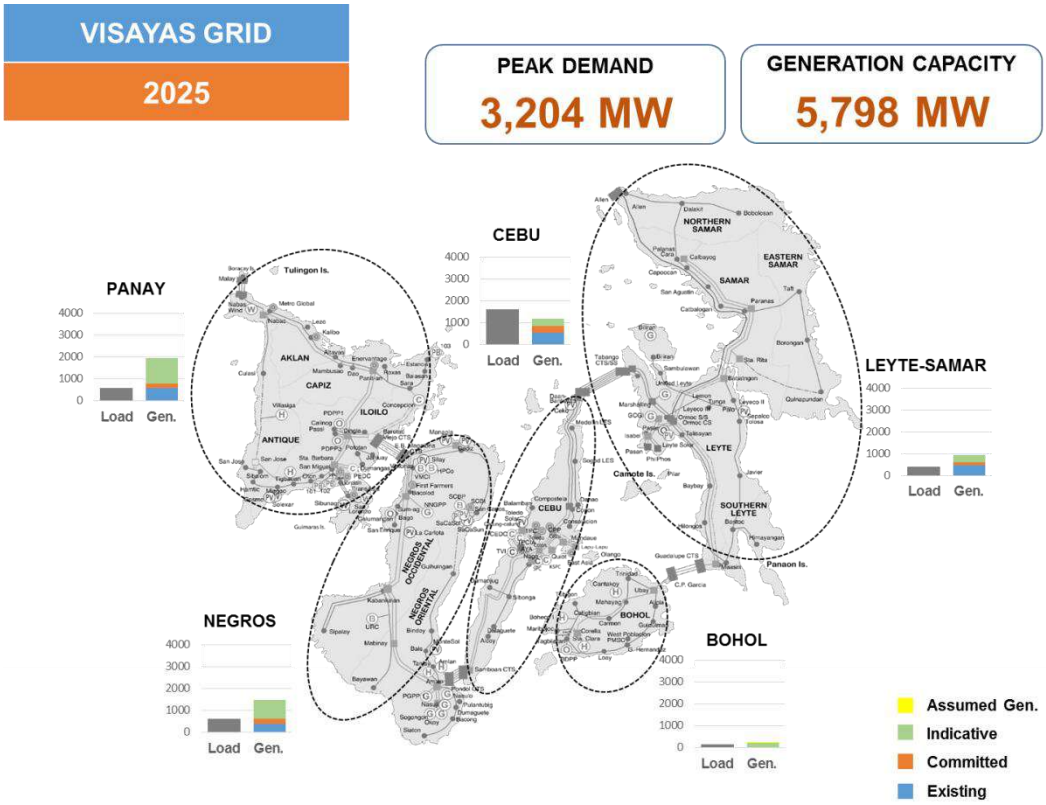


Figure A3.5 – Projected Visayas Grid Generation and Load Distribution in 2025

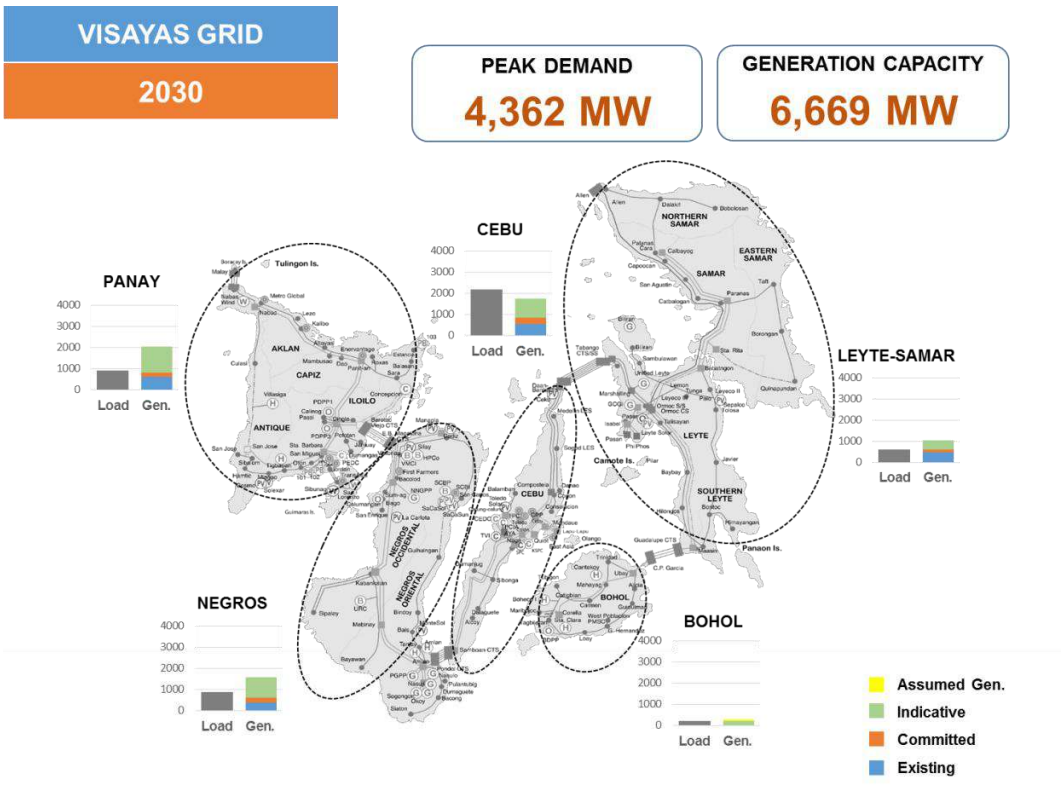


Figure A3.6 – Projected Visayas Grid Generation and Load Distribution in 2030

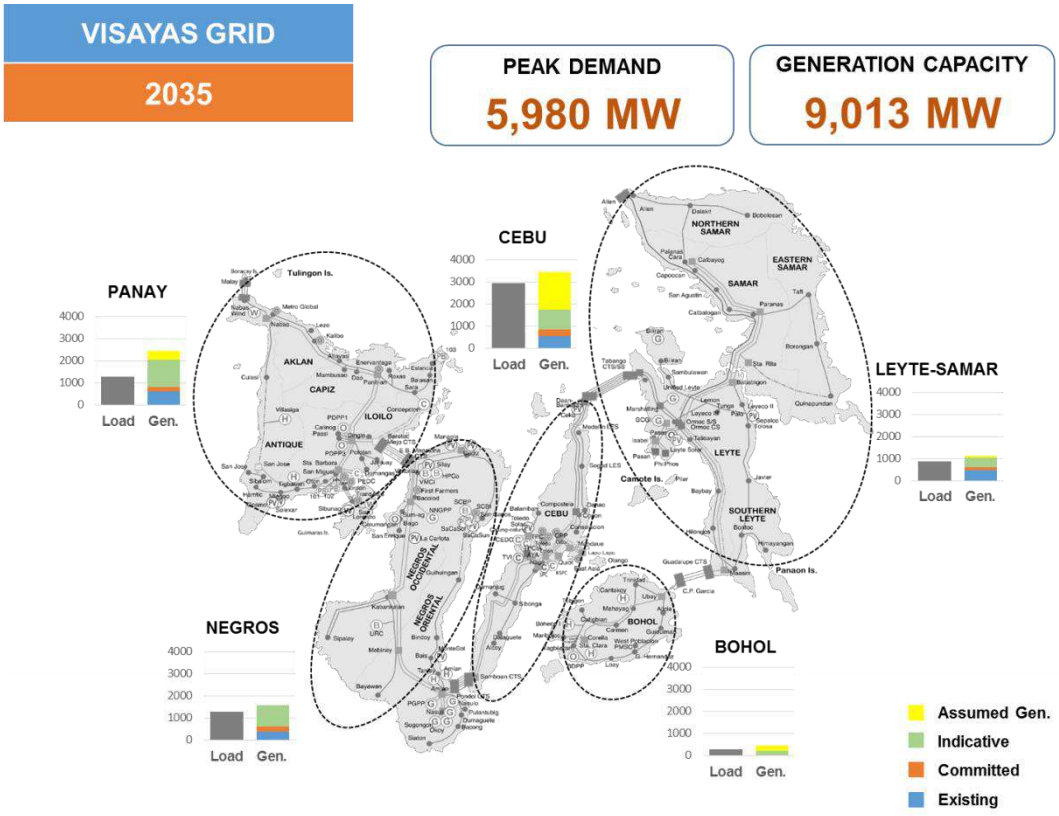


Figure A3.7 – Projected Visayas Grid Generation and Load Distribution in 2035

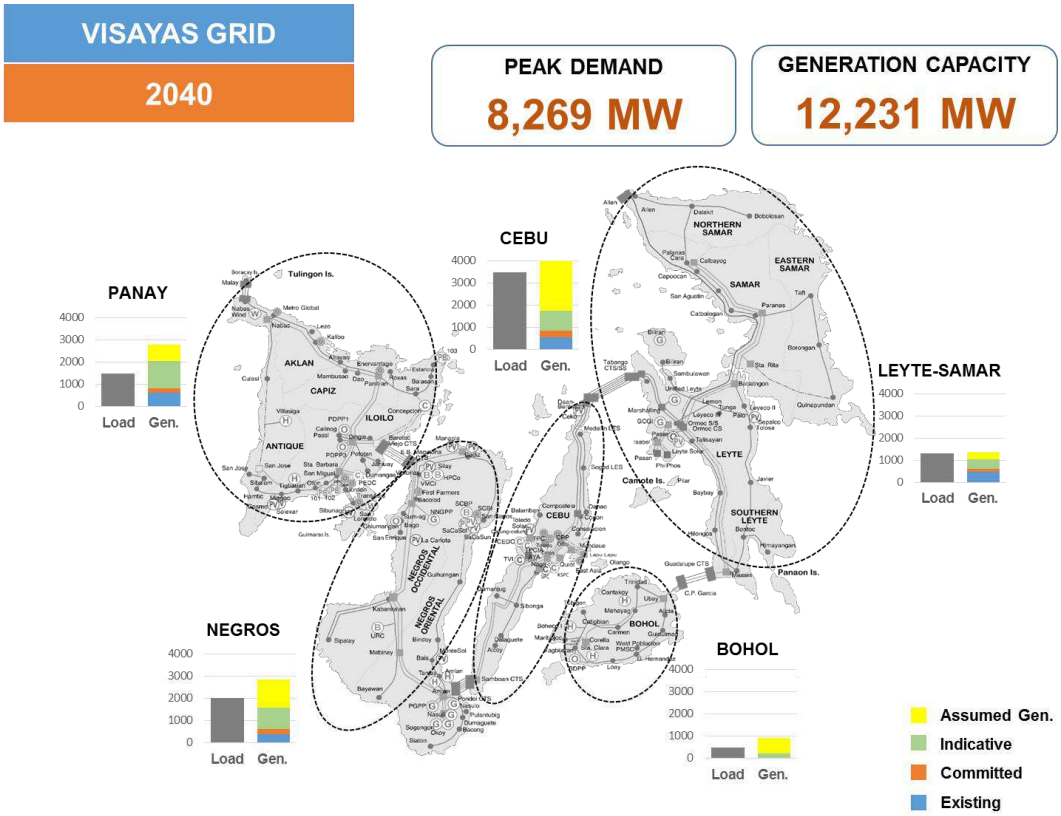


Figure A3.8 – Projected Visayas Grid Generation and Load Distribution in 2040

Generation and Load Distribution in the Mindanao Grid

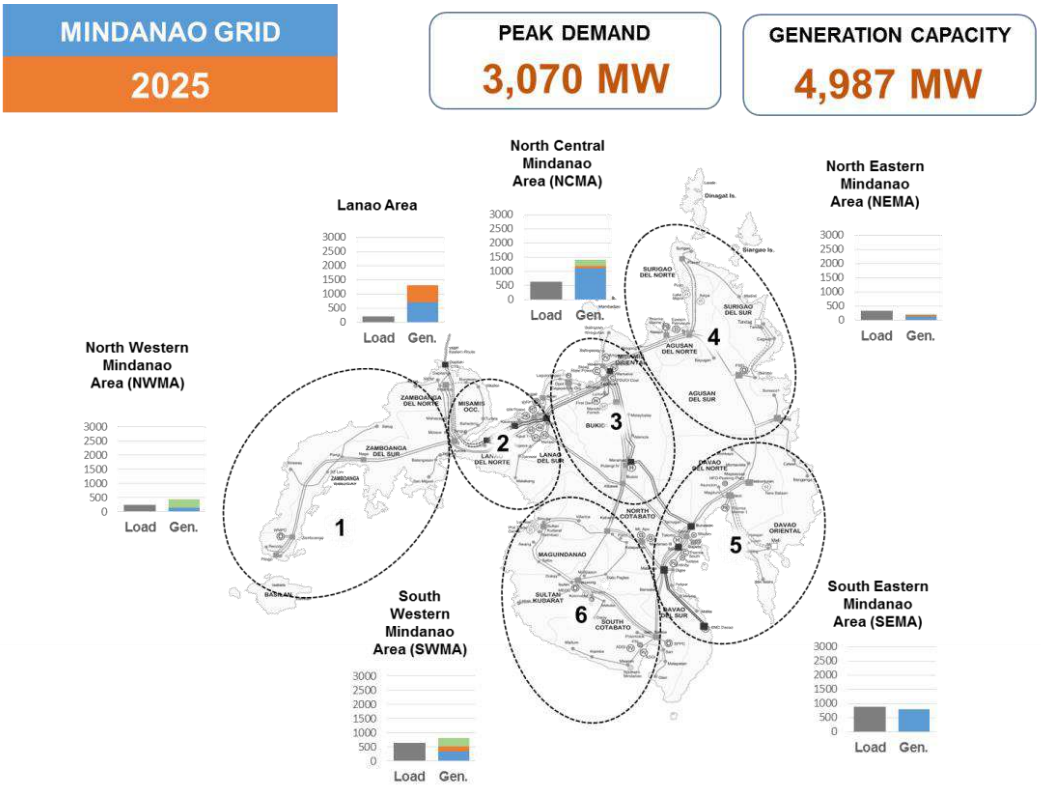


Figure A3.9 – Projected Mindanao Grid Generation and Load Distribution in 2025

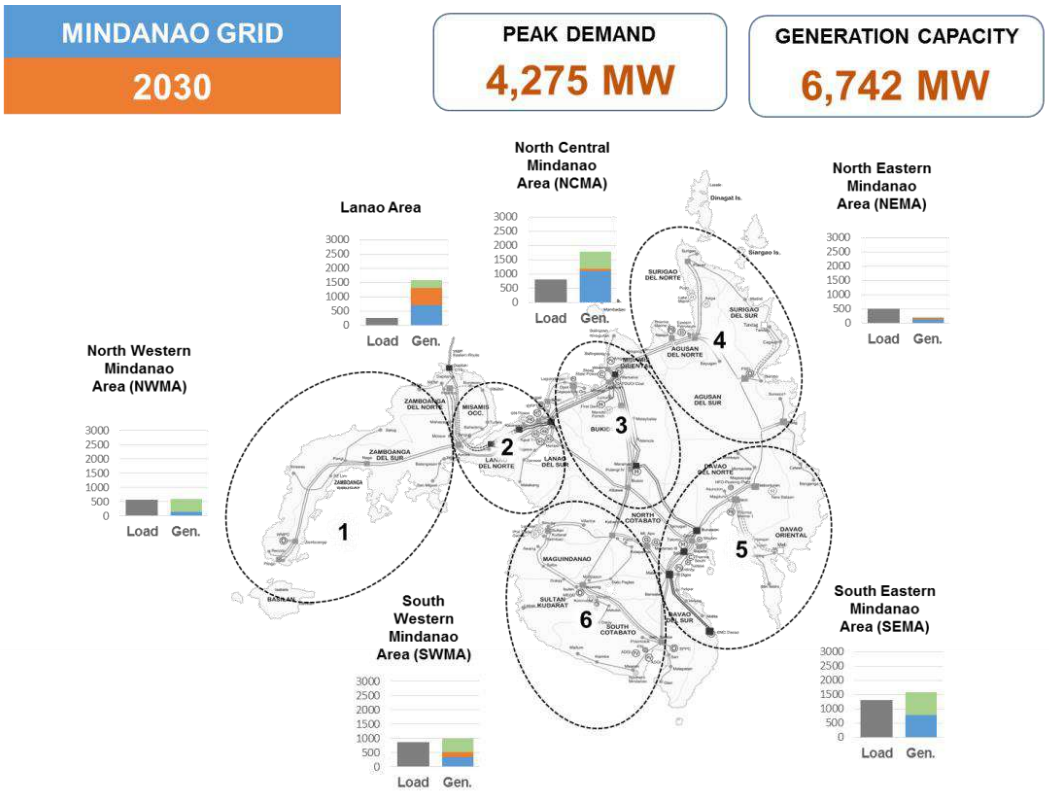


Figure A3.10 – Projected Mindanao Grid Generation and Load Distribution in 2030

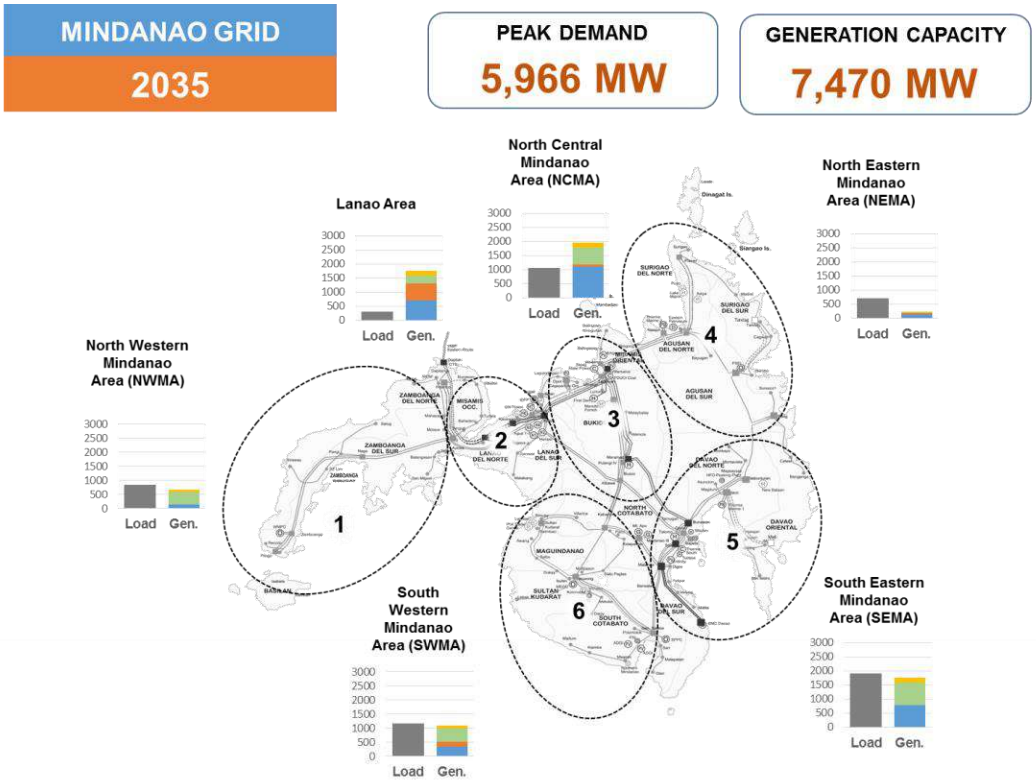


Figure A3.11 – Projected Mindanao Grid Generation and Load Distribution in 2035

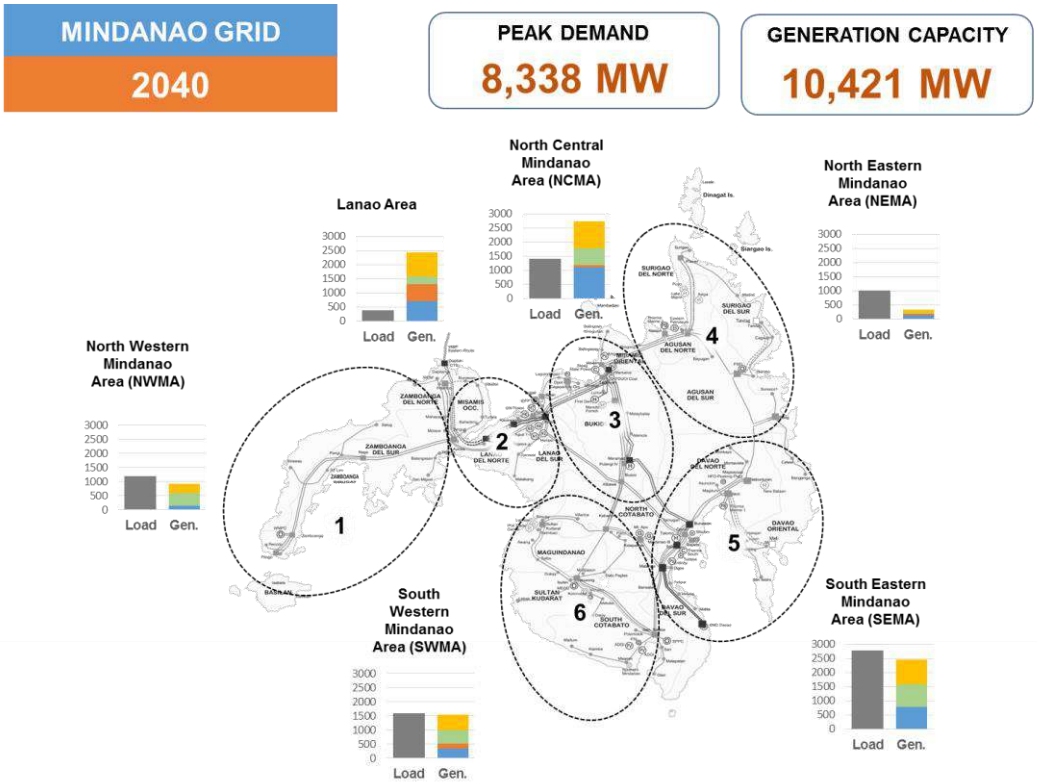


Figure A3.12 – Projected Mindanao Grid Generation and Load Distribution in 2040

USAID Biomass Resource Assessment - Luzon

Table A4.1 Theoretical Total MW Potential

Provinces	Rice Hull (2012)	Rice Straw (2012)	Coco Husk (2011)	Coco Shell (2011)	Coco Frond (2011)	CornCob (2012)	Corn Stalk (2012)	Bagasse (2011)	Trash (2011)	Total
Albay	5.40	21.40	27.10	12.30	5.90	5.20	61.80		0.00	**139.10**
Aurora	2.40	9.40	34.70	15.70	7.50	1.90	22.70		0.00	**94.30**
Batangas	1.10	4.50	21.20	9.60	4.60	1.40	16.50		0.50	**59.30**
Cagayan	22.80	90.80	5.50	2.50	1.20	38.70	464.50		0.10	**626.10**
Isabela	31.70	126.20	2.60	1.20	0.60	108.40	1,299.40		0.00	**1,570.00**
Masbate	4.00	16.00	48.10	21.80	10.40	3.10	37.30		0.0	**140.80**
Nueva Ecija	41.30	164.6	0.10	0.10	0.00	1.70	20.80		0.00	**228.70**
Palawan	7.00	27.80	48.70	22.10	10.60	1.60	19.20		0.00	**136.80**
Pampanga	10.10	40.30	0.00	0.00	0.00	4.40	52.70	0.10	0.10	**107.70**
Pangasinan	27.50	109.70	4.50	2.10	1.00	25.50	306.40		0.00	**476.70**
Quezon	4.20	16.70	187.60	85.00	40.70	3.30	39.50		0.00	**377.00**

