TRANSMISSION DEVELOPMENT PLAN

2024-2050

NGCP

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Chapter 1 NGCP and Power Grid

1.1 Introduction

With the enactment of the Philippines Electric Power Industry Reform Act of 2001 (EPIRA) into law in June 2001, the Philippine Electricity Industry was subdivided into four sectors: generation, transmission, distribution, and supply. The transmission and distribution sectors are regulated. Generation and supply or aggregators for the sale of electricity, on the other hand, operate in a competitive environment.

The NGCP plays a critical role in the Philippines' power sector by serving as the System Operator and Transmission Network Provider (TNP) by linking power generators and distribution utilities, including directly connected customers, to deliver electricity where it is needed. Its interconnected transmission towers and substations serve as the highway for electricity emanating from various energy sources and conveyed to direct-connected customers, private distribution utilities, electric cooperatives, until it reaches the end-users. 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 grid's reliability, adequacy, security, and stability in the three major regions of the Philippines: Luzon, the Visayas, and Mindanao.

As the country's sole TNP and System Operator, NGCP fulfills three core functions:

Planning and Engineering.

NGCP commits to enhancing the transmission infrastructure alongside increasing the power supply. It continuously expands the transmission network to meet system requirements. By proactively planning and implementing new transmission facilities, NGCP ensures grid readiness for new power plants to meet the projected demand.

Operations and Maintenance.

NGCP's task in the O&M is to ensure the country's transmission assets are in optimal condition for the safe, quality, and reliable delivery of electricity. This involves routine inspection and repair of lines and substations, clearing Right-of-Way obstructions, and timely restoration efforts during and after natural disasters.

System Operations.

NGCP, as System Operator, maintains grid stability by balancing power supply and demand. NGCP monitors and manages the grid in real time, ensuring optimal performance and addressing disruptions promptly. Their role is critical for maintaining electricity quality and reliability.

To ensure a transmission network that can support growth and competitive electricity prices, NGCP envisioned its goal of unified grid by implementing the Transmission Backbone and Major Island Interconnections. A key milestone towards achieving this vision is the completion of the Mindanao – Visayas Interconnection Project in 2024. This project significantly strengthens the transmission backbone and facilitates interconnections between major islands, paving the way for a more reliable and efficient power grid.

NGCP is persistently committed to the following international standards to advance the Vision and Mission of the corporation:

- Risk Management – International Organization for Standardization (ISO) 31000:2018
- Quality Management System (QMS) – ISO 9001:2015
- Environmental Management System (EMS)– ISO 14001:2015
- Occupational Health and Safety Management System (OHSMS) – ISO 45001:2018
- Business Continuity Management System (BCMS) – ISO 22301:2019
- Information Security and Management System (ISMS) – ISO 27001:2013

1.2. Transmission Grid Performance

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

In compliance with the amended RTWR, NGCP filed its application for Maximum Allowable Revenue (MAR) for the 5th RP (2021-2025) discussing NGCP's proposed Performance Indices for the 5th RP. Notwithstanding the delay in the reset process, NGCP continuously monitors the performance of the transmission grid following the performance indicators proposed for the 5th RP:

- System Interruption Severity Index (SISI)
- System Availability (SA)
- Voltage Limit Compliance (VLC)
- Frequency of Tripping (FOT)
- Ancillary Services Availability Indicator (ASAI)
- Average Frequency Outage Duration (AFOD)

The 2023 performance of the transmission grid covering the period 01 October 2022 – 30 September 2023 is shown in Table 1.1.

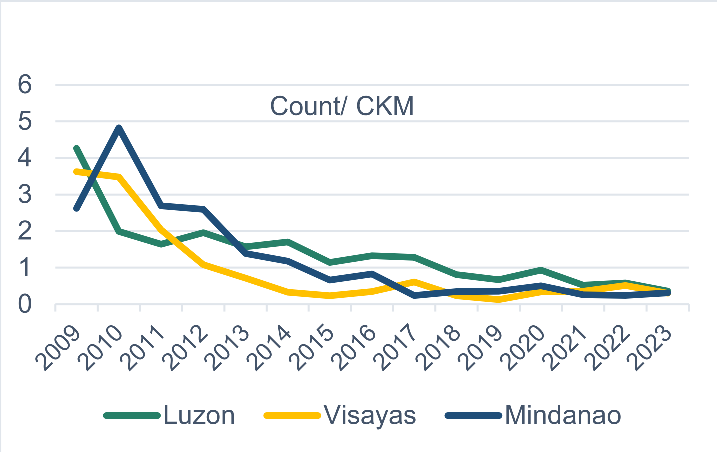
Table 1.1: 2023 Performance of Transmission Grid

Performance Indicator	System Interruption Severity Index, system-min.	Frequency of Tripping, count per 100ckt-km	System Availability, %	Frequency Limit Compliance, %	Voltage Limit Compliance, %	Average Forced Outage Duration, System Min.
Luzon	3.5970	0.3613	98.8488	99.8466	99.9916	262.3067
Visayas	29.1808	0.3045	98.7703	100	99.9987	211.8537
Mindanao	1.5226	0.3164	99.7574	99.9706	99.9992	205.8500

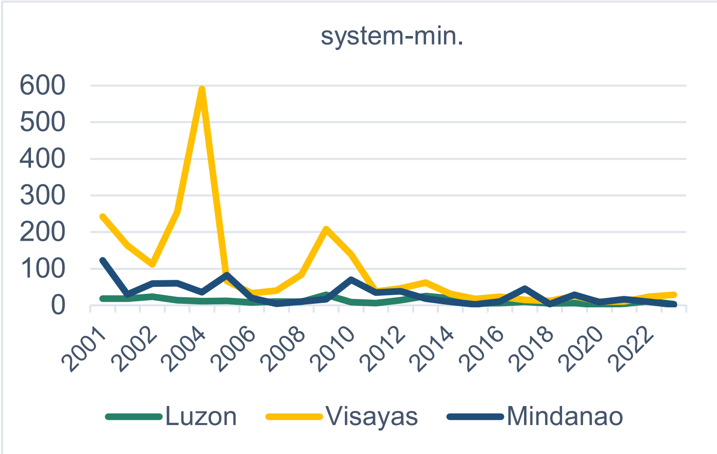
NGCP continues to improve the overall performance of the transmission system since taking over the transmission business from the government and commencing commercial operations in 2009. While there are decreases in performance indices year-on-year, NGCP has continuously performed over and above the targets based on the 3rd RP-approved limits. This results from NGCP's relentless efforts to upgrade, expand, and improve transmission facilities continuously.

As a regulated entity, NGCP provides Transmission Services to all users of the grid and is bound by the Transmission Reliability Standards under Chapter 3 of the Philippine Grid Code (PGC). Correspondingly, power interruptions caused or initiated by transmission lines and equipment that resulted in the loss of service to grid users were included in the evaluation.

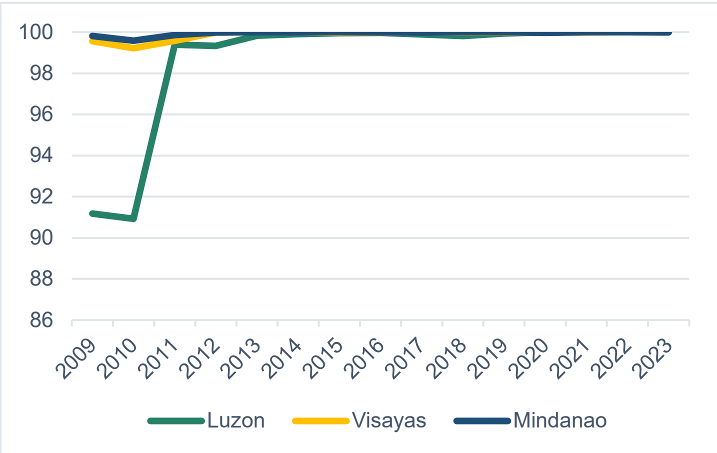
Frequency of Tripping (FOT)



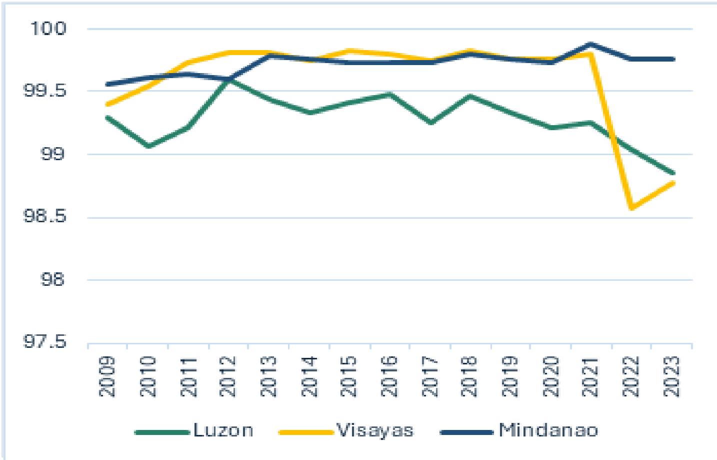
System Interruption Severity Index (SISI)



Voltage Limit Compliance (VLC)



System Availability (SA)



Frequency Limit Compliance (FLC)

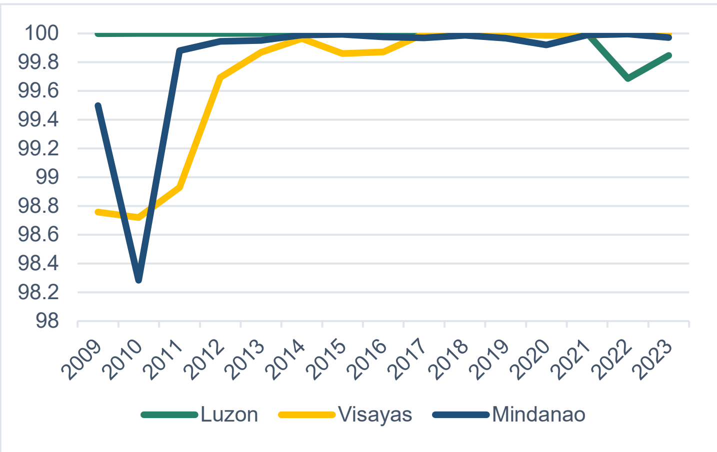


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Figure 1.1 2023 Performance of Transmission Grid

1.3 Existing Transmission Network

As of June 2024, NGCP was able to accommodate about 238 generator customers, 131 distribution utilities, 72 industry customers, and 11 government customers by NGCP's comprehensive network of transmission assets. Tables 1.2 and 1.3 show the existing transmission facilities and NGCP's capacity additions, respectively.

Table 1.2: Summary of Existing Facilities as of June 2024

GRID	TRANSMISSION LINE-LENGTH (CKM)	SUBSTATION CAPACITY (MVA)	NUMBER OF SUBSTATIONS	CAPACITOR (IN MVAR)	REACTOR (IN MVAR)
LUZON	9,923.91	37,786.0	83	3,332.50	930
VISAYAS	6,634.26	9,796.2	84	388.20	855
MINDANAO	6,469.76	8,426.2	46	580.00	92.5
TOTAL	23,027.93	56,008.4	213	4,300.70	1,877.50

Table 1.3: Summary of Capacity Additions as of June 2024

GRID	TRANSMISSION LINE-LENGTH ADDITION (CKM)	SUSBTATION CAPACITY ADDITION (MVA)	CAPACITOR ADDITION (MVAR)	REACTOR ADDITION (MVAR)	ASSET REPLACEMENT (MVA)		DECOMMISSIONED ASSETS (MVA)
					Replaced Assets	New Asset Capacity	
LUZON	1,261	26,280	3,003	410	7,505	11,355	9,928
VISAYAS	1,508	4,660	118	490	580	975	942.5
MINDANAO	2,459	7,455	380	105	1,140	11,665	1,707.5
TOTAL	5,228	38,395	3,501	1,005	9,225	23,995	12,578

1.4 LUZON Transmission Network

The bulk generation sources in the Luzon Grid are in the northern and southern parts of Luzon Island, while the load center is in the Metro Manila area. Since almost 60% of the total demand in Luzon is in Metro Manila, NGCP's transmission backbone must have the capability to transfer bulk power from both the northern and southern parts of Luzon to the Metro Manila area.

Northern Transmission Corridor – 500 kV backbone in North Luzon transmits bulk power from the generation hub to Metro Manila. The Bolo – Nagsaag – San Jose 500 kV backbone, rated at 2,850 MVA per circuit, currently allows the transfer of around 2,200 MW generation capacity in Pangasinan and Zambales.

The recently completed Mariveles – Hermosa (Balsik) – San Jose 500 kV that spans 276 ckt-km accommodates incoming generations in Bataan Peninsula and Zambales. It transmits bulk power merging from the new 500 kV Hermosa Substation to the load center in Metro Manila. This transmission backbone rated at 4,700 MVA per circuit, currently allows the transfer of around 1,800 MW generation capacity from Bataan. Another major project completed in the northern transmission corridor is the Western 500kV Backbone Project, Stage 1 that accommodates bulk generation in Zambales area.

The transmission corridor in the Ilocos Region extends from Bolo 230 kV Substation in Pangasinan to Laoag in Ilocos Norte through double circuit transmission line with 300 MVA per circuit. Meanwhile, the transmission corridor in Cagayan Valley Area emanates from Bayombong in Nueva Vizcaya up to Tuguegarao in Cagayan through double circuit transmission line with 300 MVA capacity per circuit.

The underlying 230 kV transmission Corridor in Central Luzon includes the following:

1. Labrador – Botolan – Olongapo 230 kV Lines
2. Olongapo – Hermosa and Olongapo–Subic–Hermosa 230 kV Lines
3. San Manuel – Concepcion–Mexico 230 kV Lines
4. San Manuel – Pantabangan – Cabanatuan – Mexico 230 kV Lines.

Metro Manila – As the major center of commerce and trade, Metro Manila accounts for about 60% of the total load in the Luzon Grid. It relies on a network of substations that deliver electricity from both north and south Luzon.

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

Sector 1: Served by Quezon, Manila, Marilao, and San Jose 230 kV Substations
Sector 2: Served by Taytay and Doña Imelda 230 kV Substations
Sector 3: Served by Muntinlupa and Las Piñas 230 kV Substations.

To address Metro Manila's continuing increase in the energy demand, new substations such as Antipolo, Navotas, and Pasay 230 kV Substation are being developed.

In the northern part of Metro Manila, the power requirements are drawn from the San Jose 500 kV Substation. Quezon and Taytay Substations heavily rely on the power delivered through the 230 kV lines from San Jose Substation.

On the other hand, the power requirements in the southern part of Metro Manila are drawn from Dasmariñas 500 kV Substation. Particularly, the Las Piñas Substation is connected through a double-circuit 230 kV line from Dasmariñas Substation, while Muntinlupa has a four-circuit supply line from Biñan Substation.

