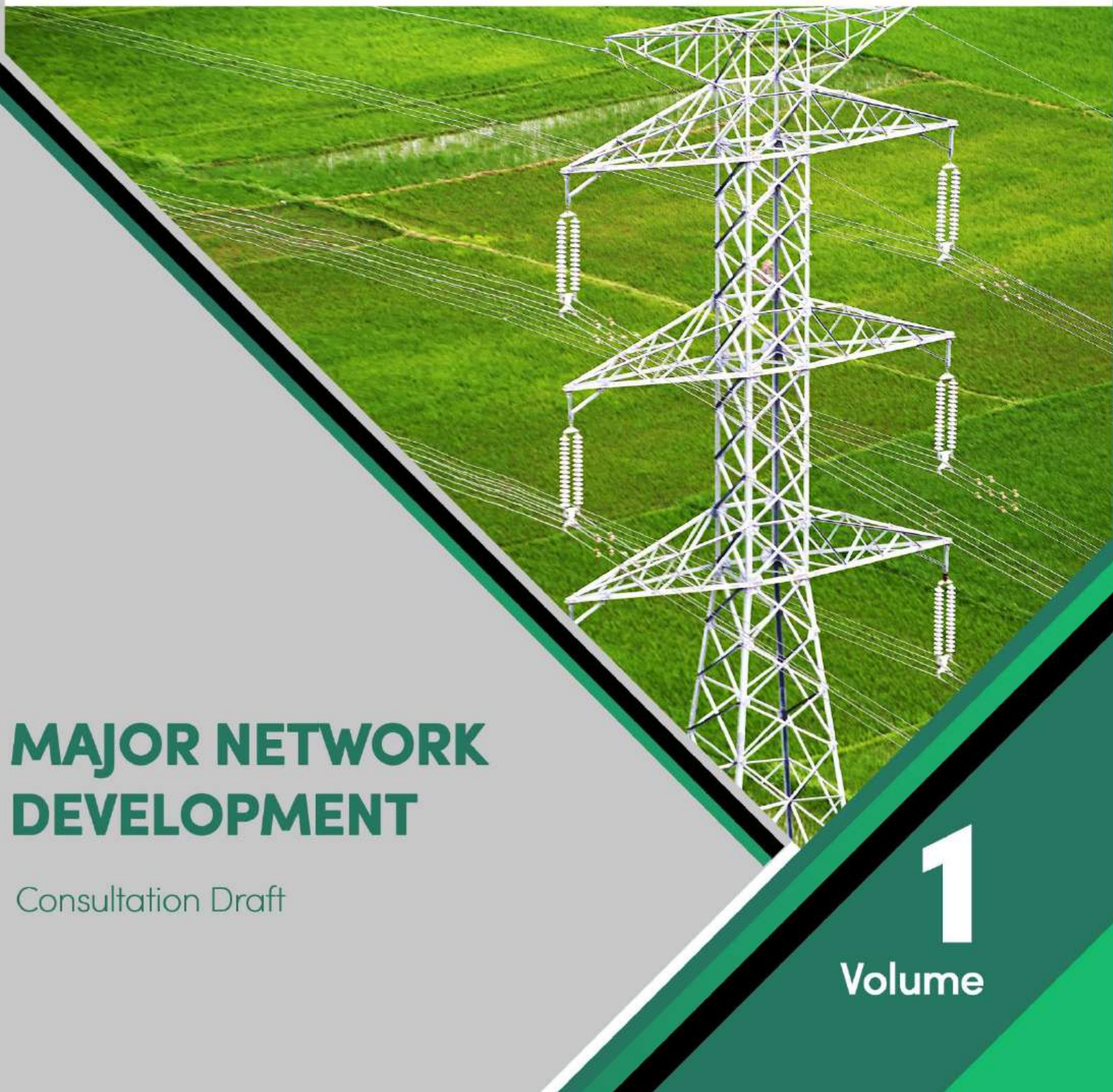
TRANSMISSION DEVELOPMENT PLAN 2020-2040



MAJOR NETWORK DEVELOPMENT

Consultation Draft

1

Volume

NGCP

BRIDGING POWER & PROGRESS

TRANSMISSION DEVELOPMENT PLAN 2020-2040

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FOREWORD

NGCP is pleased to present its Transmission Development Plan 2020-2040, the 21-year roadmap for the expansion of the Philippine power grid. TDP 2020-2040 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 the 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.

The enhancement of the transmission planning process through policy initiatives is through the Department of Energy's (DOE) Department Circular No. 2018-09-0027, entitled "Establishment and Development of Competitive Renewable Energy Zone (CREZ) in the Country". The CREZ transmission planning process applies to RE expansions that is constrained by the lack of existing transmission facilities, hence the need to plan, approve, and build the transmission infrastructure that connects the RE Zones to the power system, thus addressing the circular dilemma or more popularly known as the "chicken or egg" scenario -- the usual approach that usually leads to the Variable Renewable Energy (VRE) plants being completed ahead of the needed transmission system.

In August 2019, another DOE policy initiative was issued through Department Circular No. 2019-08-0012, entitled "Providing a Framework for Energy Storage System in the Electric Power Industry", thus establishing a policy on the operation, connection and application of Energy Storage System (ESS), among others. The increasing integration of VREs, such as wind and solar PVs in the transmission system necessitates the recognition of ESS as one of the technologies to manage the intermittent operation of VRE generating plants' output to ensure stability. One of the ESS considered is the Battery Energy Storage System (BESS) – a new technology that has various applications in the transmission system, such as the provision of Ancillary Service (AS), transmission facility upgrades deferment and transmission congestion relief. Initially, NGCP has determined the capacities and sites of the BESS intended to provide AS as primary reserve. Continuous technical and economic study will be conducted for suitability of BESS for other applications in the transmission system.

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 require 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 with other infrastructure developments to facilitate right-of-way acquisitions and minimize its effect on human settlements.

In summary, the TDP 2020-2040 is coined by NGCP into one acronym as “TRANSMISYON 2040”, i.e., Transmission Resiliency and Augmentation for Nationwide Smart Grid Management through Inter-connected SYstems, Organizations and Networks 2040. It is complementary to the Power Development Program (PDP) prepared by the DOE, which is aligned with “AmBisyon Natin 2040”-- the collective and long-term vision of the Filipinos for the country. In the next 21 years, the Luzon, Visayas and Mindanao Grids will continue to evolve as a unified grid towards a more robust, flexible, resilient and smart transmission system by 2040.

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.”

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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 Network Provider (TNP), 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 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 Transmission Grid Performance

The RTWR provides for the establishment of a Performance Incentive Scheme (PIS) with rewards and penalties applied to the extent that the actual level of performance by the Regulated Entity exceeds or falls below the performance measures that have been established and approved by the Regulator within a certain regulatory period.

NGCP continuously monitors the following performance indices relevant to the transmission projects:

a) System Interruption Severity Index (SISI) - the ratio of the unserved energy compared to the system peak load occurring during the rating/reporting period. Unserved energy is the energy not served due to transmission line interruption(s) computed by outage duration multiplied by the load involved before the interruption. System Peak Load, on the other hand, is the highest demand for a particular rating/reporting period measured in megawatts (MW).

b) Frequency of Tripping per 100 ckt-km (FOT/100 ckt-km) - measures the number of transmission line outages (transients and permanent or sustained) initiated by the tripping of relays subject to exclusion of identified events.

c) System Availability (SA) – a proportion of total circuit time is the percentage of the system being considered on-line during the rating/reporting period. A circuit is regarded as being unavailable when it is out of service for construction, refurbishment, maintenance or fault.

d) Frequency Limit Compliance (FLC) – refers to the percentage of time during the rating period that the system frequency is within the allowable frequency range of 60 ± 0.3 Hz.

e) Voltage Limit Compliance (VLC) – refers to the percentage of the number of voltage measurements during the rating period that the voltage variance did not exceed ± 5% of the nominal voltage of all buses identified in the inclusion (Luzon – 230 kV and 500 kV, Visayas – 138 kV and 69 kV, Mindanao – 138 kV) monitored at the high side of the substation.

f) Congestion Availability Indicator (ConA) – for Luzon grid only – measures the availability of a subset of lines and transformers in the Luzon and Visayas Grids.

The transmission expansion projects in the Transmission Development Plan (TDP) are geared towards continuous improvement of the performance of the grid in the long term.

Substation Expansion Projects are intended to comply with N-1 contingency criterion of the Philippine Grid Code (PGC) and address load growth through the installation of additional transformers at various existing substations. These projects will improve the system reliability down to the substation level resulting in the improvement of both SISI and SA performance indices by minimizing unserved energy to the customers.

Transmission Backbone and Transmission Line Upgrading Projects are intended to increase the transfer capacity through construction of transmission lines at higher voltages or reconductoring of existing lines with higher capacity/temperature conductors. The backbone transmission lines are usually implemented by stages and can be initially energized at lower voltage, with a long-term goal of forming a transmission loop configuration to improve the system reliability and provide operational flexibility. As such, these projects will have positive impact to SISI, SA, ConA and FOT indices.

Voltage Improvement Projects aim to maintain the power quality at different nodes in the system through the installation of power compensating equipment, i.e., capacitor banks, shunt reactors and static VAR compensator (SVC), etc. The power quality is monitored through the voltage variance set at PGC-prescribed limit of ± 5% of the nominal voltage of all buses. Hence, these projects are implemented to directly meet the target VLC performance index.

Island Interconnection Projects are intended to link the off-grid power systems of various islands to improve supply security as well as system reliability. In addition, these island interconnections to the main grid through submarine cables will also reduce the system reserve requirements without additional new power generation. Due to the archipelagic nature of the country, these projects coupled with the improvements in the power system within the island have direct positive impact to SISI and SA as well as indirect impact to VLC and FOT performance indices.

The 2019 performance of the transmission grid covering the period 26 August 2018 – 25 August 2019 is shown in Table 1.1.

Table 1.1: 2019 Performance of Transmission Grid

Performance Indicator	Luzon	Visayas	Mindanao
System Interruption Severity Index (SISI), system-min.	5.9460	25.2200	28.6170
Frequency of Tripping (FOT), count per 100 ckt-km	0.6700	0.1280	0.3560

System Availability (SA), %	99.3372	99.7619	99.7658
Frequency Limit Compliance (FLC), %	100.0000	99.9961	99.9668
Voltage Limit Compliance (VLC), %	99.9412	99.9902	99.9973
Congestion Availability Indicator (ConA), %	99.0665	-	-

Figures 1.1 to 1.5 show the chart of each of the seven ERC-approved Performance Indices' comparative performances for 2017, 2018 and 2019.

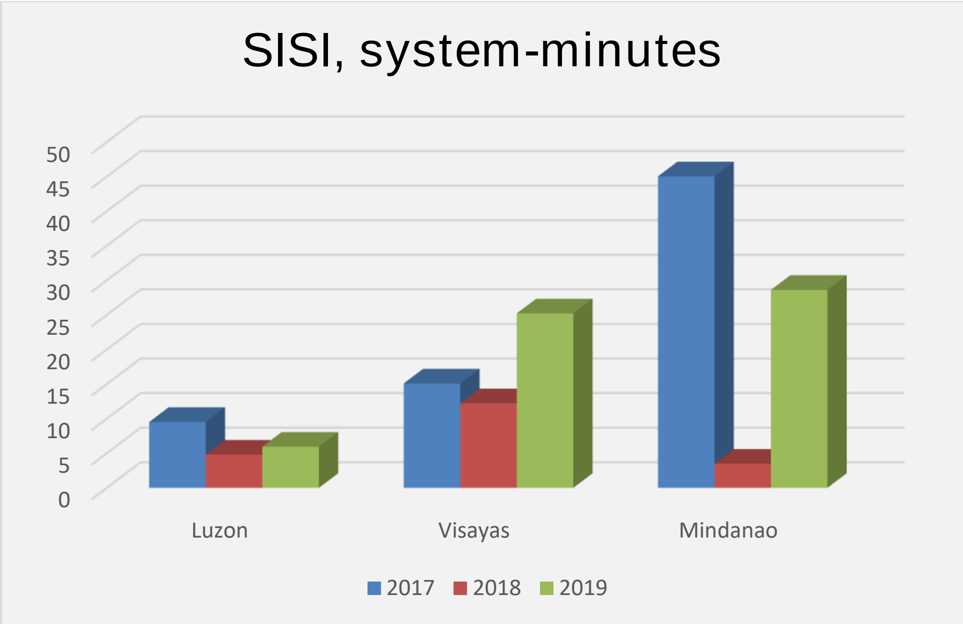


Figure 1.1: SISI Comparative Performance

Luzon, Visayas and Mindanao SISI have declined as compared to the 2018 actual results. This is due to several significant events that incurred high Unserved Energy (UE) per region.

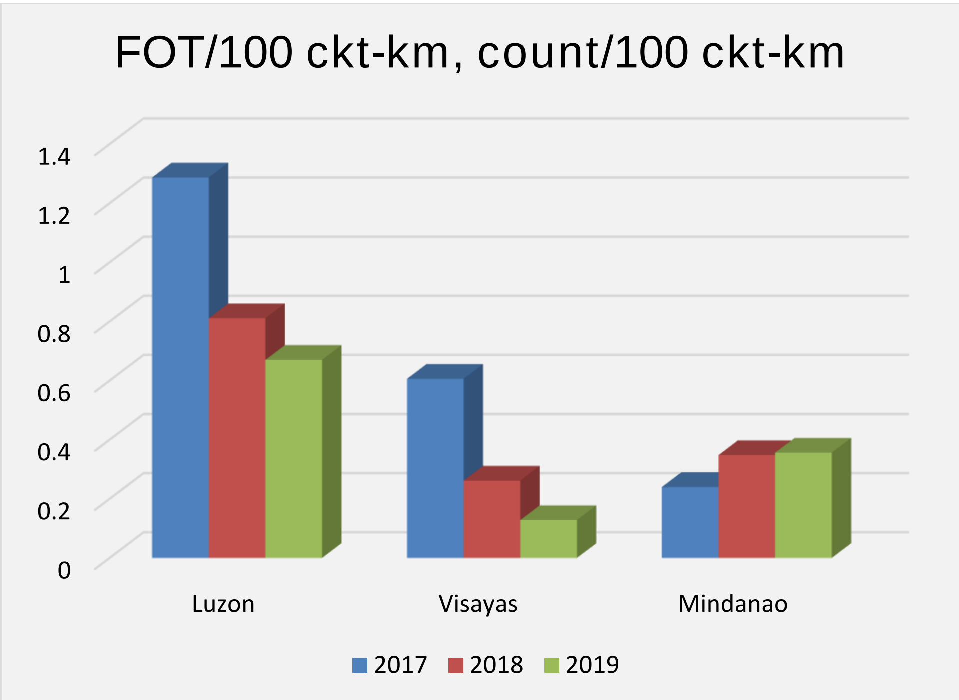


Figure 1.2: FOT/100 ckt-km Comparative Performance

Luzon and Visayas FOTs actual performance improved this 2019, compared to 2018 cumulative results, while the Mindanao FOT declined.

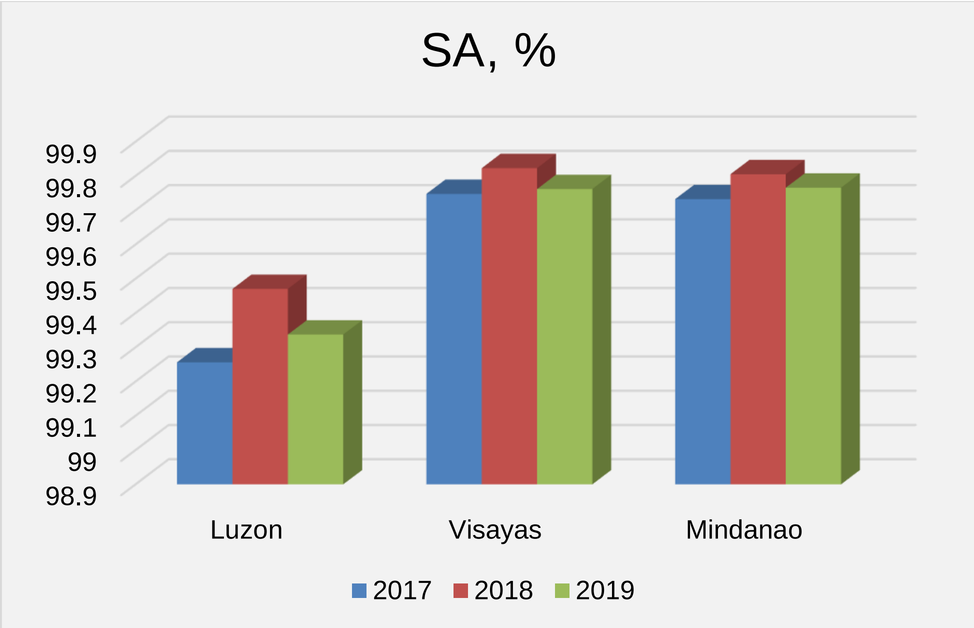


Figure 1.3: SA Comparative Performance

The cumulative SA performances of the Luzon, Visayas, and Mindanao Grids have declined this 2019 Regulatory Period.

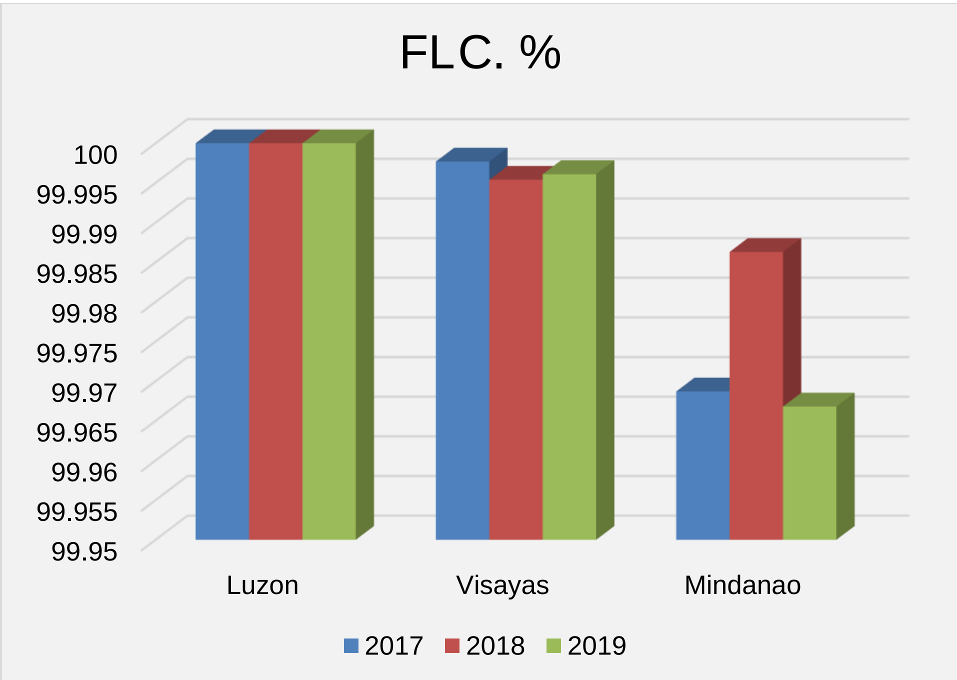


Figure 1.4: FLC Comparative Performance

Luzon and Visayas FLC for 2019 improved compared to the 2018 actual results. Mindanao FLC declined this year which is mostly affected by the very low system demand aggravated by the over-nomination during off-peak period and under-nomination during peak period and testing and commissioning of new plants causing customer sensitive loads to trip.

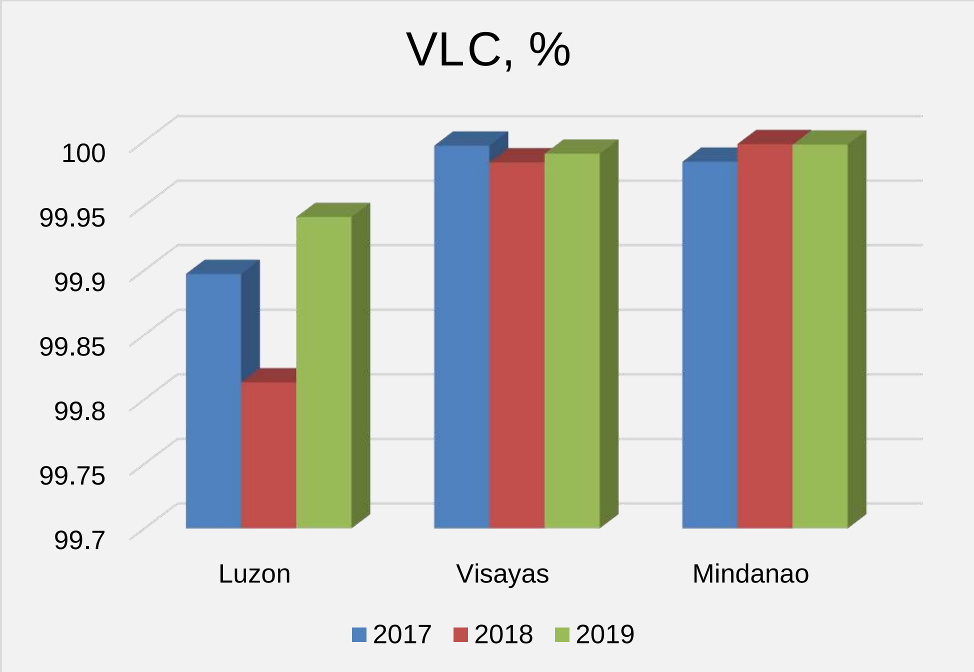


Figure 1.5: VLC Comparative Performance

VLC performance for 2019 improved in Luzon and Mindanao but took a downward trend in Visayas, which is mostly affected by the generation deficiency during tripping of large coal power plants and lack of reactive power support.

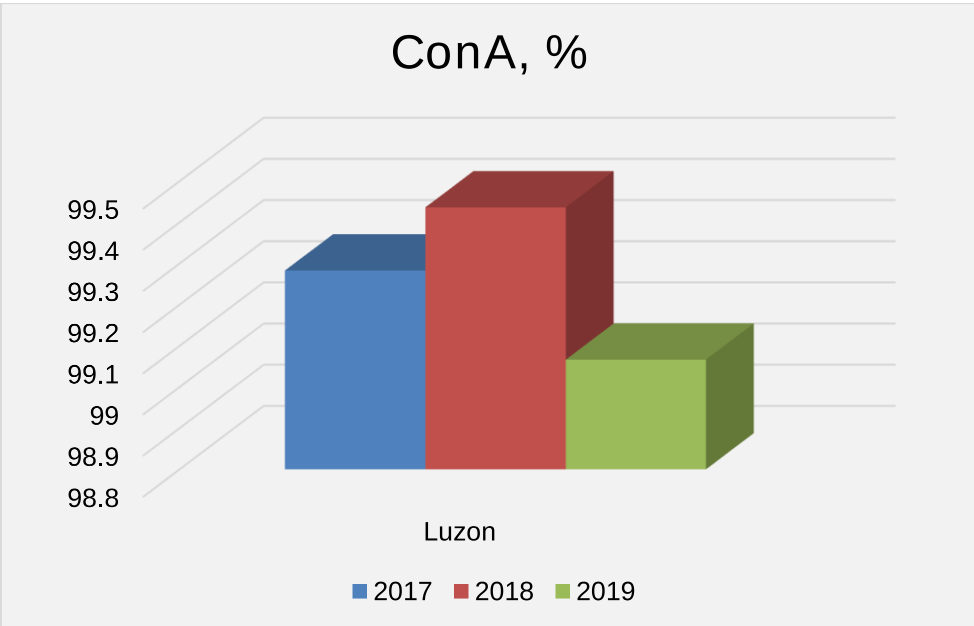


Figure 1.6: ConA Comparative Performance

Luzon ConA for 2019 declined as compared to its 2018 actual results.

The TDP outlines the planned projects which are required to address the system needs for the period 2020 to 2040. This will be the counterpart TDP to the Power Development Plan (PDP) 2020-2040 of the Department of Energy (DOE).

1.3 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 TNP, 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 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.

The TDP 2020-2040 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 TNP 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	discuss the establishment and development of Competitive Renewable Energy Zones (CREZ) pursuant to DOE Department Circular No. 2018-09-0027 and recommends possible scenarios for consideration in future system simulations;

Chapter 7	discuss the recommended capacities and sites of Battery Energy Storage System (BESS) in Luzon, the Visayas, and Mindanao Grids;
Chapter 8	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 9	enumerates the ERC-approved projects in Luzon, the Visayas, and Mindanao Grids that are in various stages of implementation;
Chapter 10 - 12	discuss the transmission outlook for 2020-2040 including discussion on project components and drivers of the proposed transmission projects for Luzon, the Visayas and Mindanao Grids;
Chapter 13	presents the major island interconnections, such as the Mindanao-Visayas Interconnection Project, and transmission backbone projects for the period 2020-2040. Also includes information on small islands for potential interconnections to the main grids; and
Chapters 14	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 2019-2040 vs. TDP 2020-2040.

In summary, the TDP 2020-2040 is coined by NGCP into one acronym as "TRANSMISYON 2040", which stands for Transmission Resiliency and Augmentation for Nationwide Smart Grid Management through Inter-connected SYstems, Organizations and Networks 2040. In the next 21 years, the Luzon, Visayas, and Mindanao Grids will continue to evolve as a unified grid towards a more robust, flexible, resilient and smart grid-ready transmission system by 2040.

Table 1.2 shows the brief description of each agenda for each Regulatory Period considering the 16,982 MW unified Philippine Grid's 2020 system peak demand as base data. This is projected to exhibit an AACGR of 6.29% for the period 2020-2025, 6.10% for 2026-2030 and 6.23% for 2031-2040, thereby increasing up to 56,136 MW system peak demand by 2040:

Table 1.2: TRANSMISYON 2040

2016-2020 (part of 4 RP)	2021-2025 (5 RP)	2026-2030 (6 RP)	2031-2035 (7 RP)	2036-2040 (6 RP)
AGENDA				
#OneGrid2020 (MVL Interconnection) 16,982 MW	#Smart2025 (Smart Grid) 22,812 MW	#ReadyBy2030 (N-1)[1] 30,676 MW	#GridRefresh2035 (PIPO)[2] 41,414 MW	#TransMisyon 2040 (RE) 56,136 MW

[1] N-1: Single Outage Contingency
[2] PIPO: Phase In Phase Out

Enabling capacity-sharing through grid interconnection	Transitioning to smart grid one substation at a time	Completion of grid looping system and mandatory redundancy	Grid resiliency through asset refresh	Full harmonization with RE resources and alignment realization to "AmBisyon 2040"

Chapter 2 – TDP Volume 1 Preparation Process

2.1 TDP Process Flow

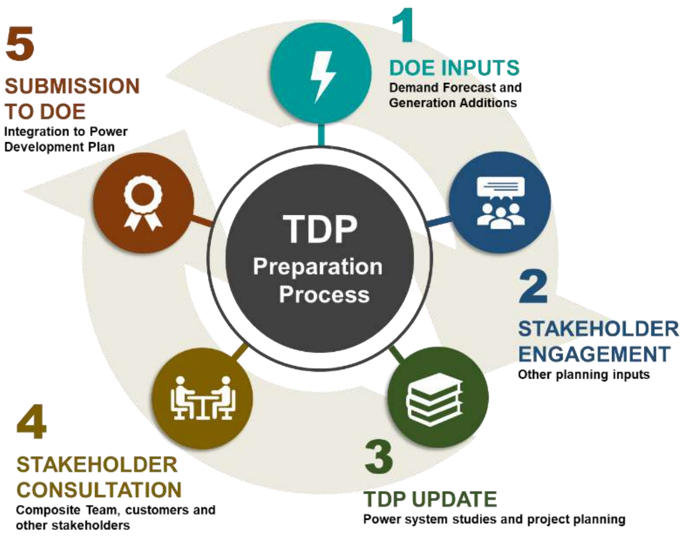


Figure 2.1: TDP Preparation Process

2.2 Description of Each Steps

Step 1: Inputs from DOE

DOE's annual System Peak Demand Forecast and Generation Capacity Addition Line-up are the two major inputs in the TDP. In relation to the transmission network analysis, the system peak demand forecast shall be broken down and forecasted into individual transformer loads. On the other hand, NGCP's own non-coincident substation peak loading forecasts are used in determining load-end substation expansion requirements.

Step 2: Coordination with Stakeholders

One of the requirements of EPIRA regarding 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 21 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 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 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: Generation 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	Specific 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 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 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 2020-2040 in the Regulatory Reset Application

The TDP 2020-2040 will be used as reference in the next regulatory reset application and in subsequent applications of NGCP. While the TDP already provides a long list of projects needed by the network, project prioritization and project ranking will 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 2020-2040 under the TDP 2020-2040 Volume 1, with components shown in Chapters 9, 10, 11, and 12, 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.

Like 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 2020-2040

Volume 1. However, a more detailed ten-year CAPEX Program[3] will be included in the next 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 (MVIP) and Batangas-Mindoro Interconnection Project (BMIP), Palawan-Mindoro Interconnection Project (PMIP), among others.

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 transmission congestions.

2.4 Project Impact to Customers

Transmission projects, which are aimed at ensuring the adequacy, reliability, and security of the power grid, 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 in the 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 final determination.

[3] Composed of two 5-year regulatory periods, i.e., 2016-2020 and 2021-2025

3.1 Grid Profile

As of December 2019, a total of 36,435.50 MVA substation capacities and 20,079.28 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 as of December 2019

SUBSTATION CAPACITY (IN MVA)								
	2012	2013	2014	2015	2016	2017	2018	2019
PHILIPPINES	27,726	27,931	30,607	31,038	33,701	34,007	34,852	36,436
Luzon	21,170	21,110	23,395	23,785	25,900	25,887	26,598	28,021
Visayas	3,414	3,504	3,734	3,926	3,899	4,474	4,874	4,884
Mindanao	3,142	3,318	3,478	3,327	3,902	3,646	3,380	3,531
TRANSMISSION LINE LENGTH (IN CKT-KM)								
	2012	2013	2014	2015	2016	2017	2018	2019
PHILIPPINES	19,490	19,425	19,463	20,073	20,159	20,849	20,505	20,079
Luzon	9,374	9,439	9,370	9,428	9,602	9,795	9,447	9,227
Visayas	4,971	4,840	4,821	4,813	4,476	4,973	5,379	5,299
Mindanao	5,145	5,146	5,272	5,832	6,081	6,081	5,679	5,553

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 as of December 2019

	CAPACITOR BANK (in MVAR)	SHUNT REACTOR (in MVAR)
PHILIPPINES	2,564	1,758
Luzon	2,013	1,160
Visayas	267	575
Mindanao	285	23

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 2019.

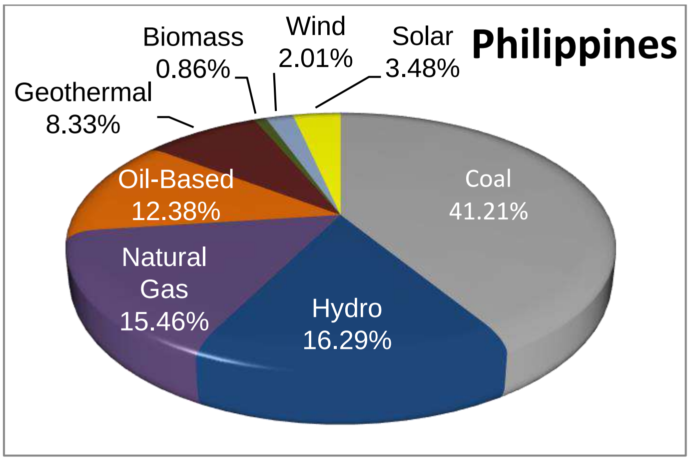


Figure 3.1: Dependable Capacity Mix (Grid-connected) as of 30 June 2019

The Philippines has a total dependable capacity of 21,258 MW including embedded generation. Coal-fired power plants (CFPP) recorded the largest share with 8,760 MW, while Oil based and Natural gas accounted for 2,631 MW and 3,286 MW, respectively. On the other hand, RE-based plants recorded 1,770 MW for Geothermal, 3,462 MW for Hydro, 182 MW for Biomass, 740 MW for Solar, and 427 MW for Wind.

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

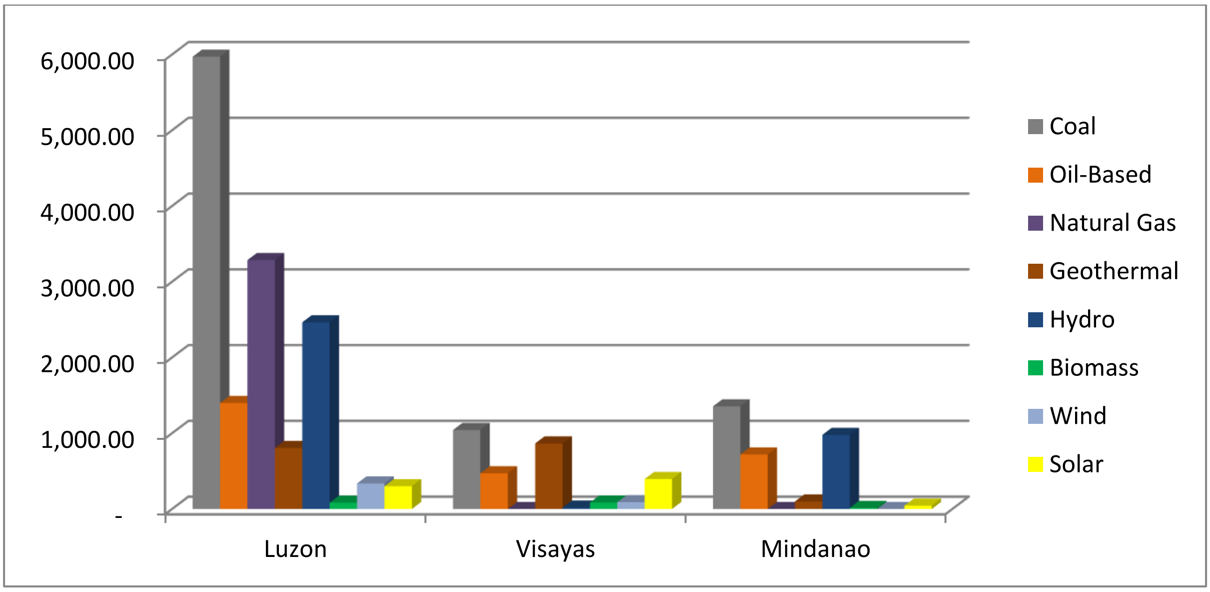


Figure 3.2: Distribution of Dependable Capacity

Table 3.3: Existing Dependable Capacity as of 30 June 2019

Power Plant Type / Fuel Source / RE Source	LUZON		VISAYAS		MINDANAO	
	MW	%	MW	%	MW	%
Conventional Power Plants	10,649	72.7%	1,677	53.6%	2,351	67.4%
▪ Coal	5,930	40.5%	1,199	38.3%	1,631	46.8%
▪ Oil-based	1,433	9.8%	478	15.3%	720	20.6%
▪ Natural Gas	3,286	22.4%	-	-	-	-
RE-Based Power Plants	3,991	27.3%	1,454	46.4%	1,136	32.6%
▪ Wind	337	2.3%	90	2.9%	-	-
▪ Solar PV	301	2.1%	396	12.6%	44	1.3%
▪ Biomass	84	0.6%	85	2.7%	14	0.4%
▪ Geothermal	805	5.5%	865	27.6%	100	2.9%
▪ Hydro	2,464	16.8%	19	0.6%	978	28.1%
TOTAL	14,640		3,131		3,486	

3.3 Luzon Transmission Network

Figure 3.3: Luzon Transmission Network

The bulk generation sources in the Luzon Grid are in the northern and southern parts of the Luzon Island while the load center is in Metro Manila area. About 50% 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 2,200 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, Marilao (Duhat), and San Jose 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 southern part of Metro Manila, 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 3,300 MW from Ilijan Natural Gas, Pagbilao and QPPL CFPP. The 230 kV transmission system in Batangas and Laguna area caters more than 3,100 MW total generation capacity of Calaca CFPP, new coal-fired power plants and the other Natural Gas Plants (San Lorenzo, Sta. Rita, and Avion).

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 have existing AC interconnections with effective transfer capacity as of December 2018 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.

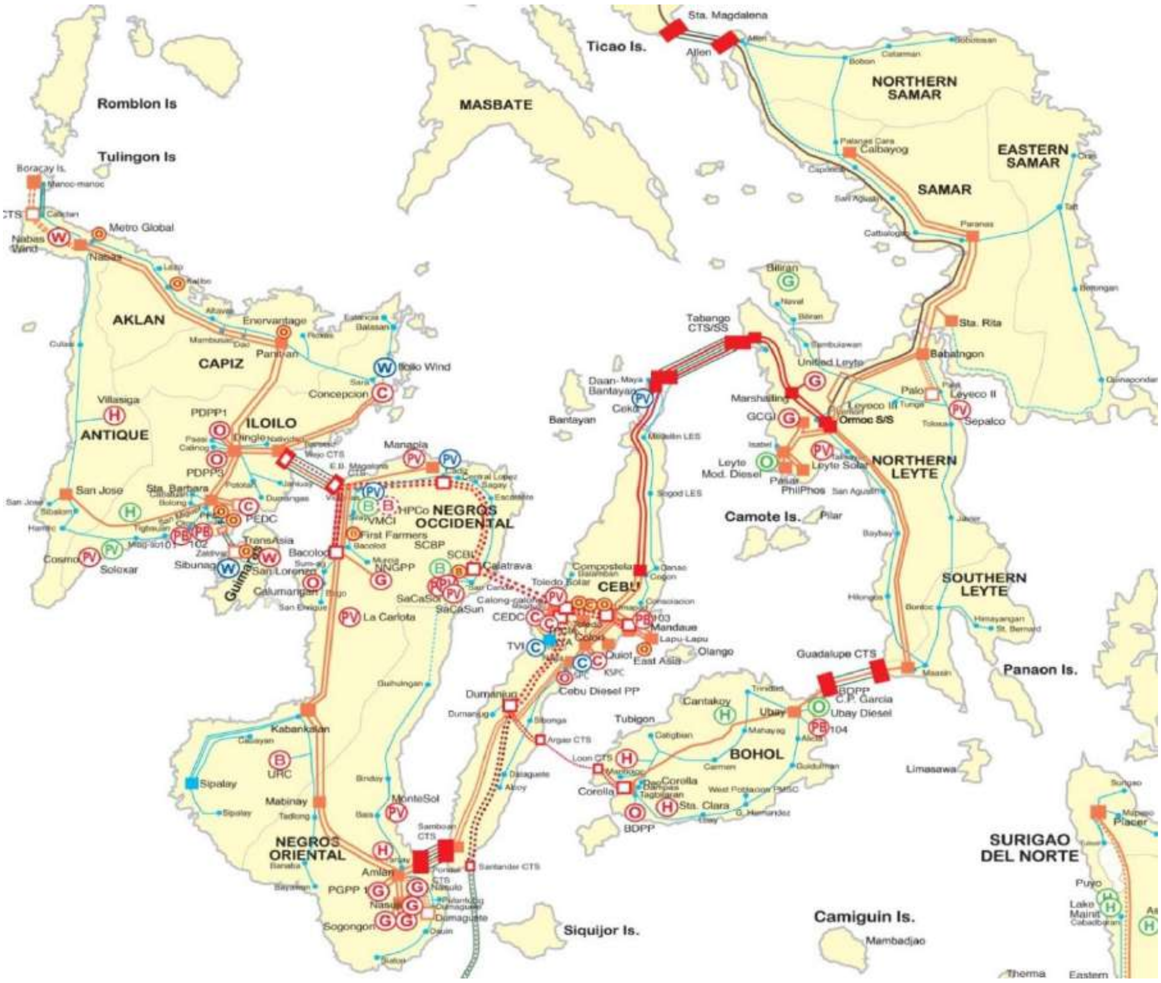


Figure 3.6: Visayas Transmission Network

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 22% 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 2019, it has a peak load of 1057 MW which accounted for 47.53% of the grid’s total demand. Bohol has the lowest peak load among sub-grids at 99 MW in 2019.

Figure 3.8: Central Visayas Transmission Network

In the Island of Negros (District 3), the load center is 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.

Figure 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 has become 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. District 1 - North Western Mindanao Area (NWMA), which covers the provinces of Zamboanga del Norte, Zamboanga del Sur, and Misamis Occidental; District 2 - Lanao Area (LA), which consists of the provinces of Lanao del Norte and Lanao del Sur; District 3 - North Central Mindanao Area (NCMA), which coverage includes the provinces of Bukidnon and Misamis Oriental; District 4 - North Eastern Mindanao Area (NEMA), which comprises of the Agusan del Norte, Agusan del Sur, Surigao del Norte, and Surigao del Sur provinces; Distict 5 - South Eastern Mindanao Area (SEMA) covers the Davao Region, which is composed of the following provinces: Davao del Sur, Davao del Norte, Davao Oriental, Davao Occidental, and Davao de Oro; and lastly, District 6 - South Western Mindanao Area (SWMA), which covers the provinces of the South Cotabato, Cotabato, North Cotabato, Sultan Kudarat, and Maguindanao.

While the bulk of power generation is situated in the northern part of the island, the areas that consume the bigger power allotment are the regions of Davao and Soccsksargen located in southern Mindanao. Their load demand accounts to almost half of the total load demand in the island.

The bulk of energy sources is a combination of renewable and conventional power plants which are generated in Lanao Area and Misamis Oriental for northern Mindanao and in Davao Area in southern Mindanao. Geographical locations of the said power plans are shown in the figure below.

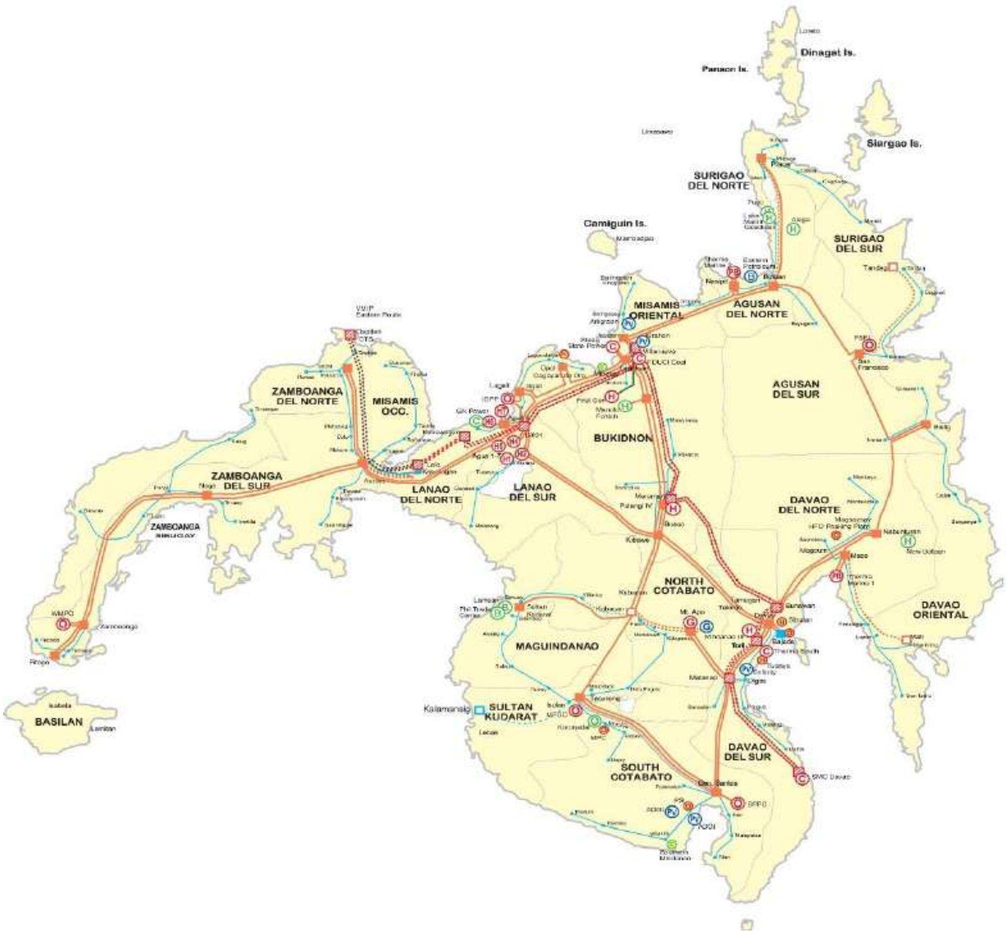


Figure 3.11: Mindanao Transmission Network

The power supply for Cagayan de Oro City, Davao City, and General Santos City are transmitted through a looped transmission line via the Balo-i-Tagoloan-Maramag-Kibawe-Davao 138 kV corridor and the Balo-i-Villanueva-Maramag-Bunawan 230 kV backbone. The Mindanao Grid comprises mostly of 138 kV transmission corridors and 69 kV radial lines. Each line is designed to provide reliable and quality power supply to the customer.

There are three high voltage transmission corridors emanate from the Lanao Area. These allow the bigger portion of generated power supply in the area, which is produced by the hydroelectric and the coal-fired power plants, to be transmitted all over Mindanao.

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 2020-2040 adopted the peak demand projections of the Department of Energy (DOE) based on high GDP-to-elasticity approach with 7.5% assumed GDP growth rate.

4.1.2 Historical and Projected Demand for Electricity

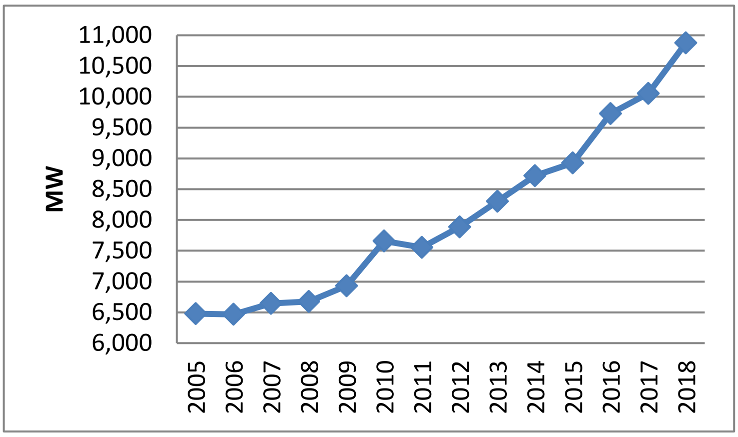
Total peak demand (in MW, non-coincident sum) of the Philippines shows consistent upward trend from 2005 to 2018 with an Average Annual Compounded Growth Rate (AACGR) of 4.26%. Total demand growth was at its highest in 2010 (at 9.53%) while it was at its most sluggish in 2011 (at 0.04%).

Table 4.1: Summary of Historical Demand per Grid (2005-2018), 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
2018	10,876	2.053	1,853	14,782
%AACGR (2006-2018)	4.07%	5.96%	3.74%	4.26%

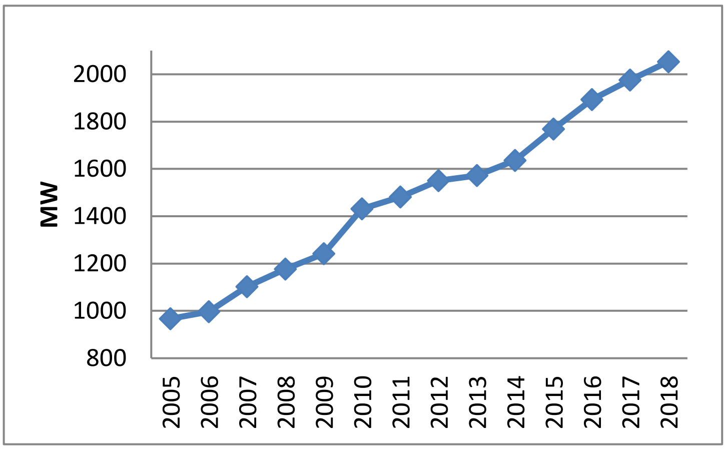
*Includes embedded generation monitored by NGCP

4.1.2.1 Luzon



The Luzon Grid has posted an AACGR of 4.07% for the period 2006-2018. 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 2018, Luzon posted an average annual growth of 5.58% or by 514 MW.

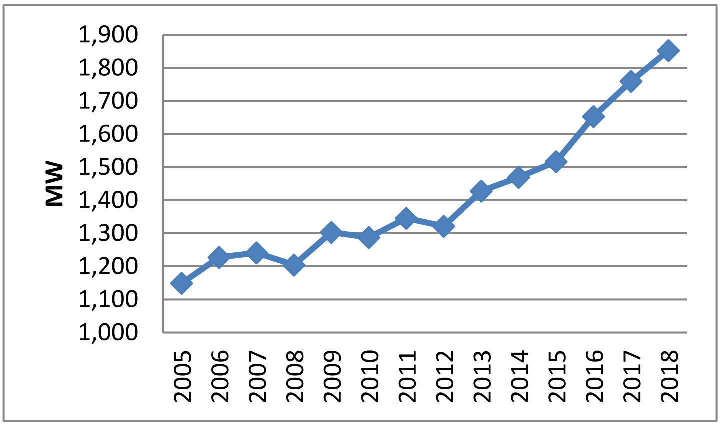
4.1.2.2 Visayas



The aggregate demand in Visayas Grid has posted an AACGR of 5.96% for the period 2006-2018. 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, 160 MW load was added to the demand of Visayas.

4.1.2.3 Mindanao

Mindanao Grid has posted an AACGR of 3.74% for the period 2006-2018. After recording high annual growth rates 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. In the last two years, 200 MW load was added to the demand of Mindanao.

4.2 Forecast for TDP 2020-2040

Power demand for the country is expected to grow at an AACGR of 6.29% for the period 2020-2025, 6.10% for 2026-2030 and 6.23% 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 2020-2040 while the Luzon and Visayas Grids at 5.86% and 6.96%, respectively. 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 16 August 2019 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 1.

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

Dist.	Area	2019	2020	2021	2022	2023	2024	2025	2030	2035	2040
Luzon		11,476	12,285	13,037	13,789	14,579	15,415	16,300	21,561	28,578	37,954
MERALCO		8,392	8,421	8,459	8,726	8,999	9,310	9,633	11,422	13,547	16,071
1	NCR	5,888	5,907	5,934	6,121	6,312	6,530	6,757	8,012	9,503	11,273
2	North	365	366	368	379	390	404	418	495	588	698
3	South	2,140	2,150	2,159	2,226	2,294	2,374	2,457	2,914	3,458	4,099
North Luzon		2,343	2,957	3,533	3,931	4,364	4,811	5,291	8,301	12,709	19,073
1	Ilocos	204	245	282	302	323	346	370	502	660	852
2	Mt. Province	128	162	190	206	223	242	263	381	542	743
3	North Central	239	319	402	440	482	526	574	863	1281	1838
4	Cagayan Valley	272	331	381	417	458	501	547	833	1253	1823
5	West Central	486	583	667	739	809	890	979	1581	2485	3948
6	South Central	939	1236	1523	1735	1972	2204	2452	3999	6292	9600
7	North Tagalog	76	82	88	92	96	102	107	142	195	268
South Luzon		740	907	1,045	1,132	1,216	1,294	1,376	1,838	2,322	2,810
1	Batangas/Cavite	369	459	550	617	682	727	774	1043	1331	1626
2	Laguna/ Quezon	96	109	120	124	128	135	141	173	203	230
3	Bicol	276	339	375	392	406	433	461	622	789	954
Visayas		2,211	2,419	2,572	2,737	2,915	3,108	3,314	4,600	6,437	9,086
1	Panay	415	454	482	513	547	583	622	863	1208	1704
2a	Cebu	1065	1165	1239	1319	1404	1497	1597	2216	3101	4377
2b	Bohol	94	103	110	117	124	132	141	196	274	387
3	Leyte-Samar	274	300	319	339	362	386	411	571	798	1127
4	Negros	363	397	422	449	478	510	543	754	1056	1490
Mindanao		2,130	2,278	2,436	2,607	2,790	2,987	3,198	4,515	6,399	9,095
1	North Western	251	269	288	313	351	379	411	600	885	1302
2	Lanao Area	149	156	162	172	181	190	201	255	329	425
3	North Central	494	562	599	642	677	715	757	1114	1549	2106
4	North Eastern	175	186	197	214	231	250	271	387	562	817
5	South Eastern	635	667	728	774	825	892	958	1342	1928	2818
6	South Western	425	439	463	493	525	560	600	818	1145	1627
Philippines		15,817	16,982	18,046	19,133	20,284	21,510	22,812	30,676	41,414	56,136

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.

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 have clearance to undertake System Impact Study (SIS) but are not yet included in the DOE's list of Private Sector Initiated Power Projects (PSIPP) 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 PSIPP. (Refer to Appendix 2 for the generation list).

It is worth noting that the proponents should regularly provide the DOE 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).

New generating power plants are connecting the grid every year to increase the supply of electricity. Table 5.1 shows the list of grid-connected additional capacities in 2019.

Table 5.1: List of Additional Capacities as of December 2019

Power Plant	Location	Installed Capacity (MW)	Dependable Capacity (MW)	Connection Point
LUZON				
Masinloc Power Partners Co. LTD.	Masinloc, Zambales	335	335	Masinloc–Bolo 230 kV Line 1 and Line 2
Cagayan Biomass Energy Corporation	Burgos, Isabela	15	13.5	Gamu–Roxas 69 kV Line
Clear Green Energy Corporation	Orani, Bataan	12	10.8	Hermosa–Calaguiman 69 kV Line
Green Inovation for Tomorrow Corporation	Nueva Ecija	6	5.4	Cabanatuan–Pantabangan 69 kV Line
VS Gripal Power Corporation	San Jose City, Nueva Ecija	6	5.4	Cabanatuan–Masiway 69 kV Line
Grass Gold Renewable Eneryg Corp.	Llanera, Nueva Ecija	12	12	Cabanatuan–Pantabangan 69 kV Line
Concepcion 1 Solar	Concepcion, Tarlac	30	30	QPPL 230kV Substation
San Buenaventura Power Ltd. Co. (SBPL) Project	Mauban, Quezon	500	500	QPPL 230kV Substation
Sub-total (Luzon)		916	912	

Power Plant	Location	Installed Capacity (MW)	Dependable Capacity (MW)	Connection Point
VISAYAS				
Therma Visayas, Inc, Unit 1	Toledo City, Cebu	170	150	Magdugo 230 kV Substation
Therma Visayas, Inc, Unit 2	Toledo City, Cebu	170	150	Magdugo 230 kV Substation
Calumangan DPP Unit 5	Bago City, Negros Occidental	31	25.4	Tap to Bacolod-San Enrique 69 kV Line
Victorias Milling Company, Inc.	Victorias City, Negros Occidental	40	21.45	NGCP Silay–VMC 69 kV Line
Central Azucarera De Bais, Inc.	Brgy. Calasgaan, Basi City, Negros Occidental	25	12	NGCP Amlan–Guihulngan 69 kV Line
Hawaiian Philippine Company	Silay City, Negros Occidental	28.58	8	NGCP Silay–VMC 69 kV Line
	Sub-total (Visayas)	464.58	366.85	
MINDANAO				
GNPower Kauswagan U1	Kauswagan, Lanao Del Norte	150	138	Kauswagan 230 kV Substation
GNPower Kauswagan U2	Kauswagan, Lanao Del Norte	150	138	Kauswagan 230 kV Substation
Asiga	Pangaylan, Santiago, Agusan del Norte	8	8	Embedded Generation -No Transmission Reinforcement Required
SMEC Coal	Brgy. Kamanga, Maasim, Sarangani	100	100	PCB included in Kabacan Substation Project
	Sub-Total (Mindanao)	408	384	
	TOTAL	1,788.58	1,662.85	

In addition to the existing capacity, there are also private sector-initiated power projects for Luzon, the Visayas, and Mindanao, as shown in the following tables:

Table 5.2: Capacity of Private Sector Initiated Power Projects as of 31 October 2019

	Total Committed Capacity (MW)	Total Indicative Capacity (MW)
Luzon	4,400.6	35,804.5
Visayas	503.7	4,120.0
Mindanao	463.9	2,746.4
PHILIPPINES	5,368.2	42,670.9

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.

Table 5.3: Private Sector Initiated Power Projects in Luzon as of 31 October 2019

Proposed Generation Facility / Name of the Project	Capacity (MW)	Location	Commissioning Year
COMMITTED POWER PLANTS			
COAL			
GNPower Dinginin 2 x 668 MW Supercritical Coal-Fired Power Project	1336	Mariveles, Bataan	1st Qtr. 2020
RPEI Coal-Fired Power Plant	600	Cawag, Subic Bay Freeport Zone	Unit I - TBD Unit II -TBD
A1E Coal-Fired Power Project	1200	Atimonan, Quezon	Unit I - Q4 2023 Unit II - TBD
Sub-Total Coal	3,136		
OIL-BASED			
Ingrid Pililla Diesel Power Plant *	650	Pililla, Rizal	Dec 2019
Sub-Total Oil-based	650		
NATURAL GAS			
EWC CCGT Power Plant*	300	Brgy. Ibabang Polo, Grande Island, Pagbilao, Quezon	Dec 2021
Sub-Total Natural Gas	300		
HYDRO			
Biyao	0.8	Balbalan, Kalinga	Nov 2019
Colasi	1	Mercedes, Camarines Norte	Nov 2019
Labayat River (Upper Cascade)	3	Real, Quezon	Nov 2019
Man-Asok	3	Buguias, Benguet	Nov 2020
Laguio Malaki 1	1.6	Mauban, Quezon	Nov 2020
Matuno 1*	8	Ambaguio, Nueva Vizcaya	Nov 2020
Tubao	1.5	Tubao, La Union	Nov 2021
Rangas	1.5	Goa & Tigaon, Camarines Sur	Nov 2021
Sub-Total Hydro	20.4		
SOLAR			
ELPI Pasuquin Solar Power Plant Project	100	Pasuquin, Ilocos Nort	December 2019
Concepcion 1 Solar Power Project	115	Concepcion, Tarlac	Dec 2020
Sub-Total Solar	215		
GEOTHERMAL			
Bacman 3 (Tanawon)	31	Guinlajon, Sorsogon	Nov 2022
Sub-Total Geothermal	31		
BIOMASS			
FQBC Biogas Power Plant Project	1.2	Quezon	Nov 2019
Isabela La Suerte Rice Husk-Fired	5	Camarines Sur	Nov 2019
HEC Rice Husk-Fired Biomass Power Plant Project	12	Bulacan	Nov 2019
CEC Biomass Power Plant Project	12	Orani, Bataan	Sep 2019
GITC Biomass Power Plant Project	18	Bacal 2, Talavera, Nueva Ecija	Nov 2019
Sub-Total Biomass	48.2		
TOTAL COMMITTED	4,400.6		
INDICATIVE POWER PLANTS			
COAL			
H & WB PCB Supercritical Coal-Fired Power Project	700	Jose Panganiban, Camarines Norte	Unit I - 2023 Unit II - Subject to the completion of the proposed 500 kV Tagkawayan S/S and to the demand and

Proposed Generation Facility / Name of the Project	Capacity (MW)	Location	Commissioning Year
			supply of Luzon Grid
2x500 MW KEPCO Pangasinan Coal-Fired Power Project	1000	Sual, Pangasinan	Sep 2023
Quezon Coal Fired Thermal Plant Project	1,200	Tagkawayan, Quezon	Dec 2023
SRPGC 2x350MW Coal-Fired Power Project*	700	Brgy. San Rafael, Calaca, Batangas	2025
Global Luzon Coal-Fired Power Project	670	Brgys. Carisquis and Nalvo Sur, Luna, La Union	TBD
Merbau Coal Fired Thermal Power Project	600	Brgy. Pinamukan Ibaba, Batangas City	TBD
SMC Circulating Fluidized Bed Coal-Fired Power Project	600	Brgy. Ibabang Polo, Pagbilao, Quezon	TBD
SMC Circulating Fluidized Bed Coal-Fired Power Project	600	Sariaya, Quezon	TBD
Zestpower Coal Thermal Project	660	Mariveles, Bataan	TBD
SMC Mariveles Coal-Fired Power Project	1,200	Mariveles, Bataan	TBD
Supercritical Pulverized Coal Thermal	1,005	Masinloc, Zambales	TBD
Sub-Total Coal	8,935		
OIL-BASED			
SPC - Tarlac Bunker Fired Power Project	11.04	Capas, Tarlac	Dec 2019
Bataan Combine Cycle Power Plant	620	Limay, Bataan	Mar 2020
Isla del Fuego Bunker Fired Diesel Power Generating Facility	35.0	Redondo Peninsula, Subic, Zambales	TBD
Panasia Energy, Inc. Combined Cycle Power Plant	1200	Brgy. Ilijan, Batangas Cit	TBD
Bataan Diesel Power Plant	150	Brgy. Batangas II, Mariveles, Bata a	TBD
Sub-Total Oil-Based	2,016.04		
NATURAL GAS			
500 MW VIRES LNG-Fired Power Barge Project	500	Batangas Bay area, Batangas	TBD
Sta. Maria Power Plant (Phase II)*	450	Santa Rita, Batangas	TBD
Lucidum Liquefied Natural Gas Power Plant	300	Silanguin Bay, Zambales	TBD
SMC Ilijan LNG Power Project	3,600	Batangas	TBD
Limay LNG Power Corporation CCGT P roject	1100	Limay, Bataan	TBD
Millennium Energy Inc. Gas Turbine Power Plant	210	Navotas Fish Port	TBD
Llyods Energy Philippines Inc. Floating Power Plant	1,200	San Pascual, Batangas Bay	TBD
First Gen Ecopower Solutions Inc. Santa Maria Combined -Cycle Power Plant Project	1,260	Batangas City	TBD
Sub-Total Natural Gas	8,620		
GEOTHERMAL			
Bacon-Manito Geothermal*	80	Bacon-Manito, Sorsogon	Sep 2021
Bacman 4 Botong-Rangas Geothermal*	20	Bacon District, Sorsogon, Sorsogon City	Nov 2022
Kayabon Geothermal*	30	Manito, Albay	Nov 2025
Kalinga Geothermal Power Project	120	Pasil, Kalinga	TBD
Maibarara Geothermal Power Project	60	Laguna/Batangas	TBD
Sub-Total Geothermal	310		
SOLAR			

Proposed Generation Facility / Name of the Project	Capacity (MW)	Location	Commissioning Year
Sta. Maria Solar Power Project	30	Sta. Maria, Isabela	January 2020
Santa Solar Power Project	20	Brgy. Nagpanaoan, Santa, Ilocos Sur	February 2020
Talugtug Solar PV Power Project	125	Talugtug, Nueva Ecija	April 2020
Greenergy Capas Solar Power Project	50	Capas, Tarlac	April 2020
Ilagan II Solar PV Power Project	100	Ilagan City, Isabela	April 2020
Cabanatuan Solar Power Plant	6.25	Cabanatuan, Nueva Ecija	April 2020
Clark Solar Power Project	35	Northern Runway Approach of Clark International Airport, Clark Pampanga	December 2020
Bongabon Solar Power Plant	18.75	Bongabon, Nueva Ecija	March 2022
Earthenergy Solar Power Plant	30	Balayan, Batangas	'TBD
Macabud Solar Photovoltaic Power Project	30	Brgy. Macabud, Rodriguez, Rizal	TBD
Cavite Solar Power Project	3	Cavite Economic Zone, Rosario Cavite	TBD
V-Mars Solar Power Project	10	San Jose/Lupao, Nueva Ecija	TBD
SJC Solar Power Project	10	San Jose City, Nueva Ecija	TBD
RGEC Solar Power Project	30	Nasugbu and Tuy, Province of Batangas	TBD
Calabanga Solar Power Project	50	Calabanga, Camarines Sur	TBD
FPI Solar PV Power Project	50	Tarlac City, Tarlac	TBD
Nueva Ecija Solar Power Project	100	Pantabangan, Nueva Ecija	TBD
Sta. Maria Solar PV Power Project	125	Sta. Maria, Isabela	TBD
Solana Solar Photovoltaic (PV) Plant Phase I	24	Hermosa, Bataan	TBD
Solana Solar Photovoltaic (PV) Plant Phase II	14	Hermosa, Bataan	TBD
Cordon Solar PV Power Project	50	Cordon, Isabela	TBD
Sta. Rita Solar Power Project - Phase II	67.86	Mt. Sta. Rita, Morong and Hermosa, Bataan	TBD
Botolan Solar Power Project	39.27	Brgy. San Juan, Botolan, Zambales	TBD
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

Proposed Generation Facility / Name of the Project	Capacity (MW)	Location	Commissioning Year
Laguna Lake-Bay SPP	126	Bay-Calauan and Victoria, Laguna and Laguna de Bay	TBD
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	600	Maragondon-Naic-Tanza, Cavite	TBD
Sunray Tarlac Solar Power Project	100	Capas and Bamban, Tarlac	TBD
Currimao Solar Power Project	30	Currimao, Ilocos Sur	TBD
Sulvec Solar Power Plant	20	Narvacan, Ilocos Sur	TBD
San Miguel Solar Power Plant	100	San Miguel, Bulacan	TBD
Alabel Solar Power Plant	100	Alabel, Sarangani Province	TBD
San Pablo Solar Power Project	130	Isabela	TBD
Laguna Bay 2 Solar Power Project	300	Pililia, Rizal	TBD
Cabatang Tiaong Solar Power Project	600	Tiaong, Quezon	
Santa Rosa Nueva Ecija 1 Solar Power Plant	300	Santa Rosa and Peñaranda, nueva Ecija	TBD
San Ildefonso Solar Power Project	55	San Ildefonso, Bulacan	TBD
Sub-Total Solar	10,284.45		
HYDRO			
Lalawinan Mini-Hydro	3	Real, Quezon	Nov 2019
Ibulao Hydroelectric Power Project	4.5	Lagawe, Ifugao	Nov 2020
Ibulao 1	6.75	Kiangan, Ifugao	Nov 2020
Dupinga Hydroelectric Power Project	3	Gabaldon, Nueva Ecija	Nov 2022
Gened - 1 Hydroelectric Power Project	150	Pudtol, Apayaw	4th Qtr 2022
Didipio 1	2.1	Kasibu, Nueva Vizcaya	Nov 2024
Kabayan 2 (Natalang HEP)	38	Kabayan, Benguet	Nov 2024
Ilaguen 3	11	Echague, Isabela	Nov 2024
Kapangan	60	Kapangan & Kibungan, Benguet	Nov 2025
Tumauini (Lower Cascade)	7.8	Tumauini, Isabela	Nov 2025
Abdao HEP	2	Tabaan Sur, Tuba, Benguet	Nov 2025
Barit (Irrigation Discharge) Hydroelectric Power Project	0.4	Buhi, Camarines Sur	Nov 2025
Talubin Hydropower Project	4.9	Bontoc, Mountain Province	Nov 2025
Ilaguen 4	10	Echague	Nov 2025
Matuno 1*	7.4	Ambaguio, Nueva Vizcaya	Nov 2025
Hungduan	4.04	Kiangan, Ifugao	Nov 2025
Asin	7.04	Kiangan, Ifugao	Nov 2025
Ilaguen	19	San Mariano & San Guillermo	Nov 2025
Piapi	3.30	Mauban, Quezon	Nov 2025
Lower Labayat	1.40	Real, Quezon	Nov 2026
Ilaguen 2	14	Dinapique, Isabela	Nov 2026
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

Proposed Generation Facility / Name of the Project	Capacity (MW)	Location	Commissioning Year
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
Tignoan HEP	20	Real, Quezon	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
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
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	15.68	Pasil, Kalinga	TBD
Pasil C Hydroelectric Power Project	9.75	Pasil, Kalinga	TBD
Lamut Hydroelectric Power Project	6	Lamut/Asipulo, Ifugao	TBD
Calanan Hydropower Project*	60	Tabuk, Kalinga	TBD
Dalimuno Hydropower Project*	58	Tabuk, Kalinga	TBD
Pampang Hydroelectric Power	26	Sta. Fe Vizcaya & San Nicolas Pangasinan	TBD
Colasi Mini-Hydroelectric Power Plant Project	4	Mercedes, Camarines Norte	TBD
ARIIS 2 Hydroelectric Power Project	0.48	San Manuel, Pangasinan	TBD
ARIIS 3 Hydroelectric Power Project	0.48	San Manuel, Pangasinan	TBD
Boga Hydroelectric Power Project	1	Bauko, Mountain Province	TBD
Upper Chico Hydroelectric Power Projects	2.1	Bauko, Mountain Province	TBD
Kadipo Bauko Hydropower	3.4	Bauko and Sadanaga	TBD
Cupis Hydroelectric Power ProjectStrat egic	10	Brgy. Nabuangan, Conner, Apaya o	TBD
Rizal Hydroelectric	10	CorpBrgy. Rizal San Guillermo, Is abel	TBD
Sub-Total Hydro	3484.58		
WIND			
Pagudpud Wind Power Project	84	Brgy. Balaoi and Caunayan, Pagudpud, Ilocos Norte	Nov 2019
Burgos 2 Wind Power Project	183	Burgos, Ilocos Norte	Nov 2019
Sembrano Wind Power Project *	80.40	Mt. Sembrano, Mabitac, Laguna	Dec 2019
Matnog 1 Wind Power Project	153	Matnog, Sorsogon	Jul 2020

Proposed Generation Facility / Name of the Project	Capacity (MW)	Location	Commissioning Year
Matnog 2 Wind Power Project	206	Matnog, Sorsogon	Jul 2020
Matnog 3 Wind Power Project	206	Matnog, Sorsogon	Jul 2020
Pasuquin East Wind Phase 1 *	48	Pasuquin, Ilocos Norte	TBD
Balaoi Wind Power Project	45	Brgy. Balaoi, Pagudpud, Ilocos Norte	TBD
Talisay Wind Power Project	50	Camarines Norte	TBD
Talim Wind Power Project	140	Rizal	TBD
Calatagan Wind Power Project	80	Batangas	TBD
Tanay Wind Power Project	100	Antipolo and Tanay, Rizal	TBD
Rizal Wind Power Project	603	Antipolo and Tanay, Rizal	TBD
Siruma Wind Power Project	60	Siruma, Camarines Sur	TBD
Sub-Total Wind	2,038.4		
BIOMASS			
NREDC Biomass Power Project	24	Cagayan	Jun 2020
Santa Biomass Power*	10	Brgy. Nagpanaoan, Santa, Ilocos Sur	Jun 2020
Polillo Biomass Power Project	1.5	Quezon	Nov 2020
EcoMarket Solutions Coconut Waste-Fired Biomass Power	2.5	Aurora	Nov 2020
CJ Global Waste-to-Energy Power	20	Camarines Sur	Nov 2020
Green Atom Pampanga Waste to Energy	6	Mabalacat City, Pampanga	Nov 2020
Green Atom Pangasinan Waste to Energy	6	Laoac, Pangasinan	Nov 2020
Green Atom Batangas Waste to Energy	6	Brgy. Aya, San Jose, Batangas	Nov 2020
Bataan 2020 Multi-Feedstock Cogeneration Power Project	25	Mariveles, Bataan	TBD
CBEC Biomass Power Project	15	Brgy. Raniag, Burgos, Isabela	TBD
Sub-Total Biomass	116		
BATTERY			
Mexico Battery Energy Project	40	Mexico, Pampanga	TBD
Angat Battery Energy Project	20	Angat, Bulacan	TBD
Isabela Battery Energy Project	20	Isabela	TBD
Laoag Battery Energy Project	40	Laoag, Ilocos Norte	TBD
Albay Battery Energy Project	20	Legazpi, Albay	TBD
Limay Battery Energy Storage	40	Limay, Bataan	TBD
Pampanga Battery Energy Storage	40	Mexico, Pampanga	TBD
San Manuel / San Roque Battery Energy Storage	20	San Roque / San Manuel	TBD
SN Aboitiz Battery Energy Storage System	20	Isabela	TBD
Concepcion Battery Energy Storage System	20	Concepcion, Tarlac	TBD
Lumban Battery Energy Storage System	40	Lumban, Laguna	TBD
Masinloc Battery Energy Storage System	10	Masinloc, Zambales	TBD
Zambales Battery Energy Storage System	30	Zambales	TBD
Bals Battery Energy Storage System	10	Negros Oriental	TBD
ISOC San Manuel Energy Storage, Inc.	40	San Manuel, Pangasinan	TBD
ISOC Iridium Energy Storage, Inc.	40	Lumban, Laguna	TBD
ISOC Paladium Energy Storage, Inc.	40	Concepcion, Tarlac	TBD
ISOC Cadmium Energy Storage, Inc.	40	Mexico, Pampanga	TBD
Bauang BESS Project	40	Bauang, La Union	TBD
Hermosa BESS Project	40	Hermosa, Bataan	TBD
Labrador BESS Project	40	Labrador, Pangasinan	TBD
San Manuel BESS Project	40	San Manuel, Pangasinan	TBD
Cabanatuan BESS Project	40	Cabanatuan, Nueva Ecija	TBD

Proposed Generation Facility / Name of the Project	Capacity (MW)	Location	Commissioning Year
Bayombong Battery Energy Storage	40	Bayombong, Nueva Ecija	TBD
Mindoro Battery Energy Storage	20	Mindoro	TBD
Navotas Battery Energy Storage	20	Navotas, Metro Manila	TBD
Gamu Battery Energy Storage	20	Gamu, Isabela	TBD
San Rafael Battery Energy Storage	20	San Rafael, Bulacan	TBD
Magapit Battery Energy Storage	20	Magapit, Cagayan	TBD
Maco Battery Energy Storage	20	Maco, Compostela Valley	TBD
Masinloc Battery Energy Storage	20	Masinloc, Zambales	TBD
Nagsaag Battery Energy Storage	20	Nagsaag, Pangasinan	TBD
Lumban Battery Energy Storage	20	Lumban, Laguna	TBD
Laoag Battery Energy Storage	20	Laoag, Ilocos Norte	TBD
Concepcion Battery Energy Storage	20	Concepcion, Tarlac	TBD
Labrador Battery Energy Storage	20	Labrador, Pangasinan	TBD
Pililla Battery Energy Storage	50	Pilillia, Rizal	TBD
Currimao Battery Energy Storage	50	Currimao, Ilocos Norte	TBD
Sub-Total Battery	1110		
TOTAL INDICATIVE	36.914.5		
TOTAL INDICATIVE W/O BATTERY	35,804.5		

* - with SIS

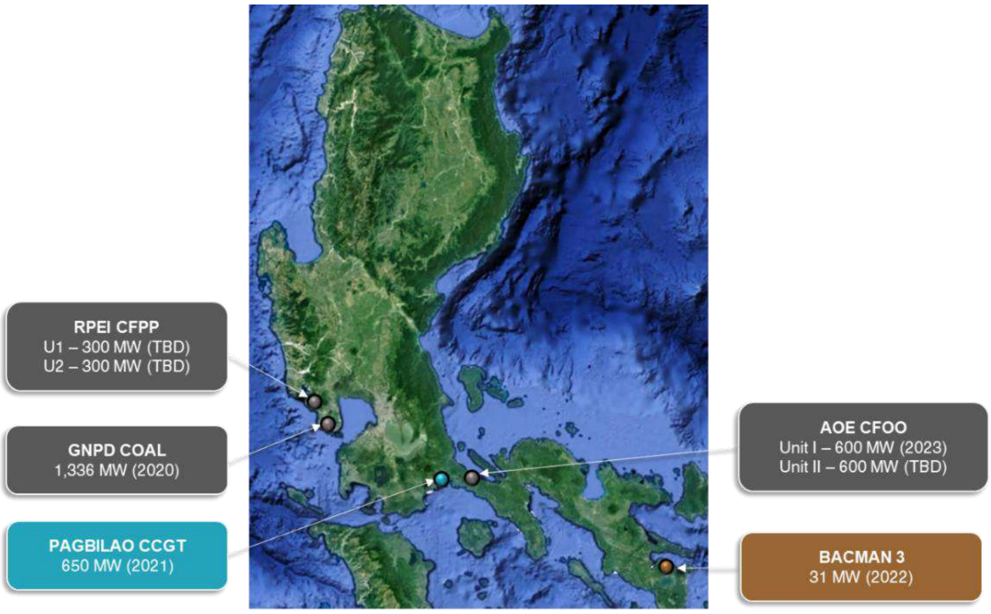


Figure 5.1: Luzon Committed Power Plants[4]

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 5.4: Luzon Committed Power Plants and Associated Transmission Projects

Based on DOE List of Private Sector Initiated Power Projects as of July 2019			Based on Transmission Development Plan 2020-2040		
Proposed Major Power Plants	Capacity (MW)	Comm. Year	Connection Point	Associated Transmission Project	ETC
COAL					
GNPower Dinginin 2 x 660 MW Supercritical Coal-Fired Power Project	1336	2020	Limay 500 kV Substation	Mariveles–Hermosa 500 kV Transmission Line Project	Dec 2020

[4] Indicated power plants are those with 20 MW and above in capacity based on DOE's List of Private Sector Initiated Power Projects as of October 31, 2019

				Hermosa–San Jose 500 kV Transmission Line Project	Mar 2021
RPEI Coal-Fired Power Project	600	Unit I 2020 Unit II 2021	Hermosa 230 kV Substation (Initial Connection) Castillejos 230 kV Substation (Final Connection)	Western 500 kV Backbone – Stage 2	Aug 2024
A1E Coal-Fired Power Project	1200	Unit I Mar 2023 Unit II TBD	Pagbilao 500 kV Substation	Pagbilao 500 kV Substation Pagbilao–Tayabas 500 kV Transmission Line Project	Mar 2021 Jul 2023
NATURAL GAS					
Pagbilao CCGT Power Project *	650	Mar 2021	Pagbilao 230 kV Substation	Pagbilao 500 kV Substation	Mar 2021
SOLAR					
ELPI Pasuquin Solar Power Plant Project	100	Dec 2019	Laoag 115 kV Substation	None	2020
GEOTHERMAL					
Bacman 3 (Tanawon)	31	Nov 2022	Bacman 230 kV Substation	None[5]	N/A
BIOMASS					
FQBC Biogas Power Plant Project	1.2	Nov 2019		None	N/A
Isabela La Suerte Rice Husk-Fired	5	Nov 2019	ISELCO II San Manuel 13.2 kV feeder	None	N/A
HEC Rice Husk-Fired Biomass Power Plant Project	12	Nov 2019	Cut-in along MERALCO-owned Sta. Maria–Saog 115 kV Line	None	N/A
CEC Biomass Power Plant Project	12	Nov 2019	Gamu 69 kV Substation	None	N/A
GITC Biomass Power Plant Project	18	Nov 2019	Cabanatuan 69 kV Substation	None	N/A

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

Table 5.5: Private Sector Initiated Power Projects in Visayas as of 31 October 2019

Proposed Generation Facility / Name of the Project	Capacity (MW)	Location	Commissioning Year
COMMITTED POWER PLANTS			
COAL			
Palm Concepcion Coal-Fired Power Project*	135	Brgy. Nipa, Concepcion, Iloilo	Dec 2021
Sub-Total Coal	135		
OIL-BASED			
Isabel Modular Diesel Ancillary Service Power Project *	70	Isabel, Leyte	Dec 2019
TPVI Diesel-Fired Power Plant	44.58	Brgy. Colon, Naga City, Cebu	Diesel Engine 1: Nov 2019 Diesel Engine 2: Done

[5] Bacman 3 (Tanawon) is only an expansion of the existing power plant facility. The increase in generation capacity within its facility can still be accommodated by the grid.