USAID Biomass Resource Assessment – Visayas

Table A4.2 Calculated Biomass Energy derived from Production Data (2011) with Total Potential Energy in megawatt-hour units for Provinces in the Visayas

	Rice Hull	Rice Straw	Corn Cobs	Corn Stalk	Corn Leaves&Hu	Bagasse	Cane Trash	CocoHusk	CocoShell	Chicken	Hog	Solid Waste	**Total MW**	Ranking
Aklan	0.95	2.82	0.02	0.06	0.07			6.18	3.33	3.84	1.46	1.88	20.63	
Antique	2.63	7.81	0.05	0.13	0.14	0.58	0.44	3.77	2.03	3.86	0.67	1.96	24.07	
Capiz	1.52	4.52	0.05	0.12	0.14	6.36	4.88	5.06	2.73	8.07	0.57	4.45	38.47	
Guimaras	0.21	0.63	0.06	0.15	0.17			1.33	0.72	2.03	0.63	0.57	6.51	
Iloilo	6.93	20.56	2.76	7.03	7.95	13.16	10.10	3.17	1.71	25.16	20.33	10.72	129.59	4
Negros Occidental	4.76	14.12	4.12	10.50	11.87	141.20	108.38	6.17	3.33	25.40	12.81	15.02	357.67	1
Bohol	1.86	5.51	1.24	3.15	3.57			8.86	4.78	9.65	11.76	7.79	58.16	
Cebu	0.23	0.67	9.91	25.24	28.55	5.48	4.21	5.35	2.88	28.61	41.55	15.45	168.12	2
Negros Oriental	0.82	2.44	6.63	16.89	19.11	20.85	16.01	9.68	5.22	7.66	6.95	7.81	120.08	5
Siquijor	0.04	0.12	0.63	1.61	1.83			0.59	0.32	1.79	0.10	0.33	7.36	
Biliran	0.95	2.81	0.05	0.13	0.15			3.27	1.76	0.46	0.04	0.57	10.20	
Eastern Samar	0.23	0.67	0.03	0.07	0.08	0.00	0.00	15.35	8.27	0.70	0.14	1.54	27.08	
Leyte	5.32	15.78	4.78	12.18	13.78	5.41	4.15	37.99	20.47	7.74	0.46	10.91	138.96	3
Northern Samar	0.22	0.64	1.05	2.68	3.03			18.86	10.17	1.94	0.93	2.09	41.61	
Southern Leyte	1.18	3.49	0.69	1.77	2.00	0.00	0.00	16.34	8.81	1.50	0.05	4.40	40.24	
Western Samar	0.25	0.73	0.84	2.15	2.43	0.00	0.00	7.05	3.80	1.18	0.38	1.49	20.29	

[9] All data presented in Appendix 4 are sourced from DOE.

Table A4.3 HYDROPOWER SITES OFFERED FOR OCSP

No.	Island	Name of Project	Location	Max Output (kW)	Annual Energy Generation (MWh)	Type
1	Bohol	Upper Manaba	Garcia-Hernandez, Bohol	1,000	6,094	Run of River
2	Bohol	Balite	Baggao, Cagayan	1,000	6,997	Run of River
3	Bohol	Lower Manaba	Garcia-Hernandez, Bohol	800	4,826	Run of River
4	Bohol	Odiong	Jagna, Bohol	500	2,759	Run of River
5	Mindoro	Sinambalan No. 1	Abra de Ilog, Occidental Mindoro	3,000	17,946	Run of River
6	Mindoro	Pagbahan No. 1	Sta. Cruz, Occ. Mind	6,000	31,946	Run of River
7	Negros	Binalbagan No. 1	Moises Padilla, Neg. Occidental	13,000	64,506	Pondage
8	Negros	Binalbagan No. 2	Moises Padilla, Neg. Occidental	5,000	35,546	Run of River
9	Negros	Binalbagan No. 3	Moises Padilla, Neg. Occidental	4,000	27,934	Run of River
10	Negros	Lag-il No. 1	Binalbagan, Negros Occidental	1,000	8,677	Run of River
11	Negros	Lag-il No. 2	Binalbagan, Negros Occidental	2,000	13,750	Run of River
12	Negros	Pangiplan	Himamaylan, Neg. Occidental	1,000	8,407	Run of River
13	Negros	Hilabangan No. 3	Himamaylan and Kabankalan, Negros Occidental	4,000	29,360	Run of River
15	Negros	Calatong No. 1	Sipalay, Negros Occidental	1,000	8,801	Run of River
16	Negros	Calatong No. 2	Cauayan, Negros Occidental	2,000	11,747	Run of River
17	Negros	Binulug	Sipalay, Negros Occidental	3,000	21,932	Run of River
18	Negros	Mona-ol	Bana-ol, Negros Oriental	900	6,768	Run of River
19	Negros	Cauitan	Santa Catalina, Neg. Oriental	1,000	11,207	Run of River
20	Negros	Canauay	Zamboanguita, Neg. Oriental	600	4,255	Run of River
21	Negros	Himogaan	Calatrava, Negros Occidental	2,000	13,169	Run of River
22	Negros	Guinoba-an No. 1	La Libertad, Negros Oriental	4,000	33,167	Run of River
23	Negros	Pacuan	La Libertad, Negros Oriental	4,000	31,174	Run of River
24	Negros	Guinoba-an No. 2	La Libertad, Negros Oriental	3,000	27,157	Run of River
25	Negros	San Jose	La Libertad, Negros Oriental	600	4,310	Run of River
26	Negros	Talaptap	Bindoy, Negros Oriental	1,000	9,664	Run of River
27	Negros	Hinotongan	Sibulan, Negros Oriental	600	4,286	Run of River
30	Panay	Dugayan	Libertad, Antique	1,000	6,949	Run of River
31	Panay	Bulanao No. 1	Libertad, Antique	1,000	6,561	Run of River
32	Panay	Tibiao No. 2	Tibiao, Antique	2,000	9,191	Run of River
33	Panay	Ulian No. 2	Lambunao, Iloilo	1,000	7,482	Run of River
34	Luzon	Solsona	Solsona, Ilocos Norte	3,000	11,121	Run of River
35	Luzon	Madongan 1	Nueva Era, Ilocos Norte	4,000	15,457	Run of River
36	Luzon	Madongan 2	Nueva Era, Ilocos Norte	5,000	19,375	Run of River
37	Luzon	Nailiman 2	Nagtipunan, Quirino	3,000	16,230	Run of River
38	Luzon	Dabubu No. 2	Maddela, Quirino	7,000	39,280	Run of River
39	Luzon	Dibuluan No. 2	Maddela, Quirino	3,000	17,750	Run of River
40	Luzon	Maplas	Ilagan, Isabela	4,000	17,608	Run of River
41	Luzon	Tuguegarao 2	Peñablaca, Cagayan	3,000	26,358	Run of River
42	Luzon	Natulud 1	Peñablaca, Cagayan	2,000	40,153	Run of River
43	Luzon	Natulud 2	Peñablaca, Cagayan	3,000	110,978	Reservoir
44	Luzon	Pered 1	Peñablaca, Cagayan	3,000	21,797	Run of River
45	Luzon	Immurung	Baggao, Cagayan	1,000	20,549	Run of River
46	Luzon	Tabo-an 2	Baggao, Cagayan	1,000	11,171	Run of River
47	Luzon	Dikatayan	San Pablo, Isabela	5,000	19,149	Run of River

Table A4.4 Sites under Wind Resource Assessment Project (WRAP)

1	Brgy. Malasin, San Jose City, Nueva Ecija
2	Brgy. Fatima, Pantabangan, Nueva Ecija
3	Brgy. Ibis, Bagac, Bataan
4	Puro, Magsingal, Ilocos Sur
5	East Poblacion, Pantabangan, Nueva Ecija
6	Malacapas, Dasol, Pangasinan
7	Cabusao, Camarines Sur
8	Happy Valley, San Isidro, Northern Samar
9	Mahawan, Kananga, Leyte
10	Poblacion Norte, Culasi, Antique

Note: Listed sites are subject for detailed analysis to determine its viability

Table A4.5 POTENTIAL GEOTHERMAL PROJECTS WITHOUT RESC

LINE NO.	REGION	PROVINCE	CITY MUNICIPALITY	PROJECT NAME	COMPANY NAME	PROPONENT	PROJECT STATUS*	SUB-CATEGORY	PROPOSED CAPACITY 2016-2030
2	CAR	Benguet		Acupan-Itogon Geothermal Power Project			Pending Service Contract	Base-load	20
3	CAR	Ifugao		Buguias-Tinoc Geothermal Power Project			Pending Service Contract	Base-load	60
5	CAR	Mt. Province		Mainit-Sadanga Geothermal Power Project			Pending Service Contract	Base-load	80
17	IV-A	Batangas	Tingloy	Maricaban Island Geothermal Power Project			Pending Service Contract	Base-load	-
33	VIII	Southern Leyte		Southern Leyte			Pending Service Contract	Base-load	40
35	VIII	Biliran		Biliran 2	Biliran Geothermal Inc.	Biliran Geothermal Inc.	Pending Service Contract	Base-load	-
39	X	Lanao del Norte		Sapad-Salvador Geothermal Prospect			Pending Service Contract	Base-load	30
40	XI	Compostela Valley		Amacan Geothermal Prospect			Pending Service Contract	Base-load	40
41	XI	Davao Occidental		Balut Island Geothermal Prospect			Pending Service Contract	Base-load	23
45	XII	South Cotabato		Mt. Parker Geothermal Prospect			Pending Service Contract	Base-load	60
46	XII	South Cotabato		Mt. Matutum Geothermal Prospect			Pending Service Contract	Base-load	20
47	XIII	Surigao del Norte		Mainit Geothermal Prospect			Pending Service Contract	Base-load	30
									1,371

NOTE
:

1. The row with a " Yellow mark" indicates geothermal projects that the Geothermal Energy Management Division have identified with potential and can be offered for investment. Suggested to include "Potential Project" that has no pending RE Service Contract application
2. TBD - To be determined
   GEMD has insufficient data to estimate the potential capacity of a service contracts with TBD.
   These areas are still conducting geological, geochemical and geophysical studies.

Table A4.6 AWARDED HYDROPOWER PROJECTS

Island/Grid	Region	Province	Municipality	Name of Project	Developer	Potential Capacity (MW)
Luzon	CAR	Benguet	Tuba	Abdao	AV Garcia Power Systems Corp.	2.00
Luzon	CAR	Benguet	Buguias	Man-asok	Benguet Electric Cooperative, Inc.	3.00
Luzon	IVB	Oriental Mindoro	Baco	Dulangan	PNOC - Renewables Corp.	8.25
Luzon	V	Camarines Sur	Buhi	Barit Irrigation Discharge	NASCENT Technologies Corp.	0.40
Luzon	III	Nueva Ecija	Gabaldon	Dupinga	Constellation Energy Corporation	3.00
Luzon	V	Catanduanes	San Miguel	Kapipian	Sunwest Water & Electric Company, Inc.	2.40
Luzon	III	Aurora	Dingalan	Davildavilan	PTC Energy, Inc.	1.00
Luzon	II	Cagayan	Peñablanca	Pinacanauan River	Sunwest Water & Electric Company, Inc.	6.00
Luzon	CAR	Mt. Province	Bauko	Ampassit	Kadipo Bauko Hydro Power Corp.	1.20
Luzon	CAR	Ifugao	Kiangan	Asin	Kiangan Mini Hydro Corporation	7.04
Luzon	IVB	Oriental Mindoro	San Teodoro	Inabasan	Ormin Power, Inc	10.00
Luzon	II	Nueva Vizcaya	Bambang	Matuno	Epower Technologies Corp.	8.00
Luzon	CAR	Ifugao	Lagawe	Ibulao	Hydrocore, Inc.	4.50
Luzon	IVB	Oriental Mindoro	Naujan	Catuiran	Catuiran Hydro Power Corp.	8.00
Luzon	IVB	Oriental Mindoro	Naujan	Catuiran (Upper Cascade)	Philnew Hydro Power Corp	8.00
Luzon	CAR	Ifugao	Tinoc	Tinoc 1	Quadriver Energy Corporation	3.00
Luzon	CAR	Ifugao	Tinoc	Tinoc 2	Quadriver Energy Corporation	6.50
Luzon	CAR	Ifugao	Tinoc	Tinoc 3	Quadriver Energy Corporation	5.00
Luzon	CAR	Ifugao	Tinoc	Tinoc 4	Philnew Hydro Power Corp	6.00
Luzon	II	Isabela	Tumauini	Tumauini (Upper Cascade)	Philnew Hydro Power Corp	14.00
Luzon	II	Isabela	Tumauini	Tumauini (Lower Cascade)	Quadriver Energy Corporation	7.80
Luzon	II	Quirino	Cabugao	Diduyon	Green Energy Management (GEM) & Holdings, Inc.	320.00
Luzon	CAR	Apayao	Cabarroguis & Nagtipunan	Gened 1	Pan Pacific Renewable Power Philippine Corp.	600.00

Island/Grid	Region	Province	Municipality	Name of Project	Developer	Potential Capacity (MW)
Luzon	II	Cagayan	Gonzaga	Baua 1	Pan Pacific Renewable Power Philippine Corp.	4.44
Luzon	CAR	Kalinga	Tinglayan	Tinglayan	Pan Pacific Renewable Power Philippine Corp.	4.32
Luzon	I	Ilocos Sur	Alilem	Alilem HEP	Philnewriver Power Corp.	16.20
Luzon	I	Ilocos Sur	Sugpon	Danac HEP	Philnewriver Power Corp.	3.00
Luzon	I	Ilocos Sur	Quirino	Quirino HEP	Philnewriver Power Corp.	11.50
Luzon	CAR	Ifugao	Tinoc	Tinoc 5 (Lower Luhong) HEP	Philnewriver Power Corp.	6.90
Luzon	CAR	Ifugao	Tinoc	Tinoc 6 (Wangwang) HEP	Philnewriver Power Corp.	8.00
Luzon	II	Isabela	San Mariano & San Guillermo	Ilaguen	Isabela Power Corp.	19.00
Luzon	CAR	Mt. Province	Tadian	Dicapan	Asiapac Green Renewable Energy Corporation	3.00
Luzon	CAR	Mt. Province	Natonin	Lower Siffu	Asiapac Green Renewable Energy Corporation	8.00
Luzon	CAR	Mt. Province	Natonin	Upper Siffu	Asiapac Green Renewable Energy Corporation	8.00
Luzon	III	Nueva Ecija	General Tinio	Balintingon HEP	First Gen Luzon Power Corporation	30.00
Luzon	III	Nueva Ecija	Pantabangan	Pantabangan (Pump Storage) HEP	First Gen Prime Energy Corporation	300.00
Luzon	CAR	Benguet	La Trinidad	Bineng 1-2B Combination	Hedcor, Inc.	19.00
Luzon	IVB	Palawan	Narra	Batang-Batang	Langongan Power Corporation	3.50
Luzon	CAR	Mt. Province	Bauko	Boga	Kadipo Bauko Hydro Power Corp.	1.00
Luzon	CAR	Mt. Province	Bauko	Enodey 1A	Kadipo Bauko Hydro Power Corp.	1.80
Luzon	IVA	Laguna & Quezon	Pangil & Real & Mauban	Siniloan	Sierra Madre Water Corporation	35.00
Luzon	II	Isabela & Quirino	San Agustin & Maddela	Dabubu	Greenpower Resources Corporation	4.50
Luzon	II	Isabela	San Agustin	Dibuluan	Greenpower Resources Corporation	5.50
Luzon	II	Isabela	San Mariano	Disabungan	Greenpower Resources Corporation	5.50
Luzon	II	Nueva Vizcaya	Ambaguio	Matuno 1	Smith Bell Mini-Hydro Corp.	7.40
Luzon	II	Nueva Vizcaya	Bambang	Matuno 2	Smith Bell Mini-Hydro Corp.	7.90
Luzon	CAR	Mt. Province	Bauko	Enodey-Abit 1	Kadipo Bauko Hydropower Corp.	2.00
Luzon	CAR	Mt. Province	Natonin	Malecom	Southeast Asia Renewable Power Corporation	0.80
Luzon	CAR	Mt. Province	Natonin	Malig	Southeast Asia Renewable Power Corporation	1.10
Luzon	III	Bataan	Mariveles	Mariveles	Southeast Asia Renewable Power Corporation	1.10
Luzon	CAR	Mt. Province	Natonin	Pantor	Southeast Asia Renewable Power Corporation	1.20
Luzon	I	La Union	Tubao	Tubao	Tubao Mini Hydro-Electric Corporation	1.50
Luzon	IVA	Quezon	Lucban	Maapon	Renesons Energy Corporation	2.60
Luzon	II	Nueva Vizcaya	Alfonso Castañeda	Mangayngay	United Hydro Power Builders	1.60
Luzon	CAR	Benguet	Tuba	Kanggas	Goldlink Global Energy Corporation	3.00
Luzon	CAR	Benguet	Tuba	Tadiangan	Goldlink Global Energy Corporation	4.70
Luzon	CAR	Mt. Province	Bauko	Enodey-Abit 2	Kadipo Bauko Hydropower Corp.	1.20
Luzon	CAR	Mt. Province	Bauko	Enodey-Abit 3	Kadipo Bauko Hydropower Corp.	2.00
Luzon	CAR	Ifugao	Kiangan	Ibulao 2	Enerhighlands Corporation	8.80
Luzon	CAR	Ifugao	Kiangan	Hungduan	Kiangan Mini Hydro Corporation	4.04
Luzon	CAR	Ifugao	Lamut	Lamut	Enerhighlands Corporation	6.00
Luzon	IVB	Oriental Mindoro	San Teodoro	Linao Cawayan Phase 2 (Tail-End)	Mindoro Grid Corporation	1.00
Luzon	II	Nueva Vizcaya	Kasibu	Didipio 1	AT Dinum Company	2.10
Luzon	II	Nueva Vizcaya	Kasibu & Nagtipunan	Didipio 2	Alimit Hydro Corp.	9.40
Luzon	II	Isabela	Nagtipunan	Ilaguen 2	Isabela Power Corporation	14.00
Luzon	II	Isabela	Echague	Ilaguen 3	Isabela Power Corporation	11.00
Luzon	II	Isabela	Echague	Ilaguen 4	Isabela Power Corporation	10.00
Luzon	CAR	Mt. Province	Besao	Besao 1	BIMAKA Renewable Energy Development Corporation (BREDCO)	5.00