Southern Transmission Corridor – The Southern Transmission Corridor stretches from Naga Substation in Camarines Sur to Tayabas Substation in Quezon province. It transmits about 3,300 MW of Natural Gas and Coal-Fired Power Plants (CFPP) in Batangas and Quezon. This connection, along with the existing link between Tayabas and San Jose 500 kV Substations, creates a complete 500 kV transmission loop that allows the transfer of energy generated from northern and southern parts of Luzon.

The transmission corridor also includes a 230 kV transmission line in Batangas and Laguna, which caters to more than 3,100 MW total generation capacity of Coal and Natural Gas Plant in Calaca and Batangas City.

The line segment from Pagbilao to Naga Substation is currently energized at 230 kV. It is worth noting that Naga Substation serves as the termination point for the High Voltage Direct Current (HVDC) Interconnection System (energized in 1998) that allows the exchange of power up to 440 MW between Luzon and the Visayas Grids.

Finally, the 500 kV backbone extends from Tayabas to Dasmariñas Substation, supplying power to adjacent provinces south of Metro Manila.

1.5 VISAYAS Transmission Network

The Visayas Grid is composed of five different sub-grids, namely: Leyte – Samar, Cebu, Bohol, Negros and Panay. These sub-grids are interconnected via submarine cables with effective transfer capacity as follows: Leyte – Cebu (200 MW and 240 MW), Cebu – Negros (2x90 MW and 2x400 MW), Negros – Panay (90 MW and 2x400 MW), and Leyte-Bohol (90 MW). The installed submarine cables provide the capability of sharing excess generation between islands to accommodate the Visayas' growing demand.

Eastern Visayas is composed of Samar and Leyte Islands. Leyte Island has the largest geothermal power plants in the Visayas, with a total capacity of 667 MW. This supplies the islands of Leyte, Samar and Bohol through the Babatngon – Paranas 138 kV TL and Leyte – Bohol 138 kV Interconnection. Leyte Island has already reached 294 MW peak demand [1]. Furthermore, Leyte Island also has an existing 230 kV interconnection to Cebu Island enabling the other islands to source power from cheaper geothermal resources. The Leyte – Luzon HVDC Interconnection facility with a transfer capacity of 440 MW allows the exchange of power from Luzon to the Visayas and vice versa. Samar Island has already reached 78 MW peak demand[3] and has only a few existing power plants, such as the Taft Hydroelectric Power Plant (HEPP) in Eastern Samar.

Central Visayas is composed of Cebu and Bohol Islands. Metro Cebu is considered as the major load center of the Visayas Grid. Cebu Island has already reached 1,220 MW peak demand[1] with numerous CFPP in Naga and Toledo areas. With the completion of the Cebu – Negros – Panay (CNP) 230 kV Backbone Project, it allowed the utilization of the excess generations from Mindanao, Negros and Panay Island to cater to the high demand of Cebu Island. Bohol Island is currently sourcing power from the Geothermal power plants in Leyte Island via 138 kV submarine cable with a transfer capacity of 90 MW. Bohol Island already reached 125 MW peak demand[1]. Diesel power plants are dispatched to avoid overloading of the submarine cable.

[1] Peak Demand as of May 2024

Western Visayas is composed of Negros and Panay Islands with load centers in Bacolod City and Iloilo City, respectively. Negros Island has already reached 443 MW peak demand[3] with bulk of generation, composed mostly of geothermal, solar and biomass power plants. The peak demand in Panay Island was recorded at 520 MW with bulk of generation composed mostly of large CFPP and wind power plants. The completion of the CNP 230 kV Backbone Project allowed the sharing of power generation within the Visayas.

1.6 MINDANAO Transmission Network

The Mindanao Grid consists of 138 kV transmission corridors and 69 kV radial lines, all designed to deliver reliable and high-quality power to customers. In addition, the now energized 230 kV Mindanao transmission backbone enhances electricity transmission towards the load centers.

A significant portion of the island's power supply is sourced from a mix of renewable and conventional power plants situated in Lanao and Misamis Oriental for northern Mindanao and in Davao region for southern Mindanao. The Mindanao 230 kV backbone plays a crucial role in transferring bulk power within the region, ensuring that the power needs of the region are met efficiently.

The looped transmission line which transmits power to Cagayan de Oro City, Davao City, and General Santos City utilizes both the Balo-I – Tagoloan – Maramag – Kibawe – Davao 138 kV corridor and the higher capacity 230 kV Balo-I – Villanueva – Maramag – Bunawan transmission line backbone.

Three high-voltage transmission corridors which originate from the Lanao area enable the efficient transmission of significant power generated by hydroelectric and coal-fired power plants across Mindanao. Although the bulk of power generation is located in the northern region of the island, the southern regions of Davao and SOCCSKSARGEN consume the larger portion of power accounting for nearly half of the island's total load demand. While the transmission system configuration in Mindanao is generally robust, ensuring the island's security remains a significant challenge for NGCP particularly in operating the grid and constructing major transmission projects. The Mindanao transmission system is divided into six districts:

District	Area	Province
1	North-Western Mindanao Area (NWMA)	Zamboanga del Norte, Zamboanga del Sur, Zamboanga Sibugay, Misamis Occidental
2	Lanao Area (LA)	Lanao del Norte, Lanao del Sur
3	North Central Mindanao Area (NCMA)	Bukidnon, Misamis Oriental
4	North-Eastern Mindanao Area (NEMA)	Agusan del Norte, Agusan del Sur, Surigao del Norte, Surigao del Sur
5	South-Eastern Mindanao Area (SEMA)	Daval del Sur, Davao del Norte, Davao Oriental, Davao Occidental, Davao de Oro
6	South-Western Mindanao Area (SWMA)	Cotabato, South Cotabato, Sultan Kudarat, Maguindanao del Norte, Maguindanao del Sur, Sarangani

In January 2024, NGCP successfully energized the Mindanao–Visayas Interconnection Project (MVIP), a significant undertaking that improves power stability and reliability which also fulfills NGCP's vision of a unified grid. The MVIP that connects Mindanao to the Visayas grid comprises a 184 circuit-kilometer (ckm) High-Voltage Direct Current (HVDC) submarine cable, 806 ckm of overhead transmission lines utilizing a total of 1,425 towers. Currently, MVIP's transfer capacity is 450 MW which is expandable to a full capacity of 900 MW in the future.

Ceremonial Energization of

Mariveles - Hermosa - San Jose 500 kV Transmission Line

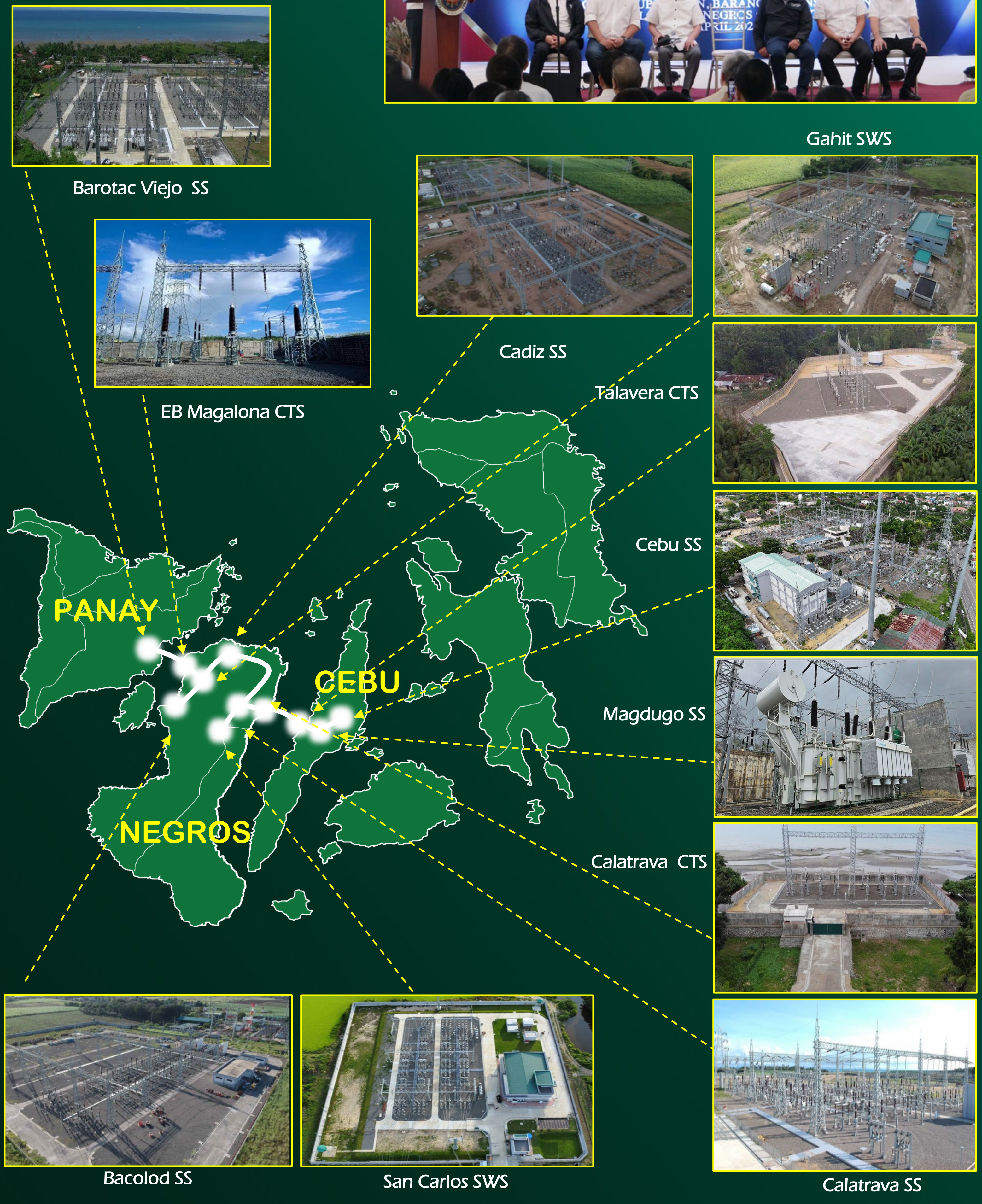
Municipality of Hermosa, Bataan
July 12, 2024

Hermosa - San Jose 500 kV TL

Mariveles - Hermosa 500 kV TL

Ceremonial Energization of
Cebu-Negros-Panay 230kV Backbone Project

Bacolod City, Negros Occidental
April 08, 2024

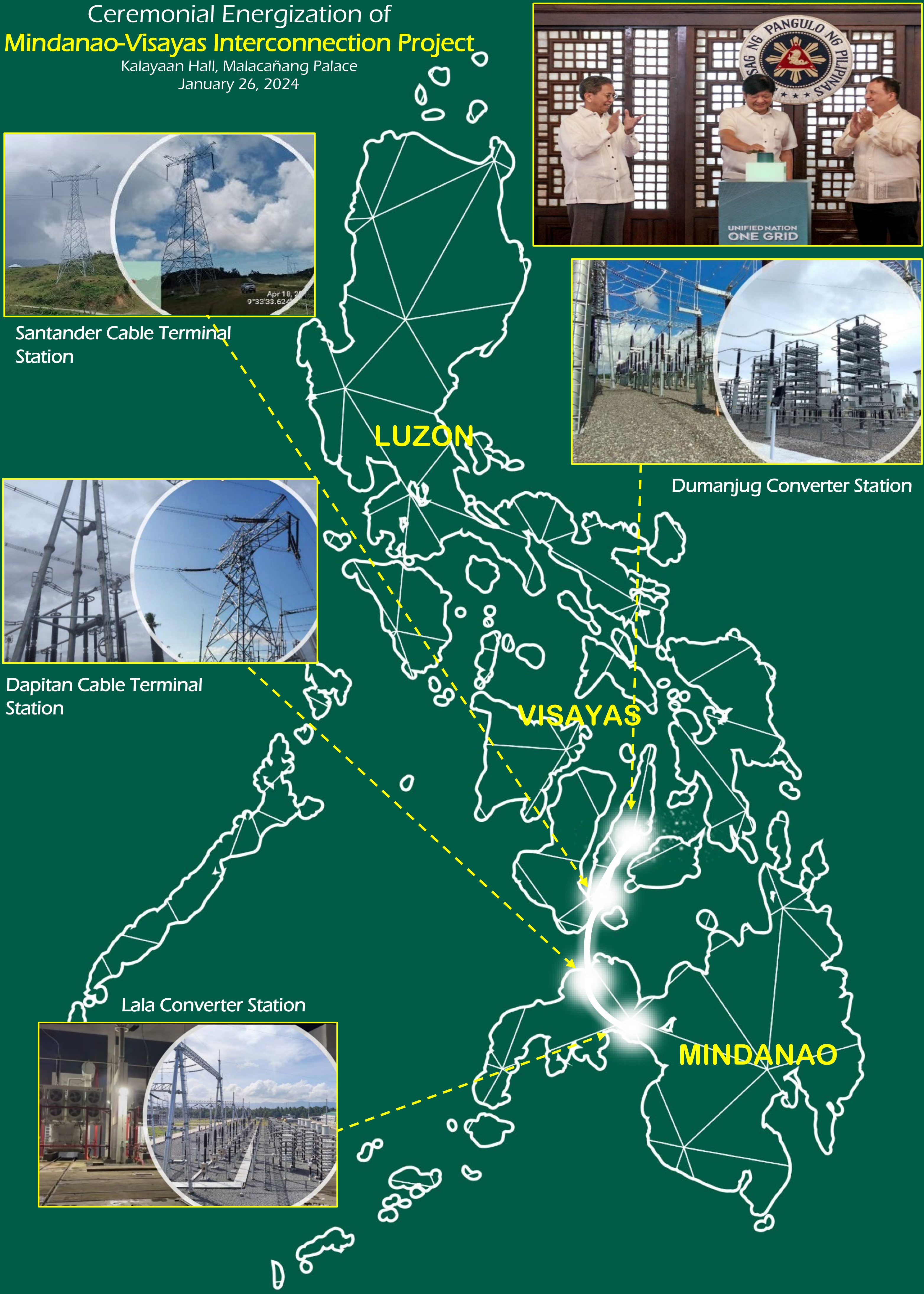


Ceremonial Energization of

Mindanao-Visayas Interconnection Project

Kalayaan Hall, Malacañang Palace

January 26, 2024



1.7 Major Grid Developments

Despite the archipelago's challenging geography, including mountainous terrain and scattered islands, NGCP is determined to find an innovative solution to interconnect all the islands and provide secure and reliable source of power. Figure 1.2 below shows the major grid developments until 2050. Detailed information of each backbone or interconnection project is provided in Chapters 5, 6 and 7 for Luzon, the Visayas and Mindanao Transmission Outlook, respectively.