Proposed Generation Facility / Name of the Project	Capacity (MW)	Location	Commissioning Year
			Diesel Engine 3: Nov 2019 Diesel Engine 4: Nov 2019 Diesel Engine 5: Nov 2019 Diesel Engine 6: Done
Sub-Total Oil-Based	114.58		
HYDRO			
Igbulo (Bais) Hydro*	5.1	Igbaras, Iloilo	Nov 2019
Timbaban*	18.0	Madalag, Aklan	Nov 2019
Sub-Total Hydro	23.1		
BIOMASS			
BISCOM Cogeneration Power Projec*	48	Binalbagan, Negros Occidental	Oct 2019
HDJ BAVC Biomass Power Plant Project	3	Himamaylan City, Negors Occidental	Sep 2019
SNBI Cane Trash-Fired Biomass Power Project*	25	Negros Occidental	Oct 2019
NNBI Biomass Power Plant Project	25	Manapla, Negros Occidental	Nov 2019
VMC Cogeneration Power Project	60	Victoria, Negros Occidental	Jan 2021
SCBI Multi-Feedstock Biomass Power Project *	20	Negros Occidental	Nov 2019
Sub-Total Biomass	181		
GEOTHERMAL			
Biliran Geothermal Project Unit I*	50	Biliran, Biliran	Unit 1 (5 MW) - Jun 2021 Unit 2 (5 MW) - Aug 2023 Unit 3 (10 MW) - Feb 2024 Unit 4 (10MW) - Dec 2024 Unit 5 (10 MW) - Sep 2025 Unit 6 (10 MW) - May 2026
Sub-Total Geothermal	50		
TOTAL COMMITTED	503.7		
INDICATIVE POWER PLANTS			
COAL			
SMC Loboc Malabuyoc Coal-Fired Power Plant Project	300	Mactan, Cebu	TBD
SMC Global Negros Coal-Fired Power Plant Project	300	San Carlos, Negros Occidental	TBD
Sub-Total Coal	600		
NATURAL GAS			
Argao Floating CCGT Power Plant	138	Brgy. Bulasa, Argao, Cebu	TBA
Sub-Total Natural Gas	138		
OIL			
SPC Diesel Power Plant Capacity Expansion	44.2	Tagbilaran, Bohol	Jun 2020
Supreme Power Corp Diesel Power Plant	7.2	Brgy. Imelda, Ubay, Bohol	Jun 2020
Alsons Energy Bunker C Fired Power Plant	55	Calbayog, Samar	TBD
GT Energy Bunker Fired Power Plant	18	Calbayog, Samar	TBD
Sub-Total Oil	124.4		
GEOTHERMAL			
Dauin Geothermal	40	Dauin, Negros Oriental	Nov 2025

Proposed Generation Facility / Name of the Project	Capacity (MW)	Location	Commissioning Year
Mahanagdong Geothermal Binary Power plant	36	Brgy. Milagro, Kananga, Leyte	TBD
Sub-Total Geothermal	76		
SOLAR			
Bogo V Solar Power Project	16.7	Bogo, Cebu	Apr 2020
Bogo 3 Solar Power Project	15	Bogo, Cebu	Apr 2020
Sanpalo Solar Power Plant	100	San Miguel, Leyte	Aug 2020
Ceko Solar PV Project (Daanbantayan Solar PV Power Project)	100	Brgy. Tominjao, Daan Bantayan, Cebu	TBD
Silay Phase II Solar	10	Silay City, Negros Occidental	TBD
Victorias Solar	30.63	Brgy. XII, Victorias City, Negros Occidental	TBD
Grid Tied Solar Farm	25	Biliran, Biliran	TBD
Tigbauan Solar	34.30	Brgy. Cordova Norte and Bantud, Tigbauan, Iloilo	TBD
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
Gaisano Iloilo Solar	1.03	Iloilo City, Iloilo	TBD
Sub-Total Solar	703.36		
WIND			
Bronzeoak Wind Power Project	100	Calatrava, Salvador Benedicto and San Carlos, Negros Occidental	Jan 2020
Iloilo 1 Wind Power Project	213	Batad & San Dionisio, Iloilo	Jul 2020
Nabas Wind Power Project Phase II	14	Brgy. Pawa, Nabas, Aklan	Aug 2021
Montesol Wind Power Project	54	Bais City, Manjuyod and Mabinay, Negros Oriental	TBD
Iloilo 2 Wind Power Project	500	Concepcion, Iloilo	TBD
Negros Wind Power Project	262	Manapla & Cadiz, Negros Occidental	TBD
Pulupandan Wind Power Project	50	Pulupandan, Negros Occidental	TBD
Aklan I Wind Power Project Phase 1-3	75	Nabas-Malay, Aklan	TBD
Anda Wind Power Project	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
San Isidro Wind Power Project	150	San Isidro, Northern Samar and Calbayog City, Samar	TBD
Sub-Total Wind	1,718		
HYDRO			
Loboc Hydroelectric Power Project	1.2	Loboc, Bohol	Nov 2020
Aklan Pumped-Storage Hydropower	300	Malay, Aklan	Jan 2024
Amlan (Plant A)	3.2	Amlan, Negros Oriental	Nov 2025
Malago	6	Silay City, Negros	Nov 2025
Amlan (Plant C)	0.8	Amlan, Negros Oriental	Nov 2026
Main Aklan River Hydroelectric Power Project	15	Libacao, Aklan	Nov 2026
Lower Himogaan	4	Sagay, Negros Occidental	Nov 2026
Amlan (Plant B)	1.5	Amlan, Negros Oriental	Nov 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 Project	21.6	Mabinay, Negros Occidental	TBD

Proposed Generation Facility / Name of the Project	Capacity (MW)	Location	Commissioning Year
Maslog Hydroelectric Power Project	40	Maslog, Eastern Samar	TBD
Sub-Total Hydro	728.2		
BIOMASS			
MCEI Multi-Feedstock Biomass Power Plant*	12	Negros Occidental	Nov 2020
UGEP Rice Husk-Fired Biomass Power Plant	2.5	Leyte	Nov 2020
GPPPI Biomass Power Plant Project	17.5	Mina, Iloilo	Nov 2022
Sub-total Biomass	32		
BATTERY			
Caticlan Battery Energy Storage System	20	Amlan, Negros Oriental	TBD
Iloilo Battery Energy Storage System	20	Ormoc, Leyte	TBD
Ormoc Battery Energy Storage System	20	Compostela, Cebu	TBD
Mactan Battery Energy Storage System	20	Cadiz City, Negros Occidental	TBD
Bohol Battery Energy Storage System	20	Bohol	TBD
Cebu Battery Energy Storage System	20	Mactan, Cebu	TBD
Samboan Battery Energy Storage System	20	Samboan, Cebu	TBD
Tabango Battery Energy Storage System	20	Tabango, Leyte	TBD
Mactan Battery Energy Storage System	20	Mactan, Cebu	TBD
San Carlos Battery Energy Storage System	20	San Carlos City, Negros Occidental	TBD
Naga Battery Energy Storage System	20	Naga, Cebu	TBD
Toledo Battery Energy Storage System	20	Toledo City, Cebu	TBD
Toledo Battery Energy Storage System	6	Toledo City, Cebu	TBD
Daanbantayan Battery Energy Storage System	10	Brgy. Talisay, Daanbantayan, Cebu	TBD
Toledo Battery Energy Storage System	7.5	Toledo City, Cebu	TBD
Tabango Battery Energy Storage System	7.5	Tabango City, Cebu	TBD
Compostela Battery Energy Storage System	7.5	Compostela, Cebu	TBD
Dingle Battery Energy Storage System	7.5	Dingle City, Cebu	TBD
Ubay Battery Energy Storage System	7.5	Ubay City, Cebu	TBD
Ormoc Energy Storage Project	50	Ormoc, Leyte	TBD
Tinampa-an Energy Storage Project	50	Cadiz, Negros Occidental	TBD
Cadiz Energy Storage Project	50	Cadiz, Negros Occidental	TBD
Sub-Total Battery	443.5		
TOTAL INDICATIVE	4,563.5		
TOTAL INDICATIVE W/O BATTERY	4,120.0		

* - with SIS

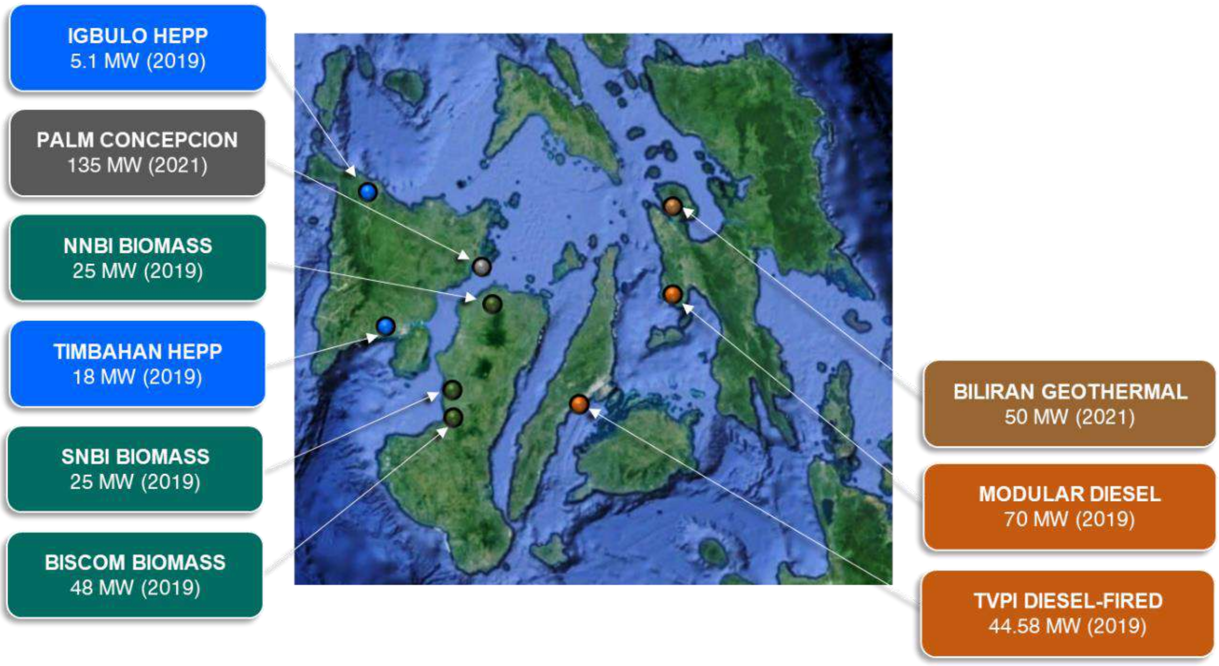


Figure 5.2: Visayas Committed Power Plants[6]

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 5.6: Visayas Committed Power Plants and Associated Transmission Projects

Based on DOE List of Private Sector Initiated Power Projects as of July 2019			Based on Transmission Development Plan 2020-2040		
Proposed Major Power Plants	Capacity (MW)	Comm. Year	Connection Point	Associated Transmission Project	ETC
COAL					
Palm Concepcion Coal-Fired Power Project*	135	Dec 2021	Direct connection to Concepcion Substation	Eastern Panay Transmission Line Project	Completed
OIL-BASED					
Isabel Modular Diesel Ancillary Service Power Project	70	May 2019	Interim: Cut-in along Isabel–Pasar 138 kV Line 2	No grid reinforcement required	N/A
			Final: Direct connection to Isabel Substation	Cebu–Leyte 230 kV Interconnection Line 3 and 4	Mar 2025
TPVI Diesel-Fired Power Plant	44.58	Sept 2019	Existing connection at NGCP's Naga 138 kV Substation	No grid reinforcement required	N/A
HYDRO					
Igbulo (Bais) Hydro*	5.1	Nov 2019	Tap connection along Sta. Barbara–Miagao 69 kV line	CNP 230 kV Backbone Stage 3	Dec 2021
Timbaban*	18	Nov 2019	Tap connection along Panitan–Nabas 69 kV line	CNP 230 kV Backbone Stage 3	Dec 2021
BIOMASS					

[6] Indicated power plants are those with 5 MW and above in capacity based on DOE's List of Private Sector Initiated Power Projects as of October 31, 2019

Based on DOE List of Private Sector Initiated Power Projects as of July 2019			Based on Transmission Development Plan 2020-2040		
Proposed Major Power Plants	Capacity (MW)	Comm. Year	Connection Point	Associated Transmission Project	ETC
BISCOM Cogeneration Power Plant*	48	Mar 2019	Tap connection along Kabankalan–La Castellana 69 kV line	CNP 230 kV Backbone Stage 3	Dec 2021
HDJ BAVC Biomass Power Plant Project	3	Sep 2019	Tap connection along Bayawan-Tadlong	CNP 230 kV Backbone Stage 3	Dec 2021
SNBI Cane trash-Fired Biomass Power Project *	25	Oct 2019	Tap connection along Bacolod–San Enrique 69 kV line	CNP 230 kV Backbone Stage 3	Dec 2021
NNBI Biomass Power Plant Project	25	Nov 2019	Direct connection to NGCP's 69 kV Cadiz Substation or tap connection along Cadiz-Victorias 69 kV line	CNP 230 kV Backbone Stage 3	Dec 2021
VMC Cogeneration Power Project	60	Jan 2021	Tap connection along Cadiz-Victorias 69kV line	CNP 230 kV Backbone Stage 3	Dec 2021
SCBI Multi-Feedstock Biomass Power Project *	20	Dec 2019	Tap connection along Cadiz–San Carlos 69 kV line	CNP 230 kV Backbone Stage 3	Dec 2021
GEOTHERMAL					
Biliran Geothermal Project Unit I *	50	Jul 2021	Tap connection along Ormoc–Biliran 69 kV line	Tabango–Biliran 69 kV Transmission Line Project	Jun 2025

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

Table 5.7: Private Sector Initiated Power Projects in Mindanao as of 31 October 2019

Proposed Generation Facility / Name of the Project	Capacity (MW)	Location	Commissioning Year
COMMITTED POWER PLANTS			
COAL			
FDC-MPC CFB Coal-Fired Power Plant	405	Misamis Oriental	TBD
Sub-Total Coal	405		
HYDRO			
Lake Mainit*	25	Jabonga, Agusan del Norte	Nov 2020
Sub-Total Hydro	25		
SOLAR			
ADGI GenSan Solar Power Project	24.96	General Santos City, South Cotabato	July 2019
Sub-Total Solar	24.96		
BIOMASS			
PTCI Rice Husk-Fired Biomass Cogeneration Facility	3	Sultan Kudarat, Maguindanao	Jun 2019 (On-going Testing and Commissioning)
BFI Biomass Power Plant Project	5.96	Tantangan, South Cotabato	Nov 2019
Sub-Total Biomass	8.96		
BESS			
TMI Hybrid BESS	49	Maco, Compostela Valley	TBD

Proposed Generation Facility / Name of the Project	Capacity (MW)	Location	Commissioning Year
Sub-Total BESS	49		
TOTAL COMMITTED	512.9		
TOTAL COMMITTED W/O BESS	463.9		
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	TBD
SMC Davao Power Project Phase II*	300	Brgy. Culaman, Malita, Davao Occidental	TBD
SMC Global Power (4 x 82 MW)*	328	Brgy. Darong, Santa Cruz, Davao del Sur	TBD
Sub-Total Coal	928		
OIL-BASED			
TPI Diesel Power Plant*	5.883	Mati, Davao Oriental	Jun 2020
Sub-Total Oil-Based	5.883		
GEOTHERMAL			
EDC Mindanao 3 Geothermal Power Plant*	30	Kidapawan, North Cotabato	Nov 2021
Sub-Total Geothermal	30		
HYDRO			
Bubunawan Hydroelectric Power Project	23	Baungon and Libona, Bukidnon	Nov 2021
Pulanai	10.6	Valencia, Bukidnon	Nov 2022
Tagum	2.60	Maco, Compostela Valley	Nov 2024
Tagoloan	39	Impasugong & Sumilao, Bukidnon	Nov 2025
Culaman Hydroelectric Power Project	10	Manolo Fortich, Bukidnon	Nov 2025
Katipunan River Mini Hydro Power Project	6.2	Cabanglasan, Bukidnon	Nov 2025
Cabadbaran Hydroelectric Power Project	9.75	Cabadbaran, Agusan del Norte	Nov 2025
Lower Maladugao River Mini-Hydropower Project	15.7	Kalilangan and Wao, Bukidnon	Nov 2025
Maladugao (Upper Cascade) Hydroelectric Power Project	8.4	Kalilangan, Bukidnon	Nov 2026
Sawaga River Mini Hydro Power Project	4.5	Malaybalay, Bukidnon	Nov 2026
Liangan Hydropower Project	11.9	Bacolod, Lanao del Norte	Nov 2026
Malitbog	3.4	Malitbog, Bukidnon	Nov 2026
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
South Pulangi Hydoelectric Power Project	250	Damulos, Bukidnon	TBD
Sub-Total Hydro	853.19		
SOLAR			
Sumilao Solar Power Project	2	San Vicente, Sumilao, Bukidnon	Nov 2019
Liberty Solar Projec	7	La Libertad, Zamboanga del SuR	Jun 2020
Greenlight Solar Power Project	50	Datu Odin, Sinsuat, Maguindanao	Sep 2020
Sarangani Solar PV Power Plant	100	Alabel, Sarangani	Sep 2020
Banale Solar Power Project	13	Brgy. Banale, Pagadian	Nov 2020

Proposed Generation Facility / Name of the Project	Capacity (MW)	Location	Commissioning Year
Conel Solar Power Project	16	General Santos City, South Cotabato	Mar 2021
Mabuhay Solar Power Project	44	General Santos City, South Cotabato	Mar 2021
GenSan Solar Power Project Phase I*	48	Brgy. Conel, General Santos City, South Cotabato	TBD
GenSan Solar Power Project Phase II*	48	Brgy. Tambler, General Santos City, South Cotabato	TBD
60 MW General Santos City Solar Power Project	60	General Santos City, South Cotabato	TBD
San Francisco Solar Power Project	10	San Francisco, Agusan del Sur	TBD
Jasaan Solar Power Project	60	Jasaan, Misamis Oriental	TBD
Lal-lo Solar PV Power Plan	100	Maasim, Sarangan	TBD
Ecoglobal 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
South Cotabato Solar Power Project	24.96	Lanado del Norte/Lanao del Sur	TBD
Sub-Total Solar	809.96		
BIOMASS			
Suralla PGI Biomass Power Plant Project	6	Surallah, South Cotabato	Nov 2019
12 MW Napier Grass-Fired Biomass Power Project	12	Bukidnon	Nov 2020
10MW Malay-balay Bio-Energy Corporation Multi Feedstock Generating Facility	10	Bukidnon	Nov 2020
NAREDCO Biogas Power Plant	24	Lal-lo, Cagaya	Nov 2020
Napier Grass-Fired Biomass Power Project	5	Bukidnon	Nov 2020
NREDC Biogas Power Project	24	Maasim, Sarangani	Nov 2020
23.5 MW Woody Biomass Power Project	23.5	Agusan del Norte	2022
Bagasse-Fired Co-generation Power Project	14.9	Maramag, Bukidnon	TBD
Sub-Total Biomass	119.4		
BESS			
Surigao / Butuan Battery Energy Storage	20	Surigao / Butuan	TBD
Zamboanga Battery Energy Storage	200	Zamboanga	TBD
Pitogo Battery Energy Storage	60	Brgy. Sinunuc, Pitogo, Zamboanga City, Zamboanga del Sur	TBD
Sangali Battery Energy Storage	40	Sangali, Zamboanga City, Zamboanga del Sur	TBD
Aurora (Pangadian) Battery Energy Storage	40	Aurora, Zamboanga del Norte	TBD
Kibawe Energy Storage Project	50	Kibawe, Bukidno	TBD
Sub-Total Battery	410		
TOTAL INDICATIVE	3,156.4		
TOTAL INDICATIVE W/O BESS	2,746.4		

* - with SIS

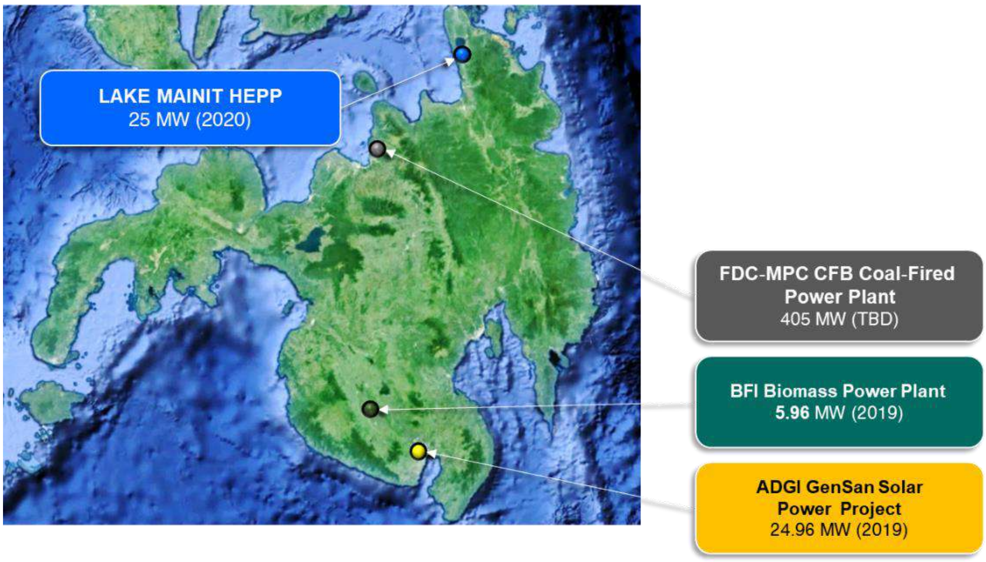


Figure 5.3: Mindanao Major Committed Power Plants[7]

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 5.8: List of Mindanao Committed Plants and Associated Transmission Projects

Based on DOE List of Private Sector Initiated Power Projects as of December 2018			Based on Transmission Development Plan 2020-2040		
Proposed Major Power Plants	Capacity (MW)	Comm. Year	Connection Point	Associated Transmission Project	ETC
COAL					
FDC-MPC CFB Coal-Fired Power Plant	405	TBD	Villanueva Substation	None	2022
HYDRO					
Lake Mainit	25	Nov 2020	ANECO's Santiago Substation	Embedded Generation -No Transmission Reinforcement Required	N/A
SOLAR					
ADGI GenSan Solar Power Project	24.96	Jul 2019	General Santos Substation	Embedded Generation -No Transmission Reinforcement Required	N/A
BIOMASS					
PTCI Rice Husk-Fired Biomass Cogeneration Facility	3	Jun 2019	Sultan Kudarat Substation	Embedded Generation -No Transmission Reinforcement Required	N/A
BFI Biogas Power Project	5.96	Nov 2018	SOCOTECO I's 69 kV Sub-Transmission Line	Embedded Generation -No Transmission Reinforcement Required	N/A

[7] Indicated power plants are those with 5 MW and above in capacity based on DOE's List of Private Sector Initiated Power Projects as of October 31, 2019

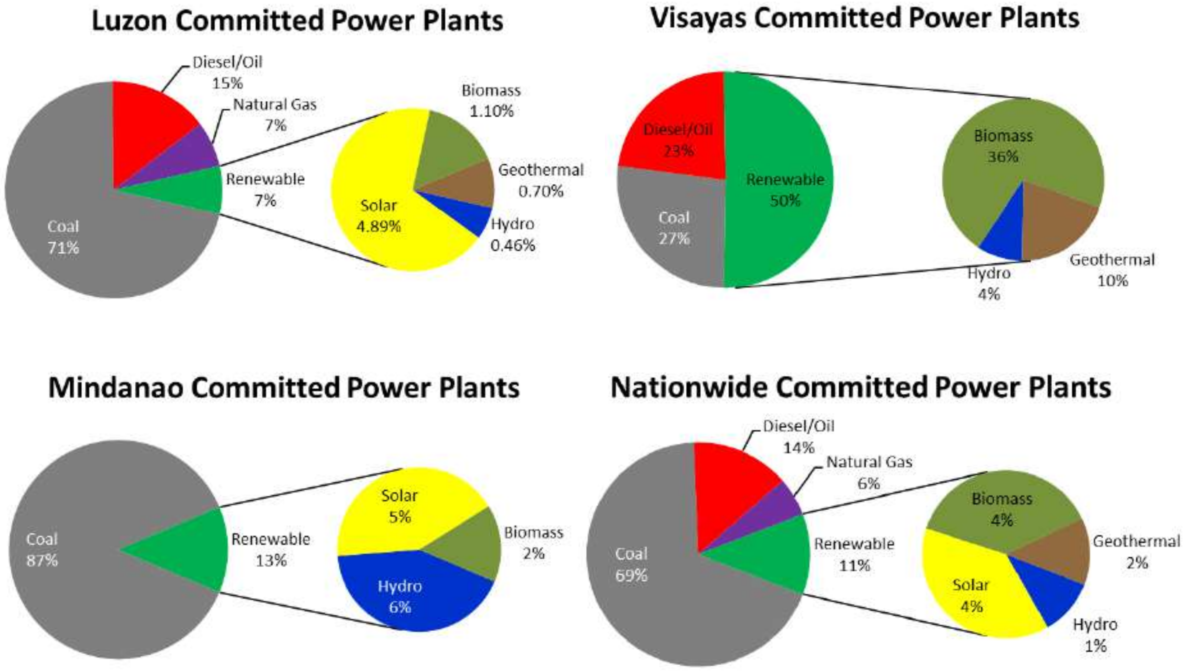


Figure 5.4: Generation Capacity Mix of Committed Power Plants

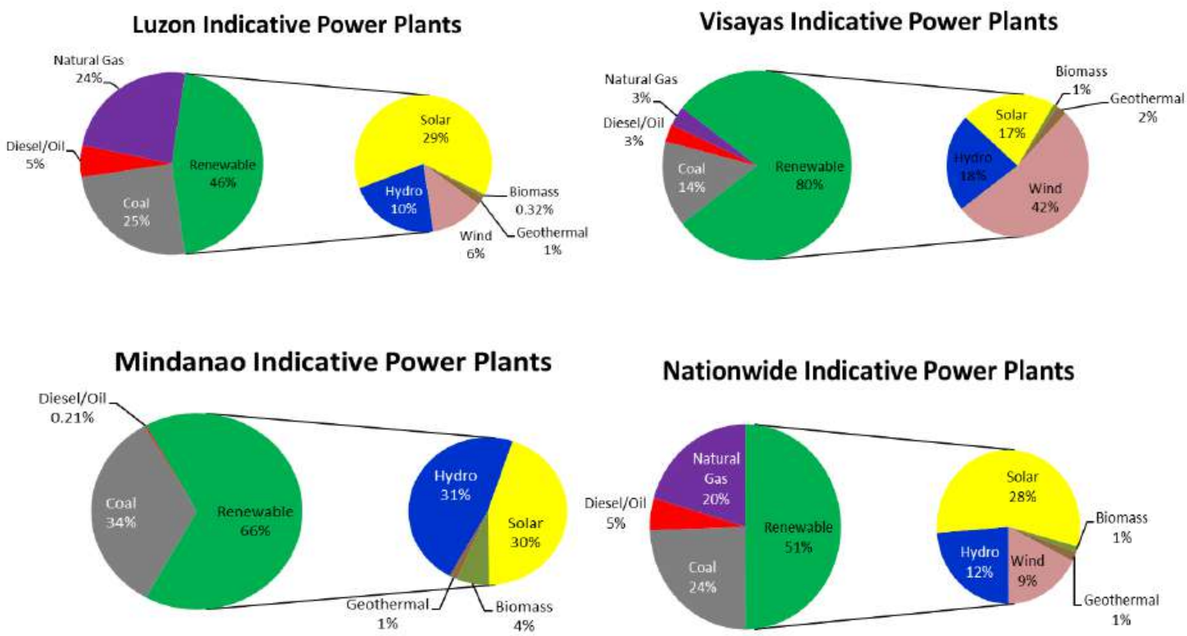


Figure 5.5: Generation Capacity Mix of Indicative Power Plants

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 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. Chapter 6 will expound more on this transmission planning improvement involving VREs, while Chapter 7 discusses the entry of Energy Storage System in the grids.

5.2.2 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 RE projects are concentrated in one area only. While transmission projects are already being proposed, the completion of transmission projects would take longer time, averaging about 3 to 5 years with major backbone much longer to implement, compared with the duration of power plant construction.

In the table below, the major RE projects with Certificate of Confirmation of Commerciality[8] as of October 2019 are summarized together with the required grid reinforcement and its timing.

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

Table 5.9: Major RE projects with Certificate of Confirmation of Commerciality in Luzon

Location	Project Name	Target Date of Commercial Operation	Affirmed Capacity (MW)	Required Grid Reinforcement	ETC
Biomass Projects			56.7		
Nueva Ecija	GGREC 12 MW Biomass Power Plant	Sep 2019	10.8	No grid reinforcement required	
Isabela	CBEC 15 MW Biomass Power Plant Project	Oct 2019	13.5	No grid reinforcement required	
Nueva Ecija	GITC 6 MW Biomass Power Plant Project	Nov 2019	5.4	No grid reinforcement required	
Bataan	CEC 12 MW Biomass Power Plant Project	Dec 2019	10.8	No grid reinforcement required	
Bulacan	HEC 12MW Biomass Power Plant Project	Dec 2019	10.8	No grid reinforcement required	
Nueva Ecija	VSGPC 6 MW Biomass Power Plant Project	Dec 2019	5.4	No grid reinforcement required	
Geothermal Projects			41		
Naujan, Oriental Mindoro	MGPP 10 MW Montelago Geothermal Power Project	2021	10	No grid reinforcement required	
Guinlajon, Sorsogon	EDC BacMan 3 Geothermal Power Project	2022	31	No grid reinforcement required	
Hydro Projects			2		
Laguna	Majayjay Hydroelectric Power Project	May 2019	2	No grid reinforcement required	

Table 5.10: Major RE projects with Certificate of Confirmation of Commerciality in the Visayas

Location	Project Name	Target Date of Commercial Operation	Affirmed Capacity (MW)	Required Grid Reinforcement	ETC
Biomass Projects			55.45		
Negros Occidental	HPC 28.58 MW Bagasse Cogeneration Power Plant	Jan 2019	8	CNP 230 kV Backbone Stage 3	Jun 2021
Negros Occidental	VMCI 40MW Biomass Power Plant Expansion Project	Feb 2019	21.45	CNP 230 kV Backbone Stage 3	Jun 2021
Negros Occidental	SCBI 20 MW Biomass Power Plant Project	Sep 2019	14-18	CNP 230 kV Backbone Stage 3	Jun 2021

Location	Project Name	Target Date of Commercial Operation	Affirmed Capacity (MW)	Required Grid Reinforcement	ETC
Negros Occidental	CAB 25MW Biomass Power Plant	Sep 2019	12	CNP 230 kV Backbone Stage 3	Jun 2021
Geothermal Projects			55		
Caibiran, Naval, Biliran	BGI Biliran Geothermal Power Project	Phase 1 2021 Phase 2 2023 Phase 3 2024 Phase 4 2024 Phase 5 2025 Phase 6 2026	5 10 10 10 10 10	No grid reinforcement required	N/A

Table 5.11: Major RE projects with Certificate of Confirmation of Commerciality in Mindanao

Location	Project Name	Target Date of Commercial Operation	Affirmed Capacity (MW)	Required Grid Reinforcement	ETC
Biomass Projects			23.2		
Maguindanao	PTCI 3 MW Biomass Power Plant Project	Dec 2019	2.6	No grid reinforcement required	
Agusan del Norte	CARAGA REC 23.5 MW Biomass Power Plant Project	Dec 2019	20.6	No grid reinforcement required	

The other renewable energy potentials are shown in Appendix 3.

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 39% in 2018. 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 of 2015[9].

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

Table 5.12: 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

5.3.2 Oil

Oil-based power generation contributed to 14% of the power generation mix in 2018. 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 5.13 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.

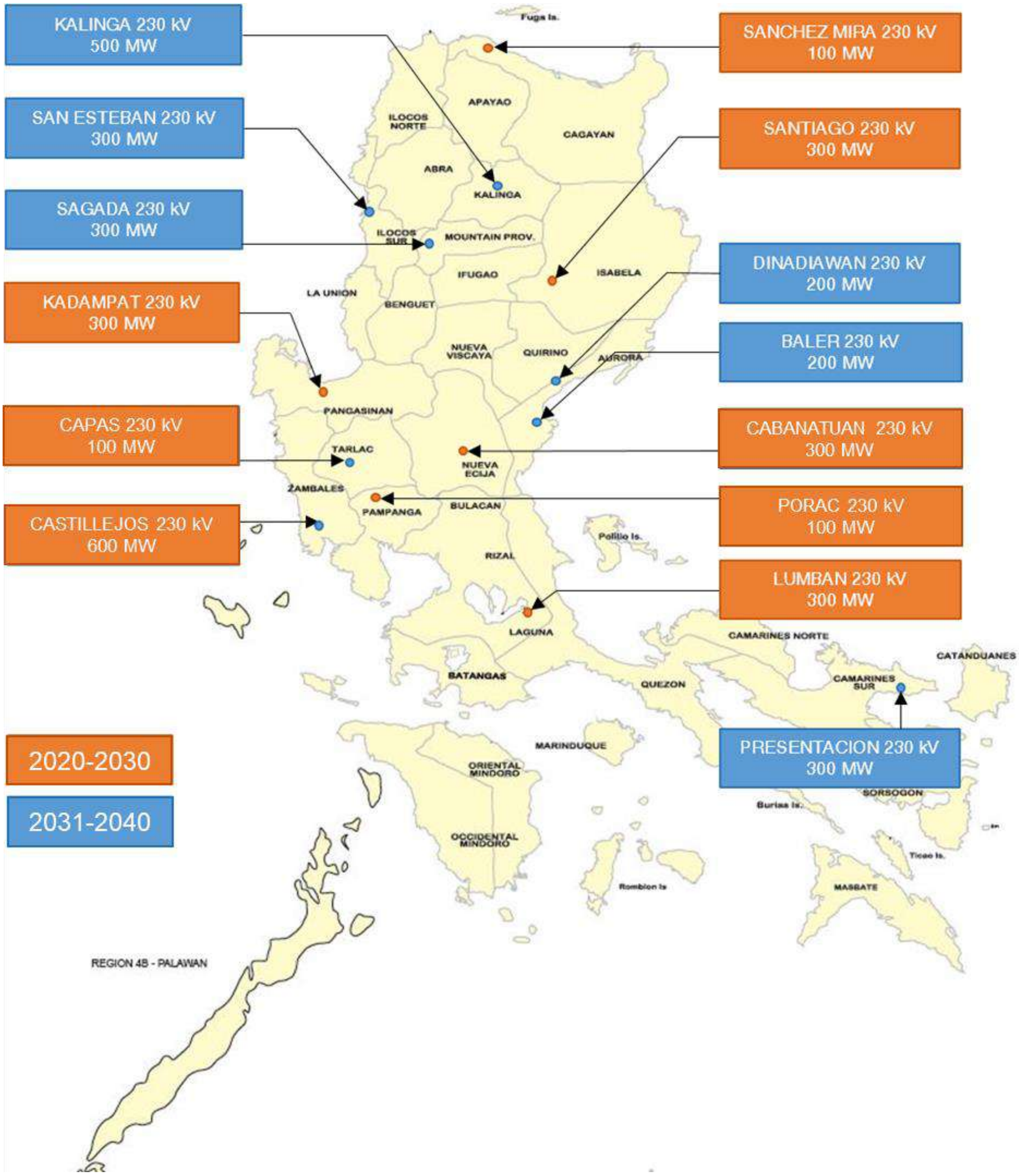


Figure 5.6: Recommended Power Plant Connection Points (Luzon)

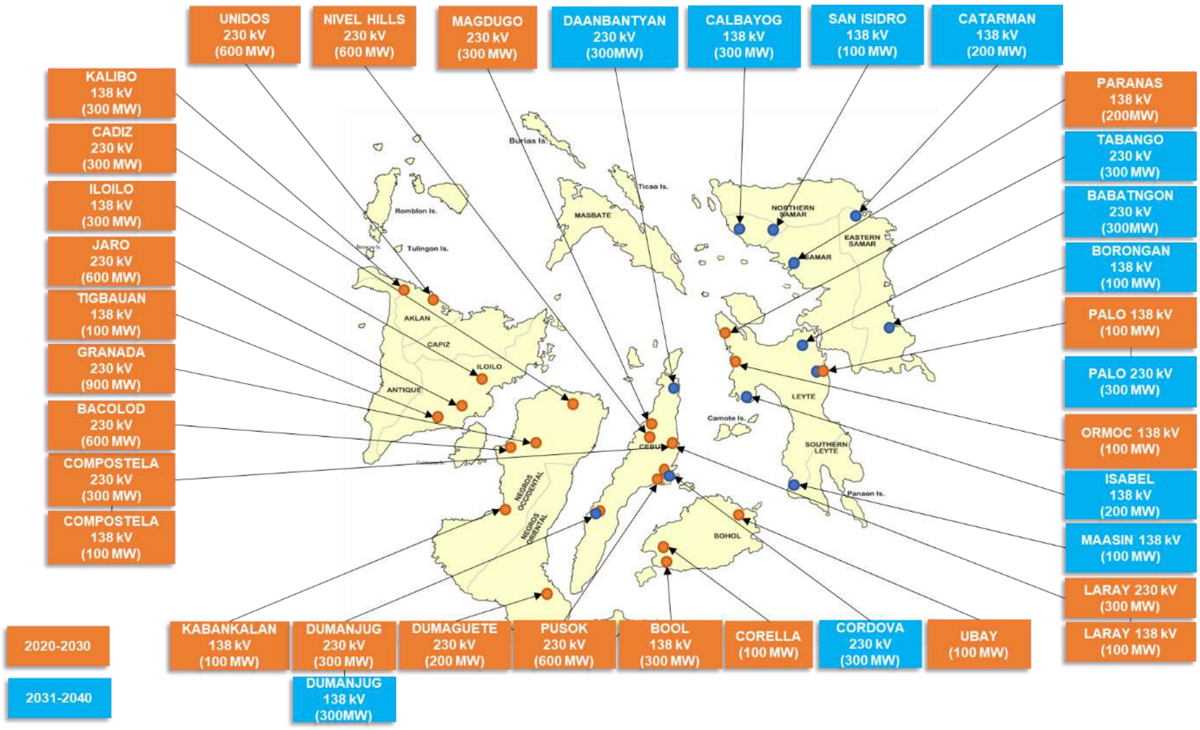


Figure 5.7: Recommended Power Plant Connection Points (Visayas)

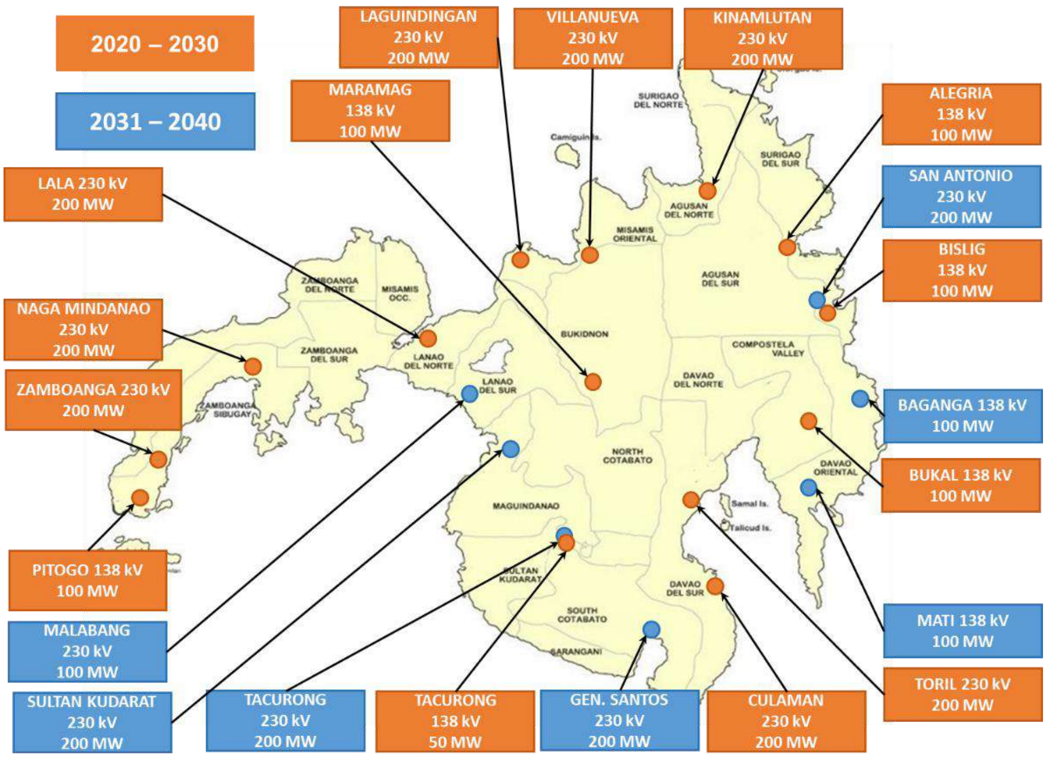


Figure 5.8: Recommended Power Plant Connection Points (Mindanao)

6.1 Background

Available indigenous RE resources could significantly contribute to the Government's vision to ensure sustainable, secure, sufficient, and affordable energy. The indigenous RE developments, however, are currently limited both by significant transmission constraints and by regulatory barriers to financial investment by the private sector developers. Thus, the initiative to work on the Philippine CREZ process, which aims to encourage the transmission upgrades and expansion towards the optimal utilization of the country's indigenous RE resources. The CREZ process was adopted from the Texas model that was successfully implemented in the Unites States of America (USA). The Philippine Department of Energy together with the United States Agency for International Development (USAID) – National Renewable Energy Laboratory (NREL) partnership lead the group of power sector decision makers in the conduct of CREZ process which will be integrated in the TDP process.

6.2 General Principles and Objectives

On 13 September 2018, the DOE issued the Department Circular No. 2018-09-0027 entitled, "Establishment and Development of Competitive Renewable Energy Zones in the Country." The circular is intended to enhance the planning process and implementation of the PEP, PDP, TDP, and National Renewable Energy Program (NREP). To achieve this, the DOE, in partnership, with other stakeholders, i.e., NGCP, TransCo, ERC, PEMC/IEMOP, NEA, and NAMRIA, shall identify and develop RE Zones (RE Zones) and upgrade and expand transmission facilities through policy initiatives and activities that shall enable the optimal use of indigenous RE resources of the country.

6.3 CREZ Transmission Planning

Traditional transmission planning could not efficiently support RE developments mainly due to the misalignment in terms of planning and construction time of RE and transmission facilities. Solar PV and Wind Farms are location-based and potential power generation needs to be harnessed on sunny and windy places, which are almost always far from the load centers. Accessing such power from VRE requires more than 5 years for the transmission system to plan and construct. Meanwhile, VRE generation projects only take about 2-3 years. Financers will not provide funding when such RE do not have transmission access. Likewise, transmission developments will not push through when regulators cannot see a definite need for the dedicated/associated lines for the incoming VREs. These relationships are shown in Circular Dilemma in Figure 6.1.

In the case for conventional power plants, planning and construction timings are not as challenging as compared to what RE plants experience. Thus, there is a need to consider transmission expansion in RE planning.

6.4 CREZ Process

Table 6.1 shows the outline of the CREZ Transmission Planning Process that applies to RE expansion that is constrained by the lack of existing transmission. It is an approach to plan, approve, and build transmission infrastructure that connects REZs to the power system.

Table 6.1: CREZ Transmission Planning Process

Steps	Process/Output	Detailed Tasks	Timeline
Step 1. Process Design and Vision Statement			Jun 2018 – Jun 2020
Step 2. RE Resource Assessment	Process: Select areas with highest potential Output: Study areas map and supply curves	▪ Assess resource ▪ Screen exclusion areas ▪ Identify the areas with the highest quality, developable resource	
Step 3. Candidate Zones Selection	Process: Identify zones with highest probability of development Output: Candidate zone map and supply curves (one per area)	▪ Gauge commercial interest ▪ Identify areas where high quality resources intersect with commercial interest	
Step 4. Transmission Options Development	Process: Bundle candidate zones and conduct analyses of the options Output: Cost, benefit, and reliability impacts for each transmission alternative	▪ Select scenario creation (bundling) methodology ▪ Conduct cost-benefit analysis of options ▪ Steady-state, dynamic stability, production cost, and reliability analysis	
Step 5. Final Transmission Plan Designation	Process: Select transmission option according to pre-set criteria Output: Final transmission order	▪ Select transmission option that best complies with predetermined criteria, including reliability standards, economic benefits, and environmental goals	Jul 2020 – Jun 2021
Step 6. Transmission System Upgrade			2021 Onwards

6.5 Selection of Candidate CREZ

An RE Zone (REZ) is a geographical area that enables the development of profitable, cost-effective, grid-connected RE (large-scale). As shown in Figure 6.2, REZs must have high quality RE resources, suitable topography and land-use designations, and demonstrated interest from developers.

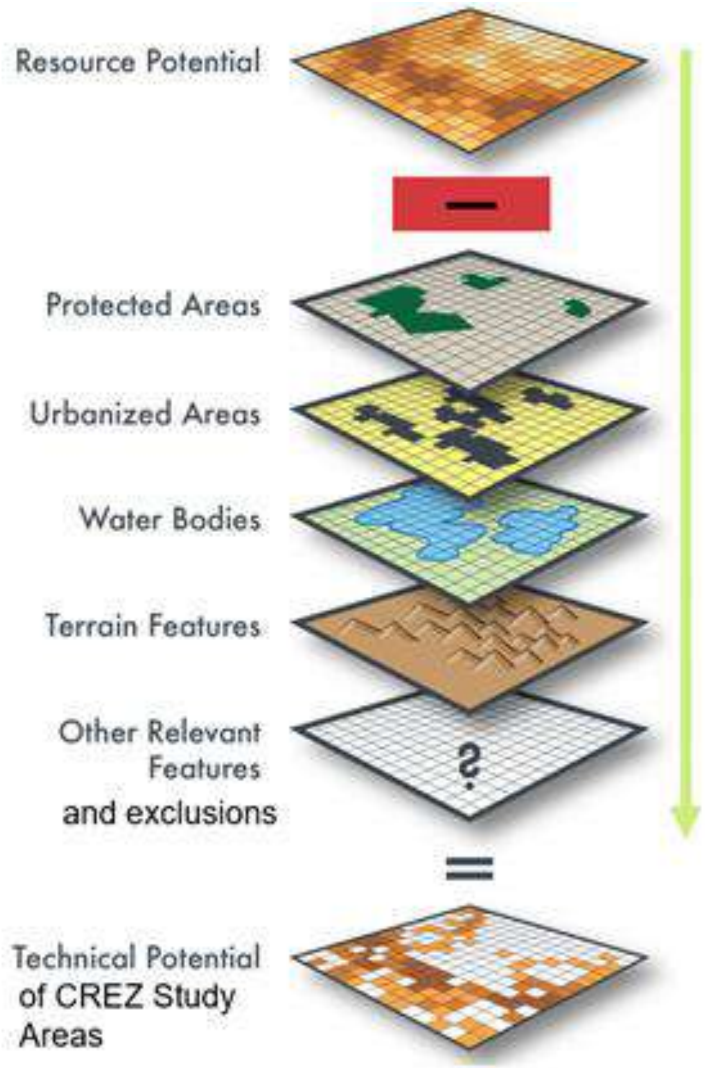


Figure 6.2: Selection Criteria for CREZ[10]

The Zone Working Group (ZWG) was tasked to identify CREZ study areas with the objective to pinpoint the areas that are off limits to RE development and which the remaining areas have the highest concentrations of high-quality wind and solar resources. Overall, the ZWG initially identified a total of 34 CREZ study areas and the zones with the highest production potential and highest level of demonstrated commercial interest (through service contract coverage). A total of 25 CREZ were selected in the Philippines based on the selection criteria, as seen in Figure 6.3.

[10] Lopez, Anthony. 2016. "High-Level Overview of Data Needs for RE Analysis." Presentation NREL/PR-6A20-67835. Golden, CO: National Renewable Energy Laboratory (NREL). http://www.nrel.gov/docs/fy17osti/67835.pdf.

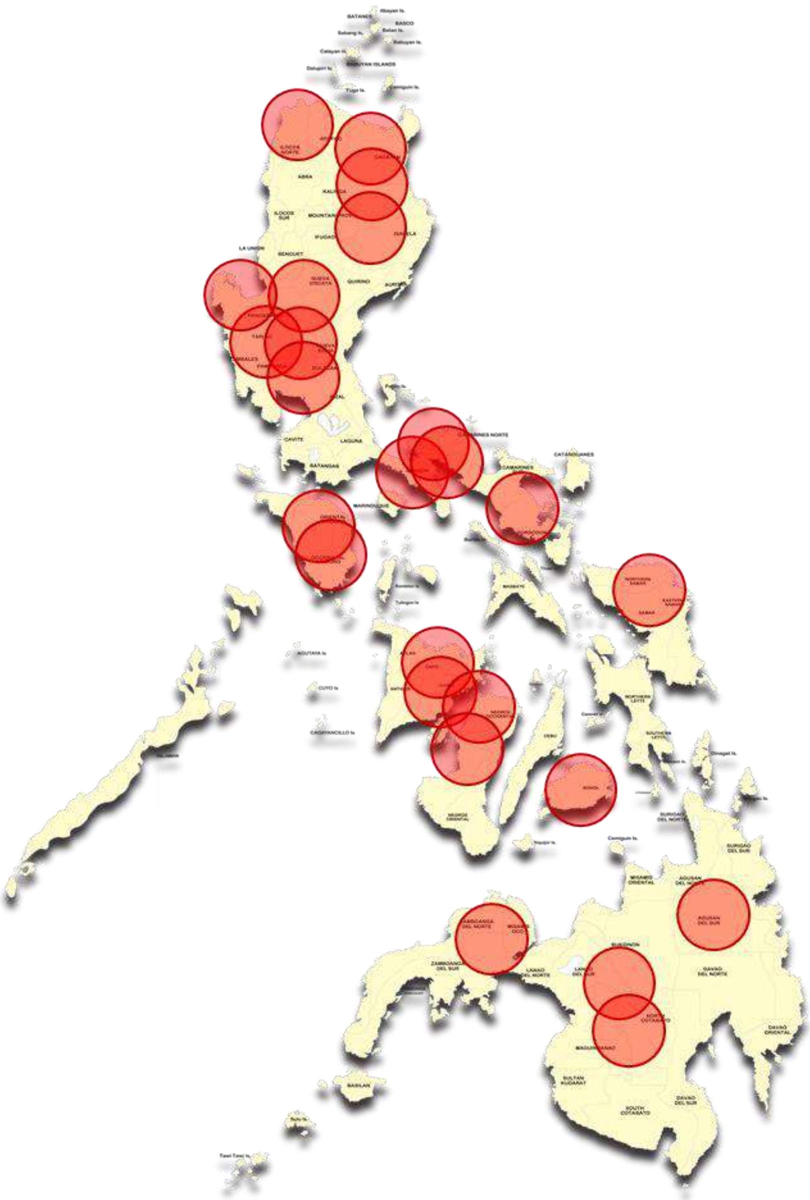


Figure 6.3: The 25 Candidate CREZs

6.6 System Modeling Approach

With the objective of identifying and characterizing a set of implementable transmission development plans that could provide transfer capacity to deliver power from the candidate CREZ to load throughout the Philippines, the modeling process flow is used for the CREZ process, as seen in Figure 6.4.

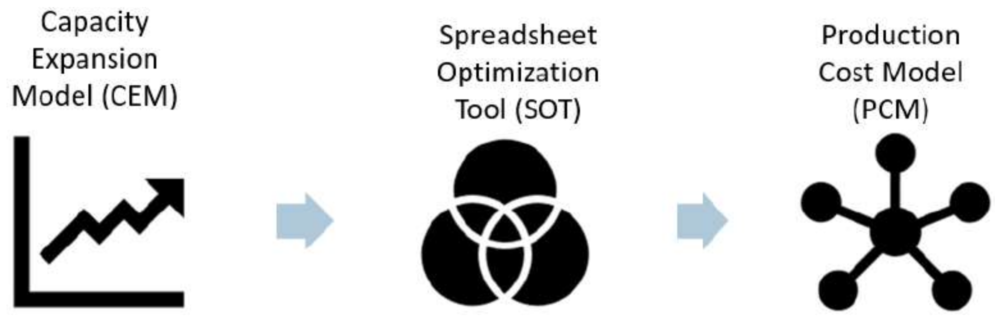


Figure 6.4: Philippine System Modelling Approach

The Philippine DOE is responsible in the preparation of the Capacity Expansion Model (CEM), while NGCP is responsible for implementing the Spreadsheet Optimization Tool (SOT) and the preparation of the Production Cost Model (PCM)

6.7 Scenarios

In the CEM, two cases are considered. Case 1 deals with a transmission network wherein Luzon, Visayas, and Mindanao Grids are treated as isolated systems with no interconnections among them. The existing Luzon-Visayas HVDC Interconnection System and the upcoming Mindanao-Visayas HVDC Interconnection are disregarded. Case 2 incorporates the interconnections among the grids with corresponding limits. Both cases were simulated but focus was given to Case 2: Interconnected Systems since it considers the constraints in the transfer capacities between grids. Scenarios considered for the CREZ process are summarized in Figure 6.5.

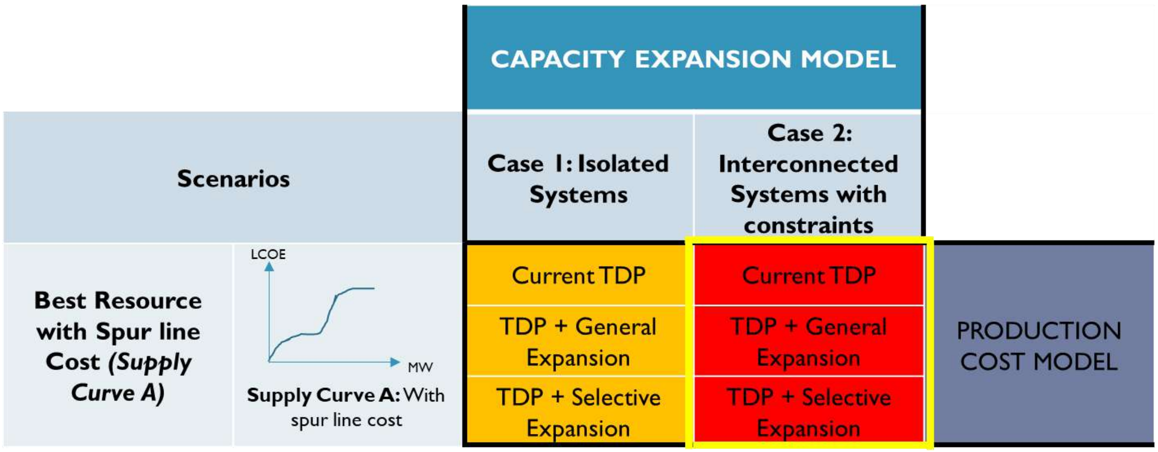


Figure 6.5: Scenarios Considered for Philippine CREZ Process

For the PCM, three scenarios are considered:

A. Base
   1. Current TDP – No additional transmission reinforcement aside from TDP 2016-2040

B. TDP + Expansion – Additional Grid reinforcements
   2. TDP + General Expansion: Directly increasing the capacity of the lines and transformers with violations

3. TDP + Selective Expansion: Upgrading selected facilities with thermal violations (≥5% interval)

Note that in the PCM Scenario 1, transmission lines and transformers can have power flows greater than their thermal limits with corresponding penalty values to be used in the optimization. Lines and transformers which exhibited thermal violations are the ones subjected for upgrades in scenarios 2 and 3.

6.8 Capacity Expansion Model

A CEM attempts to determine the optimal build out of new generation over a considered planning horizon to meet demand and required reserve requirements. For the Philippine CREZ Process, it is assumed that the CEM is a pure generation build out and does not consider transmission build out. Thus, the transmission network considered for the CEM is simplified and lumped to three nodes, with each node representing the Luzon, Visayas, and Mindanao Grid. Inputs to the CEM include generation build out cost, fuel cost, heat rates, demand growth rate, etc. The selected 25 candidate CREZ have corresponding wind and solar capacity factors each. The major output of the CEM is the generation build out per year per technology and the total wind and solar capacity build out.

Shown in Table 6.2 are the resulting capacity addition by 2040 based from the output of the CEM for case 2: interconnected systems.

Table 6.2: Capacity Addition by 2040

Generator Type[11]	Luzon	Visayas	Mindanao	Philippines
New ICE – Diesel	1,040	80	160	1,280
New ICE – LNG	8,540	3,980	1,240	13,760
New CCGT	11,400	1,500	4,200	17,100
New OCGT	400	100	200	700
New Biomass	300	300	260	860
New Hydro	0	300	0	300
New VRE	20,931	7,425	6,278	34,634
Total	42,611	13,685	12,338	68,634

6.9 Spreadsheet Optimization Tool

The generation build out output of the CEM is used as the generation addition input for the PCM. However, the allocation of capacity per CREZ needs further optimization due to factors listed below:

[11] ICE – Internal Combustion Engine; CCGT – Combined Cycle Gas Turbine; OCGT – Open Cycle Gas Turbine

a) Only one build out cost each for VRE is considered across Luzon, Visayas, and Mindanao;

b) The build out cost does not consider spur (connection asset) line cost;

c) Only one capacity profile, i.e., representative capacity factor for VRE in a CREZ; and

d) Temporal resolution (time interval) of the CEM may not fully represent the difference between CREZs.

The SOT is used to incorporate the detailed supply curve per CREZ, which results to the CREZ capacities optimized with the use of the Levelized Cost of Electricity (LCOE). Shown in Table 6.3 is the resulting allocation per CREZ based on the output of the SOT.

Table 6.3: CREZ Capacity Addition with LCOE Optimization in MW/Interconnected Systems

CREZ	PV	WIND
LUZON		
L1	985	1,280
L2	651	654
L3	496	544
L4	1,046	1,047
L5	536	531
L6	101	356
L7	926	834
L8	1,070	1,072
L9	1,109	1,239
L10	765	752
L11	811	675
L12	707	708
L13	486	502
Mr1	130	386
Mr2	213	324
Total	10,032	10,904
VISAYAS		
B1	506	443
N1	355	708
N2	854	551
Py1	579	693
Py2	908	676
S1	513	644
Total	3,715	3,715
MINDANAO		
Mn2	1	560
Mn4	522	1,263
Mn7	705	788
Mn8	969	1,472
Total	2,197	4,083
PHILIPPINES		
Total	15,944	18,702
	34,646	

6.10 Production Cost Model

A production cost model optimizes the day-ahead dispatch schedule of generating units subject to physical and economic constraints of the system. Physical constraints include thermal limits of transmission lines and generators' operational requirements such as ramp rates, minimum number of hours units should be on or off, and minimum stable output if on. Economic parameters include inputs pertaining to cost assumptions. The DOE provided the production cost data for all generator types including other generator parameters.

The 2040 transmission network considered for the PCM already reflects all planned transmission network enhancements as stated in TDP 2016-2040 Volume 1. Corresponding additional grid reinforcements are reflected for both cases of general and selective expansion in the PCM. For the additional generating capacities, committed power plants included in the list of PSIPP as of December 2017 are considered as well as the output generation build out from the CEM.

To simplify the model and reduce run-times, only thermal limits of transmission lines with voltage rating greater than or equal to 138 kV are considered. It was observed that considering such limit maintains the accuracy in terms of transmission line flows and reasonable run-times. In addition, a lossless system is considered, while N-1 contingency provision is not considered, and no transmission line, transformer, and generator outages are included. However, future modeling exercises can consider these additional inputs.

6.11 Initial Assessment

The CREZ' Transmission Working Group conducted simulations and produced results of a scenario following a complete REZ process as outlined in Section 6.4. Thus, only preliminary results which are subject for changes and/or improvements are presented.

Shown in Figures 6.6 and 6.7 below are the resulting Capacity Mix and Energy Mix by 2040, respectively, when CREZ are included in the system.

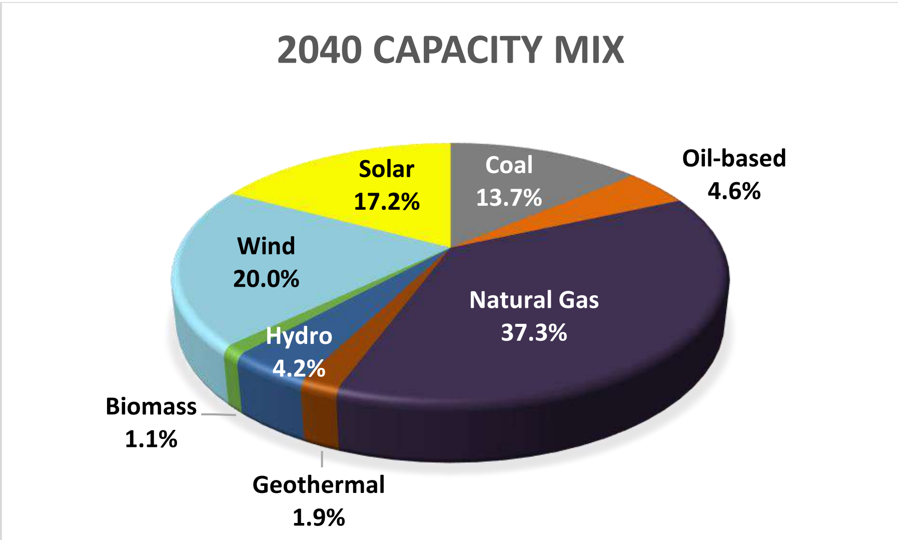


Figure 6.6: 2040 Philippine Capacity Mix with CREZ

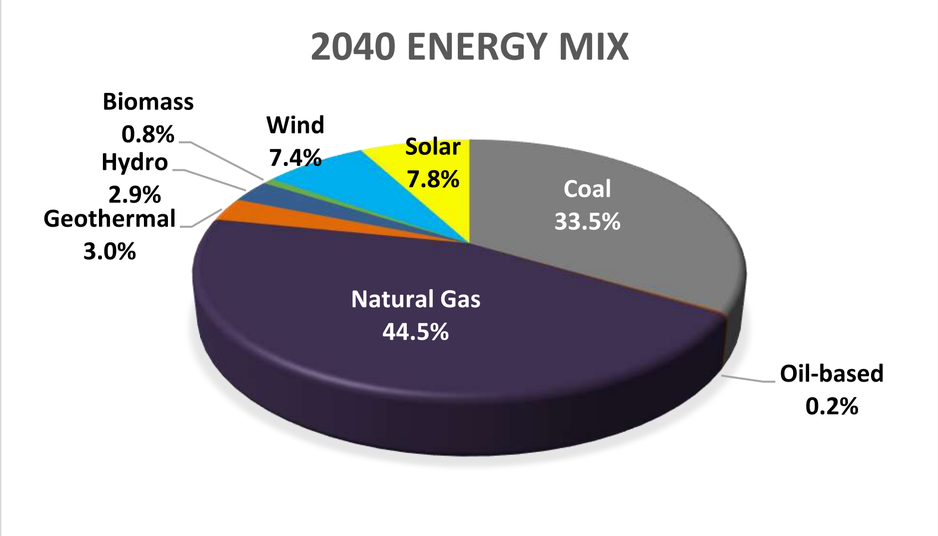


Figure 6.7: 2040 Philippine Energy Mix with CREZ

With majority of generation addition based from the CEM output are generating facilities utilizing Liquefied Natural Gas (LNG) as fuel, the part of Natural Gas plants for both capacity and energy mixes is largest among power plants with other fuel types comprising of about 37.3% and 44.5%, respectively. VRE constitutes to about 37.2% of the capacity mix. However, due to its intermittency, it could only contribute about 15.2% in the energy mix. The overall RE contribution in the capacity mix is about 44.4%

Table 6.4: 2040 Comparative RE and CREZ Energy Share and CREZ Curtailment

Scenario	RE Energy Share (%)	CREZ Energy Share (%)	CREZ Curtailment) (%)
TDP 2016-2040	21.3	14.0	4.7
TDP and General Grid Expansion	21.8	14.6	0.7
TDP and Selective Grid Expansion	21.5	14.3	2.4

Table 6.4 shows that by 2040, the total RE share can be brought to about 21.8% with the VRE (CREZ) contributing about 14.6%. When no transmission enhancements aside from TDP 2016-2040 are considered, curtailment level from CREZ is about 4.7%. Through general expansion, this level can be brought down to as much as 0.7%

Listed below are some notes for consideration:

a) The PCM results do not consider intra-hour VRE generation variation. Hence, the impact of such amount of capacity in terms of real-time supply-demand balancing, i.e., frequency regulation, may be considered in a separate study;

b) The impact of such amount of capacity in terms of voltage regulation, stability, among others will be best investigated on a separate reliability study/analysis; and

c) The aggregate VRE capacity by 2040 may only be realized upon the completion of transmission projects considered in the system model.

6.12 Way Forward

Enumerated below are possible scenarios for consideration in future simulations under the Philippine CREZ process:

a) Incorporate in the CEM and PCM the BESS for AS and other applications;
b) Instead of letting the CEM optimize capacity build outs for VRE, set capacity target for VRE by year 2040, i.e., 40 GW by 2040;
c) Test additional Transmission Scenario build outs to increase VRE share, i.e., new transmission corridors and island interconnections;
d) Combine various “flexibility options” in increasing VRE share, i.e., adding flexible generation (GT), Demand-Side Management through BESS, transmission expansion, etc.;
e) Include N-1 contingency provision for transmission build outs; and
f) Conduct separate study for intra-hour variation of VRE for System Operations

7.1 The Energy Storage System (ESS)

In August 2019, the DOE issued Department Circular No. DC2019-08-0012 entitled, "Providing a Framework for Energy Storage System in the Electric Power Industry", establishing a policy on the operation, connection and application of ESS among others. It recognizes that the ESS technologies are applied to serve variety of functions in the generation, transmission and distribution of electric energy, which include Energy Generation, Peak Shaving and Ancillary Services (AS). The increasing integration of VREs in the transmission system necessitates the recognition of ESS as one of the technologies to manage the intermittent operation of the VRE-generating plants' output to ensure stability. Moreover, ESS will be one of the key elements in the proposed Smart Grid Roadmap towards power system modernization.

The ESS refers to a facility acting as a load and a generator, which is designed to receive, store and convert such energy to electricity. ESS shall include:

a) Battery Energy Storage System (BESS);
b) Compressed Air Energy Storage (CAES);
c) Flywheel Energy Storage (FES); and
d) Pumped-Storage Hydropower (PSH)

The DOE may identify, adopt, and recognize any other ESS technologies that may be developed in the future.

As stated in the Department Circular, NGCP is mandated to incorporate in the annual TDP the recommended sizing and siting of ESS, while taking into consideration the existing transmission capacity and planned upgrading. Also, ESS must be considered as an alternative solution to address the transmission congestion and transmission facilities upgrade deferment.

7.2 Applications of BESS

BESS is a new technology that has various applications for a transmission system, such as provision of AS, transmission facility upgrades deferment and transmission congestion relief.

The increasing penetration of VREs has the potential to cause significant degradation of the power system performance due to their intermittent nature, which necessitates an increase in the required AS. With focus on large scale wind and solar power generation connected to the grid, rapidly varying power output depending on many factors result in many challenges in the System Operations. BESS is now being widely used to mitigate the effects of integrating RE resources. BESS is capable of absorbing and delivering both real and reactive power in a millisecond time frame. With such capability, BESS is being used in addressing the challenges on the intermittency brought by RE, i.e., solar and wind energy sources on their ramp rate, frequency, and power quality.

Moreover, the applications considered for the BESS also include frequency regulation, RE fluctuation stabilization, etc. The system inertia, governor droop and damping capability of the BESS can be set (dynamically) according to the power system requirements. Thus, BESS appears to offer one of the most flexible providers of AS to the transmission system.

Furthermore, BESS when connected to appropriate nodes may defer the need for additional transmission facility upgrades by supplying the peak demand of grid/end-users through BESS. It can also mitigate or eliminate the congestion when demand for power exceeds the transmission network capability that may lead to a violation of thermal or voltage stability.

7.3 NGCP's Recommended Sites and Capacities for BESS

7.3.1 Methodology

The methodology used in determining the recommended capacities and sites of BESS involved load flow analyses to determine the maximum capacity that each site can accommodate during charging and discharging states of BESS with unity power factor.

The scenarios considered in the system simulation were base case peak demand. To test the available capacity of NGCP substation/facilities, the worst generation dispatch was used to see the total power flowing to the connection points. The generation dispatch scenarios discussed in Section 2.2 were considered in the system simulation involving BESS.

The following criteria are considered for normal and N-1 conditions:

a) No overloading of the existing and future equipment and facilities once the BESS are connected and operating as a load and as a generator;

b) The resulting voltages are within the PGC prescribed limits; and

c) Substation termination is available

7.3.2 Application

NGCP initially identified BESS's application as a provision for AS, particularly as a reserve. Considering the forthcoming transition to new AS classifications, i.e., primary, secondary, and tertiary reserves and with BESS's fast response and flexibility, it is initially seen to be well suited as a primary reserve. Further studies will be conducted to explore other applications of BESS including adoption of the best practices in other jurisdictions in determining additional reserves due to rapidly increasing VRE penetration in the grid.

7.3.3 List of Recommended Capacities and Sites

The following are the initial lists of recommended capacities and sites of BESS as a primary reserve in Luzon, the Visayas, and Mindanao Grids:

Table 7.1: Initial Recommended BESS Capacities and Sites

Substation	Voltage Level	Recommended BESS Capacity (MW)
LUZON GRID		
Masinloc	69 kV	20
Daraga	69 kV	40
Laoag	69 kV	40
San Rafael	69 kV	20
Labo	69 kV	20

Substation	Voltage Level	Recommended BESS Capacity (MW)
Mexico	69 kV	20
San Manuel	69 kV	20
Bay	69 kV	20
Labrador	69 kV	20
Lamao	230 kV	30
Lumban	69 kV	40
	Total Capacity	290
VISAYAS GRID		
Kabankalan	138 kV	10
Ormoc	69 kV	20
Samboan	69 kV	10
Sta. Barbara	138 kV	10
Compostela	230 kV	20
	Total Capacity	70
MINDANAO GRID		
Villanueva	138 kV	10
Davao	69 kV	20
Maco	69 kV	20
Kibawe	69 kV	20
Butuan	69 kV	20
	Total Capacity	90

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[12].

8.1 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.

8.1.1 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.

8.1.2 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[13]. 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.

8.1.3 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;

[12] CIGREE-IEEE joint task force on stability terms and definitions
[13] 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.

8.1.4 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, 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.

8.1.5 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.

8.2 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.

8.3 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.

8.4 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.

8.4.1 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)14. Appendix 4 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. In the succeeding years, 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.

8.4.2 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

8.5 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

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

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.

In 2019, DOE drafted a circular entitled "Providing a National Smart Grid Policy Framework for the Philippine Electric Power Industry and Roadmap for Distribution Utilities". It envisions the Philippines to reach a level of Smart Grid development capable of (1) Self-healing grid; (2) Full implementation of Retail Competition and Open Access (RCOA), Renewable Portfolio Standards (RPS), Green Energy Option (GEOP), and Net Metering; (3) Full Customer Choice, (4) Demand Response and Peak Load Management; (5) Optimized Energy Storage Systems (ESSs), Energy Management Systems (EMSs), and Distribution Energy Resources (DERs) Management Systems; Virtual Power Plant Integration; and (6) Smart Homes and Cities.

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.[15]

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.[16]

Over the past 9 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.

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

[15] From IEC Definition of Smart Grid
[16] From IEC Smart Grid Standardization Roadmap

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.

In 2019, NGCP completed a total of 55 circuit-km of overhead transmission lines, installed 3,200 MVA additional substation capacities, and added 1,353 MVAR for voltage improvement (See Appendix 5). Other projects approved by the ERC are currently in various stages of implementation. The approvals for the projects were obtained either during the regulatory reset process or through a separate application to the ERC. For the Fourth and Fifth Regulatory Periods, which is from 2016 to 2020 and 2021 to 2025, respectively, a combined regulatory reset process is expected for the ERC's further review of the capital expenditure. For a summary of projects for implementation and other proposed projects, please refer to Appendix 6. Also, a summary of the changes in the components and ETC of the projects from the TDP 2019-2040 to TDP 2020-2040 can be seen in Appendix 7.

9.1 Projects for Implementation

The list below summarized the updates on the ERC-approved projects with ETC by 2019 onwards with their implementation status as of December 2019.

Table 9.1: 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.	Jun 2020
		Study Components: ▪ Power System Study; ▪ Feasibility Study. Bulk Cost Estimate: 194 Million Pesos Status: ERC-approved	
San Jose–Quezon 230 kV Line 3	SR	To increase transfer capacity of the existing corridor and maintain the N-1 contingency provision.	Mar 2020
		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 Status: Construction ongoing: Transmission Line: 90.05%; Substation: 98.08%	
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 2020
		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 Status: Construction ongoing: Turnkey (T/L): 84.27% complete	
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.	Dec 2020
		Substation Components:	

Project Name	Driver	Purpose and Components	ETC
		▪ 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. <u>Transmission Components:</u> ▪ 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 Status: Construction ongoing: Turnkey (Secondary Equipment): 75.80% complete, Erection (Primary Equipment): 24.35%	
Calamba 230 kV Substation	LG	To accommodate the intensive load growth of MERALCO's Laguna Sector.	Jun 2020
		<u>Substation Components:</u> ▪ Calamba 230 kV Substation, 10-230 kV PCBs and associated equipment. <u>Transmission Components:</u> ▪ Bus-in Lines, 230 kV Transmission Line, SP-DC, 2-610 mm^2 TACSR/AS, 1.5km. Bulk Cost Estimate: 1,069 Million Pesos Status: Construction ongoing: Transmission Line: 34.78%; Calamba S/S: 67.58%	
Tower Structure Upgrading of Bicol Transmission Facilities	SR	To reconstruct the affected transmission lines and transmission towers and structures marred by Typhoon Nina.	Jun 2020
		<u>Transmission Components:</u> ▪ 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 Status: Construction ongoing (88.30%)	
Mariveles–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.	Dec 2020
		<u>Substation Components:</u> ▪ Mariveles 500 kV Switching Station (New), 12-500 kV PCBs and associated equipment. ▪ Hermosa 500 kV Substation, 2-500 kV PCBs and associated equipment. <u>Transmission Components:</u> ▪ 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 Status: Construction ongoing: Transmission Line: 29.24%; Substation: 2.34%	
North Luzon Substation Upgrading Project	SR	To cater the load growth and provide N-1 contingency to various substations in the North Luzon Region.	Nov 2020
		Stage 1: <u>Substation Components:</u> ▪ Bauang 230 kV Substation (Replacement), 1x100 MVA 230/115/69-13.8 kV Power Transformer and accessories, 7-230 kV PCBs and associated equipment;	Mar 2020

Project Name	Driver	Purpose and Components	ETC
		▪ Gamu 230 kV Substation, 1x100 MVA Power Transformer and accessories,10-230 kV PCBs and associated equipment, 2-69 kV PCBs and associated equipment;	Mar 2020
		▪ Bayombong 230 kV Substation, 1x100 MVA Power Transformer and accessories, 5-230 kV PCBs and associated equipment, 3-69 kV PCBs and associated equipment;	Jun 2020
		▪ Hermosa 69 kV Substation, 10-69 kV PCBs and associated equipment;	Mar 2020
		▪ 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;	Nov 2020
		▪ Quezon 230 kV Substation (Expansion), 3-230 kV PCBs and associated equipment	Nov 2020
		▪ 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.	Mar 2020
		▪ Doña Imelda Substation, 1-115 kV PCBs and associated equipment and neutral grounding transformer and accessories;	Mar 2020
		▪ Concepcion 69 kV Substation, 22-69 kV PCBs and associated equipment	Nov 2020
		Stage 2: <u>Substation Components:</u> ▪ 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 Status for Stage 1: Bayombong S/S: 87.44%, Gamu S/S: 80.11%, San Jose S/S: 87.06%, Bauang S/S: 85.39%, Hermosa S/S: 84.60%, Malaya S/S: 89.42%, Gamu S/S (Secondary Devices): 49.90%, Bayombong S/S (Secondary Devices) : 77.99%, San Jose S/S (Secondary Devices) : 47.30%, Bauang S/S (Secondary Devices) : 42.90%, Hermosa S/S (Secondary Devices) : 31.23%, Malaya S/S (Secondary Devices): 40.19%, San Jose S/S Turnkey (S/S): 98.40%, San Jose S/S (Protection System) Turnkey (S/S): 95.59%, Malaya S/S Turnkey (S/S): 3.20%	
		Status for Stage 2: Substation: 3.20%	

Project Name	Driver	Purpose and Components	ETC
Luzon PCB Replacement	SR	To replace old power circuit breakers and improve the substation reliability of San Jose, Labo, Malaya and Gumaca Substation.	Dec 2020
		Substation Components: ▪ San Jose Substation, 9-115 kV PCBs and associated equipment. ▪ Malaya Substation, 4-230 kV PCBs and associated equipment. Bulk Cost Estimate: 30 Million Pesos Status: Construction ongoing: San Jose S/S: 87.06% complete, Malaya S/S: 89.42% complete	
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.	Jun 2022
		Stage 1: Substation Components: ▪ Baler Load-End 69 kV Substation, 3x2.5 MVAR, 69 kV Capacitor Banks and accessories, 4-69 kV PCBs and associated equipment;	Dec 2020
		▪ Pantabangan Load-end 69 kV Substation, 1x5 MVAR, 69 kV Capacitor Bank and accessories, 1-69 kV PCBs and associated equipment;	Dec 2020
		▪ Umingan Load-end 69 kV Substation, 3x5 MVAR 69 kV Capacitor Banks and accessories, 4-69 kV PCBs and associated equipment;	Dec 2020
		▪ Camiling Load-end 69 kV Substation, 3x5 MVAR 69 kV Capacitor Banks and accessories, 4-69 kV PCBs and associated equipment;	Dec 2020
		Stage 2: Substation Components: ▪ San Esteban 230 kV Substation, 2x25 MVAR, 230 kV Capacitor Banks and accessories, 2-230 kV PCBs and associated equipment;	Aug 2020
		▪ 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;	Dec 2020
		▪ Itogon Load-end 69 kV Substation, 1x7.5 MVAR, 69 kV Capacitor Bank and accessories, 1-69 kV PCBs and associated equipment;	Dec 2020
		▪ Antipolo 230 kV Substation, 2x100 MVAR, 230 kV Capacitor Banks and accessories, 2-230 kV PCBs and associated equipment;	Aug 2020
		▪ Taytay 230 kV Substation, 3x100 MVAR, 230 kV Capacitor Banks and accessories, 3-230 kV PCBs and associated equipment;	Apr 2020
		▪ Quezon 230 kV Substation, 1x100 MVAR, 230 kV Capacitor Banks and accessories, 1-230 kV PCBs and associated equipment;	Apr 2020
		▪ 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 Status for Stage 1: Mexico S/S: 60.50% Status for Stage 2: Lal-lo S/S: 42.17%; San Esteban S/S: 30.87%	Dec 2020
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.	Mar 2021
		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.	

Project Name	Driver	Purpose and Components	ETC
		Transmission Components: ▪ Clark-Mabiga 69 kV Transmission Line, 1-410mm^2 TACSR/AS, SP-DC, 6 km. Bulk Cost Estimate: 549 Million Pesos Status: Construction ongoing: Transmission Line: For re-rerouting of line; Clark S/S: 93.76%	
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.	Mar 2021
		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 Status: Construction ongoing: Transmission Line: 12.65%; Substation: Site Development: 63.64%; Turnkey: Secondary Equipment and Erection of Primary Equipment: 1.82%	
Pagbilao 500 kV Substation	GE	To develop new 500 kV substation that aims to accommodate the connection of incoming power plants in Quezon Province	Mar 2021
		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 Status: Construction ongoing: Transmission Line: 29.24%; Substation: 2.72%	
Navotas 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.	Mar 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 Status: Construction ongoing: Turnkey (S/S): 83.65%	
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.	May 2021

Project Name	Driver	Purpose and Components	ETC
		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 Status: Construction ongoing: Transmissio Line: 47.16%; Substation: 80.90%	
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.	Jun 2021
		Transmission Components: ▪ Hermosa–Duhat 230 kV Transmission Line, 230 kV, SP-SC, 2-795 MCM, 20 steel poles. Bulk Cost Estimate: 222 Million Pesos Status: Construction ongoing: 53.51% complete	
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 2021
		Substation Components: ▪ New Hermosa 230 kV Substation, 4-230 kV PCBs and associated equipment. Transmission Components: ▪ Castillejos–Hermosa 500 kV Transmission Line, ST-DC, 4-410 mm^2 TACSR/AS, 34 km. Bulk Cost Estimate: 2,631 Million Pesos Status: Construction ongoing: Transmission Line: 59.51%	
Taguig 500 kV Substation	LG	To alleviate the anticipated overloading of San Jose EHV Substation and to relieve the criticality of Quezon–Muntinlupa 230 kV Line during N-1 contingency.	Jun 2021
		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 Status: Construction ongoing: Taguig–Baras T/L: 7.02%; Substation Site Development: 88.09%; Taguig 500 kV S/S: 26.17%	
Antipolo 230 kV Substation	LG	To accommodate the demand increase in Metro Manila and maintain the N-1 contingency provision for Taytay Substation.	Aug 2021
		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	

Project Name	Driver	Purpose and Components	ETC
		Status: Construction ongoing: Site Development (S/S): 8.64%, Turnkey (Secondary Equipment): 54.52%; Erection (Primary Equipment): Securing of LGU Permits	
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.	Nov 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 Status: Turnkey (T/L): Preparation of bid documents	
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.	Nov 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 Status for Stage 1: Turnkey (S/S): 91.70% complete Status for Stage 2: Turnkey (T/L): Preparation of bid documents	
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 ▪ Calaca (new) Substation, Replacement of Current Transformers and Busworks Transmission Components: ▪ 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 Status: Construction Ongoing: Tuy S/S: 14.70%	
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	Dec 2021

Project Name	Driver	Purpose and Components	ETC
		Stage 1: Substation Components: ▪ 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: Substation Components: ▪ Daraga 230 kV Substation (Replacement), 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 Status for Stage 1: Las Pinas S/S: 23.21% Status for Stage 2: Pre-construction activity	Sep 2021 Sep 2021 Sep 2021 Jun 2022 Jun 2022 Jun 2022
Eastern Albay 69 kV Line Stage 2	SR	To provide the looping configuration for the 69 kV line in eastern Albay.	Sep 2022
		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 Status: Construction ongoing: Sto. Domingo S/S: Notice of Award	
La Trinidad–Calot 69 kV Transmission Line	SR	To improve the reliability and increase the transfer capacity of the 69 kV transmission line serving the load-end substations of BENECO and HEDCOR's Asin and Ampohaw.	Oct 2022
		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 Status: Pre-construction activity	
Luzon Voltage Improvement – 4	SR	To address the anticipated undervoltage problem during peak condition at various substations in the Luzon Grid.	Jun 2022

Project Name	Driver	Purpose and Components	ETC
		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 Status for Stage 1: Turnkey (S/S): Notice of Award Status for Stage 2: Pre-construction activity	Feb 2023 Feb 2023 Feb 2023 Feb 2023 Feb 2023 Feb 2023 Feb 2023 Feb 2023 Feb 2023 Feb 2023

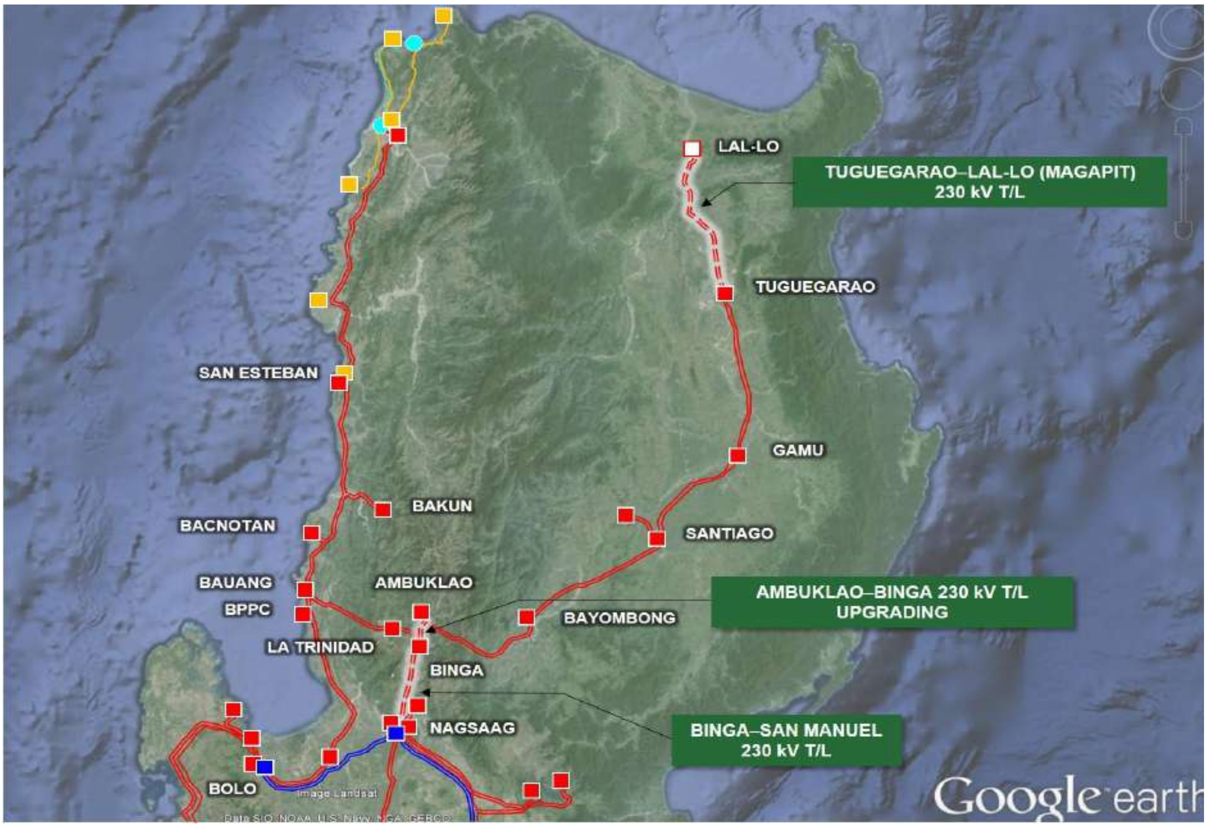


Figure 9.1: North Luzon Projects for Implementation

Figure 9.2: Central Luzon Projects for Implementation

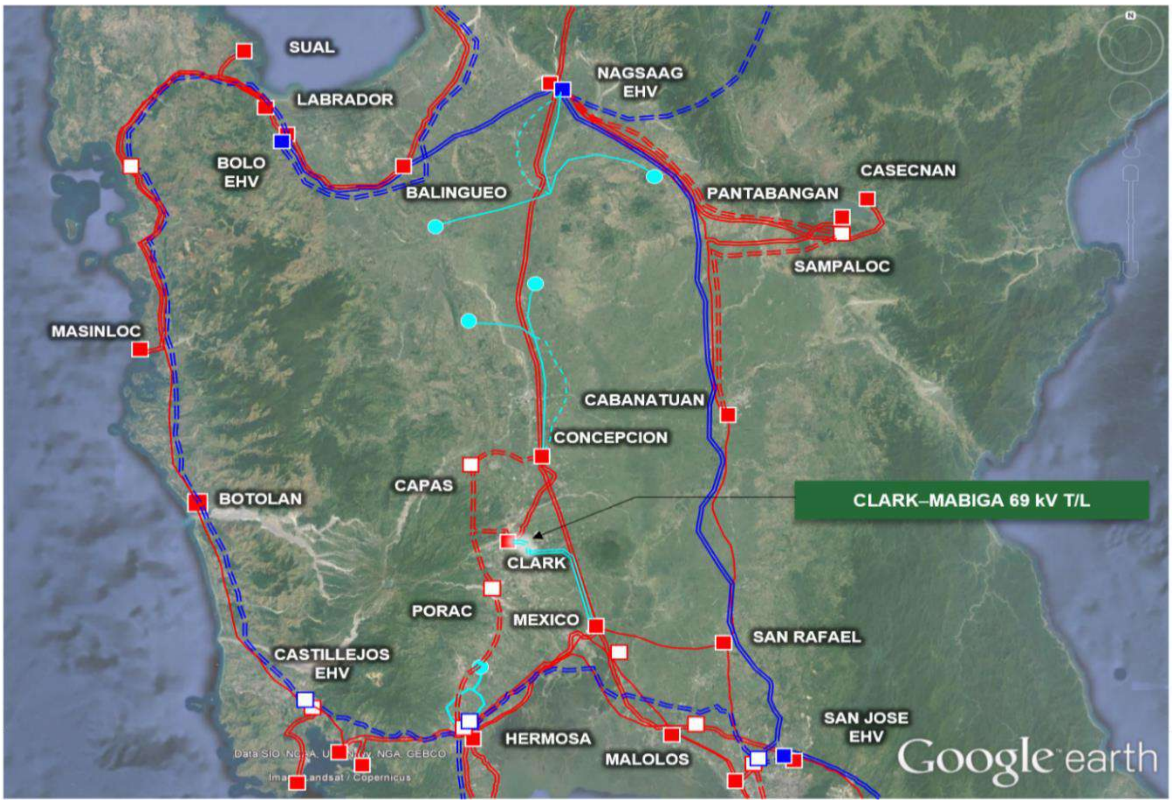


Figure 9.3: Metro Manila Projects for Implementation

Figure 9.4(a): South Luzon Projects for Implementation

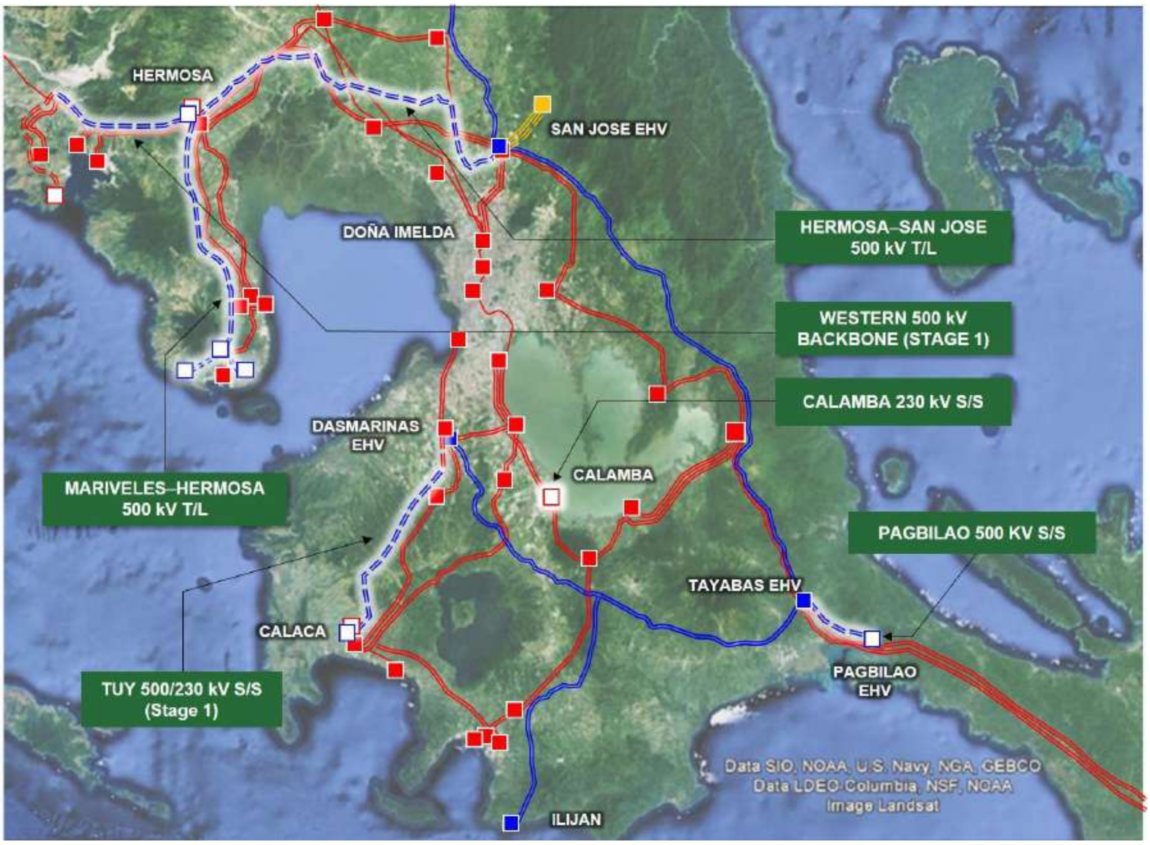


Figure 9.4(b): South Luzon Projects for Implementation

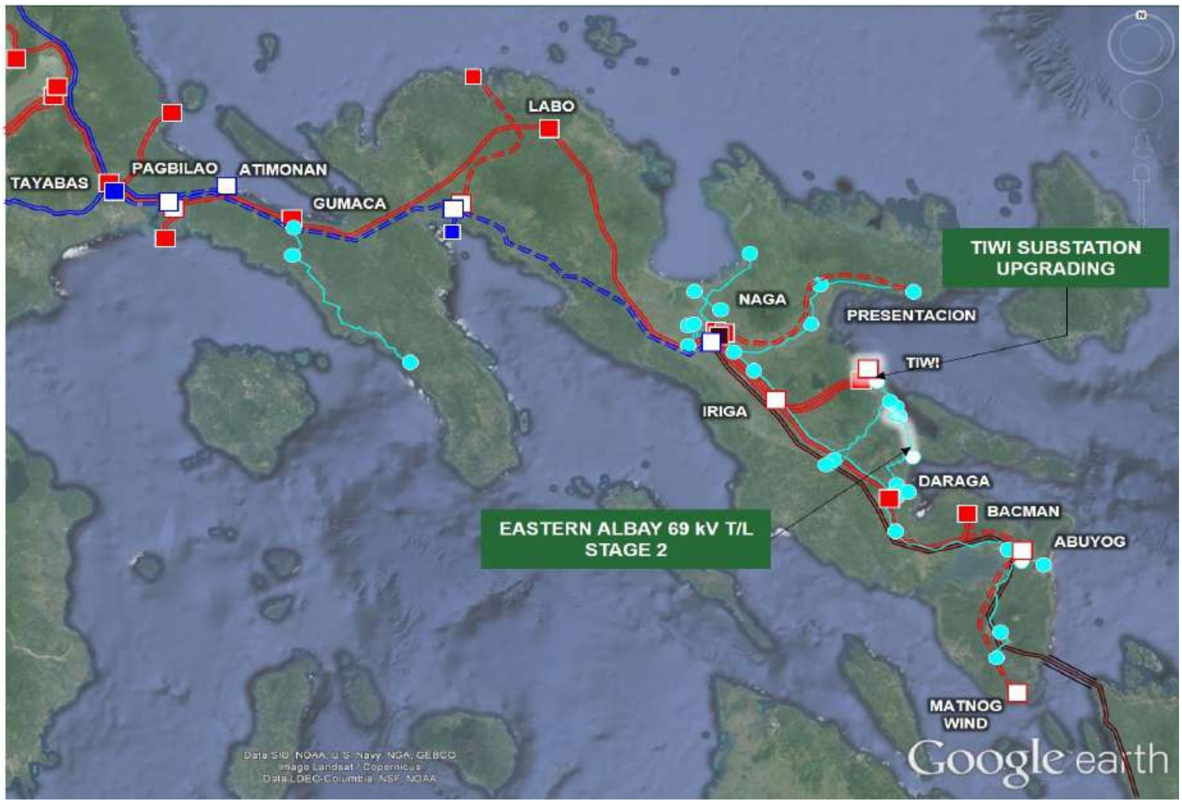


Figure 9.5: Bicol Region Projects for Implementation

Table 9.2: Projects for Implementation in Visayas

Project Name	Driver	Purpose and Components	ETC
Visayas Substation Reliability Project I	SR	To add substation capacity and provide N-1 contingency in various substations in the Visayas Grid.	Jun 2020
		<u>Substation Components:</u> ▪ Maasin Substation Expansion, 1x50 MVA 138/69-13.8 kV Power Transformer and accessories. Bulk Cost Estimate: 1,190 million Pesos Status: Construction ongoing: Maasin S/S: 97.20%	
Visayas Substation Reliability Project II	SR	To add substation capacity to provide N-1 contingency in various substations in the Visayas Grid.	Jun 2020
		<u>Substation Components:</u> ▪ Mandaue 138 kV Substation 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 Substation 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 Substation Expansion, 1-69 kV PCBs and associated equipment; ▪ Sta. Barbara 69 kV Substation Expansion, 2-69 kV PCBs and associated equipment. ▪ Sta. Rita Substation Expansion, Transfer of 50 MVA transformer from Ormoc Substation Bulk Cost Estimate: 532 million Pesos Status: Construction ongoing: Lapu-Lapu S/S: 97.40%; Mandaue S/S: 97.40%	
New Naga (Colon) Substation Project (Remaining Works)	LG	To upgrade existing substation to meet load growth	Dec 2020
		<u>Substation Components:</u> ▪ Colon 138 kV Substation, 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. <u>Transmission Components:</u> ▪ Transfer of Sibonga and VECO Naga 69 kV Feeder from Naga Substation to Colon Substation, SP-DC, 1-795 MCM ACSR, 1.5 km. Bulk Cost Estimate: 313 million Pesos Status: Construction ongoing: 7.04%	
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 2020
		<u>Transmission Components:</u> ▪ San Carlos–Guihulngan 69 kV Transmission Line, ST-SC, 1-336.4 MCM ACSR, 58 km. Bulk Cost Estimate: 467 million Pesos Status: Construction ongoing: Transmission Line: 97.38%	
Sta. Rita–Quinapondan 69 kV Transmission Line	SR	To provide a more reliable and quality transmission service to Eastern Samar.	Dec 2020
		<u>Substation Components:</u> ▪ Sta. Rita Substation Expansion, 2-69 kV PCBs and associated equipment; ▪ Quinapondan Substation Expansion, 2-69 kV Air break switches. <u>Transmission Components:</u> ▪ Sta. Rita–Quinapondan 69 kV Transmission Line, ST-SC, 1-336.4 MCM, 97 km. Bulk Cost Estimate: 363 million Pesos Status: Construction ongoing: 99.67%	
Cebu–Negros–Panay 230 kV	GE, SR	To increase transfer capacity of the existing corridor and maintain the N-1 contingency provision.	Dec 2020

Project Name	Driver	Purpose and Components	ETC
Backbone Project - Stage 1		<u>Substation Components:</u> ▪ Bacolod Substation Expansion, 2-138 kV PCBs and associated equipment. <u>Transmission Line Components:</u> ▪ Bacolod–E. B. Magalona, 230 kV Transmission Line (initially energized at 138 kV), ST-DC, 2-795 MCM ACSR, 39 km. Bulk Cost Estimate: 6,104 million Pesos Status: Construction ongoing: Submarine Cable: Energized; Bacolod-E. B. Magalona T/L: 79.89%	
Naga (Visayas) Substation Upgrading Project	SR	To replace and upgrade the existing antiquated and aging primary and secondary equipment and devices in Naga Substation.	Dec 2020
		<u>Substation Components:</u> ▪ Naga 138 kV Substation, 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 Status: Construction ongoing: 71.04%	
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.	Dec 2020
		<u>Substation Components:</u> ▪ Panitan 138 kV Substation, 1-138 kV PCB and associated equipment; ▪ Nabas 138 kV Substation, 3-138 kV PCBs and associated equipment. <u>Transmission Components:</u> ▪ Panitan–Nabas 138 kV Transmission Line, ST-DC (2nd circuit stringing), 1-795 MCM ACSR, 95 km. Bulk Cost Estimate: 634 million Pesos Status: Construction ongoing; Substation: 25.28%	
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.	Dec 2020
		<u>Substation Components:</u> ▪ Tagbilaran 69 kV Substation (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 Status: Construction ongoing: 51.47%	
Cebu–Lapu-Lapu 230 kV Transmission Line Project	SR	To increase transfer capacity of the existing corridor and maintain the N-1 contingency provision.	Dec 2021
		<u>Transmission Components:</u> ▪ Cebu–Umapad 230 kV Transmission Line, ST/SP-DC, 2-410 mm^2 STACIR, 9 km. Bulk Cost Estimate: 1,884 million Pesos Status: Construction ongoing: 97.63%	
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 2021
		<u>Substation Components:</u> ▪ Magdugo 230 kV Substation, 3x300 MVA 230/138 kV Power Transformer and accessories, 2x70 MVAR 230 kV Reactor, 17-230 kV PCBs, 15-138 kV PCBs and associated equipment, 2x70 MVAR 230 kV Line Reactor; ▪ Calatrava 230 kV Substation, 2x100 MVA 230/69 kV Power Transformer and accessories, 2x70 MVAR 230 kV Reactor, 1x70 MVAR 230 kV Line Reactor, 1x70 MVAR 230 kV Bus Reactor, 12-230 kV PCBs, 8-69 kV PCBs; ▪ Cadiz 230 kV Substation, 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 Line Reactor 9-230 kV PCBs and associated equipment; ▪ Barotac Viejo 230 kV Substation, 3x300 MVA 230/138 kV Power Transformer and accessories, 1x70 MVAR 230 kV Line Reactor, 8-230 kV PCBs, 6-138 kV PCBs and associated equipment; ▪ Bacolod 230 kV Substation, 2x300 MVA 230/138 kV Power Transformer and accessories, 6-230 kV PCBs, 1-138 kV PCB and associated equipment; ▪ Colon 138 kV Substation, 2-138 kV PCBs and associated equipment. ▪ San Carlos 69 kV SWS, 11-69 kV PCBs and associated equipment. ▪ Quiot 138 kV S/S, Uprating of 4-138 kV PCBs and associated equipment ▪ Cebu 138 kV S/S, Uprating of 2-138 kV PCBs and associated equipment Transmission Components: ▪ Magdugo–Cebu 230 kV Transmission Line, ST-DC, 4-795 MCM ACSR, 35 km; ▪ Talavera–Magdugo 230 kV Transmission Line, ST-DC, 4-795 MCM ACSR, 6 km; ▪ Cadiz–Calatrava 230 kV Transmission Line, ST-DC, 4-795 MCM ACSR, 80 km; ▪ E. B. Magalona–Cadiz 230 kV Transmission Line, ST-DC, 4-795 MCM ACSR, 45 km; ▪ Transfer of the CEDC 138 kV Line from AYA Substation to Colon Substation; ▪ Calatrava CTS–Calatrava Substation, 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 Transmission Line, ST-DC, 1-795 MCM ACSR, 5 km. Submarine Cable Components: ▪ Calatrava–Talavera 230 kV Submarine Cable, Double Circuit, 6-1,600 mm^2 XLPE, 29 km; ▪ Talavera CTS, Cable Sealing End; ▪ Calatrava CTS, Cable Sealing End. Bulk Cost Estimate: 44,563 million Pesos Status of Phase 1: Construction ongoing: Submarine Cable: 84.94%, Transmission Line: Reconductoring/Bundling of 138 kV T/L: 93.78%; Transmission Line: E. B. Magalona–Cadiz–Calatrava 230 kV T/L: Ongoing check survey and stacking of Monument; Magdugo–Cebu (TVI) 230 kV T/L: 14.98%; Barotac Viejo S/S: 55.18%; Bacolod S/S: 0.18% Status of Phase 2: Notice to Proceed	
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 2021 (Stage 1) Jan 2022 (Stage 2)
		Substation Components: Stage 1 (Jan 2021) ▪ Compostela 138 kV S/S, 2x20 MVAR, 138 kV Capacitor Banks and accessories, 2-138 kV PCBs and associated equipment; ▪ Lapu-lapu 138 kV S/S, 2x20 MVAR, 138 kV Capacitor Banks and accessories, 2-138 kV PCBs and associated equipment; ▪ Corella 69 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.	