Island/Grid	Region	Province	Municipality	Name of Project	Developer	Potential Capacity (MW)
Luzon	CAR	Mt. Province	Besao	Besao 2	BIMAKA Renewable Energy Development Corporation (BREDCO)	7.00
Luzon	CAR	Mt. Province	Besao	Besao 3	BIMAKA Renewable Energy Development Corporation (BREDCO)	4.50
Luzon	CAR	Mt. Province	Besao	Besao 1A	BIMAKA Renewable Energy Development Corporation (BREDCO)	2.60
Luzon	CAR	Mt. Province	Besao	Besao 1B	BIMAKA Renewable Energy Development Corporation (BREDCO)	1.70
Luzon	CAR	Mt. Province	Besao	Besao 2A	BIMAKA Renewable Energy Development Corporation (BREDCO)	1.50
Luzon	CAR	Abra	Tubo	Amtuagan	Sta. Clara Power Corp.	8.50
Luzon	CAR	Abra	Manabo	Three Rivers	Sta. Clara Power Corp.	10.00
Luzon	CAR	Abra	Lagayan	Tineg	Sta. Clara Power Corp.	16.00
Luzon	CAR	Abra	Tubo	Gayaman (Tubo)	Sta. Clara Power Corp.	8.50
Luzon	I	Ilocos Sur	San Emilio	Matibuey	Sta. Clara Power Corp.	16.00
Luzon	IVA	Quezon	Mauban	Calmenue	Sta. Clara Power Corp.	2.00
Luzon	CAR	Ifugao	Kiangan	Ibulao 1	Kiangan Mini Hydro Corporation	6.75
Luzon	CAR	Benguet	Kibungan	Kibungan	Kibungan Hydropower Corporation	1,000
Luzon	II	Nueva Vizcaya	Dupax del Norte and Alfonso Castañeda	Casignan	JRV Renewable Energy Corporation	5.00
Luzon	IVA	Quezon	Real	Kinanliman	Municipality of Real, Quezon	1.60
Luzon	I	La Union	Bagulin	Baroro 1	Team (Philippines) Renewable Energy Corporation	1.00
Luzon	I	La Union	Bagulin	Baroro 2	Team (Philippines) Renewable Energy Corporation	3.00
Luzon	I	La Union	Bagulin	Baroro 3	Team (Philippines) Renewable Energy Corporation	1.50
Luzon	CAR	Benguet	Kapangan and Kibungan	Kapangan	Cordillera Hydro Electric Power Corporation	60.00
Luzon	CAR	Benguet	Buguias & Kabayan	Kabayan 1	Hedcor Benguet, Inc.	20.00
Luzon	CAR	Benguet	Kabayan	Kabayan 2	Hedcor Kabayan, Inc.	52.00
Luzon	II	Isabela	Ramon	Maris Main Canal 1	SN Aboitiz Power - Magat, Inc.	6.00
Luzon	CAR	Ifugao	Ramon	Maris Main Canal 2	SN Aboitiz Power - Magat, Inc.	1.75
Luzon	IVB	Palawan	Alfonso Lista	Bulalakao 1 North River	Alternergy Viento Partners Corporation	0.34
Luzon	IVB	Palawan	El Nido	Bulalakao 2 South River	Alternergy Viento Partners Corporation	0.44
Luzon	II	Quirino	Cabarroguis	Addalam	Quirino Resources Development Corp.	26.00
Luzon	IVB	Oriental Mindoro	Naujan	Mag-asawang Tubig B	Philippine Hybrid Energy Systems, Inc.	1.00
Luzon	IVA	Rizal	Rodriguez	Wawa Pumped Storage 1	Olympia Violago Water & Power, Inc.	500.00
Luzon	IVA	Rizal	Rodriguez	Wawa Pumped Storage 3	Olympia Violago Water & Power, Inc.	50.00
Luzon	IVA	Rizal	Rodriguez	Wawa Pumped Storage 2	Olympia Violago Water & Power, Inc.	100.00
Luzon	III	Nueva Ecija	San Jose	SDC	PNOC-Renewables Corporation	0.50
Luzon	IVB	Oriental Mindoro	Sibagat	Bongabong	S&B Power Corporation	2.60
Luzon	CAR	Kalinga		Chico	San Lorenzo Ruiz Piat Energy & Water, Inc.	150.00
Luzon	III	Nueva Ecija	Bongabon	Calaanan	Hydrokinetic Corp.	2.00
Luzon	II	Nueva Vizcaya	Dupax del Sur	Abaca	JRV Renewable Energy Corporation	3.20
Luzon	II	Isabela	Cabagan	Balasig 1	Greenpower Resources Corporation	9.00
Luzon	II	Isabela	Balasig	Balasig 2	Greenpower Resources Corporation	7.00
Luzon	IV-A	Laguna	Majayjay	Majayjay	Majayjay Hydropower Company, Inc.	2.20
Luzon	V	Camarines Norte	Mercedes	Colasi	Colasi Mini Hydro Electric Power Plant Corporation	0.96
Luzon	II	Quirino	Aglipay	Addalam	Quirino Power Energy Corporation	3.80
Luzon	IVA	Quezon	Real	Labayat River (Upper Cascade)	Repower Energy Development Corporation	3.00
Luzon	IVA	Quezon	Real	Piapi River	Repower Energy Development Corporation	3.30

Island/Grid	Region	Province	Municipality	Name of Project	Developer	Potential Capacity (MW)
Luzon	IVA	Quezon	Real	Labayat River (Lower Cascade)	Repower Energy Development Corporation	1.40
Luzon	IVA	Quezon	Real	Tignoan River (Upper Cascade)	Repower Energy Development Corporation	1.50
Luzon	IVA	Quezon	Real	Lalawinan	Repower Energy Development Corporation	3.00
Luzon	IVA	Quezon	Real	Tibag	Repower Energy Development Corporation	4.40
Luzon	CAR	Benguet	Bokod & Kabayan	Kabayan-Bokod	Hedcor Benguet, Inc.	27.00
Luzon	CAR	Kalinga	Balbalan	Biyao	Biyao Hydro Power Corporation	0.80
Luzon	III	Tarlac	Mayantoc	Camiling 1	Northgreen Energy Corporation	5.40
Luzon	III	Aurora	San Luis	Diteki	PTC Energy, Inc.	1.67
Luzon	III	Aurora	Dinalungan	Talaytay	PTC Energy, Inc.	1.45
Luzon	IVA	Quezon	Mauban	(Laguio) Laginbayan Malaki 2	Enervantage Supplier's Co., Inc.	3.10
Luzon	V	Sorsogon	Sorsogon	Cawayan 2	Sunwest Water and Electric Co., Inc.	0.99
Luzon	IVB	Oriental Mindoro	Bansud & Gloria	Bansud	Sunwest Water and Electric Co., Inc.	1.50
Luzon	CAR	Benguet		Cattubo II	Green Indigenous Environment Development Corporation	3.00
Luzon	CAR	Benguet	Atok	Cattubo I	Green Indigenous Environment Development Corporation	2.00
Luzon	I	La Union	Atok	Bagulin I	Green Indigenous Environment Development Corporation	9.00
Luzon	IVA	Quezon	Real	Tignoan	Aurora All Asia Energy Corporation	20.00
Luzon	II	Nueva Vizcaya	Alfonso Castañeda	Denip	JRV Renewable Energy Corporation	2.30
Luzon	CAR	Mt. Province	Bontoc	Talubin	Mountain Province Electric Cooperative, Inc.	4.90
Luzon	II	Isabela	Ilagan	Ilagan	Trans-Asia Oil and Energy Development Corp,	10.00
Luzon	IVA	Rizal	Pililla	Pililia Pumped Storage	Trans-Asia Oil and Energy Development Corp,	300.00
Luzon	III	Zambales	Masinloc	Coto 1	Coto Hydro Corp.	6.50
Luzon	III	Zambales	Masinloc	Coto 2	Coto Hydro Corp.	2.80
Luzon	II	Quirino	Nagtipunan	Gawagan 1	Gawagan Hydro Power Corp.	4.30
Luzon	II	Quirino	Nagtipunan	Gawagan 2	Gawagan Hydro Power Corp.	2.60
Luzon	II	Quirino	Nagtipunan	Geblem 1	Gawagan Hydro Power Corp.	0.70
Luzon	CAR	Ifugao	Lagawe	Alimit	SN Aboitiz Power - Ifugao, Inc.	100.00
Luzon	CAR	Ifugao	Lagawe & Mayoyao	Alimit-Pumped Storage	SN Aboitiz Power - Ifugao, Inc.	240.00
Luzon	CAR	Ifugao	Ilagan	Olilicon	SN Aboitiz Power - Ifugao, Inc.	10.00
Luzon	II	Isabela	Lagawe & Mayoyao	Abuan River 1	Greenpower Resources Corporation	10.80
Luzon	IV-B	Palawan	Narra	Bato-Bato (Kaliwa) HEP	AQA Global Power Inc.	12.00
Luzon	IV-B	Palawan	Busuanga	Busuanga River 1 HEP	AQA Global Power Inc.	8.00
Luzon	IV-B	Palawan	Rizal	Culasian River HEP	AQA Global Power Inc.	10.00
Luzon	IV-B	Palawan	Narra	Estrella River HEP	AQA Global Power Inc.	8.00
Luzon	IV-B	Palawan	Puerto Princesa	Inaguan River HEP	AQA Global Power Inc.	12.00
Luzon	IV-B	Palawan	Narra	Malasgao (Kaliwa) HEP	AQA Global Power Inc.	10.00
Luzon	IV-B	Palawan	Bataraza	Marangas River	AQA Global Power Inc.	12.00
Luzon	IV-B	Palawan	Brooke's Point	Sologon River HEP	AQA Global Power Inc.	12.00
Luzon	V	Camarines Sur	Buhi	Barit 2	People's Energy Services Inc.	0.60
Luzon	III	Nueva Ecija	Pantabangan	Diaman	United Hydro Power Builders	1.80
Luzon	CAR	Benguet	Kabayan	Eddet Adaoay 1	United Hydro Power Builders	1.00
Luzon	CAR	Benguet	Kabayan	Eddet Adaoay 2	United Hydro Power Builders	1.80
Luzon	IVB	Oriental Mindoro	Baco	San Ignacio	Alpaparay Resort & Development Corporation	0.50
Luzon	IVB	Oriental Mindoro	San Teodoro	Alag Tributary 1	Constellation Energy Corporation	2.80
Luzon	IVB	Oriental Mindoro	San Teodoro	Alag Tributary 2	Constellation Energy Corporation	2.80

Island/Grid	Region	Province	Municipality	Name of Project	Developer	Potential Capacity (MW)
Luzon	IVA	Cavite	Indang & Maragondon	Indang	Energywise Corporation	1.50
Luzon	IVA	Quezon	Mauban	Mauban	Aurora All Asia Energy Corporation	10.00
Luzon	CAR	Benguet	Tublay & La Trinidad	Tublay 1	AT Dinum Company	0.90
Luzon	III	Nueva Ecija	General Tinio	Rio Chico	LGU of Gen. Tinio	2.00
Luzon	III	Tarlac	Mayantoc	Camiling River 3	Northgreen Energy Corporation	3.40
Luzon	CAR	Kalinga	Tabuk	Chico River	San Lorenzo Ruiz Builders & Developers Group, Inc.	45.00
Luzon	II	Isabela	Cordon	Magat F	PhilCarbon Inc.	0.60
Luzon	IVA	Quezon	Mauban	Laguio (Laginbayan) Malaki 1	Enervantage Supplier's Co., Inc.	1.60
Luzon	I	La Union	Naguilian	Naguilian	Naguilian Mini-Hydro Electric Corporation	6.10
Luzon	IVB	Oriental Mindoro	San Teodoro & Puerto Gallera	Inabasan Phase II	Ormin Power, Inc.	10.00
Luzon	II	Nueva Vizcaya	Kasibu	Namanaan	AT Dinum Company	0.60
Luzon	II	Nueva Vizcaya	Kasibu	Edralin	AT Dinum Company	1.20
Luzon	IVA	Laguna	Majayjay	Upper Botocan River	Aurora All Asia Energy Corporation	8.64
Luzon	CAR	Benguet	Itogon	San Roque Upper East Pump Storage	Strategic Power Development Corp.	600.00
Luzon	CAR	Benguet	Itogon	San Roque West Pump Storage	Strategic Power Development Corp.	400.00
Luzon	IVB	Quezon	General Nakar	Kanan B-1	Energy World Kanan River, Inc.	150.00
Luzon	II	Quirino	Nagtipunan	Dakgan 1	Asiapacific Renewables Corporation	9.00
Luzon	II	Quirino	Nagtipunan	Dakgan 2	Asiapacific Renewables Corporation	12.00
Luzon	CAR	Benguet	Bakun & Mankayan	Mankayan 1	Hedcor, Inc.	12.70
Luzon	IVB	Palawan	Puerto Princesa	Langogan	Langongan Power Corporation	6.80
Luzon	CAR	Mt. Province	Bauko	Lower Chico	Kadipo Bauko Hydro Power Corp.	3.40
Luzon	III	Nueva Ecija / Aurora	Gabaldon / San Luis	Lingod River	United Hydro Power Builders	2.50
Luzon	IVA	Quezon	General Nakar	Umiray 1	Laguna Hydroenergy Corporation	6.00
Luzon	II	Isabela	San Pablo	San Pablo	Greenpower Resources Corporation	8.00
Luzon	III	Nueva Ecija	Pantabangan	Sampaloc	San Lorenzo Ruiz Builders & Developers Group, Inc.	14
Luzon	IVA	Laguna	Majayjay & Magdalena	Balanac (Middle)	Repower Energy Development Corporation	5.00
Luzon	II	Quirino	Nagtipunan	Dagkan	United Hydro Power Builders	142
Luzon	CAR	Benguet	Tublay	Tublay 2	AT Dinum Company	6.00
Luzon	CAR & I	Benguet & Ilocos Sur	Bakun & Cervantes	Mankayan 2	Hedcor, Inc.	20.30
Luzon	II	Quirino	Maddela	Dabubu 2	Greenpower Resources Corporation	4.30
Luzon	IVA	Quezon	General Nakar	Umiray Site 2 River	Laguna Hydroenergy Corporation	3.90
Luzon	II	Quirino	Maddela	Dibuluan 2	Greenpower Resources Corporation	3.2
Luzon	IVA	Quezon	General Nakar	Umiray Site 4 River	Laguna Hydroenergy Corporation	2.80
Luzon	CAR	Mt. Province	Bauko	Upper Chico	Kadipo Bauko Hydro Power Corp.	2.10
Luzon	CAR	Kalinga	Pasil	Pasil B	I-Magat Renewable Energy Corporation	14.00
Luzon	CAR	Kalinga	Pasil	Pasil C	I-Magat Renewable Energy Corporation	11.00
Luzon	II	Isabela	San Pablo	San Pablo Site 2	Greenpower Resources Corporation	3.00
Luzon	II	Isabela	San Pablo	San Pablo Site 3	Greenpower Resources Corporation	4.90
Luzon	II	Isabela	Ilagan	Abuan 2	Greenpower Resources Corporation	8.10
Luzon	CAR	Benguet	Tublay	Tublay 3	AT Dinum Company	1.00
Luzon		Zambales	Masinloc	Coto 3	AT Dinum Company	2.20
Luzon	CAR	Apayao	Conner	Nabuangan River	Strategic Power Development Corp.	10.00
Luzon		Bulacan	Norzagaray	Angat Run-of-River	Strategic Power Development Corp.	10.00
Luzon	III	Aurora	Dingalan	Dingalan Pumped-Storage	Strategic Power Development Corp.	500.00
Luzon	CAR	Abra	Tineg & Lagayan	Binongan-Tineg	First Gen Mindanao Hydro Power Corp.	175.00
Luzon	CAR	Benguet	Kibungan	Kibungan Pumped-Storage	Coheco Badeo Corporation	500.00
Luzon	I	Ilocos Norte	Dumalneg	Bulo 2	Phildane Resources Corporation	5.00

Island/Grid	Region	Province	Municipality	Name of Project	Developer	Potential Capacity (MW)
Luzon	III	Pangasinan	San Quintin	Dipalo	Power Beacon Renewable Solutions, Inc.	2.50
Luzon	I	Ilocos Sur	Suyo	Suyo 2	Satrap Power Corporation	3.00
Luzon		Benguet	Itogon	San Roque Lower East Pumped-Storage	Strategic Power Development Corp.	400.00
Visayas	VI	Aklan	Madalag	Timbaban	Oriental Energy and Power Generation Corporation	18.00
Visayas	VI	Negros Occidental	Kabankalan	Hilabangan (Upper Cascade)	Century Peak Energy Corporation	4.80
Visayas	VI	Negros Occidental	Kabankalan	Hilabangan (Lower Cascade)	Century Peak Energy Corporation	3.00
Visayas	VI	Iloilo	Igbaras	Igbulo (Bais)	Century Peak Energy Corporation	5.10
Visayas	VI	Antique	San Remigio	Maninila (Lower Cascade)	Century Peak Energy Corporation	4.50
Visayas	VI	Antique	San Remigio	Maninila (Upper Cascade)	Century Peak Energy Corporation	3.10
Visayas	VI	Antique	San Remigio	Sibalom (Upper Cascade)	Century Peak Energy Corporation	4.20
Visayas	VI	Antique	San Remigio	Sibalom (Middle Cascade)	Century Peak Energy Corporation	4.00
Visayas	VI	Antique	San Remigio	Sibalom (LowerCascade)	Century Peak Energy Corporation	3.30
Visayas	VII	Negros Oriental	La Libertad	Pacuan-Guinobaan	PNOC - Renewables Corp.	13.80
Visayas	VII	Cebu	Badian	Basak II	Rapids Innoenergy, Inc.	0.50
Visayas	VI	Negros Occidental	Silay City	Malugo	Vivant-Malogo Hydropower, Inc.	6.00
Visayas	VI	Antique	Sebaste	Caro-an	Antique Electric Cooperative, Inc.	0.84
Visayas	VI	Antique	Sebaste	Ipayo	Antique Electric Cooperative, Inc.	1.30
Visayas	VI	Antique	Bugasong	Villasiga	Sunwest Water & Electric Company, Inc. 2	8.00
Visayas	VI	Aklan	Libacao	Main Aklan	Sunwest Water & Electric Company, Inc.	15.00
Visayas	VII	Negros Oriental	Amlan	Amlan (Plant A)	Natural Power Sources Intergration,Inc.	3.20
Visayas	VII	Negros Oriental	Amlan	Amlan (Plant B)	Natural Power Sources Intergration,Inc.	1.50
Visayas	VII	Negros Oriental	Amlan	Amlan (Plant C)	Natural Power Sources Intergration,Inc.	0.80
Visayas	VII	Bohol	Danao	Cantakoy	Quadriver Energy Corporation	8.00
Visayas	VIII	Leyte	Kananga	Bao	Leyte V Electric Cooperative, Inc (LEYECO V)	1.50
Visayas	VIII	Western Samar	Calbiga & Pinabacdao	Calbiga	Meadowland Developers, Inc.	15.00
Visayas	VIII	Leyte	Inopacan	Caminto River	Leyte IV Electric Cooperative, Inc.	0.50
Visayas	VI	Negros Occidental	San Carlos City	Bago 1	Alsons Energy Development Corporation	4.00
Visayas	VI	Negros Occidental	San Carlos City & Murcia	Bago 2	Alsons Energy Development Corporation	10.00
Visayas	VI	Aklan	Malay	Aklan Pumped-Storage	Strategic Power Development Corp.	300.00
Visayas	VI	Antique	Bugasong	Villasiga 2	Sunwest Water and Electric Co., Inc.	9.40
Visayas	VI	Negros Occidental	Victorias and Cadiz	Malogo Phase 2	Vivant-Malogo Hydropower, Inc.	5.00
Visayas	VI	Negros Occidental	Silay & E. B Magalona	Malogo Phase 3	Vivant-Malogo Hydropower, Inc.	2.00
Visayas	VI	Negros Occidental	Sagay City	Lower Himogaan	LGU of Sagay	4.00
Visayas	VI	Negros Occidental	San Carlos City	Bago Prosperidad 2	Bago River Hydro Power Corporation	3.50
Visayas	VI	Negros Occidental	San Carlos City	Initihan	Bago River Hydro Power Corporation	3.50
Visayas	VIII	Eastern Samar	Lawaan	Pumped Storage Bolusao	San Lorenzo Ruiz Samar Energy and Water, Inc.	300.00