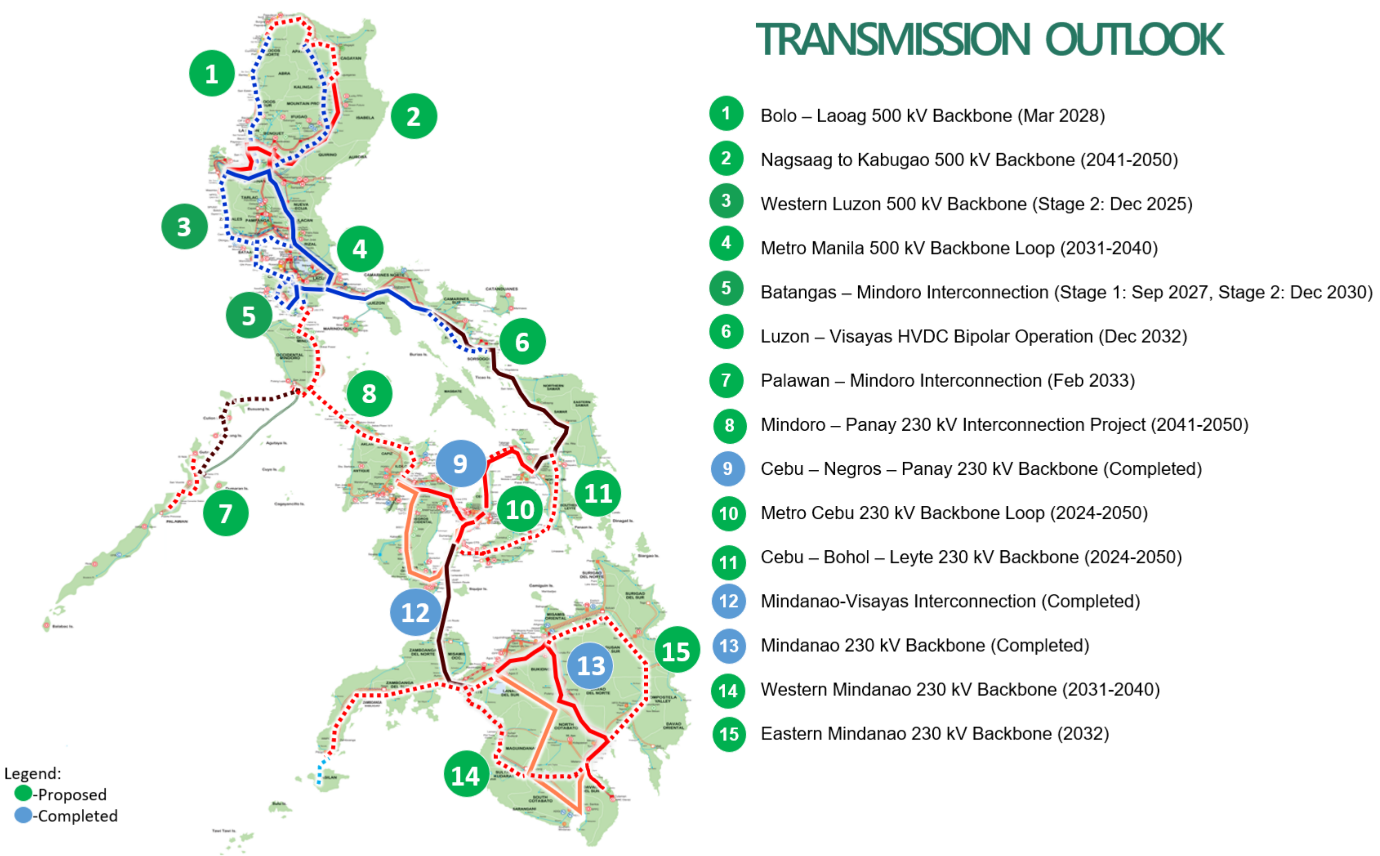


Figure 1.2: Transmission Outlook

Chapter 2 TDP Preparation and Planning Inputs

2.1 TDP Process

The EPIRA requires NGCP to work with various stakeholders, including power generators, distribution utilities, government agencies, and the government, to develop a Transmission Development Plan (TDP). The collaboration within these entities ensures an optimal grid expansion plan that provides solutions and mitigations to the energy and power requirements to meet the growing electricity demands.

The following is the step-by-step process in the development of the TDP Report:

1. **DOE's Inputs**
   The TDP primarily considers DOE's annual System Peak Demand Forecast and Generation Capacity Addition Line-up as inputs in the TDP. The TDP considers and incorporates relevant policies promoting renewable energy sources, smart grid technologies, and other regulations required for the development of the Grid.

2. **Stakeholder's Engagement**
   One of the requirements of the EPIRA in the preparation of the TDP is to conduct consultations with the electric power industry participants. NGCP regularly conducts joint planning to gather inputs from the DU's Distribution Development Plans (DDP), Generator Company's expansion programs, and concerns of directly connected customers.

3. **Updating of the TDP**
   The TDP is updated with inputs from the DOE and the electric power industry participants to determine the system requirements of the grid until 2050. This involves the conduct of various Grid Planning Studies using various power system simulation software. The assessments of projects are made in reference to the planning criteria and comply with the limits prescribed in the PGC.

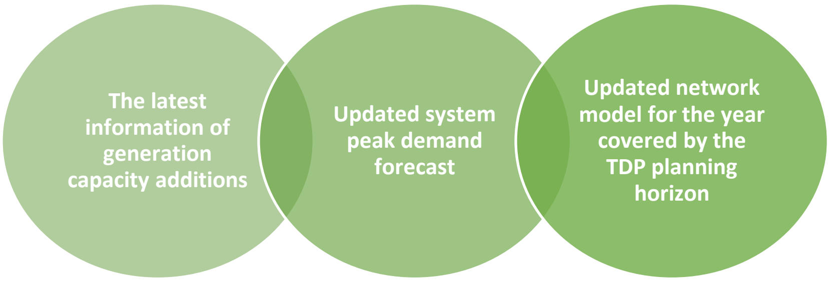
4. **Consultation with Stakeholders**
   As part of the EPIRA mandates, nationwide forums are conducted. Public consultations provide a platform for a broad audience of stakeholders to raise comments and suggestions on the proposed transmission network developments outlined in the TDP Report.

5. **Submission to DOE**
   Upon comprehensive review and incorporating stakeholder inputs, the final TDP Report is submitted to the DOE for approval and for integration to the Power Development Plan (PDP) and the Philippine Energy Plan (PEP).

Figure 2.1: TDP Process

2.2 Planning Criteria System Assessment

Using the latest baseline case of the transmission network, the system planners refer and use the following inputs:



Simulation. Various generation dispatch scenarios and sensitivity assessment are considered in grid planning studies to determine the network requirements. This assesses whether the existing transmission facilities are still adequate to support the system requirements. The results of the simulations identify and determines the required transmission facilities packaged as projects and considering alternative projects to ensure that the projects lined up in the TDP are optimal for grid development.

Another consideration is an electricity market approach, since 2019 NGCP continuously develops its market model utilizing a market-based scenario to enhance the long-term transmission planning. This is to ensure other uncertainties in the future are considered to establish a range of plausible system condition-based scenarios for identifying projects.

Table 2.1. Generation Dispatch Scenarios for each Grid

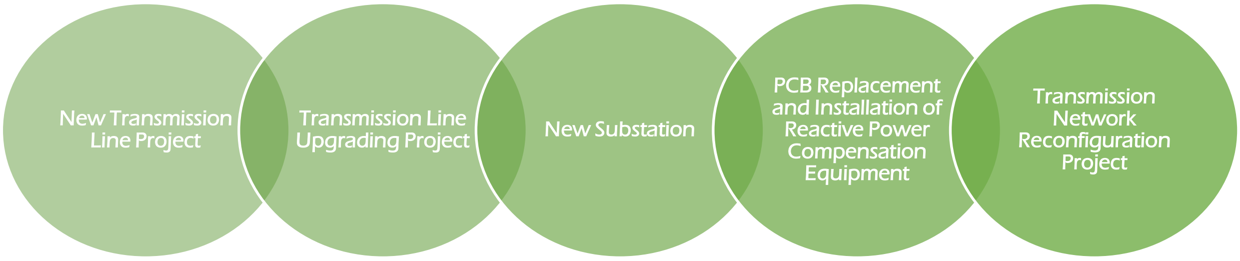
LUZON Dispatch Scenarios			
Maximum North Wet Season	Maximum South Dry Season	Typical Generation Scenario	Other Generation Scenario
All generation facility outputs in the northern part of the grid are set to their maximum capacities	All generation facility outputs in the southern part of the grid are set to their maximum capacities	Power generation is based on the typical output levels of power plants during system peak load	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 East	Maximum West	Typical Scenario
All generation facilities in Leyte and Samar Islands are set to their maximum capacities, while the conventional power plants in Negros and Panay Island are set to minimum. Generation facilities in Cebu is also maximized.	All generation facilities in Negros and Panay Islands are set to their maximum capacities, while the conventional power plants in Leyte and Samar Island are set to minimum. Generation facilities in Cebu is also maximized.	Power Generation is based on the typical output levels of power plants during system peak load.

MINDANAO Dispatch Scenarios		
Maximum North Dispatch Scenario	Dry Season Dispatch Scenario	Other Future Scenarios
Generation in the northern region especially from hydroelectric plants is optimized to achieve the maximum thermal load that the transmission corridors toward Davao and South Cotabato can accommodate	Decrease in power generated by hydro power plants from the north is augmented by available power in the grid either from the Visayas or from peaking plants in Mindanao	With the establishment of the 230 kV transmission loop network in southwestern Mindanao, the power generated from thermal sources in the region can be transmitted to other parts of the grid through the Mindanao-Visayas interconnection facilities.

Evaluation of Results and Project Proposals.

The project proposals are based on the system simulation results such as TL loading, transformer loading, substation fault level, voltage profile, system response to disturbance, among others. The system planners shall determine the necessary solutions or mitigations for the foreseen system deficiency. The following are the solutions or mitigations that can be proposed:



One important consideration in the identification of projects is the overall long-term transmission development for each grid. This is where the line-up of projects in the given planning horizon is established together with the estimated time of completion (ETC). Some projects may have to be implemented by stages or may be initially energized at a lower voltage level while waiting for the completion of other components, particularly for transmission backbone, island interconnections and looping projects but will remain consistent with the target end-state of the grid. The selected solution from the result of Grid Planning Studies, as well as the conduct of economic assessment, will form part of the documentation in the preparation/updating of the TDP.

In the case of expansion plans for Load-End Substations (LES), a direct comparison of the existing substation (SS) capacity and the load forecast determines the 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 availability in an existing SS. Moreover, the 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 substations in the grid.

The latest TDP will be used as a reference in the subsequent Regulatory Reset application of NGCP. While the TDP already provides a long list of projects needed by the network, project prioritization and project ranking are another important process and a separate exercise during the capital expenditure (CAPEX) application. This involves further assessment of various generation dispatch scenarios as stated above, assessment of the impact if a project is not implemented yet, and cost - benefit analyses (CBA).

Detailed information on the major transmission projects for the period 2024-2050 is provided in Luzon, the Visayas, and Mindanao Transmission Outlook chapters. Project components are based on the selected implementation scheme considering all the technically feasible alternatives. The determination of project components, such as the line length are based on the line routes, SS sites are based on the coordination and identification during desktop study and further assessed during the route/site selection, field investigations and route/site workability assessments. A least-cost development approach was also applied consistent with various NGCP Planning and Design Standards utilizing the database for cost estimates derived from recently completed projects and prices of materials and equipment obtained through vendor consultation.

2.3 Project Drivers

Shown in Figure 2.2 are the six project drivers for the transmission projects.

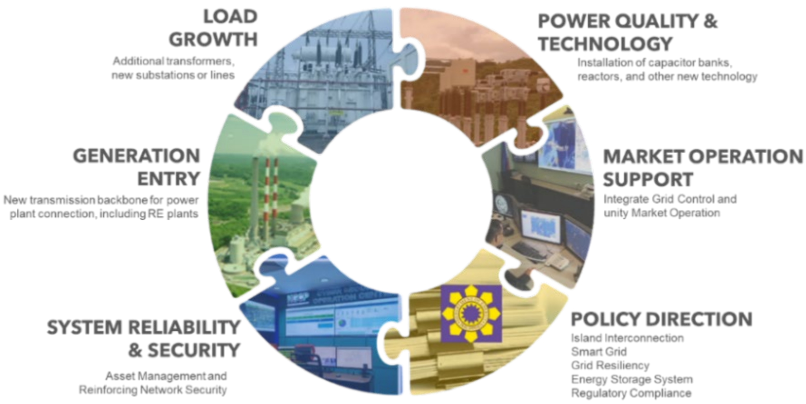


Figure 2.2: Project Driver

2.4 System Peak Demand

The annual System Peak Demand (SPD) forecast is a crucial input in the preparation of the TDP. The demand forecast for the TDP 2024-2050 adopted the SPD projections of the DOE consistent with the Draft PDP 2023-2050. The SPD is used in updating the per grid's yearly network model considering the horizon period with which all the Grid Planning Studies took off. The SPD information when incorporated in the network model would aid in the checking and verification whether the existing transmission equipment and facilities are still adequate and will also aid in identifying equipment and facilities for upgrading, expansion and new TL and SS when used during simulation.

2.4.1 Historical Demand for Electricity

Total SPD (in MW, non-coincident sum) of the Philippines shows a consistent upward trend from 2005 to 2019. However, SPD in 2020 declined by 1.92% or 299MW across all Grids – Luzon, Visayas and Mindanao. This can be largely attributed to the economic downturn brought about by the COVID-19 pandemic. The implementation of community quarantine in varying stringency levels beginning 15 March 2020 and lasting until the end of the year limited movement across the country and gravely affected the operations of commercial and industrial sectors causing the decline in demand. Demand began to recover as the Government loosened up quarantine restrictions and rolled out its COVID-19 vaccination program, leading to significant growth in 2021 and 2022. In 2023, the demand continued to rise across all grids, with Luzon, Visayas, and Mindanao registering 3.61%, 6.13%, and 7.20% increase from the 2022 level. The Average Annual Compounded Growth Rate (AACGR) for 2006-2023 was recorded at 3.74% for Luzon, 5.32% for Visayas, 3.99% for Mindanao, and 3.97% for total Philippines.