Project Name	Driver	Purpose and Components	ETC
		Bulk Cost Estimate: 805 million Pesos Status: Construction ongoing, Stage 1: Cebu S/S: 97.93%	

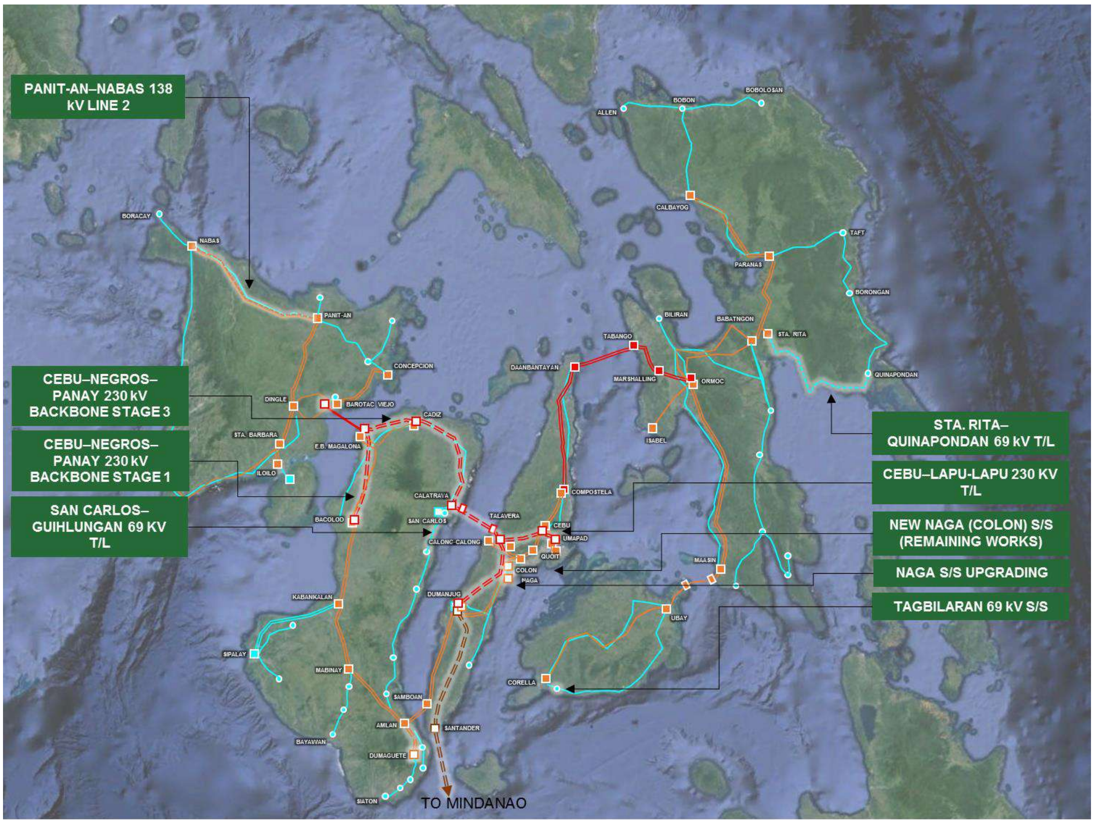


Figure 9.6(a): Visayas Projects for Implementation

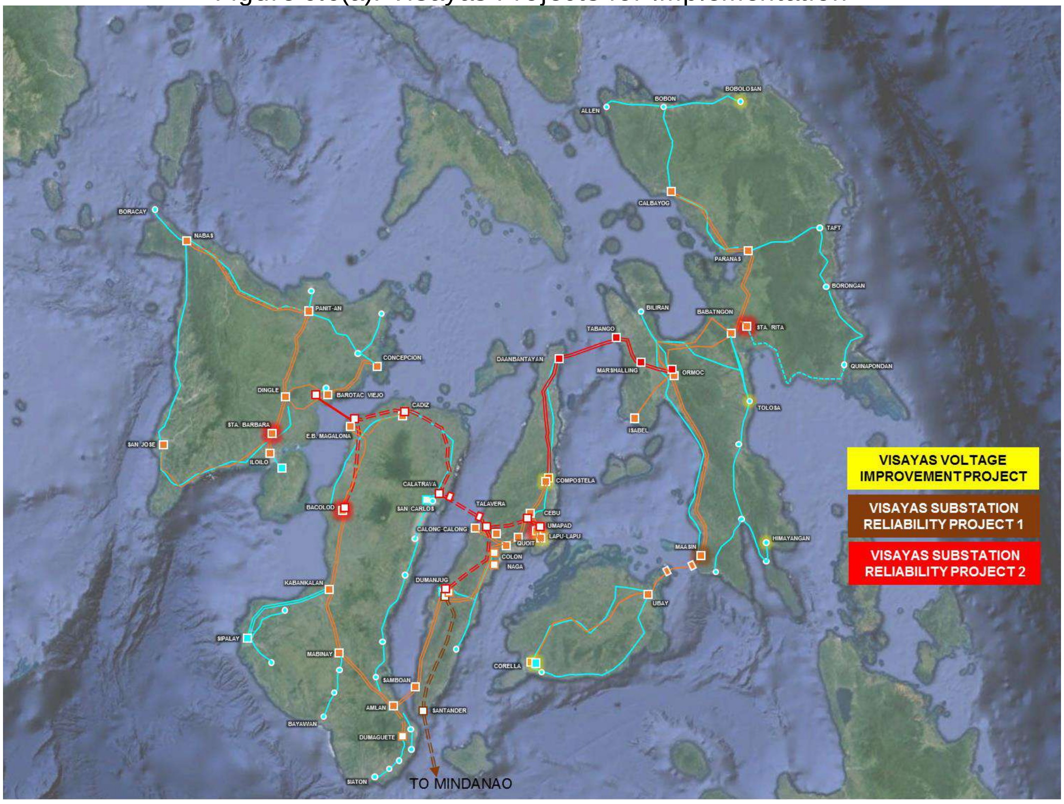


Figure 9.6(b): Visayas Projects for Implementation

Table 9.3: Projects for Implementation in Mindanao

Project Name	Driver	Purpose and Components	ETC
MINDANAO			
Mindanao 230 kV Transmission Backbone	GE	To increase the thermal capacity of the existing corridors and to comply with the N-1 requirement of the grid code.	Mar 2020
		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. ▪ Matanao–Toril–Bunawan 230 kV Transmission Line - Construction ongoing, Transmission Line Erection: 91.84% ▪ Schedule 1 Culaman S/S: 90.90%, Matanao S/S: 79.37%, Toril S/S: 92.07%, and Bunawan S/S: 89.78% ▪ Schedule 2 Baloi S/S: 91.78%, Villanueva S/S: 94.24%, and Maramag S/S: 95.89% Bulk Cost Estimate: 7,090 Million Pesos Status: Construction ongoing: Matanao–Toril–Bunawan T/L: 97.85%; Culaman S/S: 90.90%; Matanao S/S: 89.35%; Toril S/S 94.22%; Bunawan S/S: 93.47%	
Sultan Kudarat (Nuling) Capacitor Project	SR	To mitigate the projected low voltage problems in Maguindanao area.	Jun 2020
		Substation Components: ▪ Sultan Kudarat 138 kV Substation, 2x7.5 MVAR, 69 kV Capacitor Banks and accessories. Bulk Cost Estimate: 54 Million Pesos Status: Civil Works: 98.00%	
Butuan–Placer 138 kV Transmission Line	SR	To provide N-1 to the existing corridor through the installation of a second circuit.	Jun 2020
		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 Status: Construction ongoing, Erection: 87.89%	
Kauswagan–Lala 230 kV Transmission Line Project (Formerly Balo-i–Kauswagan–Aurora 230 kV Transmission Line Project (Phase 2)	GE, SR	To enhance reliability of power supply delivery towards Zamboanga Peninsula. This complements the transmission of power through Mindanao-Visayas Interconnection Project.	Dec 2020
		Substation Components: ▪ 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. Transmission Components: ▪ Kauswagan-Lala 230 kV Transmission Line: ST-DC, 4-795 MCM ACSR, 56 km;	

Project Name	Driver	Purpose and Components	ETC
		▪ Lala-Aurora 138 kV Transmission Line: ST-DC, 2-795 MCM ACSR, 27.17 km. Bulk Cost Estimate: 5,040 Million Pesos Status: Turn-key (Secondary Equipment): 99.80%	
Mindanao Substation Upgrading Project (MSUP)	LG	To enhance the substation capacity and to comply to the N-1 of the grid code	Dec 2021
		Substation Components: ▪ Polanco 138 kV Substation, 1x75 MVA 138/69 kV Power Transformer and accessories, 3-138 kV PCB, 1-69 kV PCB and associated equipment; ▪ 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 Jan 2021 ** Shunt capacitors of General Santos and Tacurong 138 kV substations will be installed in Pitogo Substation. Status for Stage 1: Construction ongoing: Substation: 43.21%; Schedule 3 (General Santos S/S): 25.24% Status for Stage 2: Construction ongoing: Substation: 25.24%	
Agus 2 Switchyard Upgrading Project	SR	To upgrade the existing antiquated and aging primary and secondary equipment and devices in Agus 2 Switchyard	Dec 2020
		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 Status: Construction ongoing, Erection: 94.78%	
Mindanao Substation Rehabilitation Project (MSRP)	SR	To upgrade the obsolete and aging primary and secondary equipment and devices in various Mindanao Substations	Jan 2021
		Substation Components:	

Project Name	Driver	Purpose and Components	ETC
		▪ 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 January 2022 Status for Stage 1: Construction ongoing: Substation: 32.67% Status for Stage 2: Notice of Award	
Tacurong–Kalamansig 69 kV Transmission Line	SR	To connect the currently off-grid part of southwestern area in Sultan Kudarat to the Mindanao Grid.	Aug 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 Status: Notice of Award	

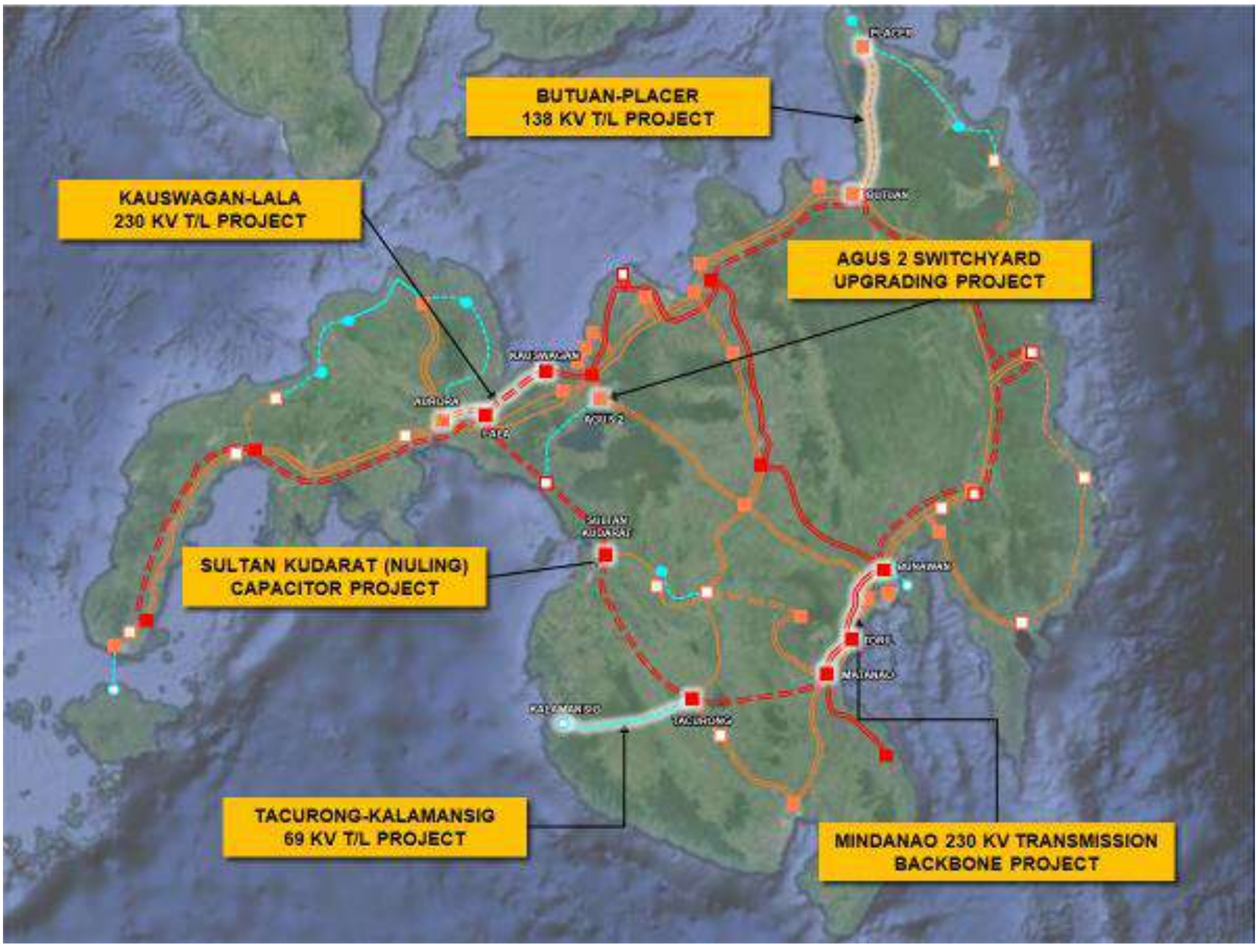


Figure 9.7: Mindanao Projects for implementation

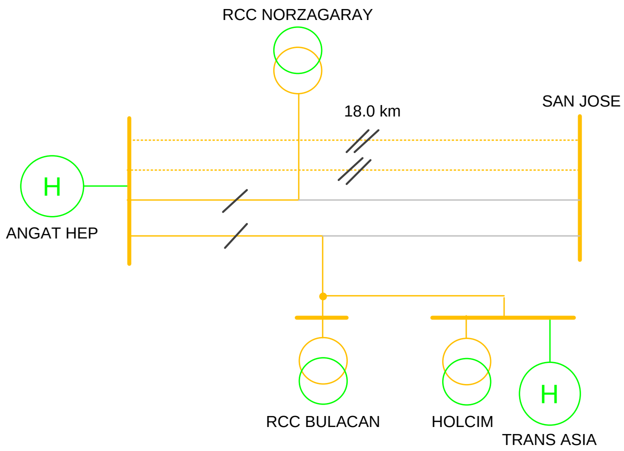
9.2 Luzon Grid

9.2.1 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.

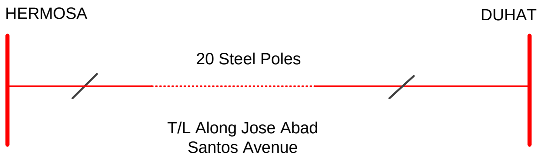
The project involves system studies for the establishment of the appropriate cable capacity based on the available technologies and conduct of surveys for both submarine and overhead portion of the Bataan–Cavite Transmission Line.

9.2.2 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.

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

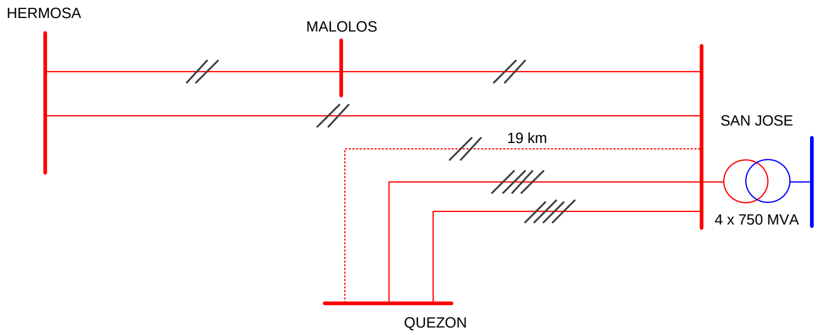


This undertaking is in connection to the road widening project along Jose Abad Santos Avenue in San Fernando, Pampanga which left some 18 steel poles at the middle of the road. The proposed relocation will eliminate the danger brought about by the remaining steel pole structures as well as to prevent 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.

9.2.4 Luzon PCB Replacement

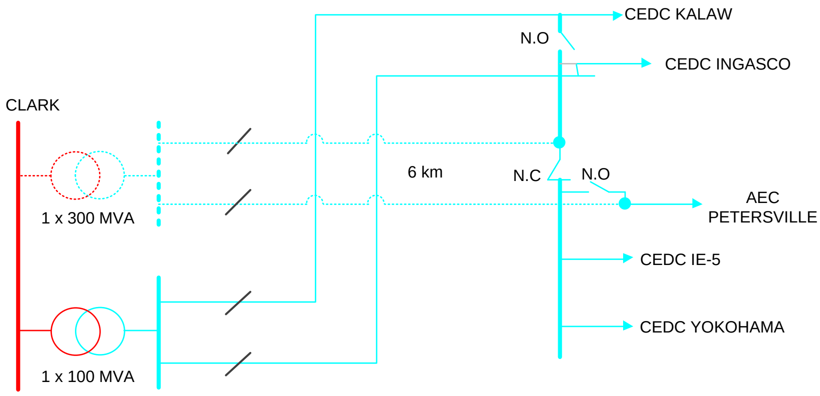
The Luzon PCB Replacement Project aims to improve the system reliability in San Jose, Gumaca, Malaya and Labo Substations in the Luzon Grid. The Project involves the replacement of old and underrated power circuit breakers (PCB). The PCBs with insufficient interrupting capacities pose risk in efficiently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

9.2.5 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.

9.2.6 Clark–Mabiga 69 kV Transmission Line



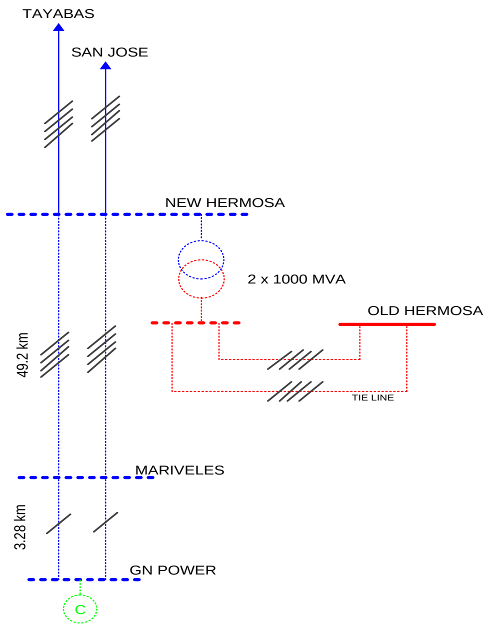
The Clark–Mabiga 69 kV Line Project aims to provide transmission capacity reinforcement to the Mexico–Clark 69 kV Line which is serving PRESCO, PELCO I, PELCO II, Angeles Electric Corporation (AEC), Quanta Paper Corporation and Clark Electric Development Corporation (CEDC). This will address the load 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.

9.2.7 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.

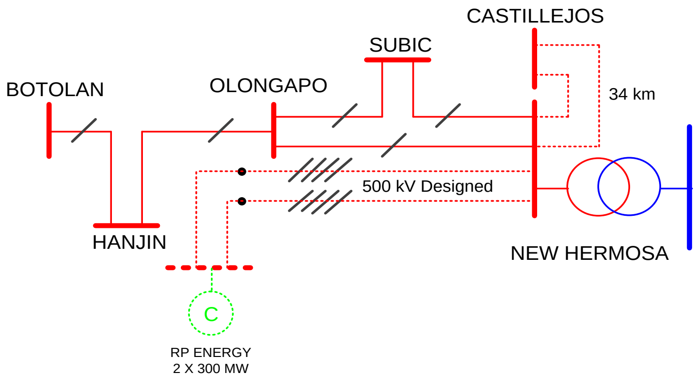
9.2.8 Mariveles–Hermosa 500 kV Transmission Line

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 and 8x150 MW SMC Consolidated Power Corporation CFPP. 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 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.



9.2.9 Western 500 kV Backbone (Stage 1)

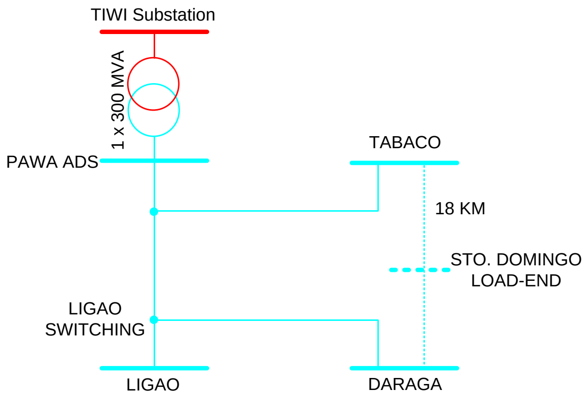
The Western Luzon Backbone (Stage 1: Castillejos–Hermosa 500 kV Transmission Line Project) aims to provide a transmission facility to connect the 2x300 MW RP Energy CFPP to the Luzon Grid through Hermosa Substation.The project involves the implementation of a 32 km double circuit 500 kV designed transmission 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.



9.2.10 Luzon Voltage Improvement Project 3

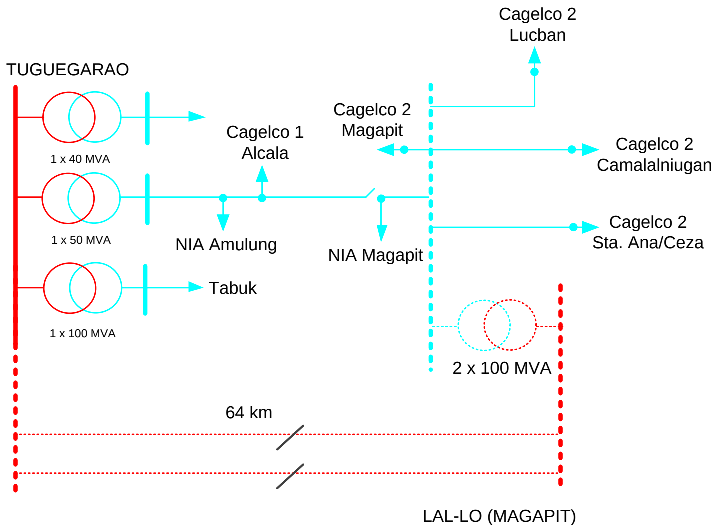
The Luzon Voltage Improvement Project 3 aims to address the anticipated undervoltage problem during peak load condition and overvoltage problem during off peak load condition at various 500 kV, 230 kV and 69 kV load-end substations in the North Luzon Grid. The Luzon Voltage Improvement Project 3 involves 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.

9.2.11 Eastern Albay 69 kV Transmission Line Stage 2



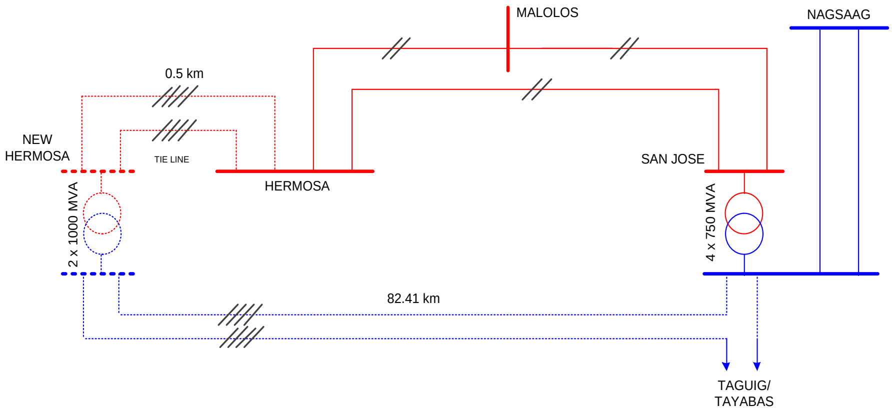
The Eastern Albay 69 kV Line Project aims to provide a more reliable transmission corridor in the eastern coast of Albay to serve the increasing eco-tourism developments in the area which include the Misibis Resort, Estate and Spa in Cagraray Island. The Eastern Albay 69 kV Line Project is divided into 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 1-336.4 MCM ACSR/AS conductor. 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 1-336.4 MCM ACSR/AS conductor.

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



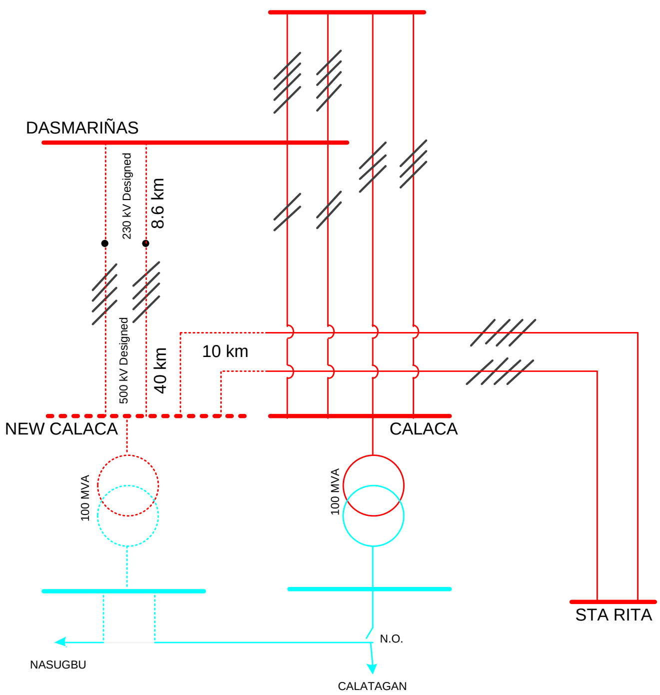
The Tuguegarao–Lal-lo (Magapit) 230 kV Transmission Line project aims to address the imminent overloading of the Tuguegerao–Magapit 69 kV Line due to the forecasted load growth in the northern part of Cagayan Province. It also aims to improve the power quality and reliability of supply in the area which 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.

9.2.13 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.

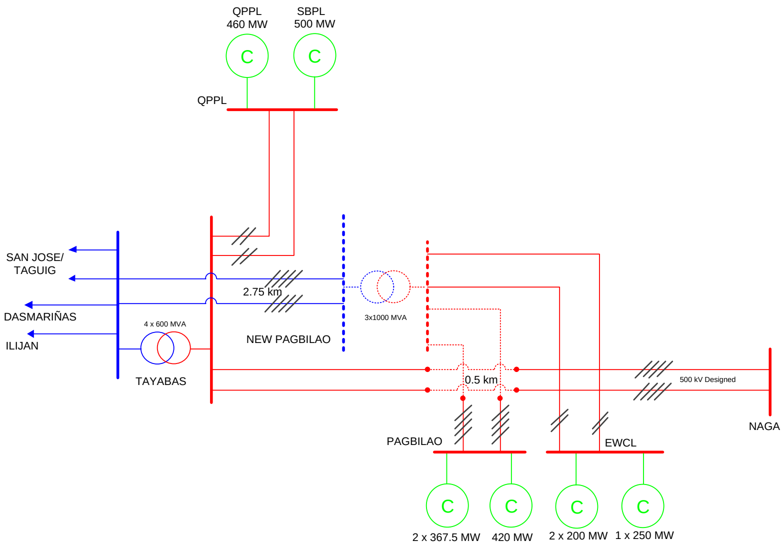
9.2.14 Tuy 500 kV Substation (Stage 1)



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.

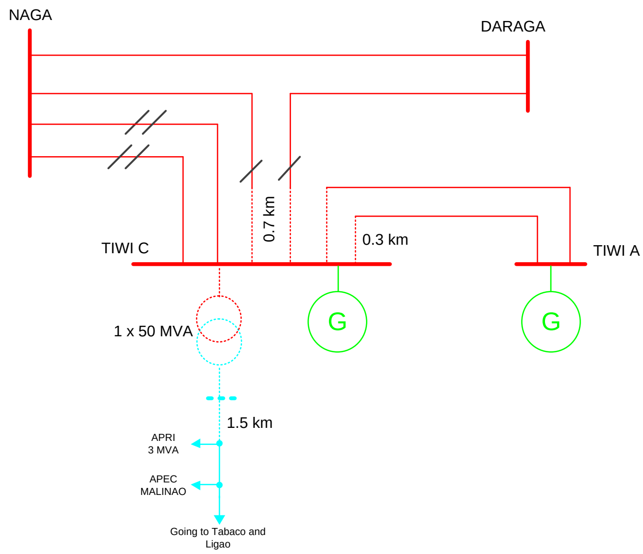
The Tuy 500 kV Substation (Stage 1) Project will involve the development of Tuy 500 kV Substation which will initially involve 230 kV facilities only. The project will also invove the development of Tuy–Dasmariñas 500 kV designed transmission line but will be initially energized at 230 kV. Furthermore, 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.

9.2.15 Pagbilao 500 kV Substation



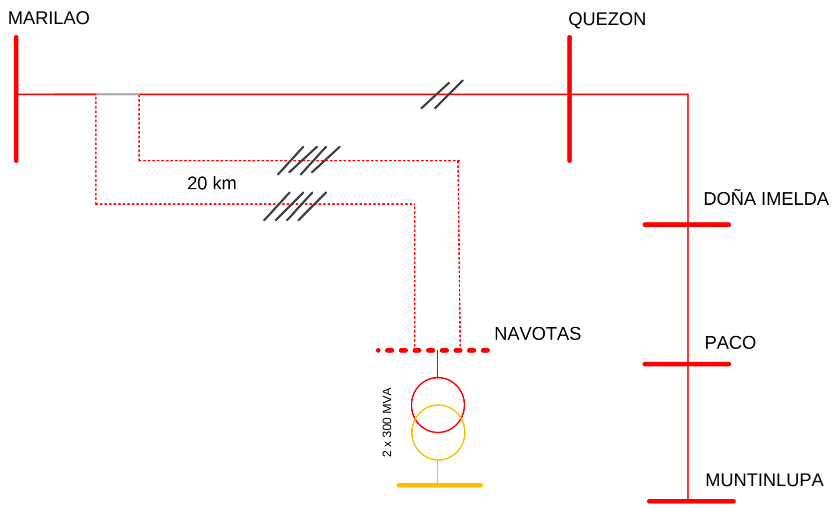
The Pagbilao 500 kV Substation Project will accommodate the connection of incoming power plants in Quezon Province which include the 420 MW Pagbilao Coal-Fired Power Plant (CFPP) Expansion, 500 MW San Buenaventura Power Ltd. Co. (SBPL) Coal-Fired Power Plant and 600 MW Energy World Corporation (EWC) 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.

9.2.16 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.

9.2.17 Navotas 230 kV Substation

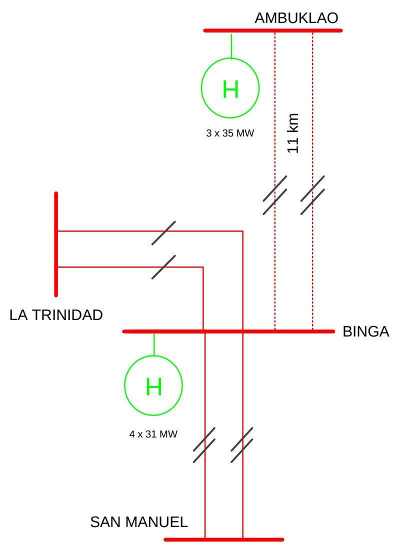


The Navotas 230 kV Substation aims to cater the load growth in the Sector 1 of MERALCO and serve as a connection point for power plants in the area such as the TMO and Millennium Power Plants. With the further increase in load, the existing 230/115 kV substations in Metro Manila become heavily loaded 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.

9.2.18 South Luzon 230 kV Substation Upgrading Project

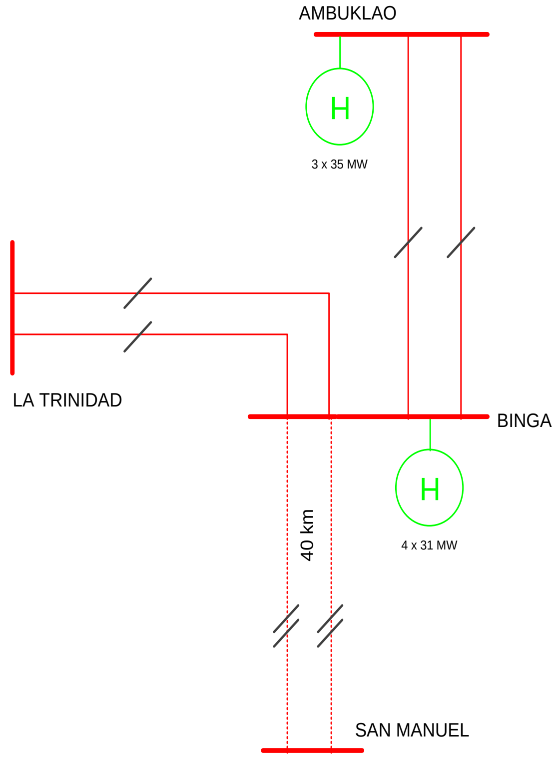
The South Luzon Substation Upgrading Project aims to cater the load growth and provide N-1 contingency to various substations in NGCP's South Luzon Region which include Las Piñas, Lumban, Labo, Naga, Gumaca and Daraga Substations. The Project involves transformer installations, and replacement and rearrangements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

9.2.19 Ambuklao–Binga 230 kV Transmission Line Upgrading



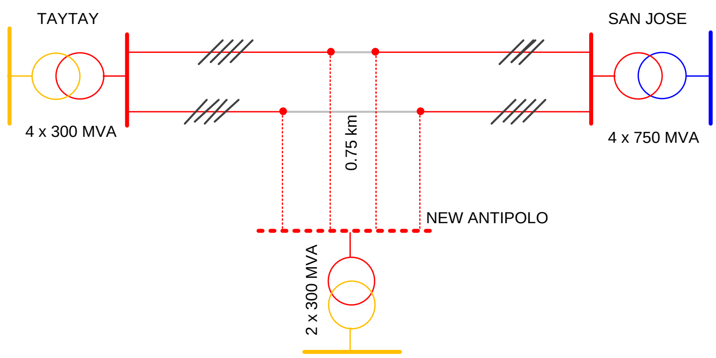
The Ambuklao–Binga 230 kV Transmission Line Upgrading project aims to upgrade the existing line in order to address its old age condition and also to maintain the N-1 contingency provision taking into consideration the repowering of Ambuklao HEPP and the proposed generation capacity additions in the 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.

9.2.20 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.

9.2.21 Antipolo 230 kV Substation

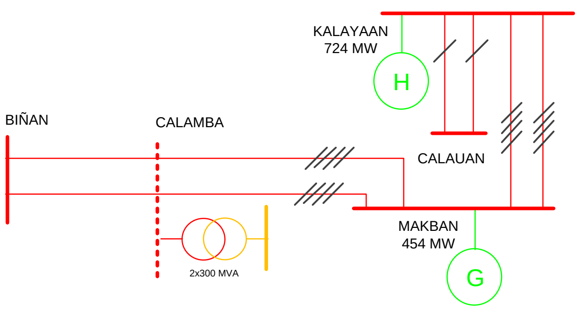


The Antipolo 230 kV Substation aims to cater the load growth in the Sector 2 of MERALCO. With the further increase in load, the existing 230/115 kV substations in Taytay and Doña Imelda become heavily loaded and have been losing already the provision for N-1 contingency and have space constraints for 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.

9.2.22 Luzon Voltage Improvement Project 4

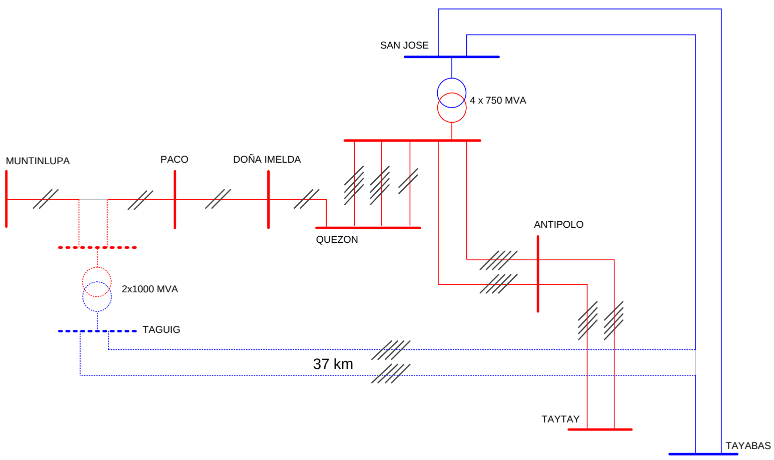
The Luzon Voltage Improvement Project 4 aims to address the anticipated undervoltage problem during peak load condition at various 230 kV and 69 kV load-end substations in the South Luzon Grid. The Luzon Voltage Improvement Project 4 involves the installation of capacitors to substations in the South 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.

9.2.23 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.

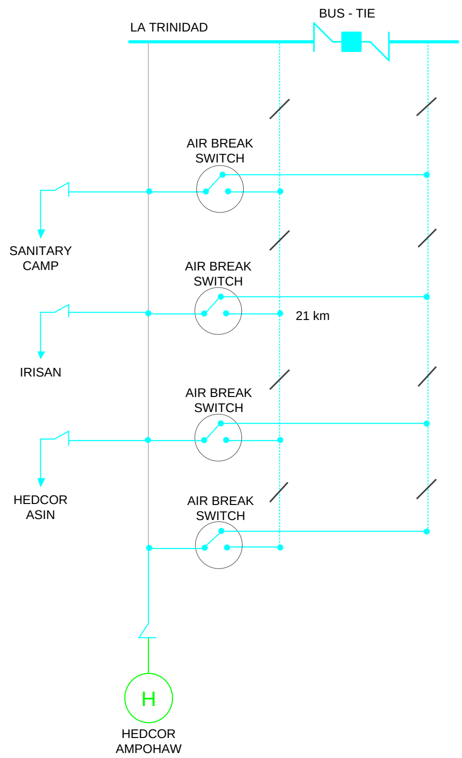
9.2.24 Taguig 500 kV Substation



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.

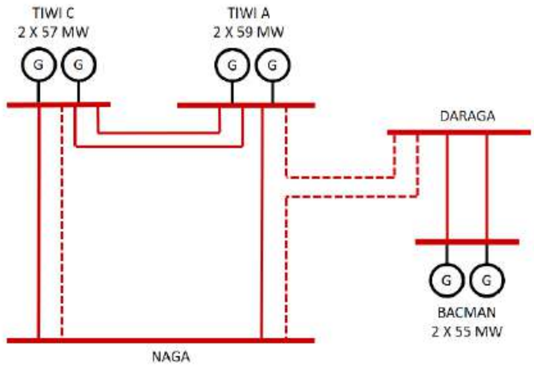
9.2.25 La Trinidad–Calot 69 kV Transmission Line

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.



9.2.26 Tower Structure Upgrading of Bicol Transmission Facilities

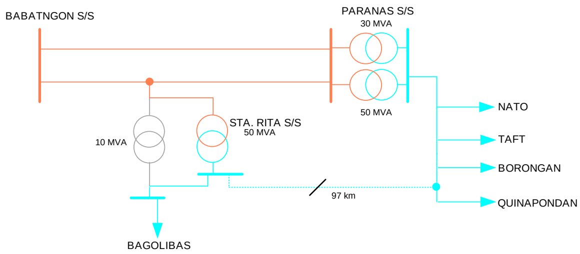
The restoration project of Bicol transmission facilities offers the reconstruction of the affected transmission lines marred by Typhoon Nina, namely the Naga–Daraga–Tiwi A and Naga–Tiwi C 230 kV Transmission Lines. The project provides permanent solution to address the limitations of the emergency restoration 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.



9.3 Visayas Grid

9.3.1 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 Substation.

9.3.2 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, Sta. Rita, 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.

9.3.3 Visayas Substation Reliability Project I

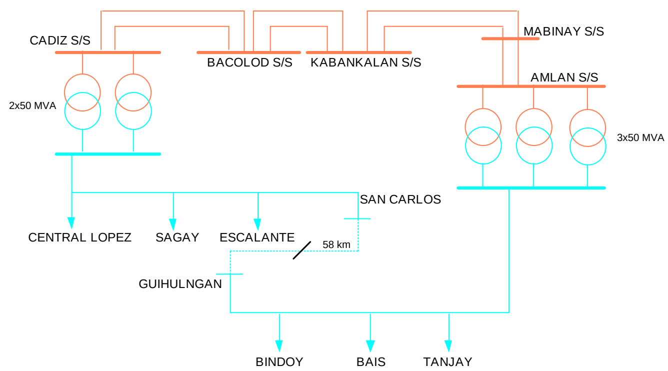
This project is intended to provide capacity additions in various substations to address the overloading during N-1 condition or outage of one transformer. This will ensure the reliability of the substations and comply with the N-1 provision of the Philippine Grid Code.

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.

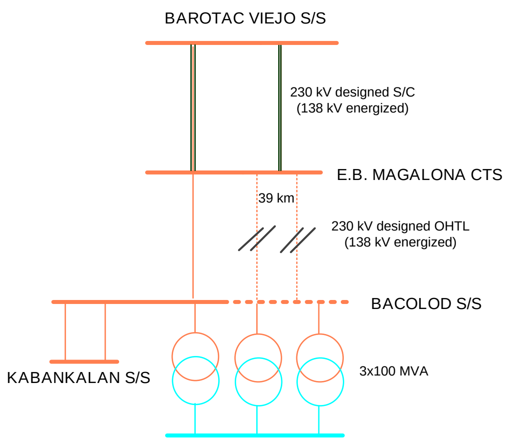
9.3.4 San Carlos–Guihulngan 69 kV Transmission Line

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.



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

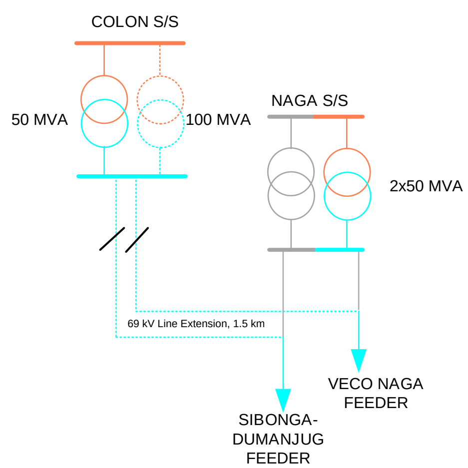


The development of new power plants, particularly in Panay and Negros Islands will result in the increase in power exchange between the islands of Panay, Negros and Cebu. However, the existing Negros-Panay interconnection system has limited capacity to cater the excess power generation from Panay towards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

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 Substation to Bacolod Substation 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.

9.3.6 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 Substation are proposed to be transferred to Colon Substation. However, the existing Colon Substation 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 Substation, there is a need to increase the substation capacity. The project involves the installation of 100 MVA transformer at Colon Substation and the transfer of the Naga–Sibonga–Dumanjug and VECO Naga 69 kV feeders from Naga Substation to Colon Substation, 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.

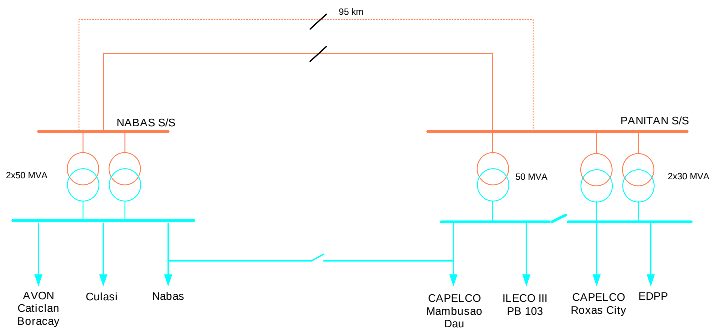
The implementation of the remaining works under the New Naga (Colon) Substation Project will be pursued in the 4th Regulatory Period in consideration of the renewed need to address, among others, the increase in power demand along the Naga–Sibonga–Dumanjug and VECO Naga 69 kV feeders.

9.3.7 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.

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.

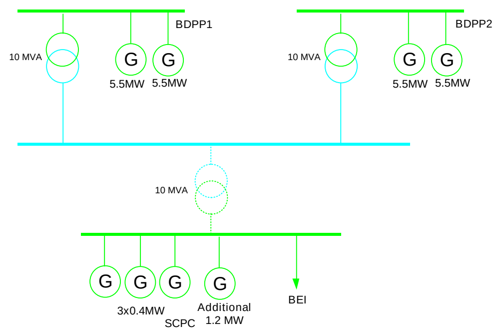
9.3.8 Panitan–Nabas 138 kV Transmission Line 2 Project



The northwestern part of Panay, which includes the Boracay Island, is served by Nabas Substation which normally draws power from the grid through the existing Panitan–Nabas 138 kV Transmission Line. The Nabas Substation is also linked to San Jose Substation by 69 kV transmission line. 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.

To cater the entire power requirement of Nabas Substation even during N-1 condition, a new 138 kV circuit will be installed from Panitan Substation and Nabas Substation. 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.

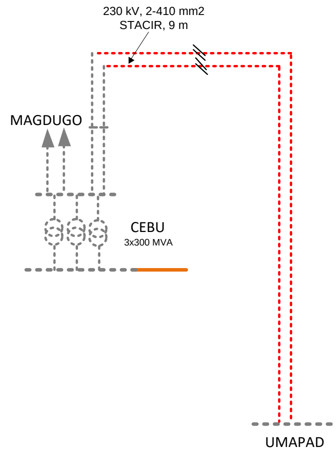
9.3.9 Tagbilaran 69 kV Substation Project



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 Sta. Clara Power Corp. (SCPC). 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 SCPC is being disrupted. With the project, BEI and SCPC will have dedicated connection to Tagbilaran Substation and expansion of SCPC's Hydro Electric Power Plant will be catered.

9.3.10 Cebu–Lapu-Lapu 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.

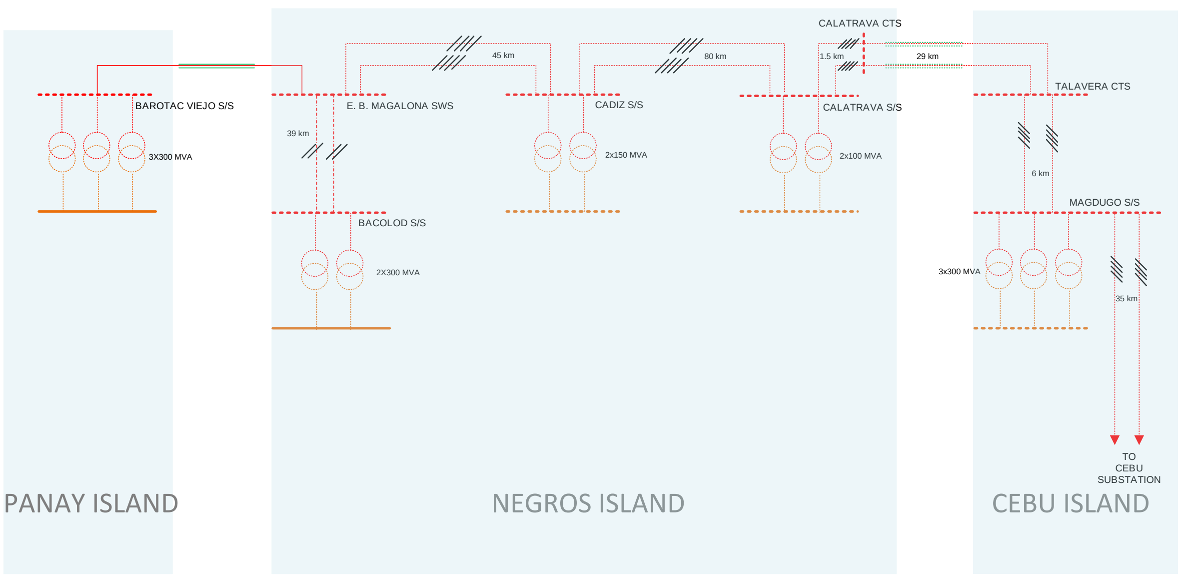


To maintain the continuous transmission of power towards the major loads centers in Mandaue and Mactan even during N-1 condition, a new transmission corridor, composed of overhead transmission line and submarine/underground cable system, is proposed between Cebu Substation and Lapulapu Substation.

9.3.11 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.

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.



9.3.12 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.

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

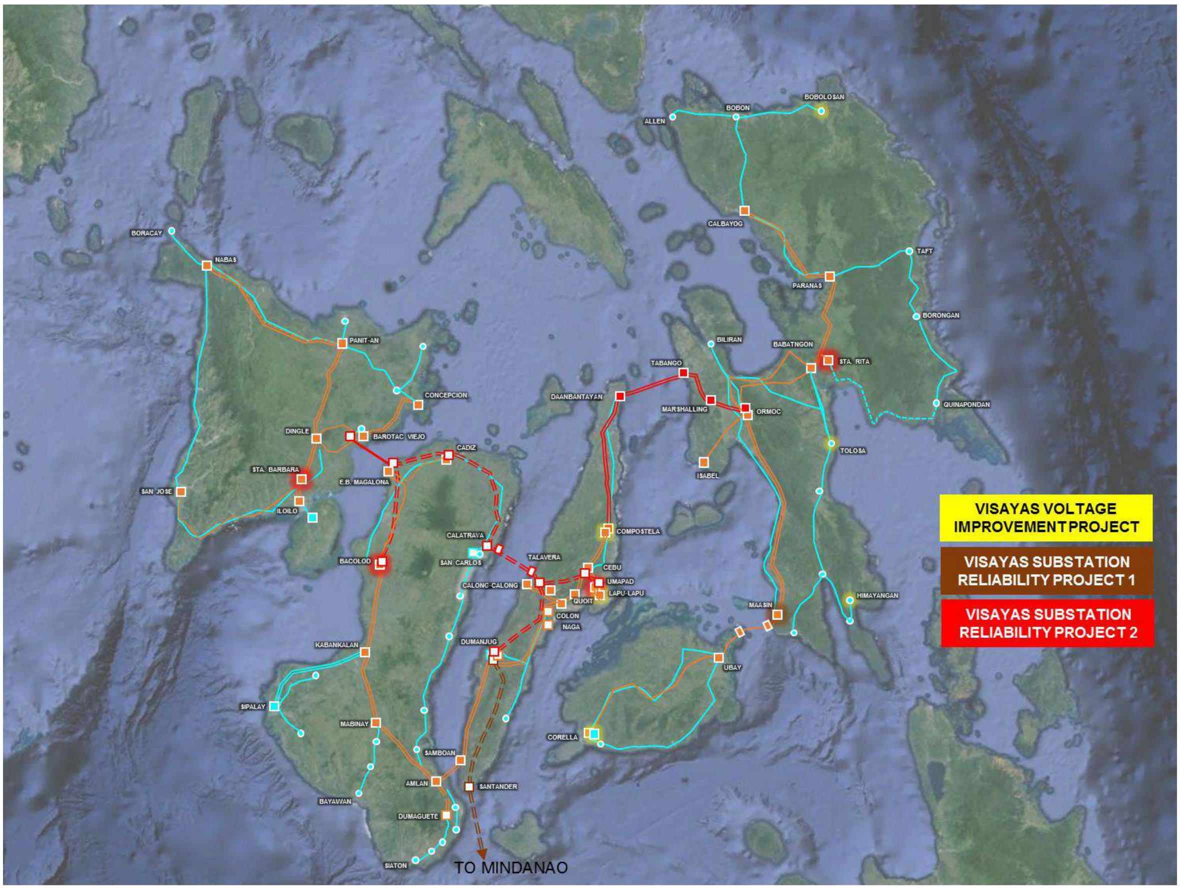


Figure 9.8: Visayas Projects for Implementation

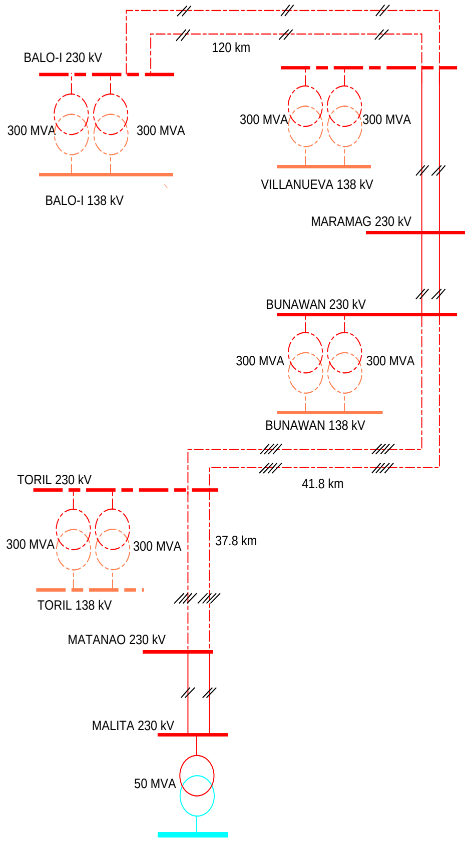
9.4 Mindanao Grid

9.4.1 Mindanao 230 kV Transmission Backbone Project

The project upgrades the thermal capacity of the existing transmission backbone. It comprises of the extension of the transmission line towards Culaman Substation in Davao Occidental allowing the full capacity dispatch of SMCPC, TSI and other power plants.

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

The transmission line portion of the project utilizes the existing 230 kV PCBs in Matanao Substation and the installation of transformers in the substations of Toril and Bunawan. However, the energization of the whole stretch of the backbone to 230 kV level requires the installation of additional transformers in the substations of Culaman, Toril, Bunawan, and Villanueva.

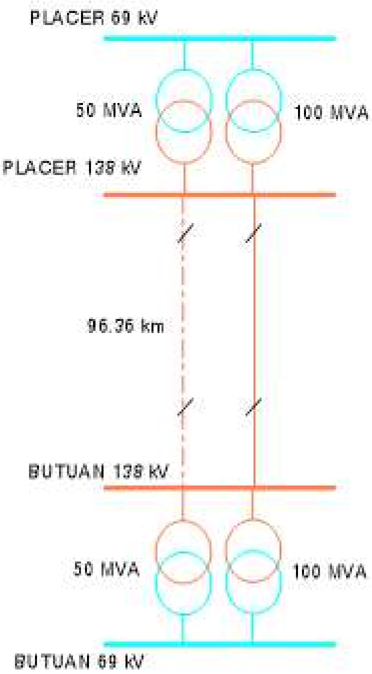


9.4.2 Sultan Kudarat (Nuling) Capacitor Project

The deferment of the implementation of Tacurong-Sultan Kudarat high voltage network in southwestern Mindanao area, which can provide strong transmission backbone in the region, is due to the security concerns in the areas to be traversed by the proposed line.

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

9.4.3 Butuan Placer 138 kV Transmission Line Project



This project was part of the Reliability Compliance Project I - Mindanao. It comprises of the installation of the second circuit for the existing Butuan-Placer 138 kV transmission corridor by using 96.36- kilometer, single-circuit, 1-795 MCM conductor and 4-138 kV power circuit breakers.

Currently, the Butuan and Placer Substations are connected through a single- circuit transmission line, where power delivery to northeastern Mindanao is used to be in critical condition. Due to lack of alternative corridor, an outage of this line segment results to significant load dropping in the area

The Butuan-Placer 138 kV Transmission Line Project provides the needed line reinforcement to achieve reliable and continuous power supply. The project satisfies the compliance of the transmission line facility to the single-outage contingency criterion of the PGC. In addition, the project also reduces the transmission losses and improves the voltage level in the served area.

9.4.4 Agus 2 Switchyard Upgrading Project

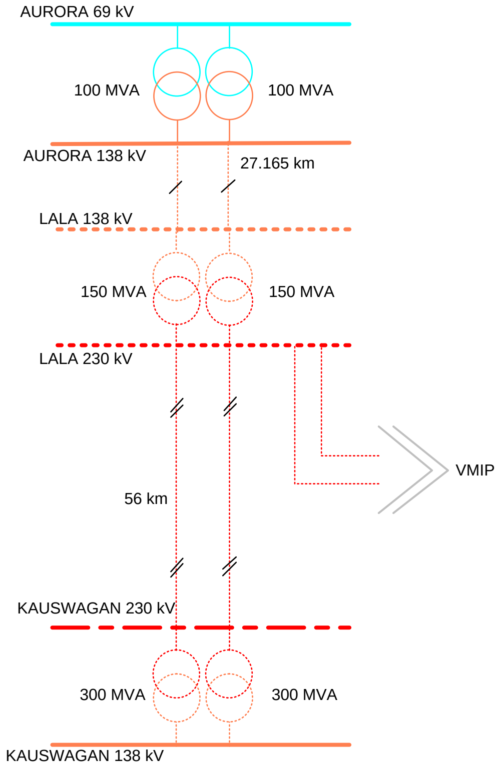
The Agus 2 Switchyard improves the operational capability of the substation, which can efficiently respond to any system disturbance. The project enhances the operational stability of the grid that ensures the continuity of service of the power plant's transmission corridor. It will provide clear demarcation 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.

9.4.5 Kauswagan-Lala 230 kV Transmission Line Project

The project connects the Kauswagan Substation and Lala Substation utilizing a double-circuit tower in a bundle-of-two power conductor configuration in 230 kV voltage level. The project also includes the installation of two power transformers in Lala Substation to be linked to the existing Aurora Substation through a 138 kV transmission line. To complete the project, the installation of 6-230 kV and 9-138 kV power circuit breakers are 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 condition. The project provides a 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 complements the Mindanao – Visayas Interconnection Project.



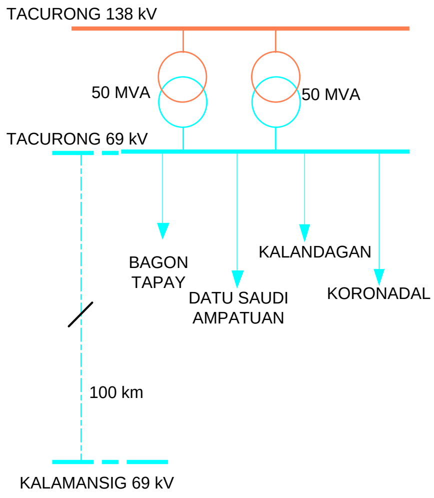
9.4.6 Mindanao Substation Upgrading Project

The existing transformer capacities in various substations in Mindanao are insufficient to accommodate the projected demand load 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) provides 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, 90 MVAR capacitor banks, 26-138 kV PCBs and 55-69 kV PCBs.

9.4.7 Tacurong-Kalamansig 69 kV Transmission Line Project

This project allows the towns of Lebak, Kalamansig, Bagumbayan and Senator Ninoy Aquino to enjoy cheaper electricity from the grid. These areas located in the Province of Sultan Kudarat in SOCCSKSARGEN Region are considered off-grid loads and 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. The completion of the project ends the dependency of the customers from the SPUG and starts enjoying the reliable and cheaper power supply from the grid.

9.4.8 Mindanao Substation Rehabilitation Project

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 a number of coal-fired power plant projects. The integration of these power plant projects to the Mindanao Grid and the implementation of the interconnection between Mindanao and Visayas drive the development of new transmission backbones. The aforementioned major interconnection project, which is the final link to interconnect the Philippine Grid, is further discussed in Chapter 13.

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 69 kV transmission system are necessary to support the demand load 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 challenging its grid operations and construction of key transmission projects. Notably, another vital issue in the Mindanao grid is the looming low voltage 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, the impending low voltage in the area cannot be resolved simply by installing 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.

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 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 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 for the 500 kV system, upgrading of old transmission lines and substations as well as installation of reactive power compensation equipment at various substations.

10.1 Proposed Transmission Projects up to 2025

The major transmission projects covering the year 2019-2025 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.

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.

In Cagayan and Cordillera Region, the generation development in the region will be addressed by the implementation of the Nagsaag–Santiago 500 kV Transmission Line.

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, Capas 230 kV Substation in Tarlac, Plaridel 230 kV Substation in Bulacan, Sampaloc 230 kV Substation in Nueva Ecija, Castillejos 230 kV Substation in Zambales, 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.

Shown in Table 10.1 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 10.1: Proposed Transmission Projects for Luzon

Project Name/Driver(s)	Province(s) and Components	ETC
Generation Entry		
Pagbilao–Tayabas 500 kV Transmission Line	Quezon	Jul 2023
	Substation Components: ▪ Pagbilao 500 kV Substation, 4-500 kV PCBs and associated equipment 4-230 kV PCBs and associated equipment. Transmission Components:	

Project Name/Driver(s)	Province(s) and Components	ETC
	▪ 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	
Pinamucan 500 kV Substation	Batangas	Oct 2023
	<u>Substation Components:</u> ▪ Pinamucan 500 kV Substation, 2x1,000 MVA, 500/230 kV Power Transformers and accessories, 12-500 kV PCBs and associated equipment; ▪ Pinamucan 230 kV Substation, 2x100 MVA 230/69 kV Power Transformers and accessories, 10-230 kV PCBs and associated equipment, 4-69 kV PCBs and associated equipment. <u>Transmission Components:</u> ▪ Pinamucan 500 kV bus-in Transmission Line, ST-DC, 4-795 MCM ACSR, 1 km; ▪ Pinamucan–Taysan 69 kV Transmission Line, SP-DC, 1-795 MCM ACSR, 10 km. Bulk Cost Estimate: 4,261 Million Pesos	
Northern Luzon 230 kV Loop	Ilocos Norte, Apayao, Cagayan	Jun 2024
	<u>Substation Components:</u> ▪ 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, 14-230 kV PCBs, 18-115 kV PCBs and associated equipment;4x50 MVAR, 115 kV Shunt Capacitor and accessories, 4x25 MVAR, 115 kV Shunt Reactor and accessories; ▪ Sanchez Mira 230 kV Substation (New), 2x300 MVA, 230/69-13.8 kV Power Transformers and accessories, 18-230 kV PCBs and associated equipment, 8-69 kV PCB's and associated equipment; 4x25 MVAR, 230 kV Shunt Capacitor and accessories, 4x25 MVAR, 230 kV Shunt Reactor and accessories; ▪ 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. <u>Transmission Components:</u> ▪ 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; ▪ Pudtol–Sanchez Mira 230 kV Transmission Line, ST-DC, 2-795 MCM, ACSR, 57 km; ▪ Lal-lo (Magapit)–Pudtol 230 kV Transmission Line, ST-DC, 2-795 MCM, ACSR, 38 km. Bulk Cost Estimate: 18,102 Million Pesos	
Nagsaag–Santiago 500 kV Transmission Line	Isabela, Pangasinan	Aug 2024
	<u>Substation Components:</u> ▪ New Santiago 500 kV Substation, 2x1,000 MVA 500/230-13.8 kV Power Transformers and accessories, 8-500 kV PCBs and 23-230 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, 6-230 kV PCBs and associated equipment;	

Project Name/Driver(s)	Province(s) and Components	ETC
	▪ Nagsaag 500 kV Substation, 2-500 kV PCBs and accessories. Transmission Components: ▪ Nagsaag–Santiago 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: 13,642 Million Pesos	
Luzon–Visayas HVDC Bipolar Operation	Camarines Sur and Leyte	Jan 2025
	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.	
Cabanatuan–Sampaloc–Nagsaag 230 kV Transmission Line	Nueva Ecija, Pangasinan	Jul 2025
	Substation Components: ▪ Sampaloc 230 kV Substation, 6-230 kV PCBs and associated equipment; ▪ Nagsaag 230 kV Substation Expansion, 3-230 kV PCBs and associated equipment. ▪ Cabanatuan 230 kV Substation Expansion, 4-230 kV PCBs and associated equipment. Transmission Components: ▪ Sampaloc–Nagsaag 230 kV Transmission Line, ST-DC, 4-795 MCM ACSR/AS, 68 km. ▪ Sampaloc–Cabanatuan 230 kV Transmission Line, ST-DC, 4-795 MCM ACSR/AS, 53 km. Bulk Cost Estimate: 7,041 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, 10-230 kV PCBs and associated equipment. ▪ Pagbilao 500 kV Substation, 2-500 kV PCBs and associated equipment. Transmission Components: ▪ Tagkawayan Bus-in to Pagbilao–Naga 500 kV Line, ST-DC, 4-795 MCM ACSR/AS, 1 km. Bulk Cost Estimate: 3,467 Million Pesos	
Load Growth		
North Luzon Substation Upgrading 2	La Union, Ilocos Norte, Nueva Vizcaya, Isabela, Ilocos Sur, Pangasinan, Cagayan, Tarlac	Dec 2021/ Dec 2026
	Stage 1: Substation Components: ▪ Nagsaag 230 kV Substation, 1x100 MVA 230/69-13.8 kV Power Transformer and associated equipment; ▪ Balingueo 230 kV Substation, 1x100 MVA 230/69-13.8 kV Power Transformer and associated equipment; ▪ Tuguegarao 230 kV Substation (Replacement), 1x100 MVA 230/69-13.8 kV Power Transformer and associated equipment; ▪ Laoag 115 kV Substation (Replacement), 1x100 MVA 115/69-13.8 kV Power Transformer and associated equipment;	

Project Name/Driver(s)	Province(s) and Components	ETC
	▪ Concepcion 230 kV Substation (Replacement), 2x300 MVA 230/69-13.8 kV Power Transformer and associated equipment; Stage 2: <u>Substation Components:</u> ▪ Bauang 230 kV Substation (Replacement), 1x100 MVA 230/115/69-13.8 kV Power Transformer and associated equipment; ▪ Bayombong 230 kV Substation, 2x100 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; ▪ San Esteban 115 kV Substation, 2x100 MVA 115/69-13.8 kV Power Transformer and associated equipment. Bulk Cost Estimate: 4,076 Million Pesos	
Pinili 230 kV Substation	Ilocos Norte	Mar 2022
	<u>Substation Components:</u> ▪ Pinili 230 kV Substation (New), 2x100 MVA 230/69-13.8 kV Power Transformer and accessories, 10-230 kV PCBs and associated equipment, 5-69 kV PCBs and associated equipment. <u>Transmission Components:</u> ▪ 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	
Concepcion–Sta. Ignacia 69 kV Transmission Line	Tarlac	Apr 2022
	<u>Transmission Components:</u> ▪ Concepcion–Sta. Ignacia 69 kV Transmission Line, 69 kV, SP-DC, 1-795 MCM ACSR, 27 km. Bulk Cost Estimate: 672 Million Pesos	
Nagsaag–Tumana 69 kV Transmission Line	Pangasinan	Apr 2022
	<u>Transmission Components:</u> ▪ Nagsaag–Tumana 69 kV Transmission Line, 69 kV, ST/SP-DC1, 1-795 MCM ACSR, 23 km. Bulk Cost Estimate: 711 Million Pesos	
San Simon 230 kV Substation	Pampanga	Jul 2022
	<u>Substation Components:</u> ▪ 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. <u>Transmission Components:</u> ▪ 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.	

Project Name/Driver(s)	Province(s) and Components	ETC
	Bulk Cost Estimate: 2,318 Million Pesos	
Marilao 500 kV Substation	Bulacan	Oct 2022
	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; ▪ 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	
Luzon Voltage Improvement Project 5	North Luzon	Nov 2022
	Substation Components: ▪ Solana Load-end Substation, 4x7.5 MVAR, 69 kV Capacitor Banks and accessories; 5-69 kV PCBs and associated equipment ▪ Bongabon Load-end Substation, 4x5 MVAR, 69 kV Capacitor Banks and accessories; 5-69 kV PCBs and associated equipment ▪ Candelaria Load-end Substation, 4x2.5 MVAR, 69 kV Capacitor Banks and accessories; 5-69 kV PCBs and associated equipment ▪ Bani Load-end Substation, 4x5 MVAR, 69 kV Capacitor Banks and accessories; 5-69 kV PCBs and associated equipment ▪ San Fabian Load-end Substation, 4x5 MVAR, 69 kV Capacitor Banks and accessories; 5-69 kV PCBs and associated equipment ▪ Aglipay Load-end Substation, 4x5 MVAR, 69 kV Capacitor Banks and accessories; 5-69 kV PCBs and associated equipment ▪ Cauayan Load-end Substation, 4x5 MVAR, 69 kV Capacitor Banks and accessories; 5-69 kV PCBs and associated equipment ▪ Ilagan Load-end Substation, 4x2.5 MVAR, 69 kV Capacitor Banks and accessories; 5-69 kV PCBs and associated equipment Bulk Cost Estimate: 2,735 Million Pesos	
Capas 230 kV Substation	Tarlac	May 2023
	Substation Components: ▪ Capas 230 kV Substation, 2x300 MVA 230/69-13.8 kV Power Transformers and accessories, 3x100 MVAR 230 kV Shunt Capacitor and accessories; 6-230 kV PCBs and associated equipment, 8-69 kV PCBs and associated equipment; ▪ Concepcion 230 kV Substation (Expansion), 4-230 kV PCBs and associated equipment. Transmission Components: ▪ Concepcion–Capas 230 kV Transmission Line, ST-DC, 4-795 MCM ACSR, 15 km. Bulk Cost Estimate: 2,619 Million Pesos	

Project Name/Driver(s)	Province(s) and Components	ETC
Abuyog 230 kV Substation	Sorsogon	May 2023
	Substation Components: ▪ Abuyog 230 kV Substation, 1x100 MVA 230/69-13.8 kV Power Transformer and accessories, 2x25 MVAR, 230 kV Shunt Capacitor and accessories, 2x25 MVAR, 230 kV Shunt Reactor and accessories, 6-230 kV PCBs and associated equipment, 4-69 kV PCBs and associated equipment. ▪ Toblijon 230 kV Switching Station, 10-230 kV PCBs and associated equipment. Transmission Components: ▪ Toblijon-Abuyog 230 kV Transmission Line, 2-795 MCM ACSR/AS, ST-DC, 22.7 km. ▪ Toblijon Bus-in Transmission Line, 1-795 MCM ACSR/AS, ST-DC, 2 km. ▪ 69 kV Line Extensions, 1-336.4 MCM ACSR, SP-SC, 3 km. Bulk Cost Estimate: 2,853 Million Pesos	
Porac 230 kV Substation	Pampanga	Jun 2023
	Substation Components: ▪ Porac 230 kV Substation, 2x300 MVA 230/69 kV Power Transformers and accessories, 3x100 MVAR, 230 kV Shunt Capacitor and accessories, 13-230 kV PCBs and associated equipment, 19-69 kV PCBs and associated equipment; ▪ Hermosa 230 kV Substation (Expansion), 2-230 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. Transmission Components: ▪ 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: 8,324 Million Pesos	
Tanauan 230 kV Substation	Batangas	Aug 2023
	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. 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	
Sampaloc 230 kV Substation	Nueva Ecija	Sep 2023
	Substation Components: ▪ Sampaloc 230 kV Substation, 2x100 MVA 230/69 kV Power Transformer and accessories, Control Room, 10-230 kV PCBs and associated equipment, 5-69 kV PCBs and associated equipment. Transmission Components:	

Project Name/Driver(s)	Province(s) and Components	ETC
	▪ Sampaloc Bus-in to Cabanatuan-Pantabangan and Nagsaag-Pantabangan 230 kV Transmission Line, ST-DC, 1-795 MCM ACSR/AS, 2 km; ▪ Sampaloc Cut-in to Cabanatuan-Pantabangan 69 kV Transmission Line, ST-DC, 1-336 MCM ACSR/AS, 1 km; ▪ Sampaloc–SAJELCO 69 kV Transmission Line, SP-SC, 1-410 mm^2 TACSR/AS, 7 km. Bulk Cost Estimate: 1,459 Million Pesos	
Plaridel 230 kV Substation	Bulacan	Nov 2023
	Substation Components: ▪ Plaridel 230 kV Substation, 12-230 kV PCBs and associated equipment, 2x100 MVAR, 230 kV Shunt Capacitor and accessories Transmission Components: ▪ Plaridel 230 kV bus-in Transmission Line, ST-DC, 2-795 MCM ACSR, 1 km. Bulk Cost Estimate: 1,155 Million Pesos	
Daraga–Bitano 69 kV Line	Albay	Dec 2023
	Substation Components: ▪ Daraga 69 kV Substation, 1-69 kV PCBs and associated equipment. Transmission Components: ▪ Daraga–Bitano 69 kV Transmission Line, SP-SC, 1-795 MCM ACSR, 6 km; Bulk Estimate: 176 Million Pesos	
Castillejos 230 kV Substation	Zambales	Feb 2024
	Substation Components: ▪ Castillejos 230 kV Substation, 14-230 kV PCBs and associated equipment, 4-69 kV PCBs and associated equipment. Transmission Components: Castillejos 69 kV Line Extension, 1-410 mm^2 TACSR/AS, SP/ST-DC, 1km. Bulk Cost Estimate: 975 Million Pesos	
Tuguegarao–Enrile 69 kV Line	Tuguegarao	Mar 2024
	Substation Components: ▪ Tuguegarao 69 kV Substation, 2-69 kV PCBs and associated equipment. Transmission Components: ▪ Tuguegarao–Enrile 69 kV Transmission Line, 1-795 MCM ACSR, SP-SC, 30 km. Bulk Cost Estimate: 772 Million Pesos	
Silang 500 kV Substation	Cavite	May 2024
	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, 3 km; ▪ Tuy 500 kV Line diversion (initially energized at 230 kV), 500 kV Transmission Line, ST-DC, 4-410 mm2 TACSR/AS, 4.5 km; ▪ Biñan 230 kV Transmission Line diversion, ST-DC, 4-410 mm2 TACSR/AS, 4.5 km.	