Island/Grid	Region	Province	Municipality	Name of Project	Developer	Potential Capacity (MW)
Visayas	VIII	Eastern Samar	Lawaan	Run-of-River Bolusao	San Lorenzo Ruiz Samar Energy and Water, Inc.	12.00
Visayas	VI	Negros Occidental	Bago & Murcia	Bago 4	Alsons Energy Development Corporation	11.00
Visayas	VII	Cebu	Argao	Argao	Universal Hydrotechnologies, Inc.	0.80
Visayas	VII	Negros Oriental	Siaton	Canaway 1	Orbysy Holdings, Inc.	1.60
Visayas	VII	Negros Oriental	Siaton	Canaway 2	Orbysy Holdings, Inc.	1.40
Visayas	V	Camarines Sur	Goa & Tigaon	Ranggas	Clean and Green Energy Solutions, Inc.	1.50
Visayas	VIII	Leyte	Jaro & Pastrana	Binaha-an River	Engineering & Development Corporation of the Philippines	2.20
Visayas	VII	Siquijor	Lazi	Senona	AQA Global Power Inc.	3.20
Visayas	VII	Siquijor	Lazi	Gabangan	AQA Global Power Inc.	4.14
Visayas	VII	Cebu	Alegria	Compostela	T.A.G Mineral Resources, Inc.	0.50
Visayas	VII	Bohol	Loboc	Loboc (Expansion)	Sta. Clara Power Corp.	1.2
Visayas	VIII	Eastern Samar	Maslog	Maslog	Iraya Energy Corporation	40.00
Visayas	VIII	Eastern Samar	Maslog	Upper Maslog	Iraya Energy Corporation	9.00
Visayas	VII	Negros Occidental	Isabela	Limalima-Sacop Phase 1	888 Blue Energy Corporation	2.00
Visayas	VII	Negros Occidental	Isabela	Limalima-Sacop Phase 2	888 Blue Energy Corporation	8.00
Visayas	VIII	Western Samar	Calbayog City	Bugtong Falls	Clean and Green Energy Solutions, Inc.	1.80
Visayas	VIII	Eastern Samar	Maydolong	Buhid	Vivant Energy Corp.	20.20
Visayas	VII	Negros Oriental	Mabinay	Ilog	Trans-Asia Oil and Energy Development Corp,	21.60
Mindanao	X	Bukidnon	Baungon and Libona	Bubunawan	FGEN Bubunawan Hydro Corporation	23.00
Mindanao	XIII	Agusan del Norte	Cabadbaran	Cabadbaran	FGEN Cabadbaran Hydro Corporation	9.75
Mindanao	XIII	Agusan del Norte	Jabonga	Puyo	FGEN Puyo Hydro Corporation	30.00
Mindanao	X	Bukidnon	Impasugong and Sumilao	Tagoloan	FGEN Tagoloan Hydro Corporation	39.00
Mindanao	X/ARMM	Lanao del Norte/Lanao del Sur	Pantar & Baloi/Saguiaran	Agus III	Maranao Energy Corp.	225.00
Mindanao	X	Bukidnon	Manolo Fortich	Culaman	Oriental Energy and Power Generation Corporation	10.00
Mindanao	IX	Zamboanga City	Zamboanga City	Pasonanca	PhilCarbon Inc.	0.05
Mindanao	IX	Zamboanga City	Zamboanga City	Pasonanca (Upstream)	PhilCarbon Inc.	1.00
Mindanao	X	Misamis Occidental	Clarin	Clarin	Philnew Hydro Power Corp	6.20
Mindanao	X	Cagayan de Oro	Claveria	Mat-I 1	Philnew Hydro Power Corp	4.85
Mindanao	X	Misamis Occidental	Cagayan de Oro City	Limbatangon HEP	Turbines Resource & Development Corp.	9.00
Mindanao	XII	Sultan Kudarat	Isulan	Kabulnan 2 HEP	Philnewriver Power Corp.	110.00
Mindanao	X	Bukidnon	Malitbog	Malitbog HEP	Philnewriver Power Corp.	5.00
Mindanao	X	Bukidnon	Manolo Fortich	Mangima HEP	Philnewriver Power Corp.	10.00
Mindanao	X	Misamis Oriental	Claveria	Mat-i 2 HEP	Philnewriver Power Corp.	1.60
Mindanao	X	Misamis Oriental	Claveria	Mat-i 3 HEP	Philnewriver Power Corp.	3.25
Mindanao	X	Bukidnon	Malitbog	Silo-o HEP	Philnewriver Power Corp.	4.50
Mindanao	XII	North Cotabato	Alamada	Alamada HEP	Euro Hydro Power (Asia) Holdings, Inc.	2.84
Mindanao	X	Lanao del Norte	Iligan City	Bayug HEP	Euro Hydro Power (Asia) Holdings, Inc.	1.00
Mindanao	XI	Compostela Valley	New Bataan	New Bataan HEP	Euro Hydro Power (Asia) Holdings, Inc.	2.40
Mindanao	X	Lanao del Norte	Kolambogan	Titunod HEP	Euro Hydro Power (Asia) Holdings, Inc.	1.00

Island/Grid	Region	Province	Municipality	Name of Project	Developer	Potential Capacity (MW)
Mindanao	XIII	Agusan del Norte	Santiago	Asiga	Asiga Green Energy Corporation	8.00
Mindanao	XIII	Agusan del Norte	Butuan City	Taguibo 1	Equi-Parco Construction Co.	2.00
Mindanao	XIII	Agusan del Norte	Butuan City	Taguibo 2	Equi-Parco Construction Co.	2.00
Mindanao	XII	Sarangani	Maasim	Siguil 1	Alsons Energy Development Corporation	8.70
Mindanao	XII	Sarangani	Maasim	Siguil 2	Alsons Energy Development Corporation	3.20
Mindanao	XII	Sarangani	Maasim	Siguil 3	Alsons Energy Development Corporation	4.80
Mindanao	IX	Zamboanga del Norte	Leon Postigo	Polandoc Hydroelectric Power Project	Euro Hydro Power (Asia) Holdings, Inc.	2.00
Mindanao	X	Bukidnon	Valencia	Upper Manupali	Bukidnon II Electric Cooperative, Inc.	4.40
Mindanao	X	Misamis Oriental	Jasaan	Lower Cabulig	Mindanao Energy Systems, Inc.	10.00
Mindanao	XIII	Surigao del Sur	Carrascal and Cantilan	Carac-an	Hydro Link Projects Corporation	25.00
Mindanao	XIII	Agusan del Norte	Jabonga	Lake Mainit	Agusan Power Corporation	25.00
Mindanao	XII	Sarangani	Maitum	Kalaong 1	Alsons Energy Development Corporation	12.00
Mindanao	XII	Sarangani	Maitum	Kalaong 2	Alsons Energy Development Corporation	6.00
Mindanao	XI	Davao Del Sur	Digos City	Ruparan	Davao de Sur Electric Cooperative, Inc.	5.00
Mindanao	IX	Zamboanga del Norte	Mutia	Dapitan River (Upper)	Euro Hydro Power (Asia) Holdings, Inc.	3.60
Mindanao	IX	Zamboanga del Norte	Mutia	Dapitan River (Middle)	Euro Hydro Power (Asia) Holdings, Inc.	3.60
Mindanao	XI	Davao Oriental	Caraga	Caraga 4	LGS Renewable Energies Corporation	35
Mindanao	X	Bukidnon	Malaybalay	Middle Canayan	Sta. Clara Power Corp.	3.00
Mindanao	XI	Compostela Valley	Maco	Upper Maco	Sta. Clara Power Corp.	4.00
Mindanao	XI	Compostela Valley	Maco	Mt. Leonard	Sta. Clara Power Corp.	2.00
Mindanao	XI	Compostela Valley	Maco	Tagum R	Sta. Clara Power Corp.	4.00
Mindanao	XI	Compostela Valley	Maco	Hijo River I	Sta. Clara Power Corp.	3.00
Mindanao	XI	Compostela Valley	Maco	Hijo River II	Sta. Clara Power Corp.	3.00
Mindanao	XIII	Agusan del Norte	Butuan City	Bugsukan	Global Sibagat Hydro Power Corp.	5.00
Mindanao	XIII	Agusan Del Sur	Sibagat	Managong	Global Sibagat Hydropower Corporation	6.00
Mindanao	XIII	Agusan del Sur	Sibagat	Wawa	Global Sibagat Hydropower Corporation	13.00
Mindanao	XIII	Agusan del Sur	Bongabong	Wawa 1	Equi-Parco Construction Co.	7.70
Mindanao	XIII	Agusan del Sur	Sibagat	Wawa 2	Equi-Parco Construction Co.	7.00
Mindanao	XIII	Agusan del Sur	Sibagat	Wawa 3	Equi-Parco Construction Co.	5.60
Mindanao	X	Bukidnon	Impasugong	Gakaon	LGU of Impasugong	2.23
Mindanao	X	Lanao del Norte	Bacolod	Liangan	Liangan Power Corporation	11.90
Mindanao	XI	Davao City		Davao	San Lorenzo Ruiz Olympia Energy & Water, Inc.	140.00
Mindanao	XIII	Surigao del Sur	Cantilan	Lower Carac-an	Meadowland Developers, Inc.	5.00
Mindanao	XII	South Cotabato	Lake Sebu	Lanon (Lam-alu)	Euro Hydro Power (Asia) Holdings, Inc.	9.00
Mindanao	X	Bukidnon		Pulanai River	Repower Energy Development Corporation	10.60
Mindanao	X	Bukidnon	Cabanglasan	Katipunan River	Repower Energy Development Corporation	6.20

Island/Grid	Region	Province	Municipality	Name of Project	Developer	Potential Capacity (MW)
Mindanao	X	Bukidnon	Malaybalay	Sawaga	Repower Energy Development Corporation	2.00
Mindanao	X	Bukidnon	Dancagan	Kitaotao 1	Hedcor Bukidnon, Inc.	70.00
Mindanao	X	Bukidnon	Kalilangan & Wao	Maladugao River (Lower Cascade)	Bukidnon Maladugao Hydro Power Corp.	15.70
Mindanao	X	Bukidnon	Wao	Maladugao River (Upper Cascade)	UPHC Bukidnon Hydro Power I Corp.	8.40
Mindanao	XII	South Cotabato	Lake Sebu	Takbo	South Cotabato I Electric Cooperative, Inc.	15.00
Mindanao	XI	Davao del Sur	Malita	Malita	LGU of Malita, Davao del Sur	2.50
Mindanao	X	Misamis Oriental	Gingoog City	Odiongan River A	JE Hydropower Ventures, Inc.	0.25
Mindanao	IX	Zamboanga del Sur	Dumingag & Midsalip	Sindangan 4	Alsons Energy Development Corporation	8.00
Mindanao	XI	Davao Oriental	Lupon	Sumlog 1	Alsons Energy Development Corporation	8.00
Mindanao	XI	Davao Oriental	Lupon & Mati	Sumlog 2	Alsons Energy Development Corporation	15.00
Mindanao	XII	Sarangani	Maitum	Kalaong 3	Alsons Energy Development Corp	4.00
Mindanao	XII	North Cotabato	Magpet	Magpet 1	Universal Hydrotechnologies, Inc.	9.80
Mindanao	XII	North Cotabato	Magpet	Magpet 2	Universal Hydrotechnologies, Inc.	1.30
Mindanao	XII	North Cotabato	Makilala	Makilala-1	Universal Hydrotechnologies, Inc.	2.00
Mindanao	XI	Davao Oriental	Caraga	Manorigao	LGS Renewable Energies Corp	17.00
Mindanao	X	Bukidnon	Valencia	Manupali	Matic Hydropower Corporation	9.00
Mindanao	XI	Davao Oriental	Manay	Casauman	Global Sibagat Hydro Power Corp.	34.00
Mindanao	X	Bukidnon	Maramag	Maramag	First Bukidnon Electric Cooperative, Inc. transferred to Maramag Mini-Hydro Corporation	1.40
Mindanao	XI	Davao del Sur	Goa & Tigaon	Guma	Euro Hydro Power (Asia) Holdings, Inc.	1.70
Mindanao	ARMM	Lanao del Sur	Malabang & Tubaran	Maitling River HEP	AQA Global Power Inc.	50.00
Mindanao	ARMM	Lanao del Sur	Malabang	Matadi River HEP	AQA Global Power Inc.	27.00
Mindanao	ARMM	Lanao del Sur	Pualas & Ganassi	Lake Dapao HEP	AQA Global Power Inc.	50.00
Mindanao	ARMM	Lanao del Sur	Malabang	Baras River HEP	AQA Global Power Inc.	30.00
Mindanao	XI	Davao Oriental	Baganga	Cateel	Global Sibagat Hydro Power Corp.	16.00
Mindanao	X	Lanao del Norte	Iligan City	Lower Bayug	Euro Hydro Power (Asia) Holdings, Inc.	4.00
Mindanao	X	Lanao del Norte	Iligan City	Upper Bayug	Euro Hydro Power (Asia) Holdings, Inc.	3.30
Mindanao	IX	Zamboanga del Sur	Bayog	Bayog	Global Sibagat Hydro Power Corp.	6.00
Mindanao	XI	Davao Oriental	Baganga	Baganga River	Global Sibagat Hydro Power Corp.	11.00
Mindanao	XI	Davao Oriental	Governor Generoso	Osmena	LGS Renewable Energies Corporation	2.00
Mindanao	X	Lanao del Norte	Iligan City	Bulanog-Batang	Bukidnon Hydro Energy Corporation	150.00
Mindanao	IX	Zamboanga City		Patalon	Everhydro Corporation	0.50
Mindanao	IX	Zamboanga City		Alimpaya	Everhydro Corporation	1.20
Mindanao	IX	Zamboanga City		Tagpangi	Everhydro Corporation	0.50
Mindanao	IX	Zamboanga City		Ayala	Everhydro Corporation	1.00
Mindanao	IX	Zamboanga del Sur	Zamboanga City	Saaz	Meadowland Developers, Inc.	1.00
Mindanao	XI	Davao Oriental	Governor Generoso	Tibanban	LGS Renewable Energies Corporation	2
Mindanao	X	Misamis Occidental	Calamba	Langaran	Kaltimex Langaran Hydro Inc.	3.60
Mindanao	X	Bukidnon	Impasugong	Atugan 1 River	Gerphil Renewable Energy, Inc.	2.40
Mindanao	X	Lanao del Norte	Iligan City	Agus VIII Modular	Fu-Tai Philippines, Inc.	12.00

Island/Grid	Region	Province	Municipality	Name of Project	Developer	Potential Capacity (MW)
Mindanao	X	Bukidnon	Maramag	Pulangui IV	Repower Energy Development Corporation	10.00
Mindanao	X	Misamis Occidental	Cagayan de Oro City	Umalag 1	Meadowland Developers, Inc.	1.80
Mindanao	X	Bukidnon	Impasugong	Atugan 4	Gerphil Renewable Energy, Inc.	3.50
Mindanao	XIII	Surigao del Sur	San Miguel	Sagbayan	Surigao del Sur II Electric Cooperative, Inc.	0.64
Mindanao	X	Bukidnon	Santiago	Manolo Fortich 1	Hedcor Bukidnon, Inc.	43.40
Mindanao	X	Bukidnon	Santiago	Manolo Fortich 2	Hedcor Bukidnon, Inc.	25.40
Mindanao	X	Bukidnon	Libona	Umalag 2	Meadowland Developers, Inc.	2.50
Mindanao	XIII	Surigao del Sur	San Miguel	Carromata	Surigao del Sur II Electric Cooperative, Inc.	5.60
Mindanao	XI	Davao del Sur	Davao City	Tamugan	Hedcor, Inc.	11.50
Mindanao	XI		Davao City	Apo Agua	Apo Agua Infrastructura, Inc.	2.20
Mindanao	X	Lanao del Norte	Iligan City	Cagayan 1N	First Gen Mindanao Hydro Power Corp.	160.00
Mindanao	XI	Davao Oriental	Baganga	Cateel	First Gen Mindanao Hydro Power Corp.	17.50

Table A4.7 AWARDED BIOMASS PROJECTS

Island/Grid	Region	Province	Municipality	Name of Project	Developer	Potential Capacity (MW)
Luzon	IV-A	Rizal	Rodriguez	14.8 MW Montalban Landfill Methane Recovery and Power Generation Facility	Montalban Methane Power Corporation	6.475
Luzon	III	Nueva Ecija	San Jose City	24 MW San Jose City Rice Husk-Fired Biomass Power Plant Project	San Jose City I Power Corporation	12.00
Luzon	I	La Union	Rosario	1 MW Pepsi Biomass Power Plant Project	Sure PEP, Inc.	1.00
Luzon	NCR	Metro Manila	Quezon City	1.5 MW Payatas Landfill Methane Recovery and Power Generation Facility	Pangea Green Energy Philippines, Inc.	0.624
Luzon	III	Aurora	Dilasag	2.5 MW EMS Woody Biomass Power Plant Project	EcoMarketSolutions, Inc.	2.50
Luzon	IV-B	Orriental Mindoro	Bongabong	0.4 MW VMA Rice Husk-Fired Biomass Power Plant Project	V. M. Agbayani Rice Mill	0.40
Luzon	V	Camarines Sur	Pili	5 MW BBEC Rice Husk-Fired Biomass Power Plant Project	Bicol Biomass Energy Corporation	5.00
Luzon	IV-A	Batangas	Lian	8.8 MW Biogas Power Plant Project	AseaGas Corporation	8.80
Luzon	III	Tarlac	Tarlac City	2 MW ACNPC WTE Biomass Power Plant Project	Asian Carbon Neutral Power Corporation	2.00
Luzon	III	Nueva Ecija	Llanera	12 MW G2REC Napier Grass-Fired Biomass Power Plant Project	Grass Gold Renewable Energy Corporation	12.00
Luzon	IV-A	Quezon	Polillo	1.5 MW Coconut Waste-Fired Biomass Power Plant Project	Renesons Energy Polillo, Inc.	1.50
Luzon	II	Cagayan	Lal-lo	24 MW Biomass Power Plant Project	Natures Renewable Energy Development Corporation	24.00
Luzon	I	Ilocos Sur	Santa	10 MW Biomass Power Plant Project	SATRAP Power Corporation	10.00

Island/Grid	Region	Province	Municipality	Name of Project	Developer	Potential Capacity (MW)
Luzon	II	Isabela	Aurora,	5MW Biomass Power Plant Project	Isabela La Suerte Rice Mill Corporation	5.00
Luzon	V	Camarines Sur	Naga City	20MW Waste-to-Energy Power Plant Project	CJ Global Green Energy Philippines Corporation	20.00
Visayas	NIR	Negros Occidental	Victorias City	63 MW VMCI Bagasse-Fired Cogeneration Power Plant	Victorias Milling Company Inc.	29.00
Visayas	NIR	Negros Occidental	San Carlos City	20 MW SCBPI Multi-Feedstock Power Plant Project	San Carlos Biopower Inc.	20.00
Visayas	NIR	Negros Occidental	Silay City	28.58 MW HPCo Bagasse Cogeneration Power Plant Project	Hawaiian-Philippine Company	20.58
Visayas	NIR	Negros Occidental	Himamaylan City	12 MW Multi-Feedstock Biomass Power Plant Project	Megawatt Clean Energy, Inc.	12.00
Visayas				25MW Cane Trash-fired Biomass Power Plant Project	South Negros Biopower, Inc.	25.00
Visayas		Negros Oriental	Bais City	25MW Cogeneration Power Plant Project	Central Azucarera de Bais	25.00
Visayas	NIR	Negros Occidental		48.5 MW Cogen Project	BISCOM	48.50
Mindanao	X	Bukidnon	Malaybalay	10 MW Malaybalay Multi Feedstock Biomass Power Plant Project	Malaybalay BioEnergy Corporation	10.00
Mindanao	ARMM	Maguindanao	Sultan Kudarat	15 MW LPC Rice Husk-Fired Biomass Power Plant Project	Lamsan Power Corporation	15.00
Mindanao	CARAGA	Agusan del Norte	Buenavista	23.5 MW Woody Biomass Power Plant Project	CARAGA Renewable Energy Corporation	23.50
Mindanao	ARMM	Maguindanao	Buluan	3.5 GEEC MW Biomass Cogeneration System	Green Earth Enersource Corporation	3.50
Mindanao	X	Bukidnon	Manolo Fortich	12 MW Napier Grass-Fired Biomass Power Plant Project	Manolo Fortich Renewable Energy Corporation	12.00
Mindanao	ARMM	Maguindanao	Sultan Kudarat	5.5 MW Biomass Power Plant Project	Lamsan Power Corporation	5.50

Table A4.8 AWARDED OCEAN ENERGY PROJECTS

Island/Grid	Region	Province	Municipality	Name of Project	Developer	Potential Capacity (MW)
LUZON	III	Zambales	Cabangan	Cabangan Ocean Thermal Energy Conversion (OTEC)	Bell Pirie Power Corporation	5.00
	V	Sorsogon	Southeast side of Municipality of Matnog	San Bernardino Strait Between Bicol Peninsula and Samar Leyte Corridor (2 sites) - Area 1OP (Tidal In-Stream Energy Conversion TISEC Project)	H & WB Corporation	5.00
LUZON Sum						10.00
VISAYAS	VIII	Northern Samar	San Bernardino Strait	TISEC-Project Site (Areas 4&5)	Poseidon Renewable Energy Corporation	
			Capul Pass, Dalupiri Island, San Antonio	TISEC-Project Site (Area 6)	Poseidon Renewable Energy Corporation	
			East side of Municipality of Capul and West side of Municipality of San Antonio	San Bernardino Strait Between Bicol Peninsula and Samar Leyte Corridor (2 sites) - Area 2OP	H & WB Corporation	5.00
			East side of Municipality of San Antonio and West side of Municipalities of San Isidro and Victoria	San Bernardino Strait Between Bicol Peninsula and Samar Leyte Corridor (2 sites) - Area 3OP	H & WB Corporation	5.00
VISAYAS Sum						10.00
MINDANAO	CARAGA	Surigao del Norte	Surigao City	Gaboc Channel Ocean Energy	Adnama power Resources, Inc.	6.00
MINDANAO Sum						6.00

Table A4.9 AWARDED GEOTHERMAL PROJECTS

Island/Grid	Region	Province	Name of Project	Developer	Potential Capacity (MW)
LUZON	CAR	Abra	Sal-lapadan-Boliney-Bucloc-Tubo Geothermal Power Project	Pan Pacific Power Phils. Corp.	
		Benguet / Nueva Ecija	Daklan Geothermal Project	Clean Rock Renewable Energy Resources Corporation	60.00
		Kalinga	Kalinga Geothermal Project	Aragorn Power and Energy Corporation	120.00
		Ifugao, Benguet, Mountain Province	East Mankayan Geothermal Power Project	Basic Energy Corp.	
	I	Ilocos Sur / Mt. Province / Benguet	Cervantes Geothermal Power Project	Pan Pacific Power Phils. Corp.	
	II	Cagayan	Cagua-Baua Geothermal Power Project	Pan Pacific Power Phils. Corp.	45.00
	III	Bataan	Mariveles Geothermal Power Project	Basic Energy Corp.	