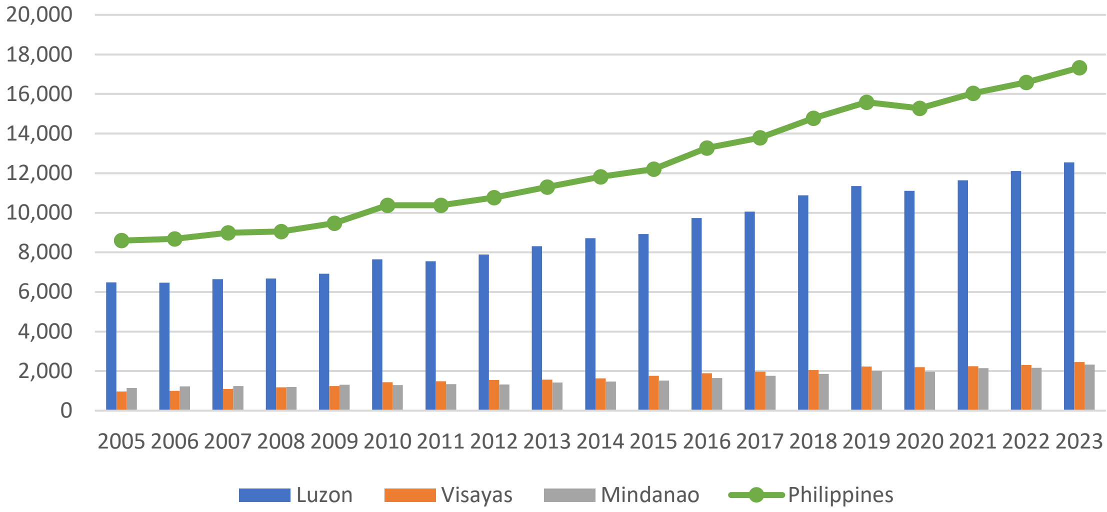
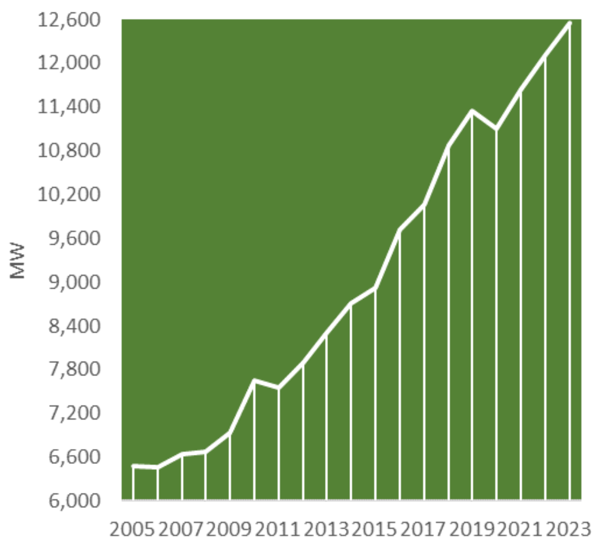


Figure 2.3: Summary of Historical Demand per Grid (2005-2023), in MW*
*includes embedded generation monitored by NGCP

2.4.2 Luzon Historical Demand

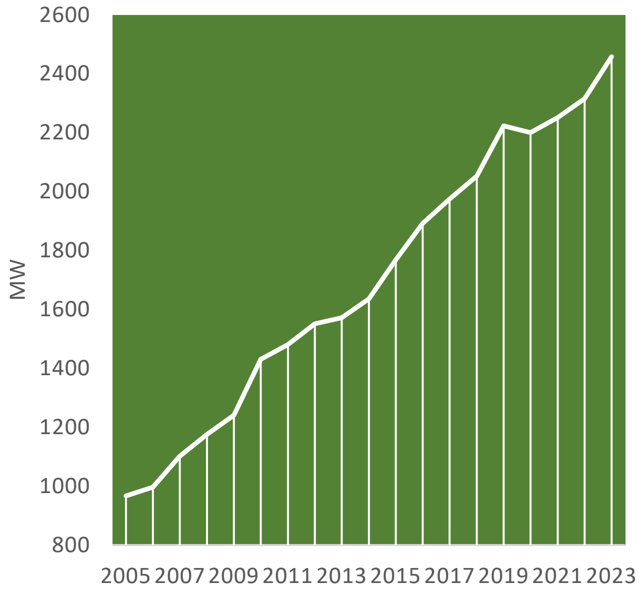
The Luzon Grid has posted an AACGR of 3.74% for the period 2006-2023. Steady growth was observed except for the decrease in 2006 and 2011 due to reduced power consumption by MERALCO during the global financial crisis and La Niña phenomenon, respectively. MERALCO's demand accounts for at least 70% of the total system peak demand (SPD) in Luzon. Demand growth in 2010 was unprecedented at 10.51%, driven by election spending, GDP growth, and El Niño's impact on summer temperatures. This growth was not sustained in 2011, with a 1.36% decline in SPD, but demand recovered with a 4.46% growth in 2012. From 2013 to 2019, Luzon saw an average annual growth of 5.36% or 507 MW. In 2020, Luzon SPD declined by 2.12% or 241MW due to community quarantines starting in March. Metro Manila, Central Luzon, and CALABARZON were under Enhanced Community Quarantine (ECQ) for three months, leading to the temporary closure of large commercial, manufacturing, and industrial establishments



during peak summer months. Metro Manila remained in General Community Quarantine (GCQ) by the end of 2020, resulting in lower electricity demand. In 2021 and 2022, demand recovered with 4.84% and 4.06% growth, respectively, as the government loosened quarantine restrictions and rolled out the COVID-19 vaccination program. The Luzon Grid recorded a 3.61% demand growth in 2023 or equivalent to 437 MW.

2.4.3 Visayas Historical Demand

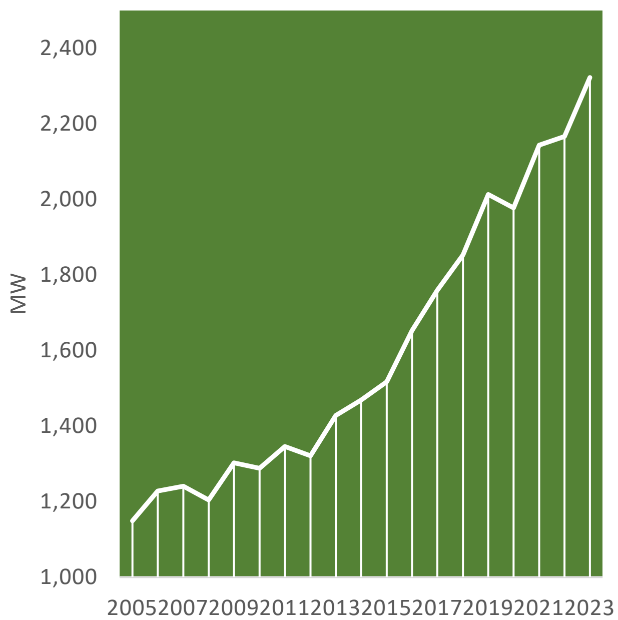
The aggregate demand for Visayas Grid has posted an AACGR of 5.32% for the period 2006-2023. The year 2010 brought a significant increase in the demand for electricity in the Visayas. Compared with the SPD recorded in 2009, Visayas Grid grew by a record high of 15.31% in 2010. This growth was attributed to improved economic activities and increased reliance on the power supply from the Grid by existing large customers with self-generation. Furthermore, the realization of a 346 MW increase in generation capacity from CEDC, KEPCO, and PEDC bolstered 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 two years (2011-2012). In 2013, the total demand in Visayas posted a meager increase of only 1.35%, largely due to the impact of Typhoon Yolanda, which struck the region in November and caused a significant decrease in power consumption. Despite the challenges, Visayas demand grew by 4.07% in the year following Typhoon Yolanda, and the demand continued to rise steadily from 2014 to 2019. The onset of the COVID-19 pandemic in 2020 led to a decreased demand of 1.03% or 23 MW, with load centers such as Cebu, Iloilo, and Bacolod City experiencing longer ECQ periods compared to other areas in Visayas. However, similar to Luzon, the demand of Visayas Grid demonstrated resilience and recorded a 2.29% increase in 2021, followed by a 2.84% increase in 2022, and a 6.13% increase in 2023. Despite the challenges such as natural disasters and the pandemic, Visayas has shown consistent growth in its electricity demand, underlining its importance in supporting the nation's economic development.



2.4.4 Mindanao Historical Demand

Mindanao Grid has posted an AACGR of 3.99% for the period 2006-2023. 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 the 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 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 also added to Mindanao. In 2017 and 2018 the demand for



Mindanao further improved and posted an increase of 6.46% and 5.28% respectively. In 2019, a 160 MW demand increase was recorded in the Mindanao Grid: the highest in terms of absolute increase in the past 14 years. Similar to Luzon and Visayas, Mindanao SPD declined by 1.76% or 35MW in 2020. ECQ was also implemented in Davao, load center in Mindanao, for some time and was under GCQ by the end of 2020. Large DUs in Mindanao, including Davao, recorded decreased demand for the period
of April to December in 2020 compared with the level recorded during the same period in 2019. In 2021, Mindanao recorded the highest percent growth in demand, across all grids, recording 8.42% growth while only 1.07% increase in demand was recorded in 2022. In 2023, the demand for electricity in Mindanao reached 2,323 MW or equivalent to 156 MW increase from its 2022 demand.

2.4.5 Forecast for TDP 2024-2050

The power demand for the country is expected to grow at an AACGR of 5.60% for the period 2024-2030, 5.95% for 2026-2030, 5.36% for 2031-2040 and 4.82% for 2041-2050. It is projected that Visayas will have the highest AACGR compared with the two other Grids. Visayas is forecasted to reach an AACGR of 5.59% for 2024-2050 while the Luzon and Mindanao Grids at 5.10% and 5.47%, respectively.

Table 2.1 shows the projected demand disaggregated per O&M District based on the transformer peak demand coincident with the System Peak. It was derived from the DOE Forecast presented in December 2023 in the Virtual Information, Education and Communication (IEC) on the Draft Power Development Plan 2023-2050. The complete set of System Peak Demand Forecast was also provided to NGCP through a letter dated 29 January 2024. A comparison of the projected load and generation capacity per area per grid is also available in Appendix 5.

Table 2.1: Projected demand per O&M District

	Area	2024	2025	2030	2035	2040	2045	2050
LUZON		13,092	13,728	18,038	23,293	29,984	38,172	48,014
MERALCO		8,716	9,114	11,261	13,825	16,972	20,836	25,580
North Luzon		3,293	3,485	5,110	7,052	9,596	12,891	16,636
1	Ilocos	250	258	376	453	594	815	1,072
2	Mt. Province	148	152	217	275	355	478	617
3	North Central	385	405	608	818	1,070	1,455	1,915
4	Cagayan Valley	334	357	526	678	885	1,210	1,584
5	West Central	602	622	811	972	1,191	1,534	1,920
6	South Central	1,480	1,597	2,451	3,714	5,328	7,177	9,251
7	North Tagalog	94	94	122	143	173	222	278
South Luzon		1,083	1,129	1,667	2,416	3,416	4,444	5,798
1	Batangas/Cavite	524	546	824	1,202	1,717	2,229	2,898
2	Laguna/ Quezon	146	152	210	285	384	496	646
3	Bicol	413	431	633	929	1,315	1,720	2,255
VISAYAS		2,538	2,687	3,753	5,047	6,634	8,503	10,678
1	Panay	476	504	705	947	1,245	1,596	2,005
2a	Cebu	1,178	1,247	1,742	2,343	3,080	3,947	4,957
2b	Bohol	111	117	164	220	290	371	466
3	Leyte-Samar	345	365	510	685	901	1,155	1,450
4	Negros	428	453	633	851	1,118	1,433	1,800
MINDANAO		2,425	2,588	3,585	4,717	6,140	7,828	9,791
1	North Western	243	276	423	592	810	1,072	1,382
2	Lanao Area	131	150	249	314	384	462	542
3	North Central	544	562	729	939	1,196	1,490	1,820
4	North Eastern	178	191	269	372	502	654	830
5	South Eastern	809	853	1,181	1,545	2,013	2,579	3,246
6	South Western	520	556	734	955	1,235	1,571	1,971
PHILIPPINES		18,055	19,003	25,376	33,057	42,758	54,503	68,483

2.4.6 Demand Projections for Substation Capacity Addition

The demand projections for SS 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 operation 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.

2.4.7 Demand Projections for Transmission Expansions

The SPD projection for each Grid is used in determining the necessary transmission expansion projects. However, for the figure to be usable in the power system analysis software, it is 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. Applicable plant station uses, and system loss were applied to the generation level to disaggregate the forecast down to the NGCP transformers. 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.

2.5 Generation Capacity Addition

This section shows the additional capacities and the proposed generating plants in Luzon, the Visayas, and Mindanao Grids. Generation Projects are classified as follows:

- 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.
- Indicative – Projects with service contracts, in the development/commercial stage but with no financing yet.
- Prospective – Projects with completed SIS as of June 2024 (See Appendix 2). These capacity additions are identified by NGCP which are not yet included in the DOE's PSIPP.

The DOE's Green Energy Auction Program (GEAP) has also contributed to this capacity expansion. Most of the projects secured through GEAP were included in the list of Committed Power Plant projects as of May 2024. This program is among the DOE strategies to achieve the RE goals of 35% capacity mix by 2030 and 50% by 2040. Section 3.4 of this report provides further details on GEAP.

It is worth emphasizing that the proponents should regularly provide the DOE with their plans and updates regarding the status of their projects for monitoring and inclusion in the official list of DOE's PSIPP. Proponents are advised to regularly coordinate with the DOE's Electric Power Industry Management Bureau.

2.5.1 New Grid-connected Power Plants

New generating power plants are linked to the grid every year to maintain the demand-supply balance in the system. Table 2.2 provides a list of the additional grid-connected capacities installed since 2023, based on the DOE data as of May 2024.

Table 2.2: List of Grid-Connected Additional Capacities from January 2023 to May 2024

Power Plant	Location	Installed Capacity (MW)	Dependable Capacity (MW)	Connection Point
LUZON		265.6	221.6	
Mariveles Coal- Unit 1	Barangay Biaan, Mariveles, Bataan	150.0	132.0	Mariveles (Alas-asin) 500 kV SS
Arayat-Mexico Solar	Barangay San Antonio, Arayat, and Barangay Buenavista, Mexico, Pampanga	43.7	30.9	Mexico–Clark 69 kV TL 2
Raslag III Solar	Barangay Bical, Mabalacat, Pampanga, and Brgy. San Jose, Magalang, Pampanga	18.0	14.4	Mexico-Clark 69 kV TL 1
Currimao Solar	Barangay Paguludan-Salindeg, Currimao, Ilocos Norte	48.1	38.5	Currimao 115 kV SS
Tibag Hydro	Barangay Cagsiay III, Mauban, Quezon	5.8	5.8	Lumban–FAMY-Infanta 69 kV TL
Trust Solar	Barangay Paralayunan, Mabalacat City, Pampanga	20.9	15.4	Mexico- Clark 69 kV TL 1
Pinugay Solar	Barangay Pinugay, Baras, Rizal	95.8	71.6	Tap connection along MERALCO-owned- Dolores - Teresa- Malaya 115 kV Sub TL
Lower Labayat Hydro	Barangay Lubayat, Real, Quezon	1.4	1.4	Famy- Comon 69 kV TL
VISAYAS		30.1	29.5	
Calbayog BCFDPP	Purok 1, Sitio Looc, Barangay Carayman, Calbayog City, Samar	11.2	10.6	Calbayog 69 kV SS
Timbaban HEPP	Barangay Ma. Cristina, Madalag, Aklan	18.9	18.9	Tap Connection to Panitan-Nabas 69 kV TL

2.5.2 Committed and Indicative Capacities

In addition to the existing capacity, table 2.3 below presents the DOE's projected committed and indicative capacities as of May 2024. Until 2030, a significant 16,895.98 MW of committed capacity is expected to contribute to the grid, with nearly half coming from renewable energy sources. Further, DOE identifies a 77.8 GW of indicative capacity that could potentially connect to the grid in the future, which is still subject to further assessment.