Project Name/Driver(s)	Province(s) and Components	ETC
	Bulk Cost Estimate: 3,659 Million Pesos	
Kawit 230 kV Substation		Aug 2024
	Substation Components: ▪ Kawit 230 kV Substation, 2x300 MVA, 230/115 kV Power Transformers and accessories; 2x100 MVAR 230 kV Shunt Capacitor and accessories; 12-230 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 and associated equipment. ▪ Rosario 115 kV Substation, 1x100 MVA, 115/34.5 kV Power Transforers and accessories; 10-115 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: 8,880.960 Million Pesos	
Dasol 230 kV Substation	Zambales	Dec 2025
	Substation Components: ▪ Dasol 230 kV Substation, 2x100 MVA, 230/69-13.8 kV Power Transformer and accessories, 10-230 kV PCBs and 4-69 kV PCBs and associated equipment. Transmission Components: ▪ Dasol Bus-in to Masinloc–Kadampat 230 kV Transmission Line, ST-DC, 4-795 MCM ACSR/AS, 2 km; ▪ Dasol–Dasol (PANELCO I) 69 kV Transmission Line, SP-SC, 1-795 MCM ACSR/AS, 17.7 km; ▪ Dasol–Sta. Cruz 69 kV Transmission Line, SP-SC, 1-795 MCM ACSR/AS, 17.3 km; Bulk Cost Estimate: 2,194 Million Pesos	
System Reliability		
San Manuel–Nagsaag 230 kV Transmission Line	Pangasinan	Mar 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	
Navotas–Dona Imelda 230 kV Transmission Line	Metro Manila	May 2022
	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	
Taguig–Taytay 230 kV Transmission Line	Rizal, Metro Manila	Apr 2023
	Substation Components:	

Project Name/Driver(s)	Province(s) and Components	ETC
	▪ 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	
Minuyan 115 kV Switching Station	Bulacan Substation Components: ▪ Minuyan Switching Station, 11-115 kV PCBs and associated equipment. Transmission Components: ▪ San Jose 115 kV Transmission Line Extension, 2-795 MCM ACSR/AS, ST-DC, 0.5 km. ▪ Angat 115 kV Transmission Line Extension, 2-795 MCM ACSR/AS, ST-DC, 1 km. Bulk Cost Estimate: 529 Million Pesos	Sep 2023
Olongapo 230 kV Substation Upgrading	Zambales Substation Components: ▪ Olongapo 230 kV Substation, 1x100 MVA, 230/69 kV Power Transformers and accessories; 8-230 kV PCB (GIS) and associated equipment. . Bulk Cost Estimate: 969 Million Pesos	Dec 2023
Western 500 kV Backbone – Stage 2	Pangasinan, Zambales Substation Components: ▪ Castillejos 500 kV Substation, 2x1,000 MVA, 500/230-13.8 kV Power Transformers and accessories, 2x90 MVAR, 500 kV Shunt Reactor and accessories, 2x60 MVAR, 500 kV Line Reactor and accessories, 12-500 kV PCBs and associated equipment; ▪ Bolo 500 kV Substation, 4-500 kV PCBs and associated equipment; ▪ 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: 19,078 Million Pesos	Aug 2024
Marilao–Mexico 230 kV Transmission Line	Pampanga, Bulacan Substation Components: ▪ Marilao 230 kV Substation, 4-230 kV PCBs and associated equipment. ▪ Mexico 230 kV Substation, 230 kV series reactor, 4-230 kV PCBs and associated equipment. Transmission Components: ▪ Marilao–Mexico 230 kV Transmission Line, ST-DC, 4-795 MCM ACSR, 42 km. Bulk Cost Estimate: 2,064 Million Pesos	Dec 2024
Calaca–Salong 230 kV Transmission Line 2	Batangas 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, 4 km.	Dec 2025

Project Name/Driver(s)	Province(s) and Components	ETC
	Bulk Cost Estimate: 733 Million Pesos	

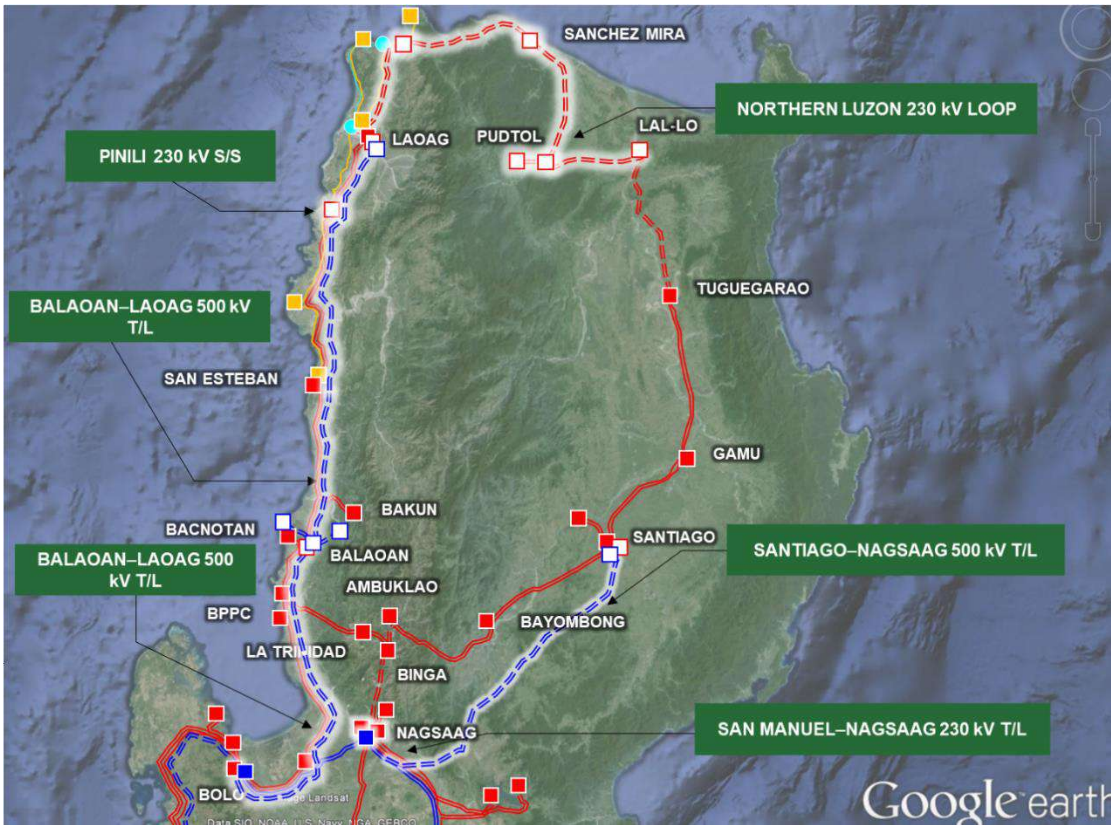


Figure 10.1: Proposed North Luzon Transmission Outlook for 2025

Figure 10.2: Proposed Central Luzon Transmission Outlook for 2025

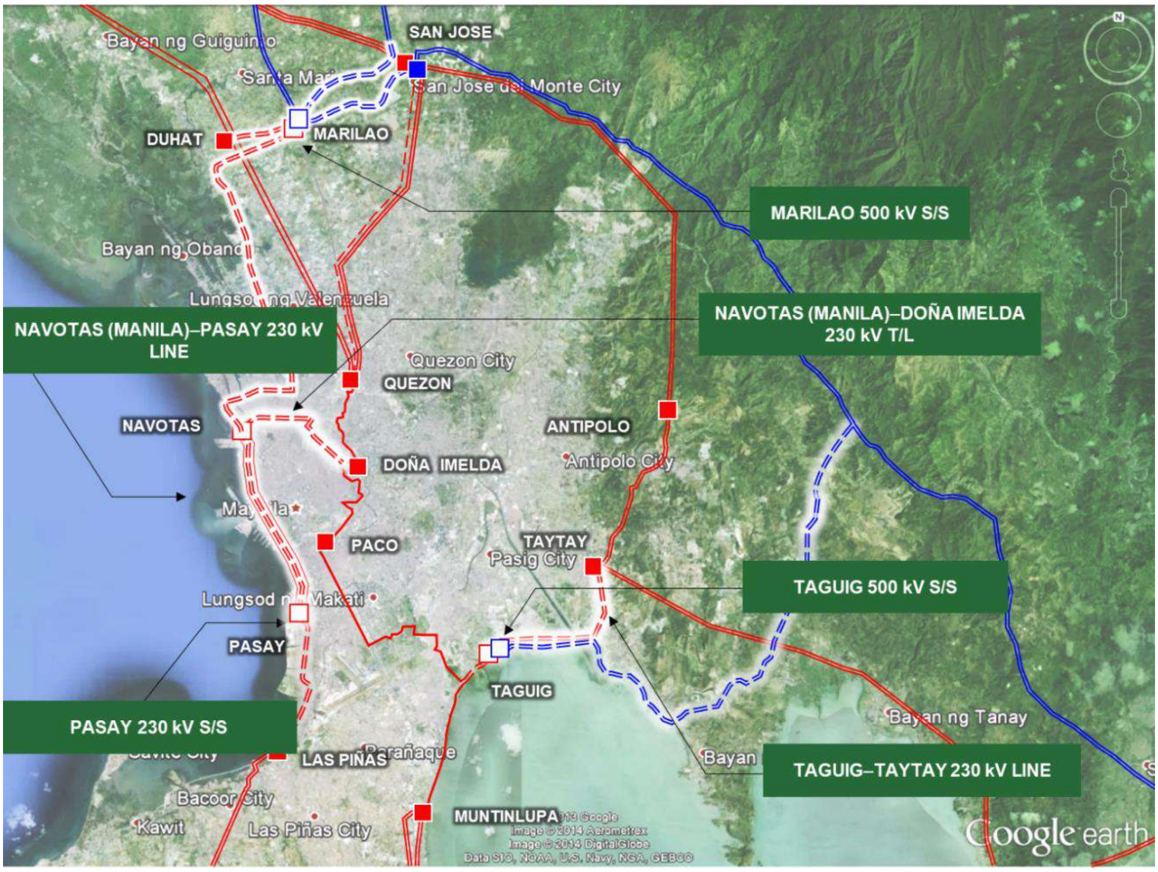


Figure 10.3: Proposed Metro Manila Transmission Outlook for 2025

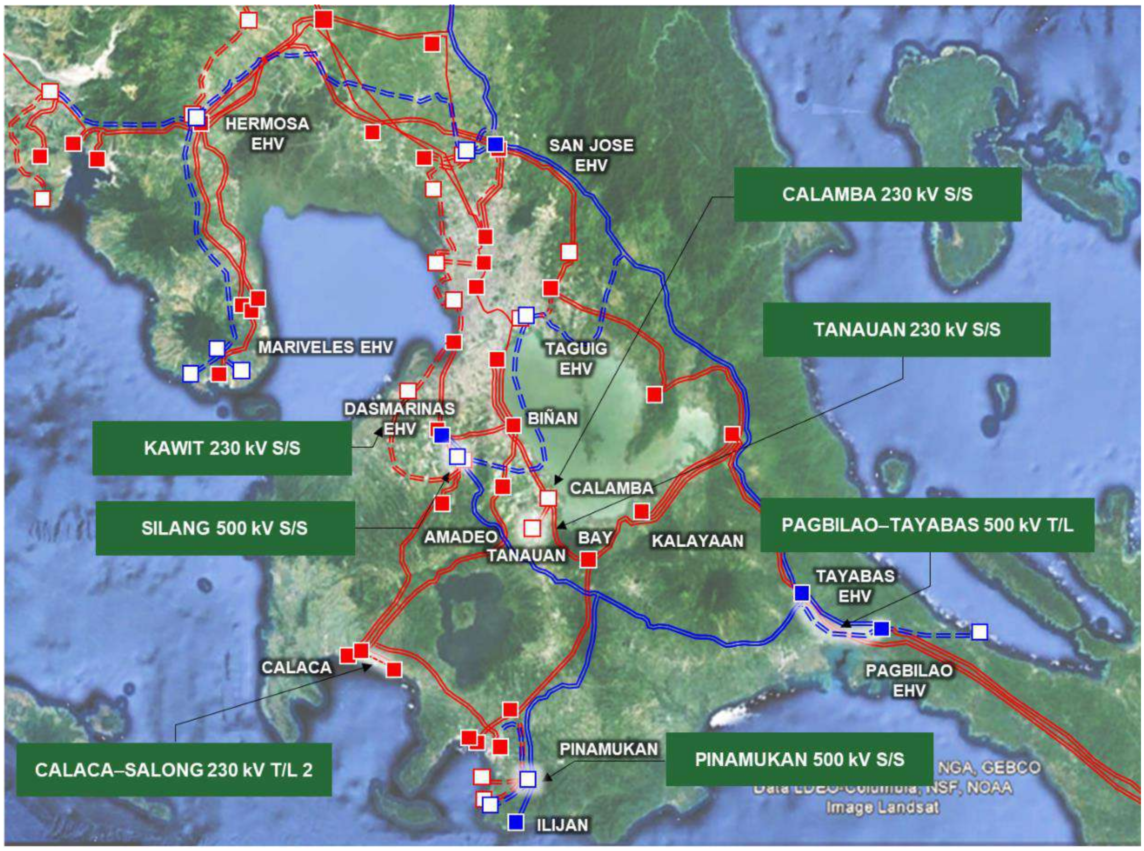


Figure 10.4: Proposed South Luzon Transmission Outlook for 2025

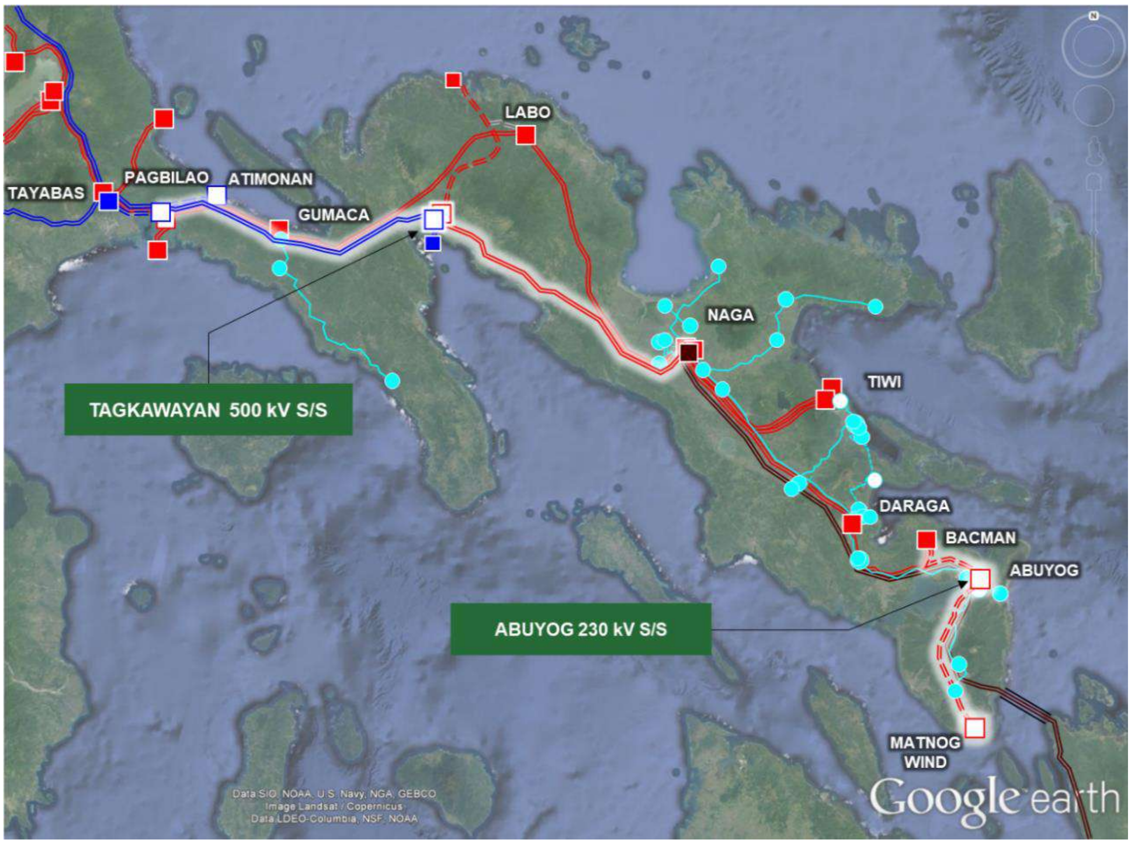
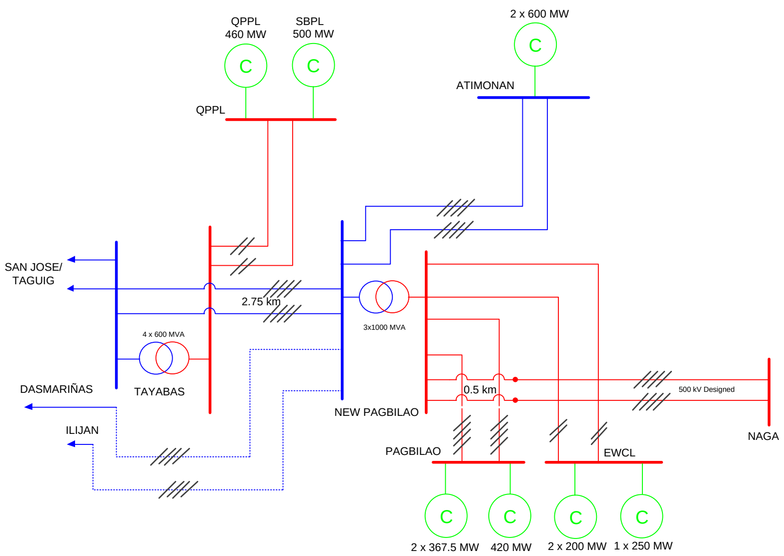


Figure 10.5: Proposed Bicol Region Transmission Outlook for 2025

10.1.1 Pagbilao–Tayabas 500 kV Transmission Line

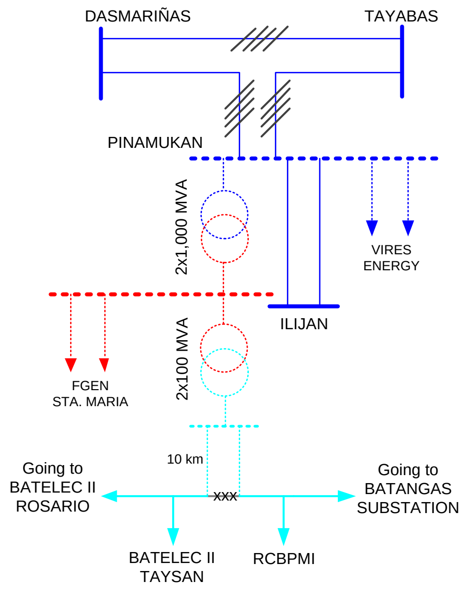


The Pagbilao–Tayabas 500 kV Transmission Line Project aims to accommodate further generation capacity additions in the Quezon province and to provide additional reliability in the Luzon 500 kV Grid. The proposed 1,200 MW Atimonan CFPP which will connect to Pagbilao Substation is the next major generation addition in the area that triggered this project. 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 at Tayabas 500 kV Substation and will address the high 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.

10.1.2 Pinamucan 500 kV Substation

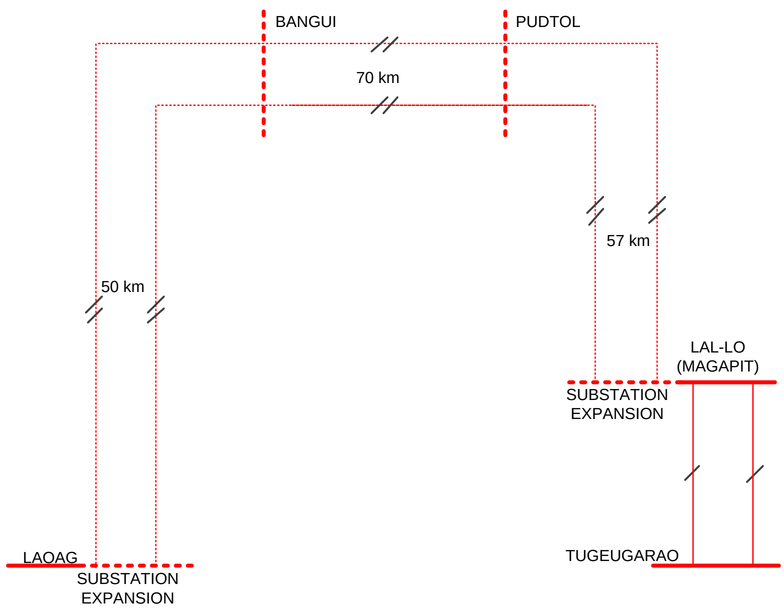
The Pinamucan 500 kV Substation Project aims to allow the connection of incoming bulk generation capacities in Batangas City Area which are mostly LNG-fired power plants. This substation will also serve as a new drawdown 230/69 kV drawdown substation for MERALCO and BATELEC II loads. The proposed 500 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.

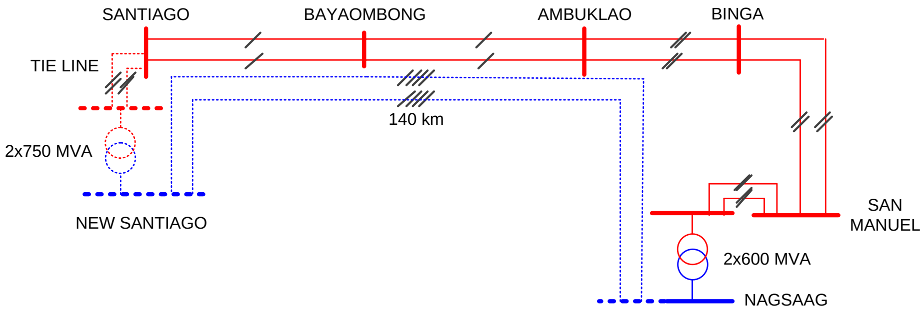


10.1.3 Northern Luzon 230 kV Loop

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, Pudtol-Sanchez Mira and the Lal-lo-Pudtol 230 kV Line, will be constructed to complete the 230 kV Loop.



10.1.4 Nagsaag–Santiago 500 kV Transmission Line

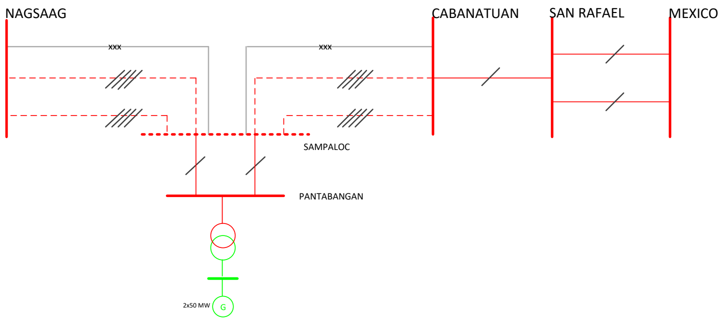


The Nagsaag–Santiago 500 kV Transmission Line Project aims to serve as a new transmission backbone to support the generation developments in Cagayan Valley and Cordillera, which includes hydro power plants, wind farms and other conventional power plants. It will relieve the overloading that will be experienced 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.

10.1.5 Luzon–Visayas HVDC Bipolar Operation

The Luzon–Visayas High Voltage Direct Current (HVDC) Bipolar Operation aims to accommodate additional generation, import and export to the Visayas Grid. This includes the development of the Naga 500/230 kV Substation, as well as upgrading of the Naga and Ormoc Converter/Inverter Stations. The detailed information of this project is discussed in section 8.2.

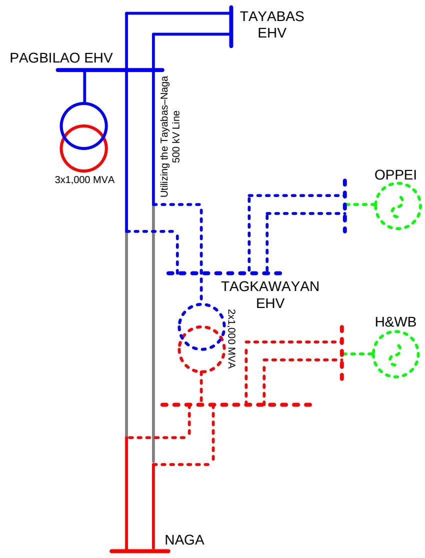
10.1.6 Cabanatuan–Sampaloc–Nagsaag 230 kV Transmission Line



The Cabanatuan–Sampaloc–Nagsaag 230 kV Transmission Line Project aims to address the overloading of the single circuit, single bundle Cabanatuan–Sampaloc / Pantabangan–Nagsaag 230 kV transmission line. Aside from the anticipated overloading, these transmission facilities already reached its 50-year asset life and thus, provides low reliability. These transmission facilities were commissioned in year 1967.The project involves the upgrading of the Sampaloc–Nagsaag 230 kV Transmission Line and the Sampaloc–Cabanatuan 230 kV Transmission Line from a single circuit, 1-795 MCM ACSR conductor to a double circuit, 4-795 MCM ACSR conductor. These transmission facilities will already exceed its asset life. This results to reliability issues in the aforementioned transmission facilities.

10.1.7 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 Pagbilao–Naga 230 kV Transmission Line. This scheme will necessitate the energization of the Tagkawayan–Pagbilao segment into 500 kV voltage level.

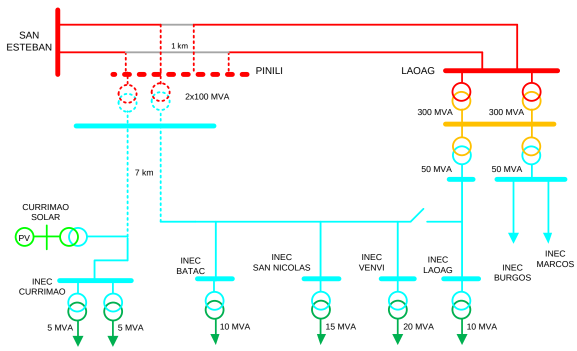


10.1.8 North Luzon 230 kV Substation Upgrading Project 2

The North Luzon Substation Upgrading Project 2 aims to cater the load growth and provide N-1 contingency to various substations in NGCP's North Luzon Region, Nagsaag, Balingueo, Tuguegarao, Laoag, Concepcion, Bauang, Bayombong, Santiago and San Esteban 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.

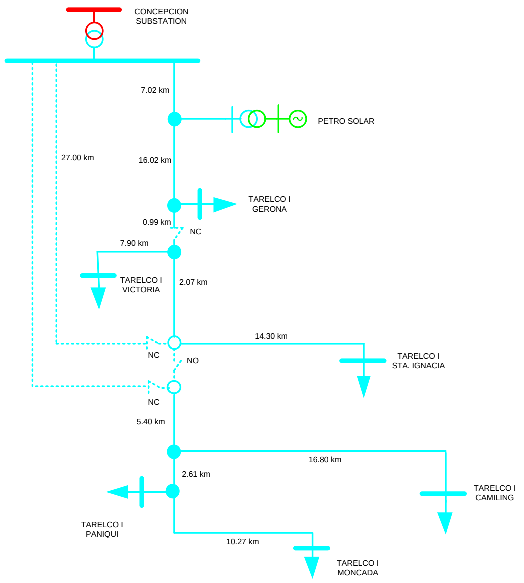
10.1.9 Pinili 230kV Substation

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. This will also serve 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 2x100 MVA, 230/69-13.8 kV Power Transformer, 10-230 kV PCBs, 5-69 kV PCBs and its associated equipment.



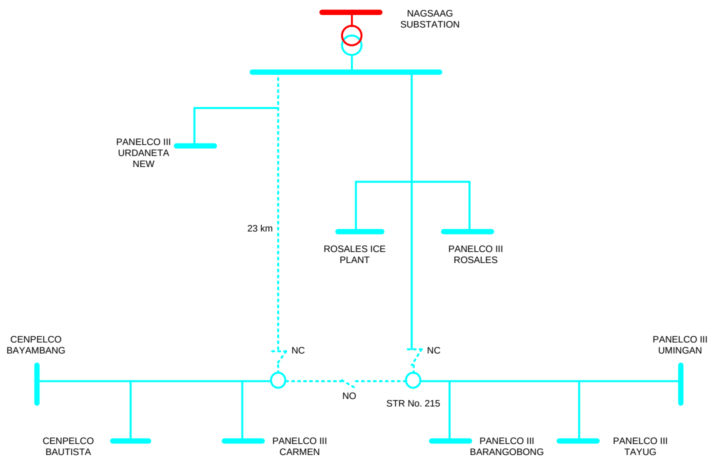
10.1.10 Concepcion–Sta. Ignacia 69 kV Transmission Line

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) will already be overloaded. The Concepcion–Sta. Ignacia 69 kV Transmission Line Project involves the construction of a new double circuit 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.

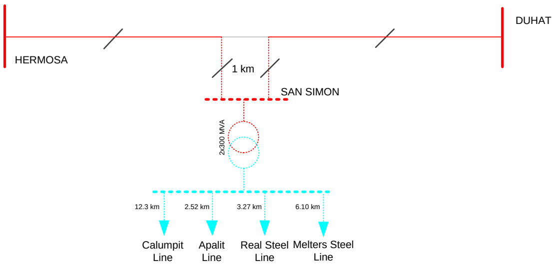


10.1.11 Nagsaag–Tumana 69 kV Transmission Line

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.

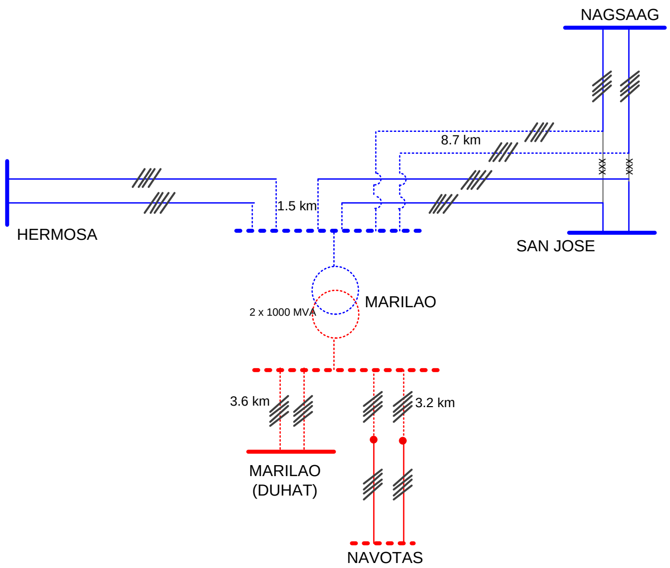


10.1.12 San Simon 230 kV Substation



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.

10.1.13 Marilao 500 kV Substation



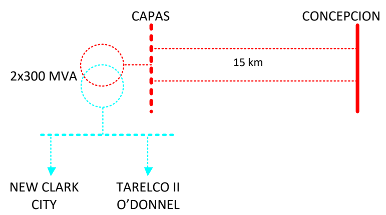
The Marilao 500 kV Substation aims to provide another drawdown substation to support the increasing demand in Metro Manila and will also address the further increase in bulk power injection to the 500 kV system coming from the new power plants in the grid. The project will also address the initial line 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.

10.1.14 Luzon Voltage Improvement Project 5

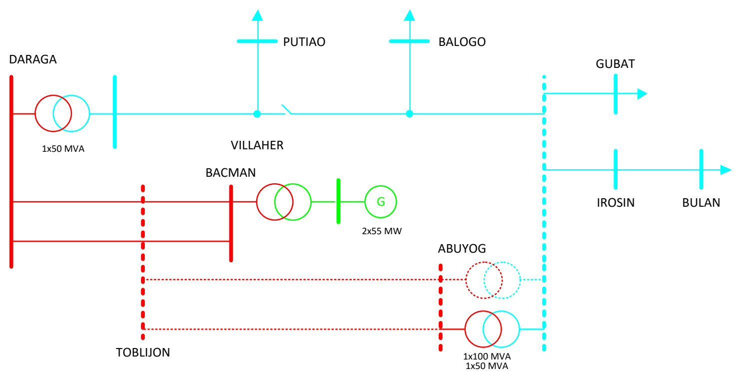
The Luzon Voltage Improvement Project 5 aims to address the anticipated undervoltage problem during peak load condition at various load-end substations in Cagayan, Tarlac, Nueva Ecija, Pampanga, Zambales, Pangasinan, Batangas, Quirino, Isabela, Nueva Viscaya, and Benguet.

10.1.15 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.

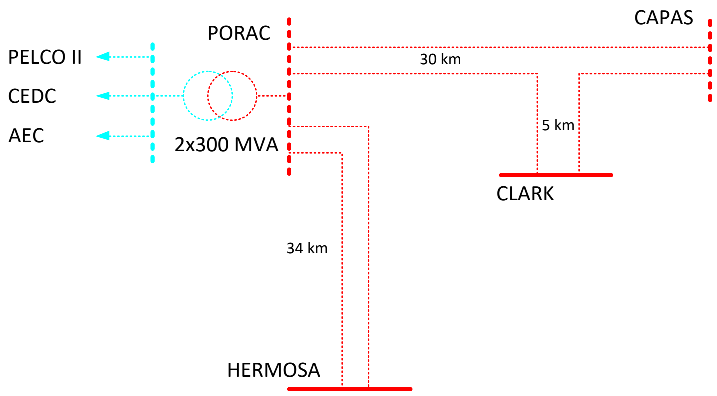


10.1.16 Abuyog 230 kV Substation



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 proposed Abuyog 230 kV Substation will connect to a new switching station in Toblijon, Sorsogon through a 22.7 km ST-DC, 2-795 MCM ACSR transmission line. The switching station will bus-in along Daraga–Bacman 230 kV Line. The Abuyog Substation involves the installation of 1x100 MVA, 230/69-13.8 kV Power Transformer. In addition to this, the refurbished 50 MVA 230/69 kV transformer from Daraga Substation will be installed in Abuyog 230 kV Substation.

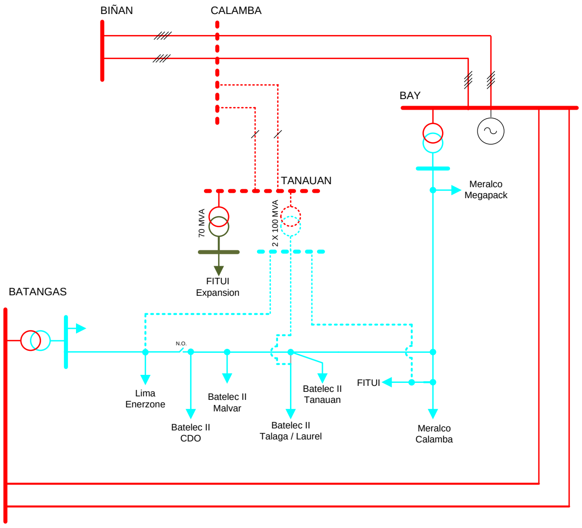
10.1.17 Porac 230 kV Substation



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.

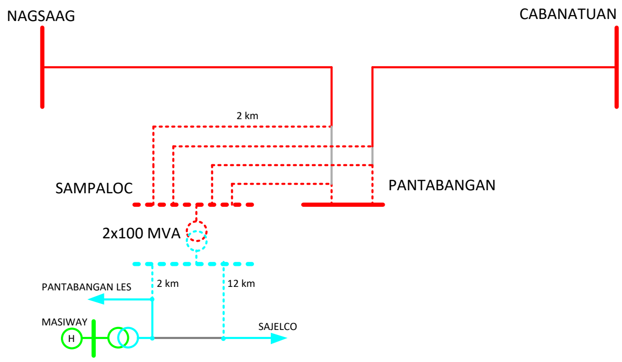
10.1.18 Tanauan 230 kV Substation

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. 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 supply to the aforementioned loads. The Project involves the development of Tanauan 230 kV Substation and will be radially connected to the Calamba 230 kV Substation.

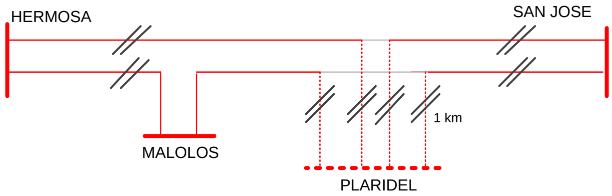


10.1.19 Sampaloc 230 kV Substation

The Sampaloc 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 Sampaloc 230 kV Substation will be connected to the Luzon Grid through a 'bus-in' along the Nagsaag–Pantabangan 230 kV Line and the Cabanatuan–Pantabangan 230 kV Line via a 2 km ST-DC 1-795 MCM ACSR/AS 230 kV Transmission Line with 2x100 MVA transformer capacity. Ultimately, this substation will be linked to Nagsaag and Cabanatuan 230 kV Substations through a new double circuit Sampaloc–Nagsaag–Cabanatuan 230 kV Transmission Line.

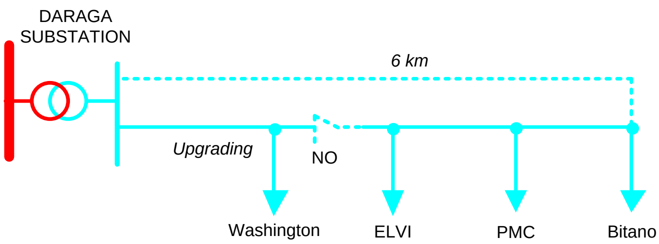


10.1.20 Plaridel 230 kV Substation



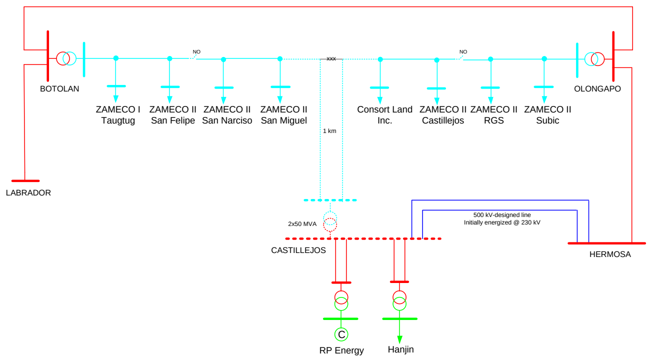
The Plaridel 230 kV Substation will serve as an additional drawdown substation to address the continuous load growth in MERALCO's Bulacan Sector. This project will provide N-1 contingency provision to the 230/69 kV transformers at San Rafael and Malolos Substations. The Plaridel 230 kV Substation will 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.

10.1.21 Daraga–Bitano 69 kV Transmission Line



The Daraga–Bitano 69 kV Transmission Line 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. This new line will address the reliability of supply in Legaspi.

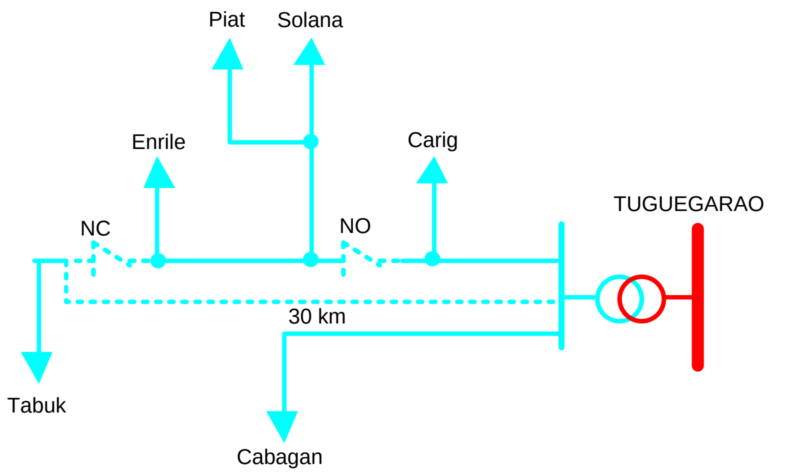
10.1.22 Castillejos 230 kV Substation



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 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).

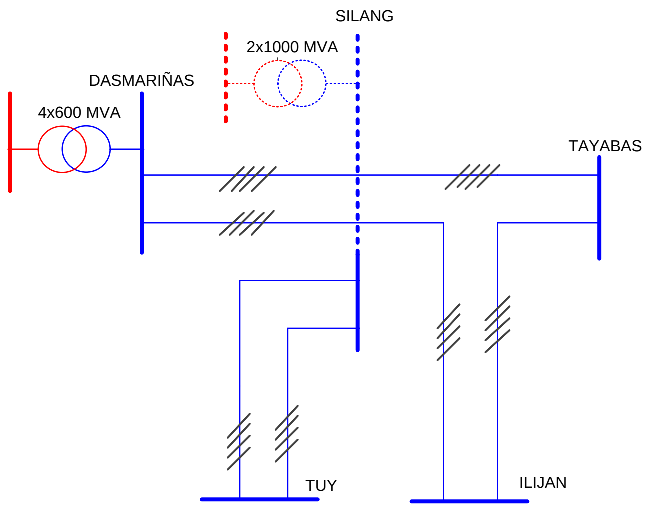
10.1.23 Tuguegarao–Enrile 69 kV Transmission Line

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, 15 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 15 km 1-795 MCM ACSR 69 kV transmission line.



10.1.24 Silang 500 kV Substation

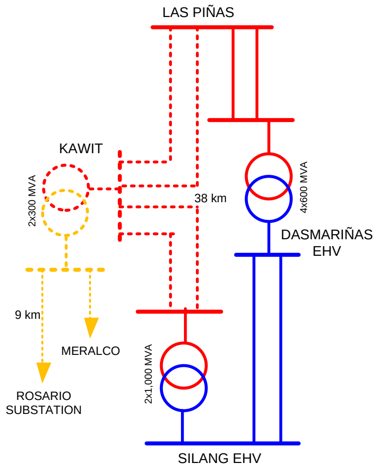
The Silang 500 kV Substation aims to complement the development of the Tuy 500 kV Substation which will support the entry of additional generation capacities in Batangas Area. Due to space limitation at Dasmariñas 500 kV Substation, the Silang 500 kV Substation will be developed to terminate the 500 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 Biñan 230 kV line going to Dasmariñas will be diverted to Silang 500/230 kV Substation.

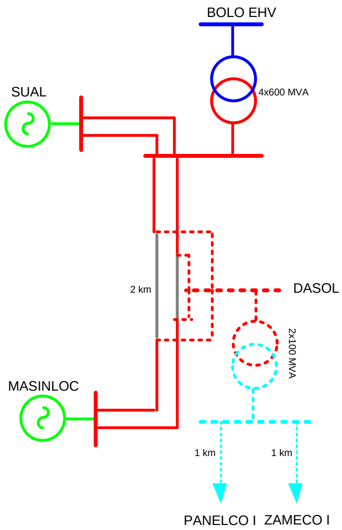
10.1.25 Kawit 230 kV Substation

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 space limitation 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.

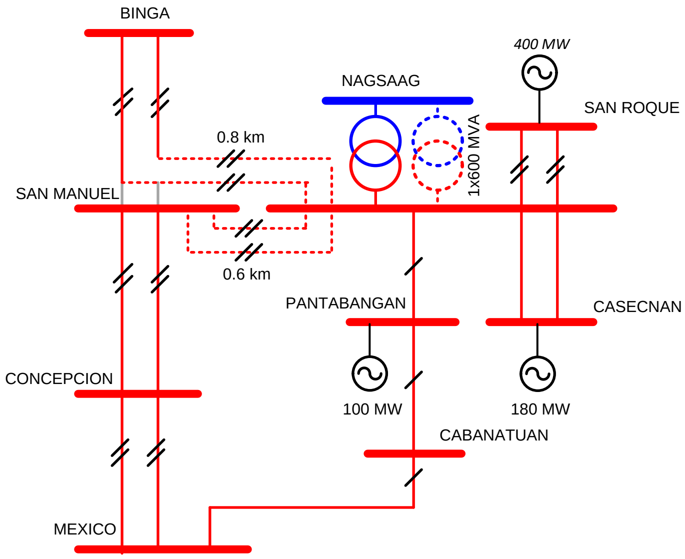


10.1.26 Dasol 230 kV Substation

The Dasol 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 of supply to the aforementioned loads. The Project involves the development of Dasol 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.

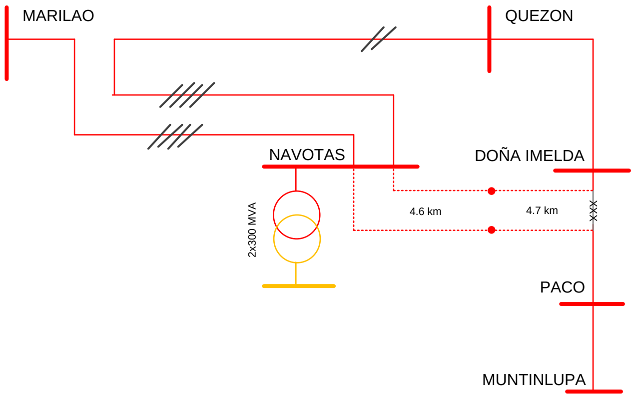


10.1.27 San Manuel–Nagsaag 230 kV Transmission Line



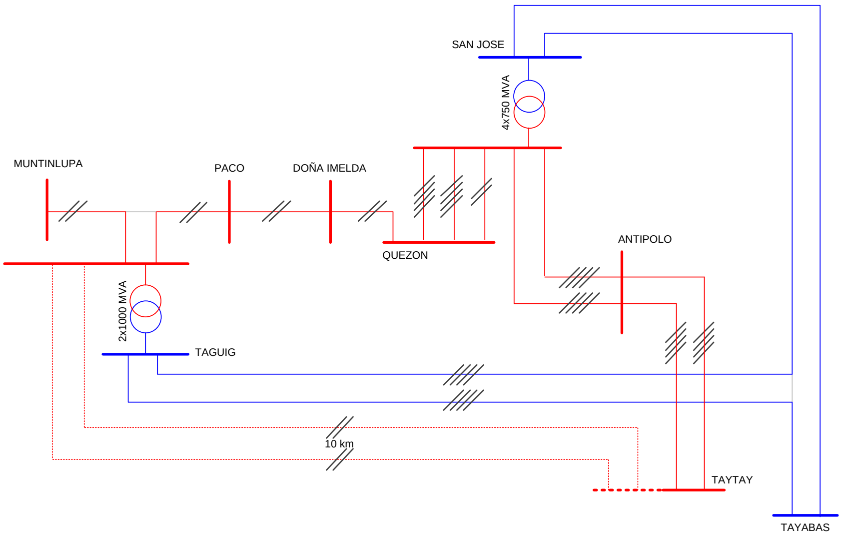
The project aims to address the overloading of the San Manuel–Nagsaag 230 kV tie line, Pantabangan–Cabanatuan 230 kV Line, and the Nagsaag 500/230 kV transformer. During Maximum North condition and the hydro plants are maximized, outage of the San Manuel–Nagsaag 230 kV tie line will result in the overloading 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.

10.1.28 Navotas–Doña Imelda 230 kV Transmission Line



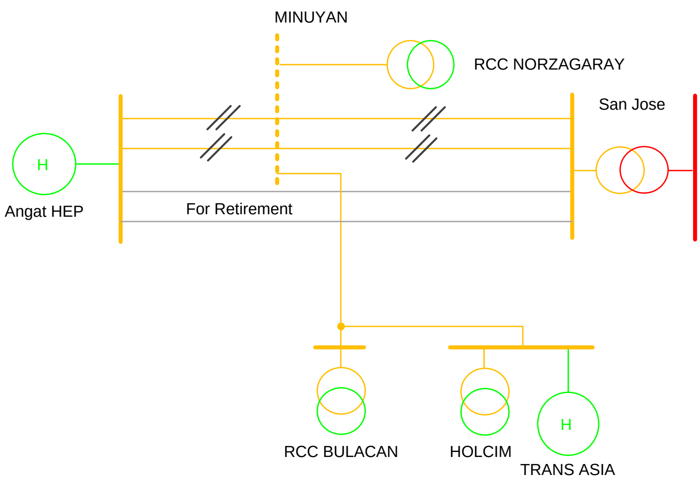
This project aims to provide additional transmission corridor that will complement the existing single circuit Quezon–Doña–Paco–Muntinlupa 230 kV line and will help address its criticality. Effectively, the Marilao–Navotas 230 kV Line and the Navotas–Doña Imelda 230 kV Line together with the existing 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.

10.1.29 Taguig–Taytay 230 kV Transmission 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.

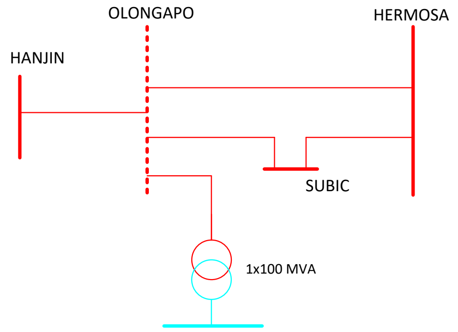
10.1.30 Minuyan 115 kV Switching Station



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.

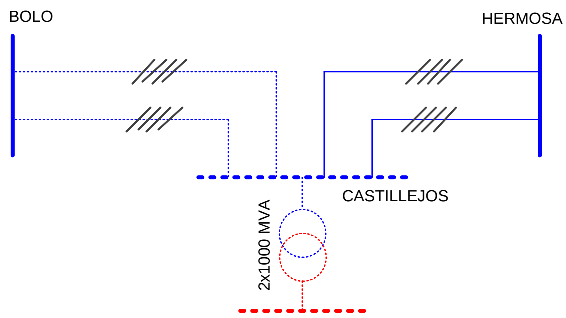
10.1.31 Olongapo 230 kV Substation Upgrading

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 to ensure continuous reliable operation of the substation.



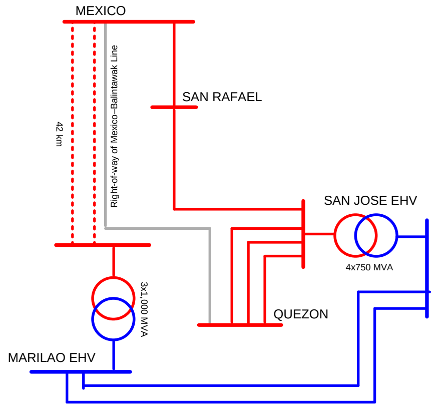
10.1.32 Western 500 kV Backbone – Stage 2

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.



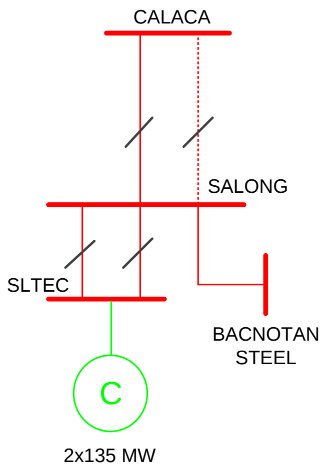
10.1.33 Marilao–Mexico 230 kV Transmission Line

The Marilao–Mexico 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.



10.1.34 Calaca–Salong 230 kV Transmission Line 2

The Calaca–Salong 230 kV Transmission Line 2 Project will provide 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.



10.2 Proposed Transmission Outlook for 2030

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 Pinamucan to Tuy 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. On the other hand, further generation capacity addition in Northern Luzon particularly in Ilocos Norte, since this is a Renewable Energy Zone, will be addressed by both Bolo–Balaoan 500 kV Transmission Line Project and the Balaoan–Laoag 500 kV Transmission Line Project.

To address the forecasted load growth, the development of new drawdown substations will be needed. These include the development of Magalang, Guagua and Apalit 230 kV Substations in Pampanga, Baler 230 kV Substation in Aurora, San Fabian 230 kV Substation in Pangasinan, Valenzuela 230 kV Substation in Metro Manila, Balanga 230 kV Substation in Bataan, Cabatuan 230 kV Substation in Isabela, San Isidro 230 kV Substation in Nueva Ecija, Malvar 230 kV Substation in Batangas, Iriga 230 kV Substation in Camarines Sur, Nuvali 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 230 kV transmission corridor, the Hermosa–Mexico 230 kV Transmission Line, and the Mexico–Clark 69 kV Transmission Line. In North Luzon, upgrading of the Bauang–La Trinidad 230 kV Transmission Line will also be implemented. In Metro Manila, additional transmission corridors will be implemented such as the Limay–Pasay and Pasay–Taguig 230 kV Transmission Line.

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

Table 10.2: Proposed Luzon Transmission Outlook for 2030

Project Name/Driver(s)	Province(s) and Components	ETC
Generation Entry		
Bolo–Balaoan 500 kV Transmission Line	La Union, Pangansinan	Nov 2026
	Substation Components: ▪ Balaoan 500 kV Substation, 2x750 MVA, 500/230-13.8 kV Power Transformers and accessories, 20-500 kV PCBs and associated equipment, 21-230 kV PCBs and associated equipment 4x90 MVAR, 500 kV Shunt Reactor and accessories, 2x60 MVAR, 500 kV Line Reactor and accessories, 3x100, 230 kV Shunt Capacitor Banks and accessories. ▪ Bolo 500 kV Substation, 4-500 kV PCBs and associated equipment. Transmission Components: ▪ Bolo–Balingueo 500 kV Transmission Line (Stage 1), ST-DC, 4-410 mm^2 TACSR, 41 km; ▪ Balingueo–Balaoan 500 kV Transmission Line (Stage 2), ST-DC, 4-410 mm^2 TACSR, 89 km; ▪ Bacnotan–Balaoan 230 kV Transmission Line, ST-DC, 1-795 MCM ACSR, 11 km; ▪ Balaoan–Bakun 230 kV Transmission Line, ST-DC, 1-795 MCM ACSR, 13.7 km; ▪ Balaoan Bus-in to Bauang–San Esteban 230 kV Transmission Line, ST-DC, 1-795 MCM ACSR/AS, 2x0.6 km.	
Balaoan–Laoag 500 kV Transmission Line	La Union, Ilocos Norte	Nov 2026
	Substation Components: ▪ Laoag 500 kV Substation (new), 2x1,000 MVA, 500/230-13.8 kV Power Transformers and accessories, 11-500 kV PCBs and associated equipment, 8-230 kV PCBs and associated equipment, 3x90 MVAR, 500 kV Shunt Reactor and accessories, 2x60 MVAR, 500 kV Line Reactor and accessories; ▪ Laoag 230 kV Substation, 2-230 kV PCBs and associated equipment. ▪ New Bantay 230 kV Substation, 2x100 MVA, 230/69 kV Power Transformer and accessories, 10-230 kV PCBs and associated equipment, 6-69 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. ▪ Bantay Bus-in 230 kV Line, ST-DC,1-795 MCM ACSR, 2 km	
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.	

Project Name/Driver(s)	Province(s) and Components	ETC
Tuy 500/230 kV Substation (Stage 2)	Batangas	Dec 2027
	Substation Components: ▪ Tuy 500/230 kV Substation, 3x1,000 MVA, 500/230 kV Power Transformers and accessories, 8-500 kV PCBs and associated equipment, 1-230 kV PCBs and associated equipment.	
Bolo 5th Bank	Pangasinan	Dec 2028
	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	
Pinamucan–Tuy 500 kV Line	Batangas, Laguna	Oct 2029
	Substation Components: ▪ Pinamucan 500 kV Substation, 2-500 kV PCBs and associated equipment; ▪ Tuy 500 kV Substation, 4-500 kV PCBs and associated equipment. Transmission Components: ▪ Pinamucan–Tuy 500 kV Transmission Line, ST-DC, 4-795 MCM ACSR/AS, 60.0 km.	
Load Growth		
South Luzon Substation Upgrading 2	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; ▪ Tuy 230 kV Substation, 1x100 MVA, 230/69-13.8 kV Power Transformer and associated equipment; ▪ Tanauan 230 kV Substation, 1x100 MVA, 230/69-13.8 kV Power Transformer and associated equipment; ▪ Labo 230 kV Substation (Replacement), 1x100 MVA, 230/69-13.8 kV Power Transformer and associated equipment; ▪ Daraga 230 kV Substation (Replacement), 2x100 MVA, 230/69-13.8 kV Power Transformer and associated equipment; ▪ Abuyog 230 kV Substation (Replacement), 1x100 MVA, 230/69 kV Power Transformer and associated equipment.	
North Luzon 69 kV Transmission Line Upgrading 1	Ilocos Norte, Benguet, Isabela, Bataan, Nueva Ecija	Dec 2026
	Transmission Components: ▪ Laoag–Laoag Load-End 69 kV Transmission Line, SP/ST-SC, 1-160mm^2 STACIR, 2.29 km. ▪ La Trinidad–Lamut Load-End 69 kV Transmission Line, SP/ST-SC, 1-160mm^2 STACIR, 1 km. ▪ Santiago–Cordon Load-End 69 kV Transmission Line, SP/ST-SC, 1-160mm^2 STACIR, 5.03 km. ▪ Limay–Mariveles Load-End 69 kV Transmission Line 1, SP/ST-SC, 1-160mm^2 STACIR, 13.88 km. ▪ Mariveles–AFAB Load-End 69 kV Transmission Line, SP/ST-SC, 1-160mm^2 STACIR, 5 km. ▪ Cabanatuan–Talavera Load-End 69 kV Transmission Line, SP/ST-SC, 1-160mm^2 STACIR, 18 km.	
South Luzon 69 kV Transmission Line Upgrading 1	Batangas	Dec 2026
	Transmission Components: ▪ Tuy–Nasugbu Load-End 69 kV Transmission Line, SP/ST-SC, 1-160mm^2 STACIR, 15 km. ▪ Calaca–Mataas na Kahoy Load-End 69 kV Transmission Line, SP/ST-SC, 1-160mm^2 STACIR, 2.42 km.	

Project Name/Driver(s)	Province(s) and Components	ETC
Sampaloc–Baler 230 kV Transmission Line	Nueva Ecija, Aurora	Dec 2026
	Transmission Components: ▪ Sampaloc–Baler 230 kV Transmission Line (initially energized at 69 kV), 2-795 MCM ACSR ST-DC, 57 km.	
Marilao 500 kV Substation Expansion	Bulacan	Dec 2026
	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.	
Taguig EHV Substation Expansion	Metro Manila	Dec 2027
	Substation Components: ▪ Taguig 500 kV Substation, 1x1,000 MVA, 500/230 kV Power Transformer and accessories.	
Magalang 230 kV Substation	Pampanga	Dec 2027
	Substation Components: ▪ Magalang 230 kV Substation, 2x300 MVA 230/69 kV Power Transformer and accessories, 8-230 kV PCBs and associated equipment, 8-69 kV PCB and associated equpment Transmission Components: ▪ Magalang *'bus-in' to Concepcion*–Mexico 230 kV Transmission Line, ST-DC, 2-410 mm^2 TACSR/AS, 5 km;	
San Agustin 230 kV Substation	Tarlac	Dec 2027
	Substation Components: ▪ San Agustin 230 kV Substation, 2x300 MVA 230/69 kV Power Transformer and accessories, 3x50 MVAR, 230 kV Shunt Capacitor and accessories, 13-230 kV PCBs and associated equipment, 6-69 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.	
San Fabian 230 kV Substation	La Union	Dec 2027
	Substation Components: ▪ San Fabian 230 kV Substation, 2x100 MVA 230/69 kV Power Transformer and accessories, 10-230 kV PCBs and associated equipment, 4-69 kV PCBs and associated equipment. Transmission Components: ▪ San Fabian Bus-in to Bauang–BPPC–Balingueo 230 kV Transmission Line, ST-DC, 1-795 MCM ACSR/AS, 3.76 km. ▪ Bolo–Balingueo 230 kV Transmission Lune (Upgrading), ST-DC, 4-795 MCM ACSR, 40.67 km ▪ San Fabian (NGCP)–San Fabian (LUELCO) 69 kV Transmission Line, SP-SC, 1-795 MCM ACSR, 1.36 km ▪ San Fabian (NGCP)–San Fabian (DECORP) 69 kV Transmission Line, SP-SC, 1-795 MCM ACSR, 2.4 km	
Apalit 230 kV Substation	Pampanga	Dec 2027
	Substation Components: ▪ Apalit 230 kV Substation, 2x300 MVA 230/69 kV Power Transformer and accessories, 3x100 MVAR, 230 kV Shunt Capacitor and accessories, 13-230 kV PCBs and associated equipment, 8-69 kV PCBs and associated equipment. Transmission Components: ▪ Apalit Bus-in to Marilao–Mexico 230 kV Transmission Line, ST-DC, 4-795 MCM ACSR/AS, 5 km. ▪ Apalit–Apalit Load-end Substation 69 kV Transmission Line, SP/ST-SC, 1-410 mm^2 TACSR, 2 km ▪ Apalit–LINDE 69 kV Transmission Line, SP/ST-SC, 1-410 mm^2 TACSR, 6 km	

Project Name/Driver(s)	Province(s) and Components	ETC
Valenzuela 230 kV Substation	Metro Manila	Dec 2027
	Substation Components: ▪ Valenzuela 230 kV Substation, 3x100 MVAR, 230 kV Shunt Capacitor and accessories, 9-230 kV PCBs and associated equipment; ▪ Marilao 230 kV Substation, 2-230 kV PCBs and associated equipment; Transmission Components: ▪ Valenzuela–Marilao 230 kV Transmission Line, ST-DC, 4-795 MCM ACSR, 8 km	
Iriga 230 kV Substation	Camarines Sur	Dec 2028
	Substation Components: ▪ Iriga 230 kV Substation, 2x300 MVA, 230/69-13.8 kV Power Transformer and accessories, 3x50 MVAR, 230 kV Shunt Capacitor and accessories, 13-230 kV PCBs and associated equipment, 6-69 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.	
Malvar 230 kV Substation	Batangas	Dec 2028
	Substation Components: ▪ Malvar 230 kV Substation, 2x100 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.	
Balanga 230 kV Substation	Bataan	Dec 2028
	Substation Components: ▪ Balanga 230 kV Substation, 2x300 MVA 230/69 kV Power Transformer and accessories, 3x100 MVAR, 230 kV Shunt Capacitor and accessories, 13-230 kV PCBs and associated equipment, 6-69 kV PCBs and associated equipment. Transmission Components: ▪ Balanga Bus-in to BCCPP B–Hermosa 230 kV Transmission Line, ST-DC, 2-410 mm^2 TACSR/AS, 2 km. ▪ Balanga 69 kV Line Extension, SP/ST-SC, 1-410 mm^2 TACSR, 1 km	
San Isidro 230 kV Substation	Nueva Ecija	Dec 2028
	Substation Components: ▪ San Isidro 230 kV Substation, 2x300 MVA 230/69 kV Power Transformer and accessories, 3x50 MVAR, 230 kV Shunt Capacitor and accessories, 13-230 kV PCBs and associated equipment, 6-69 kV PCBs and associated equipment. Transmission Components: ▪ San Isidro Bus-in to Mexico–Cabanatuan 230 kV Transmission Line, ST-DC, 4-795 MCM ACSR, 2 km. ▪ San Isidro–Bulualto Load-end Substation 69 kV Transmission Line, SP/ST-DC, 1-410 mm^2 TACSR, 5 km	
FBGC 230 kV Substation	Metro Manila	Dec 2028
	Substation Components: ▪ FBGC 230 kV Substation, 8-230 kV PCBs (GIS) and associated equipment. Transmission Components: ▪ FBGC Cut-in to Taguig–Paco 230 kV Transmission Line, SP-SC, 2-610 mm^2 TACSR/AS, 2 km. ▪ Taguig–FBGC 230 kV Transmission Line, SP-SC, 2-410 mm^2 TACSR/AS, 7.0 km	

Project Name/Driver(s)	Province(s) and Components	ETC
Alaminos EHV Substation	Laguna <u>Substation Components:</u> ▪ 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. <u>Transmission Components:</u> ▪ 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;	Dec 2030
Guagua 230 kV Substation	Pampanga <u>Substation Components:</u> ▪ Guagua 230 kV Substation, 2x300 MVA 230/69 kV Power Transformer and accessories, 3x100 MVAR, 230 kV Shunt Capacitor and accessories, 13-230 kV PCBs and associated equipment, 12-69 kV PCBs and associated equipment. <u>Transmission Components:</u> ▪ Guagua Bus-in to Hermosa–Mexico 230 kV Transmission Line, ST-DC, 4-795 MCM ACSR/AS, 2 km. ▪ Guagua–SFELAPCO Magdalena 69 kV Transmission Line, SP/ST-SC, 1-410 mm^2 TACSR, 2 km ▪ Guagua–Guagua Load-end Substation 69 kV Transmission Line, SP/ST-SC, 1-410 mm^2 TACSR, 1 km ▪ Guagua–Manibaug Load-end Substation 69 kV Transmission Line, SP/ST-SC, 1-410 mm^2 TACSR, 16 km	Dec 2029
Baler 230 kV Substation	Aurora <u>Substation Components:</u> ▪ Baler 230 kV Substation, 2x100 MVA 230/69 kV Power Transformer and accessories, 3x25 MVAR, 230 kV Shunt Capacitor and accessories, 9-230 kV PCBs and associated equipment, 6-69 kV PCBs and associated equipment.	Dec 2030
Nuvali 230 kV Substation	Laguna <u>Substation Components:</u> ▪ Nuvali 230 kV Substation, 3x100 MVAR, 230 kV Shunt Capacitor and accessories, 13-230 kV PCBs and associated equipment. <u>Transmission Components:</u> ▪ Nuvali 230 kV bus-in Transmission Line, ST-DC, 2-795 MCM ACSR, 2 km	Dec 2030
Cabatuan 230 kV Substation	Isabela <u>Substation Components:</u> ▪ Cabatuan 230 kV Substation, 2x300 MVA 230/69 kV Power Transformer and accessories, 3x50 MVAR, 230 kV Shunt Capacitor and accessories, 13-230 kV PCBs and associated equipment, 8-69 kV PCBs and associated equipment. <u>Transmission Components:</u> ▪ Cabatuan Bus-in to Santiago–Gamu 230 kV Transmission Line, ST-DC, 1-795 MCM ACSR, 2 km. ▪ Cabatuan–Cabatuan Load-end Substation 69 kV Transmission Line, SP/ST-SC, 1-795 MCM ACSR, 6.36 km ▪ Cabatuan–Reina Mercedes Load-end Substation 69 kV Transmission Line, SP/ST-SC, 1-795 MCM ACSR, 19.59 km ▪ Cabatuan–Cauayan Load-end Substation 69 kV Transmission Line, SP/ST-DC, 1-410 mm^2 TACSR, 14.49 km	Dec 2030
System Reliability		
Bauang–La Trinidad 230 kV Transmission Line Upgrading	La Union, Benguet <u>Transmission Components:</u> Bauang–La Trinidad 230 kV Transmission Line, 4-795 MCM ACSR ST-DC, 35.8 km.	Jun 2027

Project Name/Driver(s)	Province(s) and Components	ETC
Taguig–Silang 500 kV Transmission Line	Cavite, Metro Manila Substation Components: Silang 500 kV Substation, 4-500 kV PCBs and associated equipment; Transmission Components: Taguig–Silang 500 kV Transmission Line, ST-DC, 4-410mm^2 TACSR, 72 km;	Dec 2027
Mexico–Clark 69 kV Transmission Line Upgrading	Pampanga Transmission Components: Mexico–Clark Line 69 kV Transmission Line, ST-DC, 2-795 MCM ACSR, 18 km.	Apr 2028
Cabanatuan–San Rafael–Mexico 230 kV Transmission Line Upgrading	Nueva Ecija, Pampanga, Bulacan Transmission Components: ▪ Cabanatuan–San Rafael–Mexico 230 kV Transmission Line, ST-DC, 4-795 MCM ACSR, 87 km.	Apr 2028
Hermosa–Mexico 230 kV Transmission Line Upgrading	Bataan, Pampanga Transmission Components: ▪ Hermosa–Mexico 230 kV Transmission Line, ST-DC, 4-795 MCM ACSR, 37.65 km.	Dec 2028
Pasay–Taguig 230 kV Transmission Line	Metro Manila Transmission Components: Pasay–Taguig 230 kV Transmission Line, 2-410 mm^2 TACSR SP-DC, 16 km.	Dec 2030
Navotas–Pasay 230 kV Transmission Line	Metro Manila 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.	Dec 2030
Naga–Presentacion 230 kV Transmission Line	Camarines Sur 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).	Dec 2030
Limay–Pasay 230 kV Transmission Line	Bataan, Metro Manila 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.	Dec 2030
Power Quality		
Luzon Voltage Improvement Project 6	Metro Manila, Bulacan, Laguna, Pampanga Substation Components: ▪ Taguig 230 kV Substation, 1x100 MVAR, 230 kV Capacitor Banks and accessories; ▪ 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;	Dec 2030

10.3 Proposed Transmission Outlook for 2035

For year 2031-2035, the development of new delivery substations is still necessary to meet the forecasted increase in demand in the area. These substations are the Sariaya 230 kV Substation in Quezon, Presentacion 230 kV Substation in Camarines Sur, Bustos 230 kV Substation in Bulacan, and San Mateo 230 kV Substation in Rizal.

The transmission corridor in Metro Manila will be further strengthened by upgrading the Taguig–Muntinlupa 230 kV Transmission Line from single circuit to double circuit.

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.

Table 10.3: 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
	<u>Substation Components:</u> ▪ 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. <u>Transmission Components:</u> ▪ Santiago–Kabugao 500 kV Transmission Line, ST-DC, 4-795 MCM ACSR, 171 km.	
Load Growth		
North Luzon Substation Upgrading 3	Ilocos Norte, Benguet, Pangasinan, Isabela, Cagayan, Bataan, Zambales, Tarlac, Pampanga, Nueva Ecija	Dec 2031
	<u>Substation Components:</u> ▪ Laoag 230 kV Substation, 1x100 MVA 115/69-13.8 kV Power Transformer and associated equipment; ▪ La Trinidad 230 kV Substation, 1x300 MVA 230/69-13.8 kV Power Transformer and associated equipment; ▪ San Manuel 230 kV Substation (Replacement), 2x300 MVA 230/69-13.8 kV Power Transformer and associated equipment; ▪ Dasol 230 kV Substation, 1x100 MVA 230/69-13.8 kV Power Transformer and associated equipment; ▪ Santiago 230 kV Substation (Replacement), 2x300 MVA 230/69-13.8 kV Power Transformer and associated equipment; ▪ Tuguegarao 230 kV Substation (Replacement), 2x300 MVA 230/69-13.8 kV Power Transformer and associated equipment; ▪ Lal-lo 230 kV Substation, 1x100 MVA 230/69-13.8 kV Power Transformer and associated equipment; ▪ Bangui 230 kV Substation, 2x50 MVA 230/69-13.8 kV Power Transformer and associated equipment; ▪ Hermosa 230 kV Substation, 1x300 MVA 230/69-13.8 kV Power Transformer and associated equipment; ▪ Limay 230 kV Substation (Replacement), 2x300 MVA 230/69-13.8 kV Power Transformer and associated equipment; ▪ Mariveles 230 kV Substation, 1x100 MVA 230/69-13.8 kV Power Transformer and associated equipment; ▪ Olongapo 230 kV Substation (Replacement), 2x300 MVA 230/69-13.8 kV Power Transformer and associated equipment; ▪ Botolan 230 kV Substation (Replacement), 2x100 MVA 230/69-13.8 kV Power Transformer and associated equipment; ▪ Castillejos 230 kV Substation (Replacement), 2x100 MVA 230/69-13.8 kV Power Transformer and associated equipment; ▪ Concepcion 230 kV Substation, 1x300 MVA 230/69-13.8 kV Power Transformer and associated equipment;	

Project Name/Driver(s)	Province(s) and Components	ETC
	▪ Capas 230 kV Substation, 1x300 MVA 230/69-13.8 kV Power Transformer and associated equipment; ▪ Mexico 230 kV Substation (Replacement), 2x300 MVA 230/69-13.8 kV Power Transformer and associated equipment; ▪ Clark 230 kV Substation, 1x300 MVA 230/69-13.8 kV Power Transformer and associated equipment; ▪ San Simon 230 kV Substation, 1x300 MVA 230/69-13.8 kV Power Transformer and associated equipment; ▪ Porac 230 kV Substation, 1x300 MVA 230/69-13.8 kV Power Transformer and associated equipment; ▪ Magalang 230 kV Substation, 1x300 MVA 230/69-13.8 kV Power Transformer and associated equipment; ▪ Cabanatuan 230 kV Substation, 1x300 MVA 230/69-13.8 kV Power Transformer and associated equipment; ▪ Sampaloc 230 kV Substation, 1x100 MVA 230/69-13.8 kV Power Transformer and associated equipment;	
South Luzon Substation Upgrading 2	Batangas, Albay	Dec 2031
	Substation Components: ▪ Tuy 230 kV Substation, 1x100 MVA 230/69-13.8 kV Power Transformer and associated equipment; ▪ Tiwi 230 kV Substation (Replacement), 1x100 MVA 230/69-13.8 kV Power Transformer and associated equipment; ▪ Pinamucan 230 kV Substation, 1x100 MVA 230/69-13.8 kV Power Transformer and associated equipment;	
North Luzon 69 kV Transmission Line Upgrading 2	Ilocos Sur, Ilocos Norte, Bataan, Zambales, Tarlac	Dec 2031
	Transmission Components: ▪ San Esteban–Candon Load-End 69 kV Transmission Line, SP/ST-SC, 1-160mm^2 STACIR, 24.12 km. ▪ Laoag–San Nicolas Load-End 69 kV Transmission Line, SP/ST-SC, 1-160mm^2 STACIR, 6.85 km. ▪ Hermosa–Calaguiman Load-End 69 kV Transmission Line, SP/ST-SC, 1-160mm^2 STACIR, 13.95 km. ▪ Limay–Alas-asin Load-End 69 kV Transmission Line, SP/ST-SC, 1-160mm^2 STACIR, 11.34 km. ▪ Olongapo–Subic Load-End 69 kV Transmission Line, SP/ST-SC, 1-160mm^2 STACIR, 5.06 km. ▪ Botolan–Iba Load-End 69 kV Transmission Line, SP/ST-SC, 1-160mm^2 STACIR, 5.04 km. ▪ Concepcion–Gerona Load-End 69 kV Transmission Line, SP/ST-SC, 1-160mm^2 STACIR, 23.04 km.	
South Luzon 69 kV Transmission Line Upgrading 2	Batangas, Camarines Sur, Albay	Dec 2031
	Transmission Components: ▪ Tuy–Balayan Load-End 69 kV Transmission Line, SP/ST-SC, 1-160mm^2 STACIR, 11 km. ▪ Naga–Concepcion Load-End 69 kV Transmission Line, SP/ST-SC, 1-160mm^2 STACIR, 4.88 km. ▪ Daraga–Washington Load-End 69 kV Transmission Line, SP/ST-SC, 1-160mm^2 STACIR, 3.66 km. ▪ Daraga–Ligao Load-End 69 kV Transmission Line, SP/ST-SC, 1-160mm^2 STACIR, 21.5 km. ▪ Tiwi–Malinao Load-End 69 kV Transmission Line, SP/ST-SC, 1-160mm^2 STACIR, 8.1 km. ▪ Naga–Pamplona Load-End 69 kV Transmission Line, SP/ST-SC, 1-160mm^2 STACIR, 21.15 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:	

Project Name/Driver(s)	Province(s) and Components	ETC
	▪ San Mateo Cut-in to San Jose - Antipolo 230 kV Transmission Line, ST-DC, 4-795 MCM ACSR, 2 km.	
Bustos 230 kV Substation	Bulacan	Dec 2035
	Substation Components: ▪ Bustos 230 kV Substation, 10-230 kV PCBs and associated equipment Transmission Components: ▪ Bustos Bus-in to San Rafael–San Jose 230 kV Transmission Line, ST-DC, 4-795 MCM ACSR, 3 km.	
Sariaya 230 kV Substation	Quezon	Dec 2035
	Substation Components: ▪ Sariaya 230 kV Substation, 2x100 MVA, 230/69 kV Power Transformers and accessories, 2x100 MVAR, 230 kV Shunt Capacitor and accessories, 12-230 kV PCBs and associated equipment, 6-69 kV PCBs and associated equipment. Transmission Components: ▪ Malvar–Sariaya–Pagbilao 230 kV Transmission Line, ST-DC, 2-410 mm^2 TACSR/AS, 70 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, 3x25 MVAR, 230 kV Shunt Capacitor and accessories, 9-230 kV PCBs and associated equipment, 3-69 kV PCBs and associated equipment.	
System Reliability		
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 2	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.	

10.4 Proposed Transmission Outlook for 2040

From year 2035 to 2040, most of the projects will be focusing on the reliability of 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 Baler–Dinadiawan–Santiago 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 Kalinga 500 kV Substation will be developed 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.

Table 10.4: Proposed Luzon Transmission Outlook for 2040

Project Name/Driver(s)	Province(s) and Components	ETC
Generation Entry		
Matnog 230 kV Substation	Sorsogon	Dec 2040
	Substation Components: ▪ Matnog 230 kV Substation, 2x50 MVA, 230/69 kV Power Transformer and accessories, 3x25 MVAR, 230 kV Shunt Capacitor and accessories, 9-230 kV PCBs and associated equipment; ▪ Abuyog 230 kV Substation, 4-230 kV PCB and associated equipment. Transmission Components: ▪ Abuyog–Matnog 230 kV, 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. ▪ Kalinga–Tuguegarao 230 kV Transmission Line, ST-DC, 4-795 MCM ACSR, 70 km	
Load Growth		
North Luzon Substation Upgrading 4	Pangasinan, Cagayan, Zambales, Pampanga, Nueva Ecija	Dec 2036
	Substation Components: ▪ Labrador 230 kV Substation (Replacement), 2x300 MVA 230/69-13.8 kV Power Transformer and associated equipment; ▪ Balingueo 230 kV Substation (Replacement), 2x300 MVA 230/69-13.8 kV Power Transformer and associated equipment; ▪ Bayombong 230 kV Substation (Replacement), 2x300 MVA 230/69-13.8 kV Power Transformer and associated equipment; ▪ Tuguegarao 230 kV Substation (Replacement), 1x300 MVA 230/69-13.8 kV Power Transformer and associated equipment; ▪ Olongapo 230 kV Substation (Replacement), 1x300 MVA 230/69-13.8 kV Power Transformer and associated equipment; ▪ Porac 230 kV Substation, 1x300 MVA 230/69-13.8 kV Power Transformer and associated equipment; ▪ Magalang 230 kV Substation, 1x300 MVA 230/69-13.8 kV Power Transformer and associated equipment; ▪ San Simon 230 kV Substation, 1x300 MVA 230/69-13.8 kV Power Transformer and associated equipment; ▪ Cabanatuan 230 kV Substation, 1x300 MVA 230/69-13.8 kV Power Transformer and associated equipment; ▪ Sampaloc 230 kV Substation, 1x100 MVA 230/69-13.8 kV Power Transformer and associated equipment;	
South Luzon Substation Upgrading 3	Batangas, Camarines Sur, Albay, Sorsogon	Dec 2036
	Substation Components: ▪ Malvar 230 kV Substation, 1x300 MVA 230/69-13.8 kV Power Transformer and associated equipment; ▪ Naga 230 kV Substation, 1x300 MVA 230/69-13.8 kV Power Transformer and associated equipment; ▪ Daraga 230 kV Substation (Replacement), 2x300 MVA 230/69-13.8 kV Power Transformer and associated equipment; ▪ Abuyog 230 kV Substation, 1x100 MVA 230/69-13.8 kV Power Transformer and associated equipment;	
System Reliability		
Baras 500 kV Substation	Rizal	Dec 2038
	Substation Components: ▪ Baras 500 kV Substation, 2x1,000 MVA, 500/230 kV, 10-500 kV PCBs and associated equipment. ▪ Antipolo 230 kV Substation, 4-230 kV PCBs and associated equipment Transmission Components:	

Project Name/Driver(s)	Province(s) and Components	ETC
	▪ Antipolo–Baras 230 kV Line, ST-DC, 4-795 MCM ACSR, 18 km.	
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.	
Dinadiawan–Santiago 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 500 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.	
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 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. 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 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 2018, the maximum demand in Bohol reached 91 MW. By 2021, even when all diesel power plants are utilized in Bohol Island, the Leyte–Bohol 138 kV submarine cable is expected to 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.

11.1 Proposed Transmission Projects up to 2025

Shown in Table 11.1 is the list of transmission projects planned for Visayas in the period 2020-2025 in addition to the projects already approved by the ERC.

Table 11.1: Proposed Transmission Projects for Visayas

<table>
<tr><th>Project Name/Driver(s)</th><th>Province(s)</th><th>ETC</th></tr>
<tr><td colspan="3">Generation Entry</td></tr>
<tr><td rowspan="2">Cebu–Negros–Panay 230 kV Backbone Project – Stage 2</td><td>Cebu</td><td>Dec 2021</td></tr>
<tr><td colspan="2">Substation Components:
▪ Cebu 230 kV Substation, 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 mm² 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 mm² 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: 3,329 million Pesos</td></tr>
<tr><td rowspan="2">Panay–Guimaras 138 kV Interconnection Project</td><td>Panay</td><td>Nov 2021</td></tr>
<tr><td colspan="2">Substation Components:
▪ Iloilo S/S, 2x100 MVA, 138/69-13.8 kV Power Transformers and accessories, 2-138 kV PCBs, 10-69 kV PCBs (GIS) and associated equipment;
▪ Buenavista S/S, 2x100 MVA, 138/69-13.8 kV Power Transformers and accessories, 6-138 kV PCBs (GIS), 4-69 kV PCBs and associated equipment;
Transmission Components:
▪ Iloilo–Ingore 138 kV T/L, ST-DC, 1-795 MCM ACSR, 2 km.
▪ Sawang–Buenavista 138 kV T/L, ST-DC, 1-795 MCM ACSR, 1 km.
▪ Zaldivar bypass line, 0.7 km, 69 kV, 1-336.4 MCM ACSR, ST-SC
▪ PECO Baldoza 69 kV line Transfer, 0.07 km, 1-336.4 MCM ACSR, SP-SC
▪ PPC & PECO 69 kV line Transfer, 0.09 km, 69 kV, 1-336.4 MCM ACSR, SP-SC
▪ Banuyao 69 kV line Transfer, 0.8 km, 69 kV, 1-336.4 MCM ACSR, SP-SC
▪ Extension of Sta. Barbara–Iloilo 138 kV Line, two circuits of 138 kV U/C of 400 MW-capacity, 0.15 km;
▪ Iloilo 69 kV Underground Cables four circuits of 100 MW-capacity, 0.25 km;
▪ Extension of Iloilo–Ingore 138 kV Line, two circuits of 138 kV U/C of 200 MW-capacity, 0.15 km;
▪ Iloilo 69 kV Underground Cables three circuits of 100 MW-capacity, 0.15 km;
▪ Buenavista 138 kV U/C two circuits of 200 MW-capacity, 0.15 km.

Bulk Cost Estimate: 2,419 million Pesos</td></tr>
<tr><td rowspan="2">Negros–Panay 230 kV Interconnection Line 2 Project</td><td>Negros and Panay</td><td>Feb 2022</td></tr>
<tr><td colspan="2">Substation Components:
▪ Barotac Viejo Substation Expansion, 1x70 MVAR, 230 kV Line reactor, 2-230 kV PCBs and associated equipment, associated submarine cable termination equipment;
▪ E.B. Magalona Substation (Expansion), 1x70 MVAR, 230 kV Line reactor, 3-230 kV PCB and associated equipment.
▪ E.B Magalona 230 kV CTS (Expansion)
Submarine Cable Components:
▪ Barotac CTS–Barotac Viejo S/S, 1-1,600 mm² XLPE Underground Cable, S/C, 0.75 km;
▪ Barotac Viejo–E. B. Magalona, 230 kV, Single Circuit, 3-1,600 mm² XLPE submarine cables, 22 km.

Bulk Cost Estimate: 8,342 million Pesos</td></tr>
</table>

Project Name/Driver(s)	Province(s)	ETC
Barotac Viejo–Unidos 230 kV Transmission Line Project	Iloilo, Aklan	Dec 2024
	Substation Components: ▪ Unidos S/S, 2x300 MVA, 230/138 kV Power Transformer and accessories, 8-230 kV PCBs, 9-138 kV PCBs and associated equipment. ▪ Barotac Viejo 230 kV Substation (Expansion), 2-230 kV PCBs and associated equipment. Transmission Components: ▪ Barotac Viejo–Nabas Transmission Line (Extension), ST-DC, 4-795 MCM ACSR, 140 km. ▪ Barotac Viejo–Unidos 230 kV Transmission Line (Extension up to Nabas), ST-DC, 4-795 MCM ACSR, 140 km. ▪ Bus-in of Unidos S/S to Nabas–Caticlan T/L (Going to Caticlan), 138 kV T/L, ST-DC, 1-795 MCM ACSR, 1 km. ▪ Bus-in of Unidos S/S to Nabas–Caticlan T/L (Going to Nabas), 230 kV T/L, ST-DC, 4-795 MCM ACSR, 1 km. Bulk Cost Estimate: 10,389 million Pesos	
Luzon–Visayas HVDC Bipolar Operation Project	Camarines Sur and Leyte	Jan 2025
	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.	
Silay 138 kV Substation Project	Negros	Dec 2025
	Substation Components: ▪ Silay 138 kV S/S, 2x100 MVA Power Transformer and accessories, 6-138 kV PCBs, 6-69 kV PCBs and associated equipment; Transmission Components: ▪ Bus-in of Silay S/S to Bacolod–Cadiz T/L, 138 kV T/L, ST-SC, 1-795 MCM ACSR, 1 km; ▪ Bus-in of Silay S/S to Bacolod–Cadiz T/L, 69 kV T/L, ST-SC, 1-336.4 MCM ACSR, 3 km. Bulk Cost Estimate: 709 million Pesos	
Load Growth		
Nabas–Caticlan–Boracay Transmission Line Project	Aklan	May 2021
	Stage 1 (Mar 2020) Submarine Cable Components: ▪ Caticlan–Boracay S/C, 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 (May 2021) Substation Components: ▪ Boracay 138 kV GIS S/S (New), 2x100 MVA 138/69-13.2 kV Power Transformer and accessories, 5-138 kV PCBs, 6-69 kV PCBs and associated equipment; ▪ Nabas 138 kV Substation, 4-138 kV PCB and associated equipment. Transmission Components: ▪ Nabas–Unidos 230 kV Transmission Line (Initially energized at 138 kV), 230 kV, ST/SP-DC, 4-795 MCM ACSR, 14 km. ▪ Unidos–Caticlan 138 kV T/L, ST/SP-DC, 138 kV, 1-795 MCM ACSR, 2.5 km; ▪ Unidos–Caticlan 138 kV U/G, Double circuit, 138 kV Underground Cable System of 180 MW capacity per circuit, 4.5 km. Bulk Cost Estimate: 8,519 million Pesos	
Cebu–Bohol 230 kV Interconnection Project	Cebu, Bohol	Dec 2021
	Substation Components: ▪ Dumanjug 230 kV S/S, 2x70 MVAR 230 kV line reactors, 4-230 kV PCBs and associated equipment;	

Project Name/Driver(s)	Province(s)	ETC
	▪ Corella 230 kV S/S, 2x300 MVA, 230/138kV Power Transformer and accessories, 2x70 MVAR 230 kV line reactors, 8-230 kV PCBs, 5-138 kV PCBs and associated equipment. ▪ Argao CTS (with provision to be SWS) ▪ Loon CTS (with provision to be SWS) Transmission Components: ▪ Dumanjug–Argao T/L, 230 kV, ST-DC, 4-795 MCM ACSR, 29 km; ▪ Loon–Corella T/L, 230 kV, ST-DC, 4-795 MCM ACSR, 26 km. Submarine Cable Components: ▪ Argao–Loon 230 kV S/C, Double circuit submarine cable system with transfer capacity of 600 MW at 230 kV, 30 km. (with provision for 3rd circuit) Bulk Cost Estimate: 19,762 million Pesos	
Laray 230 kV Substation Project (Initially energized at 138 kV)	Cebu	Apr 2022
	Substation Components: ▪ Laray 230 kV S/S (New), 3x100 MVA 138/69-13.8 kV Power Transformer and accessories, 10-230 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	Nov 2022
	Substation Components: ▪ Amlan 138 kV S/S, 3-138 kV PCBs and associated equipment; ▪ Dumaguete 138 kV S/S (New), 2x100 MVA, 138/69-13.8 kV Power Transformer and accessories, 6-138 kV PCBs, 4-69 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	
Babatngon–Palo 230 kV Transmission Line Project (Initially energized at 138 kV)	Southern Leyte	Feb 2023
	Substation Components: ▪ Babatngon 138 kV S/S, 3-138 kV PCBs and associated equipment; ▪ Palo 138 kV S/S (New), 3x100 MVA, 138/69-13.8 kV Power Transformer and accessories, 8-230 kV PCBs, 9-69 kV PCBs and associated equipment. Transmission Components: ▪ Babatngon–Palo 230 kV T/L (138 kV energized), ST-DC, 4-795 MCM ACSR, 20 km. ▪ Palo Cut-in Lines, 69 kV T/L, SP-DC, 1-336.4 MCM ACSR, 2 km. Bulk Cost Estimate: 3,044 million Pesos	
Granada 230 kV Substation Project	Granada, Negros Occidental	Oct 2024
	Substation Components: ▪ Granada 230 kV S/S, 3x300 MVA, 230/69-13.8 kV Power Transformer and accessories, 12-230 kV PCBs and associated equipment, 10-69 kV PCBs and associated equipment. Transmission Components: ▪ Granada 230 kV Bus-in Lines, ST-DC, 2-795 MCM ACSR, 2x0.50 km. Bulk Cost Estimate: 2,042 million Pesos	
Kalibo 138 kV Substation Project	Panay	Dec 2024
	Substation Components: ▪ Kalibo 138 kV S/S, 3x100 MVA, 138/69 kV Power Transformer and accessories, 12-138 kV PCBs, 8-69 kV PCBs and associated equipment. Transmission Components: ▪ Bus-in of Kalibo Substation to Panitan–Nabas T/L, 138 kV Transmission Line, ST-DC, 1-795 MCM ACSR, 1 km. Bulk Cost Estimate: 1,087 million Pesos	

Project Name/Driver(s)	Province(s)	ETC
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, 3-69 kV PCBs and associated equipment. Transmission Components: ▪ La Carlota 138 kV Bus-in Lines, ST-DC, 1-795 MCM ACSR, 2x0.50 km, ▪ Reconductoring of Bacolod–San Enrique–La Carlota Line, 69 kV, 1-160 mm2 STACIR, 42 km. Bulk Cost Estimate: 1,123 million Pesos	
Sumangga 138 kV Substation Project	Leyte	Dec 2024
	Substation Components: ▪ Sumangga S/S, 2x100 MVA, 138/69 kV Power Transformer and accessories, 10-138 kV PCBs, 4-69 kV PCBs and associated equipment; ▪ Ormoc S/S, 2-69 kV PCBs and associated equipment. Transmission Components: ▪ Sumangga 138 kV Bus-in Lines, ST-DC, 1-795 MCM ACSR, 2x1.50 km; ▪ Sumangga 69 kV Cut-in Lines, SP-DC, 1-336.4 MCM ACSR, 2 km; ▪ Reconductoring of Ormoc–Simangan, 69 kV, 1-160 mm^2 STACIR, 6 km. Bulk Cost Estimate: 1,204 million Pesos	
Tigbauan 138 kV Substation Project	Iloilo	Dec 2023
	Substation Components: ▪ Tigbauan 138 kV S/S, 2x100 MVA 138/69 kV Power Transformer and accessories, 10-138 kV PCBs, 4-69 kV PCBs and associated equipment; ▪ Sta. Barbara S/S, 1-138 kV PCB and associated equipment; ▪ San Jose S/S, 2-138 kV PCBs and associated equipment. Transmission Components: ▪ Stringing of Sta. Barbara–San Jose 138 kV Line 2, ST-DC2, 1-795 MCM ACSR, 93 km. ▪ Reconductoring of portion of Sta. Barbara–San Jose 69 kV Line, 1-160 mm^2 STACIR, 30 km ▪ Tigbauan 138 kV Bus-in Lines, ST-DC, 1-795 MCM ACSR, 2x0.50 km. ▪ Tigbauan 69 kV Cut-in Lines, SP-DC, 1-160 mm^2 STACIR, 1 km. Bulk Cost Estimate: 1,384 million Pesos	
Bool 138 kV Substation Project	Bohol	Nov 2023
	Stage 1 (Nov 2019–Dec 2024) Substation Components: ▪ Bool S/S, 2-69 kV Air Break Switch (ABS); ▪ Corella S/S (Expansion): 1x100 MVA 138/69 kV Power Transformer and accessories, 4-69 kV PCB and associated equipment; Transmission Components: ▪ Corella–Bool 138 kV T/L (69 kV energized), ST-DC, 1-795 MCM ACSR, 6 km; Stage 2 (Aug 2027–Dec 2029) Substation Components: ▪ Bool S/S, 2x100 MVA 138/69 kV Power Transformer and accessories, 8-138 kV PCBs, 11-69 kV PCBs and associated equipment; ▪ Transfer of 1x100 MVA 138/69 kV Power Transformer and accessories to Bool Substation; Transmission Components: ▪ Bool 69 kV Cut-in Lines, SP-DC, 1-336.4 MCM ACSR, 1 km. Bulk Cost Estimate: 2,141 million Pesos	
Carmen 230 kV Substation Project	Carmen, Cebu	Jun 2025
	Substation Components: ▪ Carmen 230 kV S/S, 3x300 MVA, 230/69-13.8 kV Power Transformer and accessories, 11-230 kV PCBs, 4-69 kV PCBs and associated equipment. Transmission Components: ▪ Carmen 230 kV Bus-in Lines, ST-DC, 772 mm2 (796 MVA), 2x0.50 km; ▪ Carmen 69 kV Cut-in Lines, SP-DC, 1-336.4 MCM ACSR, 2 km.	