Island/Grid	Region	Province	Name of Project	Developer	Potential Capacity (MW)
			Mt. Natib Geothermal Project	Clean Rock Renewable Energy Resources Corporation	40.00
		Zambales, Pampanga	Negron-Cuadrado Geothermal Power Project	Negron Cuadrado Geothermal Inc.	
	IV-A	Batangas	San Juan Geothermal Power Project	San Juan Geothermal Power Inc.	20.00
		Laguna/Batangas	Makban Geothermal Power Project	Philippine Geothermal Production Company, Inc.	
		Laguna / Quezon / Batangas	Tiaong Geothermal Power Project	Tiaong Geothermal Power Corp.	
		Laguna	Mt. Puting Lupa Geothermal Project	Filtech Energy Drilling Corp.	
		Tayabas / Laguna	Tayabas - Lucban Geothermal Power Project	Tayabas Geothermal Power Inc.	
		Rizal	Talim Geothermal Power Project	Alco Steam Energy Corp.	
	IV-B	Oriental Mindoro	Montelago Geothermal Project	Mindoro Geothermal Power Corp.	40.00
	V	Albay	Tiwi Geothermal Power Project	Philippine Geothermal Production Company, Inc.	
		Quezon / Camarines Norte & Sur	Mt. Labo Geothermal Project	Energy Development Corporation	65.00
		Sorsogon	Southern Bicol Geothermal Project	SKI Construction Group Inc.	40.00
			West Bulusan Geothermal Power Project	Basic Energy Corp.	
		Sorsogon / Albay	Bacon-Manito Geothermal Production Field	Energy Development Corporation	
		Camarines Sur, Albay	Iriga Geothermal Power Project	Basic Energy Corp.	
LUZON Sum					430.00
VISAYAS	VI	Negros Occidental	Northern Negros Geothermal Production Field	Energy Development Corporation	
			Mandalagan Geothermal Prospect	Energy Development Corporation	20.00
	VIII	Biliran	Biliran Geothermal Project	Biliran Geothermal Incorporated	50.00
VISAYAS Sum					70.00
MINDANAO	IX	Zamboanga del Sur / Zamboanga del Norte / Zamboanga Sibugay	Lakewood Geothermal Prospect	Energy Development Corporation	40.00

Island/Grid	Region	Province	Name of Project	Developer	Potential Capacity (MW)
	IX / X	Misamis Occidental / Zamboanga del Norte / Zamboanga del Sur	Ampiro Geothermal Power Project	Energy Development Corporation	30.00
	X	Misamis Oriental / Bukidnon	Balatukan-Balingasag Geothermal Prospect	Energy Development Corporation	20.00
	XI	Davao del Sur	Mt. Sibulan-Kapatagan Geothermal Power Project	Mount Apo Geopower, Inc.	
	XI / XII	North Cotabato / Davao del Sur	Mt. Zion Geothermal Power Project	Energy Development Corporation	20.00
			Mt. Zion 2 Geothermal Power Project	Energy Development Corporation	
		North Cotabato and Davao del Sur	Mt. Talomo-Tico Geothermal Power Project	Mount Apo Geopower, Inc.	
MINDANAO Sum					110.00

Appendix 5 – Changes from TDP 2016 – 2040 to TDP 2019 – 2040

Project Name	TDP 2016 – 2040	TDP 2019 – 2040	Remarks
Luzon Projects			
Hermosa–Floridablanca 69 kV T/L	ETC: Jun 2019	ETC: Dec 2018	Updated ETC based on project timeline
Bataan 230 kV Grid Reinforcement	ETC: Aug 2019	ETC: Dec 2018	Updated ETC based on project timeline
San Jose–Angat 115 kV Line Upgrading	ETC: Dec 2018	ETC: Jun 2019	Updated ETC based on project timeline
Relocation of Steel Poles along Hermosa–Duhat 230 kV Transmission Line	ETC: Jun 2019	ETC: Aug 2019	Updated ETC based on project timeline
Luzon PCB Replacement	ETC: Dec 2018	ETC: Oct 2019	Updated ETC based on project timeline
Balsik (Hermosa)–San Jose 500 kV Transmission Line	ETC: Oct 2020	ETC: Oct 2019	Updated ETC based on project timeline
Clark–Mabiga 69 kV Transmission Line	ETC: Jun 2019	ETC: Nov 2019	Updated ETC based on project timeline
San Jose–Quezon 230 kV Line 3	ETC: Mar 2019	ETC: Dec 2019	Updated ETC based on project timeline
Antipolo 230 kV Substation	ETC: Oct 2019	ETC: May 2020	Updated ETC based on project timeline
Mariveles–Balsik (Hermosa) 500 kV Transmission Line	ETC: Sep 2019 • New Mariveles 500 kV Substation, 14-500 kV PCBs and associated equipment.	ETC: Jun 2020 • Mariveles 500 kV Switching Station (New), 12-500 kV PCBs and associated equipment. • Balsik (Hermosa) 500 kV Substation, 2-500 kV PCBs and associated equipment.	Updated the project components Renamed the project based on Site and Equipment Identification Labelling (SEIL) Updated ETC based on project timeline
North Luzon Substation Upgrading Project	ETC: Stage 1 Sep 2019 Stage 2 Jun 2022	ETC: Stage 1 Jul 2019 Stage 2 Sep 2020	Updated ETC based on project timeline Change in components

Project Name	TDP 2016 – 2040	TDP 2019 – 2040	Remarks
	• Bauang 230 kV Substation (Replacement), 1x100 MVA 230/115/69-13.8 kV Power Transformer and accessories, 6-230 kV PCBs and associated equipment; • Labrador 230 kV Substation (Replacement), 1x300 MVA 230/69-13.8 kV Power Transformer and accessories, 5-230 kV PCBs and associated equipment, 2-69 kV PCBs and associated equipment;	• Bauang 230 kV Substation (Replacement), 1x100 MVA 230/115/69-13.8 kV Power Transformer and accessories, 7-230 kV PCBs and associated equipment; • Labrador 230 kV Substation (Replacement), 1x100 MVA 230/69-13.8 kV Power Transformer and accessories, 5-230 kV PCBs and associated equipment, 2-69 kV PCBs and associated equipment;	
Pagbilao 500 kV Substation	ETC: Sep 2020	ETC: Dec 2020	Updated ETC based on project timeline
Manila (Navotas) 230 kV Substation	ETC: Mar 2020	ETC: Feb 2021 • Navotas (Manila) 230 kV Substation	Rename based on SEIL The ETC of transmission portion will be in Feb 2021 The ETC of substation portion will be Mar 2020 Updated ETC based on project timeline
Ambuklao–Binga 230 kV Transmission Line Upgrading	ETC: Apr 2021	ETC: May 2021	Updated ETC based on project timeline
Binga–San Manuel 230 kV Transmission Line Stage 1 & 2	ETC: Apr 2021	ETC: May 2021	Updated ETC based on project timeline
Tuy 500/230 kV Substation (Stage 1)	ETC: Aug 2020	ETC: Dec 2021	Updated ETC based on project timeline
Luzon Voltage Improvement Project – 4	• Bulan Load-End 69 kV Substation, 3x2.5 MVAR, 69 kV Capacitor	• Sorsogon 69 kV Switching Station, 3x5 MVAR, 69 kV Capacitor Banks and accessories, 4-69 kV	Update on project component

Project Name	TDP 2016 – 2040	TDP 2019 – 2040	Remarks
	Banks and accessories, 4-69 kV PCBs and associated equipment	PCBs and associated equipment	
Santiago–Nagsaag 500 kV Transmission Line	ETC: Dec 2024	ETC: Jan 2024	Updated ETC based on project timeline
Northern Luzon 230 kV Loop	• Sanchez Mira 230 kV Substation (New), 2x300MVA, 230/115-13.5 kV Transformer, 10-230 kV PCBs and associated equipment, 4-115 kV PCBs and associated equipment	• Sanchez Mira 230 kV Substation (New), 2x300MVA, 230/69-13.8 kV Transformer, 10-230 kV PCBs and associated equipment, 4-69 kV PCBs and associated equipment	Change in secondary voltage of the transformer for the new substation, from 115 kV to 69 kV.
Pinamukan 500/230 kV Substation	• Pinamukan 500 kV Substation, 10-500 kV PCBs and associated equipment	• Pinamukan 500 kV Substation, 2x1000 MVA, 500/230 kV Power Transformers and accessories, 12-500 kV PCBs and associated equipment • Pinamukan 230 kV Substation, 2x100 MVA, 230/69 kV Power Transformers, 6-230 kV PCBs and associated equipment, 6-69 kV PCBs and associated equipment, • Pinamukan–Taysan 69 kV Line, SP-DC, 1-795 MCM ACSR, 10 km	Additional components on the project
Bolo–San Pablo 500 kV Transmission Line	• San Pablo 500 kV Substation, 2x750 MVA, 500/230-13.8 kV Power Transformer and accessories, 6-500 kV PCBs and associated equipment • San Pablo 230 kV Substation, 10-230 kV PCBs and associated equipment • Balaoan 500 kV Switching Station, 10-500	• The project is harmonized with San Esteban–Laoag 115 kV Transmission Line Upgrading and becomes Bolo–Balaoan 500 kV Transmission Line Project.	Revision of project

Project Name	TDP 2016 – 2040	TDP 2019 – 2040	Remarks
	kV PCBs and associated equipment • Bolo 500 kV Substation, 2-500 kV PCBs and associated equipment		
Pasay 230 kV Substation	• Pasay 230 kV Substation, 5-230 kV PCBs (GIS) and associated equipment; • Las Piñas–Pasay 230 kV Transmission Line, 230 kV, SP-DC, 2-795 MCM ACSR/AS, 4.2 km; 230 kV UG-DC, 2-1C-2,000 mm² XLPE, 3.9 km	• Pasay 230 kV Substation, 11-230 kV PCBs (GIS) and associated equipment; • Las Piñas–Pasay 230 kV Transmission Line, 230 kV Double Circuit Underground Cable, 2-2,500 mm^2 XLPE (1-core), 9.0 km.	Additional components on the project
Tanauan 230 kV Substation	ETC: Jun 2020	ETC: Nov 2022 • FITUI Malvar Load-end 69 kV Substation, 2x5 MVAR, 69 kV Capacitor Banks and accessories, 3-69 kV PCBs and associated equipment	Updated ETC based on project timeline Additional components on the project
San Simon 230 kV Substation	ETC: Nov 2022	ETC: May 2022	Updated ETC based on project timeline
Capas 230 kV Substation	ETC: Dec 2025 • Capas 230 kV Substation, 2x300 MVA 230/69 kV transformer and accessories, 6-230 kV PCBs, 6-69 kV PCBs and associated equipment	ETC: Sep 2023 • Capas 230 kV Substation, 2x300 MVA 230/69-13.8 kV Power Transformers and accessories, 3x100 MVAR 230 kV Shunt Capacitor and accessories; 7-230 kV PCBs and associated equipment, 6-69 kV PCBs and associated equipment;	Updated ETC based on project timeline Revision on the project components
Porac 230 kV Substation	ETC: Dec 2024 • Porac 230 kV Substation, 2x300 MVA, 230/69 kV	ETC: Oct 2023 • Porac 230 kV Substation, 2x300 MVA 230/69 kV Power Transformers and	Updated ETC based on project timeline Revision on the project components

Project Name	TDP 2016 – 2040	TDP 2019 – 2040	Remarks
	transformer and accessories, 8-230 kV PCBs,4-69 kV PCBs and associated equipment	accessories, 3x100 MVAR, 230 kV Shunt Capacitor and accessories, 7-230 kV PCBs and associated equipment, 6-69 kV PCBs and associated equipment;	
Abuyog 230 kV Substation	ETC: Dec 2023 • Abuyog (Sorsogon) 230 kV Substation, 2-50 MVA 230/69-13.8 kV Power Transformer and accessories, 2-25 MVAR Capacitor, 2-25 MVAR Shunt Reactor, 10-230 kV PCBs, 5-69 kV PCBs and associated equipment	ETC: Nov 2023 • Abuyog 230 kV Substation, 1x50 MVA 230/69-13.8 kV Power Transformer and accessories, 2x25 MVAR, 230 kV Capacitor Banks and accessories, 2x25 MVAR, 230 kV Shunt Reactor and accessories, 6-230 kV PCBs and associated equipment, 5-69 kV PCBs and associated equipment. • Bacman 230 kV Substation, 6-230 kV PCBs and associated equipment	Updated ETC based on project timeline Revision on the project components
Liberty 230 kV Substation	ETC: Dec 2024 • Liberty 230 kV Substation, 1x100 MVA 230/69 kV Power Transformer and accessories, Control Room, 5-230 kV PCBs and associated equipment, 1-69 kV PCBs and associated equipment • *Liberty 'cut-in' to* Pantabangan–Nagsaag 230 kV Transmission Line, ST-DC, 1-795 MCM ACSR/AS, 2 km; 69 kV line extension, SP-	ETC: Nov 2023 • Liberty 230 kV Substation, 1x100 MVA 230/69 kV Power Transformer and accessories, Control Room, 6-230 kV PCBs and associated equipment, 6-69 kV PCBs and associated equipment. • Liberty Cut-in to Pantabangan–Nagsaag 230 kV Transmission Line, ST-DC, 1-795 MCM ACSR/AS, 2 km; • Pantabangan Load End–Liberty Substation 69 kV Transmission Line, SP-DC, 1-410 mm^2 TACSR/AS, 2 km; • Liberty–SAJELCO 69 kV Transmission Line,	Updated ETC based on project timeline Revision on the project components

Project Name	TDP 2016 – 2040	TDP 2019 – 2040	Remarks
	SC, 1-336.4 MCM ACSR, 2 km	SP-SC, 1-410 mm^2 TACSR/AS, 12 km.	
Silang 500 kV Substation	ETC: Dec 2025	ETC: Nov 2023 • Las Piñas 230 kV Transmission Line diversion, ST-DC, 4-795 MCM ACSR, 10 km	Updated ETC based on project timeline Additional components of the project
Tower Structure Upgrading of Bicol Transmission Facilities	ETC: Jul 2018	ETC: Jun 2019	Updated ETC based on project timeline
La Trinidad–Calot 69 kV Transmission Line	ETC: Dec 2021	ETC: Jun 2019	Updated ETC based on project timeline
San Manuel–Nagsaag 230 kV Transmission Line	ETC: Dec 2021	ETC: Dec 2021	Updated ETC based on project timeline
Navotas (Manila)–Dona Imelda 230 kV Transmission Line	ETC: Dec 2023	ETC: Dec 2021	Updated ETC based on project timeline
Minuyan 115 kV Switching Station	ETC: Apr 2024	ETC: Aug 2023	Updated ETC based on project timeline
Nasugbu 69 kV Switching Station	ETC: Dec 2021	ETC: Dec 2024	Updated ETC based on project timeline
Calaca–Salong 230 kV Transmission Line 2	ETC: Mar 2025	ETC: Jul 2025	Updated ETC based on project timeline
San Esteban–Laoag 115 kV Transmission Line Upgrading	-	• The project is harmonized with Bolo–San Pablo 500 kV Transmission Line and becomes Balaoan–Laoag 500 kV Transmission Line Project.	Revision of project
Daraga–Washington 69 kV Line	-	ETC: Dec 2022	New project under TDP 2019-2040
Batangas–Taysan 69 kV Transmission Line Extension	-	ETC: Dec 2022	New project under TDP 2019-2040
San Rafael–San Jose 230 kV Transmission Line Upgrading	-	ETC: Dec 2035	New project under TDP 2019-2040

Project Name	TDP 2016 – 2040	TDP 2019 – 2040	Remarks
Luzon Voltage Improvement Project VI	-	ETC: Dec 2030	New project under TDP 2019-2040
Alaminos EHV Substation	-	ETC: Dec 2030	New project under TDP 2019-2040
North Luzon Substation Upgrading II	-	ETC: Dec 2026	New project under TDP 2019-2040
South Luzon Substation Upgrading II	-	ETC: Dec 2026	New project under TDP 2019-2040
Taguig EHV Substation Expansion	-	ETC: Dec 2027	New project under TDP 2019-2040
Mexico–Marilao 230 kV Transmission Line	-	ETC: Dec 2024	New project under TDP 2019-2040
Olongapo 230 kV Substation Upgrading	-	ETC: Dec 2023	New project under TDP 2019-2040
Marilao EHV Substation Expansion	-	ETC: Dec 2025	New project under TDP 2019-2040
Castillejos 230 kV Substation	-	ETC: Aug 2024	New project under TDP 2019-2040
Kawit 230 kV Substation	-	ETC: Nov 2024	New project under TDP 2019-2040
Eguia 230 kV Substation	-	ETC: Dec 2025	New project under TDP 2019-2040
Tuguegarao–Enrile 69 kV Line	-	ETC: Dec 2021	New project under TDP 2019-2040
Bolo–Balaoan 500 kV Transmission Line	-	ETC: Jul 2025	New project under TDP 2019-2040
Balaoan–Laoag 500 kV Transmission Line	-	ETC: Jul 2025	New project under TDP 2019-2040
Tagkawayan 500kV Substation	-	ETC: Dec 2025	New project under TDP 2019-2040
San Jose 500 kV Substation Expansion	-	ETC: Mar 2019	New project under TDP 2019-2040

Project Name	TDP 2016 – 2040	TDP 2019 – 2040	Remarks
Luzon Voltage Improvement Project V	-	ETC: Apr 2021	New project under TDP 2019-2040

Project Name	TDP 2016 – 2040	TDP 2019 – 2040	Remarks
Visayas Projects			
Visayas Substation Reliability I	ETC : Mar 2018 Cost Estimate 1,161 Million Pesos	ETC : Dec 2018 Cost Estimate 1,190 Million Pesos	Updated cost estimate and ETC based on project timeline
Sta. Rita– Quinapondan 69 kV Transmission Line	• Sta. Rita– Quinapondan T/L ST/SP/WP-SC, 1-336.4 MCM, 103 km	• Sta. Rita– Quinapondan T/L ST-SC, 1-336.4 MCM, 97 km	Updated tower structure and length based on actual components
Cebu-Negros-Panay 230 kV Backbone Stage 1	ETC : Dec 2018 • Bacolod S/S - E. B. Magalona T/L ST-DC, 2-795 MCM ACSR, 42 km Cost Estimate 5,099 Million Pesos	ETC : Jul 2019 • Bacolod S/S - E. B. Magalona T/L ST-DC, 2-795 MCM ACSR, 39 km Cost Estimate 6,104 Million Pesos	Updated cost estimate and ETC based on project timeline Updated OHTL length based on survey
San Carlos – Guihulngan 69 kV Transmission Line	ETC : Dec 2018 • San Carlos– Guihulngan 69 kV T/L SP-SC 1-336.4 MCM ACSR, 58 km Cost Estimate 455 Million Pesos	ETC : Jun 2019 • San Carlos– Guihulngan 69 kV T/L ST-SC 1-336.4 MCM ACSR, 58 km Cost Estimate 467 Million Pesos	Updated cost estimate and ETC based on project timeline Updated tower structure based on actual components
Ormoc–Babatngon 138 kV Transmission Line	• Babatngon S/S Expansion 1-138 kV PCB Cost Estimate 696 Million Pesos	• Babatngon S/S Expansion 2-138 kV PCB Cost Estimate 962 Million Pesos	Updated cost estimate Updated number of PCBs in Babatngon S/S based on actual components
Visayas Substation Reliability II	 Cost Estimate 662 Million Pesos	• Bacolod 138 kV S/S Expansion 1-69 kV PCBs • Sta. Barbara 69 kV S/S Expansion 2-69 kV PCBs and associated equipment Cost Estimate 532 Million Pesos	Updated cost estimate Substation Expansion in Bacolod and Sta. Barbara will be for CENECO and ILECO I respectively.