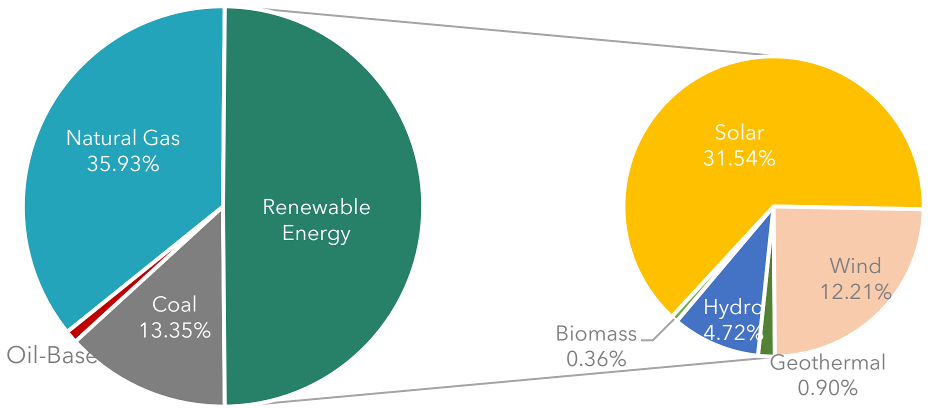


Table 2.3 Summary of Committed Power Plants as of May 2024

PHILIPPINES	COMMITTED POWER PLANT PROJECTS (MW)								
Plant Type	2024	2025	2026	2027	2028	2029	2030	TBD	TOTAL
Coal	450.00	350.00	485.00	270.00	700.00	-	-	-	2,255.00
Oil-Based	19.54	56.00	-	-	-	-	-	95.20	170.74
Natural Gas	1,320.00	-	-	-	-	1,100.00	-	3,650.00	6,070.00
Renewable Energy	2,070.850	3,042.20	2,471.36	200.80	5.30	-	532.00	77.73	8,400.24
Geothermal	81.22	28.00	-	42.00	-	-	-	-	151.22
Hydropower	80.28	101.80	-	-	5.30	-	532.00	77.73	797.11
Biomass	29.08	31.20	-	-	-	-	-	-	60.28
Solar	1,720.27	2,311.05	1,239.37	58.00	-	-	-	-	5,328.69
Wind	160.00	570.15	1,231.99	100.80	-	-	-	-	2,062.94
TOTAL	**3,860.39**	**3,448.20**	**2,956.36**	**470.80**	**705.30**	**1,100.00**	**532.00**	**3,822.93**	**16,895.98**

Table 2.4 Summary of Indicative Power Plants as of May 2024

PHILIPPINES	INDICATIVE POWER PLANT PROJECTS (MW)									
Plant Type	2023	2024	2025	2026	2027	2028	2029	2030	2031-2035	TBD	TOTAL
Coal	-	-	-	-	639.00	-	-	-	-	1,050.00	1,689.00
Oil-Based	-	60.00	-	-	-	-	-	-	-	-	60.00
Natural Gas	-	-	-	-	-	3,710.00	2,250.00	1,428.00	-	1,260.00	8,648.00
Renewable Energy	14.40	1,157.85	3,240.15	6,205.80	7,758.13	8,137.17	7,850.13	14,805.00	18,166.31	50.00	67,384.94
Geothermal	*-*	*-*	*40.00*	*-*	*105.00*	*70.00*	*-*	*-*	*120.00*	*50.00*	*385.00*
Hydropower	*-*	*-*	*-*	*123.50*	*2,823.86*	*310.00*	*1,164.00*	*2,850.00*	*44.76*	*-*	*7,316.12*
Biomass	*14.40*	*12.00*	*-*	*50.00*	*-*	*-*	*-*	*-*	*-*	*-*	*76.40*
Solar	*-*	*1,145.85*	*2,500.65*	*4,790.30*	*2,030.27*	*701.97*	*-*	*-*	*-*	*-*	*11,169.04*
Wind	*-*	*-*	*699.50*	*1,242.00*	*2,799.00*	*7,055.20*	*6,686.13*	*11,955.00*	*18,001.55*	*-*	*48,438.38*
TOTAL	14.40	1,217.85	3,240.15	6,205.80	8,397.13	11,847.17	10,100.13	16,233.00	18,166.31	2,360.00	77,781.94

Figure 2.4 below illustrates the projected timeline for these capacity additions alongside peak demand forecasts, providing valuable insights into the country's future power generation potential [2].

[2] *Based on DOE's List of Private Sector Initiated Power Projects as of May 2024*

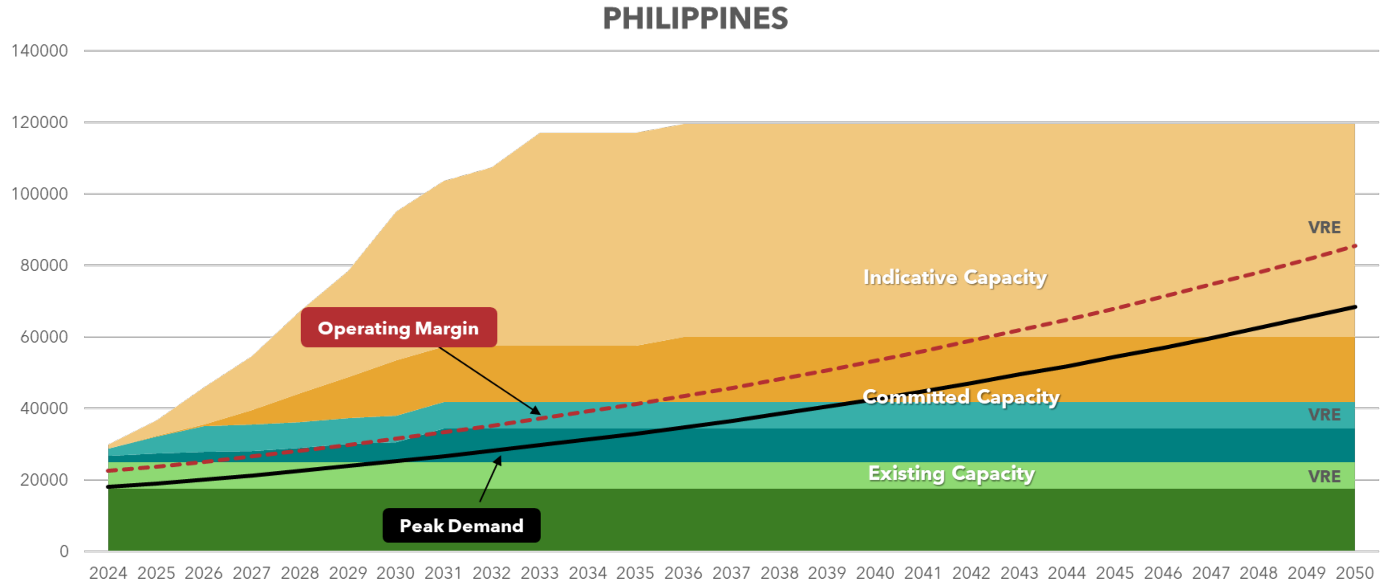


Figure 2.4: Future Power Generation Potential

It can be noted that the list includes small capacity power plants, which may not actually connect directly to the transmission system. 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 DU from NGCP Substations and would not generally require reinforcement in the transmission network.

Appendix 3 shows the detailed list of Committed Power Plants with associated transmission projects and Indicative Power Plants based on DOE's list as of May 2024. Generation projects are tagged if they are included in the DOE's GEAP and have undergone System Impact Study (SIS).

2.6 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 power plants:

- Fuel supply/transport
- Topology/geology of site
- Accessibility
- Availability of area
- Availability of cooling water
- Fresh water supply
- Security
- Environmental/Social concerns

It can be emphasized, however, that the existing transmission facilities in some generation potential areas barely have excess capacity to cater to additional power generation. This would require new transmission backbone developments to interconnect the new large capacity power plants.

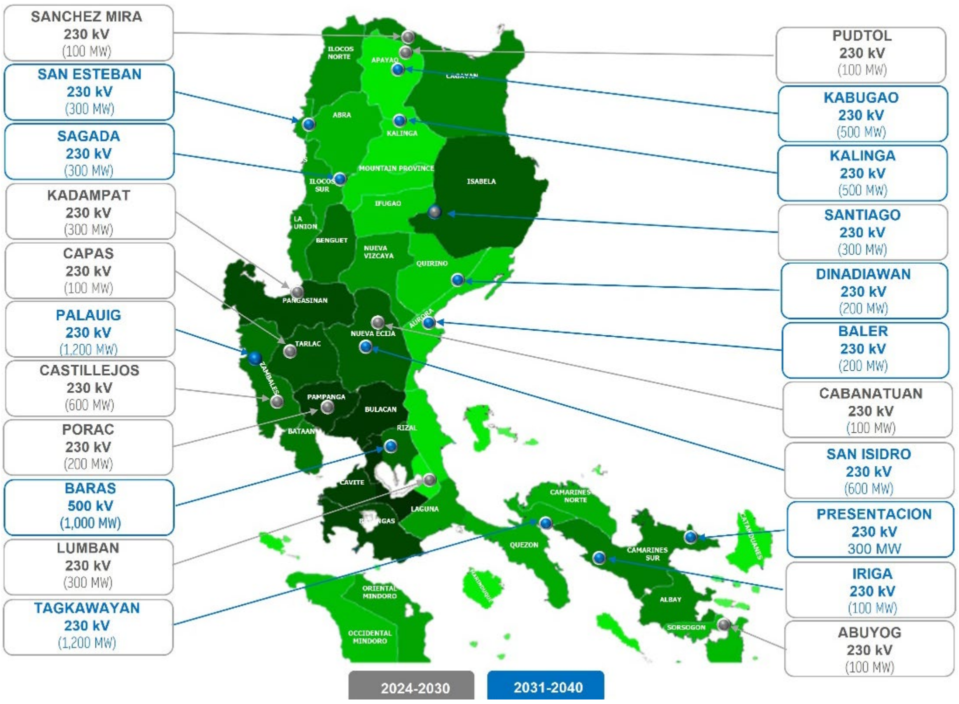


Figure 2.5: Recommended Power Plant Connection Points (Luzon) and available capacity

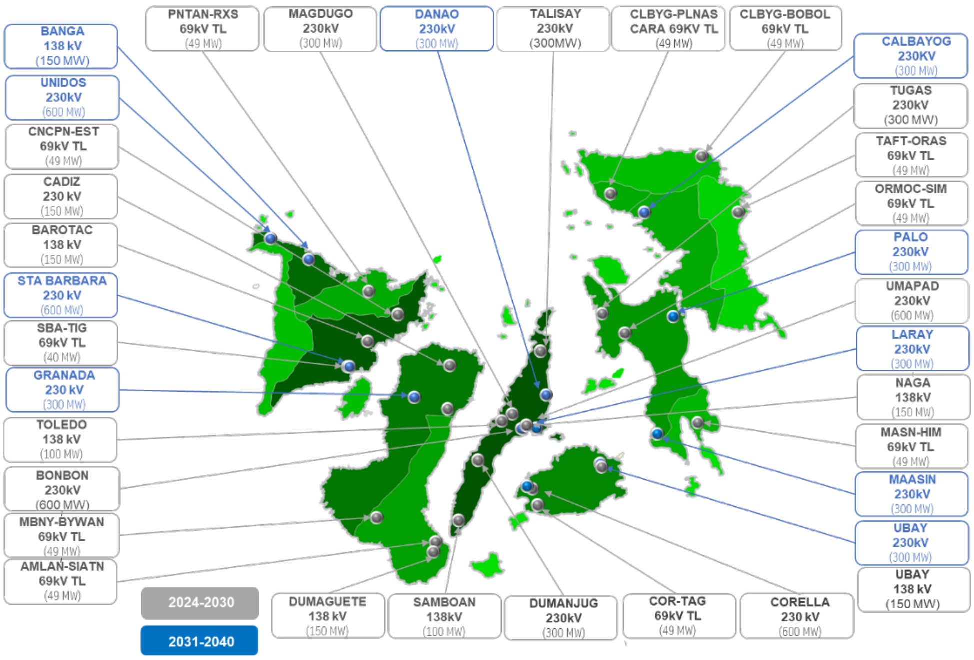


Figure 2.6 Recommended Power Plant Connection Points (Visayas) and available capacity

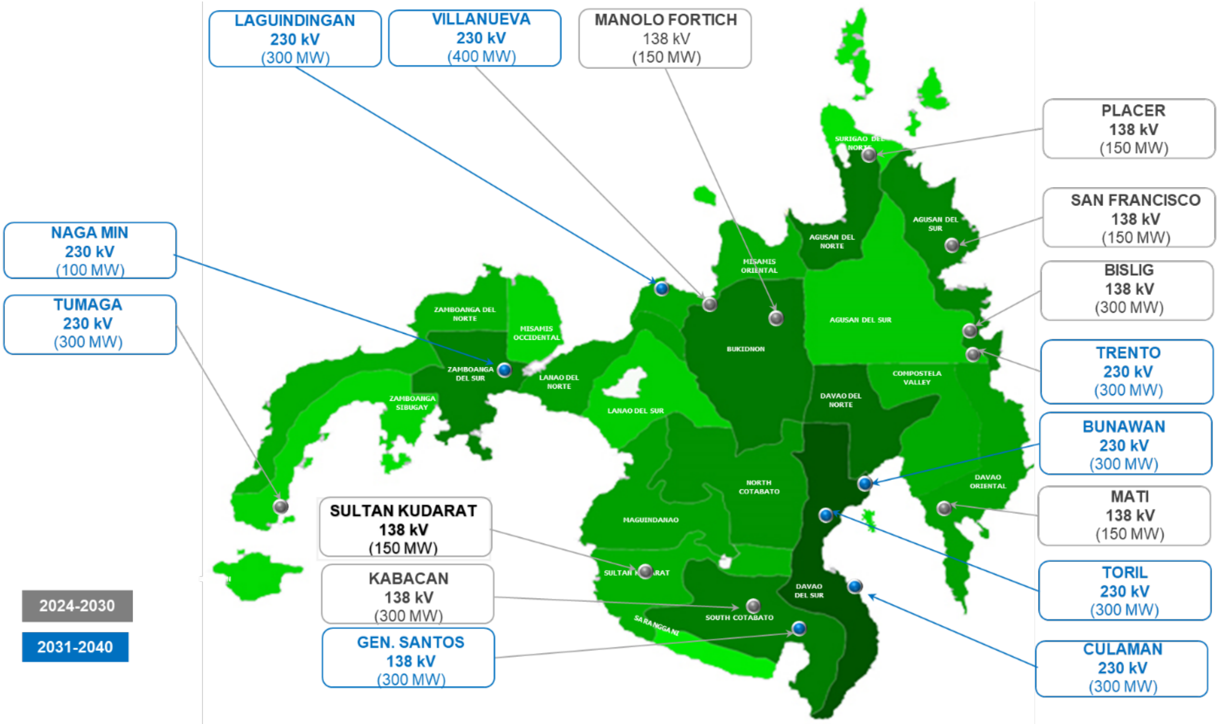


Figure 2.7: Recommended Power Plant Connection Points (Mindanao) and available capacity

2.7 Grid Resiliency

To improve the ability of the power system to withstand the adverse effects of 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 the high availability of the electricity supply service, while excellent system security gives robustness to the power system to withstand unexpected events that have severe impact and consequences.