Project Name/Driver(s)	Province(s)	ETC
	Bulk Cost Estimate: 1,553 million Pesos	
Jaro 230 kV Substation Project	Iloilo, Panay	Jun 2025
	<u>Substation Components:</u> ▪ Jaro 230 kV S/S, 2x300 MVA, 230/69-13.8 kV Power Transformer and accessories, 6-230 kV PCBs, 8-69 kV PCBs and associated equipment; ▪ Barotac Viejo Substation (Expansion), 3-230 kV PCBs and associated equipment. <u>Transmission Components:</u> ▪ Barotac Viejo–Jaro 230 kV T/L, ST-DC, 4-795 MCM ACSR, 52 km. Bulk Cost Estimate: 4,257 million Pesos	
Power Quality		
Visayas Voltage Improvement Project 2	Negros, Leyte, Panay	Dec 2022
	<u>Substation Components:</u> ▪ 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. Bulk Cost Estimate: 638 million Pesos	
System Reliability		
Visayas Substation Upgrading Project 1	Cebu, Leyte, Samar	Nov 2021
	<u>Substation Components:</u> Cebu: ▪ Daanbantayan S/S, 1x150 MVA 230/69-13.8 kV Power Transformer and accessories, 1-230 kV PCB, 3-69 kV PCBs and associated equipment. Leyte: ▪ Tabango S/S, 1x50 MVA 230/69-13.8 kV Power Transformer and accessories, 1-230 kV PCB, 2-69 kV PCBs and associated equipment; ▪ 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–San Isidro 138 kV Transmission Line Project	Samar, Northern Samar	Apr 2022
	<u>Substation Components:</u> ▪ Calbayog S/S, 2-69 kV PCBs and associated equipment. ▪ Allen and Bobon LES, 1-138 kV and 2-69 kV Air-break Switches. ▪ San Isidro S/S, 2x50 MVA 138/69 kV Power Transformer and accessories (1x50 MVA transformer from Paranas S/S), 11-138 kV PCBs, 5-69 kV PCBs and associated equipment; <u>Transmission Components:</u> ▪ Calbayog–San Isidro 138 kV T/L, ST-DC, 1-795 MCM ACSR, 58 km; ▪ San Isidro–Allen 69 kV T/L, SP-SC, 1-336.4 MCM ACSR, 20 km. Bulk Cost Estimate: 944 million Pesos	
Barotac Viejo–Natividad 69 kV Transmission Line Project	Iloilo	Jul 2022
	<u>Substation Components:</u> ▪ Natividad LES, 3-69 kV Air-break Switches. <u>Transmission Components:</u> ▪ 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	Jul 2022
	<u>Substation Components:</u> Leyte: ▪ Isabel S/S, 1x50 MVA 138/69-13.8 kV Power Transformer and accessories (1x50 MVA transformer transferred from Calong-calong Substation), 1-138 kV PCBs, 2-69 kV PCBs and associated equipment. (Additional), 9-138 kV PCBs, 2-69 kV	

Project Name/Driver(s)	Province(s)	ETC
	PCBs and associated equipment. (Replacement), Upgrading of existing SCADA system and Control Room; ▪ Tabango S/S, 1x50 MVA 230/69-13.8 kV Power Transformer and accessories, 2-230 kV PCBs, 2-69 kV PCBs and associated equipment; ▪ Maasin S/S, 1x50 MVA 138/69-13.8 kV Power Transformer and accessories, 4-138 kV PCBs, 8-69 kV PCBs and associated equipment; Samar: ▪ Paranas S/S, 2x100 MVA 138/69-13.8 kV Power Transformer and accessories, 2-69 kV PCBs and associated equipment, Transfer of termination of various transmission lines and Transfer of 50 MVA Transformer to San Isidro S/S; ▪ Calbayog S/S, 1x50 MVA 138/69-13.8 kV Power Transformer and accessories, 4-138 kV PCB, 7-69 kV PCBs and associated equipment. Cebu: ▪ Calong-calong S/S, 3x100 MVA 138/69-13.8 kV Power Transformer and accessories (Replacement of 2x50 MVA transformers), 2-138 kV PCBs, 4-69 kV PCBs and associated equipment, Transfer of 2x50 MVA transformers to Isabel and San Isidro S/S, Construction of new Control building; ▪ Compostela S/S, 1x150 230/138-13.8 kV Power Transformer, 2x100 MVA 138/69-13.8 kV Power Transformer and accessories, 1-69 kV PCB and associated equipment; ▪ Samboan S/S, 3-138 kV PCB and Associated equipment, 69 kV Tie Breaker and Associated equipments; ▪ Toledo S/S, 3x100 MVA 138/34.5-13.8 kV Power Transformer and accessories, 2-34.5 kV PCBs and associated equipment (Replacement), Transfer of termination of various transmission lines; ▪ Daanbantayan S/S, 1x150 MVA 230/69-13.8 kV Power Transformer and accessories, 1-69 kV PCB and associated equipment; Bohol: ▪ Ubay S/S, 1x100 MVA 138/69-13.8 kV Power Transformer and accessories, 4-138 kV PCBs, 10-69 kV PCBs and associated equipment, Construction of new control building; ▪ Corella S/S, 1x100 MVA 138/69-13.8 kV Power Transformer and accessories, 2-138 kV PCBs, 8-69 kV PCBs and associated equipment; Negros: ▪ Kabankalan S/S, 2x100 MVA 138/69-13.8 kV Power Transformer and accessories (Replacement of 30 and 50 MVA Transformers), 2-69 kV PCBs and associated equipment, Transfer of 50 MVA transformer to Sipalay S/S; ▪ 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; Panay: ▪ San Jose S/S, 2x50 MVA 138/69-13.8 kV Power Transformer and accessories, 6-138 kV PCBs, 4-69 kV PCBs and associated equipment; ▪ Panitan S/S, 3x100 MVA 138/69-13.8 kV Power Transformer and accessories (Replacement of 2x30 and 50 MVA transformers), 2-138 kV PCBs, 11-69 kV PCBs and associated equipment. Rehabilitation of the Control Center and other facilities; ▪ Dingle S/S, 2x100 MVA 138/69-13.8 kV Power Transformer and accessories (Replacement of 2x50 MVA Transformers), 1-69 kV PCB and associated equipment, transfer of 50 MVA Transformer to Sta. Barbara S/S; ▪ Concepcion S/S, 1x100 MVA 138/69-13.8 kV Power Transformer and accessories, 1-138 kV PCBs, 2-69 kV PCBs and associated equipment; ▪ Barotac Viejo S/S, 50 MVA 138/69-13.8 kV Power Transformer and accessories (50 MVA Transformer transferred from Iloilo Substation), 2-138 kV PCBs, 2-69 kV PCBs and associated equipment; ▪ Sta. Barbara S/S, 1x50 MVA 138/69-13.8 kV Power Transformer and accessories. (50 MVA Transformer transferred from Dingle Substation), 3-138 kV PCBs, 2-69 kV PCBs and associated equipment. Bulk Cost Estimate: 10,662 million Pesos	

Project Name/Driver(s)	Province(s)	ETC
Tabango–Biliran 69 kV Transmission Line Project	Leyte	Jun 2025
	<u>Substation Components:</u> ▪ Tabango S/S, 1-69 kV PCB and associated equipment; ▪ Biliran LES, 3-69 kV Air-break Switches. <u>Transmission Components:</u> ▪ Tabango–Biliran 69 kV T/L, ST-DC, 1-795 MCM ACSR, 35 km. Bulk Cost Estimate: 1,235 million Pesos	
Nivel Hills 230 kV Substation Project	Nivel Hills, Cebu	Dec 2023
	<u>Substation Components:</u> ▪ Nivel Hills GIS S/S, 3x300 MVA 230/69 kV Power Transformer and accessories, 6-230 kV PCBs, 10-69 kV PCBs and associated equipment; ▪ Bobon SWS, 10-230 kV PCB and associated equipment. <u>Transmission Components:</u> ▪ Nivel Hills-Bobon T/, ST-DC, 4-795 MCM ACSR, 230 kV, 5 km; ▪ Bus-in of Bobon SWS to Cebu-Magdugo OHTL, ST-DC, 4-795 MCM ACSR, 230 kV, 2x0.5 km. Bulk Cost Estimate: 3,370 million Pesos	
Permanent Restoration of Colon–Samboan 138 kV Lines 1 and 2 affected by Landslide	Colon, Cebu	Oct 2020
	<u>Transmission Components:</u> ▪ Colon-Samboan Line 1, 1-795 MCM ACSR, 138 kV, ST-DC1, 8km, 26 rerouted towers; ▪ Colon-Samboan Line 2, 1-795 MCM ACSR, 138 kV, ST-DC1, 8km, 21 rerouted towers; ▪ Colon-Samboan Lines 1 and 2 (Common Tower), 138 kV, ST-DC, 3 rerouted towers. Bulk Cost Estimate: 357 million Pesos	
Permanent Restoration of Panit-an–Nabas 138 kV Line affected by Typhoon Ursula	Panay	Dec 2020
	<u>Transmission Components:</u> ▪ Panit-an-Nabas Transmission Line, 1-795 MCM ACSR, 138 kV, ST-DC1, toppled towers;	
Cebu–Leyte 230 kV Interconnection Line 3 and 4 Project	Cebu and Leyte	Mar 2025
	<u>Substation Components:</u> ▪ Daanbantayan S/S (Expansion), 2x70 MVAR, 230 kV Line Reactor, 9-230 kV PCBs and associated equipment; ▪ Tabango S/S (Expansion), 2x70 MVAR, 230 kV Line Reactor, 4-230 kV PCBs and associated equipment; ▪ Ormoc S/S (Expansion), 2-230 kV PCBs and associated equipment; ▪ Tabango S/S (Expansion), 4-230 kV PCBs and associated equipment. <u>Transmission Components:</u> ▪ Daanbantayan–Tabango S/C, Submarine Cable, 600 MW capacity per ckt, Double Circuit, 32.49 km; ▪ Bobon SWS–Daanbantayan T/L, 4-795 MCM ACSR, 120 km; ▪ Ormoc–Kananga T/L, 4-795 MCM ACSR, 7 km; ▪ Tabango–Kananga T/L, 4-795 MCM ACSR, 38 km.	
Kananga 230 kV Switching Station Project	Kananga, Ormoc	Mar 2025
	<u>Substation Components:</u> ▪ Babatngon S/S, 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. <u>Transmission Components:</u> ▪ Kananga–Babatngon T/L, ST-DC, 4-795 MCM ACSR, 65 km.	
Lapu-lapu 230 kV Substation Project	Lapu-lapu, Cebu	Aug 2022
	<u>Substation Components:</u> ▪ Ibo 230 kV GIS S/S (New), 2x300 MVA 230/69-13.8 kV Power Transformer and accessories, 8-230 kV PCB (GIS), 10-69 kV PCB (GIS) and associated equipment. <u>Submarine cable Components:</u>	

Project Name/Driver(s)	Province(s)	ETC
	▪ Umapad–Ibo 230 kV S/C, 600 MW per circuit, Double circuit, 2.1 km. Bulk Cost Estimate: 4,356 million Pesos	

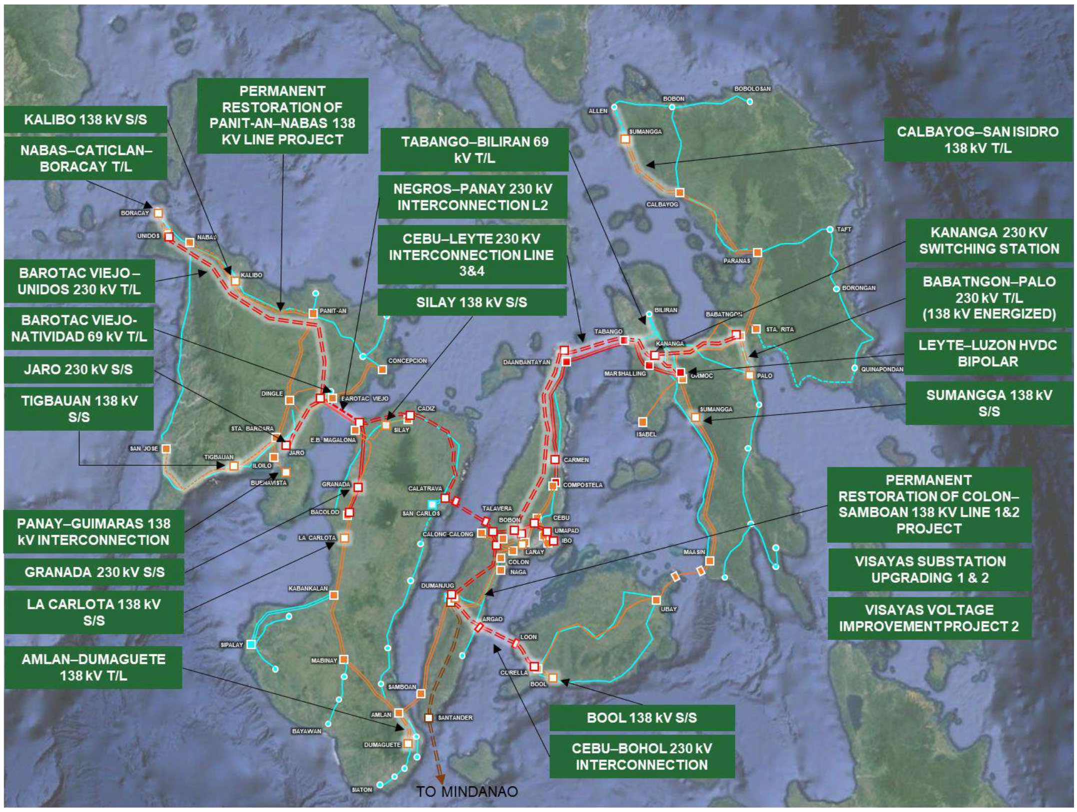


Figure 11.1: Proposed Visayas Transmission Outlook for 2025

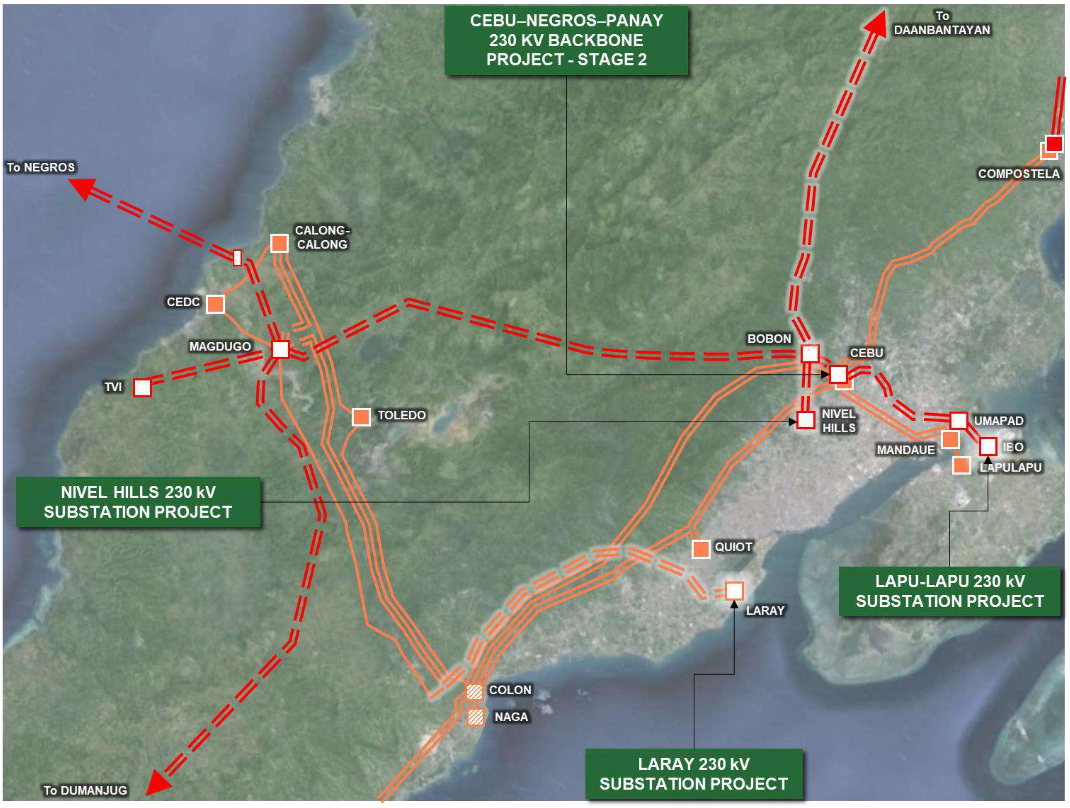
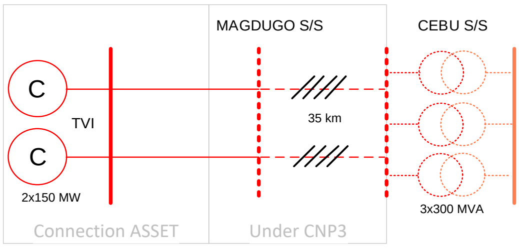


Figure 11.2: Proposed Metro Cebu Transmission Outlook for 2025

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

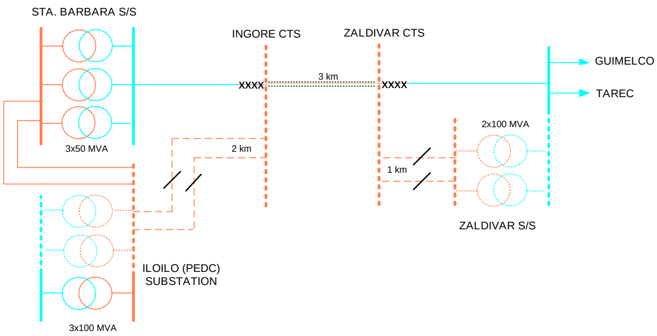


Therma Visayas, Inc. is developing a 300 MW coal-fired power plant in Toledo City, Cebu and is intended to supply additional power to the load centers in Metro Cebu. However, the existing transmission system between the area of Toledo and the major drawdown substations in Metro Cebu has limited capacity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

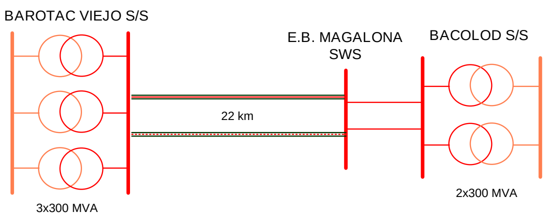
11.1.2 Panay–Guimaras 138 kV Interconnection Project



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 transmission line from the cable terminal station in Ingore towards Iloilo Substation, as well as the expansion and upgrading works at Zaldivar Substation and Iloilo Substation.

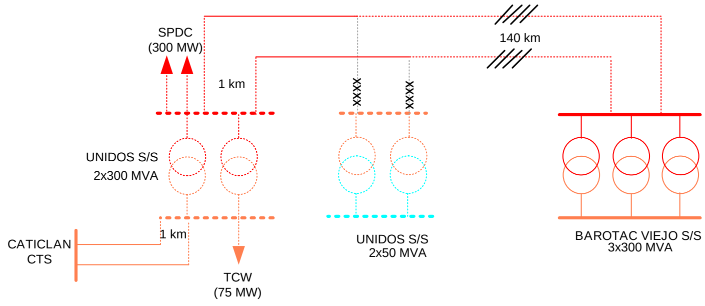
11.1.3 Negros–Panay 230 kV Interconnection Line 2 Project



The project aims to address the need to increase the interconnection capacity between Negros and Panay to cater the incoming large generators in Panay, particularly the 300 MW Aklan Pump Storage Hydro Power Plant. 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.

11.1.4 Barotac Viejo–Unidos 230 kV Transmission Line Project

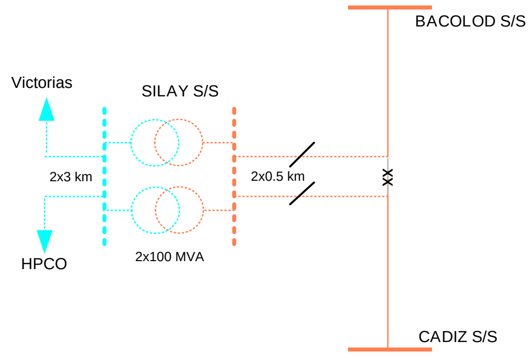
This project is an extension of the 230 kV transmission line backbone to provide a high capacity transmission corridor to the expected large generation entry in Northern Panay. The main beneficiary of this project is the indicative 300 MW Aklan Pumped-Storage Hydropower in Malay, Nabas.



11.1.5 Silay 138 kV Substation Project

The development of new power plants in Northern Negros will result in increased power transmission towards Cadiz Substation. Currently, the existing transmission line has a limited capacity to accommodate the power from Cadiz.

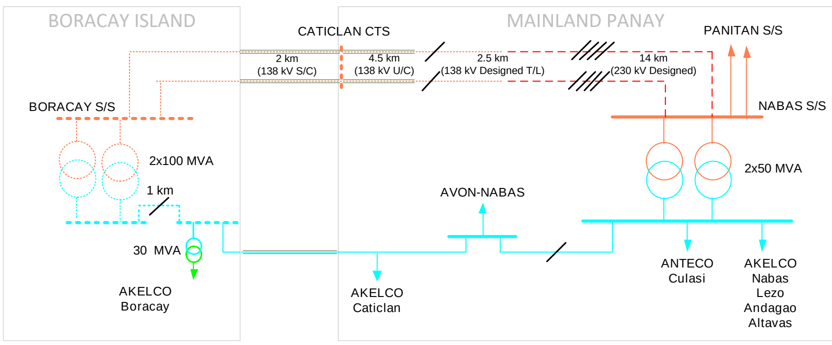
To ensure the full dispatch of the power plants in Northern Negros, it is proposed to energize the new substation between Bacolod and Cadiz. The project will cut-in the 69 kV line between Victorias and Silay.



11.1.6 Luzon–Visayas HVDC Bipolar Operation Project

The development of new power plants in Luzon will result in increased excess generation in the island. Currently, the transfer capacity of the HVDC from Luzon to Visayas is only 440 MW. The Luzon–Visayas High Voltage Direct Current (HVDC) Bipolar Operation aims to accommodate additional generation, import and export to the Visayas Grid.

11.1.7 Nabas–Caticlan–Boracay Transmission Line Project



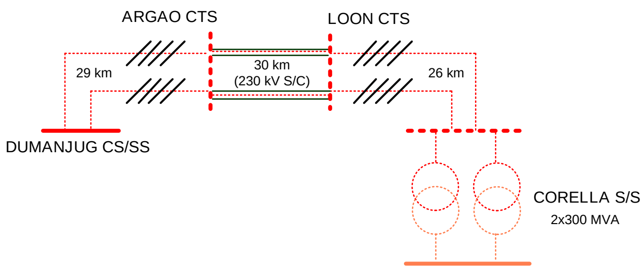
In line with the developments in the tourism industry in Boracay Island, the power requirement is expected to increase. The power requirement of Caticlan and Boracay Island is currently supplied by Nabas Substation via a single circuit 69 kV overhead transmission line and submarine cable. These 69 kV transmission facilities are not enough to cater the forecasted demand of the island.

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 Substation, 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 230 kV OHTL which will be initially energized at 138 kV, 138 kV underground cable in Caticlan and installation of 2x100 MVA 138/69 kV power transformer in Boracay Substation.

The submarine cable from Boracay to Caticlan was changed from single to double circuit submarine cable for outright compliance 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.

11.1.8 Cebu–Bohol 230 kV Interconnection Project

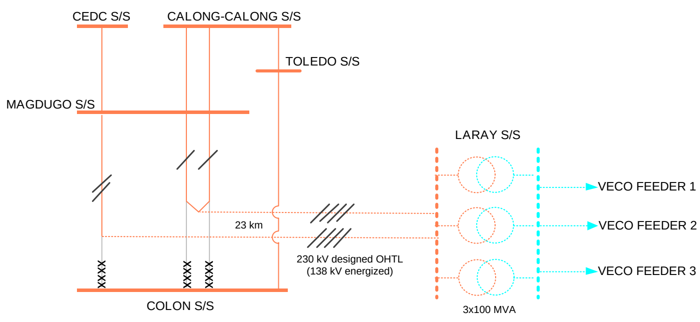
Currently, Cebu, Leyte and Bohol are connected radially which are prone to isolations. By year 2021, even when all the diesel power plants in Bohol are dispatched at full capacity, the Leyte–Bohol 138 kV submarine cable will be overloaded which could result in load curtailment in the said island. With 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 backbone towards Bohol.



The project involves laying of outright double circuit 230 kV submarine cable with 600 MW capacity per circuit with provision for a 3rd circuit between Cebu and Bohol, construction of 230 kV double circuit overhead transmission line, development of a 230 kV switchyard in the existing Corella Substation and the expansion of the proposed Dumanjug 230 kV Substation under the Mindanao–Visayas Interconnection Project (MVIP).

11.1.9 Laray 230 kV Substation Project (Initially energized at 138 kV)

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.



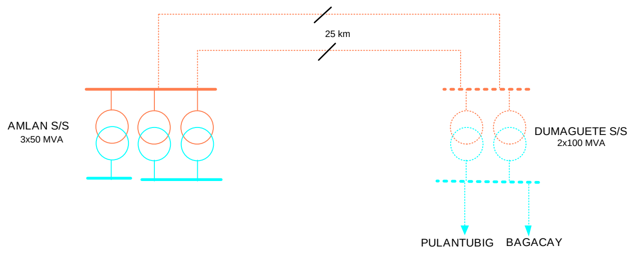
The project aims to provide alternative connection point to power consumers in Metro Cebu, thus, will accommodate the projected increase in the power demand. It will cut-in to the Magdugo–Colon 138 kV Line via 230 kV transmission lines that will be initially energized at 138 kV. The Magdugo–Colon 138 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–Alpaco 230 kV Energization Project.

11.1.10 Amlan–Dumaguete 138 kV Transmission Project

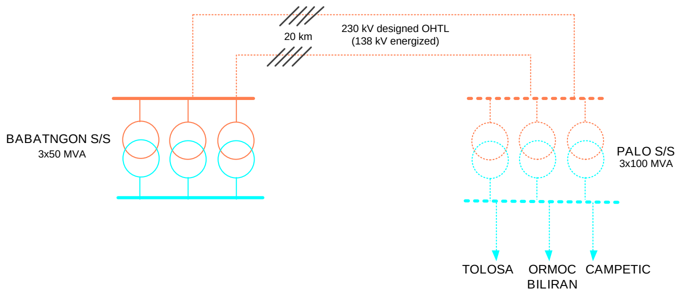
The power requirement in the southern part of Negros Oriental is being served by 69 kV line which draws power from Amlan Substation. However, the 69 kV line will not be sufficient to cater the projected increase in the power demand in the area.



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 Substation via 138 kV transmission line.

11.1.11 Babatngon–Palo 230 kV Transmission Line Project (Initially energized at 138 kV)

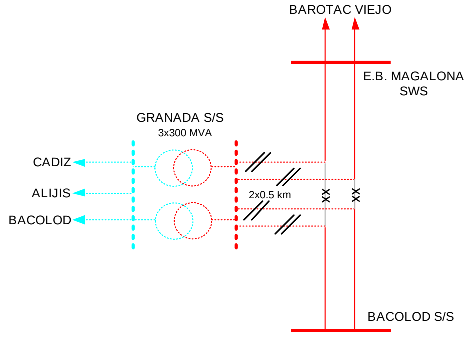
Large part of the power customers in the eastern Leyte area is being served through 69 kV lines which draw power from Babatngon Substation and Ormoc Substation in the north and Maasin Substation in the south. However, due to long distances and mountainous terrain, the quality and reliability of transmitting 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 Substation 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.

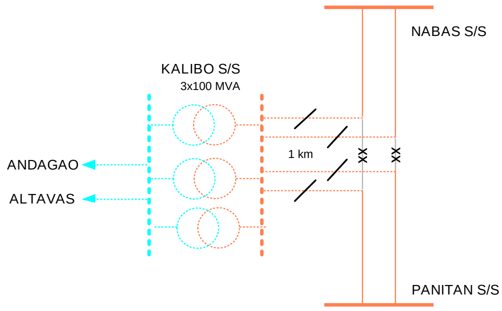
11.1.12 Granada 230 kV Substation Project



Large part of the power consumers in Northern Negros currently draws power from Bacolod and Cadiz Substation. 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 Granada.

11.1.13 Kalibo 138 kV Substation Project

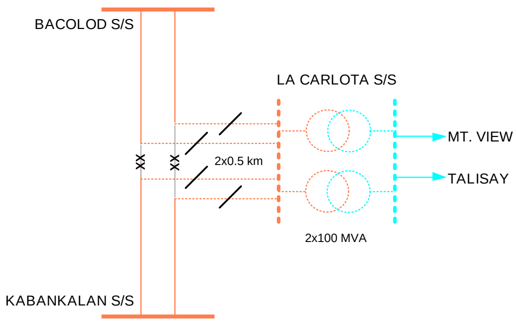


Power consumers in Northern Panay draw power from Nabas and some from Panit-an Substation. With the continuing economic and infrastructure developments within the area, the projected power requirement will not be adequately served by the existing substation capacity.

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.

11.1.14 La Carlota 138 kV Substation Project

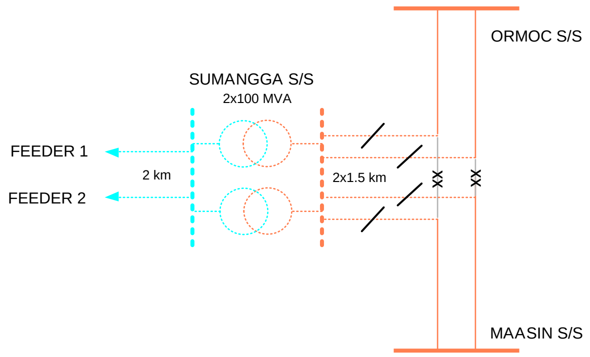


Power consumers in Southern Bacolod draws power from Bacolod Substation. With the continuing economic and infrastructure developments within the area, the projected power requirement will not be adequately served by the existing substation capacity.

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.

11.1.15 Sumangga 138 kV Substation Project

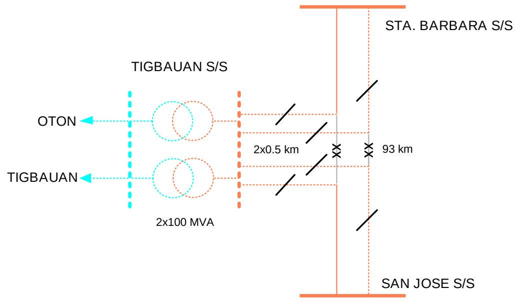


Power consumers in Leyte in the area of Sumangga draw power from Ormoc and some from Maasin Substation. With the continuing economic and infrastructure developments within the area, the projected power requirement will not be adequately served by the existing substation capacity.

The project aims to provide alternative connection point to power consumers particularly for the area of Sumangga, 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 Sumangga, Leyte.

11.1.16 Tigbauan 138 kV Substation Project

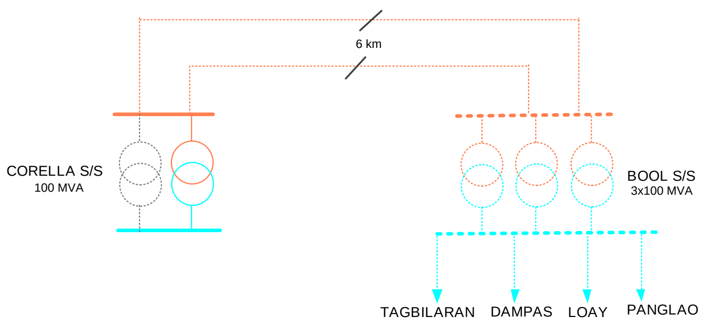


Power consumers in Southern Panay draws power from Sta. Barbara and San Jose Substation. With the continuing economic and infrastructure developments within the area, the projected power requirement will not be adequately served by the existing substation capacity.

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.

11.1.17 Bool 138 kV Substation Project



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

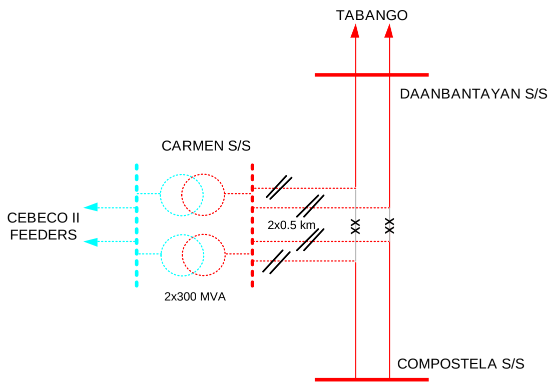
The project aims to provide alternative connection point to power consumers particularly for Southern Bohol, thus, will accommodate the projected increase in the power demand.

The project will be implemented into two stages. Stage 1 involves the construction of the overhead transmission line from Corella to Bool that will be energized at 69 kV and the additional 100 MVA transformer in Corella Substation. Stage 2 of the project involves the construction of the substation in Bool. Loads served by BOHECO I and II are the primary beneficiaries of the project.

11.1.18 Carmen 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.

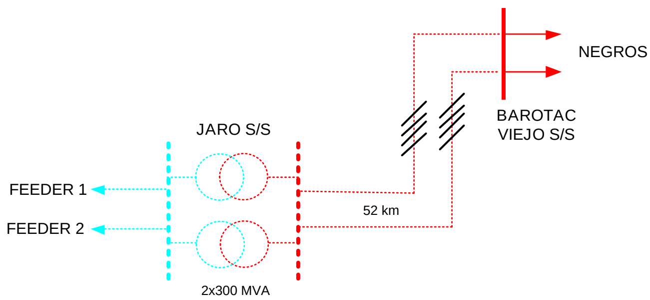
The project aims to provide alternative connection point to power consumers particularly for Northern Cebu, thus, will accommodate the projected increase in the power demand.



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

11.1.19 Jaro 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.

11.1.20 Visayas Voltage Improvement Project 2

Various areas in Leyte, Negros and Panay are experiencing low voltage occurrences due to high concentration of load. These low voltages may result in power curtailment.
To address the low voltage problems in these areas, capacitor banks are proposed to be strategically installed at identified substations.

11.1.21 Visayas Substation Upgrading Project – 1

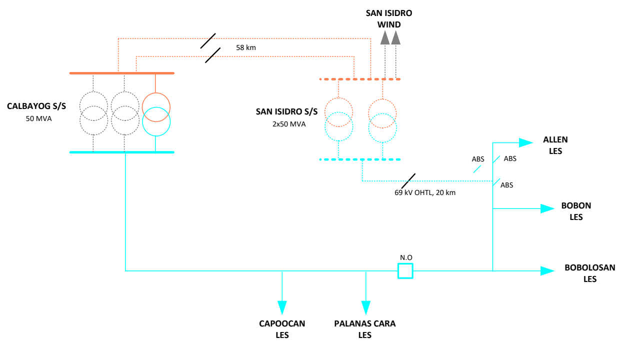
To accommodate the projected demand and avoid overloading of the transformer, there is a need to upgrade the substation capacity of Tabango Substation to 1x50 MVA. This will provde N-1 provision on the said substation.

To accommodate the proposed 100 MW CEKO Solar Power Plant and the increase in demand in the area, there is a need to upgrade the substation capacity in Daanbantayan Substation to 1x150 MVA.

To comply with the N-1 contingency criterion of the PGC, an additional 1x50 MVA transformer needs to be installed at Maasin and Calbayog Substations.

11.1.22 Calbayog–San Isidro 138 kV Transmission Line Project

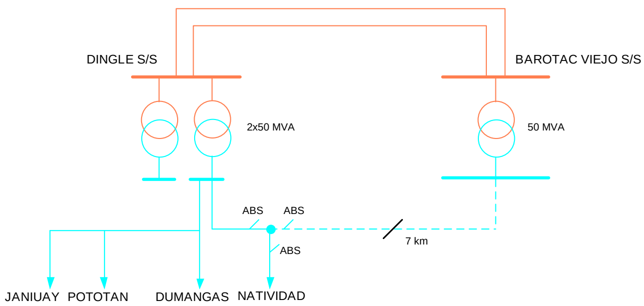
The power consumers in the northern part of Samar draws power from Calbayog Substation via the existing Calbayog-Palanas Cara and Palanas Cara-Catarman-Allen-Bobolosan 69 kV transmission lines, which traverse the mountainous area of Calbayog and Catarman. Such terrain poses frequent and extended outage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



In order to improve the reliability of power delivery and accommodate the load growth and power plant in the northern part of Samar, a 138 kV transmission line traversing northern Samar up to the new substation which is located in San Isidro which will cater the loads in Northern Samar. The project aims to form a loop, thus, will provide single outage contingency to the transmission lines serving Northern Samar.

11.1.23 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.

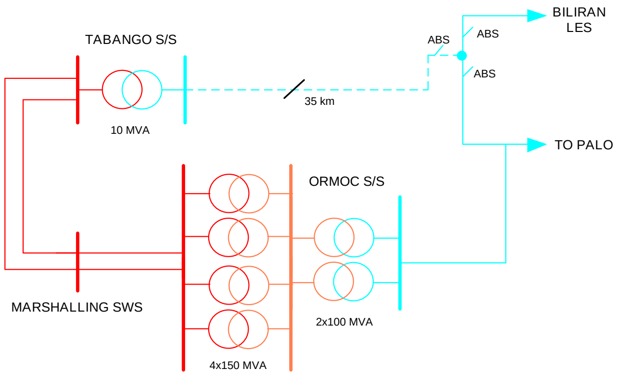


11.1.24 Visayas Substation Upgrading Project – 2

To comply with the N-1 contingency criterion of the PGC, an additional 100 MVA transformer needs to be installed at Concepcion, Ubay and Corella Substations. An additional 50 MVA transformers will be installed in Tabango, Maasin, Calbayog, Mabinay and San Jose Substations in order to provide reliability. Considering the 15-year projected demand of the distribution utilities (DUs) being served by Paranas, Compostela, Kabankalan and Dingle, the existing transformers will be upgraded to 2x100 MVA transformers to increase the substation capacity and improve the reliability up to the substation level. While the existing transformers of Toledo, Calong-calong and Panit-an Substations will be upgraded to 3x100 transformers. Existing transformers of Calong-calong and Dingle Substations will be utilized by Isabel and Sta. Barbara Substation. Additional 150 MVA transformers will be installed in Daanbantayan Substation in order to provide reliability. This project will provide additional substation capacity and reliability in order to cater the projected demand of the DUs.

11.1.25 Tabango–Biliran 69 kV Transmission Line Project

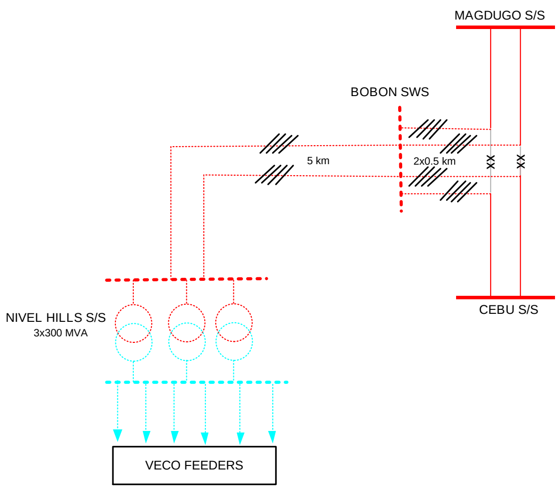
In line with the frequent and extended outage of the 69 kV lines in the area coupled with the rugged terrain which restricts movement and prolongs fault clearance, construction of a 69 kV line from Tabango to Biliran is needed to form a loop and provide single outage contingency (N-1) capability to the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



11.1.26 Nivel Hills 230 kV Substation Project

Power consumers in Central Cebu currently draws power from Cebu and some from Quiot 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 Central Cebu, thus, will accommodate the projected increase in the power demand.

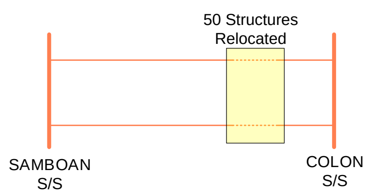


The new substation will be connected to Bobon Switching Station that will bus-in to the Cebu–Magdugo 230 kV Transmission Line and will be located in Nivel Hills, Cebu.

11.1.27 Permanent Restoration of Colon–Samboan 138 kV Lines 1 and 2 Affected by Landslide Project

The fatal landslide that struck Brgy. Tina-an, City of Naga, Cebu last 20 September 2018 was a result of a natural phenomenon and man-made actions.

The portion of mountainous areas of the Tina-an, City of Naga, Cebu, where located the Colon-Samboan 138 kV

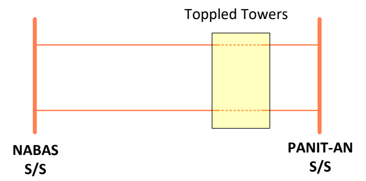


Lines 1 and 2 are within the declared danger zone of MGB of the Department of Environmental and Natural Resources (DENR) hindering maintenance and construction activities in the affected transmission line. Moreover, in the event of recurrence of landslide and ground movements, toppling of the structures will affect the stability of the grid.

The project includes the rerouting of the portion of Colon-Samboan 138 kV Line 1 and 2 affected by the landslide. This will avoid the 1 km danger zone declared by Mines and Geosciences Bureau (MGB).

11.1.28 Permanent Restoration of Panit-an–Nabas 138 kV Line Affected by Typhoon Ursula Project

In 2019, the super typhoon Ursula has caused the toppling of the old steel tower structures of the Panitan-Nabas 138 kV T/L. The restoration of the transmission line was undertaken through the use of emergency restoration system (ERS) and steel pole structures, which offer limited capability in terms of reliably transmitting power.

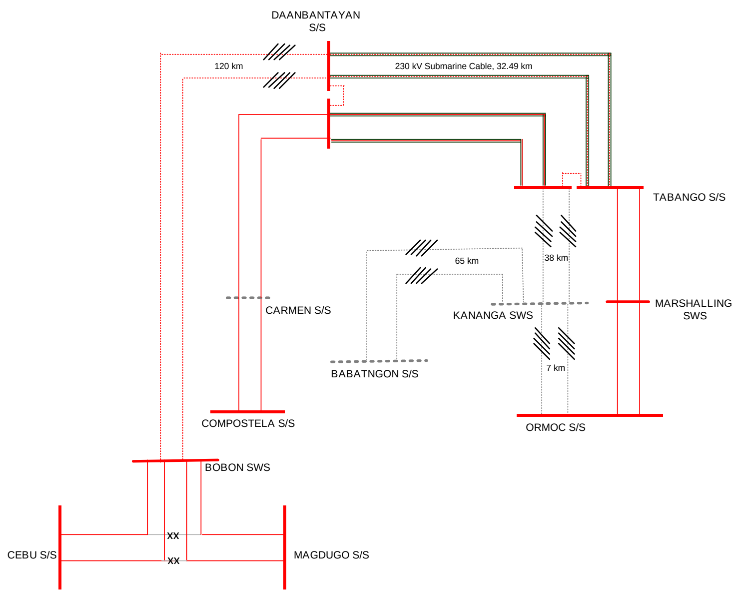


The project is intended to address the system limitation and improve the reliability of the whole stretch of the Panitan-Nabas 138 kV Transmission Line. It involves the construction of new steel tower structures and installation of associated overhead line component.

11.1.29 Cebu–Leyte 230 kV Interconnection Line 3 and 4 Project

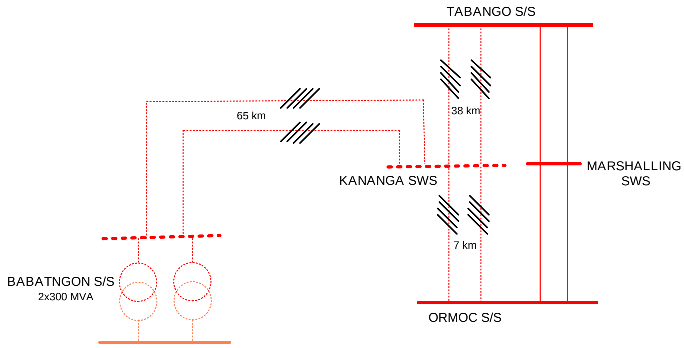
Currently, power coming from the Geothermal power plants in Leyte flows through the Marshalling–Tabango–Daanbantayan–Compotela 230 kV transmission Corridor. With the completion of the Luzon–Visayas HVDC Bipolar Operation Project, the capacity of the transmission corridor would be insufficient.

The project aims to provide an additional transmission corridor to power in Northern Leyte and Cebu, thus, will accommodate future Generation Power Plants from Leyte and Luzon.



The project involves laying of the new submarine cables from Daanbantayan to Tabango and construction of the transmission line from Daanbantayan to Bobon.

11.1.30 Kananga 230 kV Switching Station Project

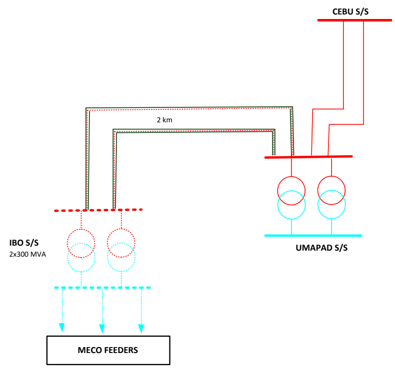


Currently, power coming from the Geothermal power plants in Leyte flows through the Marshalling–Tabango 230 kV transmission line. With the completion of the Luzon–Visayas HVDC Bipolar Operation Project, the capacity of the transmission line would be insufficient.

The project aims to provide an additional transmission corridor to power in Northern Leyte, thus, will accommodate future Generation Power Plants from Leyte and Luzon.

The new switching station will be located in Kananga, Leyte and will be connected to Babatngon Substation.

11.1.31 Lapu-lapu 230 kV Substation Project



Power consumers in Mactan Island currently draws power from Lapu-lapu 138 kV 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 Mactan Island, thus, will accommodate the projected increase in the power demand.

The new substation will be connected to Umapad 230 kV Substation and will be located in Lapu-lapu, Cebu.

11.2 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 Daanbantayan–Bobon 230 kV Transmission Line under Cebu–Leyte 230 kV Interconnection Line 3 Project. More generations are expected to come in Panay that will need major reinforcements of the 230 kV lines. While extension of the 138 kV line from Calbayog to Catarman will provide reliability as the demand in the Northern Samar increases.

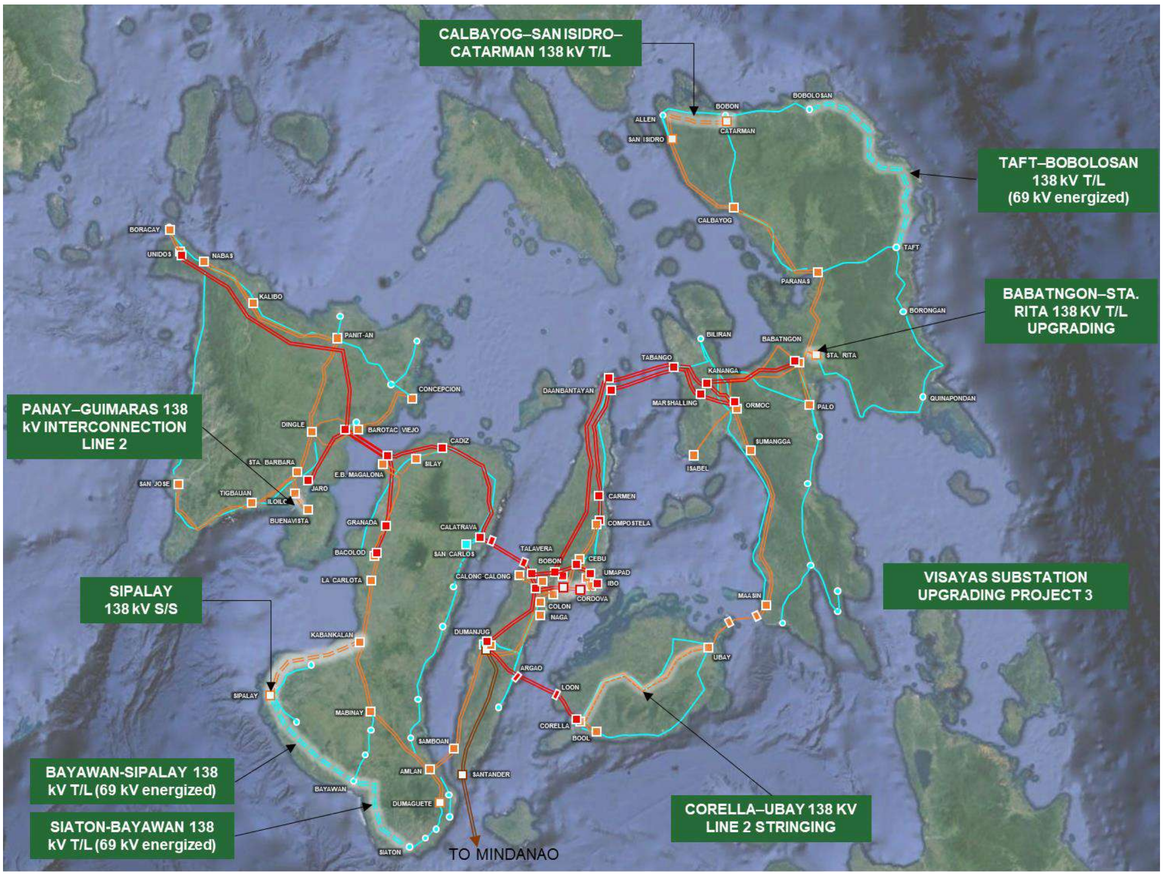


Figure 11.3: Proposed Visayas Transmission Outlook for 2030

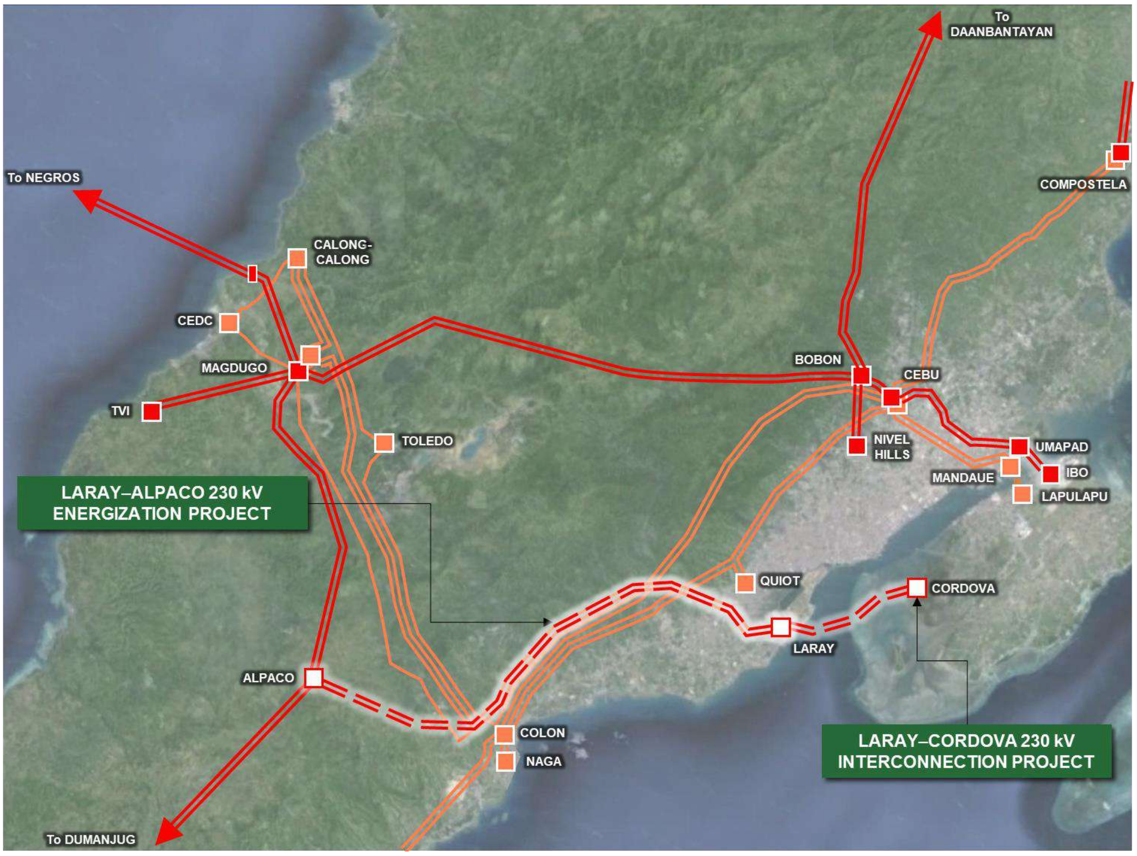


Figure 11.4: Proposed Metro Cebu Transmission Outlook for 2030

Shown in Table 11.2 is the list of proposed transmission projects for Visayas by 2030.

Table 11.2: Proposed Transmission Outlook for 2030

Project Name/Driver(s)	Province(s) and Components	ETC
Load Growth		
Laray–Cordova 230 kV Interconnection Project	Cebu Substation Components: ▪ Cordova S/S, 3x300 MVA, 230/69-13.8 kV Power Transformer and accessories, 8-230 kV PCBs, 9-69 kV PCBs and associated equipment. Transmission Components: ▪ Laray Underground cable, 230 kV, 600 MW capacity per circuit, Double Circuit, 1 km. Submarine cable Components: ▪ Laray–Cordova S/C, 230 kV submarine Cable, 600 MW capacity per circuit, Double Circuit, 12 km.	Dec 2030
Laray–Alpaco 230 kV Energization Project	Cebu Substation Components: ▪ Alpaco 230 kV SWS, 10-230 kV PCBs and associated equipment; ▪ Energization of Laray to 230 kV, 2x300 MVA, 230/69-13.8 kV Power Transformer and accessories. Transmission Components: ▪ Extension of Laray–Alpaco SWS 230 kV T/L, ST-DC, 4-795 MCM ACSR, 10 km.	Dec 2030
Sipalay 138 kV Substation Project	Negros Substation Components: ▪ Sipalay S/S, 2x50 MVA 138/69 kV Power Transformer and accessories, 1-138 kV PCB, 1-69 kV PCB and associated equipment. (50 MVA transformer will be transferred from Kabankalan Substation)	Dec 2029
Calbayog–San Isidro–Catarman 138 kV Transmission Line Project	Samar Substation Components: ▪ Catarman S/S, 2x100 MVA 138/69 kV Power Transformer and accessories, 10-138 kV PCBs, 6-69 kV PCBs and associated equipment. Transmission Components: ▪ Calbayog–San Isidro–Catarman T/L Extension, ST/DC, 1-795 MCM ACSR, 40 km.	Dec 2028
Reliability		
Corella–Ubay 138 kV Line 2 Stringing Project	Bohol Substation Components: ▪ Ubay S/S, 1-138 kV PCBs and associated equipment; ▪ Corella S/S, 1-138 kV PCBs and associated equipment; Transmission Components: ▪ Corella–Ubay 138 kV T/L, ST/SC2, 1-795 MCM ACSR, 93 km.	Dec 2026
Taft–Bobolosan 138 kV Transmission Line Project (Initially energized at 69 kV)	Northern and Eastern Samar Substation Components: ▪ Bobolosan LES, 1-138 kV and 2-69 kV Air-break Switches. ▪ Taft LES, 1-138 kV and 2-69 kV Air-break Switches. Transmission Components: ▪ Bobolosan–Taft 138 kV T/L (69 kV energized), ST/DC, 1-795 MCM ACSR, 123 km.	Dec 2028
Siaton–Bayawan 138 kV Transmission Line (Initially energized at 69 kV)	Negros Occidental and Negros Oriental Substation Components: ▪ Siaton LES, 1x5 MVAR 69 kV Capacitor Bank, 1-69 kV PCB and associated equipment, 1-138 kV and 2-69 kV Air-break Switches; ▪ Bayawan LES, 1-138 kV Air-break Switch. Transmission Components: ▪ Siaton–Bayawan 138 kV T/L (69 kV energized), ST-DC, 1-795 MCM ACSR, 52 km.	Dec 2027
Bayawan–Sipalay 138 kV Transmission Line (Initially energized at 69 kV)	Negros Occidental and Negros Oriental Substation Components: ▪ Bayawan LES, 1x5 MVAR 69 kV Capacitor Bank, 1-69 kV PCB and associated equipment, 2-138 kV and 2-69 kV Air-break Switches. Transmission Components: ▪ Bayawan–Sipalay 138 kV T/L (69 kV energized), ST-DC, 1-795 MCM ACSR, 74 km.	Dec 2030

Project Name/Driver(s)	Province(s) and Components	ETC
Babatngon–Sta. Rita 138 kV Transmission Line Upgrading	Leyte, Samar	Dec 2026
	<u>Substation Components:</u> ▪ Sta. Rita S/S, 1x50 MVA 138/69-13.8 kV Power Transformer and accessories, 10-138 kV PCBs, 4-69 kV PCBs and associated equipment. <u>Transmission Components:</u> ▪ Babatngon–Paranas 138 kV T/L (segment along San Juanico Strait), ST-DC, 1-795 MCM ACSR, 1.8 km; ▪ Sta. Rita Bus-in Lines, 138 kV T/L, ST-DC, 1-795 MCM ACSR, 2x0.8 km.	
Panay–Guimaras 138 kV Interconnection Line 2 Project	Guimaras, Panay	Dec 2026
	<u>Submarine Cable Components:</u> ▪ Ingore–Sawang 138 kV S/C, 3-400 mm^2 XLPE Submarine Cable, 2.56 km ▪ Sawang CTS–Zaldivar 138 kV U/C, XLPE Undeground Cable, 0.8 km	
Visayas Substation Upgrading Project 3	Cebu, Panay, Leyte, Negros and Bohol	Dec 2027
	<u>Substation Components:</u> ▪ Boracay S/S (Expansion), 1x100 MVA 138/69 kV Power Transformer and accessories, 1-138 kV PCB, 1-69 kV PCB and associated equipment; ▪ Umapad S/S (Expansion), 1x300 MVA 230/69 kV Power Transformer and accessories.	

11.3 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 Transmission Line Project aims to loop the 138 kV system in Panay, on the other hand the Bohol–Leyte 230 kV Interconnection Project and the Palo–Javier 138 kV Transmission Line Project aims to form a 230 kV loop among Cebu, Bohol and Leyte sub-grids.

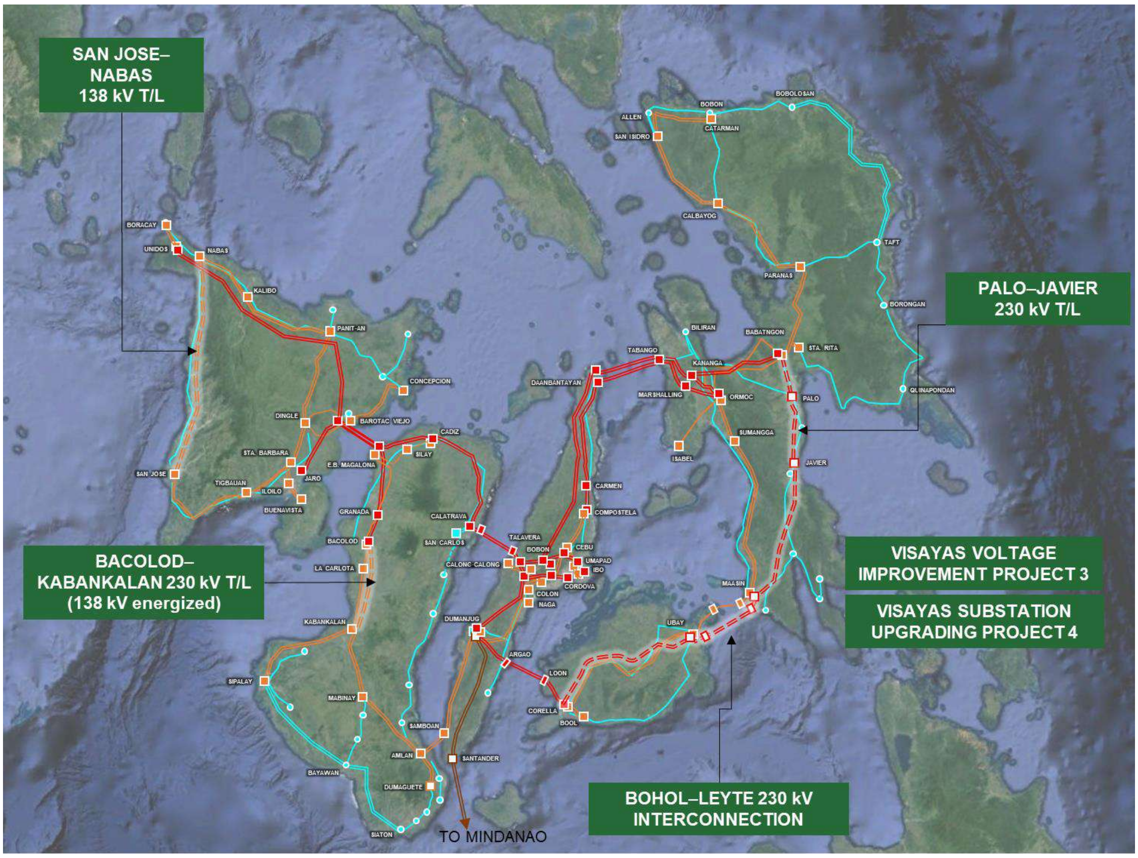


Figure 11.5: Proposed Visayas Transmission Outlook for 2035

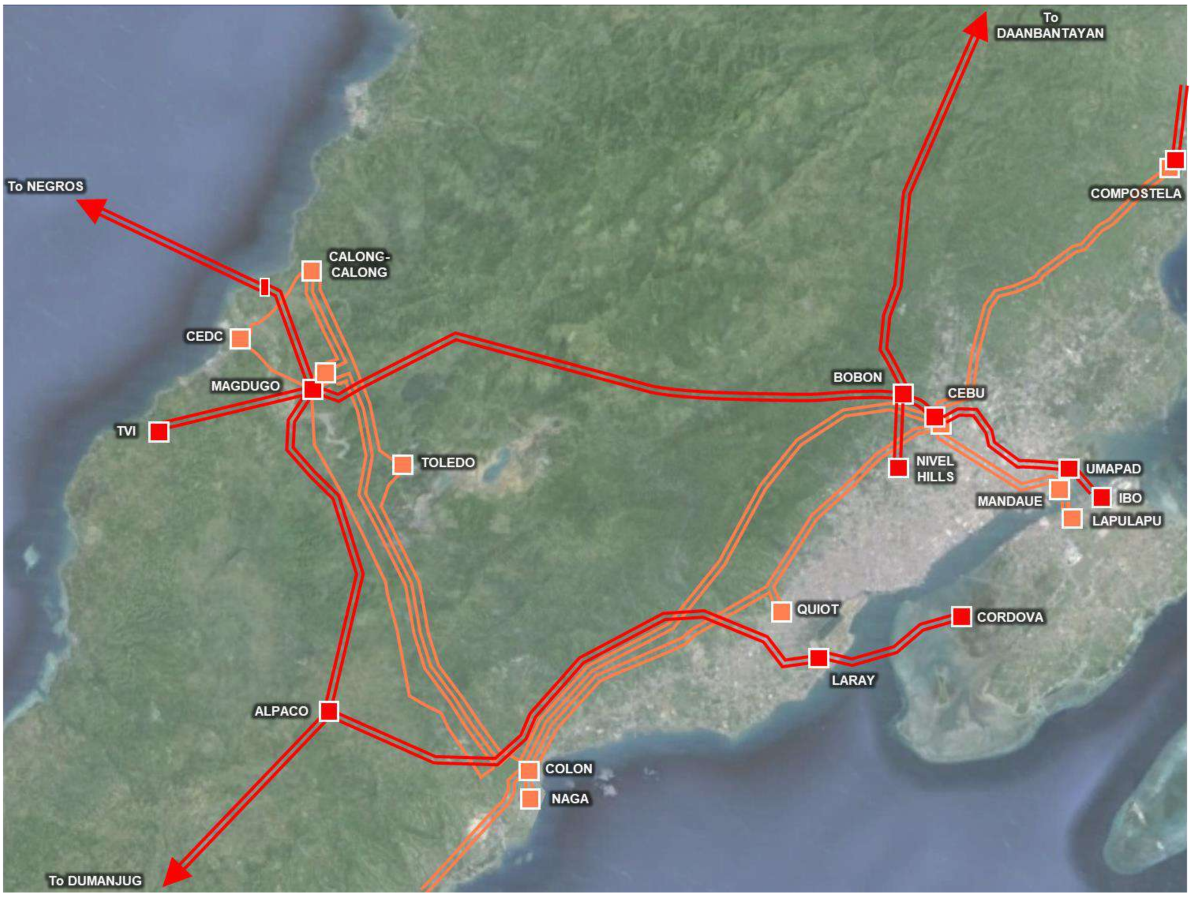


Figure 11.6: Proposed Metro Cebu Transmission Outlook for 2035

Table 11.3: Proposed Transmission Outlook for 2035

Project Name/Driver(s)	Province(s) and Components	ETC
Generation Entry		
Bacolod–Kabankalan 230 kV Transmission Line Project (Initially energized at 138 kV)	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		
Visayas Substation Upgrading Project 4	Cebu, Panay, Leyte, Negros and Bohol	Dec 2031
	Substation Components: ▪ Amlan S/S (Expansion), 3x100 MVA 138/69 kV Power Transformer and accessories (Transformers transferred from Laray 138 kV Substation); ▪ Corella S/S (Expansion), 1x100 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCB, 2-69 kV PCB and associated equipment; ▪ Jaro S/S (Expansion), 1x300 MVA 230/69 kV Power Transformer and accessories, 2-230 kV PCB, 1-69 kV PCB and associated equipment; ▪ Pusok S/S (Expansion), 1x300 MVA 230/69 kV Power Transformer and accessories; ▪ Concepcion (Replacement), 1x100 MVA 138/69 kV Power Transformer and accessories (Replacement of existing 50 MVA Transformer); ▪ Sumangga S/S (Expansion), 1x100 MVA 138/69 kV Power Transformer and accessories (Transferred from Palo 138 kV Substation), 2-138 kV PCB, 2-69 kV PCB and associated equipment; ▪ Kabankalan S/S (Expansion), 1x100 MVA 138/69-13.8 kV Power Transformer and accessories, 2-69 kV PCBs and associated equipment;	

Project Name/Driver(s)	Province(s) and Components	ETC
	▪ Panit-an S/S (Expansion), 1x100 MVA 138/69-13.8 kV Power Transformer and accessories (Transferred from Palo 138 kV Substation), 2-138 kV PCBs, 1-69 kV PCBs and associated equipment; ▪ Nabas S/S (Expansion), 2x50 MVA 138/69-13.8 kV Power Transformer and accessories (Transferred from Amlan Substation), 2-138 kV PCBs, 7-69 kV PCBs and associated equipment; ▪ Dingle S/S (Expansion), 1x100 MVA 138/69-13.8 kV Power Transformer and accessories (Transferred from Palo 138 kV Substation), 2-138 kV PCBs, 1-69 kV PCBs and associated equipment.	
Bohol–Leyte 230 kV Interconnection Project	Bohol, Leyte	Dec 2031
	<u>Substation Components:</u> ▪ Corella S/S (Expansion), 4-230 kV PCBs and associated equipment; ▪ Ubay S/S (Expansion), 2x300 MVA 230/138 kV Transformers, 4-230 kV PCBs and associated equipment; ▪ Tugas SWS, 2x70 MVAR Line Reactor, 8-230 kV PCBs and associated equipment; ▪ Guadalupe SWS, 2x70 MVAR Line Reactor, 8-230 kV PCBs and associated equipment; <u>Transmission Components:</u> ▪ Ubay–Tugas T/L, 4-795 MCM ACSR, ST-DC, 20 km; ▪ Corella–Ubay T/L, 4-795 MCM ACSR, ST-DC, 95 km; ▪ Guadalupe–Javier T/L, 4-795 MCM ACSR, ST-DC, 120 km. <u>Submarine Cable Components:</u> ▪ Tugas–Guadalupe S/C, 2 ckts XLPE submarine cable of 600 MW capacity per ckt, 17.6 km.	
San Jose–Nabas 138 kV Transmission Line Project	Panay	Dec 2033
	<u>Substation Components:</u> ▪ San Jose S/S, 2-138 kV PCBs and associated equipment; <u>Transmission Components:</u> ▪ San Jose–Nabas T/L, ST-DC, 1-795 MCM ACSR, 125 km.	
Palo–Javier 230 kV Transmission Line Project	Leyte	Sep 2034
	<u>Transmission Components:</u> ▪ Palo–Javier T/L, ST-DC, 4-795 MCM ACSR, 45 km. <u>Substation Components:</u> ▪ 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)	
Power Quality		
Visayas Voltage Improvement Project 3	Negros	Jul 2035
	<u>Substation Components:</u> ▪ Silay 138 kV S/S, 3x50 MVAR Capacitor Bank, 3-138 kV PCBs and associated equipment. ▪ Sumangga 138 kV S/S, 1x50 MVAR Capacitor Bank, 1-138 kV PCBs and associated equipment.	

11.4 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.

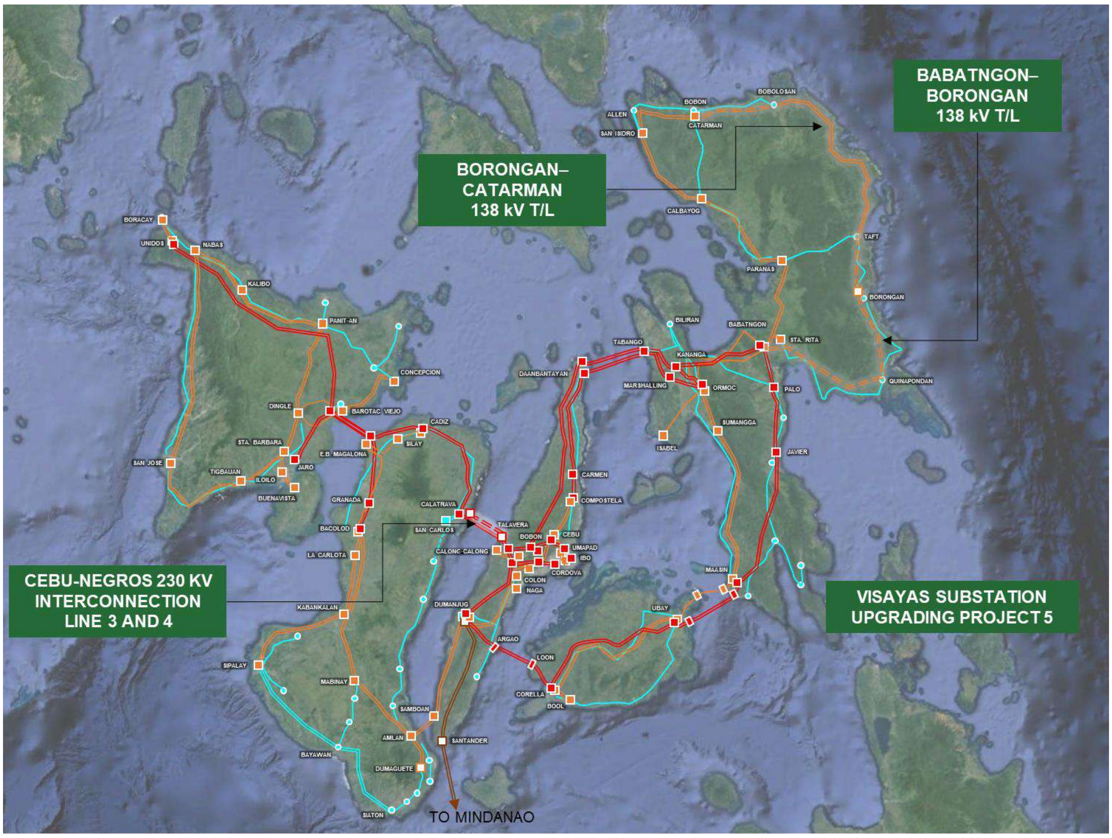


Figure 11.7: Proposed Visayas Transmission Outlook for 2040

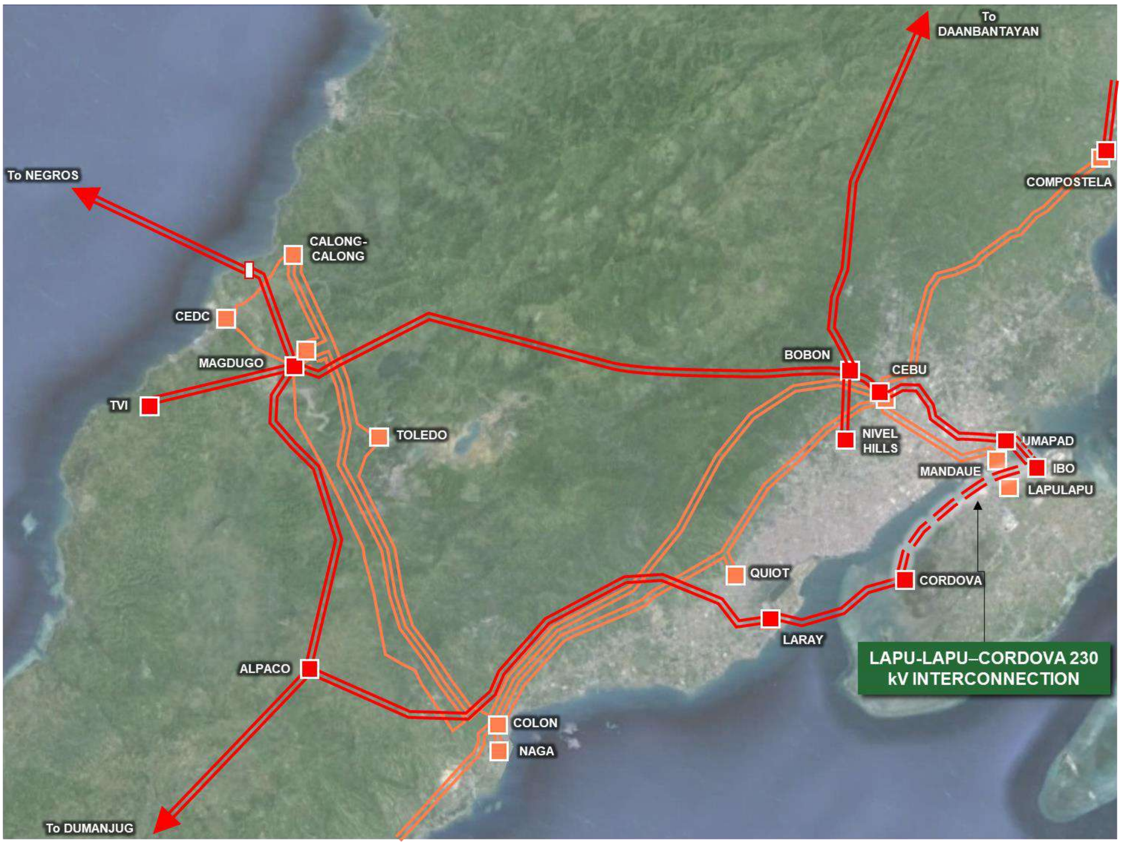


Figure 11.8: Proposed Metro Cebu Transmission Outlook for 2040

Shown in Table 11.4 is the list of proposed transmission projects for Visayas by the 2040.

Table 11.4: Proposed Transmission Outlook for 2040

Project Name/Driver(s)	Province(s) and Components	ETC
Generation Entry		
Cebu–Negros 230 kV Interconnection Line 3 and 4 Project	Cebu and Negros	Dec 2040
	Substation Components: ▪ Talavera SWS (Expansion), 12-230 kV PCBs and associated equipment, 2x70 MVAR 230 kV Line Reactor; ▪ Calatrava SWS (Expansion), 12-230 kV PCBs and associated equipment, 2x70 MVAR 230 kV Line Reactor; Transmission Components: ▪ Calatrava–Talavera 230 kV S/C, 2 ckts XLPE submarine cable of 400 MW per ckt capacity, 29 km.	
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 T/L, ST-DC, 1-795 MCM ACSR, 185 km. .	
Reliability		
Visayas Substation Upgrading Project 5	Cebu, Panay, Leyte and Negros	Dec 2036
	Substation Components: ▪ Nivel Hills S/S (Expansion), 1x300 MVA 230/69 kV Power Transformer and accessories, 1-230 kV PCB, 1-69 kV PCB and associated equipment; ▪ Cadiz S/S (Expansion), 1x100 MVA 138/69 kV Power Transformer and accessories. (Replacement of existing 50 MVA transformer). ▪ Dumanjug S/S (Expansion), 1x100 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCB, 2-69 kV PCB and associated equipment.	
Lapu-lapu–Cordova 230 kV Interconnection Project	Cebu	Dec 2038
	Transmission Components: ▪ Ibo–Cordova S/C S/C, 2 ckts XLPE submarine cable of 600 MW per ckt capacity, 6 km; Substation Components: ▪ Cordova S/S (Expansion), 4-230 kV PCBs and associated equipment.	
Borongan–Catarman 138 kV Transmission Line Project	Samar	Sep 2040
	Substation Components: ▪ Catarman S/S, 3x30 MVAR Bus Reactor; 4-138 kV PCBs, associated equipment; ▪ Borongan S/S, 2x20 MVAR Bus Reactor, 2-138 kV PCBs and associated equipment. Transmission Components: Borongan–Catarman T/L, ST-DC, 1-795 MCM ACSR, 118 km.	

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, new transmission backbones were developed.

Further, the proponents of the coal-fired power plant projects have plans to expand their capacity in the future which could reach a total of 600 MW to 1,200 MW of power generation capacity in each site. With such aggressive plans for expansion of power plants in the island and with the implementation of the interconnection between Mindanao and Visayas, there would be more opportunities for power exchange. This major interconnection project, which is the final link to interconnect the Philippine Grid, is further discussed in this Chapter.

Meanwhile, to cater the other requirements of the Mindanao Grid, reinforcements of the existing 138 kV substations, extension of some of the existing 230 kV and 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.

12.1 Proposed Transmission Projects up to 2025

Shown in Table 12.1 is the list of transmission projects planned for Mindanao Grid for the period 2020-2025 in addition to the projects already approved by the ERC.

Table 12.1: Proposed Transmission Projects for Mindanao

Project Name/Driver(s)	Province(s)	ETC
Load Growth		
Laguindingan 230 kV SS Project	Misamis Oriental	July 2023
	Substation Components: ▪ Laguindingan 230 kV Substation: 2-300 MVA, 230/138-13.8 kV Power Transformer and accessories, 1-100 MVA, 230/69-13.8 kV Power Transformer and accessories, 10-230 kV PCBs and associated equipment, 6-138 kV PCBs and associated equipment, 6-69 kV PCBs and associated equipment. Transmission Components: ▪ Balo-i-Villanueva 230 kV line bus-in to Laguindingan 230 kV SS: 230 kV, ST-DC, 2x795 MCM ACSR/AS, 5.75 km Bulk Cost Estimate: 2,634.457 Million Pesos	
Mindanao Substation Expansion 3 Project	Zamboanga del Sur, Surigao del Norte, Agusan del Sur, Davao Occidental	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: 1,464.64 Million Pesos	
Tumaga 138 kV Substation Project	Zamboanga del Sur	Dec 2023
	Substation Components: ▪ Tumaga 138 kV Substation: 2-100 MVA, 138/69-13.8 kV Power Transformer and accessories, 9-138 kV PCBs, 5-69 kV PCBs and associated equipment; Transmission Components: ▪ Tumaga-Zamboanga, 69 kV Transmission Line, SP-DC, 2-795 MCM ACSR, 23 km;	
Tigbao 138 kV Substation Bus-in	Zamboanga del Sur	Dec 2023
	Substation Components: ▪ Tigbao 138 kV Substation (New), 2x150 MVA 138/69-13.8 kV Power Transformer and accessories, 10-138 kV PCBs, 8-69 kV PCB and associated equipment. ▪	
Naga Mindanao–Salug 138 kV Transmission Line Project (Energized at 69 kV)	Zamboanga Sibugay, Zamboanga del Norte	Dec 2023
	Substation Components: ▪ Naga 138 kV Substation, 2-138 kV PCBs and associated equipment; ▪ Salug 138 kV Substation, 4-138 kV PCBs and associated equipment. Transmission Components: ▪ Naga-Salug 138 kV Transmission Line, ST-SC, 1-795 MCM ACSR, 60 km.	
Koronadal 138 kV Substation Project	South Cotabato	Dec 2023
	Substation Components: ▪ Koronadal 138 kV Substation (New), 2x150 MVA 138/69-13.8 kV Power Transformer and accessories, 10-138 kV PCBs, 6-69 kV PCBs and associated equipment;	
Maco–Tagum 69 kV Transmission Line Project	Davao de Oro, Davao del Norte	Jun 2024
	Substation Components: ▪ Maco 69 kV Substation, 1-69 kV PCBs and associated equipment; Transmission Components: ▪ Maco-Tagum-Magdum 69 kV Transmission Line (Upgrading), SP-SC, 1-795 MCM ACSR/AS, 31 km; ▪ Maco-Tagum 69 kV Transmission Line, SP-SC, 1-795 MCM ACSR/AS, 12 km. Bulk Cost Estimate: 1,505.236 Million	
Agus 6–Kiwalan–Lugait 69 kV Transmission Line Project	Lanao del Norte	Dec 2024
	Transmission Components: ▪ Agus 6-Kiwalan-Lugait, 69 kV Transmission Line (Upgrading), SP-SC, 1-795 MCM ASCR/AS, 27 km; Bulk Cost Estimate: 842.794 Million Pesos	
Mindanao Substation Expansion 4 Project	Zamboanga del Sur, Zamboanga del Norte, Lanao del Norte, Bukidnon, Davao del Norte, Davao Occidental, Maguindanao, Agusan del Norte	Dec 2024
	Substation Components: ▪ Naga 138 kV Substation, 1x100 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCBs, 2-69 kV PCBs and associated equipment; ▪ Polanco 138 kV Substation, 1x100 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCBs, 2-69 kV PCBs and associated equipment; ▪ Agus 6 Switchyard 138 kV Substation, 1x100 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCBs, 2-69 kV PCBs and associated equipment; ▪ Maramag 138 kV Substation, 1x100 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCBs, 2-69 kV PCBs and associated equipment; ▪ Maco 138 kV Substation, 1x100 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCBs, 2-69 kV PCBs and associated equipment;	

	▪ Culaman 138 kV Substation, 1x100 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCBs, 2-69 kV PCBs and associated equipment; ▪ Sultan Kudarat 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, 1x100 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCBs, 2-69 kV PCBs and associated equipment; Bulk Cost Estimate: 3,691.658 Million Pesos	
Villanueva–Kinamlutan 230 kV Transmission Line	Misamis Oriental, Agusan del Norte	Jan 2025
	<u>Substation Components:</u> ▪ Kinamlutan 230 kV Substation (Butuan 230 kV Substation): 2-300 MVA, 230/138-13.8 kV Power Transformer and accessories, 8-230 kV PCBs and associated equipment, 7-138 kV PCBs and associated equipment; ▪ Butuan 138 kV Substation: 2-138 kV PCBs and associated equipment; ▪ Villanueva 230 kV Substation: 4-230 kV PCBs and associated equipment, 2x100 ohm, 138 kV Series Line Reactor. <u>Transmission Components:</u> ▪ Villanueva-Kinamlutan 230 kV Transmission Line, ST-DC, 2-795 MCM ACSR/AS, 157.5 km. ▪ Butuan-Kinamlutan 138 kV Tie-Line: ST-DC, 2-795 MCM ACSR/AS, 0.85 km Bulk Cost Estimate: 6,944.336 Million Pesos	
System Reliability		
Nasipit Substation Bus-In Project	Agusan Del Norte	Apr 2022
	<u>Substation Components:</u> ▪ 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 <u>Transmission Components:</u> ▪ 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: 1,171.71 Million Pesos	
Kabacan 138 kV Substation Project	North Cotabato, Misamis Oriental, Sultan Kudarat, Maguindanao	May 2022
	<u>Substation Components:</u> ▪ Kabacan 138 kV Substation, 1x50 MVA 138/69-13.8 kV Power Transformer and accessories, 12-138 kV PCBs, 1-69 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. <u>Transmission Components:</u> ▪ Kabacan-Kidapawan 138 kV Transmission Line, ST-DC, 1-795 MCM ACSR/AS, 50.6 km ▪ Kabacan-Villarica 69 kV Transmission Line, SP-SC, 1-160 mm^2 STACIR/AW, 37.2 km. ▪ Kibawe Line Extension,138 kV, ST-DC, 1-795 MCM ACSR/AS, 0.5 km ▪ Tacurong Line Extension, 138 kV, ST-SC, 1-795 MCM ACSR/AS, 1.86 km ▪ Sultan Kudarat Line Extension, 138 kV, ST-SC, 1-795 MCM ACSR/AS, 1.88 km Bulk Cost Estimate: 4,167.87 Million Pesos	
Zamboanga Peninsula Voltage Improvement Project	Zamboanga del Sur	Dec 2023
	<u>Substation Components:</u> ▪ Aurora 138 kV Substation, 2x100 MVAR STATCOM, 4-138 kV PCB and associated equipment ▪ Pitogo 138 kV Substation, 2x7.5 MVAR Shunt Capacitor, 2-69 kV PCBs and associated equipment Bulk Cost Estimate: 920.877 Million Pesos	
Eastern Mindanao Voltage Improvement Project	Agusan del Norte, Agusan del Sur, Surigao del Sur, Davao de Oro	Dec 2023
	<u>Substation Components:</u> ▪ Butuan 138 kV Substation: 3x10 MVAR Shunt Capacitors and accessories; ▪ San Francisco 138 kV Substation: 3x10 MVAR Shunt Capacitors and accessories; ▪ Nabunturan 138 kV Substation: 3x10 MVAR Shunt Capacitors and accessories; ▪ Maco 138 kV Substation: 3x10 MVAR Shunt Capacitors and accessories.	

	Bulk Cost Estimate: 159.687 Million Pesos	
Mindanao Substation Upgrading 2 Project (MSU2P)	South Cotabato, Davao del Sur, Zamboanga del Sur, Misamis Oriental, Bukidnon	Dec 2023
	<u>Substation Components:</u> ▪ Balo-i 138 kV Substation, 2x100 MVA 138/69 kV Power Transformer and accessories, 4-138 kV PCBs, 4-69 kV PCBs and associated equipment; ▪ Jasaan 138 kV Substation, 1x100 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCBs, 2-69 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; ▪ Butuan 138 kV Substation, 1x100 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCBs, 2-69 kV PCBs and associated equipment; ▪ Davao 138 kV Substation, 2x150 MVA 138/69 kV Power Transformer and accessories, 4-138 kV PCBs, 4-69 kV PCBs and associated equipment; ▪ Toril 138 kV Substation, 2x100 MVA 138/69 kV Power Transformer and accessories, 4-138 kV PCBs, 4-69 kV PCBs and associated equipment; ▪ Bunawan 138 kV Substation, 2x150 MVA 138/69 kV Power Transformer and accessories, 4-138 kV PCBs, 4-69 kV PCBs and associated equipment; ▪ Kidapawan 138 kV Substation, 1x100 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCBs, 2-69 kV PCBs and associated equipment; ▪ General Santos 138 kV Substation, 2x150 MVA 138/69 kV Power Transformer and accessories, 4-138 kV PCBs, 4-69 kV PCBs and associated equipment Bulk Cost Estimate: 7,919.161 Million Pesos	
San Francisco–Tago 138 kV Transmission Line Project	Agusan del Sur, Surigao del Sur	May 2024
	<u>Substation Components:</u> ▪ San Francisco 138 kV Substation: 2-138 kV PCBs and associated equipment; ▪ Tago 138 kV Substation (New): 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. <u>Transmission Components:</u> ▪ San Francisco–Tago 138 kV Transmission Line: ST-DC, 1-795 MCM ACSR/AS, 81.6 km; ▪ Madrid –Tago 69 kV Transmission Line, SP-SC, 1-160 mm^2 STACIR/AW, 54 km. Bulk Cost Estimate: 4,198.64 Million Pesos	
Maco–Mati 138 kV Transmission Line Project	Davao de Oro, Davao Oriental	May 2024
	<u>Substation Components:</u> ▪ 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, 2-69 kV PCBs and associated equipment. <u>Transmission Components:</u> ▪ Maco–Mati 138 kV Transmission Line: ST-DC, 1-795 MCM ACSR/AS, 72.3 km. Bulk Cost Estimate: 2,344.51 Million Pesos	
Oroquieta 69 kV Switching Station Project	Zamboanga Del Sur, Zamboanga Del Norte, and Misamis Occidental	Sep 2024
	<u>Substation Components:</u> ▪ Oroquieta Switching Station: 8-69 kV PCBs and associated equipment, 2-7.5 MVAR Shunt Capacitor; ▪ Polanco Substation: 4-10 MVAR 138 kV Shunt Capacitor, 4-138 kV PCB and associated equipment; 3-69 kV PCB and associated equipment; ▪ Aurora 69 kV Substation: 1-69 kV PCBs and associated equipment; ▪ Bañadero 69 kV Substation: 2-7.5 MVAR 69 kV Shunt Capacitor, 2-69 kV PCB and associated equipment; ▪ Villaflor 69 kV Substation: 1-7.5 MVAR 69 kV Shunt Capacitor, 1-69 kV PCB and associated equipment; <u>Transmission Components:</u> ▪ Aurora-Villaflor 69 kV Transmission Line (Upgrading): SP-SC, 1-795 MCM ACSR/AS, 84 km.	