New Naga (Colon) Substation Project (Remaining Works)	• Transfer of Naga-Sibonga-Dumanjug 69 kV Feeder from Naga S/S to Colon S/S SP-SC, 1-336.4 MCM ACSR, 1.5 km Cost Estimate 272 Million Pesos	• Transfer of Sibonga and VECO Naga 69 kV Feeders from Naga S/S to Colon S/S SP-DC, 1-795 MCM ACSR, 1.5 km Cost Estimate 313 Million Pesos	Updated cost estimate Change is done in order to transfer both Sibonga and VECO Naga 69 kV feeders to Colon Substation.
Naga (Visayas) Substation Upgrading Project	ETC : Sep 2019 Cost Estimate 516 Million Pesos	ETC : Oct 2019 Cost Estimate 481 Million Pesos	Updated cost estimate and ETC based on project timeline
Tagbilaran 69 kV Substation Project	ETC : Nov 2019 Cost Estimate 487 Million Pesos	ETC : Mar 2020 Cost Estimate 534 Million Pesos	Updated cost estimate and ETC based on project timeline
Cebu-Lapu-lapu 230 kV T/L	ETC : Nov 2019 • Cebu-Umapad CTS 230 kV T/L ST/SP-DC, 2-410 mm^2, 9 km • Umapad-Mandaue CJ 138 kV T/L SC, 3-1C 1,000mm^2 XLPE underground cables, 0.3 km • Lapu-lapu CJ-Lapu-lapu 138 kV T/L SC, 3-1C 1,000 mm^2 XLPE underground cables, 0.1km Cost Estimate 1,780 Million Pesos	ETC : Nov 2020 • Cebu-Umapad CTS 230 kV T/L ST/SP-DC, 2-410 mm^2 STACIR, 9 km Cost Estimate 1,884 Million Pesos	Updated cost estimate and ETC based on project timeline Changes are due to space limitations in Mandaue S/S and change in transmission route due to ROW issues.
Panitan-Nabas 138 kV Transmission Line 2 Project	Cost Estimate 465 Million Pesos	Cost Estimate 634 Million Pesos	Updated cost estimate
CNP 230 kV Backbone Project - Stage 3	• Calatrava 230 kV S/S 2x50 MVAR 230 kV Reactor • Reconductoring of the Cut-in Line from Quiot S/S	• Calatrava 230 kV S/S 2x70 MVAR 230 kV Reactor • Magdugo 230 kV S/S 2x70 MVAR 230 kV Reactor • Calatrava CTS-Calatrava S/S ST-DC, 4-795 MCM ACSR, 1.5 km • Reconductoring of the Cebu-Quiot-Colon 138 kV	Updated cost estimate Change in size of reactor based on the system requirement.

	Cost Estimate 43,643 Million Pesos	Transmission Corridor • Bundling of termination at Cebu-Quiot-Colon 138 kV Transmission Corridor Cost Estimate 44,563 Million Pesos	
Visayas Voltage Improvement Project	ETC : Dec 2021 Cost Estimate 786 Million Pesos	ETC : Jan 2022 Cost Estimate 805 Million Pesos	Updated cost estimate and ETC based on project timeline
CNP 230 kV Backbone Project - Stage 2 Project	ETC : Jul 2019 • Cebu 230 kV S/S 2-138 kV PCBs • Extension of Cebu-Lapulapu Lines 230 kV Lines, SP-DC, 4-795 MCM ACSR, 0.425 km Cost Estimate 2,209 Million Pesos	ETC : May 2020 • Cebu 230 kV S/S 3-138 kV PCBs • Extension of Cebu-Lapulapu Lines Underground Cable System, Double Circuit of 1200 MW Capacity, 0.425 km and 2-410 mm^2 STACIR, ST/SP-DC, 0.150 km Cost Estimate 3,204 Million Pesos	Updated cost estimate and ETC based on project timeline Based on updated lay-out/configuration Upgrading of conductor size of the 230 kV transmission lines in order to be consistent with the 230 kV transmission loop that will be developed in Metro Cebu.
Panay–Guimaras 138 kV Interconnection Project	ETC : Jan 2021 Cost Estimate 2,209 Million Pesos	ETC : Nov 2021 Cost Estimate 2,419 Million Pesos	Updated cost estimate and ETC based on project timeline
Negros–Panay 230 kV Interconnection Project Line 2	ETC : Dec 2025 • Barotac Viejo S/S Expansion 3-230 kV PCBs, 1x70 MVAR, 230 kV shunt reactor • E. B. Magalona CTS Expansion Cost Estimate 3,500 Million Pesos	ETC : May 2024 • Barotac Viejo S/S Expansion 2-230 kV PCBs, 1x40 MVAR, 230 kV shunt reactor • E.B. Magalona S/S (Expansion) 3-230 kV PCB, 1x40 MVAR, 230 kV Shunt Reactor • Barotac Viejo CTS – Barotac Viejo S/S 1-1,600 mm^2 XLPE Underground Cable, SC, 0.75 km Cost Estimate 6,937 Million Pesos	Updated cost estimate and ETC based on project timeline Based on updated lay-out/configuration

Barotac Viejo–Nabas 230 kV T/L	• Nabas S/S 2x300 MVA, 230/138 kV Power Transformer • Iloilo-Nabas 230 kV T/L ST-DC, 4-795 MCM ACSR, 180 km	• Nabas S/S 2x300 MVA, 230/138 kV Power Transformer and accessories, 10-230 kV PCBs and 2-138 kV PCBs • Barotac Viejo-Nabas 230 kV T/L ST-DC, 4-795 MCM ACSR, 140 km	Based on updated lay-out/configuration which included the PCB equipment Nabas 230 kV T/L termination from Iloilo S/S transferred to Barotac Viejo 230 kV S/S in order to utilize the 230 kV OHTL since it will be traversing on the large loads in Panay
Nabas-Caticlan-Boracay 138kV Transmission Line Project	ETC : Feb 2021 • Caticlan-Boracay Power Cable, XLPE Submarine Cable System Double circuit of 180 MW capacity at 138 kV, 2 km • Manocmanoc LES-Boracay S/S SP-SC, 1-336.4 MCM ACSR, 1 km • Boracay 138 kV S/S (New) 3x100 MVA 138/69/13.2 kV Power, 5x50 MVA 69/13.2 kV Power Transformer, 8-138 kV PCB, 15-69 kV PCB Cost Estimate 7,095 Million Pesos	ETC : Nov 2020 • Caticlan-Boracay Power Cable, XLPE Submarine Cable System Double circuit of 100 MW capacity at 138 kV, 2 km • Manocmanoc LES-Boracay S/S SP-SC, 1-336.4 MCM ACSR, 1 km • Boracay 138 kV S/S (New) 2x100 MVA 138/69/13.2 kV Power Transformer, 7-138 kV PCB and 8-69 kV PCB Cost Estimate 6,221 Million Pesos	Updated cost estimate and ETC based on project timeline Based on updated lay-out/configuration 50 MVA 69/13.2 kV Power Transformers will be implemented by AKELCO
Amlan–Dumaguete 138 kV Transmission Line Project	ETC : Dec 2021 Cost Estimate 2,495 Million Pesos	ETC : Dec 2021 Cost Estimate 2,483 Million Pesos	Updated cost estimate and ETC based on project timeline
Laray 230 kV Substation Project	ETC : May 2022 Cost Estimate 5,029 Million Pesos	ETC : Apr 2022 Cost Estimate 5,173 Million Pesos	Updated cost estimate and ETC based on project timeline
Babatngon–Palo 138 kV Transmission Line Project	Palo 138 kV S/S (New) 2x50 MVA, 138/69-13.8 kV Power Transformer, 6-138 kV PCBs and 8-69 kV PCBs Cost Estimate 3,061 Million Pesos	Palo 138 kV S/S (New) 2x50 MVA, 138/69-13.8 kV Power Transformer, 6-230 kV PCBs (energized at 138 kV) and 8-69 kV PCBs Cost Estimate 3,044 Million Pesos	Updated cost estimate PCBs will be designed at 230 kV level but will be initially energized at 138 kV
Silay 230 kV Substation Project	ETC : Sep 2024	ETC : Oct 2024 • Bus-in of Silay Substation to Bacolod–E.B. Magalona 230 kV T/L 230 kV T/L,	Updated cost estimate and ETC based on project timeline Based on updated lay-out/configuration which

	Cost Estimate 900 Million Pesos	ST/SP-DC, 2-795 MCM ACSR, 7 km Cost Estimate 2,517 Million Pesos	included the 230 kV line extension.
Unidos 138 kV Substation Project	ETC : Sep 2025 • Unidos Substation 2x100 MVA, 138/69-13.8 kV Power Transformer, 10-138 kV PCBs and 6-69 kV PCBs Cost Estimate 100 Million Pesos	ETC : Dec 2024 • Unidos Substation 2x100 MVA, 138/69-13.8 kV Power Transformer, 11-138 kV PCBs and 8-69 kV PCBs • Bus-in of Unidos Substation to Nabas–Caticlan 138 kV T/L 138 kV T/L, ST/SP-DC, 1-795 MCM ACSR, 1 km Cost Estimate 1,420 Million Pesos	Updated cost estimate and ETC based on project timeline. Based on updated lay-out/configuration. Bus-in Transmission line included in the project components
Sogod 230 kV Substation Project	ETC : Sep 2025 • Sogod Substation 2x300 MVA, 230/69-13.8 kV Power Transformer, 10-230 kV PCBs and 7-69 kV PCBs Cost Estimate 900 Million Pesos	ETC : May 2025 • Sogod Substation 2x300 MVA, 230/69-13.8 kV Power Transformer, 10-230 kV PCBs and 6-69 kV PCBs • Bus-in of Sogod Substation to Compostela–Daanbantayan 230 kV T/L 230 kV T/L, ST-DC, 2-795 MCM ACSR, 1 km Cost Estimate 2,606 Million Pesos	Updated cost estimate and ETC based on project timeline Based on updated lay-out/configuration Bus-in Transmission line included in the project components
Iloilo 230 kV Substation Project	ETC : Dec 2025 • Iloilo 230 kV S/S 2x300 MVA, 230/69-13.8 kV Power Transformer and accessories, 10-230 kV PCBs and associated equipment, 6-69 kV PCBs Cost Estimate 3,021 Million Pesos	ETC : Jun 2025 • Iloilo 230 kV S/S 2x300 MVA, 230/69-13.8 kV Power Transformer and accessories, 6-230 kV PCBs and associated equipment, 7-69 kV PCBs Cost Estimate 5,125 Million Pesos	Updated cost estimate and ETC based on project timeline Based on updated lay-out/configuration

Cebu–Bohol 230 kV Interconnection Project	ETC : Dec 2021 • Corella 230 kV S/S 2x300 MVA, 230/138kV Power Transformer, 8-230 kV PCBs, 2-138 kV PCBs and 2x40 MVAR 230 kV Reactor • Dumanjug S/S–Sibonga CTS ST-DC, 4-795 MCM ACSR, 20 km • Sibonga CTS–Loon CTS Single circuit S/C system of 400 MW capacity at 230 kV, 30km Cost Estimate 8,139 Million Pesos	ETC : Nov 2021 • Corella 230 kV S/S 2x300 MVA, 230/138kV Power Transformer, 8-230 kV PCBs, 4-138 kV PCBs and 2x40 MVAR 230 kV Reactor • Dumanjug S/S–Argao CTS ST-DC, 4-795 MCM ACSR, 20 km • Argao CTS–Loon CTS Single circuit S/C system of 400 MW capacity at 230 kV, 30km Cost Estimate 8,510 Million Pesos	Updated cost estimate and ETC based on project timeline Based on updated lay-out/configuration Change in location of the CTS in Cebu after detailed survey
Calbayog–Allen–Catarman 69 kV Transmission Line Project	ETC : Dec 2021 Cost Estimate 935 Million Pesos	ETC : Apr 2022 Cost Estimate 944 Million Pesos	Updated cost estimate and ETC based on project timeline
Visayas Substation Upgrading Project - 1	ETC : Dec 2021 Cost Estimate 1,185 Million Pesos	ETC : Jul 2021 Cost Estimate 1,187 Million Pesos	Updated cost estimate and ETC based on project timeline
Barotac Viejo–Natividad 69 kV Transmission Line	ETC : Dec 2022	ETC : Jul 2022	Updated ETC based on project timeline
Babatngon–Sta. Rita 138 kV Transmission Line Upgrading	ETC : Dec 2023 • Sta. Rita 138 kV S/S 2x50 MVA 138/69-13.8 kV Power Transformer, 10-138 kV PCB and 2-69kV PCB Cost Estimate 459 Million Pesos	ETC : Jan 2025 • Sta. Rita 138 kV S/S 1x50 MVA 138/69-13.8 kV Power Transformer, 10-138 kV PCB and 5-69kV PCB • Sta. Rita-Tapping Point 138 kV T/L (going to Babatngon) ST-DC, 1-795 MCM ACSR, 0.8 km. Cost Estimate 1,562 Million Pesos	Updated cost estimate and ETC based on project timeline Based on updated lay-out/configuration
Visayas Substation Upgrading Project - 2	• Calong-calong 138 kV S/S 1x50 MVA 138/69-13.8 kV Power Transformer, 2-138 kV PCBs and 2-69 kV PCBs	• Calong-calong 138 kV S/S 1x50 MVA 138/69-13.8 kV Power Transformer, 1-138 kV PCBs and 4-69 kV PCBs	Updated cost estimate

	• Colon 138 kV S/S 1-100 MVA 138/69-13.8 kV Power Transformer, 1-138 kV PCB and 1-69 kV PCB • Compostela 138 kV S/S 1-50 MVA 138/69-13.8 kV Power Transformer, 2-138 kV PCB and 1-69 kV PCB • Kabankalan 138 kV S/S 1x50 MVA 138/69-13.8 kV Power Transformer, 2-138 kV PCBs and 1-69 kV PCB • Mabinay 138 kV S/S 1x50 MVA 138/69-13.8 kV Power Transformer, 2-138 kV PCBs and 1-69 kV PCB • E.B. Magalona 138 kV S/S 2-30 MVA, 138/69-13.8 kV Power Transformer (transferred from Panitan S/S), 4-138 kV PCB and 2-69 kV PCB • Panitan 138 kV S/S 2x50 MVA 138/69-13.8 kV Power Transformer, 4x138 kV PCBs and 2-69 kV PCBs • Dingle 138 kV S/S 1-50 MVA 138/69-13.8 kV Power Transformer, 2-138 kV PCB and 1-69 kV PCB	• Colon 138 kV S/S 2x100 MVA 138/69-13.8 kV Power Transformer • Compostela 138 kV S/S 1x50 MVA 138/69-13.8 kV Power Transformer, 1-138 kV PCB and 4-69 kV PCB • Kabankalan 138 kV S/S 2x50 MVA 138/69-13.8 kV Power Transformer, 2-138 kV PCBs and 4-69 kV PCB • Mabinay 138 kV S/S 1x50 MVA 138/69-13.8 kV Power Transformer, 2-138 kV PCBs and 2-69 kV PCB • E.B. Magalona 138 kV S/S 2x30 MVA, 138/69-13.8 kV Power Transformer (transferred from Panitan S/S), 3-138 kV PCB and 3-69 kV PCB • Panitan 138 kV S/S 2x100 MVA 138/69-13.8 kV Power Transformer, 2-138 kV PCBs and 4-69 kV PCBs. Rehabilitation of the Control center and other facilities. • Dingle 138 kV S/S 1x50 MVA 138/69-13.8 kV Power Transformer, 2-138 kV PCB and 5-69 kV PCB • Tabango 138 kV S/S 1x50 MVA 230/69-13.8 kV Power	Based on updated lay-out/configuration in order to provide reliability on the substation Additional termination for MECO

	Cost Estimate 1,300 Million Pesos	Transformer, 2-230 kV PCBs and 4-69 kV PCBs • Daanbantayan 230 kV S/S 1x100 MVA 230/69 kV and 3-69 kV PCB • Lapu-lapu GIS 138 kV S/S 1-69 kV PCB (GIS) Cost Estimate 3,155 Million Pesos	
Tabango–Biliran 69 kV Transmission Line Project	ETC : Dec 2021 • Tabango-Biliran 69 kV T/L ST-DC, 1-795 MCM ACSR, 48 km Cost Estimate 58 Million Pesos	ETC : Jun 2025 • Tabango-Biliran 69 kV T/L ST-DC, 1-795 MCM ACSR, 35 km Cost Estimate 1,235 Million Pesos	Updated cost estimate and ETC based on project timeline Updated length based on latest desktop study
Laray–Naalad 230 kV Energization Project	ETC : Dec 2021 Cost Estimate 900 Million Pesos	ETC : Apr 2025 Cost Estimate 2,474 Million Pesos	Updated cost estimate and ETC based on project timeline
Laray–Cordova 230 kV Transmission Line Project	ETC : Dec 2021 • Cordova 230 kV S/S 2x300 MVA, 230/69-13.8 kV Power Transformer, 10-230 kV and 8-138 kV PCBs • Cordova-Laray 230 kV T/L ST-DC, 4-795 MCM ACSR, 18 km; • Cordova-Laray 230 kV Underground Cables 3-1600 mm^2 XLPE (To co-locate with the Cebu-Cordova Bridge). Cost Estimate 7,500 Million Pesos	ETC : Apr 2025 • Cordova 230 kV S/S 2x300 MVA, 230/69-13.8 kV Power Transformer, 6-230 kV PCBs and 8-138 kV PCBs; • Laray 230 kV SWS 6-230 kV PCBs; • Laray SWS-Cordova 230 kV T/L 230 kV submarine Cable, 600MW capacity or higher per circuit, Double Circuit, 6.5 km; • Laray S/S-Laray SWS 4-795 MCM ACSR, ST-DC, 5 km. Cost Estimate 13,794 Million Pesos	Updated cost estimate and ETC based on project timeline Based on updated lay-out/configuration in which laying of submarine cables will be done.
Taft–Bobolosan 69 kV Transmission Line Project	ETC : Dec 2025 • Taft 69 kV S/S 2-69 kV PCB	ETC : Jun 2025 • Taft 69 kV S/S 3-69 kV PCB	Updated cost estimate and ETC based on project timeline Based on updated lay-out/configuration

	• Bobolosan-Taft 138 kV T/L (69 kV energized) ST/SP-DC, 1-795 MCM ACSR, 50 km Cost Estimate 65 Million Pesos	• Bobolosan-Taft 138 kV T/L (69 kV energized) ST/SP-DC, 1-795 MCM ACSR, 123 km Cost Estimate 1,722 Million Pesos	Updated length based on latest desktop study
Bayawan–Sipalay 69 kV Transmission Line	ETC : Dec 2021 Cost Estimate 900 Million Pesos	ETC : Apr 2025 Cost Estimate 1,700 Million Pesos	Updated cost estimate and ETC based on project timeline
Siaton–Bayawan 69 kV Transmission Line	ETC : Dec 2021 Cost Estimate 900 Million Pesos	ETC : Apr 2025 Cost Estimate 1,562 Million Pesos	Updated cost estimate and ETC based on project timeline
Sipalay 138 kV S/S	• Sipalay S/S 2x100 MVA, 138/69 kV Power Transformer	• Sipalay S/S 2x100 MVA, 138/69 kV Power Transformer, 1-138 kV PCBs and 1-69 kV PCBs	Based on updated lay-out/configuration which included the PCB equipment
Kananga-Babatngon 230kV T/L	• Babatngon S/S 2x300 MVA, 230/138 kV Power Transformer	• Babatngon S/S 2x300 MVA, 230/138 kV Power Transformer, 10-230 kV PCBs and 3-138 kV PCBs • Kananga SWS 10-230 kV PCBs	Based on updated lay-out/configuration which included the PCB equipment
Calbayog-Allen-Catarman 138kV T/L	• Catarman S/S 2x100 MVA, 138/69 kV Power Transformer	• Catarman S/S 2x100 MVA, 138/69 kV Power Transformer, 10-138 kV PCBs and 6-69 kV PCBs • Calbayog–Allen–Catarman T/L Extension ST/DC, 1-795 MCM ACSR, 40 km.	Based on updated lay-out/configuration which included the PCB equipment
Visayas Voltage Improvement 2	• Bacolod 138 kV S/S 4x50 MVAR Capacitor • Maasin 138 kV S/S 4x20 MVAR Capacitor • Panit-an 138 kV S/Sn2x20 MVAR Capacitor	• Bacolod 138 kV S/S 4x50 MVAR Capacitor and 4-69 kV PCBs • Maasin 138 kV S/S 4x20 MVAR Capacitor and 4-69 kV PCBs • Panit-an 138 kV S/Sn2x20 MVAR Capacitor and 2-69 kV PCBs	Based on updated lay-out/configuration which included the PCB equipment
Umapad-Compostela 230 kV T/L		• Compostela S/S 4-69 kV PCBs and associated equipment	Inclusion of the expansion in Compostela 230 kV S/S

Cebu-Leyte 230kV Interconnection Line 3	• Cebu-Leyte S/C Submarine Cable,400 MW capacity, 1 km	• Cebu-Leyte S/C Submarine Cable,400 MW capacity, 32.49 km • Daanbantayan S/S 2-69 kV, 230 kV PCBs and 50 MVAR, 230 kV Reactor	Updated length of submarine cable based on latest desktop study and inclusion of the expansion in Daanbantayan 230 kV S/S
Bacolod-Kabankalan 230 kV T/L		• Bacolod S/S 2-138 kV PCBs • Kabankalan S/S 2-138 kV PCBs	Inclusion of the expansion in Bacolod and Kabankalan S/S
San Jose-Nabas 138 kV T/L		• San Jose S/S 6-138 kV PCBs • Nabas S/S 2-138 kV PCBs	Inclusion of the expansion in San Jose and Nabas S/S
Palo-Javier 230 kV T/L		• Javier S/S 2x150 MVA, 230/69 kV Power Transformer and 4-230 kV PCBs • Energization of Babatngon-Palo to 230 kV level (Transferring of termination)	Based on updated lay-out/configuration which included the PCB equipment. Included the energization of Babatngon-Palo to 230 kV level.
Bohol-Leyte 230 kV Interconnection	• Corella-Tugas CTS 4-795 MCM ACSR, ST-DC, 95 km • Tugas CTS-Maasin 2 ckts XLPE submarine cable of 400 MW capacity per ckt • Maasin-Javier T/L 4-795 MCM ACSR, ST-DC, 120 km.	• Corella S/S 4-230 kV PCBs and associated equipment • Tugas CTS-Guadalupe CTS 2 ckts XLPE submarine cable of 400 MW capacity per ckt and 4x70 MVAR Reactor • Tugas SWS 8-230 kV PCBs and associated equipment, 2x70 MVAR Reactor • Guadalupe SWS 8-230 kV PCBs and associated equipment, 2x70 MVAR Reactor	Based on updated lay-out/configuration which included the expansion in Corella S/S and CTS in Tugas and Guadalupe.