2.7.1 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 climate change. In 2018, the DOE 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 disruptive events.

In line with this, the DOE has promulgated DOE DC 2018-01-001 "Adoption of Energy Resiliency in the Planning and Programming of the Energy Sector to Mitigate the Potential Impacts of Disasters". The DOE resiliency plans and programs are summarized as follows:

- Strengthen existing infrastructure facilities
- Incorporate mitigation improvements – "Build Back Better" principle
- Improve operational and maintenance standards and practices
- Develop resiliency standards

2.7.2 Resiliency Planning for Transmission System

Absolutely, improving the power systems' resilience and reliability is essential to guaranteeing end users will always have access to electricity, particularly in the event of unfavorable weather and other disturbances. It will take a diversified approach to do this.

This entails making investments in upgraded infrastructure to withstand severe weather, putting in place cutting-edge monitoring and control systems to quickly identify and address disruptions, and adding redundancy and backup measures to lessen the effects of malfunctioning equipment or cyberattacks.

Equally important are educating and equipping staff to handle emergencies and quickly resume operations in the case of disruptions. The enhancement of power systems' resilience and security reduces the risks and guarantees a consistent energy supply to the consumers.

To further increase the transmission system's resilience to unfavorable occurrences, new engineering techniques and technologies that are resistant to a variety of dangers can be implemented. It is critical that stakeholders, including governmental organizations, engineering firms, and communities, work together to successfully implement these solutions.

The resilience of the transmission system is primarily responsible for maintaining electricity and providing protection against increasing exposures from natural and man-made catastrophes.

The NGCP is conscious of its pivotal role in the nation's power sector, particularly about guaranteeing the uninterrupted transmission and accessibility of electrical energy to consumers. NGCP has its Resiliency Plans and Programs, which can be summed up as follows, to ensure flexibility:

- **Better Wind Speed Design for Security of Transmission Assets:** When constructing new transmission towers, following wind speed design standards ensures that these can withstand strong winds and lower the risk of damage during extreme weather events.
- **Progressive Replacement of Aging Transmission Lines:** The overall dependability and efficiency of the transmission network will be increased by gradually replacing aging transmission lines with newer, more durable types.
- **Creation of Transmission Backbone Loop:** The transmission network needs to be built with a strong backbone loop, to boost redundancy and facilitate efficient power transfer across several sites. Infrastructure for telecommunications must also be integrated.
- **Better Site and Route Selection Criteria:** Substation locations and transmission line routes are selected with an emphasis on decreased sensitivity to natural disasters and other hazards by using government-provided hazard maps.
- **Establishment of spares for Emergency Restoration System (ERS)** involves keeping important components including steel poles, mobile transformers, and high-voltage equipment in good condition so that they may be quickly restored in the event of a transmission interruption.
- **Flood Control Measures at Substations:** We can lessen the likelihood of flooding-related damage and ensure that essential infrastructure will continue to operate even in the case of inclement weather by installing flood control measures at present substations.

2.7.3 Enhancement of Transmission Line and Substation Site Selection

- During TL route selection, careful evaluation prioritizes avoiding areas prone to flood, steep slopes susceptible to soil erosions, and maintaining a safe distance from fishponds, rivers, lakes, swamps, and seashores.
- When selecting locations for SS sites, a thorough assessment is conducted to minimize the risk of flooding, including flash floods. Additionally, areas with potential pollution sources are avoided, such as industrial facilities generating harmful gases, storage sites for hazardous materials, bulk oil storage tanks, and oil/gas pipelines. Proximity to the seashore is also a consideration as it can accelerate corrosion and damage the insulation of substation equipment.
- For existing overhead transmission lines that exhibit critical function to the grid and are in areas vulnerable to typhoon and storm surges, the use of HV underground cables will be thoroughly considered.

Furthermore, NGCP selects overhead TL routes and SS sites that have minimal effect on human settlement or as much as possible, minimize the removal of vegetation or cutting of trees.

2.7.4 Increase of Transmission Towers Strength and Capacity

Considering the increasing number of super typhoons that have devastated different parts of the country in the last ten years, NGCP understands the need to strengthen the overhead transmission line support structures. The maximum Wind Speed Design (WSD) is currently based on three wind zones: Zone 1 (270 kph), Zone 2 (240 kph), and Zone 3 (160 kph). However, NGCP intends to enhance the maximum velocity design of support structures to strengthen the infrastructure against the escalating consequences of extreme weather occurrences. This tactical change demonstrates NGCP's proactive approach to maintaining the transmission network's strength and dependability in the face of climate change. By raising the WSD thresholds, NGCP aims to strengthen the resilience of overhead transmission lines, thereby mitigating the risk of structural damage and minimizing disruptions to power transmission during severe weather conditions.

In response to the increasing difficulties caused by super typhoons linked to climate change, NGCP is putting into practice several focused initiatives designed to improve the overhead transmission lines' (OHTLs') resilience in Luzon:

1. **Enhancing Wind Speed Design**: It is advised that OHTLs planned for construction in Luzon be strengthened to resist gusts of up to 300 kph. The purpose of this preventive action is to make sure that the infrastructure can withstand the effects of super typhoons and increase the region's power transmission dependability. This 300 kph wind speed design is being adopted in the Tower Structure Upgrading of Bicol Transmission Facilities and Tower Resiliency of Bicol Transmission Facilities Projects.
2. **Retrofitting Existing Transmission Towers**: To enable to withstand increased wind speeds, existing transmission towers—which were initially intended to resist wind gusts of 270 kph for three seconds—are being upgraded or retrofitted.
3. **Implementation of Anti-Pilferage Measures:** NGCP is specifying the use of anti-pilferage bolts, instead of regular connection bolts, in all towers situated up to 9 meters above ground level for 138 kV lines and up to 12 meters for lines of at least 230 kV. This measure is intended to prevent the theft of tower parts, which can potentially lead to the toppling of steel towers or poles, thereby safeguarding the integrity of the transmission infrastructure.

2.7.5 Security of Transmission Assets

As part of the planning process for transmission projects, NGCP employs a strategy to evaluate and mitigate potential hazards in areas where security concerns are common.

1. **Security study:** As a crucial step in choosing a location for a substation or a transmission line route, each proposed transmission project is subjected to a comprehensive security study. The purpose of this assessment is to find and analyze any security risks that could affect the project's development and future operation.
2. **Risk Identification**: Every potential security danger is thoroughly identified throughout the security assessment, from theft and vandalism to more significant hazards like sabotage or terrorist activities. NGCP works in conjunction with pertinent parties, such as local law enforcement and security specialists, to guarantee a thorough comprehension of the security environment within the project region.
3. **Risk Mitigation Measures:** NGCP creates customized mitigation measures to address each unique issue based on the identified security threats and the hazards that go along with them. These could involve putting in place physical security barriers or deterrents, deploying security staff, stepping up surveillance, and improving security standards.
4. **Integration with Project Planning:** The project planning process incorporates the identified security risks and mitigation strategies with ease, affecting choices on construction techniques, route selection, site layout, and operational procedures. NGCP seeks to proactively mitigate potential risks and protect the integrity and continuity of the transmission infrastructure by incorporating security considerations from the inception.
5. **Continual Evaluation and Adaptation**: NGCP monitors changes in the security environment and reassesses risk levels as needed, continuously evaluating and adapting the security landscape throughout the project lifecycle. Because of this constant watchfulness, NGCP can adjust and improve mitigation strategies as necessary to successfully address changing security threats.

To guarantee the safety, security, and dependability of its transmission projects in locations vulnerable to security threats, NGCP carries out thorough security assessments and puts strong risk mitigation measures into place.

2.7.6 Transmission Line Looping Configuration

To achieve higher system reliability, more operational flexibility in the event of natural disasters, and facilitate the linking of different power plants, NGCP's long-term transmission planning includes using different transmission looping configurations. To execute these arrangements, backbone transmission systems consisting of 500 kV, 230 kV and 138 kV lines must be developed gradually over time. As a final goal, each stage is part of multiple segments that will eventually combine to form a transmission loop.

1. **Enhanced System Reliability:** The goal of NGCP is to improve the redundancy and resilience of the transmission network by setting up transmission looping arrangements. This guarantees backup power transmission channels, lowering the possibility of extensive blackouts and enhancing the system's general dependability.
2. **Operational Flexibility in Times of Disaster**: Using looping arrangements makes it possible to be more flexible in times of disaster, especially when typhoons or earthquakes occur. Through the implementation of power rerouting and redistribution, NGCP can more efficiently lessen the effects of outages and preserve critical services in impacted areas.
3. **Staged Implementation:** As part of its long-term transmission planning, NGCP uses a staged strategy to implement looping configurations, which enables the transmission network to be gradually developed and optimized over time.

2.7.7 Use of HV Underground Cables

Underground cable installations have the potential to significantly improve power systems' resilience by lessening their vulnerability to outages during extreme weather events like powerful thunderstorms and super typhoons. However, a few obstacles prevent them from being widely used:

1. **Cost considerations:** Since underground cables require excavation and burial, their installation is significantly more expensive than that of overhead lines. The first installation of underground cables is sometimes restricted to densely populated areas where dependability is essential, and the cost outweighs the benefits.
2. **Right-of-Way (ROW) Challenges:** Obtaining the essential right-of-way for underground cable installations is a difficult task, particularly in locations that are heavily developed or populated. Underground cable routes can cause delays and issues in project implementation since they frequently call for close coordination with local government agencies, property owners, and other stakeholders.
3. **Aesthetic Concerns:** In urban and suburban settings, the aesthetic impact of above-ground infrastructure, such as overhead transmission lines, is a major factor. Since underground wires are out of sight, they provide a more aesthetically pleasing option. Underground installations' visual impact, however, also needs to be carefully considered, especially in places with historical or cultural significance. To overcome these obstacles and encourage the use of underground cable installations to improve the resilience of the power system, several strategies can be considered:
   - **Cost Optimization:** Over time, the total cost of installing underground cable installations may be lowered with continued improvements in cable technology and installation techniques. Trenchless installation methods and prefabricated cable systems are two examples of innovations that can save costs by streamlining the installation process and minimizing disturbance.
   - **Collaborative Planning:** Finding appropriate underground cable routes and streamlining the ROW acquisition process can be accomplished through cooperation between utilities, local governments, and other stakeholders. Support for underground cable projects can also be increased by interacting with the local population and attending to their concerns about aesthetics and environmental effects.
   - **Selective Deployment:** To optimize resilience benefits while controlling costs, subsurface cable deployments should be prioritized in locations vulnerable to extreme weather events or areas housing vital infrastructure. Targeting key transmission corridors, urban centers, and critical infrastructure facilities can help optimize the deployment of underground cables.

Even though installing underground cables can present difficulties, utilities and policymakers should consider them as a good option to improve power system resilience and guarantee a steady supply of electricity in the face of more frequent and severe weather events. Through strategic planning and cooperation, cost, ROW, and aesthetic factors can be addressed, and underground cable adoption can help create a more resilient power infrastructure that can weather future problems.

2.7.8 Asset Replacement

International best practices in asset assessment are incorporated into NGCP's replacement program for transmission assets, guaranteeing that decisions about asset management are optimal and well-informed. The technique used is intended to give thorough assessments of the state, functionality, and viability of transmission assets in the future, empowering NGCP to make choices that optimize the worth and dependability of its infrastructure.

Key aspects of NGCP's asset assessment methodology include:

1. **Comprehensive Assessment:** The process includes a detailed evaluation of all operating assets, considering several factors including age, condition, performance history, and projected future needs. This thorough assessment guarantees that all pertinent variables are considered during the decision-making process.
2. **Risk-Based Strategy:** NGCP uses a risk-based strategy for asset management, allocating resources and actions according to the degree of risk involved in each asset. NGCP can reduce the possibility of failures and maximize asset performance by proactively identifying and managing high-risk assets.
3. **Lifecycle Analysis:** NGCP considers the transmission assets' complete lifecycle, from acquisition and installation to use and eventual replacement. This holistic perspective allows NGCP to optimize asset investments over time, balancing short-term costs with long-term benefits and ensuring the sustainability of the transmission network.
4. **Data-Driven Decision Making:** To make decisions about asset management, NGCP uses sophisticated modeling approaches and data analytics. NGCP can recognize patterns, foresee possible problems, and maximize asset performance by utilizing condition monitoring technologies, predictive analytics, and historical performance data.
5. **Continuous Improvement:** By combining input from internal and external stakeholders, industry best practices, and cutting-edge technologies, NGCP is dedicated to continuously improving and refining its asset evaluation

approach. By using an iterative process, NGCP can stay on the cutting edge of asset management techniques and adjust to changing market conditions and industry trends.

NGCP seeks to maximize the efficiency, dependability, and economy of its transmission infrastructure by implementing global best practices in asset assessment. This will ultimately improve the resilience and sustainability of the Philippine power system.

2.7.9 Asset Condition Assessment

To precisely evaluate asset conditions, NGCP's asset management strategy builds condition criteria specific to each type of asset by utilizing asset age, defect records, and operational and maintenance data. These characteristics have been carefully chosen to reflect the major causes of asset degradation. Corresponding weights have been assigned to each parameter to indicate its relative importance.

Particularly, for different kinds of assets, such as power transformers, power circuit breakers, current and potential transformers, and shunt reactors, condition parameters and sub-condition parameters have been established following various international standards such as IEEE, ANSI, IEC, CIGRE, etc. Each asset's health index is computed using these characteristics, providing a numerical representation of its relative status.