	▪ Oroquieta-Polanco 69 kV Transmission Line (New): ST-DC, 1-795 MCM ACSR/AS, 48 km. Bulk Cost Estimate: 4,561.641 Million Pesos	
Sultan Kudarat–Tacurong 230 kV Transmission Line Project	Maguindanao, Sultan Kudarat	Jan 2025
	<u>Substation Components:</u> ▪ Tacurong 230 kV Substation, 5-230 kV PCBs and associated equipment; 2-138 kV PCBs and associated equipment; ▪ Sultan Kudarat 138 kV Substation, 2-138 kV PCBs and associated equipment; ▪ Sultan Kudarat 230 kV Substation, 5-230 kV PCBs and associated equipment. <u>Transmission Components:</u> • 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: 5,232.528 Million Pesos	
Eastern Mindanao 230 kV Transmission Line Project	Agusan del Norte, Agusan del Sur, Davao de Oro	Jan 2025
	<u>Substation Components:</u> ▪ Kinamlutan 230 kV Substation (Butuan 230 kV Substation): 4-230 kV PCBs and associated equipment; ▪ Alegria 230 kV Substation (San Francisco 230 kV Substation): 10-230 kV PCBs and associated equipment; ▪ San Francisco 138 kV Substation: 2-138 kV PCBs and associated equipment; ▪ San Antonio 230 kV Substation (Bislig 230 kV Substation): 10-230 kV PCBs and associated equipment; ▪ Bukal 230 kV Substation (Nabunturan 230 kV Substation): 6-230 kV PCBs and associated equipment: ▪ Nabunturan 138 kV Substation: 3-138 kV PCBs and associated equipment; ▪ Bislig 138 kV Substation: 4-138 kV PCBs and associated equipment. <u>Transmission Components:</u> ▪ Kinamlutan-Alegria 230 kV Transmission Line: SP/ST-DC, 2-795 MCM ACSR/AS, 92.9 km; ▪ Alegria-San Antonio 230 kV Transmission Line: SP/ST-DC, 2-795 MCM ACSR/AS, 92.9 km; ▪ San Antonio-Bukal 230 kV Transmission Line: ST-DC: 2-795 MCM ACSR/AS, 96.8 km; ▪ San Francisco-Alegria 138 kV Tie Line: ST-DC, 2-795 MCM ACSR/AS, 0.75 km; ▪ Bislig-San Antonio 138 kV Tie Line: ST-DC: 2-795 MCM ACSR/AS, 0.75 km. ▪ Nabunturan-Bukal 138 kV Tie Line, ST-DC: 2-795 MCM ACSR/AS, 0.5 km. Bulk Cost Estimate: 14,180.781 Million Pesos	
Opol Substation Bus-in Project	Misamis Oriental	Dec 2025
	<u>Substation Components:</u> ▪ Opol 138 kV Substation: 1x100 MVA 138/69-13.8 kV Power Transformer and accessories, 5-138 kV PCBs, 1-69 kV PCBs and associated equipment. <u>Transmission Components:</u> ▪ Opol Substation Bus-in to Balo-i-Tagoloan 138 kV Transmission Line: ST-DC, 1-795 MCM ACSR/AS, 7 km. ▪ Opol-Carmen 69 kV transmission line reconfiguration: 69 kV SP-SC, 1x336.4 MCM, ACSR/AS, 0.5 km Bulk Cost Estimate: 768.433 Million Pesos	
Lala-Naga-Zamboanga 230 kV Transmission Line Project	Lanao del Norte, Zamboanga Sibugay, Zamboanga del Sur	Dec 2025
	<u>Substation Components:</u> ▪ Lala 230 kV Substation: 4-230 kV PCBs and associated equipment; ▪ Naga Mindanao 230 kV Substation (New): 2x300 MVA 230/138-13.8 kV Power Transformer and accessories, 10-230 kV PCBs, 4-138 kV PCBs and associated equipment; ▪ Zamboanga 230 kV Substation (New): 2x300 MVA 230/138-13.8 kV Power Transformer and accessories, 6-230 kV PCBs, 4-138 kV PCBs and associated equipment;	

	<u>Transmission Components:</u> ▪ Lala–Naga Mindanao 230 kV Transmission Line: ST-DC, 2-795 MCM ACSR/AS, 150 km; ▪ Naga Mindanao-Zamboanga 230 kV Transmission Line: ST-DC, 2-795 MCM ACSR/AS, 110 km; Bulk Cost Estimate: 19,042.944 Million Pesos

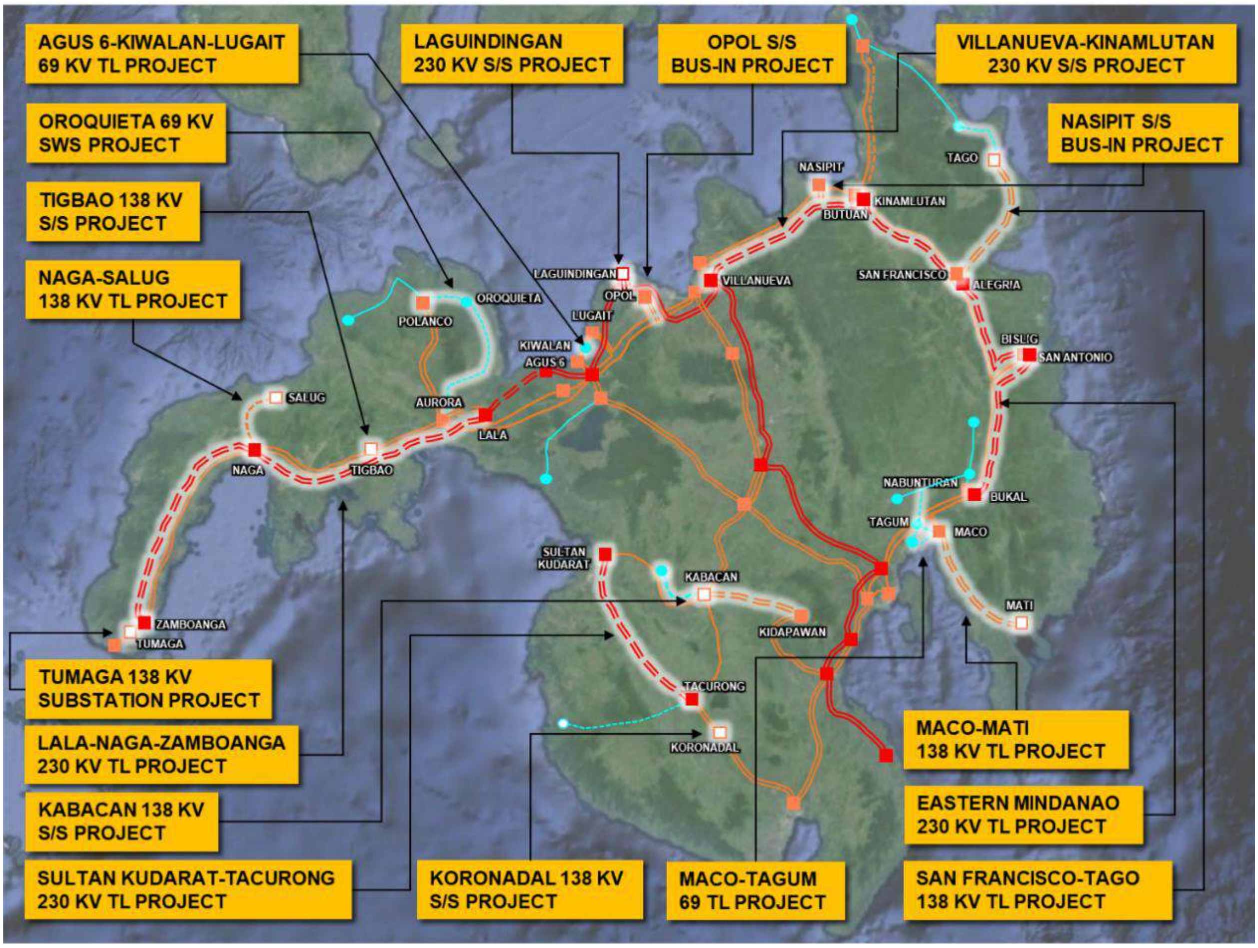


Figure 12.1: Proposed Mindanao Transmission Outlook for 2025

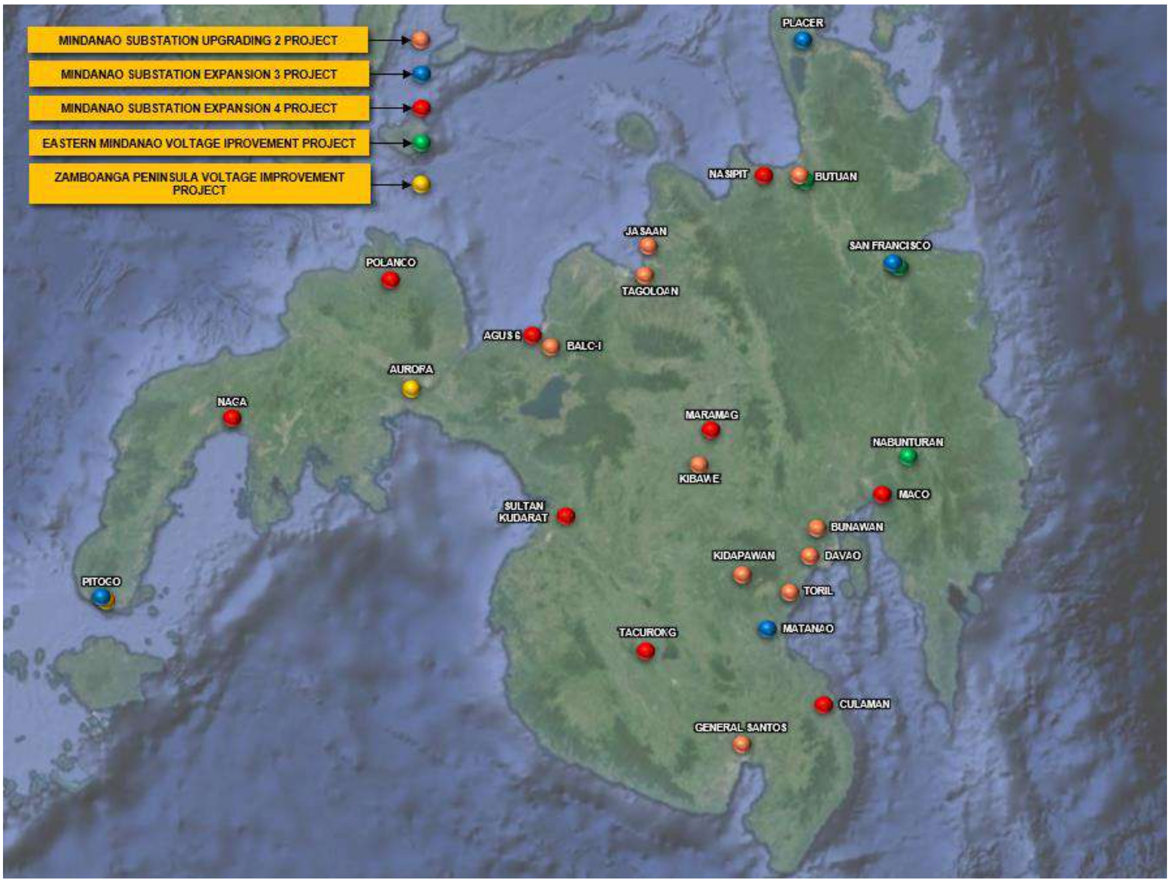
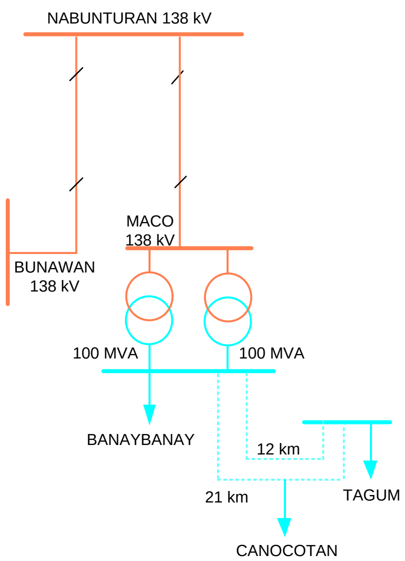


Figure 12.2: Mindanao Substation Upgrading and Voltage Improvement for 2025

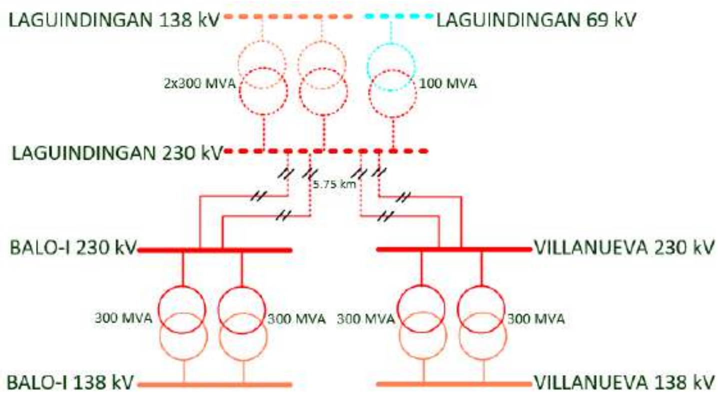
12.1.1 Maco-Tagum 69 kV Transmission Line Project

Due to rapid economic development in the Tagum City area, the existing single-circuit transmission line is already insufficient to cater to the load demand. Likewise, the line lacks alternative reinforcement needed during single-outage contingency criterial for the reliable transmission of power supply in the city.

The project involves the construction of new 12 km, 69 kV transmission line from Maco Substation to the load center, Tagum City, and upgrading of existing Maco-Tagum-Magdum 69 kV Transmission Line to 795 MCM ACSR/AS. These transmission developments aim to provide stable, reliable, flexible transmission system that can cope up with the growing economy of the area.



12.1.2 Laguindingan 230 kV Substation Project



The abrupt industrial and commercial developments in the Laguindingan area, which is adjacent to the existing airport, require substantial power supply requirements which is more than the capacity of the existing available transmission facility in the area.

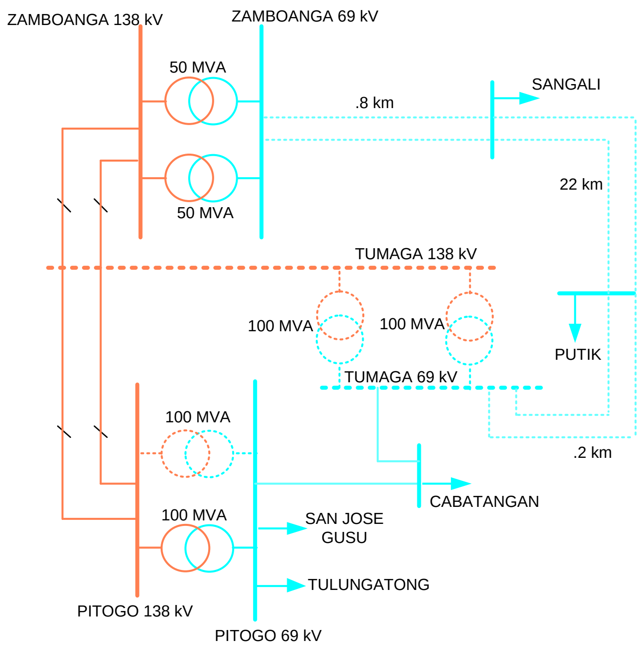
The project provides stable power supply and efficient delivery of large power capacity to the loads in the vicinity of Laguindingan through the 230 kV backbone of the Mindanao Grid. This project ensures continuous supply of electricity essential in the operation of the economic zone.

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

12.1.3 Mindanao Substation Expansion 3 Project

Starting in 2023, the existing transformers in Pitogo, Placer, San Francisco and Matanao Substations exceed their thermal capacity during N-1 condition. The Installation of additional transformer in each of these substations maintains the continuous normal state operation during outage of one of the transformers. This development also complies with the single-outage contingency criterion of the Philippine Grid Code.

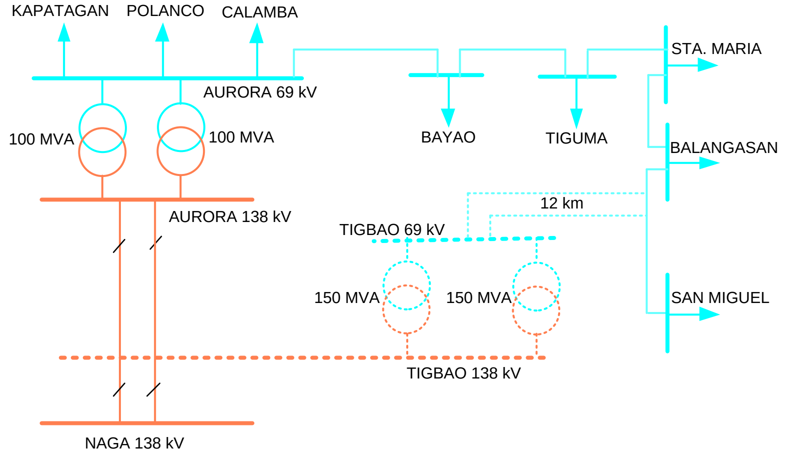
12.1.4 Tumaga 138 kV Substation Project



The Tumaga 138 kV Substation caters to the increasing demand load in Zamboanga City. With the further increase in demand load, the existing Pitogo–Tumaga and Zamboanga–Tumaga 69 kV transmission lines become heavily loaded exposing the connected loads to supply reliability risk as well as power quality concerns during system peak load condition.

The project involves the construction of new 138 kV substation to bus-in along the existing Zamboanga–Pitogo 138 kV Transmission Line. Also included in this project is the upgrading of conductor for the Tomaga – Zamboanga 69 kV transmission line from 336.4 MCM ACSR conductor to 1-160mm^2 STACIR/AW utilizing steel pole of double-circuit configuration.

12.1.5 Tigbao 138 kV Substation Project

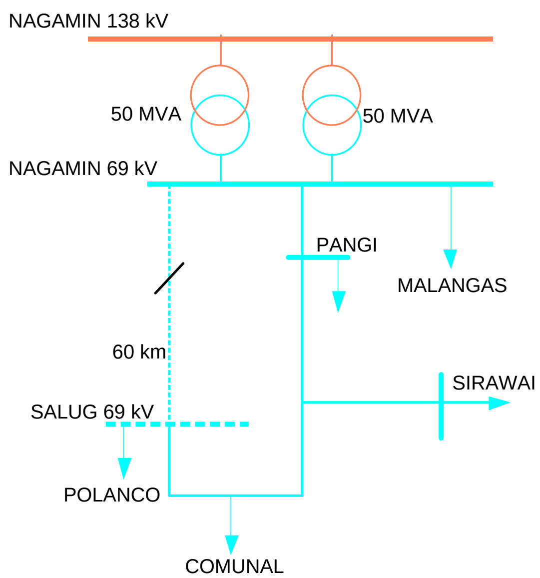


With the further increase of demand load in the area, the existing Aurora Substation becomes overloaded during N-1 condition. Due to space restrictions, a further development inside the said substation is infeasible.

The project caters to the continuously growing demand load in Zamboanga del Sur and Misamis Occidental. It also resolves power quality concerns in the area that occurred during system peak load conditions.

The project involves the construction of Tigbao Substation that bus-in the existing Aurora-Naga 138 kV transmission line and 69 kV line of a double-circuit configuration utilizing 1-160 mm^2 STACIR/AW. The 69 kV line stretches from Tigbao Substation up to the existing San Miguel – Balangasan 69 kV line located in Zamboanga del Sur.

12.1.6 Naga Mindanao-Salug 138 kV Transmission Line Project (Energized at 69 kV)



The Naga Mindanao–Salug 138 kV Transmission Line is an extension of the 138 kV transmission network towards the north-western coast of Zamboanga del Norte to support the expected load growth. It forms a looped network providing a more reliable transmission network in the area.

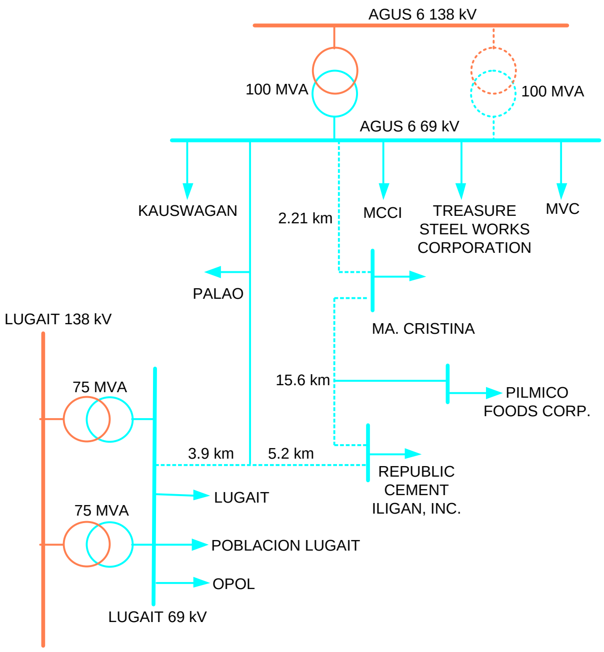
The radial Naga Mindanao–Ipil–Salug 69 kV Line is a single-circuit, 60.7-kilometer line utilizing 336.4 MCM ACSR conductor that particularly serves Liloy and Salug substations of local cooperative ZANECO. Considering the 9.34- kilometer Naga Mindanao–Ipil line, where Salug and Sirawai lines intersect, the Zamboanga del Norte and Zamboanga Sibugay are areas prone to line tripping, high system loss, and low voltage problems.

This project involves the construction of a 60 km 138 kV line, which is to be initially energized at 69 kV voltage level, connecting Naga Mindanao Substation and Salug Substation.

12.1.7 Agus 6-Lugait 69 kV Transmission Line Project

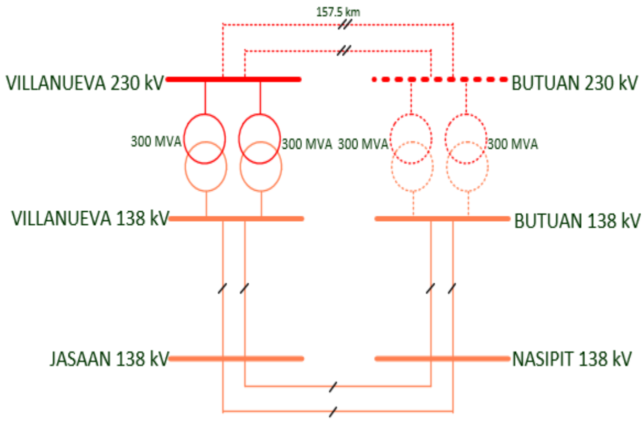
The Agus 6–Lugait 69 kV Transmission Line Project relieves the forthcoming overloading of the existing Agus 6–Kiwalan 69 kV single-circuit line due to inadequate conductor resulting from continuously increasing demand load in the area.

The project involves the upgrading of the existing Lugait–Kiwalan and Agus 6–Kiwalan 69 kV lines. It complements the power supply delivery of the Agus 6-Mapalad 69 kV Transmission Line to the Iligan City area.



12.1.8 Villanueva–Kinamlutan 230 kV Transmission Line Project

Due to increasing demand and lack of generating facility in the northeastern Mindanao area, the overloading of the existing Villanueva-Jasaan 138 kV double-circuit transmission line occurs during single-outage contingency (N-1) condition. In this condition, undervoltage in Butuan and other nearby substations in the area is being experienced.



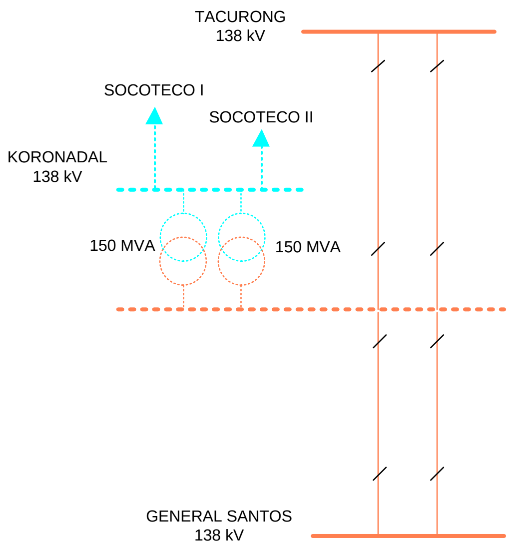
The project includes the installation of a new double-circuit, 157.5 km, 230 kV transmission line from Villanueva Substation to Butuan Substation as well as the installation of 2x100 Ohms series reactors which redirects the power flow to the 230 kV transmission corridor. The project alleviates the overloading of the remaining Villanueva–Jasaan 138 kV Transmission Line during N-1 condition. This project is an initial step towards developing a transmission corridor of higher capacity, improving the reliability and power quality of the transmission system in the area.

12.1.9 Mindanao Substation Expansion 4 Project

Several substations in Mindanao are expected to become overloaded based on the demand forecast. Thus, transmission facilities should be developed in which substation capacity must be upgraded.

The Mindanao Substation Expansion 4 Project caters to the looming demand load and fulfills the single-outage contingency criterion of the Philippine Grid Code. Starting year 2024, the existing transformers in Naga Mindanao, Polanco, Agus 6, Maramag, Maco, Culaman, Sultan Kudarat and Nasipit substations are exceeded their capacity during N-1 condition. Hence, the installation of additional transformers in the affected substations are necessary to maintain continuous normal state operation during an outage of one of the transformers.

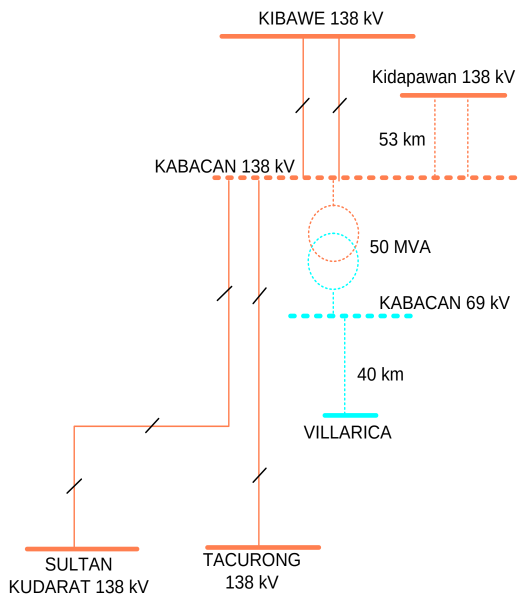
12.1.10 Koronadal Substation Project



The rapid development in South Western Mindanao Area requires expansion and development in the transmission system to improve power supply operation. The Koronadal Substation Project directly delivers the power to high demand areas in South Cotobato and avoids feeder congestions in the existing Tacurong and General Santos substations.

The new substation caters some of the current loads of the heavily loaded Tacurong and General Santos substations. It involves the creation of a new substation between the existing Tacurong – General Santos 138 kV transmission line which includes the installation of 2 x 150 MVA transformers.

12.1.11 Kabacan 138 kV Substation Project

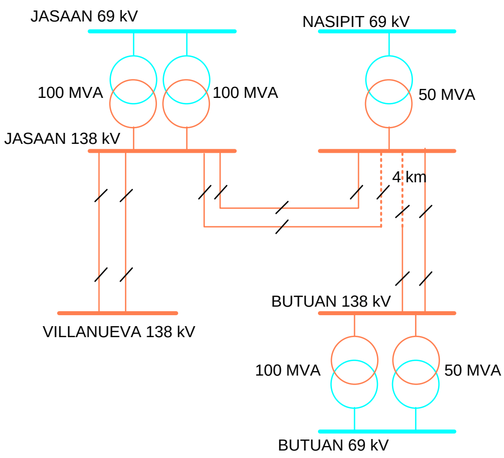


Security remains a serious concern in Mindanao. The Kibawe-Kabacan, Kabacan-Sultan Kudarat and Kabacan-Tacurong 138 kV lines traverse unrestrained regions with prevalent presence of militant groups and lawless elements. Thus, transmission facilities are exposed to a high risk of sabotage. The outage of any of these line segments results 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 provide flexibility and additional reliability to the transmission system to ensure the continuity of power supply in the concerned areas. Additionally, the project includes the installation of four new PCB in Gen. Santos Substation that allows the entry of the 105 MW Coal-Fired Power Plant Phase 2 of Sarangani Energy Corporation.

12.1.12 Nasipit Substation Bus-In Project

The outage of the existing Nasipit-Butuan 138 kV transmission line results in a low voltage in the following substations: Butuan, Placer and San Francisco.



The project improves the reliability and power quality of the transmission system in the northeastern Mindanao area. It comprises the bus-in of the existing Jasaan-Butuan 138 kV line to Nasipit Substation, installation of a new 50 MVA power transformer and replacement of defective power circuit breakers.

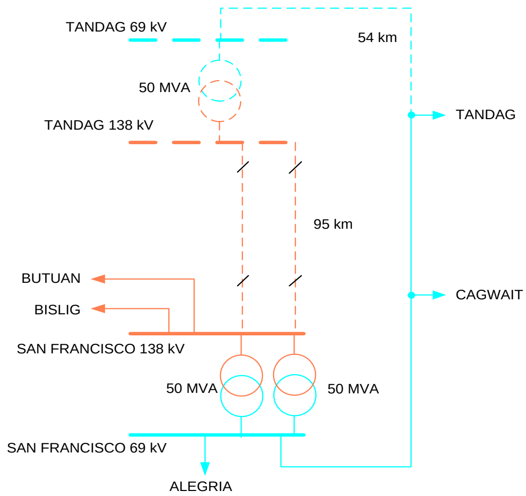
12.1.13 Zamboanga Peninsula Voltage Improvement Project

The main problem in the Zamboanga Peninsula is the deficiency of local generator which triggers voltage difficulties in the northwestern Mindanao area. Under the circumstances, voltage levels should be managed to maintain the normal operation of the grid.

The Zamboanga Peninsula Voltage Improvement Project provides voltage supports, while waiting for the necessary power plant in the area, by installing 2 x 100 MVAR synchronous condenser in Aurora Substation and 2 x 7.5 MVAR capacitor bank in Pitogo Substation. Modern type synchronous condenser is the suitable reactive power compensating device in the area since its operation is independent from voltage level of the grid. it offers sizeable and continuously adjustable reactive power, rapid response and smooth voltage regulation while providing improved short-circuit strength.

12.1.14 San Francisco-Tago 138 kV Transmission Line Project

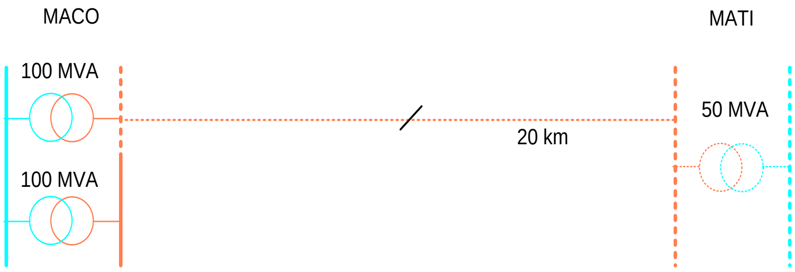
With the existing transmission line configuration, outage of the San Francisco-Tago 69 kV Transmission Line or Placer-Madrid 69 kV Transmission Line shuts down the connected loads due to the absence of an alternative transmission facility.



The solution to the problem comprises the extension of the 138 kV transmission system from San Francisco Substation to the new Tago Substation and the looping of the 69 kV transmission network in Surigao del Sur area. This project allows the switching of loads during line outage. It solves the power quality and reliability problems being experienced in the area.

12.1.15 Maco-Mati 138 kV Transmission Line Project

Presently, the existing Maco-Mati 69 kV Transmission Line is in a radial configuration. It has no alternate line to deliver power to the customer when it is shut down for any reasons. Likewise, the existing Maco Substation has no N-1 capability since It has only one unit of 50 MVA power transformer.

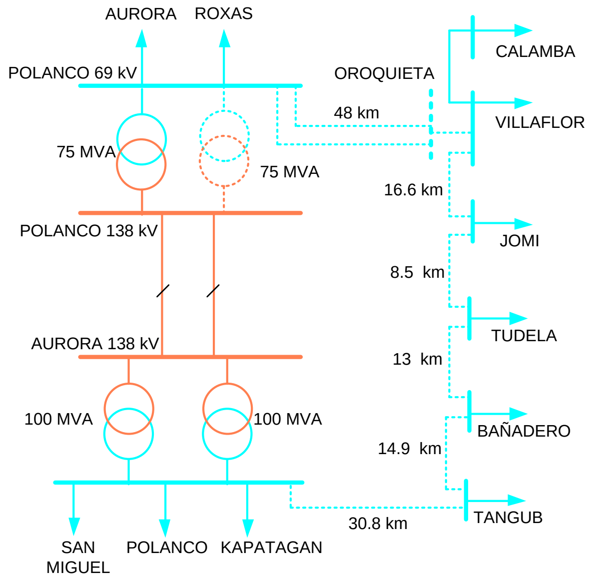


A low voltage problem is anticipated due to the rapid development and increasing power requirement of Mati City.

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

12.1.16 Oroquieta Switching Station Project

The thermal limit of the existing Aurora-Calamba 69 kV line is already exceeded by 2022 onwards, which is unable to transmit the power requirement of the connected costumers in the area. The system requires load curtailment to be able to maintain the continuous operation of the grid. Moreover, a low voltage problem is being experienced at the load-end substations due to the long distance of the 69 kV line. The limited capacity of the line and the low voltage problem suppress the progress in the area.



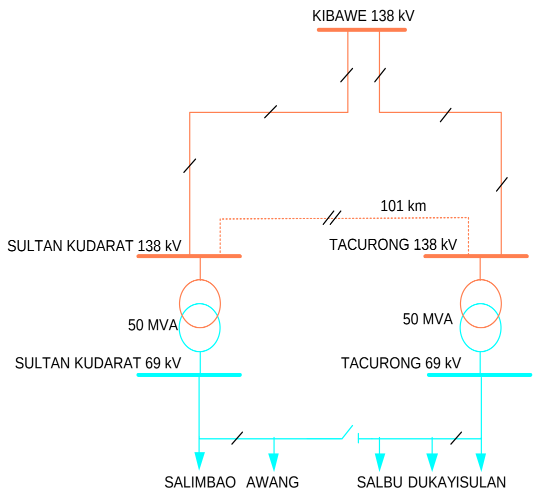
The project loops the transmission facility connecting MOELCI I and MOELCI II. It increases the transmission capacity of the existing 69 kV line providing additional connection points and improving the power quality for the costumers in Misamis Occidental.

The project covers the upgrading of the existing Aurora-Villaflor 69 kV transmission line and construction of a new 48 km, double-circuit 69 kV transmission line from Polanco Substation to the new Oroquieta Switching Station.

12.1.17 Sultan Kudarat-Tacurong 230 kV Transmission Line Project

The project ensures a reliable and flexible power transmission through a new corridor connecting the substations of Tacurong and Sultan Kudarat. It contributes to economic development in the area to complement the Lala-Malabang-Sultan Kudarat 230 kV Transmission Line Project.

Additionally, the load-end costumers connected in the substations of Tacurong and Sultan Kudarat are assured of continuous power supply even during an outage of either Kibawe-Sultan Kudarat or Kibawe-Tacurong 138 kV line. The project mitigates the voltage issue in the affected areas.

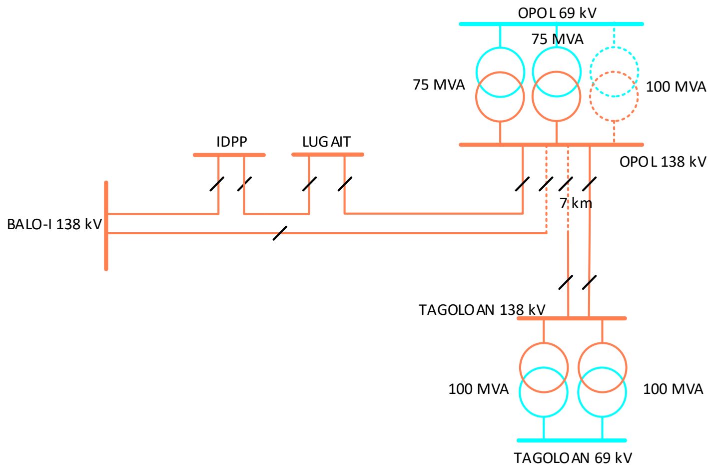


The project, which is to be initially energized at 138 kV level, includes more than one hundred kilometers of high voltage transmission line, four power circuit breakers, and other associated equipment.

12.1.18 Opol Substation Bus-in Project

Currently, the configuration of the Opol Substation is cut-in along the Lugait-Tagoloan 138 kV Transmission Line serving loads of Moresco 1 and CEPALCO. The outage of the existing Opol-Tagoloan 138 kV Transmission Line results to undervoltage in Opol Substation.

Due to rapid demand growth in the area, the existing Opol Substation no longer complies with the standard prescribed in the PGC during a single-outage contingency (N-1) condition.



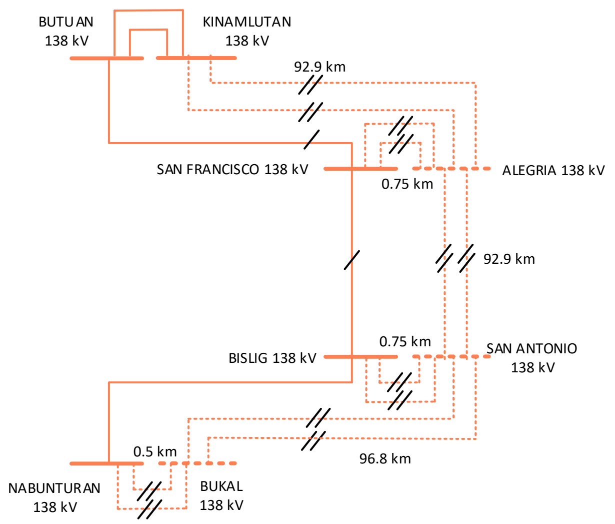
The Opol Substation Bus-in Project accommodates the increasing demand and improves the reliability and power quality of the transmission system in northern Mindanao. It is comprised of the bus-in of Opol Substation to the existing Balo-I -Tagoloan 138 kV Single Circuit Transmission Line, installation of another 100 MVA power transformer with associated circuit breakers, and secondary equipment in the said substation.

12.1.19 Eastern Mindanao Voltage Improvement Project

The substations in eastern Mindanao experience undervoltage due to increasing demand. The installation of Shunt Capacitors in the substations ensures the voltage level within the prescribed limits of the PGC even at contingent scenarios. It also helps in maintaining the normal voltage level in the area until the implementation of the Eastern Mindanao 230 kV Transmission Line Project.

12.1.20 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 lacks the single-outage contingency provision of the grid code. The area is already exposed to power quality difficulties due to the possible connection of huge mining loads.



The project strengthens the existing transmission system ensuring a stable, reliable and efficient power transmission in the eastern part of the island. This is an initial step towards establishing a bigger transmission corridor for eastern Mindanao. It will be initially energized at 138 kV voltage level which eventually improves the power quality in the area.

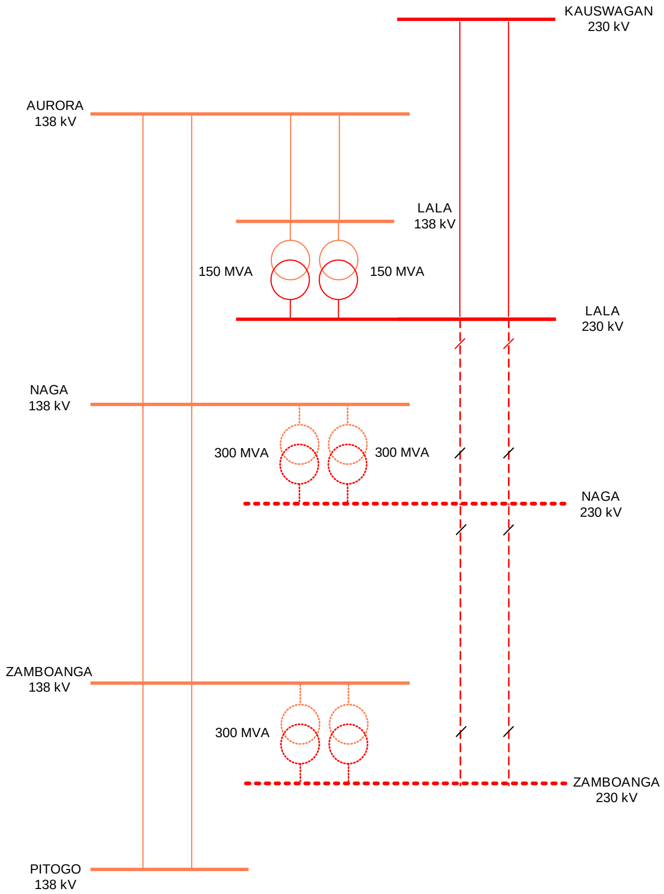
12.1.21 Mindanao Substation Upgrading 2 Project

The Mindanao Substation Upgrading 2 Project accommodates the growing demand load by providing continuous supply even during single-outage contingency condition of various substations in the island. Each existing substation capacity of Balo-i, Tagoloan, Jasaan, Kibawe, Butuan, Davao, Toril, Bunawan, Kidapawan, and General Santos substations is just adequate to support the demand load during normal operation by the year 2023. Accordingly, the project improves the transmission operation reliability by providing transformer reserved capacity to avoid power supply interruption.

12.1.22 Lala-Naga Mindanao-Zamboanga 230 kV Transmission Line Project

The main problem in the Zamboanga Peninsula is the deficiency of local generator which triggers voltage difficulties in the northwestern Mindanao area. Under the circumstances, voltage levels should be managed to maintain the normal grid operation. Further, Zamboanga Peninsula is prone to operation stability issues due to a long and radial transmission line.

The extension of the Mindanao 230 kV transmission backbone towards Zamboanga Peninsula offers operation stability by having another transmission corridor with higher power transfer capacity. The 230 kV transmission facility alleviates the power supply delivery and voltage stability issues in Zamboanga Peninsula.



12.2 Proposed Transmission Outlook for 2030

The Lala–Malabang–Sultan Kudarat 230 kV Transmission Line Project, which creates a looped system through a high voltage power line emanating from Lanao del Norte, further improves the reliability of transmitting power to southwestern Mindanao. Likewise, the various 69 kV transmission line projects such as the Siom–Sindangan–Salug line in Zamboanga Del Norte and upgrading of Placer-Madri line in Caraga Region provide flexibility in supplying power to the customers in that part of Mindanao. Two new substations namely the Salug and Midsayap substations are to be constructed for the growing demand load in the provinces of Zamboanga del Norte and Cotabato, respectively. Moreover, as indicated in Figure 10, the upgrading of the existing substations is programmed to address the growing demand requirements of different cooperatives.

In the long term, the installation of transformers in the Matanao 230 kV facility ensures adequate substation and improve voltage profile for the customers in Davao del Sur.

Finally, the implementation of Zamboanga–Basilan and Davao–Samal interconnection projects significantly boost the supply reliability supporting the load requirements of Basilan and Samal islands.

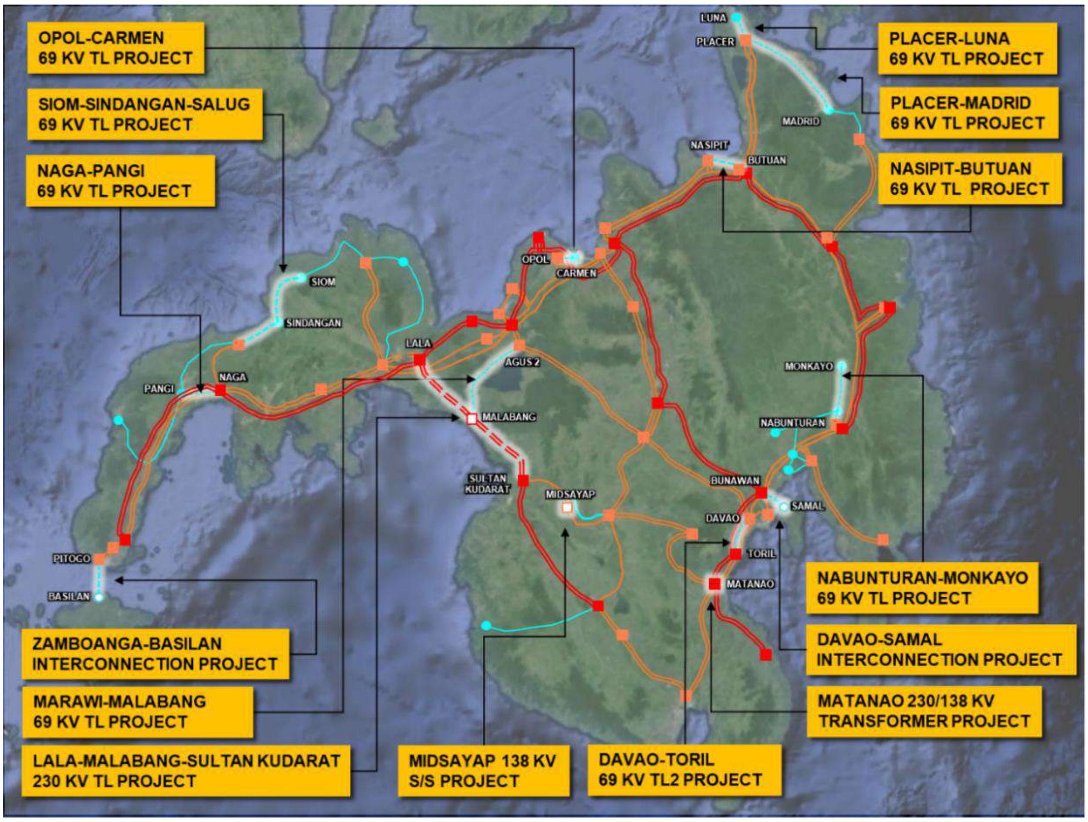


Figure 12.3: Proposed Mindanao Transmission Outlook for 2030

Table 12.2: Proposed Mindanao Transmission Outlook for 2030

Project Name/Driver(s)	Province(s) and Components	ETC
Load Growth		
Nasipit–Butuan 69 kV Transmission Line Project	Agusan del Norte	Jan 2026
	Substation Components: ▪ Nasipit 69 kV Substation: 1-69 kV PCB and associated equipment; ▪ Butuan 69 kV Substation: 1-69 kV PCB and associated equipment. Transmission Components: Nasipit-Butuan 69 kV Transmission Line (Upgrading): SP-SC, 1-160 mm^2 STACIR/AW, 25 km.	
Placer–Luna 69 kV Transmission Line Project	Surigao del Norte	Dec 2026
	Substation Components: ▪ Placer 69 kV Substation: 1-69 kV PCB and associated equipment; ▪ Luna 69 kV Substation: 1-69 kV PCB and associated equipment. Transmission Components: ▪ Placer-Luna 69 kV Transmission Line: SP-SC, 1-160 mm^2 STACIR/AW, 18 km.	
Opol–Carmen 69 kV Transmission Line Project	Misamis Oriental	Dec 2026
	Substation Components: ▪ Opol 69 kV Substation: 1-69 kV PCB and associated equipment; ▪ Carmen 69 kV Substation: 1-69 kV PCB and associated equipment. Transmission Components: Opol-Carmen 69 kV Transmission Line (Upgrading): SP-SC, 1-160 mm^2 STACIR/AW, 12 km.	
	Davao del Sur	Dec 2026

Project Name/Driver(s)	Province(s) and Components	ETC
Davao–Toril 69 kV Line 2 Transmission Line Project	Substation Components: ▪ Davao 69 kV Substation: 1-69 kV PCB and associated equipment; ▪ Toril 69 kV Substation: 1-69 kV PCB and associated equipment. Transmission Components: Davao-Toril 69 kV Transmission Line 2: SP-SC, 1-160 mm^2 STACIR/AW, 8 km.	
Naga Mindanao–Pangi 69 kV Transmission Line Project	Zamboanga Sibugay Substation Components: ▪ Naga Mindanao 69 kV Substation: 1-69 kV PCB and associated equipment; ▪ Pangi 69 kV Substation: 1-69 kV PCB and associated equipment. Transmission Components: Naga Mindanao-Pangi 69 kV Transmission Line: SP-SC, 1-160 mm^2 STACIR/AW, 13 km.	Dec 2027
Marawi–Malabang 69 kV Transmission Line Project	Lanao del Sur Substation Components: ▪ Marawi 69 kV Substation: 1-69 kV PCB and associated equipment; ▪ Malabang 69 kV Substation: 1-69 kV PCB and associated equipment. Transmission Components: Marawi-Malabang 69 kV Transmission Line (Upgrading): SP-SC, 1-160 mm^2 STACIR/AW, 62 km.	Dec 2027
Midsayap 138 kV Substation Project	Cotabato Substation Components: ▪ Midsayap 138 kV Substation (New): 10-138 kV PCB and associated equipment, 4-69 kV PCB and associated equipment;	Dec 2028
Nabunturan–Monkayo 69 kV Transmission Line Project	Davao de Oro Substation Components: ▪ Nabunturan 69 kV Substation: 1-69 kV PCB and associated equipment; ▪ Monkayo 69 kV Substation: 1-69 kV PCB and associated equipment. Transmission Components: Nabunturan-Monkayo 69 kV Transmission Line (Upgrading): SP-SC, 1-160 mm^2 STACIR/AW, 42 km.	Dec 2029
Matanao 230/138 kV Transformer	Davao Del Sur Substation Components: ▪ 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.	Dec 2030
Placer–Madrid 69 kV Transmission Line Project	Surigao del Norte Substation Components: ▪ Placer 69 kV Substation: 1-69 kV PCB and associated equipment; ▪ Marid 69 kV Substation: 1-69 kV PCB and associated equipment. Transmission Components: Placer-Madrid 69 kV Transmission Line: SP-SC, 1-160 mm^2 STACIR/AW, 84 km.	Dec 2030
Mindanao Substation Expansion 5 Project (MSE5P)	Mindanao Substation Components: ▪ Tumaga 138 kV Substation, 1x100 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCBs, 2-69 kV PCBs and associated equipment; ▪ Salug 138 kV Substation, 1x100 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCBs, 2-69 kV PCBs and associated equipment; ▪ Aurora 138 kV Substation, 1x100 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCBs, 2-69 kV PCBs and associated equipment; ▪ Bislig 138 kV Substation, 1x100 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCBs, 2-69 kV PCBs and associated equipment; ▪ Nabunturan 138 kV Substation, 2x100 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCBs, 2-69 kV PCBs and associated equipment;	Dec 2030

Project Name/Driver(s)	Province(s) and Components	ETC
	▪ Bunawan 138 kV Substation, 1x150 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCBs, 2-69 kV PCBs and associated equipment; ▪ Mati 138 kV Substation, 1x100 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCBs, 2-69 kV PCBs and associated equipment; ▪ Culaman 138 kV Substation, 1x100 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCBs, 2-69 kV PCBs and associated equipment; ▪ General Santos 138 kV Substation, 1x150 MVA 138/69 kV Power Transformer and accessories, 4-138 kV PCBs, 4-69 kV PCBs and associated equipment ▪ Tacurong 138 kV Substation, 1x100 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCBs, 2-69 kV PCBs and associated equipment ▪ Sultan Kudarat 138 kV Substation, 1x100 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCBs, 2-69 kV PCBs and associated equipment	
System Reliability		
Lala–Malabang–Sultan Kudarat 230 kV Transmission Line (Initially energized at 138 kV)	Lanao Del Norte, Lanao del Sur, Maguindanao	Dec 2030
	Substation Components: ▪ Lala 230 kV Substation: 4-230 kV PCBs and associated equipment; ▪ Malabang 230 kV Substation (New): 2x50 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: 4-230 kV PCBs and associated equipment. Transmission Components: ▪ Lala–Malabang–Sultan Kudarat 230 kV Transmission Line: ST-DC, 2-795 MCM ACSR/AS, 115 km.	
Siom–Sindangan–Salug 69 kV Transmission Line	Zamboanga Del Norte	Dec 2030
	Substation Components: ▪ Siom 69 kV Substation (Expansion): 2-69 kV PCBs and associated equipment; ▪ Sindangan 69 kV Substation (New): 2-69 kV PCBs and associated equipment; ▪ Salug 69 kV Substation (Expansion): 2-69 kV PCBs and associated equipment. Transmission Components: ▪ Siom–Sindangan–Salug 69 kV Transmission Line: SP-SC, 1-160 mm^2 STACIR/AW, 115 km.	
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.	

12.3 Proposed Transmission Outlook for 2035

The development in eastern Mindanao is expected to escalate within this period which requires a new 138 kV transmission corridor to support such progress. Further, the upgrading of the existing 69 kV transmission lines is needed to prevent thermal overloading of the existing lines through a looped network that provides adequate line capacity to sustain the growing mining operations in CARAGA Region.

Within this period, the expansion of various facilities through the installation of additional transformers in each of the affected substations support the expected load growth in Mindanao.

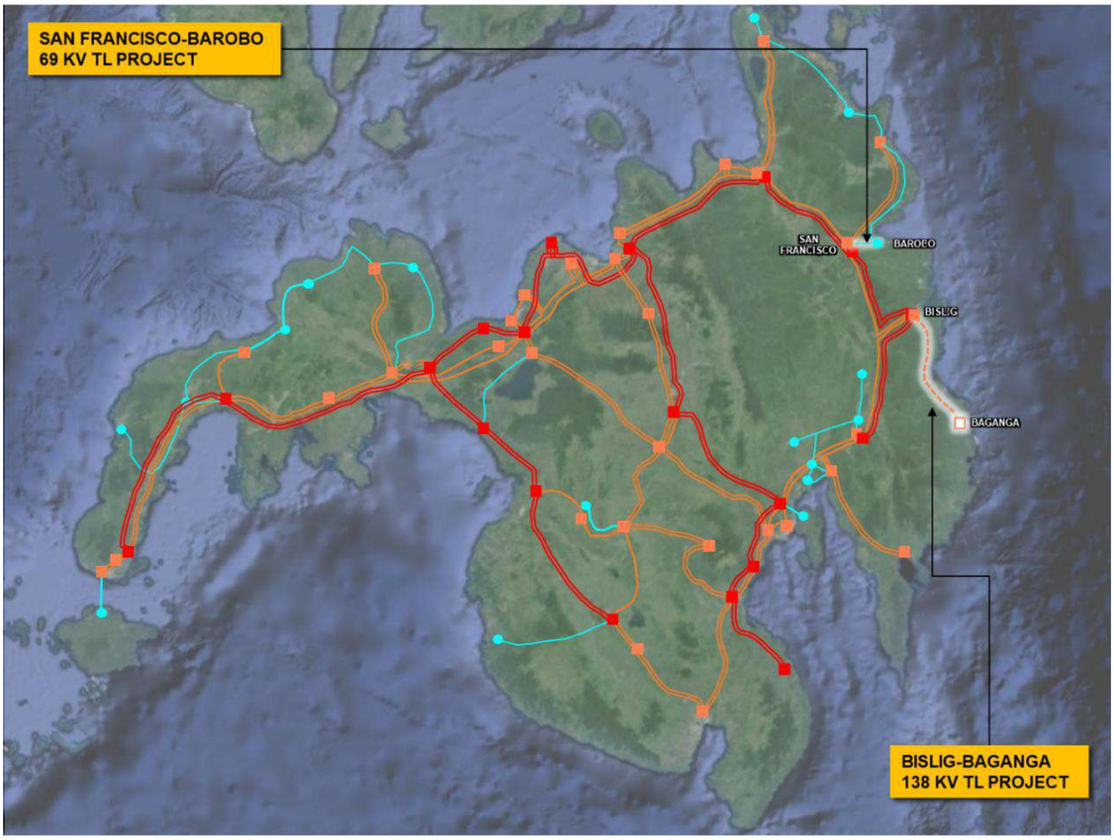


Figure 12.4: Proposed Mindanao Transmission Outlook for 2035

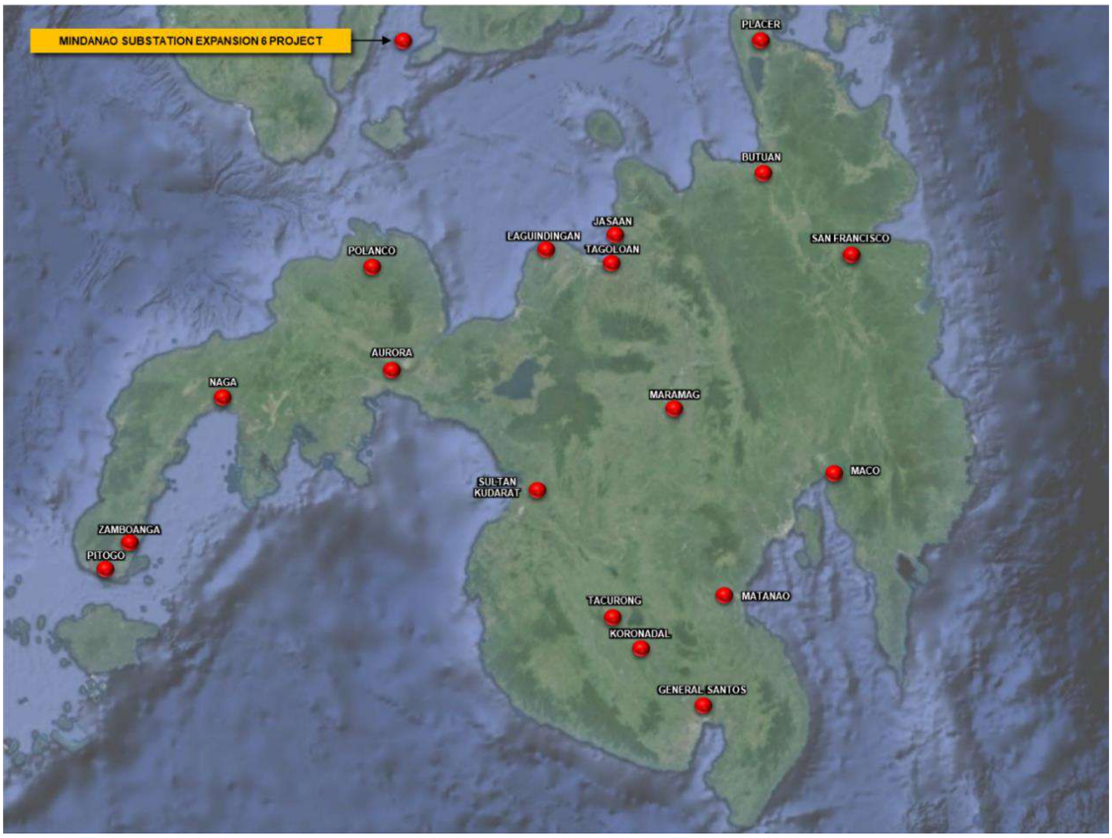


Figure 12.5: Proposed Mindanao Transmission Outlook for 2035

Table 12.3: Proposed Mindanao Transmission Outlook for 2035

Project Name/Driver(s)	Province(s) and Components	ETC
System Reliability		
San Francisco–Barobo 69 kV Transmission Line Project	Surigao del Sur	Dec 2031
	Transmission Components: ▪ San Francisco-Barobo 69 kV Transmission Line: ST-SC, 1-795 MCM ACSR, 56.6 km Substation Components: ▪ San Francisco 69 kV Substation Expansion, 1-69 kV PCBs and associated equipment; ▪ Barobo 69 kV Substation: 1-69 kV PCBs and associated equipment.	
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 Expansion, 2-138 kV PCBs and associated equipment; ▪ Baganga 138 kV Substation (New), 1-50 MVA 138/69-13.8 kV Power Transformer and accessories, 3-138 kV PCBs, 2-69 kV PCBs and associated equipment.	
Bunawan–Bukal 230 kV Transmission Line	Davao del Norte, Davao de Oro	Dec 2035
	Transmission Components: ▪ Bunawan-Bukal 230 kV Transmission Line: ST-DC, 2-795 MCM ACSR/AS, 70 km Substation Components: ▪ Bukal 230 kV Substation (New), 4-230 kV PCBs and associated equipment; Bunawan 230 kV Substation Expansion, 4-230 kV PCBs and associated equipment.	
Load Growth		
Mindanao Substation Expansion 6 Project (MSE6P)	Mindanao	Dec 2035
	Substation Components: ▪ Pitogo 138 kV Substation, 1x100 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCBs, 2-69 kV PCBs and associated equipment; ▪ Zamboanga 138 kV Substation, 1x100 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCBs, 2-69 kV PCBs and associated equipment; ▪ Naga MIndanao 138 kV Substation, 1x100 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCBs, 2-69 kV PCBs and associated equipment; ▪ Aurora 138 kV Substation, 1x100 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCBs, 2-69 kV PCBs and associated equipment; ▪ Polanco 138 kV Substation, 1x100 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCBs, 2-69 kV PCBs and associated equipment; ▪ Laguindingan 230 kV Substation, 1x300 MVA 230/138 kV Power Transformer and accessories, 2-230 kV PCBs, 2-139 kV PCBs and associated equipment; ▪ Jasaan 138 kV Substation, 1x100 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCBs, 2-69 kV PCBs and associated equipment; ▪ Tagoloan 138 kV Substation, 1x150 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCBs, 2-69 kV PCBs and associated equipment; ▪ Maramag 138 kV Substation, 1x100 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCBs, 2-69 kV PCBs and associated equipment; ▪ Butuan 138 kV Substation, 1x100 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCBs, 2-69 kV PCBs and associated equipment; ▪ Placer 138 kV Substation, 1x100 MVA 138/69 kV Power Transformer and accessories, 4-138 kV PCBs, 4-69 kV PCBs and associated equipment ▪ San Francsico 138 kV Substation, 1x100 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCBs, 2-69 kV PCBs and associated equipment ▪ Maco 138 kV Substation, 1x100 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCBs, 2-69 kV PCBs and associated equipment ▪ Matanao 138 kV Substation, 1x100 MVA 138/69 kV Power Transformer and accessories, 4-138 kV PCBs, 4-69 kV PCBs and associated equipment	

Project Name/Driver(s)	Province(s) and Components	ETC
	▪ General Santos 138 kV Substation, 1x100 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCBs, 2-69 kV PCBs and associated equipment ▪ Tacurong 138 kV Substation, 1x100 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCBs, 2-69 kV PCBs and associated equipment ▪ Koronadal 138 kV Substation, 1x100 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCBs, 2-69 kV PCBs and associated equipment ▪ Sultan Kudarat 138 kV Substation, 1x100 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCBs, 2-69 kV PCBs and associated equipment	

12.4 Proposed Transmission Outlook for 2040

The identified grid expansion projects in Mindanao by 2040 mainly consider the anticipated demand load. The Mindanao Grid 230 kV transmission backbone network is extended towards Zamboanga Sibugay, Compostela Valley, and Southwestern areas to improve power reliability. The high-voltage network expansion projects are the Matanao-Tacurong 230 kV Transmission Line and Nabunturan-Bunawan 230 kV Transmission Line. These transmission corridors complete the envisioned 230 kV loop system in the Mindanao Grid.

Expected development in new areas in Mindanao requires additional reinforcement of existing 69 kV transmission lines that provide more sustainable and reliable power supply delivery to their service areas. The reinforcement consists of upgrading the existing transmission facilities to a higher capacity which can be energized to a higher voltage level in the future.

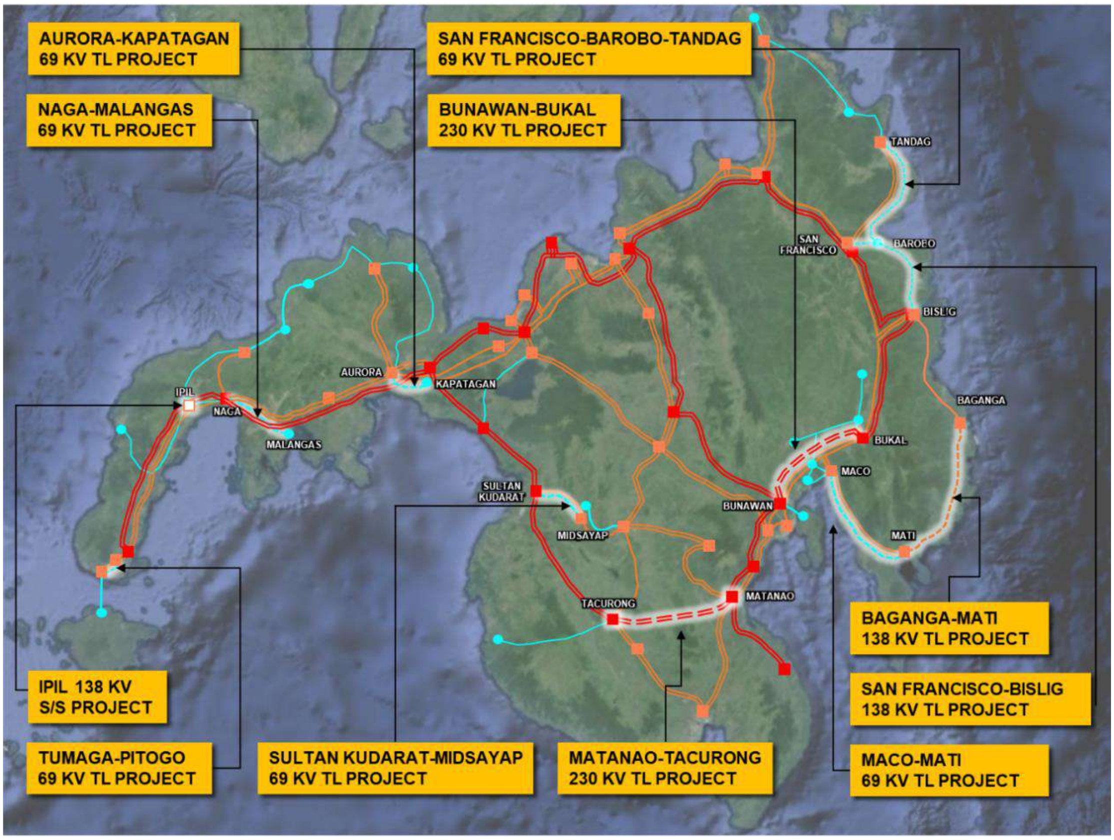


Figure 12.6: Proposed Mindanao Transmission Outlook for 2040

Table 12.4: Proposed Mindanao Transmission Outlook for 2040

Project Name/Driver(s)	Province(s) and Components	ETC
System Reliability		
Maco–Mati 69 kV Transmission Line Project	Davao de Oro	Jan 2036
	Transmission Components: ▪ Maco-Mati 69 kV Transmission Line, ST-SC, 1-795 MCM ACSR, 48 km Substation Components: ▪ Maco 69 kV Substation (Expansion), 1-69 kV PCBs and associated equipment; ▪ Mati 69 kV Substation (Expansion), 1-69 kV PCBs and associated equipment.	
San Francisco–Barobo–Tandag 69 kV Transmission Line Project	Surgao del Sur	Dec 2036
	Transmission Components: ▪ Barobo-Tandag 69 kV Transmission Line, ST-SC, 1-795 MCM ACSR, 95.1 km Substation Components: ▪ Tandag 69 kV Substation, 1-69 kV PCBs and associated equipment; ▪ San Francisco 69 kV Substation (Expansion), 1-69 kV PCBs and associated equipment.	
Naga–Malangas 69 kV Transmission Line Project	Zamboanga Sibugay	Dec 2036
	Transmission Components: ▪ Naga Mindanao-Malangas 69 kV Transmission Line, ST-SC, 1-795 MCM ACSR, 40.94 km Substation Components: ▪ Naga Mindanao 69 kV Substation (Expansion), 1-69 kV PCBs and associated equipment; ▪ Malangas 69 kV Substation, 1-69 kV PCBs and associated equipment.	
Aurora–Kapatagan 69 kV Transmission Line Project	Misamis Occidental, Lanao del Norte	Dec 2037
	Transmission Components: ▪ Aurora-Kapatagan 69 kV Transmission Line, ST-SC, 1-795 MCM ACSR, 25 km Substation Components: ▪ Aurora 69 kV Substation (Expansion), 1-69 kV PCBs and associated equipment; ▪ Kapatagan 69 kV Substation, 1-69 kV PCBs and associated equipment.	
Sultan Kudarat–Midsayap 69 kV Transmission Line Project	Maguindanao	Dec 2037
	Transmission Components: ▪ Sultan Kudarat-Midsayap 69 kV Transmission Line, ST-SC, 1-795 MCM ACSR, 29.2 km Substation Components: ▪ Sultan Kudarat 69 kV Substation (Expansion), 1-69 kV PCBs and associated equipment; ▪ Midsayap 69 kV Substation (Expansion), 1-69 kV PCBs and associated equipment.	
Baganga–Mati 138 kV Transmission Line Project	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 (Expansion), 2-138 kV PCBs and associated equipment; ▪ Mati 138 kV Substation (Expansion), 2-138 kV PCBs and associated equipment.	
San Francisco–Bislig 69 kV Transmission Line Project	Surigao del Sur	Dec 2040
	Transmission Components: ▪ San Francisco-Barobo-Bislig 69 kV Transmission Line, ST-SC, 1-795 MCM ACSR, 56.6 km	

Project Name/Driver(s)	Province(s) and Components	ETC
	Substation Components: ▪ San Francisco 69 kV Substation (Expansion), 1-69 kV PCBs and associated equipment; ▪ Bislig 69 kV Substation (Expansion), 1-69 kV PCBs and associated equipment.	
Tumaga–Pitogo 69 kV Transmission Line Project	Zamboanga del Sur	Dec 2040
	Transmission Components: ▪ Tumaga-Pitogo 69 kV Transmission Line, ST-SC, 1-795 MCM ACSR, 38.8 km Substation Components: ▪ Pitogo 69 kV Substation (Expansion), 1-69 kV PCBs and associated equipment; ▪ Tumaga 69 kV Substation (Expansion), 1-69 kV PCBs and associated equipment.	
Culaman-Gen. Santos 230 kV Transmission Line	Davao Occidental, South Cotabato	Dec 2040
	Transmission Components: ▪ Culaman–General Santos 230 kV Transmission Line, ST-DC, 2-795 MCM ACSR/AS, 60 km Substation Components: ▪ Culaman 230 kV Substation Expansion, 4-230 kV PCBs and associated equipment; ▪ General Santos 230 kV Substation (New), 4-230 kV PCBs and associated equipment.	
Load Growth		
Ipil 138 kV Substation Project	Zamboanga Sibugay	Dec 2037
	Substation Components: ▪ Midsayap 138 kV Substation (New): 10-138 kV PCB and associated equipment, 4-69 kV PCB and associated equipment;	
Mindanao Substation Expansion 7 Project (MSE7P)	Mindanao	Dec 2040
	Substation Components: ▪ Salug 138 kV Substation, 1x100 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCBs, 2-69 kV PCBs and associated equipment; ▪ Agus 6 138 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; ▪ Lugait 138 kV Substation, 1x100 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCBs, 2-69 kV PCBs and associated equipment; ▪ Opol 138 kV Substation, 1x100 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCBs, 2-69 kV PCBs and associated equipment; ▪ Tagoloan 138 kV Substation, 1x150 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCBs, 2-69 kV PCBs and associated equipment; ▪ Butuan 138 kV Substation, 1x100 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCBs, 2-69 kV PCBs and associated equipment; ▪ Tandag 138 kV Substation, 1x100 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCBs, 2-69 kV PCBs and associated equipment; ▪ Maramag 138 kV Substation, 1x100 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCBs, 2-69 kV PCBs and associated equipment; ▪ Bislig 138 kV Substation, 1x100 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCBs, 2-69 kV PCBs and associated equipment; ▪ Nabuturan 138 kV Substation, 1x100 MVA 138/69 kV Power Transformer and accessories, 4-138 kV PCBs, 4-69 kV PCBs and associated equipment ▪ Mati 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, 1x150 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCBs, 2-69 kV PCBs and associated equipment ▪ Davao 138 kV Substation, 1x150 MVA 138/69 kV Power Transformer and accessories, 4-138 kV PCBs, 4-69 kV PCBs and associated equipment	

Project Name/Driver(s)	Province(s) and Components	ETC
	▪ Toril 138 kV Substation, 1x100 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCBs, 2-69 kV PCBs and associated equipment ▪ Matanao 138 kV Substation, 1x100 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCBs, 2-69 kV PCBs and associated equipment ▪ Kidapawan 138 kV Substation, 1x100 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCBs, 2-69 kV PCBs and associated equipment ▪ General Santos 138 kV Substation, 1x100 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCBs, 2-69 kV PCBs and associated equipment ▪ Kabacan 138 kV Substation, 1x100 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCBs, 2-69 kV PCBs and associated equipment ▪ Midsayap 138 kV Substation, 1x100 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCBs, 2-69 kV PCBs and associated equipment	

13.1 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.

13.1.1 Existing Island Interconnections

As of December 2018, 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 and 230 kV cables, 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 was 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.

13.1.2 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.

13.1.3 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

13.2 Transmission Backbone and Major Island Interconnection Projects for 2016-2025

Figure 13.1 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 13.2 shows the Existing and Future Philippine Network Topology of an interconnected grid.

The formulation of the Transmission Backbone and Major Island Interconnections 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 13.1 – Transmission Backbone and Major Island Interconnections

Project Name	ETC	Project Status (as of Dec 2018)
1. Bolo to Laoag 500 kV Backbone Composed of Bolo–Balaoan and Balaoan–Laoag 500 kV Transmission Lines that will traverse the provinces of Pangasinan, La Union, and Ilocos Sur. This 500 kV Backbone is intended to support the entry of large generation capacities in La Union, Mountain Province, and Ilocos area. It also aims to address the anticipated overloading of the San Esteban–Laoag and San Esteban–Bakun/Bacnotan–Bauang 230 kV Lines during N-1 contingency event.	Nov 2026	• For ERC Application

Project Name	ETC	Project Status (as of Dec 2018)
2. Nagsaag to Kabugao 500 kV Backbone Composed of Santiago–Nagsaag and Santiago–Kabugao 500 kV Transmission Lines that will traverse the provinces of Isabela, Pangasinan, and Apayao. This is to support the generation developments in Cagayan Valley and the Cordilleras. Furthermore, it also intends to relieve the overloading of the Santiago–Bayombong and Bayombong–Ambuklao 230 kV Lines.	Dec 2035	Transmission Components: • Santiago–Nagsaag 500 kV Line: For ERC Application • Santiago–Kabugao 500 kV Line: Under Project Development
3. Western Luzon 500 kV Backbone Subdivided in two stages: (a) Stage 1 is the construction of Castillejos–Hermosa 500 kV Transmission Line (initially energized at 230 kV), which aims to provide a transmission facility to connect the 2x300 MW RP Energy CFPP to the Luzon Grid through Hermosa Substation; and (b) Stage 2 is 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. The Western Luzon 500 kV Backbone will traverse the provinces of Pangasinan and Zambales.	Aug 2024	Transmission Components: • Stage 1, Castillejos–Hermosa 500 kV Transmission Line, Erection: 50.86% Complete • Stage 2: For Bidding
4. Metro Manila 500 kV Backbone Loop The development of Metro Manila 500 kV Backbone Loop involves the implementation of the Silang 500 kV Substation, which will bus-in to the existing Dasmariñas–Tayabas 500 kV Transmission Line; the implementation of Taguig 500 kV Substation, which will cut-in to the existing San Jose–Tayabas 500 kV Transmission Line; the construction of the Silang–Taguig 500 kV Transmission Line; and the development of the Baras 500 kV Substation, which will bus-in to the existing San Jose–Taguig–Tayabas 500 kV Transmission Line. This forms the Silang–Taguig–Baras–Tayabas 500 kV Backbone Loop for Metro Manila. Another 500 kV Backbone Loop within Metro Manila will be developed through the Bataan–Cavite 500 kV Transmission Line Project.	Dec 2038	Transmission Components: • Taguig "cut-in" to San Jose-Tayabas 500kV Transmission Line, Turnkey: Transmission Line Portion (Land Portion) For Issuance of Notice to Proceed. Substation Components: • Taguig Substation, Turnkey: (Substation Portion) For Issuance of Notice to Proceed • Taguig EHV Substation project, Site Development: 47.96% complete
5. Batangas–Mindoro Interconnection The proposed interconnection of Mindoro Island with the Luzon Grid was envisioned to provide 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 nearest connection point in the Luzon Grid for the planned island interconnection project is the proposed Pinamukan 500 kV Substation, while Calapan would serve as the interconnection point in Mindoro Island.	Sep 2023	• Awaiting for ERC Decision

Project Name	ETC	Project Status (as of Dec 2018)
6. Luzon–Visayas HVDC Bipolar Operation The Luzon–Visayas High Voltage Direct Current (HVDC) Bipolar Operation aims to accommodate additional generation, import and export to the Visayas Grid. This includes the development of the Naga 500/230 kV Substation, as well as upgrading of the Naga and Ormoc Converter/Inverter Stations.	Jan 2025	• Under Project Development
7. Palawan–Mindoro Interconnection Subdivided in 2 stages: (a) Stage 1 will include the Desktop, System and Feasibility Studies, and Hydrographic Survey of the submarine cable route of the Palawan–Mindoro Interconnection. It will also include the preparation of the Mindoro Backbone through the development of Calapan–San Jose 230 kV Transmission Line Backbone and San Jose 230 kV Substation in Occidental Mindoro; and (b) Stage 2 will involve the implementation of the PMIP. It will utilize HVDC transmission system from San Jose Converter Station in Occidental Mindoro to Roxas Converter Station in Palawan. The power supply from the Luzon Grid will then be delivered to the proposed drawdown substations in Roxas, El Nido, and Irawan through the 230 kV High Voltage Alternating Current (HVAC) system. This interconnection project aims to provide the Mainland Palawan with a more reliable supply of power and to address the power quality issues, which result to frequent power interruptions.	Dec 2024 (stage 1)	• Awaiting for ERC Decision
8. Cebu–Negros–Panay 230 kV Backbone The Cebu–Negros–Panay 230 kV Backbone involves the construction of a 230 kV transmission backbone between the Cebu, Negros and Panay Islands. It aims to augment the transfer capacity of the existing corridor which will support the transmission of excess power generation in Negros and Panay Islands toward the rest of the Philippine Grid. The project is subdivided into three (3) stages: (a) Stage 1 involves the development of transmission corridor composed of submarine cable system and overhead transmission lines from Barotac Viejo Substation in Panay to Bacolod Substation in Negros; (b) Stage 2 involves the construction of 230 kV facilities in the existing Cebu 138 kV Substation and harmonize its capacity with the 230 kV transmission backbone; and (c) Stage 3 involves the construction of 230 kV facilities from Barotac Viejo Substation to Cebu Substation.	Dec 2021	Transmission Components: Stage 1 • Overhead Transmission Line, Supply: 100% complete • Bacolod–Magalona Transmission Line, Erection: 79.89% complete, Substation, Supply: 100% complete, Erection: 99% complete (remaining works associated with the completion of Transmission Line)
9. Metro Cebu 230 kV Backbone Loop The Metro Cebu 230 kV Backbone Loop aims to pool the excess power resources from Negros, Panay and Mindanao and transmit it to the main load center in Metro Cebu. It involves the construction of several 230 kV transmission corridors and 230 kV drawdown substations with adequate capacities to facilitate the power absorption by the load-end customers. This long-term plan is the basis of the transmission projects in Metro Cebu spread within the 2040 planning horizon namely: 1. Cebu–Lapu-lapu Transmission Project 2. Cebu–Negros–Panay 230 kV Backbone Project Stages 2 and 3	Dec 2040	• Under Project Development

Project Name	ETC	Project Status (as of Dec 2018)
3. Mindanao–Visayas Interconnection Project (MVIP) 4. Lapu-lapu 230 kV Substation Project 5. Laray–Alpaco 230 kV Energization Project 6. Laray–Cordova 230 kV Interconnection Project 7. Lapu-lapu–Cordova 230 kV Interconnection Project		
10. Cebu–Bohol–Leyte 230 kV Backbone The Cebu–Bohol–Leyte 230 kV Backbone involves the construction of a 230 kV transmission backbone between the Cebu, Bohol and Leyte Islands. It aims to increase the reliability the current transmission system by constructing several 230 kV facilities and to distribute the excess power generation from Negros, Panay and Mindanao toward power customers in Bohol, Leyte and Samar. This long-term plan is the basis of the transmission projects in Cebu, Bohol and Leyte spread within the 2040 planning horizon namely: 1. Cebu–Bohol 230 kV Interconnection Project 2. Babatngon–Palo 230 kV Transmission Line Project 3. Kananga 230 kV Switching Station Project 4. Cebu–Leyte 230 kV Interconnection Line 3 and 4 Project 5. Palo–Javier 230 kV Transmission Line Project 6. Bohol-Leyte 230 kV Interconnection Project	Dec 2035	For Tendering
11. Mindanao–Visayas Interconnection As part of the government's vision to interconnect the major grids into a single national grid, this interconnection project is intended to help improve the overall power supply security in the country by optimizing the use of available energy resources and additional generation capacities of the major grids through sharing of reserves from one grid to another. For more detailed information, please refer to sub-section 13.2.4.	Dec 2020	Submarine Cable Component: • Santander CTS–Dapitan CTS HVDC, Turnkey: Submarine Cable Checking of manufacturer's drawings. Substation Component: • Dumanjug Converter Station and Substation, Turnkey; Converter station / HVAC Substation / Electrode Station Checking of manufacturer's drawings. Transmission Components: • Package A: Dumanjug–Magdugo HVAC Transmission Line, Turnkey: HVAC Transmission Line (Visayas) Checking of manufacturer's drawings, Turnkey: HVAC Transmission Line (Mindanao) For Issuance of Notice to Proceed

Project Name	ETC	Project Status (as of Dec 2018)
		• Package C: Dumanjug–Santander HVDC OHTL, Lala–Dapitan HVDC OHTL, Turnkey: HVDC Transmission Line Checking of manufacturer's drawings • Package D: Alegria–Dumanjug Electrode Line, Turnkey: Electrode Line For Issuance Notice to Proceed
12. Mindanao 230 kV Transmission Backbone This project mainly concentrates on strengthening the existing transmission backbone in Mindanao. As a major transmission highway that delivers both renewable and conventional energies to load centers, it ensures the stability, reliability, and efficiency of power supply in the island. While the existing 138 kV transmission backbone is already inadequate to accommodate the increasing capacity from the new power plants, the energization of the project to 230 kV level increases the thermal capacity of the existing line allowing the transfer of huge power capacity coming from north or south of the island.	Mar 2020	Transmission Components: • Matanao–Toril–Bunawan Transmission Line, Erection: 60.76% complete Substation Components: • Culaman Substation, Supply (Power Transformer and Power Shunt Reactor): 100% complete • Toril Substation, Supply (High Voltage Equipment): 97.12% complete • Maramag Substation Schedule 1 and Schedyle 2, Turn-key: 59.09% and 87.23%, respectively.
13. Western Mindanao 230 kV Transmission Backbone The Western Mindanao 230 kV Transmission Backbone Project completes the envisioned 230 kV transmission looping at the western side of the island. It provides transmission of reliable power supply in the far-flung areas. In this part of Mindanao, currently, only 69 kV transmission facility is in existence. With the completion of this project, the alternate transmission corridor becomes available for the delivery of the full generated capacity of the power plants to the load centers in Mindanao.	Dec 2030	For bidding
14. Eastern Mindanao 230 kV Transmission Backbone The Eastern Mindanao 230 kV Transmission Backbone Project loops the 230 kV transmission line backbone in the eastern region of Mindanao. It increases the power transfer capability of the system as	Jan 2025	For bidding

Project Name	ETC	Project Status (as of Dec 2018)
this new transmission line accommodates the anticipated entry of loads from the mining industry and the expected load demand in the area. The project improves the system reliability providing a robust transmission network that offers N-1 contingency to the existing Butuan-San Francisco-Bislig-Nabunturan 138 kV single circuit line.		

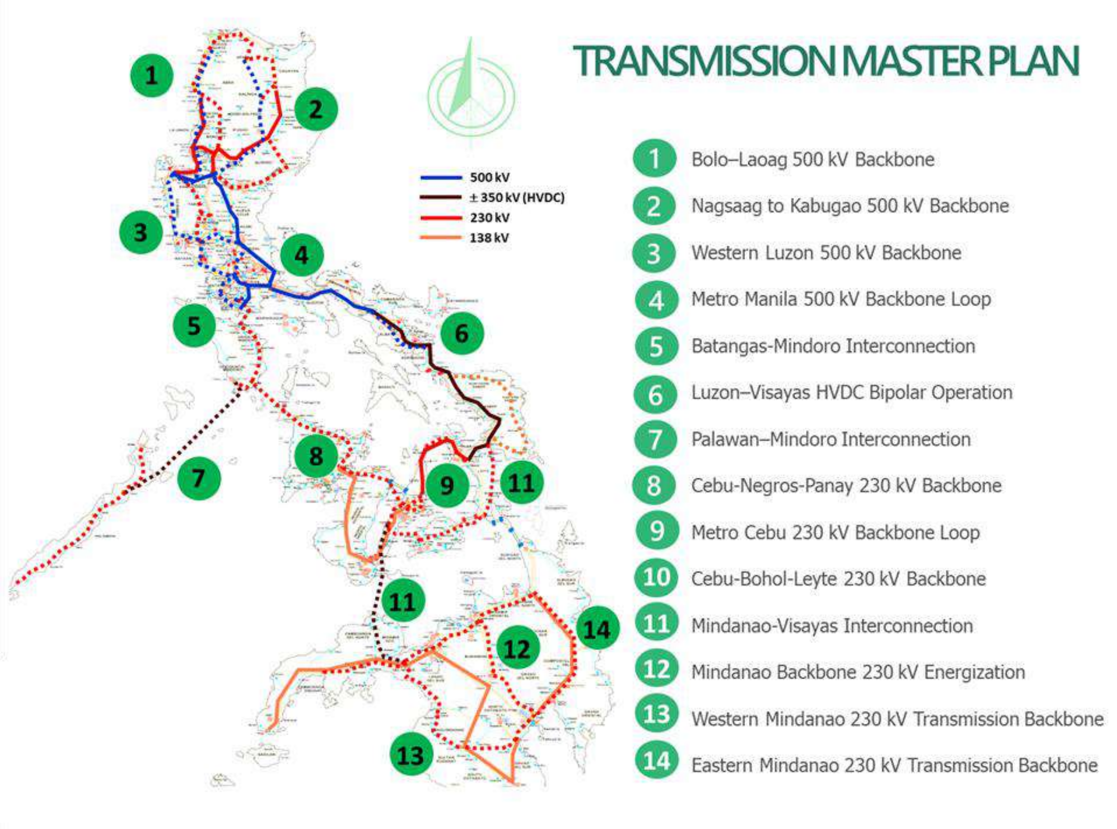


Figure 13.1 - Transmission Backbones and Island Interconnections

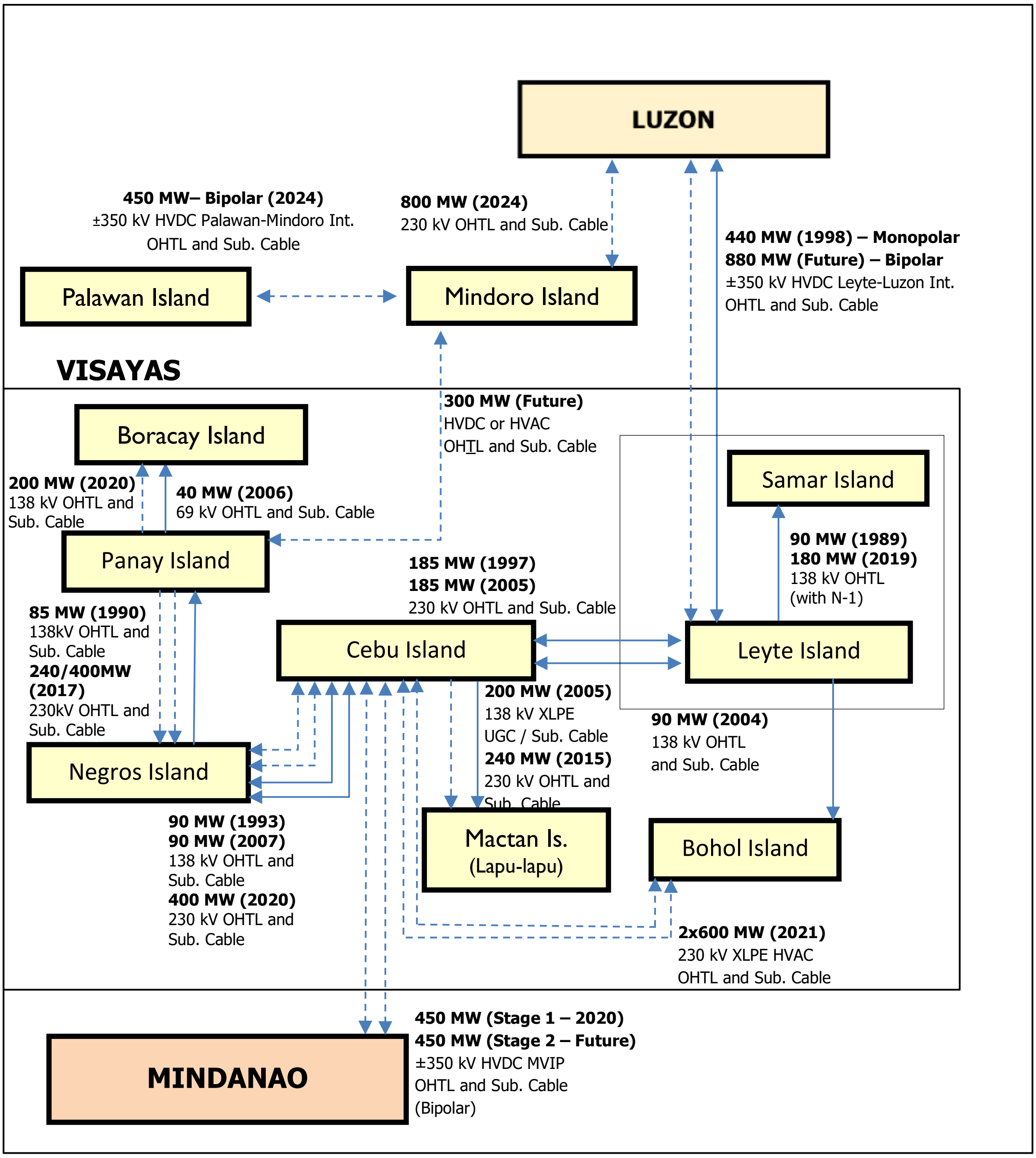


Figure 13.2 - Existing and Future Philippine Network Topology

13.2.2 Batangas–Mindoro Interconnection Project (BMIP)

Figure 13.3: Batangas–Mindoro Interconnection Project

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 2018 was more than 77 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 Transmission Line, ST-DC 2-795 MCM ACSR, 37 km;
- Lobo CTS-Mahal na Pangalan CTS 230 kV Submarine Cable, DC, 2-1,600 mm^2 XLPE, 25 km;
- Mahal na Pangalan CTS–Calapan 230 kV Transmission Line, ST-DC 2-795 MCM ACSR, 6 km;
- Pinamukan 230 kV Substation: 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 Substation: 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.