Visayas Voltage Improvement 3	• Silay 138 kV S/S 3x50 MVAR Capacitor	• Silay 138 kV S/S 3x50 MVAR Capacitor and 3-138 kV PCBs	Based on updated lay-out/configuration which included the PCB equipment
Umapad–Mactan–Cordova 230 kV T/L Project	• Cordova–Lapu-lapu CTS ST-DC, 4-795 MCM ACSR, 12 km • Lapu-lapu CTS–Umapad 2 ckts XLPE submarine cable of 400 MW per ckt capacity, 1 km • Umapad 230 kV S/S 4-230 kV PCBs and associated equipment • Lapu-lapu 230 kV CTS Cable end sealing equipment	• Cordova–Lapu-lapu S/S 2 ckts XLPE submarine cable of 600 MW per ckt capacity, 6 km • Lapu-lapu CTS–Umapad CTS 2 ckts XLPE submarine cable of 600 MW per ckt capacity, 1 km. • Umapad S/S–Umapad CTS 4-795 MCM ACSR, ST-DC, 2 km • Lapu-lapu 230 kV GIS S/S 2x300 MVA, 230/69 kV Power Transformer, 10-230 kV PCBs (GIS) and 6-69 kV PCBs (GIS)	Based on updated lay-out/configuration upon inclusion of Mactan GIS Substation. Inclusion of the new drawdown substation in Mactan area.
Kalibo 138 kV Substation Project		ETC : Dec 2024	New project under TDP 2019 – 2040
La Carlota 138 kV Substation Project		ETC : Dec 2024	New project under TDP 2019 – 2040
Baybay 138 kV Substation Project		ETC : Dec 2024	New project under TDP 2019 – 2040
Tigbauan 138 kV Substation Project		ETC : Dec 2024	New project under TDP 2019 – 2040
Corella–Tagbilaran 138 kV Transmission Line Project (69 kV energized)		ETC : Dec 2024	New project under TDP 2019 – 2040

Project Name	TDP 2016 – 2040	TDP 2019 – 2040	Remarks
Mindanao Projects			
Sultan Kudarat (Nuling) Capacitor Project	ETC: Jun 2018 Bulk Cost Estimate: 64 Million Pesos	ETC: Sep 2018 Bulk Cost Estimate: 54 Million Pesos	Updated ETC based on project timeline Change on bulk cost estimate were based on updated configuration
Agus 6 Switchyard Upgrading / Rehabilitation Project	ETC: Jun 2018 • Agus 6 Switchyard: 6-138 kV PCBs 17-69 kV PCBs Bulk Cost Estimate: 721 Million Pesos	ETC: Oct 2018 • Agus 6 Switchyard: 5-138 kV PCBs 14-69 kV PCBs Bulk Cost Estimate: 794 Million Pesos	Updated ETC based on project timeline Change on project components and bulk cost estimate were based on updated configuration
Balo-i-Kauswagan 230 kV T/L (Formerly Balo-i-Kauswagan-Aurora 230 kV T/L (Phase 1))	ETC: Apr 2018 • Balo-I – Kauswagan 230 kV T/L 11.1 km Bulk Cost Estimate: 2,222 Million Pesos	ETC: Feb 2019 • Balo-I – Kauswagan 230 kV T/L 12.1 km Bulk Cost Estimate: 2,455 Million Pesos	Updated ETC based on project timeline Change on length of transmission line and bulk cost estimate were based on updated configuration
Butuan-Placer 138 kV T/L	ETC: Oct 2018 • Butuan-Placer 138 kV T/L ST-SC, 1-795MCM, 100km Bulk Cost Estimate: 924 Million Pesos	ETC: Jun 2019 • Butuan-Placer 138 kV T/L ST-SC, 1-795MCM, 96.355 km Bulk Cost Estimate: 1,108 Million Pesos	Updated ETC based on project timeline Change on length of transmission line and bulk cost estimate were based on updated configuration
Toril 138 kV S/S Phase 2	ETC: Feb 2019 Bulk Cost Estimate: 956 Million Pesos	ETC: Jun 2019 Bulk Cost Estimate: 897 Million Pesos	Updated ETC based on project timeline Change on bulk cost estimate were based on updated configuration
Mindanao 230 kV Transmission Backbone	ETC: Mar 2019 • Bunawan 230 kV S/S: 1-69 kV PCB • Matano-Toril 230 kV T/L 34 km • Toril-Bunawan 230 kV T/L 40.2 km Bulk Cost Estimate: 6,858 Million Pesos	ETC: Jun 2019 • Bunawan 230 kV S/S: There is no 69 kV PCB • Matano-Toril 230 kV T/L 37.8 km • Toril-Bunawan 230 kV T/L 41.8 km Bulk Cost Estimate: 7,090 Million Pesos	Updated ETC based on project timeline Change on length of transmission line, components and bulk cost estimate were based on updated configuration
Agus 2 Switchyard Upgrading Project	ETC: May 2019 Bulk Cost Estimate: 569 Million Pesos	ETC: Sep 2019 Bulk Cost Estimate: 741 Million Pesos	Updated ETC based on project timeline Change on bulk cost estimate were based on updated configuration

Project Name	TDP 2016 – 2040	TDP 2019 – 2040	Remarks
Kauswagan-Lala 230 kV T/L (Formerly Balo-i-Kauswagan-Aurora 230 kV Transmission Line (Phase 2))	ETC: Dec 2020 • Lala 230 kV S/S (New) 2-300 MVA 230/69-13.8 kV Power Transformers • Kauswagan-Lala 230 kV 58 km • Lala-Aurora 138 kV T/L 30 km Bulk Cost Estimate: 5,347 Million Pesos	ETC: Aug 2020 • Lala 230 kV S/S (New) 2-150 MVA 230/69-13.8 kV Power Transformers • Kauswagan-Lala 230 kV T/L 56 km • Lala-Aurora 138 kV T/L 27.165 km Bulk Cost Estimate: 5,040 Million Pesos	Updated ETC based on project timeline Changed components on the project due to change in new location of Converter Station from New Aurora SS to Lala substation Change on length of transmission line and bulk cost estimate were based on updated configuration
Tacurong-Kalamansig 69 kV Transmission Line	ETC: Sep 2021 • Tacurong-Kalamansig 69kV T/L 120 km Bulk Cost Estimate 1,257 Million Pesos	ETC: Feb 2022 • Tacurong-Kalamansig 69kV T/L 100 km Bulk Cost Estimate 1,320 Million Pesos	Updated ETC based on project timeline Change on length of transmission line and bulk cost estimate were based on updated configuration
Mindanao Substation Rehabilitation (MSRP)	ETC: Dec 2022 Bulk Cost Estimate 3,451 Million Pesos	ETC: Dec 2022 Bulk Cost Estimate 3,418 Million Pesos	There is no changes in ETC however, 6 out of 13 substations will be completed on Oct. 2020 Change on bulk cost estimate were based on updated configuration
Mindanao Substation Upgrading Project (MSUP)	Bulk Cost Estimate 5,065 Million Pesos	Bulk Cost Estimate 5,016 Million Pesos	Updated ETC based on project timeline. However, 8 out of 13 substations will be completed on Oct. 2020 Change on bulk cost estimate were based on updated configuration
Mindanao Substation Expansion 3 Project	ETC: Dec 2023 • Placer 138 kV S/S 1-69 kV PCB Bulk Cost Estimate: 1,420 Million Pesos	ETC: Oct 2023 • Placer 138 kV S/S There is no 69 kV PCB Bulk Cost Estimate: 1,465 Million Pesos	Updated ETC based on project timeline The existing 69 kV PCB will be replaced under Mindanao Substation Upgrading Project to be completed on October 2020 Change on bulk cost estimate were based on updated configuration

Project Name	TDP 2016 – 2040	TDP 2019 – 2040	Remarks
Villanueva-Butuan 230 kV Transmission Line Project	ETC: Dec 2022 • Butuan 230 kV Substation (New) Bulk Cost Estimate: 4,193 Million Pesos	ETC: Jan 2025 • Butuan 230 kV Substation (New) 2-300 MVA 230/69-13.8 kV Power Transformers Bulk Cost Estimate: 6,539 Million Pesos	Updated ETC based on project timeline Change on bulk cost estimate were based on updated configuration
Nasipit Substation Bus-In (formerly Villanueva-Jasaan-Butuan 138 kV T/L)	ETC: Dec 2021 • Nasipit 138 kV S/S Expansion 8-138 kV PCBs, 2-69 kV PCBs Bulk Cost Estimate: 1,172 Million Pesos	ETC: Apr 2022 • Nasipit 138 kV S/S Expansion 7-138 kV PCBs, 1-69 kV PCB Bulk Cost Estimate: 1,282 Million Pesos	Updated ETC based on project timeline Change on the number of PCB was based on site inspection Change on bulk cost estimate were based on updated configuration
Kabacan 138 kV Substation	ETC: Dec 2021 Bulk Cost Estimate: 4,168 Million Pesos	ETC: Dec 2022 Bulk Cost Estimate: 4,278 Million Pesos	Updated ETC based on project timeline Change on bulk cost estimate were based on updated configuration
San Francisco–Tandag 138 kV Transmission Line	ETC: Dec 2023 Bulk Cost Estimate: 3,864 Million Pesos	ETC: Jul 2024 Bulk Cost Estimate: 3,840 Million Pesos	Updated ETC based on project timeline Change on bulk cost estimate were based on updated configuration
Maco–Mati 138 kV Transmission Line	ETC: Dec 2023 Maco 138 kV S/S Expansion 1-138 kV PCBs Bulk Cost Estimate: 2,075 Million Pesos	ETC: Jul 2024 Maco 138 kV S/S Expansion 4-138 kV PCBs Bulk Cost Estimate: 2,455 Million Pesos	Updated ETC based on project timeline Change on the number of PCB was based on site inspection Change on bulk cost estimate were based on updated configuration
Sultan Kudarat–Tacurong 230 kV Transmission Line	ETC: Dec 2025 • Sultan Kudarat–Tacurong 138 kV Transmission Line, ST-DC1, 2-795 MCM ACSR/AS, 101 km • Tacurong 138 kV Substation 2-138 kV PCBs	ETC: Jan 2025 • Sultan Kudarat–Tacurong 230 kV Transmission Line, ST-DC, 2-795 MCM ACSR, 101 km • Sultan Kudarat 138 kV S/S–Sultan Kudarat 230 kV S/S (new) 138 kV	Updated ETC based on project timeline Change on project components and bulk cost estimate were based on updated configuration

Project Name	TDP 2016 – 2040	TDP 2019 – 2040	Remarks
	• Sultan Kudarat 138 kV Substation Expansion, 2-138 kV PCBs Bulk Cost Estimate: 1,872 Million Pesos	Transmission Line, SP-SC, 1-795 MCM ACSR, 1 km • Tacurong 230 kV Substation (New) 4-230 kV PCBs • Sultan Kudarat 138 kV Substation 4-138 kV PCBs • Sultan Kudarat 230 kV Substation (New) 6-230 kV PCBs Bulk Cost Estimate: 4,467 Million Pesos	
Eastern Mindanao 138 kV Transmission Line Reinforcement Project	ETC: Dec 2025 • San Francisco 230 kV Substation (New) 4-230 kV PCBs • Bislig 230 kV Substation (New) 4-230 kV PCBs • Nabunturan 230 kV Substation (New) 4-230 kV PCBs Bulk Cost Estimate: 4,563 Million Pesos	ETC: Jan 2025 • Bislig 230 kV SS-Bislig 138 kV SS Tie Line ST-DC: 2-795 MCM ACSR/AS, 3 km. • San Francisco 230 kV Substation (New) 10-230 kV PCBs • Bislig 230 kV Substation (New) 10-230 kV PCBs • Nabunturan 230 kV Substation (New) 6-230 kV PCBs • Bislig 138 kV Substation (Expansion) 4-230 kV PCBs Bulk Cost Estimate: 17,388 Million Pesos	ETC: Dec 2025 San Francisco 230 kV Substation (New) 4-230 kV PCBs Bislig 230 kV Substation (New) 4-230 kV PCBs Nabunturan 230 kV Substation (New) 4-230 kV PCBs Bulk Cost Estimate: 4,563 Million Pesos
Opol Substation Bus-in Project (formerly Balo-i-Tagoloan-Opol 138 kV Transmission Line)	Bulk Cost Estimate: 559 Million Pesos	Bulk Cost Estimate: 1,399 Million Pesos	Change on bulk cost estimate was due error in encoding upon inclusion of the project in the TDP
Lala–Naga 230 kV Transmission Line	ETC: Dec 2040	ETC: Dec 2030	Updated ETC based on project timeline
Laguindingan 230 kV SS Project		ETC: Nov 2023	New Project under TDP 2019-2040

Project Name	TDP 2016 – 2040	TDP 2019 – 2040	Remarks
Maco-Apokon 69 kV Transmission Line		ETC: Nov 2024	New Project under TDP 2019-2040
Aurora-Calamba-Polanco 69 kV Transmission Line		ETC: Dec 2024	New Project under TDP 2019-2040

Appendix 6 – Summary of Transmission Projects

A. Projects for Implementation

	LUZON	ETC		VISAYAS	ETC		MINDANAO	ETC
1.	Bataan–Cavite Transmission Line FS	Dec 2018	1.	Sta. Rita–Quinapondan 69 kV Transmission Line	Nov 2018	1.	Sultan Kudarat (Nuling) Capacitor Project	Sept 2018
2.	Hermosa–Floridablanca 69 kV Transmission Line	Dec 2018	2.	Visayas Substation Reliability Project I	Dec 2018	2.	Agus 6 Switchyard Upgrading / Rehabilitation Project	Oct 2018
3.	Bataan 230 kV Grid Reinforcement	Dec 2018	3.	Ormoc–Babatngon 138 kV Transmission Line	Dec 2018	3.	Balo-i-Kauswagan 230 kV Transmission Line (Formerly Balo-i-Kauswagan-Aurora 230 kV Transmission Line (Phase 1))	Feb 2019
4.	San Jose–Angat 115 kV Line Upgrading	Jun 2019	4.	Visayas Substation Reliability Project II	Dec 2018	4.	Butuan–Placer 138 kV Transmission Line	Jun 2019
5.	Relocation of Steel Poles along Hermosa–Duhat 230 kV Transmission Line	Aug 2019	5.	San Carlos–Guihulngan 69 kV Transmission Line	Jun 2019	5.	Toril 138 kV Substation Phase 2	Jun 2019
6.	Luzon PCB Replacement	Oct 2019	6.	Cebu–Negros–Panay 230 kV Backbone Project - Stage 1	July 2019	6.	Mindanao 230 kV Transmission Backbone	Jun 2019
7.	Tuguegarao– Lal-lo 230 kV Transmission Line	Oct 2019	7.	New Naga (Colon) Substation Project (Remaining Works)	Sep 2019	7.	Agus 2 Switchyard Upgrading Project	Sep 2019
8.	Balsik (Hermosa)–San Jose 500 kV Transmission Line	Oct 2019	8.	Naga (Visayas) Substation Upgrading Project	Oct 2019	8.	Kauswagan–Lala 230 kV Transmission Line (Formerly Balo-i–Kauswagan–Aurora 230 kV Transmission Line (Phase 2)	Aug 2020
9.	Eastern Albay 69 kV Line Stage 2	Nov 2019	9.	Panitan–Nabas 138 kV Transmission Line 2 Project	Mar 2020	9.	Tacurong–Kalamansig 69 kV Transmission Line	Feb 2022
10.	Clark–Mabiga 69 kV Transmission Line	Nov 2019	10.	Tagbilaran 69 kV Substation Project	Mar 2020	10.	Mindanao Substation Rehabilitation Project (MSRP)	Dec 2022
11.	San Jose-Quezon 230 kV Line 3	Dec 2019	11.	Cebu–Lapulapu 230 kV Transmission Line Project	Nov 2020	11.	Mindanao Substation Upgrading Project (MSUP)	Dec 2022
12.	Antipolo 230 kV Substation	May 2020	12.	Cebu–Negros–Panay 230 kV Backbone Project - Stage 3	Dec 2020			

LUZON		ETC	VISAYAS		ETC	MINDANAO		ETC
13.	Mariveles–Balsik (Hermosa) 500 kV Transmission Line	Jun 2020	13.	Visayas Voltage Improvement Project	Jan 2022			
14.	Western 500 kV Backbone (Stage 1)	Jun 2020	14.	Sta. Rita–Quinapondan 69 kV Transmission Line	Nov 2018			
15.	Tiwi Substation Upgrading	July 2020	15.	Visayas Substation Reliability Project I	Dec 2018			
16.	North Luzon Substation Upgrading Project	Jul 2019/ Sep 2020						
17.	Pagbilao 500 kV Substation	Dec 2020						
18.	Navotas (Manila) 230 kV Substation	Feb 2021						
19.	Ambuklao–Binga 230 kV Transmission Line Upgrading	May 2021						
20.	Binga–San Manuel 230 kV Transmission Line Stage 1 & 2	May 2021						
21.	Tuy 500/230 kV Substation Project (Stage 1)	Dec 2021						
22.	Luzon Voltage Improvement Project – 3	Aug 2020/ Jun 2022						
23.	Luzon Voltage Improvement Project – 4	Jul 2020/ Jun 2022						
24.	South Luzon Substation Upgrading Project	Jul 2021/ Jun 2022						

B. Proposed Transmission Projects

LUZON		ETC	VISAYAS		ETC	MINDANAO		ETC
1.	Pagbilao–Tayabas 500 kV Transmission Line	Dec 2023	1.	Cebu–Negros–Panay 230 kV Backbone Project - Stage 2	May 2020	1.	Mindanao Substation Expansion 3 Project	Oct 2023
2.	Santiago–Nagsaag 500 kV Transmission Line	Jan 2024	2.	Panay–Guimaras 138 kV Interconnection Project	Nov 2021	2.	Laguindingan 230kV SS Project	Nov 2023
3.	Northern Luzon 230 kV Loop	Jan 2024	3.	Negros–Panay 230 kV Interconnection Line 2 Project	May 2024	3.	Maco-Apokon 69 kV Transmission Line Project	Nov 2024