The health index gives NGCP important information about an asset's general condition as well as its expected remaining life, allowing it to prioritize replacement and maintenance tasks according to the asset's state. NGCP can maximize the performance and lifespan of its transmission infrastructure, prevent downtime, and allocate resources more efficiently by assessing asset health in this way.

A proactive and data-driven approach to asset management is represented by the creation of condition parameters and the application of health indicators, which enable NGCP to make deft decisions that improve the resilience, efficiency, and dependability of the Philippine power system.

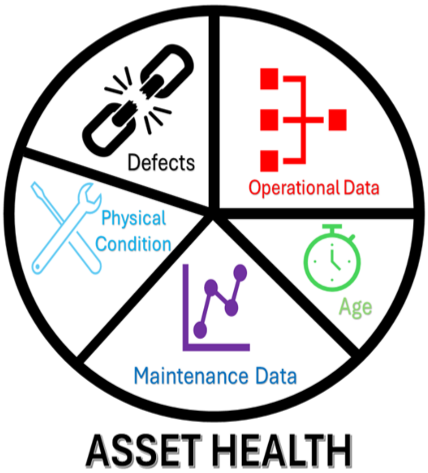


Figure 2.8: Asset Health Composition

2.7.10 Asset Prioritization

By calculating an asset's relative state and assigning it a health index, NGCP's asset management technique assigns priority to individual assets. When an asset's value drops below a minimum threshold, it's evaluated further to see if it needs to be replaced or maintained. Since this technique concentrates on evaluating the state of current assets rather than installing new installations, only replacement programs are considered for assets evaluated under this methodology. NGCP identifies and solves the most important maintenance, and replacement needs within its transmission infrastructure by using the health index as a quantitative measure of asset condition.

Furthermore, NGCP creates precise standards for figuring out when assets need to be attended to or intervened in an emergency by establishing a minimum threshold for asset condition. By taking a proactive stance, NGCP can reduce downtime, maximize asset performance, and uphold the power system's resilience and dependability.

2.7.11 Standard Asset Lives and Asset Database

In the initial stages of developing an asset refresh program, NGCP considered the standard asset lives adopted during the 2008 re-valuation of transmission assets for the 3rd Regulatory Period (2011-2015). Appendix 8 provided a summary of these asset lives and Figure 2.9 shows the age profile of overhead transmission lines (OHTLs) with voltages ranging from 13.8 kV to 500 kV.

NGCP made use of the Enterprise Asset Management (EAM) program to support the asset refresh program which acts as a centralized platform for tracking, managing, and improving asset's condition and use. Utilizing the information included in the EAM system, NGCP can make well-informed decisions on the replacement or refurbishment of its transmission assets by gaining important insights into the operation and condition of such assets.

In the future, NGCP intends to develop a system-based tool that can do sophisticated data analytics to improve its asset management capabilities. NGCP will be able to systematically identify and prioritize assets for replacement based on variables including age, condition, and criticality in this platform, which will promote corporate-wide priority of aging transmission infrastructure. Through the application of data analytics, NGCP can maximize the effectiveness of its asset renewal program, guaranteeing the effective distribution of resources and the transmission network's continuous dependability.

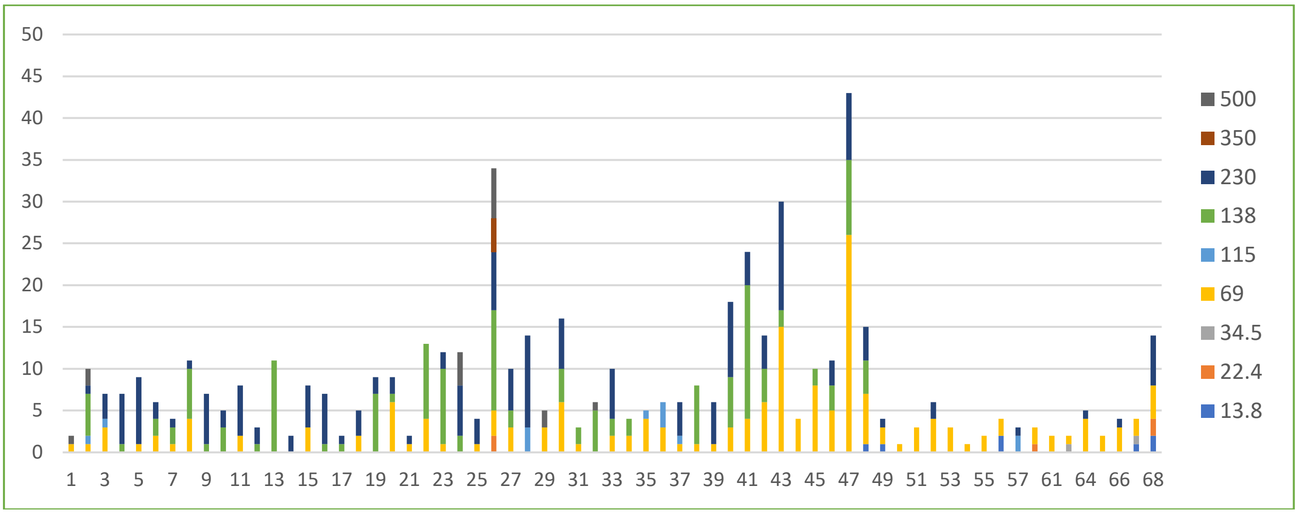


Figure 2.9: Overhead Transmission Line Age Profile (May 2024)

2.8 69 kV Facilities

One significant reform of EPIRA in the power sector pertains to the handling of 69 kV subtransmission assets, which are to be operated and maintained by the National Transmission Corporation (TransCo) until they are divested to qualified distribution utilities. TransCo has a timeline of two years (from EPIRA's effectivity or open access, whichever is earlier) to negotiate and transfer these assets and associated responsibilities to qualified buyers.

The ERC also issued the Guidelines to the Sale and Transfer of the TransCo's Subtransmission Assets and the Franchising of Qualified Consortiums on October 17, 2003, to establish the approval process of the sale and transfer of subtransmission assets to distribution utilities. This is later amended by ERC Resolution no. 15, series of 2011 with objectives to:

- Ensure continued quality, reliability, security, and affordability of electric service to end-users
- Ensure the transparent and reasonable prices of electric service in a regime of free and fair competition and to achieve greater operational and economic efficiency
- Enhance the inflow of private capital and broaden the ownership base of subtransmission assets
- Provide for the orderly and transparent sale and transfer of subtransmission assets of TransCo or NGCP to qualified buyers

The ERC's determination for the 2nd Regulatory Period (2006 - 2010) indicates that TransCo is not expected to finance further sub transmission projects after a certain timeframe. This is because the costs of these assets are to be borne solely by connected customers, who will eventually acquire them. Hence, customers requiring installation or upgrades of subtransmission assets will undertake these projects themselves.

As a way forward, short and long-term plans by NGCP and the DU need to be realized to comply with the EPIRA and transmission regulations set by the ERC
.

Short-Term	Long-term
• **Co-location:** Sharing space at DU substations for NGCP-operated capacitors, potentially improving efficiency and reducing land use. • **Line Upgrade:** Building new 69 kV lines or reconditioning existing ones to enhance capacity and reliability. • **Real-time monitoring:** Installing Remote Terminal Units (RTUs) at Large Electricity Users (LES) to facilitate market operations and grid management. • **Metering relocation:** Implementing ERC Resolution 23/2016, potentially improving metering accuracy and efficiency.	• **NGCP substations:** Building new substations to provide DUs with alternative power sources and enhance grid resiliency. • **LES capacitor integration:** Encouraging LES to incorporate capacitors in their new developments, improving power quality and reducing losses. • **DU line expansion:** Encouraging DUs to build additional outgoing lines from existing NGCP substations, potentially improving distribution capacity and reducing congestion.

2.9 Project Clustering

NGCP prioritizes efficient resource allocation for its transmission projects. To achieve this, NGCP implements a strategic project clustering approach based on their geographic location that are categorized on the following major cluster groups and further detailed in Appendix 1:

Table 2.4: Project Clusters

North Luzon 500/230 kV Transmission Projects for Reliability 1	North Luzon 500/230 kV Transmission Projects for Reliability 2	North Luzon 500/230 kV Transmission Projects for Reliability 3	North Luzon 230kV/115 kV Transmission Projects for Reliability
South Luzon 500/230 kV Backbone Project for Resiliency and System Reliability	South Luzon 230/115 kV Transmission Project for Resiliency and System Reliability	Metro Manila Backbone (North) Projects for Resiliency System Reliability and Smart Grid Development	Metro Manila Backbone (South) Projects for Resiliency System Reliability and Smart Grid Development
Metro Cebu 230/138 kV Backbone Projects for Resiliency, System Reliability and Island Interconnection	Leyte, Samar and Bohol 230/138 kV Backbone Projects for Resiliency, System Reliability, and Island Interconnection	Negros and Panay 230/138 kV Backbone Projects for Resiliency, System Reliability, and Island Interconnection	Northeastern Mindanao 230/138 kV Backbone Project for Resiliency, System Reliability, and Island Interconnection
Northwestern Mindanao 230/138 kV Backbone Project for Resiliency, System Reliability, and Island Interconnection	Southeastern Mindanao 230/138 kV Backbone Project for Resiliency, System Reliability, and Island Interconnection	Southwestern Mindanao 230/138 kV Backbone Project for Resiliency, System Reliability, and Island Interconnection	

By establishing project clusters in Luzon, the Visayas, and Mindanao, NGCP takes a proactive approach towards optimizing resource utilization and achieving cost-effective grid development. Skilled personnel, contractors, and material suppliers can efficiently serve multiple projects within a cluster. This not only reduces redundancy but also promotes knowledge exchange. Lessons learned and best practices from one project can be readily applied to others, accelerating overall project implementation.

Chapter 3 RENEWABLE Energy

In pursuit of energy security and a sustainable future, the Philippines' National Renewable Energy Program (NREP) aims for a 35 percent share of RE in the power generation mix by 2030 and a 50 percent share by 2040. To help realize these goals, the government introduced policies and programs, including the Philippine Competitive Renewable Energy Zones (CREZ) and the Green Energy Auction Program (GEAP). These government initiatives, supported by DOE's Department Circular 2022-11-0034 that allowed 100% foreign ownership of RE plants, resulted in the increased participation of private sectors in RE development, thus the influx of RE project proposals.

3.1 Competitive Renewable Energy Zone (CREZ)

The general objectives and principles behind the CREZ were adapted from the DOE's Department Circular 2018-09-0027, entitled Establishment and Development of CREZ in the Country. The CREZ Process intends to:

- Identify abundant high-quality, economic RE resources
- Reduce RE deployment barriers
- Improve national coordination for power system planning
- Enhance opportunities for RE investment

The Zone Working Group (ZWG) selected candidate Competitive RE Zones, which are geographical areas that enable the development of profitable, cost-effective, grid-connected RE. These zones were prescreened for high-quality resources, suitable topography, potential land-use constraints, and demonstrated private developer interest, thereby reducing overall feasibility assessment costs. From 34 candidate CREZ, the ZWG selected 25 CREZ in the Philippines.

Since traditional transmission planning could not efficiently support the RE developments mainly due to misalignment in terms of planning and construction time of RE and transmission facilities, both the transmission development and Variable Renewable Energy (VRE) projects go through circular dilemmas when these two do not meet (see Figure 3.1 Circular Dilemma [3]). By evaluating the transmission needs of the system, as opposed to upgrading the system incrementally based on the needs of specific projects, costs will be reduced while amplifying the benefits [4]. As part of the CREZ Process, the Transmission Working Group developed transmission expansion options that could provide sufficient transfer capability to accommodate the CREZ. Figure 3.2 shows the identified CREZ in the Philippines and the associated transmission projects.

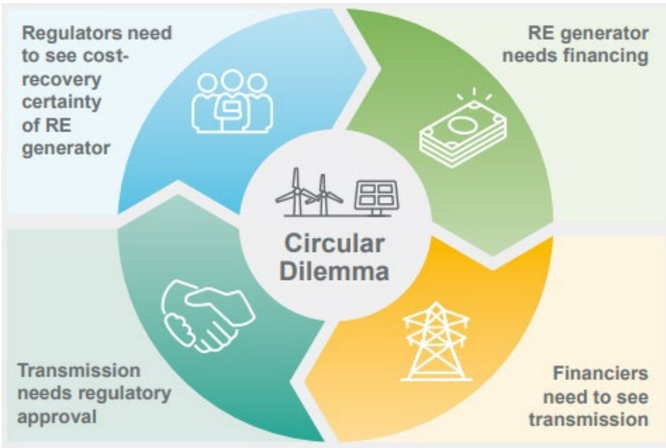


Figure 3.1: Circular Dilemma

[3] Source: Ready for Renewables: Grid Planning and CREZ in the Philippines

[4] Lee et al. (2020). Ready for Renewables: Grid Planning and CREZ in the Philippines