13.2.3 Palawan–Mindoro Interconnection Project (PMIP)

With the envisioned interconnection of Mindoro Island to the Luzon Grid, the province of Palawan will be the next big island to be interconnected in terms of land area and energy demand. Presently, the power system of Palawan Island is composed of a 69 kV transmission corridor which stretches from Roxas in the north and extending down to Brooke's Point in the south with an estimated length of about 305 circuit-km. Based from 2018 record of the National Power Corporation (NAPOCOR), the main power grid of Palawan registered a peak load of 54 MW and being served by combination of bunker and diesel power plants with a dependable capacity of 73.7 MW.

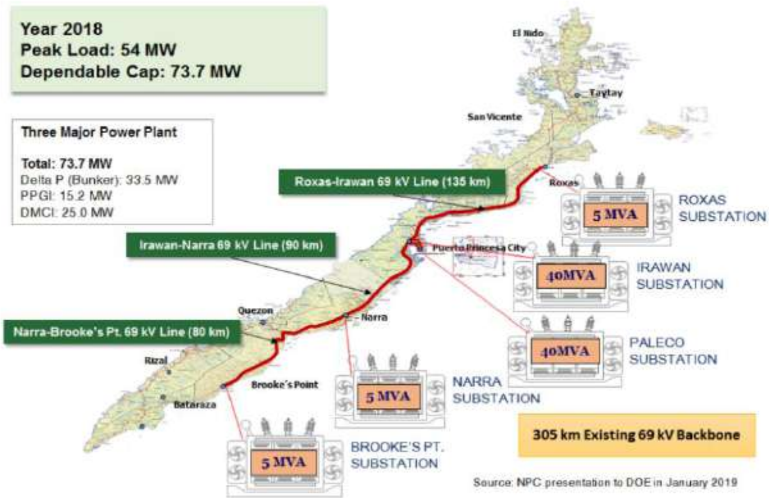


Figure 13.4: Palawan-Mindoro Interconnection Project

The Palawan-Mindoro Interconnection Project (PMIP) aims to provide the Mainland Palawan a more reliable supply of power and to address the power quality issues which result to frequent blackouts experienced by customers. The project is also in support to the government's direction of interconnecting off-grid areas into the main grid.

By interconnecting the existing Palawan grid into the Luzon grid via Mindoro island, the current energy mix of the province, which is mainly oil-based, is seen to deviate from conventional sources in the forthcoming years. This is due to the projected entry of renewable energy power plants in which Palawan has high potential. A reliable transmission backbone and an opportunity to export power to the main grid will encourage the development of more renewable power plants in the province.

To interconnect Palawan to the Luzon Grid, NGCP will be implementing a stage-by-stage project development. Stage 1 will include the Desktop, System and Feasibility Studies and Hydrographic Survey of the submarine cable route of the Palawan–Mindoro Interconnection. Furthermore, Stage 1 will include the preparation of the Mindoro Backbone through the development of Calapan–San Jose 230 kV Transmission Line Backbone and San Jose 230 kV Substation in Occidental Mindoro. On the other hand, Stage 2 of the project will involve the physical implementation of the PMIP. Due to the significant distance from Palawan to Mindoro, it will utilize High Voltage Direct Current (HVDC) transmission system from San Jose Converter Station in Occidental Mindoro to Roxas Converter Station in Palawan. The power supply from the Luzon Grid will then be delivered to the proposed drawdown substations in Roxas, El Nido, and Irawan through the 230 kV High Voltage Alternating Current (HVAC) system.

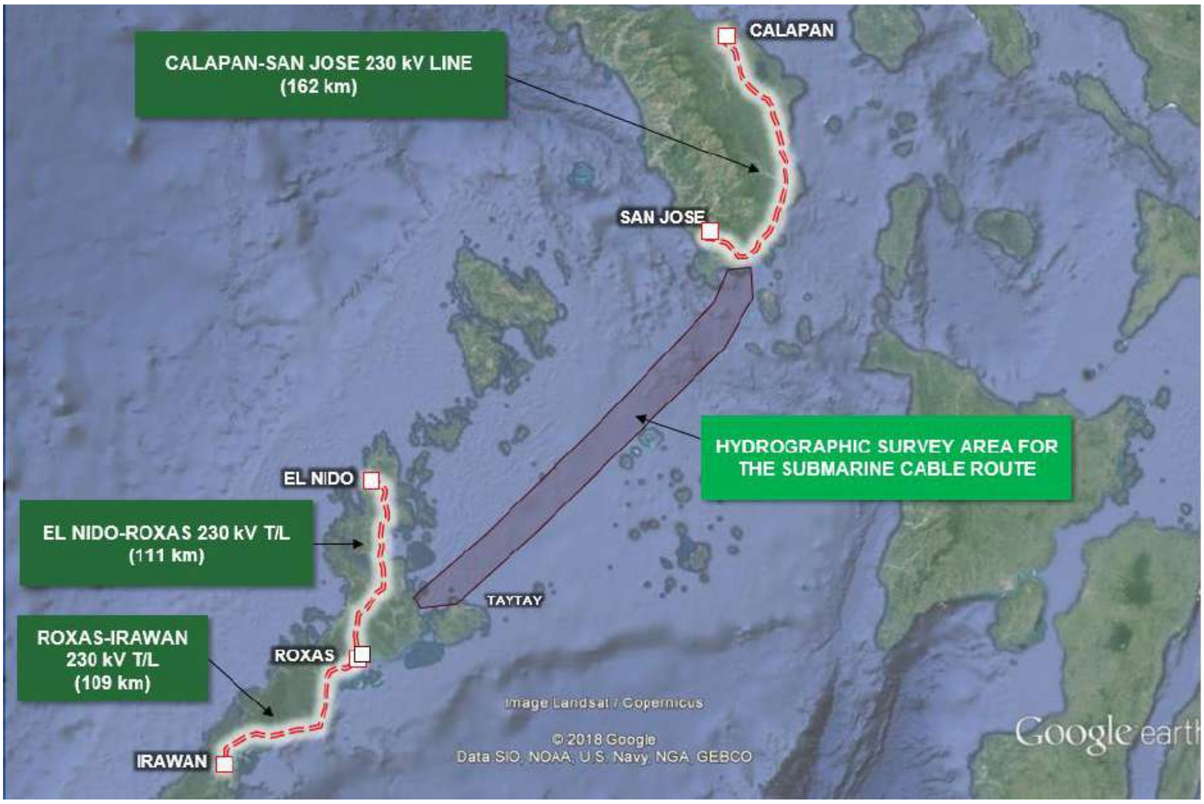


Figure 13.5: Hydrographic Survey Area for the Submarine Cable Route (PMIP)

Major Project Components:

- Desktop, System and Feasibility Studies and Hydrographic Survey of the Palawan–Mindoro Interconnection;
- Calapan–San Jose 230 kV Transmission Line, ST-DC 2-795 MCM ACSR, 154 km;
- Calapan 230 kV Substation: 4-230 kV PCBs and associated equipment;
- San Jose 230 kV Substation: 2x100 MVA 230/69 kV Power Transformer, 6-230 kV PCBs and associated equipment, 6-69 kV PCBs and associated equipment, 2x25 MVAR 230 kV Shunt Reactor and associated equipment;

This Palawan-Mindoro Interconnection Project will also prepare the country for interconnection with other ASEAN member states as envisaged in the ASEAN Power Grid under the Heads of ASEAN Power Utilities/Authorities or the regional initiatives for power grid interconnection being done by the Brunei Darussalam-Indonesia-Malaysia-Philippines East ASEAN Growth Area (See Appendix 8).

13.2.4 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 Substation: 52 km, 230 kV, ST-DC, 4-795 MCM ACSR;
- Cebu GIS Substation–Umapad Substation Line Extension: 0.1 km, 230 kV, ST-DC, 2-410 mm^2 STACIR; and
- Umapad CTS–Umapad Substation 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: 2x225 MW, 350 kV, 750 A, water cooled, air insulated, suspended, indoor 12-pulse single phase quadruple;
- Converter Transformers: 2x225 MW, 230 kV AC/350 kV DC, single phase and three - winding;
- Power Transformer: 2x150 MVA, 230/138-13.8 kV Power Transformers, 2x100 MVA 230/138-13.8 kV Power Transformers and accessories, 1-100 MVA, 138/69 kV Power Transformer and accessories;
- Power Circuit Breakers: 14-230 kV PCB and associated equipment, 12-138 kV PCB and associated equipment, 5-69 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: 2x225 MW, 350 kV, 750 A, water cooled, air insulated, suspended, indoor 12-pulse single phase quadruple;
- Converter Transformers: 2x225 MW, 230 kV AC/350 kV DC, single phase and three-winding;
- Power Transformer: 3x150 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 Substation (New): 2x300 MVA, 230/69-13.8 kV Power Transformers and accessories, 10-230 kV PCB, 8-69 kV PCBs and associated equipment;
- Magdugo Substation (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.

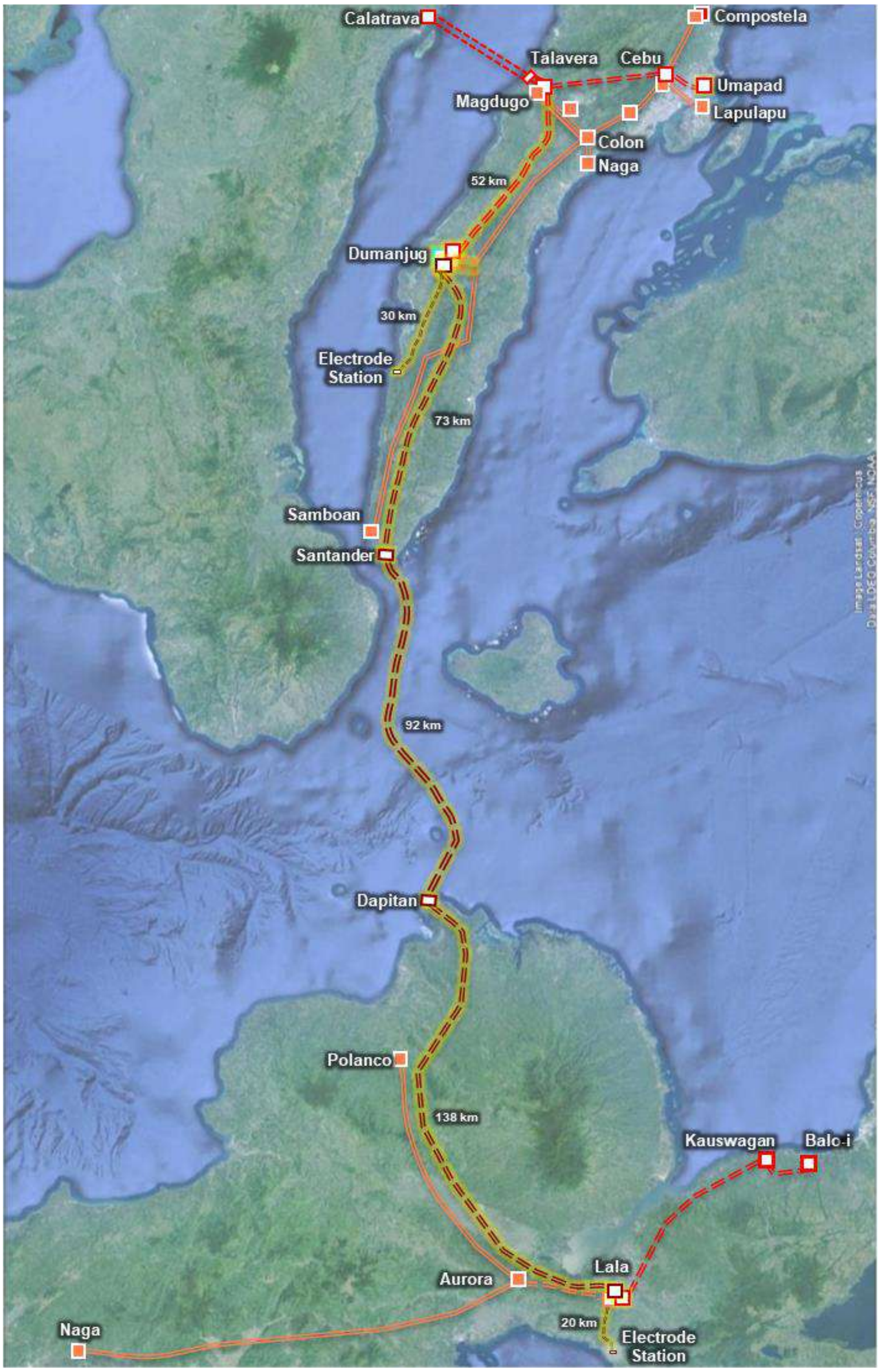


Figure 13.6: Connection Configuration of MVIP

13.2.5 Luzon–Visayas 230 kV AC Interconnection Project

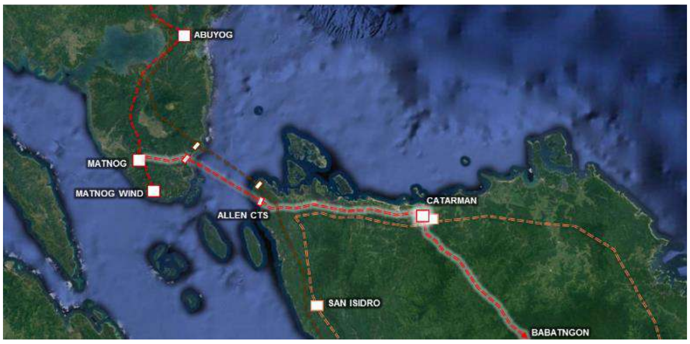


Figure 13.7: Leyte-Luzon Interconnection Project

Currently, Samar Island is highly dependent to Leyte due to the absence of generating power plants in the Island and since the existing Luzon-Visayas HVDC transmission system is terminated in Ormoc in Leyte. Isolation of Samar Island is possible in case of troubles that occur in Leyte thus, resulting to power interruption in the island. The Samar–Sorsogon AC Interconnection Project aims to provide Samar Island an alternate power source. This will address the high dependency of Samar to Leyte. Two circuits of 230 kV submarine cable with a transfer capacity of 400 MW per circuit will be laid connecting Sorsogon to Samar. Shown below are the major components of the project. This project will be pursued when the Luzon 230 kV backbone is already extended to the southern part of Sorsogon. This will provide operational flexibility for the loads in Samar. Operationally, some substations in Samar will normally draw supply from Sorsogon.

Major Project Components:

<u>Substation Portion</u>
- Catarman 230 kV Substation: 2x300 MVA, 230/138-13.8 kV Power Transformers, 2x70 MVAR 230 kV Line Reactor, 6-230 kV PCB and 4-138 kV PCB and associated equipment
- Matnog 230 kV Substation (Expansion): 2x70 MVAR 230 kV Line Reactor, 4-230 kV PCB and associated equipment;

<u>Transmission Line Portion</u>
- Allen CTS–Catarman 230 kV Transmission Line, ST-DC, 2-795 MCM ACSR, 27 km;
- Catarman–Babatngon 230 kV Transmission Line, ST-DC, 2-795 MCM ACSR, 150 km;
- Matnog–Sta. Magdalena CTS 230 kV Transmission Line, ST-DC, 2-795 MCM ACSR, 18 km;

<u>Submarince Cable Portion</u>
- Sta. Magdalena CTS–Allen CTS 230 kV XLPE Submarine Cable, Double circuit with 400 MW transfer capacity per ckt, 23 km;
- Allen CTS: Cable Sealing End;
- Sta. Magdalena CTS: Cable Sealing End.

13.2.6 Small Island Interconnection Projects

A significant number of islands and far flung areas in the country remain isolated from the main grids. These are classified as off-grid areas and the power systems in these areas are being operated and managed by NPC-SPUG. In the TDP 2019-2040 Volume 1, some of these small islands were initially considered for further assessment. Shown in Table 13.2 below are the potential small island interconnections indicating the length of the required facilities and the peak load in the island.

Table 13.2 – Potential Small Island Interconnections

Island	Interconnection Point	Length (km)			Population[a]	Land Area[b] (km^2)	2015 Peak Demand (MW)	2040 Peak Demand (MW)
		Submarine	Overhead	Total				
LUZON								
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
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

As part of the country's power infrastructure development, the DOE published in February 2019 the Department Circular No. DC2019-01-001 entitled, "Prescribing the Omnibus Guidelines on Enhancement of Off-Grid Power Development and Operation". Under Rule 9 of the said DOE Circular requires NGCP as the TNP to:

a) submit an annual program for the interconnection of off-grid areas into the grids; and

b) include the same to the annual updating of the TDP.

Appendix 1 – Generation and Load Distribution Per Area

Generation and Load Distribution in the Luzon Grid

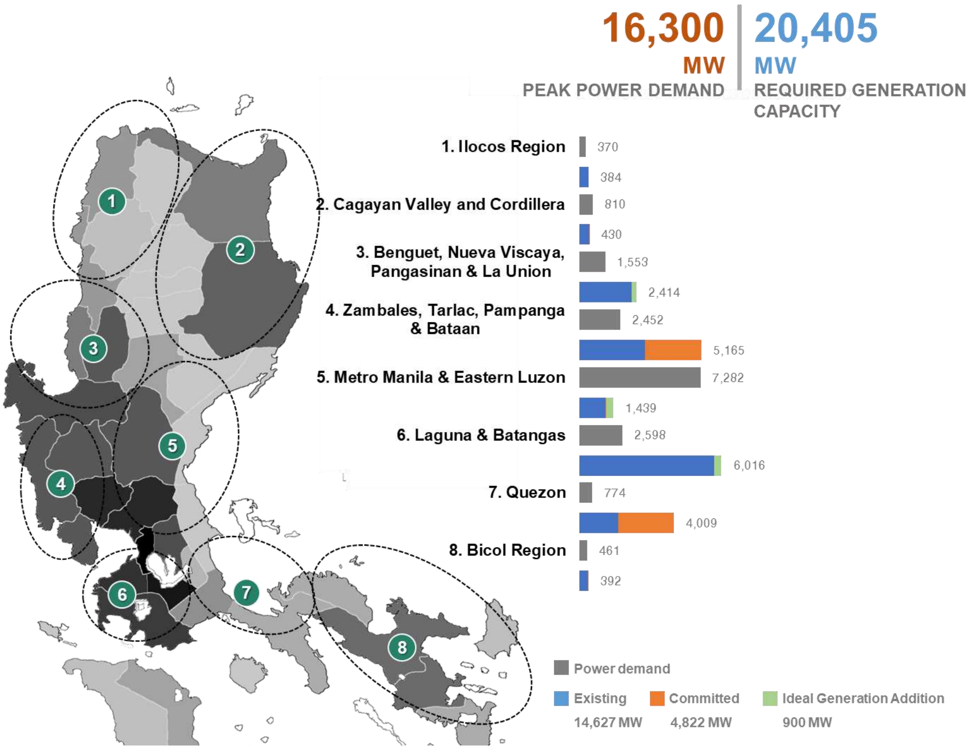


Figure A1.1 – Projected Luzon Grid Generation and Load Distribution in 2025

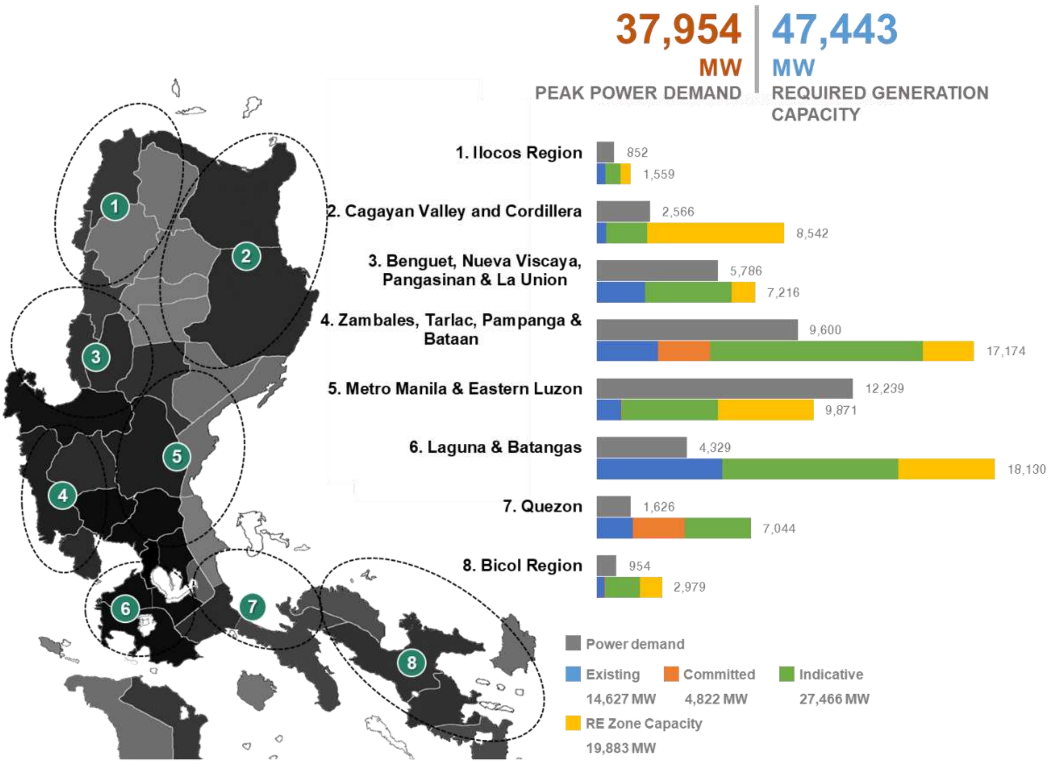


Figure A1.2 – Projected Luzon Grid Generation and Load Distribution in 2040

Generation and Load Distribution in the Visayas Grid

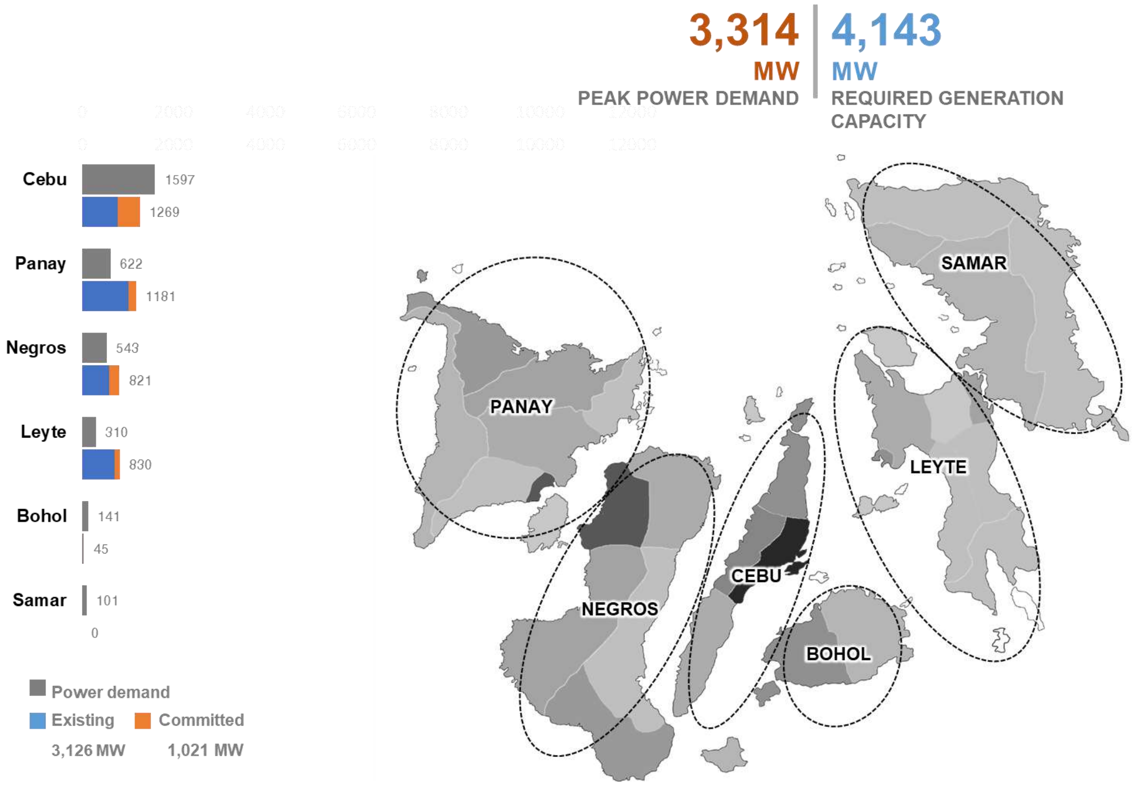


Figure A2.1 – Projected Visayas Grid Generation and Load Distribution in 2025

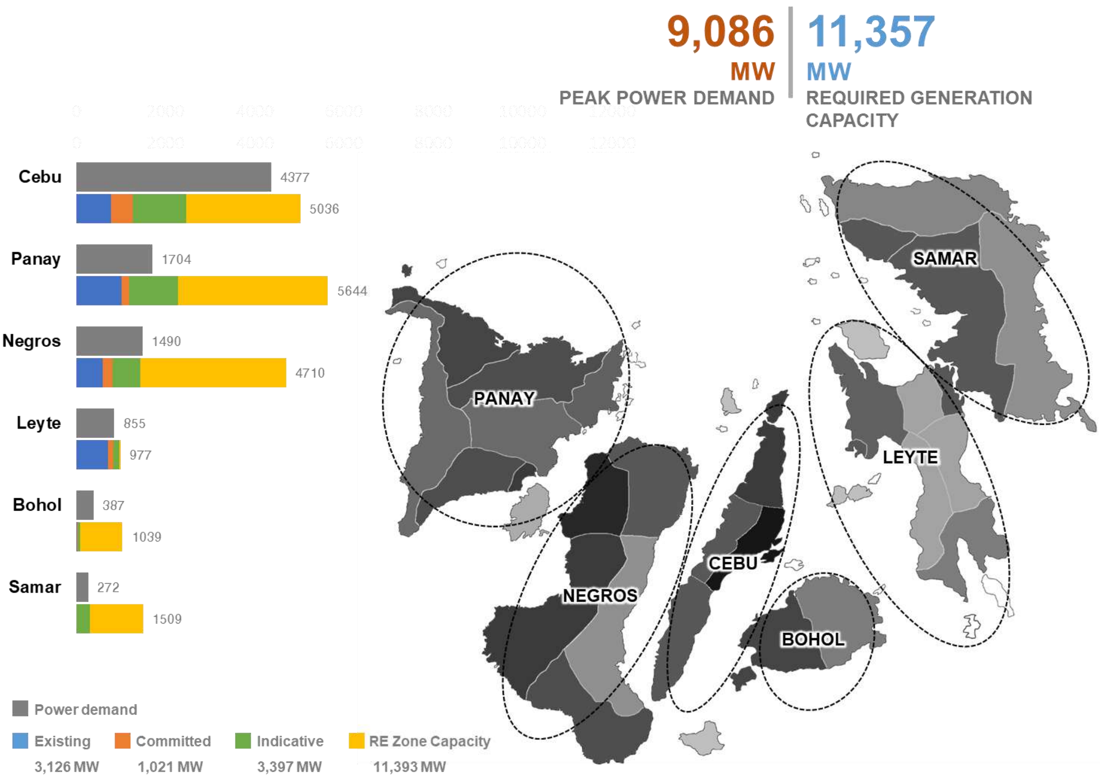


Figure A2.2 – Projected Visayas Grid Generation and Load Distribution in 2040

Generation and Load Distribution in the Mindanao Grid

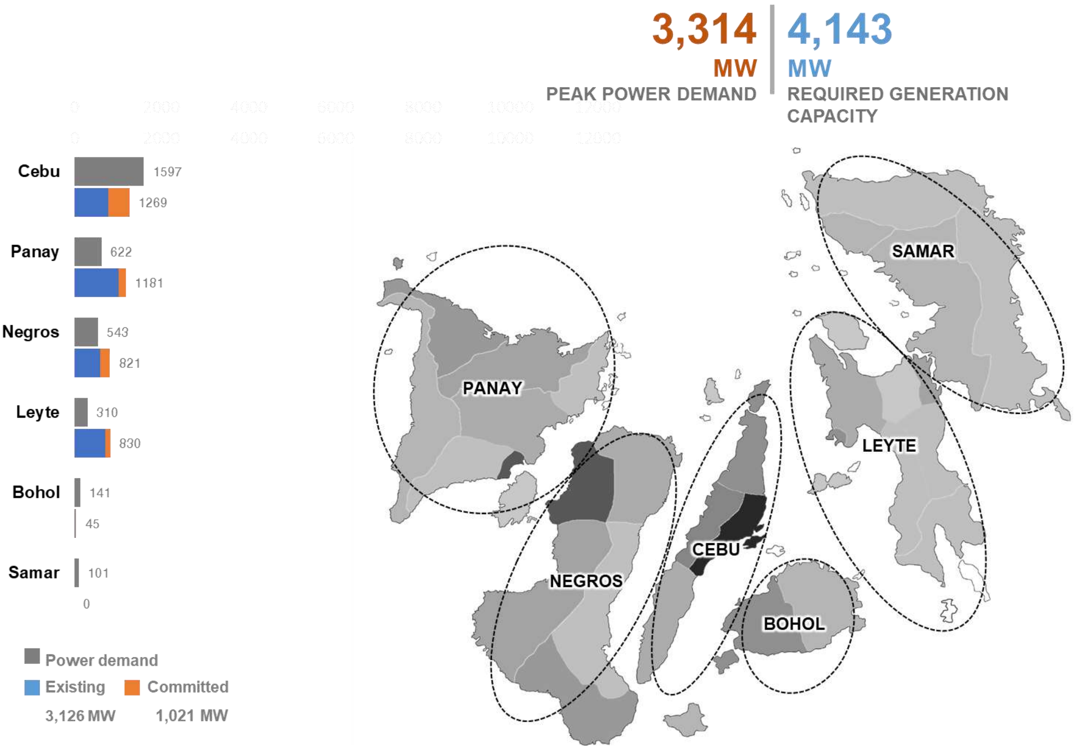


Figure A3.1 – Projected Mindanao Grid Generation and Load Distribution in 2025

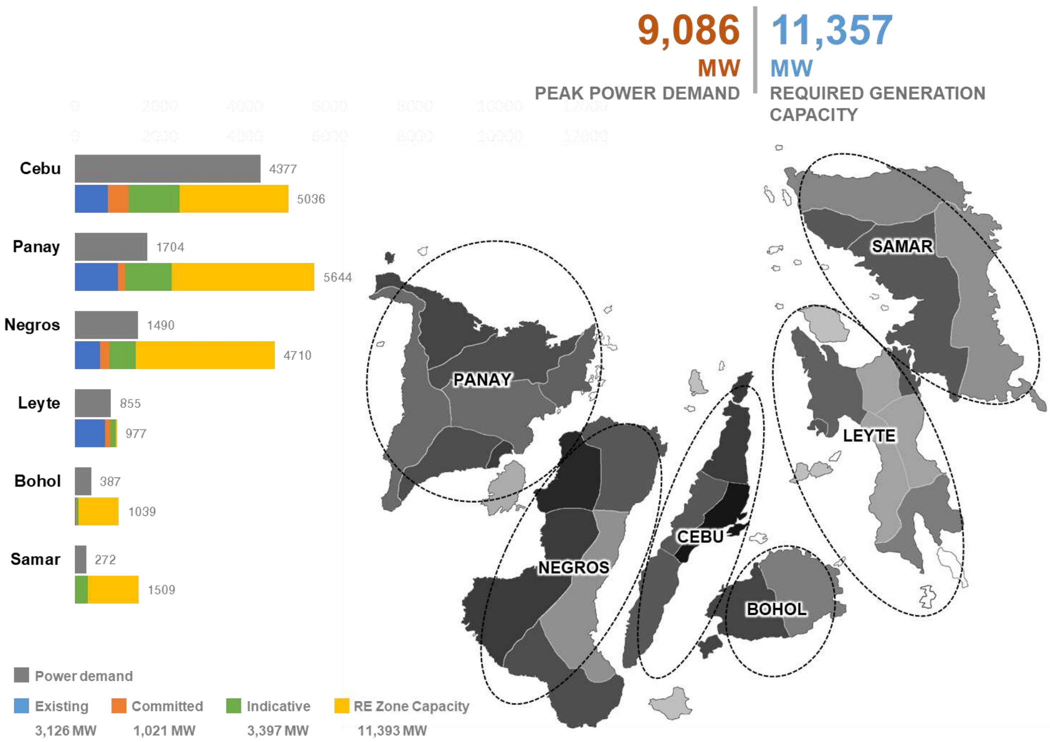


Figure A3.2 – Projected Mindanao Grid Generation and Load Distribution in 2040

Table A1.1 – List of Companies Issued with Clearance for System Impact Study

Proponent	Projects	Installed Capacity (MW)	Location
Aragorn Power & Energy Corp.	Kalinga Geothermal Power Project	120	Pasil, Kalinga
Steel Asia Lemery Works, Inc.	Manufacturing Plant	300	Lemery Batangas
FDC Utilities Inc.	CFB Coal - Fired Thermal Power Plant	3 x 135	Misamis Oriental
Violago Gold Development Corp.	Calanan Hydropower Project	60	Tabuk, Kalinga
Violago Gold Development Corp.	Dalimuno Hydropower Project	58	Tabuk, Kalinga
SN Aboitiz Power Magat, Inc.	Battery Energy Storage System	20	Isabela
SMCGP Phils. Energy Storage Co. Ltd.	Bohol Battery Energy Storage System	20	Bohol
SMCGP Phils. Energy Storage Co. Ltd.	Cebu Battery Energy Storage System	20	Compostela, Cebu
SMCGP Phils. Energy Storage Co. Ltd.	Concepcion Battery Energy Storage System	20	Concepcion, Tarlac
SMCGP Phils. Energy Storage Co. Ltd.	Lumban Battery Energy Storage System	20	Lumban, Laguna
SMCGP Phils. Energy Storage Co. Ltd.	Pagadian Battery Energy Storage System	20	Pagadian, Zamboanga del Sur
SMCGP Phils. Energy Storage Co. Ltd.	Samboan Battery Energy Storage System	20	Samboan, Cebu
SMCGP Phils. Energy Storage Co. Ltd.	Tabango Battery Energy Storage System	20	Tabango, Leyte
SMCGP Phils. Energy Storage Co. Ltd.	Masinloc Battery Energy Storage System	10	Masinloc, Zambales
SMCGP Phils. Energy Storage Co. Ltd.	Mactan Battery Energy Storage	20	Mactan, Cebu
SMCGP Phils. Energy Storage Co. Ltd.	Zambales Battery Energy Storage System	30	Zambales
Solar Valley Energy Solutions, Inc.	San Pablo Solar Power Project	130	Isabela
FDC Renewables Corporation	Pampang Hydroelectric Power Plant	26	Sta. Fe Nueva Vizcaya & San Nicolas Pangasinan
Global Business Power Corp.	Battery Energy Storage System	6	Toledo City, Cebu
GT Energy Corp.	Bunker Fired Power Plant	18	Calbayog, Samar
Bases Conversion and Development Authority	Subs Transmission Lines	69 kV	Concepcion, Tarlac
Monte Solar Energy, Inc.	Bais Battery Energy Storage	5	Bais, Negros Oriental

Proponent	Projects	Installed Capacity (MW)	Location
Alternergy Abra de Ilog Wind Corporation	Tanay Wind Power Project	100	Antipolo City and Tanay, Rizal
Pangasinan UPC Asia Corporation	Laguna de Bay 2 Solar Power Project	300	Laguna de Bay and Pililla, Rizal
Rizal I Wind Energy Corporation	Rizal Wind Power Project	603	Antipolo and Tanay, Rizal
CAMSUR II Wind Energy Corporation	Siruma Wind Power Project	60	Siruma, Camarines Sur
SPC Power Corporation	Diesel Power Plant	2 x 22	Tagbilaran, Bohol
Maibarara Geothermal Inc.	Maibarara Geothermal Power Project	60	Maibarara, Laguna/Batangas
SPC Power Corporation (Amendment)	Bohol Diesel Power Plant	44.2	Tagbilaran, Bohol
Colasi Mini Hydroelectric Powerplant Corp.	Colasi Mini-Hydroelectric Power Plant Project	4	Mercedes, Camarines Norte
C Squared Prime Commodities Corp.	ARIIS 2 Hydroelectric Power Project	0.48	San Manuel, Pangasinan
C Squared Prime Commodities Corp.	ARIIS 3 Hydroelectric Power Project	0.48	San Manuel, Pangasinan
Kadipo Bauko Hydropower Corporation	Boga Hydroelectric Power Projects	1	Bauko, Mountain Province
Kadipo Bauko Hydropower Corporation	Upper Chico Hydroelectric Power Projects	2.1	Bauko, Mountain Province
Kadipo Bauko Hydropower Corporation	Lower Chico Hydroelectric Power Projects	3.4	Bauko and Sadanga, Mountain Province
Hill Trench Power Inc.	Pitogo Battery Energy Storage Solution	3 x 20	Brgy. Sinunuc, Pitogo, Zamboanga City, Zamboanga del Sur
Hill Trench Power Inc.	Sangali Battery Energy Storage Solution	2 x 20	Sangali, Zamboanga City, Zamboanga del Sur
Hill Trench Power Inc.	Aurora (Pagadian) Battery Energy Storage Solution	2 x 20	Aurora, Zamboanga del Norte
Biotech Farms, Inc.	Biogas Cogeneration Plant Project	12.39	Brgy. San Vicente, Banga, South Cotabato
Limay Power Generation Corporation (formerly SMC Global Power)	Angat Battery Energy Storage	20	Angat, Bulacan
Limay Power Generation Corporation (formerly SMC Global Power)	Phividec Battery Energy Storage	20	Phividec, Cagayan de Oro
Limay Power Generation Corporation (formerly SMC Global Power)	Caticlan Battery Energy Storage	20	Caticlan

Proponent	Projects	Installed Capacity (MW)	Location
Limay Power Generation Corporation (formerly SMC Global Power)	Iloilo Battery Energy Storage	20	Iloilo
Limay Power Generation Corporation (formerly SMC Global Power)	Isabela Battery Energy Storage	20	isabe
Limay Power Generation Corporation (formerly SMC Global Power)	Laoag Battery Energy Storage	20	Laoag, Ilocos Norte
Limay Power Generation Corporation (formerly SMC Global Power)	Legazpi Battery Energy Storage	20	Legazpi, Albay
Limay Power Generation Corporation (formerly SMC Global Power)	Ormoc Battery Energy Storage	20	Ormoc, Leyte
Limay Power Generation Corporation (formerly SMC Global Power)	Limay Battery Energy Storage	20	Limay, Bataan
Limay Power Generation Corporation (formerly SMC Global Power)	Malita Battery Energy Storage	20	Malita, Davao Occidental
Limay Power Generation Corporation (formerly SMC Global Power)	Mactan Battery Energy Storage	20	Mactan, Cebu
Limay Power Generation Corporation (formerly SMC Global Power)	Mexico Battery Energy Storage	20	Mexico, Pampanga
Limay Power Generation Corporation (formerly SMC Global Power)	Mindoro Battery Energy Storage	20	Mindoro
Limay Power Generation Corporation (formerly SMC Global Power)	San Roque/ San Manuel Battery Energy Storage	20	San Roque / San Manuel
Limay Power Generation Corporation (formerly SMC Global Power)	Surigao / Butuan Battery Energy Storage	20	Surigao / Butuan
Limay Power Generation Corporation (formerly SMC Global Power)	Zamboanga Battery Energy Storage	20	Zamboanga
Limay Power Generation Corporation (formerly SMC Global Power)	Navotas Battery Energy Storage	20	Navotas City, Metro Manila
Limay Power Generation Corporation (formerly SMC Global Power)	San Carlos Battery Energy Storage	20	San Carlos City, Negros Occidental
Limay Power Generation Corporation (formerly SMC Global Power)	Gamu Battery Energy Storage	20	Gamu, Isabela
Limay Power Generation Corporation (formerly SMC Global Power)	San Rafael Battery Energy Storage	20	San Rafael, Bulacan
Limay Power Generation Corporation (formerly SMC Global Power)	Magapit Battery Energy Storage	20	Magapit, Cagayan

Proponent	Projects	Installed Capacity (MW)	Location
Limay Power Generation Corporation (formerly SMC Global Power)	Maco Battery Energy Storage	20	Maco, Compostela Valley
Limay Power Generation Corporation (formerly SMC Global Power)	Naga Battery Energy Storage	20	Naga, Cebu
Limay Power Generation Corporation (formerly SMC Global Power)	Masinloc Battery Energy Storage	20	Masinloc, Zambales
Limay Power Generation Corporation (formerly SMC Global Power)	Laoag Battery Energy Storage	20 (additional)	Laoag, Ilocos Norte
Limay Power Generation Corporation (formerly SMC Global Power)	Mexico Battery Energy Storage	20 (additional)	Mexico, Pampanga
Limay Power Generation Corporation (formerly SMC Global Power)	Toledo Battery Energy Storage	20	Toledo City, Cebu
Limay Power Generation Corporation (formerly SMC Global Power)	Villanueva Battery Energy Storage	20	Villanueva, Misamis Oriental
Limay Power Generation Corporation (formerly SMC Global Power)	Daraga Battery Energy Storage (formerly Legazpi)	20	Daraga, Albay
Global Business Power Corporation	Nagsaag Battery Energy Storage	20	Nagsaag, Pangasinan
Global Business Power Corporation	Lumban Battery Energy Storage	20	Lumban, Laguna
Global Business Power Corporation	Laoag Battery Energy Storage	20	Laoag, Ilocos Norte
Global Business Power Corporation	Concepcion Battery Energy Storage	20	Concepcion, Tarlac
Global Business Power Corporation	Labrador Battery Energy Storage	20	Labrador, Pangasinan
Global Business Power Corporation	Sta. Barbara Battery Energy Storage	7.5	Sta. Barbara, Iloilo
Global Business Power Corporation	Amlan Battery Energy Storage	7.5	Amlan, Negros Oriental
Global Business Power Corporation	Ormoc Battery Energy Storage	7.5	Ormoc, Leyte
Global Business Power Corporation	Samboan Battery Energy Storage	7.5	Samboan, Cebu
Horus Solar Energy Corp.	Pililla Energy Storage Project	50	Pililia, Rizal
Horus Solar Energy Corp.	Ormoc Battery Energy Storage	50	Ormoc City, Samar
Horus Solar Energy Corp.	Currimao Solar Power Project	50	Currimao, Ilocos Norte
Horus Solar Energy Corp.	Cadiz Energy Storage	50	Cadiz City, Negros Occidental
Horus Solar Energy Corp.	Tinampa-an Energy Storage Project	50	Tinampa-an

Proponent	Projects	Installed Capacity (MW)	Location
Horus Solar Energy Corp.	Kibawe Energy Storage Project	50	Kibawe, Bukidnon
Energy Development Corporation	Mahanagdong Geothermal Binary Power Plant	36	Brgy. Milagro, Kananga, Leyte
Solar Philippines Commercial Rooftop Projects, Inc.	Cabatang Tiaong Solar Power Project	600	Tiaong, Quezon
Juxtapose Ergo Consultus Inc.	Daanbantayan Battery Energy Storage System	10	Barangay Talisay, Daanbantayan, Cebu
6 Barracuda Energy Corp.	San Isidro Wind Power Project	81	San Isidro, Northern Samar and Calbayog City, Samar
Panasia Energy, Inc.	Bataan Combine Cycle Power Plant	2x310 (620)	Brgy. Luz, Limay, Bataan
Limay Power Generation Corporation (formerly SMC Global Power)	Bohol Battery Energy Storage System	20	Bohol
Limay Power Generation Corporation (formerly SMC Global Power)	Compostela Battery Energy Storage System	20	Compostela, Cebu
Limay Power Generation Corporation (formerly SMC Global Power)	Concepcion Battery Energy Storage System	20	Concepcion, Tarlac
Limay Power Generation Corporation (formerly SMC Global Power)	Lumban Battery Energy Storage System	20 (additional to 20MW)	Lumban, Laguna
Limay Power Generation Corporation (formerly SMC Global Power)	Pagadian Battery Energy Storage System	20	Pagadian, Zamboanga del Sur
Limay Power Generation Corporation (formerly SMC Global Power)	Samboan Battery Energy Storage System	20	Samboan, Cebu
Limay Power Generation Corporation (formerly SMC Global Power)	Tabango Battery Energy Storage System	20	Tabango, Leyte
Limay Power Generation Corporation (formerly SMC Global Power)	Masinloc Battery Energy Storage System	20	Masinloc, Zambales
Limay Power Generation Corporation (formerly SMC Global Power)	Mactan Battery Energy Storage	20	Mactan, Cebu
Limay Power Generation Corporation (formerly SMC Global Power)	Zamboanga Battery Energy Storage	20	Zamboanga
Global Business Power Corporation	Toledo Battery Energy Storage	7.5	Toledo City, Cebu
Global Business Power Corporation	Tabango Battery Energy Storage System	7.5	Tabango, Leyte

Proponent	Projects	Installed Capacity (MW)	Location
Global Business Power Corporation	Compostela Battery Energy Storage System	7.5	Compostela, Cebu
Global Business Power Corporation	Dingle Battery Energy Storage System	7.5	Dingle, Iloilo
Global Business Power Corporation	Ubay Battery Energy Storage System	7.5	Ubay, Bohol

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	

[17] All data presented in Appendix 3 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

Island/Grid	Region	Province	Municipality	Name of Project	Developer	Potential Capacity (MW)
Luzon	CAR	Mt. Province	Besao	Besao 1	BIMAKA Renewable Energy Development Corporation (BREDCO)	5.00
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

Island/Grid	Region	Province	Municipality	Name of Project	Developer	Potential Capacity (MW)
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
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

Island/Grid	Region	Province	Municipality	Name of Project	Developer	Potential Capacity (MW)
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
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

Island/Grid	Region	Province	Municipality	Name of Project	Developer	Potential Capacity (MW)
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
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

Island/Grid	Region	Province	Municipality	Name of Project	Developer	Potential Capacity (MW)
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
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

Island/Grid	Region	Province	Municipality	Name of Project	Developer	Potential Capacity (MW)
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
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

Island/Grid	Region	Province	Municipality	Name of Project	Developer	Potential Capacity (MW)
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
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

Island/Grid	Region	Province	Municipality	Name of Project	Developer	Potential Capacity (MW)
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
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

Island/Grid	Region	Province	Municipality	Name of Project	Developer	Potential Capacity (MW)
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
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

Island/Grid	Region	Province	Name of Project	Developer	Potential Capacity (MW)
MINDANAO	IX	Zamboanga del Sur / Zamboanga del Norte / Zamboanga Sibugay	Lakewood Geothermal Prospect	Energy Development Corporation	40.00
	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 4 – 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 5 – Projects Completed in 2019

Project Name / Components	Purpose	MVA	MVAR	CKT-KM	Date of Completion / Energization
LUZON					
Hermosa–Floridablanca 69 kV Transmission Line		-	-	17	Feb 2019
San Jose 500 kV Substation (4th Bank)		750	-	-	Apr 2019
North Luzon Substation Upgrading Project 1 – Malaya Substation		300	-	-	Oct 2019
Luzon Voltage Improvement Project 3, Stage 1 - Cabanatuan Substation (Capacitor Bank 2) - Cabanatuan Substation (Capacitor Bank 1) - Tuguegarao Substation (Capacitor Bank 1) - San Jose Substation (Capacitors Banks 5 & 6) - Mexico Substation (Capacitor Banks 3 & 7) - Tuguegarao Substation (Power Shunt Reactor) - Nagsaag Substation (Shunt Reactor) -Bantay Substation (Capacitor Bank) - Laoag Susbtation (Shunt Reactor) - Laoag Substation (Capacitor Banks)		-	50 50 25 200 200 25 90 7.5 25 50	-	Mar 2019 Oct 2019 Mar 2019 Mar 2019 Apr 2019 Aug 2019 Aug 2019 Sep 2019 Sep 2019 Sep 2019
Luzon Voltage Improvement Project 4, Stage 1 - Biñan Substation (Capacitor Bank 3 & 4) Dasmariñas Substation (Capacitor Bank 3 & 4)		-	200 200	-	Apr 2019 Apr 2019
Tower Structure Upgrading of Bicol Transmission Facilities (formerly Permanent Restoration Works of Toppled Towers by Typhoon Nina) - Naga–Tiwi C Transmission Line 2 (36 Towers)		-	-	-	Apr 2019
VISAYAS					
Visayas Voltage Improvement Project, Stage 1 - Compostela Substation - Corella Substation		- -	40 15	- -	Dec 2019 Dec 2019
MINDANAO					
Matanao–Toril–Bunawan 230kV Transmission Line		-	-	38	Dec 2019
Mindanao 230 kV Backbone, Stage 1 - Bunawan Substation - Toril Substation - Culaman Substation		600 600 50	- - -	- - -	Oct 2019 Nov 2019 Dec 2019

Project Name / Components	Purpose	MVA	MVAR	CKT-KM	Date of Completion / Energization
Balo-i–Kauswagan–Aurora 230 kV Substation Phase 1		300	-	-	Jun 2019
Mindanao 230 kV Backbone, Stage 2					
- Villanueva Substation		600	-	-	Nov 2019
- Villanueva Subststation (Shunt Reactor)		-	70	-	Sep 2019
Mindanao Substation Reliability Project 1					
- Maco Substation (Capacitor Bank 3)		-	7.5	-	Oct 2019
- Nabunturan (Capacitor Bank 5)		-	7.5	-	Oct 2019
Mindanao Substation Upgrading Project 1					
- Pitogo Substation (Capacitor Banks 3 & 4)		-	15	-	Dec 2019
- Butuan Substation (Capacitor Banks 4 & 5)		-	22.5	-	Oct 2019
- Placer Substation (Capacitor Banks 2 & 3)		-	15	-	Oct 2019
- San Francisco Substation (Capacitor Banks 1, 2, & 3)		-	22.5	-	Oct 2019
- Gen. Santos Substation (Capacitor Bank 4)		-	7.5	-	Oct 2019
- Tacurong Substation (Capacitor Bank 4)		-	7.5	-	Nov 2019
	TOTAL	3,200	1352.5	55	

Appendix 6 – Summary of Transmission Projects

A. On-going Projects

	LUZON	ETC		VISAYAS	ETC		MINDANAO	ETC
1.	Bataan–Cavite Transmission Line FS	Jun 2020	1.	Visayas Substation Reliability Project I	Jun 2020	1.	Mindanao 230 kV Transmission Backbone	Mar 2020
2.	San Jose–Quezon 230 kV Line 3	Mar 2020	2.	Visayas Substation Reliability Project II	Jun 2020	2.	Sultan Kudarat (Nuling) Capacitor Project	Jun 2020
3.	San Jose–Angat 115 kV Line Upgrading	Jun 2020	3.	New Naga (Colon) Substation Project (Remaining Works)	Dec 2020	3.	Butuan–Placer 138 kV Transmission Line	Jun 2020
4.	Tiwi Substation Upgrading	Dec 2020	4.	San Carlos–Guihulngan 69 kV Transmission Line	Jun 2020	4.	Kauswagan–Lala 230 kV Transmission Line Project (Formerly Balo-i–Kauswagan–Aurora 230 kV Transmission Line Project (Phase 2)	Dec 2020
5.	Calamba 230 kV Substation	Jun 2020	5.	Sta. Rita–Quinapondan 69 kV Transmission Line	Dec 2020	5.	Mindanao Substation Upgrading Project (MSUP)	Dec 2021
6.	Tower Structure Upgrading of Bicol Transmission Facilities	Jun 2020	6.	Cebu–Negros–Panay 230 kV Backbone Project - Stage 1	Dec 2020	6.	Agus 2 Switchyard Upgrading Project	Dec 2020
7.	Mariveles–Hermosa 500 kV Transmission Line	Dec 2020	7.	Naga (Visayas) Substation Upgrading Project	Dec 2020	7.	Mindanao–Visayas Interconnection Project	Dec 2020
8.	North Luzon Substation Upgrading Project	Nov 2020	8.	Panitan–Nabas 138 kV Transmission Line 2 Project	Dec 2020	8.	Mindanao Substation Rehabilitation Project (MSRP)	Dec 2021
9.	Luzon PCB Replacement	Dec 2020	9.	Tagbilaran 69 kV Substation Project	Dec 2020	9.	Tacurong–Kalamansig 69 kV Transmission Line	Aug 2022
10.	Luzon Voltage Improvement Project – 3	Jun 2022	10.	Cebu–Lapu-Lapu 230 kV Transmission Line Project	Dec 2021			

LUZON		ETC	VISAYAS		ETC	MINDANAO		ETC
11.	Clark–Mabiga 69 kV Transmission Line	Mar 2021	11.	Cebu–Negros–Panay 230 kV Backbone Project - Stage 3	Dec 2021			
12.	Hermosa–San Jose 500 kV Transmission Line	Mar 2021	12.	Visayas Voltage Improvement Project	Jan 2021 (Stage 1) Jan 2022 (Stage 2)			
13.	Pagbilao 500 kV Substation	Mar 2021						
14.	Navotas 230 kV Substation	Mar 2021						
15.	Tuguegarao– Lal-lo 230 kV Transmission Line	May 2021						
16.	Relocation of Steel Poles along Hermosa–Duhat 230 kV Transmission Line	Jun 2021						
17.	Western 500 kV Backbone (Stage 1)	Jun 2021						
18.	Taguig 500 kV Substation	Jun 2021						
19.	Antipolo 230 kV Substation	Aug 2021						
20.	Ambuklao–Binga 230 kV Transmission Line Upgrading	Nov 2021						
21.	Binga–San Manuel 230 kV Transmission Line Stage 1 & 2	Nov 2021						
22.	Tuy 500/230 kV Substation Project (Stage 1)	Dec 2021						

LUZON		ETC	VISAYAS		ETC	MINDANAO		ETC
23.	South Luzon Substation Upgrading Project	Dec 2021						
24.	Eastern Albay 69 kV Line Stage 2	Sep 2022						
25.	La Trinidad–Calot 69 kV Transmission Line	Oct 2022						
26.	Luzon Voltage Improvement Project – 4	Jun 2022						

B. Proposed Transmission Projects

LUZON		ETC	VISAYAS		ETC	MINDANAO		ETC
1.	Pagbilao–Tayabas 500 kV Transmission Line	July 2023	1.	Cebu–Negros–Panay 230 kV Backbone Project – Stage 2	Dec 2021	1.	Laguindingan 230kV SS Project	Jul 2023
2.	Pinamucan 500 kV Substation	Oct 2023	2.	Panay–Guimaras 138 kV Interconnection Project	Nov 2021	2.	Mindanao Substation Expansion 3 Project	Oct 2023
3.	Northern Luzon 230 kV Loop	Jun 2024	3.	Negros–Panay 230 kV Interconnection Line 2 Project	Feb 2022	3.	Tumaga 138 kV Substation Project	Dec 2023
4.	Nagsaag–Santiago 500 kV Transmission Line	Aug 2024	4.	Barotac Viejo–Unidos 230 kV Transmission Line Project	Dec 2024	4.	Tigbao 138 kV Substation Bus-in	Dec 2023
5.	Luzon–Visayas HVDC Bipolar Operation	Jan 2025	5.	Luzon–Visayas HVDC Bipolar Operation Project	Jan 2025	5.	Naga Mindanao–Salug 138 kV Transmission Line Project (Energized at 69 kV)	Dec 2023
6.	Cabanatuan–Sampaloc–Nagsaag 230 kV Transmission Line	Jul 2025	6.	Silay 138 kV Substation Project	Dec 2025	6.	Koronadal 138 kV Substation Project	Dec 2023
7.	Tagkawayan 500 kV Substation	Dec 2025	7.	Nabas–Caticlan–Boracay Transmission Project	May 2021	7.	Maco–Tagum 69 kV Transmission Line Project	Jun 2024
8.	North Luzon Substation Upgrading 2	Dec 2021 / Dec 2026	8.	Cebu–Bohol 230 kV Interconnection Project	Dec 2021	8.	Agus 6–Kiwalan–Lugait 69 kV Transmission Line Project	Dec 2024

LUZON		ETC	VISAYAS		ETC	MINDANAO		ETC
9.	Pinili 230 kV Substation	Mar 2022	9.	Laray 230 kV Substation Project (Initially Energized at 138 kV)	Apr 2022	9.	Mindanao Substation Expansion 4 Project	Dec 2024
10.	Concepcion–Sta. Ignacia 69 kV Transmission Line	Apr 2022	10.	Amlan–Dumaguete 138 kV Transmission Project	Nov 2022	10.	Villanueva– Kinamlutan 230 kV Transmission Line	Jan 2025
11.	Nagsaag–Tumana 69 kV Transmission Line	Apr 2022	11.	Babatngon–Palo 230 kV Transmission Line Project	Feb 2023	11.	Nasipit Substation Bus-In Project	Apr 2022
12.	San Simon 230 kV Substation	Jul 2022	12.	Granada 230 kV Substation Project	Oct 2024	12.	Kabacan 138 kV Substation Project	May 2022
13.	Marilao 500 kV Substation	Oct 2022	13.	Kalibo 138 kV Substation Project	Dec 2024	13.	Zamboanga Peninsula Voltage Improvement Project	Dec 2023
14.	Luzon Voltage Improvement Project 5	Nov 2022	14.	La Carlota 138 kV Substation Project	Dec 2024	14.	Eastern Mindanao Voltage Improvement Project	Dec 2023
15.	Capas 230 kV Substation	May 2023	15.	Sumangga 138 kV Substation Project	Dec 2024	15.	Mindanao Substation Upgrading 2 Project (MSU2P)	Dec 2023
16.	Abuyog 230 kV Substation	May 2023	16.	Tigbauan 138 kV Substation Project	Dec 2023	16.	San Francisco–Tago 138 kV Transmission Line Project	May 2024
17.	Porac 230 kV Substation	Jun 2023	17.	Bool 138 kV Substation Project	Nov 2023	17.	Maco–Mati 138 kV Transmission Line Project	May 2024
18.	Tanauan 230 kV Substation	Aug 2023	18.	Carmen 230 kV Substation Project	Jun 2025	18.	Oroquieta 69 kV Switching Station Project	Sep 2024
19.	Sampaloc 230 kV Substation	Sep 2023	19.	Jaro 230 kV Substation Project	Jun 2025	19.	Sultan Kudarat–Tacurong 230 kV Transmission Line Project	Jan 2025
20.	Plaridel 230 kV Substation	Nov 2023	20.	Visayas Voltage Improvement Project 2	Dec 2022	20.	Eastern Mindanao 230 kV Transmission Line Project	Jan 2025
21.	Daraga–Bitano 69 kV Line	Dec 2023	21.	Visayas Substation Upgrading Project 1	Nov 2021	21.	Opol Substation Bus-in Project	Dec 2025
22.	Castillejos 230 kV Substation	Feb 2024	22.	Calbayog–San Isidro 138 kV Transmission Line Project	Apr 2022	22.	Lala–Naga–Zamboanga 230 kV Transmission Line Project	Dec 2025
23.	Tuguegarao–Enrile 69 kV Line	Mar 2024	23.	Barotac Viejo–Natividad 69 kV Transmission Line Project	Jul 2022	23.	Nasipit–Butuan 69 kV Transmission Line Project	Jan 2026
24.	Silang 500 kV Substation	May 2024	24.	Visayas Substation Upgrading Project - 2	Jul 2022	24.	Placer–Luna 69 kV Transmission Line Project	Dec 2026

	LUZON	ETC		VISAYAS	ETC		MINDANAO	ETC
25.	Kawit 230 kV Substation	Aug 2024	25.	Tabango–Biliran 69 kV Transmission Line Project	Jun 2025	25.	Opol–Carmen 69 kV Transmission Line Project	Dec 2026
26.	Dasol 230 kV Substation	Dec 2025	26.	Nivel Hills 230 kV Substation Project	Dec 2023	26.	Davao–Toril 69 kV Line 2 Transmission Line Project	Dec 2026
27.	San Manuel–Nagsaag 230 kV Transmission Line	Mar 2021	27.	Permanent Restoration of Colon–Samboan 138 kV Lines 1 and 2 affected by landslide	Oct 2020	27.	Naga Mindanao–Pangi 69 kV Transmission Line Project	Dec 2027
28.	Navotas–Dona Imelda 230 kV Transmission Line	May 2022	28.	Permanent Restoration of Panit-an–Nabas 138 kV Line affected by Typhoon Ursula	Dec 2020	28.	Marawi–Malabang 69 kV Transmission Line Project	Dec 2027
29.	Taguig–Taytay 230 kV Transmission Line	Apr 2023	29.	Cebu–Leyte 230 kV Interconnection Lines 3 and 4 Project	Mar 2025	29.	Midsayap 138 kV Substation Project	Dec 2028
30.	Minuyan 115 kV Switching Station	Sep 2023	30.	Kananga 230 kV Switching Station Project	Mar 2025	30.	Nabunturan–Monkayo 69 kV Transmission Line Project	Dec 2029
31.	Olongapo 230 kV Substation Upgrading	Dec 2023	31.	Lapu-lapu 230 kV Substation Project	Aug 2022	31.	Matanao 230/138 kV Transformer	Dec 2030
32.	Western 500 kV Backbone – Stage 2	Aug 2024	32.	Laray–Cordova 230 kV Interconnection Project	Dec 2030	32.	Placer–Madrid 69 kV Transmission Line Project	Dec 2030
33.	Marilao–Mexico 230 kV Transmission Line	Dec 2024	33.	Laray–Alpaco 230 kV Energization Project	Dec 2030	33.	Mindanao Substation Expansion 5 Project (MSE5P)	Dec 2030
34.	Batangas–Mindoro Interconnection Project	Sep 2023	34.	Sipalay 138 kV Substation Project	Dec 2029	34.	Lala–Malabang–Sultan Kudarat 230 kV Transmission Line (Initially energized at 138 kV)	Dec 2030
35.	Palawan–Mindoro Interconnection Project	Dec 2024	35.	Calbayog–San Isidro–Catarman 138 kV Transmission Line Project	Dec 2028	35.	Siom–Sindangan– Salug 69 kV Transmission Line	Dec 2030
36.	Calaca–Salong 230 kV Transmission Line 2	Dec 2025	36.	Corella–Ubay 138 kV Line 2 Stringing Project	Dec 2026	36.	Davao–Samal 69 kV Interconnection	Dec 2030

LUZON		ETC	VISAYAS		ETC	MINDANAO		ETC
37.	Bolo–Balaoan 500 kV Transmission Line	Nov 2026	37.	Taft–Bobolosan 138 kV Transmission Line Project (Initially energized at 69 kV)	Dec 2028	37.	Zamboanga–Basilan 69 kV Interconnection	Dec 2030
38.	Balaoan–Laoag 500 kV Transmission Line	Nov 2026	38.	Siaton–Bayawan 138 kV Transmission Line (Initially energized at 69 kV)	Dec 2027	38.	San Francisco–Barobo 69 kV Transmission Line Project	Dec 2031
39.	La Trinidad–Sagada 230 kV Transmission Line	Dec 2027	39.	Bayawan–Sipalay 138 kV Transmission Line (Initially energized at 69 kV)	Dec 2030	39.	Bislig–Baganga 138 kV Transmission Line	Dec 2035
40.	Tuy 500/230 kV Substation (Stage 2)	Dec 2027	40.	Babatngon–Sta. Rita 138 kV Transmission Line Upgrading	Dec 2026	40.	Bunawan–Bukal 230 kV Transmission Line	Dec 2035
41.	Bolo 5th Bank	Dec 2028	41.	Panay–Guimaras 138 kV Interconnection Line 2 Project	Dec 2026	41.	Mindanao Substation Expansion 6 Project (MSE6P)	Dec 2035
42.	Pinamucan–Tuy 500 kV Line	Oct 2029	42.	Visayas Substation Upgrading Project 3	Dec 2027	42.	Maco–Mati 69 kV Transmission Line Project	Jan 2036
43.	South Luzon Substation Upgrading 2	Dec 2026	43.	Bacolod–Kabankalan 230 kV Transmission Line Project (Initially energized at 138 kV)	Sep 2033	43.	San Francisco–Barobo–Tandag 69 kV Transmission Line Project	Dec 2036
44.	North Luzon 69 kV Transmission Line Upgrading 1	Dec 2026	44.	Visayas Substation Upgrading Project 4	Dec 2031	44.	Naga–Malangas 69 kV Transmission Line Project	Dec 2036
45.	South Luzon 69 kV Transmission Line Upgrading 1	Dec 2026	45.	Bohol–Leyte 230 kV Interconnection Project	Dec 2031	45.	Aurora–Kapatagan 69 kV Transmission Line Project	Dec 2037
46.	Sampaloc–Baler 230 kV Transmission Line	Dec 2026	46.	San Jose–Nabas 138 kV Transmission Line Project	Dec 2033	46.	Sultan Kudarat–Midsayap 69 kV Transmission Line Project	Dec 2037
47.	Marilao 500 kV Substation Expansion	Dec 2026	47.	Palo–Javier	Sep 2034	47.	Baganga–Mati 138 kV Transmission Line Project	Dec 2040

LUZON		ETC	VISAYAS		ETC	MINDANAO		ETC
				230 kV Transmission Line Project				
48.	Taguig EHV Substation Expansion	Dec 2027	48.	Visayas Voltage Improvement Project 3	Jul 2035	48.	San Francisco–Bislig 69 kV Transmission Line Project	Dec 2040
49.	Magalang 230 kV Substation	Dec 2027	49.	Cebu–Negros 230 kV Interconnection Line 3 and 4 Project	Dec 2040	49.	Tumaga–Pitogo 69 kV Transmission Line Project	Dec 2040
50.	San Agustin 230 kV Substation	Dec 2027	50.	Babatngon–Borongan 138 kV Transmission Line Project	Dec 2038	50.	Culaman–Gen. Santos 230 kV Transmission Line	Dec 2040
51.	San Fabian 230 kV Substation	Dec 2027	51.	Visayas Substation Upgrading Project 5	Dec 2036	51.	Ipil 138 kV Substation Project	Dec 2037
52.	Apalit 230 kV Substation	Dec 2027	52.	Lapu-lapu–Cordova 230 kV Interconnection Project	Dec 2038	52.	Mindanao Substation Expansion 7 Project (MSE7P)	Dec 2040
53.	Valenzuela 230 kV Substation	Dec 2027	53.	Borongan–Catarman 138 kV Transmission Line Project	Sep 2040			
54.	Iriga 230 kV Substation	Dec 2028	54.	Luzon–Visayas 230 kV AC Interconnection Project	Dec 2040			
55.	Malvar 230 kV Substation	Dec 2028						
56.	Balanga 230 kV Substation	Dec 2028						
57.	San Isidro 230 kV Substation	Dec 2028						
58.	FBGC 230 kV Substation	Dec 2028						
59.	Alaminos EHV Substation	Dec 2030						
60.	Guagua 230 kV Substation	Dec 2029						
61.	Baler 230 kV Substation	Dec 2030						
62.	Nuvali 230 kV Substation	Dec 2030						
63.	Cabatuan 230 kV Substation	Dec 2030						
64.	Bauang–La Trinidad 230 kV Transmission Line Upgrading	Jun 2027						
65.	Taguig–Silang 500 kV Transmission Line	Dec 2027						

LUZON		ETC	VISAYAS		ETC	MINDANAO		ETC
66.	Mexico–Clark 69 kV Transmission Line Upgrading	Apr 2028						
67.	Cabanatuan–San Rafael–Mexico 230 kV Transmission Line Upgrading	Apr 2028						
68.	Hermosa–Mexico 230 kV Transmission Line Upgrading	Dec 2028						
69.	Pasay–Taguig 230 kV Transmission Line	Dec 2030						
70.	Navotas–Pasay 230 kV Transmission Line	Dec 2030						
71.	Naga–Presentacion 230 kV Transmission Line	Dec 2030						
72.	Limay–Pasay 230 kV Transmission Line	Dec 2030						
73.	Luzon Voltage Improvement Project 6	Dec 2030						
74.	Santiago–Kabugao 500 kV Transmission Line	Dec 2035						
75.	North Luzon Substation Upgrading 3	Dec 2031						
76.	South Luzon Substation Upgrading 2	Dec 2031						
77.	North Luzon 69 kV Transmission Line Upgrading 2	Dec 2031						
78.	South Luzon 69 kV Transmission Line Upgrading 2	Dec 2031						
79.	San Mateo 230 kV Substation	Dec 2033						
80.	Bustos 230 kV Substation	Dec 2035						
81.	Sariaya 230 kV Substation	Dec 2035						
82.	Presentacion 230 kV Substation	Dec 2035						
83.	San Rafael–San Jose 230 kV Line Upgrading	Dec 2035						
84.	Taguig–Muntinlupa 230 kV Transmission Line 2	Dec 2035						
85.	Matnog 230 kV Substation	Dec 2040						
86.	Kalinga 500 kV Substation	Dec 2040						

LUZON		ETC	VISAYAS		ETC	MINDANAO		ETC
87.	North Luzon Substation Upgrading 4	Dec 2036						
88.	South Luzon Substation Upgrading 3	Dec 2036						
89.	Baras 500 kV Substation	Dec 2038						
90.	Sagada–San Esteban 230 kV Transmission Line	Dec 2040						
91.	Dinadiawan–Santiago 230 kV Transmission Line	Dec 2040						
92.	Baler–Dinadiawan 230 kV Transmission Line	Dec 2040						
93.	Capas–Kadampat 230 kV Transmission Line	Dec 2040						
94.	Bataan–Cavite 500 kV Transmission Line	Dec 2040						
95.	Upgrading of Bicol Transmission Facilities	Dec 2040						

Appendix 7 – Changes from TDP 2019 – 2040 to TDP 2020 – 2040

Project Name	TDP 2019 – 2040	TDP 2020 – 2040	Remarks
LUZON PROJECTS			
Hermosa–Floridablanca 69 kV Transmission Line	ETC: Mar 2019	Completed	Completed
Bataan 230 kV Grid Reinforcement	ETC: Aug 2019	Completed	Completed
Bataan–Cavite Transmission Line Feasibility Study	ETC: Dec 2018	ETC: Jun 2020	Updated ETC based on latest project timeline considering actual implementation
San Jose–Quezon 230 kV Line 3	ETC: Jan 2020 Status: The Project is 89.72% complete	ETC: Mar 2020 Status: Transmission Line: 90.05%; Substation: 98.08%	Updated ETC based on latest project timeline considering actual implementation
San Jose–Angat 115 kV Line Upgrading	ETC: Dec 2019	ETC: Jun 2020 Status: Turnkey (T/L): 84.27% complete	Updated ETC based on latest project timeline considering actual implementation
Tiwi Substation Upgrading	ETC: Mar 2021	ETC: Dec 2020 Status: Turnkey (Secondary Equipment): 75.80% Erection (Primary Equipment): 24.35%	Updated ETC based on latest project timeline considering actual implementation
Calamba 230 kV Substation	ETC: July 2019	ETC: Jun 2020 Status: Transmission Line: 34.78% Calamba S/S: 67.58%	Updated ETC based on latest project timeline considering actual implementation
Tower Structure Upgrading of Bicol Transmission Facilities	ETC: Jun 2019	ETC: Jun 2020 Status: 88.30% Compelete	Updated ETC based on latest project timeline considering actual implementation
Mariveles–Hermosa 500 kV Transmission Line	Project name:	ETC: Dec 2020 Project name:	Updated ETC based on latest project timeline considering

Project Name	TDP 2019 – 2040	TDP 2020 – 2040	Remarks
	Mariveles–Balsik (Hermosa) 500 kV Transmission Line Status: Project erection is 1.53% complete	Mariveles–Hermosa 500 kV Transmission Line Status: Transmission Line: 29.24% Substation: 2.34%	actual implementation Updated Project Status
North Luzon Substation Upgrading Project	ETC Stage 1: May 2020 ETC Stage 2: Mar 2020	ETC: Nov 2020 Bauang 230 kV Substation ETC: Mar 2020 Gamu 230 kV Substation ETC: Mar 2020 Bayombong 230 kV Substation ETC: Jun 2020 Hermosa 69 kV Substation ETC: Mar 2020 Malaya 230 kV Substation ETC: Nov 2020 Quezon 230 kV Substation ETC: Nov 2020 San Jose 230 kV Substation ETC: Mar 2020 Doña Imelda Substation Mar 2020 Concepcion 230 kV Substation ETC: Nov 2020	Updated ETC based on latest project timeline considering actual implementation
Luzon PCB Replacement	ETC: Dec 2019 Ongoing: San Jose 115 kV Substation Labo 230 kV Substation Malaya 230 kV Substation Gumaca 230 kV Substation Status:	ETC: Dec 2020 Status: San Jose S/S: 87.06% Malaya S/S: 89.42%	Updated ETC based on latest project timeline considering actual implementation

Project Name	TDP 2019 – 2040	TDP 2020 – 2040	Remarks
	Malaya 230 kV Substation is 80% complete		
Luzon Voltage Improvement Project – 3	ETC Stage 1: Aug 2020 ETC Stage 2: Mar 2021	ETC: Jun 2022 Completed: - Bantay 115 kV Substation - Tuguegarao 230 kV Substation - Mexico 230 kV Substation - San Jose 230 kV Substation - Laoag 115 kV Substation - Cabanatuan 230 kV Substation - Nagsaag 230 kV Substation Baler Load-End 69kV Substation ETC: Dec 2020 Pantabangan Load-end 69kV Substation ETC: Dec 2020 Umingan 69 kV Substation ETC: Dec 2020 Camiling 69 kV Substation ETC: Dec 2020 San Esteban 230 kV Substation ETC: Aug 2020 Botolan 230 kV Substation ETC: Dec 2020 Itogon 69 kV Substation ETC: Dec 2020 Antipolo 230 kV Substation ETC: Aug 2020 Taytay 230 kV Substation ETC: Apr 2020 Quezon 230 kV Substation ETC: Apr 2020	Updated ETC based on latest project timeline considering actual implementation Updated Project components

Project Name	TDP 2019 – 2040	TDP 2020 – 2040	Remarks
		Bautista Load-end 69kV Substation ETC: Dec 2020 Status for Stage 1: Mexico S/S: 60.50% Status for Stage 2: Lal-lo S/S: 42.17%; San Esteban S/S: 30.87%	
Clark–Mabiga 69 kV Transmission Line	ETC: Apr 2020 Status: The Substation portion of the project is 90.10% complete	ETC: Mar 2021 Status: Transmission Line: For re-rerouting of line; Clark S/S: 93.76%	Updated ETC based on latest project timeline considering actual implementation
Hermosa–San Jose 500 kV Transmission Line	Project name: Balsik (Hermosa)–San Jose 500 kV Transmission Line ETC: Oct 2020 Status: Transmission Line is 8.78% complete Substation is 2.23% complete	ETC: Mar 2021 Project name: Hermosa–San Jose 500 kV Transmission Line Substation ETC: Mar 2020 Transmission Line ETC: May 2021 Status: Transmission Line: 12.65% Substation: 63.64%	Updated ETC based on latest project timeline considering actual implementation
Pagbilao 500 kV Substation	ETC: Dec 2020	ETC: Mar 2021 Status: Transmission Line: 29.24% Substation: 2.72%	Updated ETC based on latest project timeline considering actual implementation
Navotas 230 kV Substation	ETC: May 2021 Status: The project is 40.24% complete	Transmission Line ETC: Mar 2021 Substation ETC: Jun 2020 Status: The project is 83.65% complete	Updated ETC based on latest project timeline considering actual implementation
Tuguegarao–Lal-lo 230 kV Transmission Line	ETC: Oct 2020	Transmission Line ETC: May 2021 Substation ETC: Mar 2020	Updated ETC based on latest project timeline considering actual implementation

Project Name	TDP 2019 – 2040	TDP 2020 – 2040	Remarks
	Status: Transmission Line is 37.64% complete Substation is 71.31% complete	Status: Transmission Line: 47.16% Substation: 80.90%	
Relocation of Steel Poles along Hermosa–Duhat 230 kV Transmission Line	ETC: Dec 2019	ETC: Jun 2021 Status: 53.51% complete	Updated ETC based on latest project timeline considering actual implementation
Western 500 kV Backbone (Stage 1)	ETC: Jun 2020 Status: Project erection is 41.28% complete	ETC: Jun 2021 Status: Transmission Line: 59.51%	Updated ETC based on latest project timeline considering actual implementation
Taguig 500 kV Substation	ETC: Dec 2020	ETC: Jun 2021 Status: Taguig–Baras T/L: 7.02%; Substation Site Development: 88.09%; Taguig 500 kV S/S: 26.17%	Updated ETC based on latest project timeline considering actual implementation
Antipolo 230 kV Substation	ETC: Dec 2021	ETC: Aug 2021 Status: Site Development (S/S): 8.64% Turnkey (Secondary Equipment): 54.52% Erection (Primary Equipment): Securing of LGU Permits	Updated ETC based on latest project timeline considering actual implementation
Ambuklao–Binga 230 kV Transmission Line Upgrading	ETC: Oct 2021	ETC: Nov 2021 Status: Turnkey (T/L): Preparation of bid documents	Updated ETC based on latest project timeline considering actual implementation
Binga–San Manuel 230 kV Transmission Line Stage 1 & 2	ETC: Oct 2021	ETC: Nov 2021 Status for Stage 1: Turnkey (S/S): 91.70% complete Status for Stage 2: Turnkey (T/L): Preparation of bid documents	Updated ETC based on latest project timeline considering actual implementation

Project Name	TDP 2019 – 2040	TDP 2020 – 2040	Remarks
Tuy 500/230 kV Substation Project (Stage 1)	ETC: Oct 2020 Status: Tendering Stage (Awaiting ERC decision)	ETC: Dec 2021 Status: Tuy S/S: 14.70%	Updated ETC based on latest project timeline considering actual implementation
South Luzon Substation Upgrading Project	Stage 1 ETC: Sep 2021	Stage 1 ETC: Dec 2021 Lumban 230 kV Substation ETC: Sep 2021 San Juan 230 kV Substation ETC: Sep 2021 Naga 230 kV Substation ETC: Sep 2021 Daraga 230 kV Substation ETC: Jun 2022 Gumaca 230 kV Substation ETC: Jun 2022 Labo 230 kV Substation ETC: Jun 2022 Las Piñas 230 kV Substation was turned into its own project Status for Stage 1: Las Pinas S/S: 23.21% Status for Stage 2: Pre-construction activity	Updated ETC based on latest project timeline considering actual implementation
Eastern Albay 69 kV Line Stage 2	ETC: Sep 2020	ETC: Sep 2022 Status: Sto. Domingo S/S: Notice of Award	Updated ETC based on latest project timeline considering actual implementation
La Trinidad–Calot 69 kV Transmission Line	ETC: Jun 2019	ETC: Oct 2022 Status: Pre-construction activity	Updated ETC based on latest project timeline considering actual implementation
Luzon Voltage Improvement Project – 4	Stage 1 ETC: Mar 2022 Stage 2 ETC: Jun 2022	ETC: Jun 2022 Ligao Switchyard ETC: Feb 2023 Iriga 230 kV Substation ETC: Feb 2023	Updated ETC based on latest project timeline considering actual implementation

Project Name	TDP 2019 – 2040	TDP 2020 – 2040	Remarks
		Sorosogon 230 kV ETC: Feb 2023 Dasmariñas 230 kV Substation ETC: Feb 2023 Biñan 230 kV Substaion ETC: Feb 2023 Status for Stage 1: Turnkey (S/S): Notice of Award Status for Stage 2: Pre-construction activity	
Pagbilao–Tayabas 500 kV Transmission Line	ETC: Dec 2023	ETC: Jul 2023	Updated ETC based on latest project timeline considering actual implementation
Pinamucan 500 kV Substation	ETC: Dec 2024 ▪ Pinamucan 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.	ETC: Oct 2023 ▪ Pinamucan 230 kV Substation, 2x100 MVA 230/69 kV Power Transformers and accessories, 10-230 kV PCBs and associated equipment, 4-69 kV PCBs and associated equipment.	Updated ETC based on latest project timeline considering actual implementation Updated Project components
Northern Luzon 230 kV Loop	ETC: Jan 2024 ▪ 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;	ETC: Jun 2024 ▪ Bangui 230 kV Substation (New), 2x300 MVA, 230/115-13.8 kV Power Transformer and accessories, 14-230 kV PCBs, 18-115 kV PCBs and associated equipment;4x50 MVAR, 115 kV Shunt Capacitor and accessories, 4x25 MVAR, 115 kV Shunt Reactor and accessories; ▪ Sanchez Mira 230 kV Substation (New), 2x300 MVA, 230/69-13.8 kV Power Transformers and accessories, 18-230 kV PCBs and associated equipment, 8-69 kV	Updated ETC based on latest project timeline considering actual implementation Changed components

Project Name	TDP 2019 – 2040	TDP 2020 – 2040	Remarks
	▪ 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.	*PCB's and associated* equipment; 4x25 MVAR, 230 kV Shunt Capacitor and accessories, 4x25 MVAR, 230 kV Shunt Reactor and accessories; ▪ Pudtol–Sanchez Mira 230 kV Transmission Line, ST-DC, 2-795 MCM, ACSR, 57 km; ▪ Lal-lo–Pudtol 230 kV Transmission Line, ST-DC, 2-795 MCM, ACSR, 38 km.	
Luzon–Visayas HVDC Bipolar Operation	ETC: Dec 2030	ETC: Jan 2025	Updated ETC based on latest project timeline considering actual implementation
Liberty–Nagsaag 230 kV Transmission Line		The project is included in Cabanatuan–Sampaloc–Nagsaag 230 kV Transmission Line Project	Revision of Project
Cabanatuan–Sampaloc–Nagsaag 230 kV Transmission Line		ETC: Jul 2025	New project under TDP 2020-2040 The Liberty–Cabanatuan–San Rafael–Mexico 230 kV Transmission Line Projects and Liberty–Nagsaag 230 kV Transmission Line Projects were regrouped due to urgency of implementation, creating two new projects: the Cabanatuan–Sampaloc–Nagsaag 230 kV Transmission Line Project and the Cabanatuan–San Rafael–Mexico 230 kV Transmission Line Project (Substation site for Liberty Substation was transferred to Sampaloc Substation)

Project Name	TDP 2019 – 2040	TDP 2020 – 2040	Remarks
Tagkawayan 500 kV Substation	▪ 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. ▪ Tagkawayan Bus-in to Tayabas–Naga 500 kV Line, ST-DC, 4-795 MCM ACSR/AS, 1 km.	▪ Tagkawayan 500 kV Substation, 2x1,000 MVA, 500/230-13.8 kV Power Transformer and Accessories, 10-500 kV PCBs, 10-230 kV PCBs and associated equipment. ▪ Pagbilao 500 kV Substation, 2-500 kV PCBs and associated equipment. ▪ Tagkawayan Bus-in to Pagbilao–Naga 500 kV Line, ST-DC, 4-795 MCM ACSR/AS, 1 km.	Updated Project components
Bolo 5th Bank	ETC: Dec 2025	ETC: Dec 2028	Updated ETC based on latest project timeline considering actual implementation
North Luzon Substation Upgrading 2	ETC: Dec 2029	ETC: Dec 2021/Dec 2026	Updated ETC based on latest project timeline considering actual implementation
Pinili 230 kV Substation	ETC: Jan 2023	ETC: Mar 2022	Updated ETC based on latest project timeline considering actual implementation
Concepcion–Sta. Ignacia 69 kV Transmission Line	ETC: Dec 2021	ETC: Apr 2022	Updated ETC based on latest project timeline considering actual implementation
Nagsaag–Tumana 69 kV Transmission Line	ETC: Dec 2021	ETC: Apr 2022	Updated ETC based on latest project timeline considering actual implementation
San Simon 230 kV Substation	ETC: May 2022	ETC: Jul 2022	Updated ETC based on latest project timeline considering actual implementation