LUZON		ETC	VISAYAS		ETC	MINDANAO		ETC
4.	Pinamukan 500 kV Substation	Dec 2024	4.	Barotac Viejo–Nabas 230 kV Transmission Line Project	Dec 2025	4.	Villanueva–Butuan 230 kV Transmission Line	Jan 2025
5.	Bolo–Balaoan 500 kV Transmission Line	Jul 2025	5.	Nabas–Caticlan–Boracay Transmission Project	Nov 2020	5.	Nasipit Substation Bus-In (formerly Villanueva-Jasaan-Butuan 138 kV Transmission Line)	Apr 2022
6.	Balaoan–Laoag 500 kV Transmission Line	Jul 2025	6.	Cebu–Bohol 230 kV Interconnection Project	Oct 2021	6.	Kabacan 138 kV Substation	Dec 2022
7.	Bolo 5th Bank	Dec 2025	7.	Laray 230 kV Substation Project	Apr 2022	7.	San Francisco– Tandag 138 kV Transmission Line	Jul 2024
8.	Tagkawayan 500 kV Substation	Dec 2025	8.	Amlan–Dumaguete 138 kV Transmission Project	Dec 2021	8.	Maco–Mati 138 kV Transmission Line	Jul 2024
9.	San Jose 500 kV Substation Expansion	March 2019	9.	Babatngon–Palo 230 kV Transmission Line Project	Dec 2022	9.	Aurora-Calamba-Polanco 69 kV Transmission Line Project	Dec 2024
10.	Calamba 230 kV Substation	Jul 2019	10.	Silay 230 kV Substation Project	Oct 2024	10.	Sultan Kudarat –Tacurong 230 kV Transmission Line	Jan 2025
11.	Taguig 500 kV Substation	Dec 2020	11.	Unidos 138 kV Substation Project	Dec 2024	11.	Eastern Mindanao 230 kV Transmission Line Project	Jan 2025
12.	Luzon Voltage Improvement Project V	Apr 2021	12.	Kalibo 138 kV Substation Project	Dec 2024	12.	Opol Substation Bus-in (formerly Balo-i-Tagoloan-Opol 138 kV Transmission Line)	Dec 2025
13.	Concepcion–Sta. Ignacia 69 kV Transmission Line	Dec 2021	13.	La Carlota 138 kV Substation Project	Dec 2024	13.	Mindanao Substation Upgrading 2 Project (MSU2P)	Dec 2025
14.	Nagsaag–Tumana 69 kV Transmission Line	Dec 2021	14.	Baybay 138 kV Substation Project	Dec 2024	14.	Matanao 230/138 kV Transformer	Dec 2030
15.	Tuguegarao–Enrile 69 kV Line	Dec 2021	15.	Tigbauan 138 kV Substation Project	Dec 2024	15.	Lala–Malabang–Sultan Kudarat 230 kV Transmission Line	Dec 2030
16.	Pasay 230 kV Substation	Jan 2022	16.	Corella–Tagbilaran 138 kV Transmission Line Project (69 kV energized)	Dec 2024	16.	Siom–Sindangan– Salug 69 kV Transmission Line	Dec 2030
17.	Tanauan 230 kV Substation	Nov 2022	17.	Sogod 230 kV Substation Project	May 2025	17.	Lala–Naga 230 kV Transmission Line	Dec 2030
18.	San Simon 230 kV Substation	May 2022	18.	Iloilo 230 kV Substation Project	Jun 2025	18.	Davao–Samal 69 kV Interconnection	Dec 2030
19.	Daraga–Washington 69 kV Line	Dec 2022	19.	Visayas Substation Upgrading Project - 1	Jul 2021	19.	Zamboanga–Basilan 69 kV Interconnection	Dec 2030
20.	Batangas–Taysan 69 kV Transmission Line Extension	Dec 2022	20.	Calbayog–Allen 138 kV Transmission Line Project	Apr 2022	20.	Bislig-Baganga 138 kV Transmission Line	Dec 2035

LUZON		ETC	VISAYAS		ETC	MINDANAO		ETC
21.	Pinili 230 kV Substation	Jan 2023	21.	Barotac Viejo–Natividad 69 kV Transmission Line Project	Jul 2022	21.	San Francisco-Tandag 138 kV Transmission Line 2	Dec 2035
22.	Marilao 500 kV Substation	Jun 2023	22.	Visayas Substation Upgrading Project - 2	Dec 2024	22.	Naga-Salug 138 kV Transmission Line	Dec 2035
23.	Plaridel 230 kV Substation	Jul 2023	23.	Babatngon–Sta. Rita 138 kV Transmission Line Upgrading	Jan 2025	23.	Sultan Kudarat-Tacurong 230 kV Transmission Line 2	Dec 2035
24.	Capas 230 kV Substation	Sep 2023	24.	Bayawan–Sipalay 138 kV Transmission Line	Jan 2025	24.	Maco-Mati 138 kV Transmission Line 2	Dec 2035
25.	Porac 230 kV Substation	Oct 2023	25.	Siaton–Bayawan 138 kV Transmission Line	Jan 2025	25.	Baganga–Mati 138 kV Transmission Line	Dec 2040
26.	Abuyog 230 kV Substation	Nov 2023	26.	Laray–Naalad 230 kV Energization Project	Apr 2025	26.	Lala–San Miguel 138 kV Transmission Line	Dec 2040
27.	Liberty 230 kV Substation	Nov 2023	27.	Laray–Cordova 230 kV Transmission Line Project	Apr 2025	27.	Nabunturan– Bunawan 230 kV Transmission Line	Dec 2040
28.	Silang 500 kV Substation	Nov 2023	28.	Tabango–Biliran 69 kV Transmission Line Project	Jun 2025	28.	Matanao–Tacurong 230 kV Transmission Line	Dec 2040
29.	Castillejos 230 kV Substation	Aug 2024	29.	Taft–Bobolosan 138 kV Transmission Line Project	Jun 2025			
30.	Kawit 230 kV Substation	Nov 2024	30.	Sipalay 138 kV Substation Project	Dec 2029			
31.	Eguia 230 kV Substation	Dec 2025	31.	Calbayog–Allen–Catarman 138 kV Transmission Line Project	Dec 2030			
32.	Marilao 500 kV Substation Expansion	Dec 2025	32.	Kananga-Babatngon 230 kV Transmission Line Project	Jul 2030			
33.	Tower Structure Upgrading of Bicol Transmission Facilities	Jun 2019	33.	Visayas Voltage Improvement Project 2	Dec 2030			
34.	La Trinidad–Calot 69 kV Transmission Line	Jun 2019	34.	Umapad-Compostela 230 kV Transmission Line Project	Sep 2030			
35.	San Manuel–Nagsaag 230 kV Transmission Line	Dec 2021	35.	Cebu-Leyte 230 kV Interconnection Line 3 Project	Sep 2030			
36.	Taguig–Taytay 230 kV Transmission Line	Sep 2022	36.	Bacolod–Kabankalan 230 kV Transmission Line Project	Sep 2033			

LUZON		ETC	VISAYAS		ETC	MINDANAO		ETC
37.	Navotas (Manila)–Dona Imelda 230 kV Transmission Line	Dec 2023	37.	San Jose–Nabas 138 kV Transmission Line Project	Dec 2033			
38.	Minuyan 115 kV Switching Station	Aug 2023	38.	Palo–Javier,230 kV Transmission Line Project	Sep 2034			
39.	Olongapo 230 kV Substation Upgrading	Dec 2023	39.	Cebu–Bohol 230 kV Interconnection Line 2 Project	Dec 2035			
40.	Western 500 kV Backbone – Stage 2	Aug 2024	40.	Bohol-Leyte 230 kV Interconnection Project	Dec 2035			
41.	Nasugbu 69 kV Switching Station	Dec 2024	41.	Visayas Voltage Improvement Project 3	Jul 2035			
42.	Balayan 69 kV Switching Station	Dec 2024	42.	Babatngon–Borongan 138 kV Transmission Line Project	Dec 2038			
43.	Mexico–Marilao 230 kV Transmission Line	Dec 2024	43.	Catarman–Borongan 138 kV Transmission Line Project	Sep 2040			
44.	Calaca–Salong 230 kV Transmission Line 2	Jul 2025	44.	Umapad–Lapulapu–Cordova 230 kV Transmission Line Project	Dec 2038			
45.	Navotas–Pasay 230 kV Transmission Line	Dec 2025						
46.	Daraga–Ligao 69 kV Transmission Line Upgrading	Dec 2025						
47.	Naga–Pili 69 kV Transmission Line Upgrading	Dec 2025						
48.	La Trinidad–Sagada 230 kV Transmission Line	Dec 2027						
49.	Tuy 500/230 kV Substation (Stage 2)	Dec 2027						
50.	Pinamukan–Tuy 500 kV Line	Oct 2029						
51.	Liberty–Nagsaag 230 kV Transmission Line	Dec 2029						
52.	Luzon–Visayas HVDC Bipolar Operation	Dec 2030						
53.	San Esteban–Laoag 115 kV Transmission Line Upgrading	Dec 2030						
54.	North Luzon Substation Upgrading II	Dec 2026						

LUZON		ETC	VISAYAS		ETC	MINDANAO		ETC
55.	South Luzon Substation Upgrading II	Dec 2026						
56.	Taguig EHV Substation Expansion	Dec 2027						
57.	Saog 230 kV Substation	Dec 2027						
58.	Malvar 230 kV Substation	Dec 2028						
59.	Iriga 230 kV Substation	Dec 2028						
60.	San Agustin 230 kV Substation	Apr 2030						
61.	Mamplasan 230 kV Substation	Dec 2030						
62.	Alaminos EHV Substation	Dec 2030						
63.	Liberty–Baler 230 kV Transmission Line	Apr 2035						
64.	Pasay–Taguig 230 kV Transmission Line	Dec 2026						
65.	Silang–Taguig 500 kV Transmission Line	Dec 2027						
66.	Mexico–Clark 69 kV Transmission Line Upgrading	Apr 2028						
67.	Liberty–Cabanatuan–San Rafael–Mexico 230 kV Transmission Line Upgrading	Apr 2030						
68.	Naga – Presentacion 230 kV Transmission Line	Dec 2030						
69.	Limay–Pasay 230 kV Transmission Line	Dec 2030						
70.	Luzon Voltage Improvement Project VI	Dec 2030						
71.	Santiago–Kabugao 500 kV Transmission Line	Dec 2035						
72.	Magalang 230 kV Substation	Jun 2032						
73.	FBGC 230 kV Substation	Dec 2032						
74.	San Mateo 230 kV Substation	Dec 2033						
75.	Presentacion 230 kV Substation	Dec 2035						

LUZON		ETC	VISAYAS		ETC	MINDANAO		ETC
76.	Taguig–FBGC 230 kV Transmission Line	Dec 2033						
77.	San Rafael–San Jose 230 kV Line Upgrading	Dec 2035						
78.	Taguig–Muntinlupa 230 kV Transmission Line	Dec 2035						
79.	Matnog 230 kV Substation	May 2039						
80.	Kalinga 500 kV Substation	Dec 2040						
81.	Baras 500 kV Switching Station	Dec 2038						
82.	Sagada–San Esteban 230 kV Transmission Line	Dec 2040						
83.	Santiago–Dinadiawan 230 kV Transmission Line	Dec 2040						
84.	Baler–Dinadiawan 230 kV Transmission Line	Dec 2040						
85.	Capas–Kadampat 230 kV Transmission Line	Dec 2040						
86.	Bataan–Cavite 230 kV Transmission Line	Dec 2040						
87.	Upgrading of Bicol Transmission Facilities	Dec 2040						

Appendix 7 – Summary of Asset Lives

Table A6.1 Summary of Asset Lives

Category	Description	Life (Years)	Notes
Transmission Lines	Lattice steel tower line	50	
	Wood pole line	25	
	Concrete pole line	50	
	Steel pole line	50	
Power Cables	Submarine HVDC	50	
	Submarine HVAC	50	
	Underground HVAC	50	
Outdoor Substations – MEAs	Transformers 500 kV	45	N-1 Security
	Transformers 230 kV	35	Without N-1 Security
		45	With N-1 Security
	Transformers 115 kV	35	Without N-1 Security
		45	With N-1 Security
	Reactors	35	
	Capacitor Banks	40	
	Outdoor switch bays	40	500 kV, 230 kV, 138/115 kV, 69 kV outdoor assemblies (see Note 1)
Outdoor Substations – Individual euipment	Circuit breakers	40	500 kV, 230 kV, 138/115 kV, 69 kV
Indoor GIS Substations	500 kV GIS switch bay	45	
	230 kV GIS switch bay	45	
	115 kV GIS switch bay	45	
Substations Secondary	Protective relays and controls	15	
	Metering equipment	30	
	RTUs, SCADA systems	15	
Communications	OPGW links	50	
	PLC links	35	
System Control		15	

Notes:

1. A switchgear bay includes the primary equipment, busworks, foundations, equipment supports and other structures, protective and control equipment and cabling directly associated with the bay.

Appendix 8 – Abbreviations and Acronyms

Development Plans:

DDP	Distribution Development Plan
NREP	National Renewable Energy Program
PDP	Power Development Program
PEP	Philippine Energy Plan
TDP	Transmission Development Plan
TMP	Transmission Master Plan

Electric Cooperatives:

ABRECO	Abra Electric Cooperative
AEC	Angeles Electric Cooperative
AKELCO	Aklan Electric Cooperative
ALECO	Albay Electric Cooperative
ANECO	Agusan del Sur Electric Cooperative
AURELCO	Aurora Electric Cooperative
BATELEC	Batangas Electirc Cooperative
BILECO	Biliran Electric Cooperative
BENECO	Benguet Electric Cooperative
BUSECO	Bukidnon Electric Cooperative
CAPELCO	Capiz Electric Cooperative
CASURECO	Camarines Sur Electric Cooperative
CENECO	Central Negros Electric Cooperative
CENPELCO	Central Electric Cooperative
DANECO	Davao del Norte Electric Cooperative
DECORP	Dagupan Electric Cooperative
DORECO	Davao Oriental Electric Cooperative
DORELCO	Don Orestes Romuladez Elect Cooperative
FIBECO	First Bukidnon Electric Cooperative
FICELCO	First Catanduanes Electric Cooperative
GUIMELCO	Guimaras Electric Cooperative
ILECO	Iloilo Electric Cooperative
INEC	Ilocos Norte Electric Cooperative
ISECO	Ilocos Sur Electric Cooperative
ISELCO	Isabela Electric Cooperative
LANECO	Lanao Electric Cooperative
LEYECO	Leyte Electric Cooperative
MAGELCO	Maguindanao Electric Cooperative
MOPRECO	Mountain Province Electric Cooperative
MORESCO	Misamis Oriental Electric Cooperative
NEECO	Nueva Ecija Electric Cooperative
NOCECO	Negros Occidental Electric Cooperative
NORECO	Negros Oriental Electric Cooperative
NORSAMELCO	Northern Samar Electric Cooperative

OMECO	Occidental Mindoro Electric Cooperative
ORMECO	Oriental Mindoro Electric Cooperative
PANELCO	Pangasinan Electric Cooperative
PELCO	Pampanga Electric Cooperative
SAMELCO	Samar Electric Cooperative
SIARELCO	Siargao Electric Cooperative
SOCOTECO	South Cotabato Electric Cooperative, Inc.
SOLECO	Southern Leyte Electric Cooperative
SORECO	Sorsogon Electric Cooperative
SUKELCO	Sultan Kudarat Electric Cooperative
SURSECO	Surigao del Sur Electric Cooperative
SURNECO	Surigao del Norte Electric Cooperative
VRESCO	VMC Rural Electric Cooperative
ZAMCELCO	Zamboanga City Electric Cooperative
ZAMSURECO	Zamboanga del Sur Electric Cooperative
ZANECO	Zamboanga del Norte Electric Cooperative

Electricity Market:

IMEM	Interim Mindanao Electricity Market
PEMC	Philippine Electricity Market Corporation
WESM	Wholesale Electricity Spot Market

Government Oversight/Regulatory Agencies:

ERC	Energy Regulatory Commission
DOE	Department of Energy
GMC	Grid Management Committee
NEDA	National Economic & Development Authority
NPC	National Power Corporation
PSALM	Power Sector Assets & Liabilities Management
TRANSCO	National Transmission Corporation
SPUG	Small Power Utilities Group

Legal, Environmental and Other Requirements:

CCAP	Climate Change Action Plan
CCC	Climate Change Commission
EPIRA	Electric Power Industry Reform Act
IMS	Integrated Management System
OSHAS	Occupational Health & Safety
PGC	Philippine Grid Code
QMS	Quality Management System
RE Law	Renewable Energy Law

Other Companies and Service Providers:

CEPRI	China Electric Power Research Institute
SGCC	State Grid Corporation of China

Power Generating Companies:

CEDC	Cebu Energy Development Corporation
GN Power	General Nakar Power
FGHPC	First Gen Hydro Power Corporation
KEPCO	Korea Electric Power Corporation
KSPC	KEPCO SPC Power Corporation
MAEC	Mirae Asia Power Corporation
PCPC	Palm Concepcion Power Corporation
PEDC	Panay Energy Development Corporation
QPPL	Quezon Power Philippines Limited
RP Energy	Redondo Peninsula Energy
SMCPC	San Miguel Consolidated Power Corporation
TAREC	Trans-Asia Renewable Energy Corporation

Power Plants:

CCPP	Combined Cycle Power Plant
CFPP	Coal-Fired Power Plant
DPP	Diesel Power Plant
GPP	Geothermal Power Plant
HEPP	Hydro Electric Power Plant
LNG	Liquified Natural Gas
NGPP	Natural Gas Power Plant
RE	Renewable Energy
Solar PV	Solar Photovoltaic

Private Distribution Utilities:

BEI	Bohol Electric Inc.
CEPALCO	Cagayan Electric Power & Light Company
CEDC	Clark Electric Development Corporation
COLIGHT	Cotabato Light and Power Company
DLPC	Davao Light and Power Corporation
MERALCO	Manila Electric Company
SFELAPCO	San Fernando Electric Light and Power Company

Regions/Areas:

CBD	Central Business District
NCR	National Capital Region
NCMA	North Central Mindanao Area

NEMA	North Eastern Mindanao Area
NWMA	North Western Mindanao Area
SEMA	South Eastern Mindanao Area
SOCCSKSARGEN	South Cotabato, Cotabato, Sultan Kudarat, Sarrangani & Gen Santos
SRP	South Road Properties
SWMA	South Western Mindanao Area

Regulatory:

ASAI	Ancillary Services Availability Indicator
CA	Connection Assets
CC/RSTC	Connection Charges/Residual Sub-transmission Charges
ConA	Congestion Availability
CSI	Customer Satisfaction Indicator
FD	Final Determination
FIT	Feed-in-Tariff
FOT / 100 Ckt-km	Frequency of Tripping per 100 circuit-km
OATS	Open Access Transmission Service
PA	Provisional Authority
PBR	Performance-Based Ratemaking
RAB	Regulatory Asset Base
RSTA	Residual Sub-Transmission Assets
RTWR	Rules for Setting Transmission Wheeling Rate
SA	System Availability
SEIL	Std. Equipment Identification and Labeling
SISI	System Interruption Severity Index

Supply-Demand and Investment:

AAGCR	Annual Average Compounded Growth Rate
CAPEX	Capital Expenditures
CDOR	Consolidated Daily Operating Report
CR	Contingency Reserve
DR	Dispatchable Reserve
FRR	Frequency Regulating Reserve
GDP	Gross Domestic Product
GRDP	Gross Regional Domestic Product
IMF	International Monetary Fund
LoLp	Loss, Load Probability
SPD	System Peak Demand

Transmission Service Provider:

NGCP	National Grid Corporation of the Philippines

Transmission System/Projects:

ACSR	Aluminum Cable Steel Reinforced
ACSR/AS	Aluminum Cable Steel Reinforced/ Aluminum-clad Steel
AIS	Air Insulated Switchgear
CTS	Cable Terminal Station
CS	Converter Station
DC1	Double Circuit Transmission Line First Stringing
DC2	Double Circuit Transmission Line Second Stringing
EHV	Extra High Voltage
ES	Electrode Station
ERS	Emergency Restoration System
ETC	Expected Target Completion
GIS	Gas Insulated Switchgear
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current
MCM	Thousand Circular Mills
OHTL	Overhead Transmission Line
O & M	Operation and Maintenance
PCB	Power Circuit Breaker
ROW	Right-of-Way
SACS	Substation Automation Control System
SO	System Operations
SCADA	Supervisory Control and Data Acquisition
SIS	System Impact Study
SPD	System Peak Demand
SPS	Special Protection System
SP-SC	Steel Pole Single Circuit
SP-DC	Steel Pole Double Circuit
ST-SC	Steel Tower Single Circuit
ST-DC	Steel Tower Double Circuit
S/S	Substation
TACSR	Thermal Aluminum Cable Steel Reinforced
T/L	Transmission Line

Unit of Measure:

ckt-km	Circuit-kilometer
km	kilometer
kV	kilo-Volt
MVA	Mega-Volt Ampere
MVAR	Mega-Volt Ampere Reactive
MW	Mega-Watt
UTS	Ultimate Tensile Strength

Appendix 9 – Contact Details

For all inquiries regarding the TDP, you may contact any of the following:

Redi Allan B. Remoroza
Assistant Vice President & Head
Transmission Planning Department
Tel: 63 2 8637636
E-mail: rbremoroza@ngcp.ph

Eufemio C. Buluran, Jr.
Regional Transmission Planning Manager
Luzon System Planning Division
Tel: 63 2 8637655
E-mail: ecbuluran@ngcp.ph

Christian B. Ereño
Regional Transmission Planning Manager
Visayas System Planning Division
Tel: 63 2 9812535
E-mail: cbereno@ngcp.ph

Fernando S. Javier
Regional Transmission Planning Manager
Mindanao System Planning Division
Tel: 63 2 8637666
E-mail: fsjavier@ngcp.ph

Vicente N. Loria
Transmission Planning Manager
Grid Asset & Project Planning Special Studies Division
Tel: 63 2 8637637
E-mail: vnloria@ngcp.ph

For inquiries relating to load forecast information, you may contact:

Armando A. Pagayon
CRCP Manager
Corporate Regulatory Compliance and Planning Division
Tel: 63 2 8637209
E-mail: aapagayon@ngcp.ph