Project Name	TDP 2019 – 2040	TDP 2020 – 2040	Remarks
Marilao 500 kV Substation	ETC: Jun 2023	ETC: Oct 2022	Updated ETC based on latest project timeline considering actual implementation
Luzon Voltage Improvement Project 5	ETC: Apr 2021 ▪ Solana Load-end Substation, 4x7.5 MVAR, 69 kV Capacitor Banks and accessories; ▪ Bongabon Load-end Substation, 4x5 MVAR, 69 kV Capacitor Banks and accessories; ▪ Candelaria Load-end Substation, 4x2.5 MVAR, 69 kV Capacitor Banks and accessories; ▪ Bani Load-end Substation, 4x5 MVAR, 69 kV Capacitor Banks and accessories; ▪ San Fabian Load-end Substation, 4x5 MVAR, 69 kV Capacitor Banks and accessories; ▪ Aglipay Load-end Substation, 4x5 MVAR, 69 kV Capacitor Banks and accessories; ▪ Cauayan Load-end Substation, 4x5 MVAR, 69 kV Capacitor Banks and accessories; ▪ Ilagan Load-end Substation, 4x2.5 MVAR, 69 kV Capacitor Banks and accessories;	ETC: Nov 2022 ▪ Solana Load-end Substation, 4x7.5 MVAR, 69 kV Capacitor Banks and accessories; 5-69 kV PCBs and associated equipment ▪ Bongabon Load-end Substation, 4x5 MVAR, 69 kV Capacitor Banks and accessories; 5-69 kV PCBs and associated equipment ▪ Candelaria Load-end Substation, 4x2.5 MVAR, 69 kV Capacitor Banks and accessories; 5-69 kV PCBs and associated equipment ▪ Bani Load-end Substation, 4x5 MVAR, 69 kV Capacitor Banks and accessories; 5-69 kV PCBs and associated equipment ▪ San Fabian Load-end Substation, 4x5 MVAR, 69 kV Capacitor Banks and accessories; 5-69 kV PCBs and associated equipment ▪ Aglipay Load-end Substation, 4x5 MVAR, 69 kV Capacitor Banks and accessories; 5-69 kV PCBs and associated equipment ▪ Cauayan Load-end Substation, 4x5 MVAR, 69 kV Capacitor Banks and accessories; 5-69 kV PCBs and associated equipment ▪ Ilagan Load-end Substation, 4x2.5 MVAR, 69 kV Capacitor Banks and accessories; 5-69 kV PCBs and associated equipment	Updated ETC based on latest project timeline considering actual implementation Changed components

Project Name	TDP 2019 – 2040	TDP 2020 – 2040	Remarks
Capas 230 kV Substation	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;	ETC: May 2023 ▪ Capas 230 kV Substation, 2x300 MVA 230/69-13.8 kV Power Transformers and accessories, 3x300 MVAR 230 kV Shunt Capacitor and accessories; 6-230 kV PCBs and associated equipment, 8-69 kV PCBs and associated equipment;	Updated ETC based on latest project timeline considering actual implementation Updated Project components
Abuyog 230 kV Substation	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. ▪ Bacman-Abuyog 230 kV Transmission Line, 1-795 MCM ACSR/AS, ST-DC, 25 km.	ETC: May 2023 ▪ Abuyog 230 kV Substation, 1x100 MVA 230/69-13.8 kV Power Transformer and accessories, 2x25 MVAR, 230 kV Shunt Capacitor and accessories, 2x25 MVAR, 230 kV Shunt Reactor and accessories, 6-230 kV PCBs and associated equipment, 4-69 kV PCBs and associated equipment. ▪ Toblijon 230 kV Switching Station, 10-230 kV PCBs and associated equipment. ▪ Toblijon-Abuyog 230 kV Transmission Line, 1-795 MCM ACSR/AS, ST-DC, 22.7 km. ▪ Toblijon Bus-in Transmission Line, 1-795 MCM ACSR/AS, ST-DC, 2 km. ▪ 69 kV Bus-in Transmission Line, 1-336.4 MCM ACSR/AS, ST-SC, 3 km.	Updated ETC based on latest project timeline considering actual implementation Updated Project sceme
Porac 230 kV Substation	ETC: Oct 2023 ▪ Porac 230 kV Substation, 2x300 MVA 230/69 kV Power Transformers and accessories, 3x100 MVAR, 230 kV Shunt Capacitor and	ETC: Jun 2023 ▪ Porac 230 kV Substation, 2x300 MVA 230/69 kV Power Transformers and accessories, 3x100 MVAR, 230 kV Shunt Capacitor and	Updated ETC based on latest project timeline considering actual implementation Updated Project components

Project Name	TDP 2019 – 2040	TDP 2020 – 2040	Remarks
	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, 2x100 MVAR, 230 kV Shunt Capacitor and accessories;	accessories, 13-230 kV PCBs and associated equipment, 19-69 kV PCBs and associated equipment; ▪ Hermosa 230 kV Substation (Expansion), 2-230 kV PCBs and associated equipment; ▪ Clark 230 kV Substation (Expansion), 4-230 kV PCBs and associated equipment, 2x100 MVAR, 230 kV Shunt Capacitor and accessories; (remove)	
Plaridel 230 kV Substation	ETC: Jul 2023 ▪ Plaridel 230 kV Substation, 10-230 kV PCBs and associated equipment.	ETC: Nov 2023 ▪ Plaridel 230 kV Substation, 12-230 kV PCBs and associated equipment; 2x100 MVAR, 230 kV Shunt Capacitor and accessories	Updated ETC based on latest project timeline considering actual implementation Updated Project components
Tanauan 230 kV Substation	ETC: Nov 2022	ETC: Aug 2023	Updated ETC based on latest project timeline considering actual implementation
Sampaloc 230 kV Substation	ETC: Nov 2022 Liberty 230 kV Substation ▪ 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	ETC: Sep 2023 Sampaloc 230 kV Substation ▪ Sampaloc (Liberty) 230 kV Substation, 2x100 MVA 230/69 kV Power Transformer and accessories, Control Room, 10-230 kV PCBs and associated equipment, 5-69 kV PCBs and associated equipment. ▪ Sampaloc Bus-in to Cabanatuan-Pantabangan and Nagsaag-Pantabangan 230 kV Transmission Line, ST-DC, 1-795 MCM ACSR/AS, 2 km; ▪ Sampaloc Cut-in to Cabanatuan-	Updated ETC based on latest project timeline considering actual implementation Renamed the project based on Site and Equipment Identification Labelling (SEIL) Updated Project components

Project Name	TDP 2019 – 2040	TDP 2020 – 2040	Remarks
	Line, SP-DC, 1-410 mm2 TACSR/AS, 2 km; ▪ Liberty–SAJELCO 69 kV Transmission Line, SP-SC, 1-410 mm2 TACSR/AS, 12 km.	Pantabangan 69 kV Transmission Line, ST-DC, 1-336 MCM ACSR/AS, 1 km; ▪ Sampaloc–SAJELCO 69 kV Transmission Line, SP-SC, 1-410 mm2 TACSR/AS, 7 km.	
Daraga–Bitano 69 kV Line	ETC: Dec 2022 Daraga–Washington 69 kV Line ▪ Daraga 69 kV Substation, 1-69 kV PCBs and associated equipment. ▪ 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.	ETC: Dec 2023 Daraga–Bitano 69 kV Line ▪ Daraga 69 kV Substation, 1-69 kV PCBs and associated equipment. ▪ Daraga–Bitano 69 kV Transmission Line, SP-SC, 1-795 MCM ACSR, 6 km;	Updated ETC based on latest project timeline considering actual implementation Revision of project scheme
Castillejos 230 kV Substation	ETC: Aug 2024 ▪ Castillejos 230 kV Substation, 12-230 kV PCBs and associated equipment, 9-69 kV PCBs and associated equipment. ▪ Castillejos 69 kV Line, 1-795 MCM ACSR, SP/ST-DC, 1km.	ETC: Feb 2024 ▪ Castillejos 230 kV Substation, 14-230 kV PCBs and associated equipment, 4-69 kV PCBs and associated equipment. ▪ Castillejos 69 kV Line, 1-410 mm2 TACSR/AS, SP/ST-DC, 1km.	Updated ETC based on latest project timeline considering actual implementation Updated Project components
Tuguegarao–Enrile 69 kV Line	ETC: Dec 2021 • Tuguegarao 69 kV Substation, 1-69 kV PCBs and associated equipment. • Tuguegarao–Enrile 69 kV Transmission Line, 1-795 MCM ACSR, SP-DC, 30 km.	ETC: Mar 2024 • Tuguegarao 69 kV Substation, 2-69 kV PCBs and associated equipment. • Tuguegarao–Enrile 69 kV Transmission Line, 1-795 MCM ACSR, SP-SC, 30 km.	Updated ETC based on latest project timeline considering actual implementation Updated Project components
Silang 500 kV Substation	ETC: Nov 2023 ▪ 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),	ETC: Mar 2024 ▪ Silang 500 kV Bus-in Transmission Line, 500 kV, ST-DC, 4-795 MCM ACSR, 3 km; ▪ Tuy 500 kV Line diversion (initially energized at 230 kV),	Updated ETC based on latest project timeline considering actual implementation Updated Project components

Project Name	TDP 2019 – 2040	TDP 2020 – 2040	Remarks
	500 kV Transmission Line, ST-DC, 4-410 mm2 TACSR/AS, 11 km; ▪ Las-Piñas 230 kV Transmission Line diversion, ST-DC, 4-795 MCM ACSR, 10 km.	500 kV Transmission Line, ST-DC, 4-410 mm2 TACSR/AS, 4.5 km; ▪ Biñan 230 kV Transmission Line diversion, ST-DC, 4-410 mm2 TACSR/AS, 4.5 km.	
Kawit 230 kV Substation	ETC: Nov 2024 ▪ Kawit 230 kV Substation, 10-230 kV PCBs and associated equipment;	ETC: Aug 2024 ▪ Kawit 230 kV Substation, 2x300 MVA, 230/115 kV Power Transformers and accessories; 2x100 MVAR 230 kV Shunt Capacitor and accessories; 12-230 kV PCBs and associated equipment; ▪ Rosario 115 kV Substation, 1x100 MVA, 115/34.5 kV Power Transforers and accessories; 10-115 kV PCBs GIS and associated equipment.	Updated ETC based on latest project timeline considering actual implementation Updated Project components
Marilao 500 kV Substation Expansion	ETC: Dec 2025	ETC: Dec 2026	Updated ETC based on latest project timeline considering actual implementation
Dasol 230 kV Substation	Eguia 230 kV Substation ▪ 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. ▪ Eguia Bus-in to Masinloc–Kadampat 230 kV Transmission Line, ST-DC, 4-795 MCM ACSR/AS, 2 km;	Dasol 230 kV Substation ▪ Dasol 230 kV Substation, 2x100 MVA, 230/69-13.8 kV Power Transformer and accessories, 10-230 kV PCBs and 4-69 kV PCBs and associated equipment. ▪ Dasol Bus-in to Masinloc–Kadampat 230 kV Transmission Line, ST-DC, 4-795 MCM ACSR/AS, 2 km; ▪ Dasol–Dasol(PANELCO I) 69 kV Transmission Line, SP-SC, 1-795 MCM ACSR/AS, 17.7 km; ▪ Dasol–Sta. Cruz 69 kV Transmission Line, SP-SC, 1-795 MCM ACSR/AS, 17.3 km;	Renamed the project based on Site and Equipment Identification Labelling (SEIL) Updated Project components

Project Name	TDP 2019 – 2040	TDP 2020 – 2040	Remarks
San Manuel–Nagsaag 230 kV Transmission Line	ETC: May 2021	ETC: Mar 2021	Updated ETC based on latest project timeline considering actual implementation
Taguig–Taytay 230 kV Transmission Line	ETC: Sep 2022	ETC: Apr 2023	Updated ETC based on latest project timeline considering actual implementation
Olongapo 230 kV Substation Upgrading	▪ Olongapo 230 kV Substation, 8-230 kV PCB and associated equipment.	▪ Olongapo 230 kV Substation, 1x100 MVA, 230/69 kV Power Transformers and accessories; 8-230 kV PCB and associated equipment.	Updated Project components
Minuyan 115 kV Switching Station	ETC: Aug 2023 ▪ Minuyan Switching Station, 11-115 kV PCBs and associated equipment.	ETC: Sep 2023 ▪ Minuyan Switching Station, 11-115 kV PCBs and associated equipment. ▪ San Jose 115 kV Transmission Line Extension, 2-795 MCM ACSR/AS, ST-DC, 0.5 km. ▪ Angat 115 kV Transmission Line Extension, 2-795 MCM ACSR/AS, ST-DC, 1 km.	Updated ETC based on latest project timeline considering actual implementation Updated Project components
Western 500 kV Backbone – Stage 2	▪ 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;	▪ Castillejos 500 kV Substation, 2x1,000 MVA, 500/230-13.8 kV Power Transformers and accessories, 2x90 MVAR, 500 kV Shunt Reactor and accessories, 2x60 MVAR, 500 kV Line Reactor and accessories, 12-500 kV PCBs and associated equipment;	Updated Project components
Calaca–Salong 230 kV Transmission Line 2	ETC: Jul 2025 ▪ Calaca-Salong 230 kV Transmission Line, SP-SC, 1-795 MCM ACSR, 6 km.	ETC: Dec 2025 ▪ Calaca-Salong 230 kV Transmission Line, SP-SC, 1-795 MCM ACSR, 4 km.	Updated ETC based on latest project timeline considering actual implementation Updated Project components

Project Name	TDP 2019 – 2040	TDP 2020 – 2040	Remarks
Nagsaag–Santiago 500 kV Transmission Line	ETC: 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.	ETC: Aug 2024 Substation Components: ▪ New Santiago 500 kV Substation, 2x750 MVA 500/230-13.8 kV Power Transformers and accessories, 8-500 kV PCBs and 23-230 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, 6-230 kV PCBs and associated equipment; ▪ Nagsaag 500 kV Substation, 2-500 kV PCBs and accessories.	Updated ETC based on latest project timeline considering actual implementation Updated Project components
Bolo–Balaoan 500 kV Transmission Line	ETC: 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.	ETC: Nov 2026 Substation Components: ▪ Balaoan 500 kV Substation, 2x750 MVA, 500/230-13.8 kV Power Transformers and accessories, 20-500 kV PCBs and associated equipment, 21-230 kV PCBs and associated equipment 4x90 MVAR, 500 kV Shunt Reactor and accessories, 2x60 MVAR, 500 kV Line Reactor and accessories, 3x100, 230 kV Shunt Capacitor Banks and accessories. ▪ Bolo 500 kV Substation, 4-500 kV PCBs and associated equipment. Transmission Components: ▪ Bolo–Balingueo 500 kV Transmission Line (Stage 1), ST-DC, 4-410 mm^2 TACSR, 41 km; ▪ Balingueo–Balaoan 500 kV Transmission Line (Stage 2), ST-DC, 4-410 mm^2 TACSR, 89 km;	Updated ETC based on latest project timeline considering actual implementation Updated Project components

Project Name	TDP 2019 – 2040	TDP 2020 – 2040	Remarks
		▪ Bacnotan–Balaoan 230 kV Transmission Line, ST-DC, 1-795 MCM ACSR, 11 km; ▪ Balaoan–Bakun 230 kV Transmission Line, ST-DC, 1-795 MCM ACSR, 13.7 km; ▪ Balaoan Bus-in to Bauang–San Esteban 230 kV Transmission Line, ST-DC, 1-795 MCM ACSR/AS, 1 km.	
Balaoan–Laoag 500 kV Transmission Line	ETC: 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;	ETC: Nov 2026 Substation Components: ▪ Laoag 500 kV Substation (new), 2x750 MVA, 500/230-13.8 kV Power Transformers and accessories, 11-500 kV PCBs and associated equipment, 8-230 kV PCBs and associated equipment, 3x90 MVAR, 500 kV Shunt Reactor and accessories, 2x60 MVAR, 500 kV Line Reactor and accessories;	Updated ETC based on latest project timeline considering actual implementation Updated Project components
Tuy 500/230 kV Substation (Stage 2)	Substation Components: ▪ Tuy 500/230 kV Substation, 2x1,000 MVA, 500/230 kV Power Transformers and accessories, 6-500 kV PCBs and associated equipment.	Substation Components: ▪ Tuy 500/230 kV Substation, 3x1,000 MVA, 500/230 kV Power Transformers and accessories, 8-500 kV PCBs and associated equipment, 1-230 kV PCBs and associated equipment.	Updated Project components
San Esteban–Laoag 115 kV Transmission Line Upgrading	ETC: Dec 2030	Removed	In lieu of Balaoan–Laoag 500 kV Transmission Line Project.

Project Name	TDP 2019 – 2040	TDP 2020 – 2040	Remarks
South Luzon Substation Upgrading Project 2	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.	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; ▪ Tuy 230 kV Substation, 1x100 MVA, 230/69-13.8 kV Power Transformer and associated equipment; ▪ Tanauan 230 kV Substation, 1x100 MVA, 230/69-13.8 kV Power Transformer and associated equipment; ▪ Labo 230 kV Substation (Replacement), 1x100 MVA, 230/69-13.8 kV Power Transformer and associated equipment; ▪ Daraga 230 kV Substation (Replacement), 2x100 MVA, 230/69-13.8 kV Power Transformer and associated equipment; ▪ Abuyog 230 kV Substation (Replacement), 1x100 MVA, 230/69 kV Power Transformer and associated equipment.	Updated Project components
Sampaloc–Baler 230 kV Transmission Line	Project Name: Liberty–Baler 230 kV Transmission Line ETC: 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.	Project Name: Sampaloc–Baler 230 kV Transmission Line ETC: Dec 2026 Transmission Components: ▪ Sampaloc–Baler 230 kV Transmission Line (initially energized at 69 kV), 2-795 MCM ACSR ST-DC, 57 km.	Updated ETC based on latest project timeline considering actual implementation Updated Project Name due to change in site of substation.

Project Name	TDP 2019 – 2040	TDP 2020 – 2040	Remarks
	<u>Transmission Components:</u> ▪ Liberty–Baler 230 kV Transmission Line, 1-795 MCM ACSR ST-DC, 56.5 km.		
Saog 230 kV Substation	ETC: Dec 2027	Removed	In lieu of Valenzuela 230 kV Substation Project.
Magalang 230 kV Substation	ETC: Jun 2032 <u>Substation Components:</u> ▪ Magalang 230 kV Substation, 1x300 MVA 230/69 kV Power Transformer and accessories, 8-230 kV PCBs, and associated equipment. <u>Transmission Components:</u> ▪ Magalang *'bus-in'* to Concepcion–Mexico 230 kV Transmission Line, ST-DC, 2-410 mm^2 TACSR/AS, 5 km;	ETC: Dec 2027 <u>Substation Components:</u> ▪ Magalang 230 kV Substation, 2x300 MVA 230/69 kV Power Transformer and accessories, 8-230 kV PCBs, and associated equipment, 8-69 kV PCB and associated equpment <u>Transmission Components:</u> ▪ *Magalang 'bus-in' to* Concepcion–Mexico 230 kV Transmission Line, ST-DC, 2-410 mm^2 TACSR/AS, 5 km;	Updated ETC based on latest project timeline considering actual implementation Updated Project components
San Agustin 230 kV Substation	ETC: Apr 2030 <u>Substation Components:</u> ▪ 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. <u>Transmission Components:</u> ▪ San Agustin Bus-in to San Manuel–Concepcion 230 kV Transmission Line, ST-DC, 2-410 mm^2 TACSR/AS, 2 km.	ETC: Dec 2027 <u>Substation Components:</u> ▪ San Agustin 230 kV Substation, 2x300 MVA 230/69 kV Power Transformer and accessories, 3x50 MVAR, 230 kV Shunt Capacitor and accessories 13-230 kV PCBs and associated equipment, 6-69 kV PCBs and associated equipment. <u>Transmission Components:</u> ▪ San Agustin Bus-in to San Manuel–Concepcion 230 kV Transmission Line, ST-DC, 2-410 mm^2 TACSR/AS, 2 km.	Updated ETC based on latest project timeline considering actual implementation Updated Project components based on updated TDP Forecast

Project Name	TDP 2019 – 2040	TDP 2020 – 2040	Remarks
Iriga 230 kV Substation	<u>Substation Components:</u> ▪ Iriga 230 kV Substation, 2x100 MVA, 230/69-13.8 kV Power Transformer and accessories, 8-230 kV PCBs and associated equipment, 3-69 kV PCBs and associated equipment.	<u>Substation Components:</u> ▪ Iriga 230 kV Substation (New), 2x300 MVA, 230/69-13.8 kV Power Transformer and accessories, 3x50 MVAR, 230 kV Shunt Capacitor and accessories, 13-230 kV PCBs and associated equipment, 6-69 kV PCBs and associated equipment.	Updated Project components
Malvar 230 kV Substation	<u>Substation Components:</u> ▪ 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.	<u>Substation Components:</u> ▪ Malvar 230 kV Substation, 2x100 MVA, 230/69-13.8 kV Power Transformer and accessories, 9-230 kV PCBs and 9-69 kV PCBs and associated equipment.	Updated Project components
FBGC 230 kV Substation	ETC: Dec 2032 <u>Transmission Components:</u> ▪ Valenzuela Cut-in to Taguig–Paco 230 kV Transmission Line, SP-SC, 2-610 mm^2 TACSR/AS, 2 km.	ETC: Dec 2028 <u>Transmission Components:</u> ▪ FBGC Cut-in to Taguig–Paco 230 kV Transmission Line, SP-SC, 2-610 mm^2 TACSR/AS, 2 km. ▪ Taguig–FBGC 230 kV Transmission Line, SP-SC, 2-410 mm^2 TACSR/AS, 7.0 km	Updated ETC based on latest project timeline considering actual implementation Updated Project components
Mamplasan 230 kV Substation	ETC: Dec 2030 <u>Substation Components:</u> ▪ Mamplasan 230 kV Substation, 10-230 kV PCBs and associated equipment. <u>Transmission Components:</u> Mamplasan 230 kV bus-in Transmission Line, ST-DC, 2-795, 2 km.	Removed	In lieu of Nuvali 230 kV Substation Project.
Taguig–Silang 500 kV Transmission Line	Project Name: Silang–Taguig 500 kV Transmission Line <u>Substation Components:</u> ▪ Silang 500 kV Substation, 4-500 kV	Project Name: Taguig–Silang 500 kV Transmission Line <u>Substation Components:</u> ▪ Silang 500 kV Substation, 4-500 kV	Updated Project components

Project Name	TDP 2019 – 2040	TDP 2020 – 2040	Remarks
	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;	PCBs and associated equipment, 2x30 MVAR, 500 kV Shunt Reactor and accessories; Transmission Components: ▪ Taguig–Silang 500 kV Transmission Line, ST-DC, 4-410mm^2 TACSR, 72 km;	
Cabanatuan–San Rafael–Mexico 230 kV Transmission Line Upgrading	ETC: Apr 2030 Project Name: Liberty–Cabanatuan–San Rafael–Mexico 230 kV Transmission Line Upgrading Transmission Components: ▪ Liberty–Cabanatuan–San Rafael–Mexico 230 kV Transmission Line, ST-DC, 4-795 MCM ACSR, 140 km.	ETC: Apr 2028 Project Name: Cabanatuan–San Rafael–Mexico 230 kV Transmission Line Upgrading Transmission Components: ▪ Cabanatuan–San Rafael–Mexico 230 kV Transmission Line, ST-DC, 4-795 MCM ACSR, 87 km.	Updated ETC based on latest project timeline considering actual implementation Updated Project components
Navotas–Pasay 230 kV Transmission Line	ETC: Dec 2025	ETC: Dec 2030	Updated ETC based on latest project timeline considering actual implementation
Pasay–Taguig 230 kV Transmission Line	ETC: Dec 2026	ETC: Dec 2030	Updated ETC based on latest project timeline considering actual implementation
Presentacion 230 kV Substation	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	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, 3x25	Additional capacitor component based on updated TDP Forecast

Project Name	TDP 2019 – 2040	TDP 2020 – 2040	Remarks
	PCBs and associated equipment, 3-69 kV PCBs and associated equipment.	MVAR, 230 kV Shunt Capacitor and accessories, 9-230 kV PCBs and associated equipment, 3-69 kV PCBs and associated equipment.	
Taguig–FBGC 230 kV Transmission Line	ETC: Dec 2033	Removed	The project is included as a component in the FBGC 230 kV Substation Project
Matnog 230 kV Substation	ETC: May 2039 <u>Substation Components:</u> ▪ 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.	ETC: Dec 2040 <u>Substation Components:</u> ▪ Matnog 230 kV Substation, 2x50 MVA, 230/69 kV Power Transformer and accessories, 3x25 MVAR, 230 kV Shunt Capacitor and accessories, 9-230 kV PCBs and associated *equipment; ▪ Abuyog* 230 kV Substation, 4-230 kV PCB and associated equipment.	Updated ETC based on latest project timeline considering actual implementation Additional capacitor component based on updated TDP Forecast
Baras 500 kV Substation	ETC: Dec 2038 <u>Substation Components:</u> ▪ Baras 500 kV Substation, 10-500 kV PCBs and associated equipment.	ETC: Dec 2038 <u>Substation Components:</u> ▪ Baras 500 kV Substation, 2x1,000 MVA, 500/230 kV, 10-500 kV PCBs and associated equipment. ▪ Antipolo 230 kV Substation, 4-230 kV PCBs and associated equipment <u>Transmission Components:</u> ▪ Antipolo–Baras 230 kV Line, ST-DC, 4-795 MCM ACSR, 18 km.	Updated ETC based on latest project timeline considering actual implementation Updated Project components
Dinadiawan–Santiago 230 kV Transmission Line	Project Name: Santiago–Dinadiawan 230 kV Transmission Line	Project Name: Dinadiawan–Santiago 230 kV Transmission Line	
North Luzon Substation Upgrading 4	-	ETC: Dec 2036	New project under TDP 2020-2040

Project Name	TDP 2019 – 2040	TDP 2020 – 2040	Remarks
South Luzon Substation Upgrading 3	-	ETC: Dec 2036	New project under TDP 2020-2040
Sariaya 230 kV Substation	-	ETC: Dec 2035	New project under TDP 2020-2040
North Luzon Substation Upgrading 3	-	ETC: Dec 2031	New project under TDP 2020-2040
South Luzon Substation Upgrading 2	-	ETC: Dec 2031	New project under TDP 2020-2040
North Luzon 69 kV Transmission Line Upgrading 2	-	ETC: Dec 2031	New project under TDP 2020-2040
South Luzon 69 kV Transmission Line Upgrading 2	-	ETC: Dec 2031	New project under TDP 2020-2040
Bustos 230 kV Substation	-	ETC: Dec 2035	New project under TDP 2020-2040
Hermosa–Mexico 230 kV Transmission Line Upgrading	-	ETC: Dec 2028	New project under TDP 2020-2040
Cabatuan 230 kV Substation	-	ETC: Dec 2030	New project under TDP 2020-2040
Bauang–La Trinidad 230 kV Transmission Line Upgrading	-	ETC: Jun 2027	New project under TDP 2020-2040
Guagua 230 kV Substation	-	ETC: Dec 2029	New project under TDP 2020-2040
Baler 230 kV Substation	-	ETC: Dec 2030	New project under TDP 2020-2040
Nuvali 230 kV Substation	-	ETC: Dec 2030	New project under TDP 2020-2040
Balanga 230 kV Substation	-	ETC: Dec 2028	New project under TDP 2020-2040
San Isidro 230 kV Substation	-	ETC: Dec 2028	New project under TDP 2020-2040
San Fabian 230 kV Substation	-	ETC: Dec 2027	New project under TDP 2020-2040

Project Name	TDP 2019 – 2040	TDP 2020 – 2040	Remarks
Apalit 230 kV Substation	-	ETC: Dec 2027	New project under TDP 2020-2040
Valenzuela 230 kV Substation	-	ETC: Dec 2027	New project under TDP 2020-2040
North Luzon Transmission Line Upgrading 1	-	ETC: Dec 2026	New project under TDP 2020-2040
South Luzon 69 kV Transmission Line Upgrading 1	-	ETC: Dec 2026	New project under TDP 2020-2040

Project Name	TDP 2019 – 2040	TDP 2020 – 2040	Remarks
VISAYAS PROJECTS			
Sta. Rita–Quinapondan 69 kV Transmission Line	ETC: Jun 2019	ETC: Dec 2020	Updated ETC based on latest project timeline considering actual implementation
Visayas Substation Reliability Project II	ETC: Sep 2019	ETC: Jun 2020	Updated ETC based on latest project timeline considering actual implementation
Visayas Substation Reliability Project I	ETC: Dec 2019	ETC: Jun 2020	Updated ETC based on latest project timeline considering actual implementation
Cebu–Negros–Panay 230 kV Backbone Stage 1	ETC: Dec 2019	ETC: Dec 2020	Updated ETC based on latest project timeline considering actual implementation
Cebu–Lapu–lapu 230 kV Transmission Line Project	ETC: Nov 2020 ▪ Umapad–Lapu-lapu 230 kV S/C (initially energized at 138 kV), DC, 600 MW transfer capacity, 1.1 km ▪ Umapad 230 kV CTS (initially energized at 138 kV), Cable Sealing End Structures, 3-230 kV Disconnect Switches	ETC: Dec 2021	Updated ETC based on latest project timeline considering actual implementation Submarine Cable portion will be under Pusok 230 kV Substation Project
Cebu–Negros–Panay 230 kV	ETC: Jun 2021	ETC: Dec 2021	Updated ETC based on latest project timeline considering

Project Name	TDP 2019 – 2040	TDP 2020 – 2040	Remarks
Backbone Project - Stage 3	▪ Magdugo 230 kV S/S, 2x70 MVAR 230 kV Reactor, 15-230 kV PCBs, and associated equipment; ▪ Calatrava 230 kV S/S, 2x70 MVAR 230 kV Reactor; ▪ E. B. Magalona Switching Station, 1x70 MVAR 230 kV Reactor; ▪ Barotac Viejo 230 kV S/S, 1x70 MVAR 230 kV Reactor; ▪ Quiot and Cebu 138 kV S/S, Uprating of 138 kV PCBs and associated equipment; ▪ Calatrava–San Carlos 69 kV T/L, ST-DC, 2-795 MCM ACSR, 5 km. ▪ Talavera SWS, 8-230 kV PCBs;	▪ Magdugo 230 kV S/S, 17-230 kV PCBs and associated equipment, 2x70 MVAR 230 kV Line Reactor; ▪ Calatrava 230 kV S/S, 1x70 MVAR 230 kV Line Reactor, 1x70 MVAR 230 kV Bus Reactor; ▪ E. B. Magalona Switching Station, 1x70 MVAR 230 kV Line Reactor; ▪ Barotac Viejo 230 kV S/S, 1x70 MVAR 230 kV Line Reactor; ▪ Quiot 138 kV S/S, Uprating of 4-138 kV PCBs and associated equipment ▪ Cebu 138 kV S/S, Uprating of 2-138 kV PCBs and associated equipment ▪ Calatrava–San Carlos 69 kV T/L, ST-DC, 1-795 MCM ACSR, 5 km. ▪ Talavera CTS, Cable Sealing End;	actual implementation Specified the connection of the Reactors in Calatrava, Barotac Viejo, E.B. Magalona, and Magdugo Substations. Specified the number of PCBs to be upgraded in Cebu and Quiot Substations. Talavera will be implemented as CTS.
Visayas Voltage Improvement Project	ETC: Mar 2022	ETC: Stage 1 – Jan 2021 Stage 2 – Jan 2022	Updated ETC based on latest project timeline considering actual implementation
Cebu–Negros–Panay 230 kV Backbone Project – Stage 2	ETC: Oct 2020	ETC: Dec 2021	Updated ETC based on latest project timeline considering actual implementation
Panay–Guimaras 138 kV Interconnection Project	ETC: July 2021 ▪ PEDC 138 kV S/S, 5-138 kV PCBs, 9-69 kV PCBs and associated equipment;	ETC: Nov 2021 ▪ Iloilo S/S, 2x100 MVA, 138/69-13.8 kV Power Transformers and accessories, 2-138 kV PCBs, 10-69 kV PCBs	Updated ETC based on latest project timeline considering actual implementation

Project Name	TDP 2019 – 2040	TDP 2020 – 2040	Remarks
	▪ 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; ▪ 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.	(GIS) and associated equipment; ▪ Buenavista S/S, 2x100 MVA, 138/69-13.8 kV Power Transformers and accessories, 6-138 kV PCBs (GIS), 4-69 kV PCBs and associated equipment; ▪ Iloilo–Ingore 138 kV T/L, ST-DC, 1-795 MCM ACSR, 2 km. ▪ Sawang–Buenavista 138 kV T/L, ST-DC, 1-795 MCM ACSR, 1 km. ▪ Zaldivar bypass line, 0.7 km, 69 kV, 1-336.4 MCM ACSR, ST-SC ▪ PECO Baldoza 69 kV line Transfer, 0.07 km, 1-336.4 MCM ACSR, SP-SC ▪ PPC & PECO 69 kV line Transfer, 0.09 km, 69 kV, 1-336.4 MCM ACSR, SP-SC ▪ Banuyao 69 kV line Transfer, 0.8 km, 69 kV, 1-336.4 MCM ACSR, SP-SC ▪ Extension of Sta. Barbara–Iloilo 138 kV Line, two circuits of 138 kV U/C of 400 MW-capacity, 0.15 km; ▪ Iloilo 69 kV Underground Cables four circuits of 100 MW-capacity, 0.25 km; ▪ Extension of Iloilo–Ingore 138 kV Line, two circuits of 138 kV U/C of 200 MW-capacity, 0.15 km;	69 kV Iloilo Substation will be implemented as GIS instead of AIS because of space limitation. Change of substation name from PEDC to Iloilo and Zaldivar to Buenavista based on the SEIL. Underground cables will be implemented going inside the GIS substation.

Project Name	TDP 2019 – 2040	TDP 2020 – 2040	Remarks
		▪ Iloilo 69 kV Underground Cables three circuits of 100 MW-capacity, 0.15 km; ▪ Buenavista 138 kV U/C two circuits of 200 MW-capacity, 0.15 km.	
Negros–Panay 230 kV Interconnection Line 2 Project	ETC: May 2024 ▪ Barotac Viejo Substation Expansion 1x40 MVAR, 230 kV shunt reactor ▪ E.B. Magalona Substation (Expansion) 1x40 MVAR, 230 kV Shunt Reactor	ETC: Feb 2022 ▪ Barotac Viejo Substation Expansion 1x70 MVAR, 230 kV line reactor ▪ E.B. Magalona Substation (Expansion) 1x70 MVAR, 230 kV line Reactor	Updated ETC based on latest project timeline considering actual implementation Increased in the size of the reactor is based on the latest need of the system Specified the connection point of the Reactor.
Barotac Viejo–Unidos 230 kV Transmission Line Project	Unidos 230 kV Substation Project and Barotac Viejo–Nabas 230 kV Transmission Line Project ▪ Barotac Viejo 230 kV S/S (Expansion), 4-230 kV PCBs and associated equipment; ▪ Unidos S/S, 2x300 MVA, 230/138 kV Power, 2x100 MVA, 138/69-13.8 kV Power Transformer and accessories, 10-230 kV PCBs, 11-138 kV PCBs, 8-69 kV PCBs and associated equipment; ▪ Barotac Viejo–Nabas T/L (Extension), ST-DC, 4-795 MCM ACSR, 130 km; ▪ Bus-in of Unidos S/S to Nabas–Caticlan T/L (Going to Caticlan), 138	ETC: Dec 2024 Barotac Viejo–Unidos 230 kV Transmission Line Project ▪ Barotac Viejo 230 kV S/S (Expansion), 2-230 kV PCBs and associated equipment; ▪ Unidos S/S, 2x300 MVA, 230/138 kV Power Transformer and accessories, 8-230 kV PCBs, 9-138 kV PCBs and associated equipment; ▪ Barotac Viejo–Unidos 230 kV Transmission Line (Extension up to Nabas), ST-DC, 4-795 MCM ACSR, 140 km; ▪ Bus-in of Unidos S/S to Nabas–Caticlan T/L (Going to Caticlan), 138	Both projects are combined into one project because of the need date of the projects. Updated cost estimate and ETC based on latest project timeline considering actual implementation 69 kV portion of Unidos substation will be emitted from the components. Increased in transmission length of the transmission line upon detailed desktop study. Project will be outright 230 kV energized.

Project Name	TDP 2019 – 2040	TDP 2020 – 2040	Remarks
	kV T/L, ST/SP-DC, 1-795 MCM ACSR, 1 km; ▪ Bus-in of Unidos S/S to Nabas–Caticlan T/L (Going to Nabas), 230 kV T/L, ST/SP-DC, 4-795 MCM ACSR, 1 km. (Initially energized at 138 kV).	kV T/L, ST-DC,1-795 MCM ACSR, 1 km; ▪ Bus-in of Unidos S/S to Nabas–Caticlan T/L (Going to Nabas), 230 kV T/L, ST-DC, 4-795 MCM ACSR, 1 km.	
Nabas–Caticlan–Boracay Transmission Line Project	ETC: Aug 2021 ▪ 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; ▪ Unidos–Caticlan 138 kV T/L, Combination of ST/SP-DC, 138 kV, 1-795 MCM ACSR, and two circuits of 138 kV Underground Cable System of 180 MW capacity at 138 kV, 8 km.	ETC: May 2021 ▪ Boracay 138 kV GIS S/S (New), 2x100 MVA 138/69-13.2 kV Power Transformer and accessories, 5-138 kV PCBs, 6-69 kV PCBs and associated equipment; ▪ Unidos–Caticlan 138 kV T/L, ST/SP-DC, 138 kV, 1-795 MCM ACSR, 2.5 km; ▪ Unidos–Caticlan 138 kV U/G, Double circuit, 138 kV Underground Cable System of 180 MW capacity per circuit, 4.5 km.	Updated ETC based on latest project timeline considering actual implementation The substation will be implemented as GIS due to space limitation. Decreased in length of the Underground cable upon detailed survey.
Cebu–Bohol 230 kV Interconnection Project	▪ 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, 4-138 kV PCBs and associated equipment. ▪ Argao–Loon, Single circuit submarine cable system of 400 MW capacity at 230 kV, 30 km, with spare cable.	▪ Dumanjug 230 kV S/S, 2x70 MVAR 230 kV line reactors, 4-230 kV PCBs and associated equipment; ▪ Corella 230 kV S/S, 2x300 MVA, 230/138kV Power Transformer and accessories, 2x70 MVAR 230 kV line reactors, 5-138 kV PCBs and associated equipment. ▪ Argao–Loon 230 kV S/C, Double circuit submarine cable system with transfer capacity of 600 MW at 230 kV, 30 km. (with provision for 3rd circuit)	Updated cost estimate based on change in components Increase of reactor size is due to the requirement of the new submarine cable. Decrease in quantity of the 230 kV PCBs in Dumanjug S/S because two PCBs are already part of MVIP. Increase in quantity of the 138 kV PCBs in Corella S/S is due to adoption of breaker-and-a-half configuration.

Project Name	TDP 2019 – 2040	TDP 2020 – 2040	Remarks
	▪ Argao CTS ▪ Loon CTS	▪ Argao CTS (with provision to be SWS) ▪ Loon CTS (with provision to be SWS)	Submarine cable with 600 MW transfer capacity per circuit will be utilized because it is already available in the market.
Laray 230 kV Substation Project (Initially energized at 138 kV)	▪ Laray 230 kV S/S (New), 11-230 kV PCB (GIS) (138 kV energized) and associated equipment.	▪ Laray 230 kV S/S (New), 10-230 kV PCB (GIS) (138 kV energized) and associated equipment.	Update in the number of PCBs based on the latest configuration.
Amlan–Dumaguete 138 kV Transmission Project	ETC: Feb 2022 ▪ Dumaguete 138 kV S/S (New), 2x50 MVA, 138/69-13.8 kV Power Transformer and accessories, 6-69 kV PCBs and associated equipment.	ETC: Nov 2022 ▪ Dumaguete 138 kV S/S (New), 2x100 MVA, 138/69-13.8 kV Power Transformer and accessories, 4-69 kV PCBs and associated equipment.	Updated ETC based on latest project timeline considering actual implementation. Update in the size of transformers is due to the increased in the demand forecast.
Babatngon–Palo 230 kV Transmission Line Project (Initially energized at 138 kV)	ETC: Dec 2022 ▪ Palo 138 kV Substation (New) 2x50 MVA, 138/69-13.8 kV Power Transformer, 6-230 kV PCBs (energized at 138 kV) and 8-69 kV PCBs	ETC: Feb 2023 ▪ Palo 138 kV S/S (New), 3x100 MVA, 138/69-13.8 kV Power Transformer and accessories, 8-230 kV PCBs, 9-69 kV PCBs and associated equipment. ▪ Palo Cut-in Lines, 69 kV T/L, SP-DC, 1-336.4 MCM ACSR, 2 km.	Updated ETC based on latest project timeline considering actual implementation. Update in the number and size of transformers are due to the increased in the demand forecast. Inclusion of the 69 kV line extension needed in this project.
Granada 230 kV Substation Project	ETC: Apr 2025 ▪ 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. ▪ Bus-in of Silay S/S to Bacolod–E.B. Magalona T/L, 230 kV T/L, ST/SP-DC, 2-795 MCM ACSR, 1 km.	ETC: Oct 2024 ▪ Granada S/S, 3x300 MVA, 230/69-13.8 kV Power Transformers and accessories, 12-230 kV PCBs, 10-69 kV PCBs and associated equipment. ▪ Granada 230 kV Bus-in Lines, ST-DC, 2-795 MCM ACSR, 2x0.50 km.	Updated ETC based on latest project timeline considering actual implementation. Change of location of the substation upon detailed desktop study. Location of the substation is based on the location of the concentration of load in Negros. Increased in number of transformer is due

Project Name	TDP 2019 – 2040	TDP 2020 – 2040	Remarks
			to the increased in the demand forecast.
Kalibo 138 kV Substation Project	▪ Kalibo S/S, 2x100 MVA, 138/69 kV Power Transformer and accessories, 10-138 kV PCBs, 6-69 kV PCBs and associated equipment.	▪ Kalibo S/S, 3x100 MVA, 138/69 kV Power Transformer and accessories, 12-138 kV PCBs, 8-69 kV PCBs and associated equipment.	Increased in number of transformer is due to the increased in the demand forecast.
La Carlota 138 kV Substation Project	▪ La Carlota S/S, 2x100 MVA, 138/69 kV Power Transformer and accessories, 6-69 kV PCBs and associated equipment. ▪ Bus-in of La Carlota S/S to Bacolod–Kabankalan T/L, 138 kV T/L, ST-DC, 1-795 MCM ACSR, 1 km.	▪ La Carlota S/S, 2x100 MVA, 138/69-13.8 kV Power Transformers and accessories, 4-69 kV PCBs and associated equipment. ▪ La Carlota 138 kV Bus-in Lines, ST-DC, 1-795 MCM ACSR, 2x0.50 km. ▪ Reconductoring of Bacolod–San Enrique–La Carlota Line, 69 kV, 1-160 mm2 STACIR, 42 km.	Inclusion of reconductoring of Bacolod–San Enrique–La Carlota Line in order to address the limitation in the feeder
Sumangga 138 kV Substation Project	Baybay 138 kV Substation Project ▪ Baybay S/S: 2x100 MVA, 138/69 kV Power Transformer and accessories, 6-69 kV PCBs and associated equipment. ▪ Bus-in of Baybay S/S to Ormoc–Maasin T/L, 138 kV T/L, ST-DC, 1-795 MCM ACSR, 1 km.	Sumangga 138 kV Substation Project ▪ Sumangga S/S, 2x100 MVA, 138/69 kV Power Transformer and accessories, 4-69 kV PCBs and associated equipment; ▪ Ormoc S/S, 4-69 kV PCBs and associated equipment. ▪ Sumangga 138 kV Bus-in Lines, ST-DC, 1-795 MCM ACSR, 2x1.50 km. ▪ Sumangga 69 kV Cut-in Lines, SP-DC, 1-336.4 MCM ACSR, 2 km. ▪ Reconductoring of Ormoc–Simangan, 69 kV, 1-160 mm2 STACIR, 6 km.	Change of location of the substation upon detailed desktop study. Location of the substation is based on the location of the concentration of load in Leyte. Inclusion of the expansion needed in the 69 kV portion (69 kV line extensions and 69 kV Substation expansion)

Project Name	TDP 2019 – 2040	TDP 2020 – 2040	Remarks
Tigbauan 138 kV Substation Project	ETC: Dec 2024 ▪ Tigbauan S/S, 6-69 kV PCBs and associated equipment. ▪ 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.	ETC: Dec 2023 ▪ Tigbauan S/S, 4-69 kV PCBs and associated equipment; ▪ Sta. Barbara S/S, 1-138 kV PCB and associated equipment; ▪ San Jose S/S, 2-138 kV PCBs and associated equipment. ▪ Stringing of Sta. Barbara–San Jose 138 kV Line 2, ST-DC2, 1-795 MCM ACSR, 93 km. ▪ Reconductoring of portion of Sta. Barbara–San Jose 69 kV Line, 1-160 mm2 STACIR, 30 km ▪ Tigbauan 138 kV Bus-in Lines, ST-DC, 1-795 MCM ACSR, 2x0.50 km. ▪ Tigbauan 69 kV Cut-in Lines, SP-DC, 1-160 mm2 STACIR, 1 km.	Updated ETC based on latest project timeline considering actual implementation Inclusion of the Sta. Barbara–San Jose 138 kV Line 2 Stringing. This resulted to the inclusion of the expansion in Sta. Barbara and San Jose. Inclusion of reconductoring of 69 kV OHTL in order to address the limitation in the feeder
Bool 138 kV Substation Project	Corella–Tagbilaran 138 kV Transmission Line Project (69 kV energized) ▪ Corella–Tagbilaran 138 kV Transmission Line Project (69 kV energized) ▪ Tagbilaran SWS, 6-69 kV PCBs and associated equipment; ▪ Corella S/S: 1-69 kV PCB and associated equipment. ▪ Corella–Tagbilaran T/L, ST-DC, 1-795 MCM ACSR, 138 kV designed (69 kV energized), 5 km.	Bool 138 kV Substation Project <u>Stage 1 (Nov 2019–Dec 2024)</u> ▪ Bool S/S, 2-69 kV Air Break Switch (ABS); ▪ Corella S/S (Expansion): 1x100 MVA 138/69 kV Power Transformer and accessories, 4-69 kV PCB and associated equipment; ▪ Corella–Bool 138 kV T/L (69 kV energized), ST-DC, 1-795 MCM ACSR, 6 km;	Upon detailed assessment considering the future growth in Bohol, it is concluded that there is a need for a new substation in Bool area to cater the loads in Panglao and Tagbilaran. Will be implemented into two stages.

Project Name	TDP 2019 – 2040	TDP 2020 – 2040	Remarks
		Stage 2 (Aug 2027–Dec 2029) ▪ Bool S/S, 2x100 MVA 138/69 kV Power Transformer and accessories, 8-138 kV PCBs, 11-69 kV PCBs and associated equipment; ▪ Transfer of 1x100 MVA 138/69 kV Power Transformer and accessories to Bool Substation; ▪ Bool 69 kV Cut-in Lines, SP-DC, 1-336.4 MCM ACSR, 1 km.	
Carmen 230 kV Substation Project	ETC: May 2025 Sogod 230 kV Substation Project ▪ 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 Daanbantayan–Compostela Transmission Line, 230 kV Transmission Line, ST-DC, 4-795 MCM ACSR, 1 km	ETC: Jun 2025 Carmen 230 kV Substation Project ▪ Carmen 230 kV S/S, 3x300 MVA, 230/69-13.8 kV Power Transformer and accessories, 11-230 kV PCBs, 4-69 kV PCBs and associated equipment. ▪ Carmen 230 kV Bus-in Lines, ST-DC, 772 mm2 (796 MVA), 2x0.50 km; ▪ Carmen 69 kV Cut-in Lines, SP-DC, 1-336.4 MCM ACSR, 2 km.	Updated ETC based on latest project timeline considering actual implementation Change of location of the substation upon detailed desktop study and coordination with DUs. Location of the substation is based on the location of the concentration of load in Northern Cebu. Increased in number of transformer is due to the increased in the demand forecast.
Jaro 230 kV Substation Project	Iloilo 230 kV Substation Project ETC : Jun 2025 ▪ Barotac Viejo S/S (Expansion), 4-230 kV PCBs and associated equipment. ▪ Barotac Viejo–Iloilo 230 kV T/L, ST-DC, 4-795 MCM ACSR, 45 km.	Jaro 230 kV Substation Project ETC : Jun 2023 ▪ Barotac Viejo S/S (Expansion), 3-230 kV PCBs and associated equipment. ▪ Barotac Viejo–Jaro 230 kV T/L, ST-DC, 4-795 MCM ACSR, 52 km.	Updated ETC based on latest project timeline considering actual implementation Change of location of the substation upon detailed desktop study. Location of the substation is based on the location of the concentration of load in Iloilo. This

Project Name	TDP 2019 – 2040	TDP 2020 – 2040	Remarks
			resulted to the increase in the transmission line length.
Visayas Voltage Improvement Project 2	Visayas Voltage Improvement Project 2 ETC : Dec 2030	Visayas Voltage Improvement Project 2 ETC : Dec 2022	Updated ETC based on latest project timeline considering actual implementation
Visayas Substation Upgrading Project - 1	ETC: Sep 2021 ▪ Daanbantayan S/S, 1x100 MVA 230/69-13.8 kV Power Transformer and accessories and associated equipment;	ETC: Nov 2021 ▪ Daanbantayan S/S, 1x150 MVA 230/69-13.8 kV Power Transformer and accessories and associated equipment;	Updated ETC based on latest project timeline considering actual implementation Due to increase in forecast, number of transformers and associated equipment was updated in order to provide N-1 contingency to the substations.
Calbayog–San Isidro 138 kV Transmission Line Project	Calbayog–Allen 138 kV Transmission Line Project (Initially energized at 69 kV) ▪ Calbayog S/S, 1-69 kV PCB and associated equipment. ▪ Calbayog–Allen 138 kV T/L (69 kV energized), ST/SP-DC, 1-795 MCM ACSR, 78 km.	Calbayog–San Isidro 138 kV Transmission Line Project ▪ Calbayog S/S, 2-69 kV PCBs and associated equipment; ▪ Allen and Bobon LES, 1-138 kV and 2-69 kV Air-break Switches. ▪ San Isidro S/S, 2x50 MVA 138/69 kV Power Transformer and accessories (1x50 MVA transformer from Paranas S/S), 11-138 kV PCBs, 5-69 kV PCBs and associated equipment; ▪ Calbayog–San Isidro 138 kV T/L, ST-DC, 1-795 MCM ACSR, 58 km. ▪ San Isidro–Allen 69 kV T/L, SP-SC, 1-336.4 MCM ACSR, 20 km.	Inclusion of Air Break Switch (ABS) components. Inclusion of San Isidro Substation in order to accommodate the load growth in the area. Additional 69 kV OHTL in order to connect the LES of Northern Samar.

Project Name	TDP 2019 – 2040	TDP 2020 – 2040	Remarks
Barotac Viejo–Natividad 69 kV Transmission Line Project	ETC: Oct 2022	ETC: Jul 2022 ▪ Natividad LES, 3-69 kV Air-break Switches.	Updated ETC based on latest project timeline considering actual implementation Inclusion of Air Break Switch (ABS) components.
Visayas Substation Upgrading Project 2	ETC: Dec 2024 ▪ Calong-calong 138 kV Substation, 1x50 MVA 138/69-13.8 kV Power Transformer, 1-138 kV PCBs and 2-69 kV PCBs ▪ Compostela 138 kV Substation, 1-138 kV PCB, 1-69 kV PCB and associated equipment ▪ Umapad Substation, 2x150 MVA 230/138 kV Power Transformer and accessories ▪ Kabankalan 138 kV Substation 2x50 MVA 138/69-13.8 kV Power Transformer, 2-138 kV PCBs and 2-69 kV PCB ▪ Mabinay 138 kV Substation 1x50 MVA 138/69-13.8 kV Power Transformer, 2-138 kV PCBs and 3-69 kV PCB ▪ Panitan 138 kV Substation 2x100 MVA 138/69-13.8 kV Power Transformer, 10-69 kV PCBs. Rehabilitation of the Control center and other facilities. ▪ Dingle 138 kV Substation 1x50 MVA	ETC: Jul 2022 ▪ Calong-calong S/S, 3x100 MVA 138/69-13.8 kV Power Transformer and accessories (Replacement of 2x50 MVA transformers), 2-138 kV PCBs, 4-69 kV PCBs and associated equipment; ▪ Compostela S/S, 1x150 230/138-13.8 kV Power Transformer 1-69 kV PCB and associated equipment; ▪ Kabankalan S/S, 2x100 MVA 138/69-13.8 kV Power Transformer and accessories, 2-69 kV PCBs and associated equipment; ▪ Mabinay 138 kV Substation 1x50 MVA 138/69-13.8 kV Power Transformer, 2-138 kV PCBs and 2-69 kV PCB ▪ Panitan S/S, 3x100 MVA 138/69-13.8 kV Power Transformer and accessories, 11-69 kV PCBs and associated equipment. Rehabilitation of the Control Center and other facilities;	Updated ETC based on latest project timeline considering actual implementation Based on updated lay-out/configuration in order to provide reliability on the substation Included in Visayas Substation Upgrading Project 3 Based on updated lay-out/configuration in order to provide reliability on the substation

Project Name	TDP 2019 – 2040	TDP 2020 – 2040	Remarks
	138/69-13.8 kV Power Transformer, 2-138 kV PCB and 5-69 kV PCB ▪ Tabango 138 kV Substation 2-69 kV PCBs ▪ Daanbantayan 230 kV Substation 1x100 MVA 230/69 kV ▪ Colon 138 kV S/S, 1x100 MVA 138/69-13.8 kV Power Transformer and accessories;	▪ Dingle S/S, 2x100 MVA 138/69-13.8 kV Power Transformer and accessories, 1-69 kV PCB and associated equipment; ▪ Tabango S/S, 1x50 MVA 230/69-13.8 kV Power Transformer and accessories, 2-230 kV PCBs and associated equipment; ▪ Daanbantayan 230 kV Substation 1x150 MVA 230/69 kV, 1-69 kV PCB and associated equipment; ▪ Calbayog S/S, 1x50 MVA 138/69-13.8 kV Power Transformer and accessories, 4-138 kV PCB, 7-69 kV PCBs and associated equipment. ▪ Isabel S/S, 1x50 MVA 138/69-13.8 kV Power Transformer and accessories (1x50 MVA transformer transferred from Calong-calong Substation), 1-138 kV PCBs, 2-69 kV PCBs and associated equipment. (Additional), 9-138 kV PCBs, 2-69 kV PCBs and associated equipment. (Replacement), Upgrading of existing SCADA system and Control Room; ▪ Paranas S/S, 2x100 MVA 138/69-13.8 kV Power Transformer and accessories, 2-69 kV PCBs and associated equipment, Transfer of termination of various transmission lines and Transfer of 50 MVA	Inclusion of 69 kV Tie Breaker. Increase in transformer capacity because of the increase of demand in the area. Will be implemented under O&M Project Additional Substation expansions in order to provide N-1 contingency in the said substations

Project Name	TDP 2019 – 2040	TDP 2020 – 2040	Remarks
		Transformer to San Isidro S/S; ▪ Samboan S/S, 3-138 kV PCB and Associated equipment, 69 kV Tie Breaker and Associated equipments; ▪ Toledo S/S, 3x100 MVA 138/34.5-13.8 kV Power Transformer and accessories, 2-34.5 kV PCBs and associated equipment (Replacement), Transfer of termination of various transmission lines; ▪ Ubay S/S, 1x100 MVA 138/69-13.8 kV Power Transformer and accessories, 4-138 kV PCBs, 10-69 kV PCBs and associated equipment, Construction of new control building; ▪ Corella S/S, 1x100 MVA 138/69-13.8 kV Power Transformer and accessories, 2-138 kV PCBs, 8-69 kV PCBs and associated equipment. ▪ Concepcion S/S, 1x100 MVA 138/69-13.8 kV Power Transformer and accessories, 1-138 kV PCBs, 1-69 kV PCBs and associated equipment; ▪ Barotac Viejo S/S, 50 MVA 138/69-13.8 kV Power Transformer and accessories (50 MVA Transformer transferred from Iloilo Substation), 2-138 kV PCBs, 2-69 kV PCBs and associated equipment;	

Project Name	TDP 2019 – 2040	TDP 2020 – 2040	Remarks
		▪ Sta. Barbara S/S, 1x50 MVA 138/69-13.8 kV Power Transformer and accessories. (50 MVA Transformer transferred from Dingle Substation), 3-138 kV PCBs, 2-69 kV PCBs and associated equipment.	
Cebu–Leyte 230 kV Interconnection Line 3 and 4 Project	Cebu–Leyte 230 kV Interconnection Line 3 Project ETC: Dec 2030 ▪ Cebu-Leyte S/C Submarine Cable, 400 MW capacity, 32.49 km ▪ Daanbantayan Substation 2-69 kV, 230 kV PCBs and 50 MVAR, 230 kV Reactor	Cebu–Leyte 230 kV Interconnection Line 3 and 4 Project ETC: Mar 2025 ▪ Daanbantayan–Tabango S/C, Submarine Cable, 600 MW capacity per ckt, Double Circuit, 32.49 km; ▪ Daanbantayan S/S (Expansion), 2x70 MVAR, 230 kV Line Reactor, 9-230 kV PCBs and associated equipment; ▪ Tabango S/S (Expansion), 2x70 MVAR, 230 kV Line Reactor, 4-230 kV PCBs and associated equipment; ▪ Ormoc S/S (Expansion), 2-230 kV PCBs and associated equipment; ▪ Tabango S/S (Expansion), 4-230 kV PCBs and associated equipment. ▪ Bobon SWS–Daanbantayan T/L, 4-795 MCM ACSR, 120 km; ▪ Ormoc–Kananga T/L, 4-795 MCM ACSR, 7 km; ▪ Tabango–Kananga T/L, 4-795 MCM ACSR, 38 km.	Updated ETC based on latest project timeline considering actual implementation Inclusion of the Transmission line from Daanbantayan going to Bobon SWS in order to unload the existing Daanbantayan–Compostela 230 kV T/L. Inclusion of the Transmission line from Tabango going to Kananga then to Ormoc S/S in order to unload the existing Tabango–Marshalling 230 kV T/L.

Project Name	TDP 2019 – 2040	TDP 2020 – 2040	Remarks
Kananga 230 kV Switching Station Project	Kananga–Babatngon 230kV Transmission Line ETC: Dec 2030	Kananga 230 kV Switching Station Project ETC: Mar 2025	Updated ETC based on latest project timeline considering actual implementation
Tabango–Biliran 69 kV Transmission Line Project	▪ Tabango S/S, 2-69 kV PCB and associated equipment; ▪ Biliran SWS, 2-69 kV PCB and associated equipment.	▪ Tabango S/S, 1-69 kV PCBs and associated equipment; ▪ Biliran LES, 3-69 kV Air-break Switches.	Inclusion of Air Break Switch (ABS) components. Bobolosan will not be developed as SWS.
Laray–Cordova 230 kV Transmission Line Project	ETC: Apr 2025 Laray–Cordova 230 kV Transmission Line Project ▪ Cordova 230 kV Substation 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 Transmission Line 230 kV submarine Cable, 600MW capacity or higher per circuit, Double Circuit, 6.5 km; ▪ Laray Substation-Laray SWS 4-795 MCM ACSR, ST-DC, 5 km.	ETC: Dec 2030 Laray–Cordova 230 kV Interconnection Project ▪ Cordova S/S, 3x300 MVA, 230/69-13.8 kV Power Transformer and accessories, 8-230 kV PCBs, 9-69 kV PCBs and associated equipment; ▪ Laray–Cordova S/C, 230 kV submarine Cable, 600 MW capacity per circuit, Double Circuit, 12 km; ▪ Laray Underground cable, 230 kV, 600 MW capacity per circuit, Double Circuit, 1 km.	Updated ETC based on latest project timeline considering actual implementation Based on updated lay-out/configuration in which outright laying of submarine cables will be done from Laray Substation going to Cordova Substation.
Laray–Alpaco 230 kV Energization Project	Laray–Naalad 230 kV Energization Project ETC: Apr 2025	Laray–Alpaco 230 kV Energization Project ETC: Dec 2030	Updated ETC based on latest project timeline considering actual implementation Change of the switching station location upon completion of the detailed survey
Sipalay 138 kV Substation Project	▪ Sipalay Substation 2x100 MVA, 138/69 kV Power Transformer, 1-138 kV PCBs and 1-69 kV PCBs.	▪ Sipalay S/S, 2x50 MVA 138/69 kV Power Transformer and accessories (50 MVA transformer will be	Transformer from Kabankalan S/S will be utilized by Sipalay Substation.

Project Name	TDP 2019 – 2040	TDP 2020 – 2040	Remarks
		transferred from Kabankalan Substation).	
Calbayog–San Isidro–Catarman 138 kV Transmission Line Project	ETC: Dec 2030 ▪ Calbayog–Allen–Catarman Transmission Line Extension.	ETC: Dec 2028 ▪ Calbayog–San Isidro–Catarman Transmission Line Extension.	Updated ETC based on latest project timeline considering actual implementation Inclusion of San Isidro Substation in order to cater the loads and Power Plants in Northern Samar
Taft–Bobolosan 138 kV Transmission Line Project (Initially energized at 69 kV)	ETC: Jun 2025 ▪ Bobolosan SWS, 2-69 kV PCBs and associated equipment; ▪ Taft SWS, 3-69 kV PCB and associated equipment.	ETC: Dec 2030 ▪ Bobolosan LES, 1-138 kV and 2-69 kV Air-break Switches. ▪ Taft LES, 1-138 kV and 2-69 kV Air-break Switches.	Updated ETC based on latest project timeline considering actual implementation Inclusion of Air Break Switch (ABS) components. Bobolosan will not be developed as SWS.
Siaton–Bayawan 138 kV Transmission Line (Initially energized at 69 kV)	ETC: Jan 2025 ▪ Siaton 138 kV SWS (69 kV energized), 4-69 kV PCBs and associated equipment; ▪ Bayawan 69 kV SWS, 2-69 kV PCB and associated equipment.	ETC: Dec 2027 ▪ Siaton LES, 1-69 kV PCB and associated equipment, 1-138 kV and 2-69 kV Air-break Switches; ▪ Bayawan LES, 1-138 kV Air-break Switch.	Updated ETC based on latest project timeline considering actual implementation Inclusion of Air Break Switch (ABS) components. Siaton and Bayawan will not be developed as SWS.
Bayawan–Sipalay 138 kV Transmission Line (Initially energized at 69 kV)	ETC: Jan 2025 ▪ Bayawan 138 kV S/S (69 kV energized), 2-69 kV PCBs and associated equipment;	ETC: Dec 2030 ▪ Bayawan LES, 1-69 kV PCB and associated equipment, 2-138 kV and 2-69 kV Air-break Switches.	Updated ETC based on latest project timeline considering actual implementation Inclusion of Air Break Switch (ABS) components. Siaton and Bayawan will not be developed as SWS.
Babatngon–Sta. Rita 138 kV Transmission Line Upgrading	ETC: Jul 2025 ▪ Sta. Rita 138 kV Substation, 5-69kV PCB	ETC: Dec 2026 ▪ Sta. Rita 138 kV Substation, 4-69kV PCB ▪ Sta. Rita Bus-in Lines, 138 kV T/L, ST-DC, 1-	Updated ETC based on latest project timeline considering actual implementation

Project Name	TDP 2019 – 2040	TDP 2020 – 2040	Remarks
		795 MCM ACSR, 2x0.8 km.	Based on updated lay-out/configuration
San Jose–Nabas 138 kV Transmission Line Project	▪ San Jose Substation, 6-138 kV PCBs and associated equipment; ▪ Nabas Substation, 2-138 kV PCBs and associated equipment.	▪ San Jose S/S, 2-138 kV PCBs and associated equipment;	Nabas Substation PCBs already under Nabas–Caticlan–Boracay Transmission Project
Bohol–Leyte 230 kV Interconnection	ETC: Dec 2035 ▪ 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	ETC: Dec 2031 ▪ Tugas–Guadalupe S/C, 2 ckts XLPE submarine cable of 600 MW capacity per ckt, 17.6 km. ▪ Ubay S/S (Expansion), 2x300 MVA 230/138 kV Transformers, 4-230 kV PCBs and associated equipment; ▪ Ubay–Tugas T/L, 4-795 MCM ACSR, ST-DC, 20 km; ▪ Corella–Ubay T/L, 4-795 MCM ACSR, ST-DC, 95 km;	Updated ETC based on the need date of the project Utilized the 600 MW transfer capacity of the submarine cable since it is already available in the market Based on updated lay-out/configuration which included the expansion in Ubay Substation.
Visayas Voltage Improvement 3		▪ Sumangga 138 kV S/S, 1x50 MVAR Capacitor Bank, 1-138 kV PCBs and associated equipment.	Additional capacitor bank in Sumangga Substation
Lapu-lapu–Cordova 230 kV Interconnection Project		ETC: Dec 2038	Based on updated lay-out/configuration upon inclusion of Mactan GIS Substation
Nivel Hills 230 kV Substation Project		ETC: Dec 2023 ▪ Nivel Hills GIS S/S, 3x300 MVA 230/69 kV Power Transformer and accessories, 6-230 kV PCBs, 10-69 kV PCBs and associated equipment;	New Project under 2020-2040 Transmission Development Plan

Project Name	TDP 2019 – 2040	TDP 2020 – 2040	Remarks
		▪ Bobon SWS, 10-230 kV PCB and associated equipment. ▪ Nivel Hills-Bobon T/, ST-DC, 4-795 MCM ACSR, 230 kV, 5 km; ▪ Bus-in of Bobon SWS to Cebu-Magdugo OHTL, ST-DC, 4-795 MCM ACSR, 230 kV, 0.5 km.	
Permanent Restoration of Colon–Samboan 138 kV Lines 1 and 2 Affected by Landslide Project		ETC: Dec 2020 ▪ Colon-Samboan Line 1, 1-795 MCM ACSR, 138 kV, ST-DC1, 8km, 26 rerouted towers; ▪ Colon-Samboan Line 2, 1-795 MCM ACSR, 138 kV, ST-DC1, 8km, 21 rerouted towers; ▪ Colon-Samboan Lines 1 and 2 (Common Tower), 138 kV, ST-DC, 3 rerouted towers.	New Project under 2020-2040 Transmission Development Plan
Permanent Restoration of Panit-an–Nabas 138 kV Line affected by Typhoon Ursula Project		ETC: Dec 2020 ▪ Panit-an-Nabas Transmission Line, 1-795 MCM ACSR, 138 kV, ST-DC1, toppled towers.	New Project under 2020-2040 Transmission Development Plan
Lapu-lapu 230 kV Substation Project		ETC: Aug 2022 ▪ Ibo 230 kV GIS S/S (New), 2x300 MVA 230/69-13.8 kV Power Transformer and accessories, 8-230 kV PCB (GIS), 10-69 kV PCB (GIS) and associated equipment. ▪ Umapad–Ibo 230 kV S/C, 600 MW per circuit, Double circuit, 1.5 km.	New Project under 2020-2040 Transmission Development Plan
Silay 138 kV Substation Project		ETC: Dec 2025 ▪ Silay 138 kV S/S, 2x100 MVA Power Transformer and accessories, 6-138 kV PCBs, 6-69 kV PCBs and associated equipment;	New Project under 2020-2040 Transmission Development Plan

Project Name	TDP 2019 – 2040	TDP 2020 – 2040	Remarks
		▪ Bus-in of Silay S/S to Bacolod–Cadiz T/L, 138 kV T/L, ST-SC, 1-795 MCM ACSR, 1 km; ▪ Bus-in of Silay S/S to Bacolod–Cadiz T/L, 69 kV T/L, ST-SC, 1-336.4 MCM ACSR, 3 km.	
Corella–Ubay 138 kV Line 2 Stringing Project		ETC: Dec 2026 ▪ Ubay S/S, 1-138 kV PCBs and associated equipment; ▪ Corella S/S, 1-138 kV PCBs and associated equipment; ▪ Corella–Ubay 138 kV T/L, ST/SC2, 1-795 MCM ACSR, 93 km.	New Project under 2020-2040 Transmission Development Plan
Visayas Substation Upgrading Project 3		ETC: Dec 2027 ▪ Boracay S/S (Expansion), 1x100 MVA 138/69 kV Power Transformer and accessories, 1-138 kV PCB, 1-69 kV PCB and associated equipment; ▪ Umapad S/S (Expansion), 1x300 MVA 230/69 kV Power Transformer and accessories.	New Project under 2020-2040 Transmission Development Plan
Panay–Guimaras 138 kV Interconnection Line 2 Project		ETC: Dec 2026 ▪ Ingore–Sawang 138 kV S/C, 400 mm2 XLPE Submarine Cable, 2.56 km ▪ Sawang CTS–Zaldivar 138 kV U/C, XLPE Undeground Cable, 0.8 km	New Project under 2020-2040 Transmission Development Plan
Visayas Substation Upgrading Project 4		ETC: Dec 2031 ▪ Amlan S/S (Expansion), 3x100 MVA 138/69 kV Power Transformer and accessories (Transformers transferred from Laray 138 kV Substation);	New Project under 2020-2040 Transmission Development Plan

Project Name	TDP 2019 – 2040	TDP 2020 – 2040	Remarks
		▪ Corella S/S (Expansion), 1x100 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCB, 2-69 kV PCB and associated equipment; ▪ Jaro S/S (Expansion), 1x300 MVA 230/69 kV Power Transformer and accessories, 2-230 kV PCB, 1-69 kV PCB and associated equipment; ▪ Pusok S/S (Expansion), 1x300 MVA 230/69 kV Power Transformer and accessories; ▪ Concepcion (Replacement), 1x100 MVA 138/69 kV Power Transformer and accessories (Replacement of existing 50 MVA Transformer); ▪ Sumangga S/S (Expansion), 1x100 MVA 138/69 kV Power Transformer and accessories (Transferred from Palo 138 kV Substation), 2-138 kV PCB, 2-69 kV PCB and associated equipment; ▪ Kabankalan S/S (Expansion), 1x100 MVA 138/69-13.8 kV Power Transformer and accessories, 2-69 kV PCBs and associated equipment; ▪ Panit-an S/S (Expansion), 1x100 MVA 138/69-13.8 kV Power Transformer and accessories (Transferred from Palo 138 kV Substation), 2-	

Project Name	TDP 2019 – 2040	TDP 2020 – 2040	Remarks
		138 kV PCBs, 1-69 kV PCBs and associated equipment; ▪ Nabas S/S (Expansion), 2x50 MVA 138/69-13.8 kV Power Transformer and accessories (Transferred from Amlan Substation), 2-138 kV PCBs, 7-69 kV PCBs and associated equipment; ▪ Dingle S/S (Expansion), 1x100 MVA 138/69-13.8 kV Power Transformer and accessories (Transferred from Palo 138 kV Substation), 2-138 kV PCBs, 1-69 kV PCBs and associated equipment.	
Cebu–Negros 230 kV Interconnection Line 3 and 4 Project		ETC: Dec 2040 ▪ Talavera SWS (Expansion), 12-230 kV PCBs and associated equipment, 2x70 MVAR 230 kV Line Reactor; ▪ Calatrava SWS (Expansion), 12-230 kV PCBs and associated equipment, 2x70 MVAR 230 kV Line Reactor; ▪ Calatrava–Talavera 230 kV S/C, 2 ckts XLPE submarine cable of 400 MW per ckt capacity, 29 km.	New Project under 2020-2040 Transmission Development Plan
Visayas Substation Upgrading Project 5		ETC: Dec 2036 ▪ Nivel Hills S/S (Expansion), 1x300 MVA 230/69 kV Power Transformer and accessories, 1-230 kV PCB, 1-69 kV PCB and associated equipment; ▪ Cadiz S/S (Expansion), 1x100 MVA 138/69 kV Power Transformer and accessories.	New Project under 2020-2040 Transmission Development Plan

Project Name	TDP 2019 – 2040	TDP 2020 – 2040	Remarks
		(Replacement of existing 50 MVA transformer). ▪ Dumanjug S/S (Expansion), 1x100 MVA 138/69 kV Power Transformer and accessories, 2-138 kV PCB, 2-69 kV PCB and associated equipment.	

Project Name	TDP 2019 – 2040	TDP 2020 – 2040	Remarks
MINDANAO PROJECTS			
Sultan Kudarat (Nuling) Capacitor Project	ETC: Sep 2018 Bulk Cost Estimate: 54 Million Pesos	ETC: Jun 2020	Updated ETC based on latest project timeline considering actual implementation
Balo-i–Kauswagan 230 kV Transmission Line Project (Formerly Balo-i-Kauswagan-Aurora 230 kV Transmission Line Project (Phase 1))	ETC: Feb 2019 ▪ Balo-I–Kauswagan 230 kV Transmission Line 12.1 km Bulk Cost Estimate: 2,455 Million Pesos	Completed	Updated ETC based on latest project timeline considering actual implementation
Butuan–Placer 138 kV Transmission Line Project	ETC: Dec 2019 ▪ Butuan-Placer 138 kV Transmission Line ST-SC, 1-795MCM, 96.355 km Bulk Cost Estimate: 1,108 Million Pesos	ETC: Jun 2020	Updated ETC based on latest project timeline considering actual implementation
Toril 138 kV Substation Phase 2 Project	ETC: Dec 2019 Bulk Cost Estimate: 897 Million Pesos	Completed	Completed
Mindanao 230 kV Transmission Backbone Project	ETC: Dec 2019 ▪ Bunawan 230 kV Substation: There is no 69 kV PCB ▪ Matano-Toril 230 kV Transmission Line 37.8 km	Mar 2020	Updated ETC based on latest project timeline considering actual implementation

Project Name	TDP 2019 – 2040	TDP 2020 – 2040	Remarks
	▪ Toril-Bunawan 230 kV Transmission Line 41.8 km Bulk Cost Estimate: 7,090 Million Pesos		
Agus 2 Switchyard Upgrading Project	ETC: Dec 2019 Bulk Cost Estimate: 741 Million Pesos	Dec 2020	Updated ETC based on latest project timeline considering actual implementation Change on bulk cost estimate were based on updated configuration
Kauswagan–Lala 230 kV Transmission Line Project (Formerly Balo-i–Kauswagan–Aurora 230 kV Transmission Line Project (Phase 2))	ETC: Dec 2022 ▪ Lala 230 kV Substation (New) 2-150 MVA 230/69-13.8 kV Power Transformers ▪ Kauswagan-Lala 230 kV Transmission Line 56 km ▪ Lala-Aurora 138 kV Transmission Line 27.165 km Bulk Cost Estimate: 5,040 Million Pesos	ETC: Dec 2020	Updated ETC based on latest project timeline considering actual implementation
Tacurong–Kalamansig 69 kV Transmission Line Project	ETC: Jan 2022 ▪ Tacurong-Kalamansig 69kV Transmission Line 100 km Bulk Cost Estimate 1,320 Million Pesos	ETC: Aug 2022	Updated ETC based on latest project timeline considering actual implementation
Mindanao Substation Rehabilitation Project (MSRP)	ETC: Dec 2022 ▪ Nasipit S/S: 4-138 kV PCB ▪ Davao S/S: 4-69 kV PCB ▪ Bunawan S/S: 6-138 kV PCB ▪ Nabunturan S/S: 5-69 kV PCB ▪ Maco S/S: 0x7.5 MVAR Shunt Capacitor ▪ Sultan Kudarat S/S: 4-69 kV PCB Bulk Cost Estimate 3,418 Million Pesos	ETC: Dec 2021 ▪ Nasipit S/S: 2-138 kV PCB ▪ Davao S/S: 2-69 kV PCB ▪ Bunawan S/S: 5-138 kV PCB ▪ Nabunturan S/S: 4-69 kV PCB, 1x7.5 MVAR Shunt Capacitor ▪ Maco S/S: 1x7.5 MVAR Shunt Capacitor ▪ Sultan Kudarat S/S: 6-69 kV PCB	Updated ETC based on latest project timeline considering actual implementation, updated project components
Mindanao Substation Upgrading Project (MSUP)	▪ Pitogo S/S: 1-138 kV PCB, 1-69 kV PCB	ETC: Dec 2021 ▪ Pitogo S/S: 1-138 kV CAIS, 1-69 kV CAIS, 2-69 kV	Updated ETC based on latest project timeline considering actual implementation,

Project Name	TDP 2019 – 2040	TDP 2020 – 2040	Remarks
	▪ Agus 6 Switchyard: 2x69 kV PCB ▪ Opol S/S: 5-69 kV PCB ▪ Butuan S/S: 5-138 kV PCB, 5-69 kV PCB, 2x7.5 MVAR Shunt Capacitors ▪ Placer S/S: 3-138 kV PCB, 5-69 kV PCB, 1x7.5 MVAR Shunt Capacitors ▪ Bislig S/S: 4-138 kV PCB, 5-69 kV PCB ▪ San Francisco S/S: 2x7.5 MVAR Shunt Capacitors	PCB, 2x7.5 MVAR Shunt Capacitors ▪ Agus 6 Switchyard: 3x69 kV PCB ▪ Opol S/S: 4-69 kV PCB ▪ Butuan S/S: 3-138 kV PCB, 6-69 kV PCB, 3x7.5 MVAR Shunt Capacitors ▪ Placer S/S: 2-138 kV PCB, 7-69 kV PCB, 2x7.5 MVAR Shunt Capacitors ▪ Bislig S/S: 3-138 kV PCB, 6-69 kV PCB ▪ San Francisco S/S: 3x7.5 MVAR Shunt Capacitors	updated project components
Mindanao Substation Expansion 3 Project	ETC: Oct 2023 ▪ Placer 138 kV Substation There is no 69 kV PCB Bulk Cost Estimate: 1,465 Million Pesos		No Change
Villanueva–Butuan 230 kV Transmission Line Project	ETC: Jan 2025 ▪ Butuan 230 kV Substation (New): 4-230 kV PCBs and associated equipment; ▪ Villanueva 230 kV Substation (Expansion): 4-230 kV PCBs and associated equipment. ▪ Viillanueva–Butuan 230 kV Transmission Line, ST-DC, 2-795 MCM ACSR/AS, 99 km. Bulk Cost Estimate: 6,539 Million Pesos	Villanueva-Kinamlutan 230 kV Transmission Line Project ▪ Kinamlutan 230 kV Substation (Butuan 230 kV Substation): 2-300 MVA, 230/138-13.8 kV Power Transformer and accessories, 8-230 kV PCBs and associated equipment, 7-138 kV PCBs and associated equipment; ▪ Butuan 138 kV Substation: 2-138 kV PCBs and associated equipment; ▪ Villanueva 230 kV Substation: 4-230 kV PCBs and associated equipment, 2x100 ohm, 138 kV Series Line Reactor. ▪ Villanueva-Kinamlutan 230 kV Transmission Line, ST-DC, 2-795 MCM ACSR/AS, 157.5 km. ▪ Butuan-Kinamlutan 138 kV Tie-Line: ST-DC, 2-795 MCM ACSR/AS, 0.85 km	Updated project name based on the location new 230 kV substation. ETC based on latest project timeline considering actual implementation

Project Name	TDP 2019 – 2040	TDP 2020 – 2040	Remarks
Nasipit Substation Bus-In Project (formerly Villanueva-Jasaan-Butuan 138 kV Transmission Line)	ETC: Oct 2022 ▪ Nasipit 138 kV Substation: 1x50 MVA 138/69-13.8 kV Power Transformer and accessories, 7-138 kV PCBs and associated equipment. ▪ 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	ETC: Apr 2022 ▪ 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. ▪ 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	Updated ETC based on latest project timeline considering actual implementation 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 Project	ETC: May 2022	ETC: May 2022	Updated ETC based on latest project timeline considering actual implementation
San Francisco–Tago 138 kV Transmission Line Project	ETC: Jul 2024	ETC: May 2024	Updated project name based on the location new 138 kV substation. ETC based on latest project timeline considering actual implementation
Maco–Mati 138 kV Transmission Line Project	ETC: Jul 2024	ETC: May 2024	Updated ETC based on latest project timeline considering actual implementation
Sultan Kudarat–Tacurong 230 kV Transmission Line Project	ETC: Jan 2025		No Change
Eastern Mindanao 138 kV Transmission Line Reinforcement Project	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	▪ Kinamlutan 230 kV Substation (Butuan 230 kV Substation): 4-138 kV PCBs and associated equipment; ▪ Alegria 230 kV Substation (San Francisco 230 kV Substation): 10-230 kV PCBs and associated equipment; ▪ San Francisco 138 kV Substation: 2-138 kV PCBs and associated equipment; ▪ San Antonio 230 kV Substation (Bislig 230 kV Substation): 10-230 kV	Updated ETC based on latest project timeline considering actual implementation, updated project components

Project Name	TDP 2019 – 2040	TDP 2020 – 2040	Remarks
	▪ Bislig 138 kV Substation (Expansion) 4-230 kV PCBs Bulk Cost Estimate: 17,388 Million Pesos	PCBs and associated equipment; ▪ Bukal 230 kV Substation (Nabunturan 230 kV Substation): 6-230 kV PCBs and associated equipment: ▪ Nabunturan 138 kV Substation: 3-138 kV PCBs and associated equipment; ▪ Bislig 138 kV Substation: 4-138 kV PCBs and associated equipment. ▪ Kinamlutan-Alegria 230 kV Transmission Line: SP/ST-DC, 2-795 MCM ACSR/AS, 92.9 km; ▪ Alegria-San Antonio 230 kV Transmission Line: SP/ST-DC, 2-795 MCM ACSR/AS, 92.9 km; ▪ San Antonio-Bukal 230 kV Transmission Line: ST-DC: 2-795 MCM ACSR/AS, 96.8 km; ▪ San Francisco-Alegria 138 kV Tie Line: ST-DC, 2-795 MCM ACSR/AS, 0.75 km; ▪ Bislig-San Antonio 138 kV Tie Line: ST-DC: 2-795 MCM ACSR/AS, 0.75 km. ▪ Nabunturan-Bukal 138 kV Tie Line, ST-DC: 2-795 MCM ACSR/AS, 0.5 km.	
Opol Substation Bus-in Project (formerly Balo-i-Tagoloan-Opol 138 kV Transmission Line)	Bulk Cost Estimate: 1,399 Million Pesos	Bulk Cost Estimate: 768.433 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 2030	Lala-Naga-Zamboanga 230 kV Transmission Line Project ▪ Lala 230 kV Substation: 4-230 kV PCBs and associated equipment; ▪ Naga Mindanao 230 kV Substation (New): 2x300 MVA 138/69-13.8 kV Power Transformer and accessories, 10-230 kV PCBs, 4-138 kV PCBs and associated equipment; ▪ Zamboanga 230 lV Substation (New): 2x300 MVA 138/69-13.8 kV Power Transformer and accessories, 6-230 kV	Updated project name and components Change on bulk cost estimate was due error in encoding upon inclusion of the project in the TDP

Project Name	TDP 2019 – 2040	TDP 2020 – 2040	Remarks
		PCBs, 4-138 kV PCBs and associated equipment; ▪ ▪ Lala–Naga Mindanao 230 kV Transmission Line: ST-DC, 2-795 MCM ACSR/AS, 150 km; ▪ Naga Mindanao-Zamboanga 230 kV Transmission Line: ST-DC, 2-795 MCM ACSR/AS, 110 km; 19,042.944 Million Pesos	
Laguindingan 230 kV SS Project	ETC: May 2024	ETC: July 2023	Updated ETC based on latest project timeline considering actual implementation
Maco–Apokon 69 kV Transmission Line Project	ETC: Nov 2024 ▪ Maco 138 kV Substation: 1-138 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. ▪ Maco–Mati 138 kV Transmission Line: ST-DC1, 1-795 MCM ACSR/AS, 20 km.	Maco-Tagum 69 kV Transmission Line Project ETC: June 2024 ▪ Maco 69 kV Substation, 1-69 kV PCBs and associated equipment; ▪ Mawab-Tagum-Magdum 69 kV Transmission Line (Upgrading), SP-SC, 1-795 MCM ACSR/AS, 31 km; ▪ Maco-Tagum 69 kV Transmission Line, SP-SC, 1-795 MCM ACSR/AS, 12 km.	Updated project name and components Change on bulk cost estimate was due error in encoding upon inclusion of the project in the TDP
Aurora–Calamba–Polanco 69 kV Transmission Line Project	ETC: Dec 2024 ▪ Polanco 138 kV Substation: 1-69 kV PCB and associated equipment; ▪ Calamba 69 kV Substation: 1-69 kV PCBs and associated equipment. ▪ ▪ 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.	Oroquieta 69 kV Switching Station Project ETC: Sep 2024 ▪ Oroquieta Switching Station: 1-69 kV PCBs and associated equipment, 2-7.5 MVAR Shunt Capacitor; ▪ Polanco Substation: 4-10 MVAR 138 kV Shunt Capacitor, 4-138 kV PCB and associated equipment; 1-69 kV PCB and associated equipment; ▪ Aurora 69 kV Substation: 1-69 kV PCBs and associated equipment; ▪ Bañadero 69 kV Substation: 2-7.5 MVAR 69 kV Shunt Capacitor, 2-69	Updated project name and components Change on bulk cost estimate was due error in encoding upon inclusion of the project in the TDP

Project Name	TDP 2019 – 2040	TDP 2020 – 2040	Remarks
		kV PCB and associated equipment; ▪ Tudela 69 kV Substation: 1-7.5 MVAR 69 kV Shunt Capacitor, 1-69 kV PCB and associated equipment; ▪ Villaflor 69 kV Substation: 1-7.5 MVAR 69 kV Shunt Capacitor, 1-69 kV PCB and associated equipment; ▪ Aurora-Villaflor 69 kV Transmission Line (Upgrading): SP-SC, 1-795 MCM ACSR/AS, 84 km. ▪ Oroquieta-Polanco 69 kV Transmission Line (New): SP-SC, 1-795 MCM ACSR/AS, 48 km.	
Eastern Mindanao Voltage Improvement Project			New Project under TDP 2020-2040
Mindanao Substation Upgrading 2 Project (MSU2P)			New Project under TDP 2020-2040
Zamboanga Peninsula Voltage Improvement Project			New Project under TDP 2020-2040
Koronadal 138 kV Substation Project			New Project under TDP 2020-2040
Mindanao Substation Expansion 4 Project			New Project under TDP 2020-2040
Agus 6-Kiwalan-Lugait 69 kV Transmission Line Project			New Project under TDP 2020-2040
Naga Mindanao-Salug 138 kV Transmission Line Project (Energized at 69 kV)			New Project under TDP 2020-2040
Tumaga 138 kV Substation Project			New Project under TDP 2020-2040
Tigbao 138 kV Substation Bus-in			New Project under TDP 2020-2040

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 A8, 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 inter`connection 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.

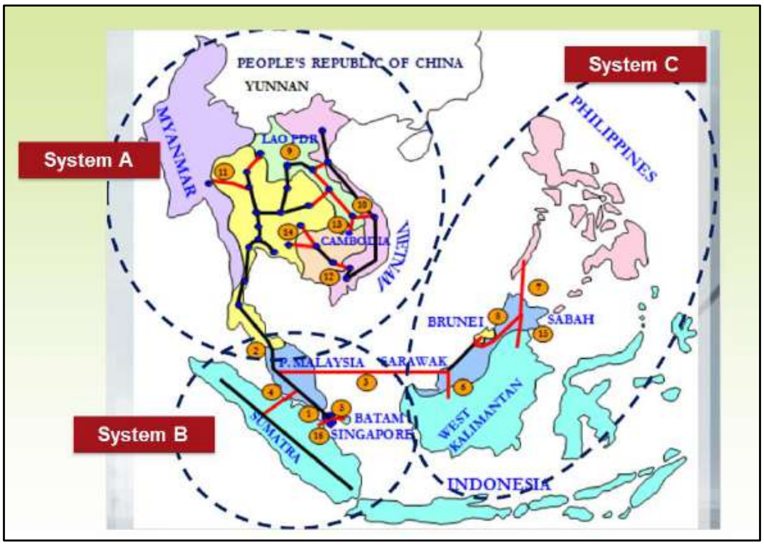


Figure A8 – The ASEAN Power Grid

Development Plans:

DDP	Distribution Development Plan
NREP	National Renewable Energy Program
PDP	Power Development Program
PEP	Philippine Energy Plan
TDP	Transmission Development 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
LA	Lanao Area
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 of Load Probability
SPD	System Peak Demand

Transmission Service Provider:

NGCP	National Grid Corporation of the Philippines

Transmission System/Projects:

AS	Ancillary Service
ACSR	Aluminum Cable Steel Reinforced
ACSR/AS	Aluminum Cable Steel Reinforced/ Aluminum-clad Steel
AIS	Air Insulated Switchgear
APG	ASEAN Power Grid
BESS	Battery Energy Storage System
CREZ	Competitive Renewable Energy Zone
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
ESS	Energy Storage System
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
TL	Transmission Line
VRE	Variable Renewable Energy

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

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