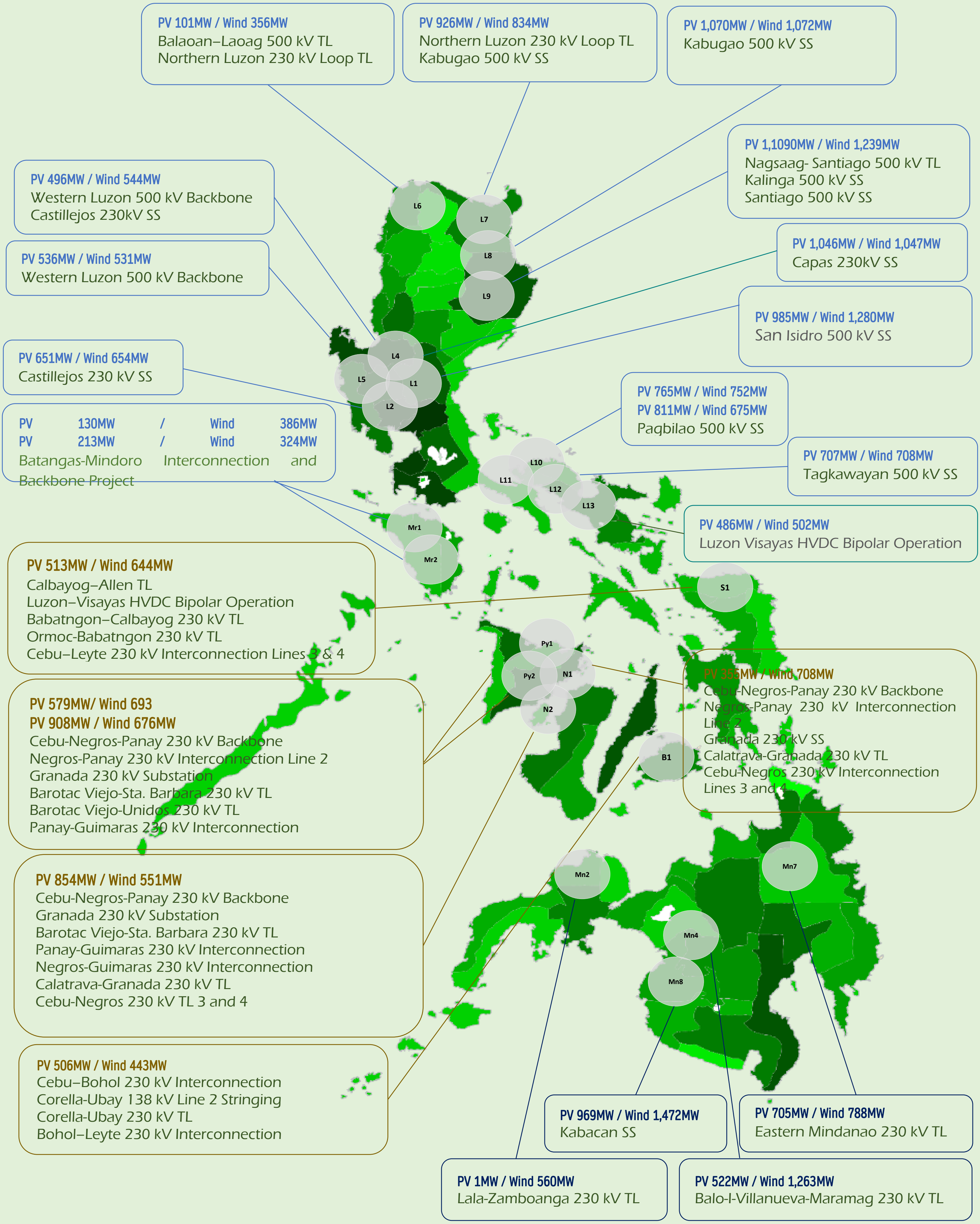


Figure 3.2: CREZ Approximate Location and Associated Transmission

Table 3.1: CREZ Location and Associated Transmission with ETCs

CREZ	PV (MW)	WIND (MW)	Associated Transmission Project	ETC
LUZON				
L1	985	1,280	• San Isidro 500 kV Substation	• 2031-2040
L2	651	654	• Castillejos 230 kV Substation	• Dec 2025*
L3	496	544	• Western Luzon 500 kV Backbone	• Jun 2027*
L4	1,046	1,047	• Capas 230kV Substation	• Dec 2029*
L5	536	531	• Western Luzon 500 kV Backbone • Palauig 500 kV Substation	• Jun 2027* • Dec 2033*
L6	101	356	• Balaoan–Laoag (Burgos) 500 kV Transmission Line • Northern Luzon 230 kV Loop Transmission Line	• Mar 2028* • Mar 2028*
L7	926	834	• Northern Luzon 230 kV Loop Transmission Line • Kabugao 500 kV Substation	• Mar 2028* • 2041-2050
L8	1,070	1,072	• Kabugao 500 kV Substation	• 2041-2050
L9	1,109	1,239	• Nagsaag- Santiago 500 kV Transmission Line • Kalinga 500 kV Substation • Santiago 500 kV Substation	• Oct 2031* • 2031-2040 • 2031-2040
L10	765	752	• Pagbilao 500 kV Substation	• Completed
L11	811	675		
L12	707	708	• Tagkawayan 500 kV Substation	• Feb 2033 *
L13	486	502	• Luzon Visayas HVDC Bipolar Operation	• Dec 2032*
Mr1	130	386	• Batangas-Mindoro Interconnection and Backbone Project	• Stage 1: Sep 2027
Mr2	213	324		• Stage 2: Dec 2030
Sub-Total	10,032	10,904		
VISAYAS				
B1	506	443	• Cebu–Bohol 230 kV Interconnection • Corella-Ubay 138 kV Line 2 Stringing • Corella-Ubay 230 kV TL • Bohol–Leyte 230 kV Interconnection	• Dec 2024 • Sep 2030* • 2031-2040 • 2031-2040
N1	355	708	• CNP 230 kV Backbone • Negros Panay 230 kV Interconnection Line 2 • Granada 230 kV Substation • Calatrava-Granada 230 kV TL Project • Cebu-Negros 230 kV Interconnection Line 3 and 4	• Completed • Completed • Jun 2030* • 2031-2040 • 2031-2040
N2	854	551	• CNP 230 kV Backbone • Granada 230 kV Substation • Calatrava-Granada 230 kV TL Project • Barotac Viejo- Sta. Barbara 230 kV TL Project • Panay- Guimaras 230kV Interconnection • Negros- Guimaras 230kV Interconnection • Cebu–Negros 230 kV Interconnection Line 3 and 4	• Completed • Jun 2030* • 2031-2040 • 2031-2040 • 2031-2040 • 2031-2040 • 2031-2040
Py1	579	693	• CNP 230 kV Backbone	• Completed
Py2	908	676	• Negros–Panay 230 kV Interconnection Line 2 • Granada 230 kV Substation • Barotac Viejo- Sta. Barbara 230 kV TL Project • Panay- Guimaras 230kV Interconnection • Barotac Viejo-Unidos 230 kV TL	• Completed • Jun 2030* • 2031-2040 • 2031-2040 • Stage 1: Dec 2029* • Stage 2: May 2033*
S1	513	644	• Calbayog–Allen TL Project • Luzon–Visayas HVDC Bipolar Operation • Babatngon-Calbayog 230 kV TL Project • Ormoc- Babatngon 230 kV TL Project • Cebu–Leyte 230 kV Interconnection Lines 3 and 4	• Dec 2027 • Dec 2032* • 2031-2040 • 2031-2040 • Stage 1: Dec 2029* • Stage 2: Dec 2031*
Sub-Total	3,715	3,715		
MINDANAO				
Mn2	1	560	• Lala – Sta. Clara –Tumaga 230 kV Transmission Line Project (formerly Lala-Naga-Zamboanga 230 kV Transmission Line Project)	• Jul 2034*
Mn4	522	1,263	• Balo-I–Villanueva–Maramag 230 kV Transmission Line	• Completed
Mn7	705	788	• Eastern Mindanao 230 kV Transmission Line	• Oct 2032*
Mn8	969	1,472	• Kabacan Substation	• Jan 2029*
Sub-Total	2,197	4,083		
Total	15,944	18,702		
PHILIPPINES	34,646			

Regulatory approval is one crucial requirement for meeting the projects' ETC (Estimated Time of Completion) in the TDP. For projects awaiting regulatory approval, it should be noted that the indicated ETC (month-year) assumes that ERC approval was issued in September 2024.

3.2 Offshore Wind Potential in the Philippines

In April 2022, the DOE and the World Bank Group (WBG) released the Offshore Wind (OSW) Roadmap for the Philippines, which provides a strategic analysis of the OSW development potential in the Philippines, considering the opportunities and challenges under different hypothetical OSW growth scenarios. The roadmap aims to provide evidence to support the Government of the Philippines in establishing policies, regulations, processes, and infrastructure to enable the successful growth of this new industry.

According to WBG's study, the Philippines' total technical potential OSW resource is estimated at 178 GW considering only the wind speed and water depth and neglecting other technical, environmental, social, or economic constraints. Potential OSW development zones are shown in Figure 3.3 along with key environmental, social, and technical considerations, and listed in Table 3.2.

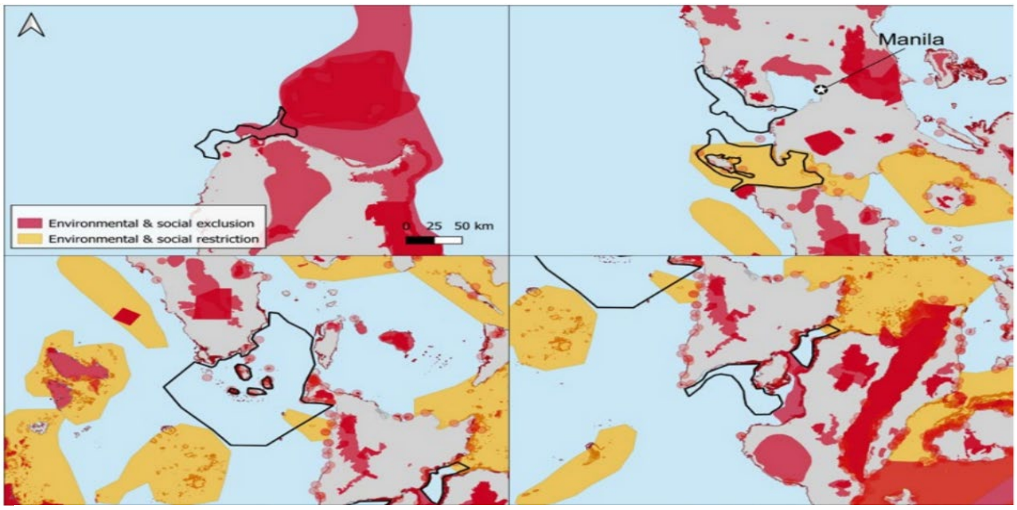


Figure 3.3 Potential Offshore Zones with Key Considerations

Table 3.2: Potential Offshore Zones

Area	Overall Impact of Considerations	Practical Capacity
Northwest Luzon	Marginal - shipping routes on western edge	2 to 5 GW
Manila	Severe - shipping routes	0 to 3 GW
Northern Mindoro	Significant - undersea cables and shipping routes	3 to 10 GW
Southern Mindoro	Marginal - shipping lanes, cables, and ecological	20 to 36 GW
Guimaras Strait	Significant - ecology, shipping, and proximity to shore	0 to 1 GW
Negros/Panay West	Marginal - shipping routes and cables	2 to 3 GW

As of March 2024, the DOE has awarded 92 OSW service contracts with an aggregate potential capacity of 65.049 GW. Among the awarded service contracts are OSW plants spread mainly in north of Luzon, west of Metro Manila, north and south of Mindoro, Guimaras Strait, Negros and Panay. Out of these 92 contracts, four were awarded to fully foreign-owned companies. The target period of entry of the proposed OSW plants is from 2026 to 2033.

It can be noted that the huge potential for OSW development is on top of the CREZ capacity earlier established. In effect, the planned green transmission system would require exploring further network modifications, e.g., extension of the 500 kV backbone up north and locating the new 500 kV substation closer to OSW locations instead of connecting at Laoag 230 Substation, the use of 500 kV backbone within Mindoro Island instead of 230 kV design only. As tapping the OSW resources would require massive transmission backbone development, further coordination with the DOE will be undertaken in updating the transmission build-out. The coordination would include the possible inclusion of OSW in CREZ and update of the generation expansion plan that will serve as guide in the prioritization of generation and transmission projects.

Appendix 4 provides the list of OSW projects that have undergone System Impact Study as of September 2024 and includes information on their connection points and associated transmission project.

3.3 Floating Solar in the Philippines

In recent years, floating solar power plants have grown popularity with their main advantage—solving land issues associated with ground-mount solar power plants—as they do not require valuable land space. These are installed where the water is very calm, such as lakes, hydro dam reservoirs, and wastewater treatment ponds.

In its memorandum on 02 February 2022, the Laguna Lake Development Authority (LLDA) offered an initial pre-determined area of about 2,000 hectares in Laguna De Bay for floating solar projects. Based on the memorandum, an RE developer applicant will be allocated a maximum of 100 hectares per block. The location of the solar projects would be 200 meters away from the lake's shoreline, with a 10.5-meter elevation requirement.

With the initial offering of LLDA in Laguna de Bay alone, approximately 2 GW in total will be added to the installed generation capacity in the country. Other locations being explored by the developers include the Mapanuepe Lake in San Marcelino Zambales and a 90-hectare fishpond in Cadiz City, northern Negros Occidental.

3.4 Green Energy Auction Program

The GEAP was issued on 03 November 2021 through DC No. DC2021-11-0036. It aims to foster greater private sector participation through the transparent and competitive selection process of RE suppliers and to accelerate the development of RE projects, ensuring that projects will be awarded at reasonable costs.

On 17 June 2022, the first auction round of GEAP or GEA-1 was conducted through an electronic bidding platform. The GEA-1 generated a total of 1,866.13 MW RE capacities from various RE resource types such as hydro, biomass, solar, and wind. The winning bidders will deliver energy in the period 2023-2025 at a competitive price lower than or equal to the Green Energy Auction Reserve prices set by the ERC. Table 3.3 shows the total awarded capacity per RE technology under GEA-1.

Table 3.3 GEA-1 Total Awarded Capacity per RE Technology

Technology	Capacity (MW)
Hydro	99.15
Biomass	3.40
Solar	1,490.38
Wind	273.20
Total	1,866.13

Similarly, the second round of GEAP or GEA-2 was also conducted on 3 July 2023 and the Notice of Award was issued by the DOE on 12 July 2023. The GEA-2 generated a total of 3,442.756 MW RE capacities from various RE resource types, such as solar (ground, roof-mounted and floating) and onshore wind. The winning bidders will deliver energy in the period 2024 to 2026 at a competitive price. Table 3.4 shows the total awarded capacity per RE technology under GEA-2.

Table 3.4 GEA-2 Total Awarded Capacity per RE Technology

Technology	Capacity (MW)
Ground-Mounted Solar	1,878.982
Rooftop Solar	9.390
Floating Solar	90.000
Onshore Wind	1,464.384
Total	3,442.756

The third round of GEAP or GEA-3, whose auction proper is scheduled in 2024, will cater to non-feed-in tariff (non-FIT) eligible RE technologies such as geothermal, impounding hydro and pumped-storage hydro. GEA-3 will also allow the inclusion of FIT run-of-river (ROR) hydro. The estimated capacities for each technology are 699 MW from impounding hydro; 3,120 MW from pumped-storage hydro; and 380 MW from geothermal. Meanwhile, 200 MW will be auctioned off for ROR hydro. The DOE set the delivery commencement period (DCP) for impounding hydro and pumped-storage hydro from 2028 to 2030, and for geothermal from 2024 to 2030. The DCP for ROR hydro is targeted between 2026 and 2028.

3.5 Grid's Readiness with the Penetration of Renewable Energy Resources

While the projected increase in the penetration of RE resources is encouraging, the intermittent nature of RE resources, particularly VRE, poses new challenges for grid planning and operation. It requires strengthening the transmission network through expansion and upgrades. The development of strong transmission backbones in Luzon, the Visayas, and Mindanao Grids, as well as significant stretches of interconnection lines through submarine cables, are the minimum requirements to ensure an efficient energy transmission from various potential RE development zones to the loads throughout the Philippines.

Operational flexibility is also crucial in addressing the additional net-load variability and reduced system inertia brought by VRE. Advanced forecasting to reduce the uncertainty of VRE, deployment of more flexible and fast-acting energy storage systems, and the application of STATCOM and grid-forming technologies are among the options to improve operational flexibility.

The NGCP is already considering RE developments in grid planning and operation. Further studies are being conducted to understand the potential impacts of high penetrations of RE and to identify solutions that will address RE integration challenges, thus meeting the target RE generation mix set by the government.

Chapter 4 TECHNOLOGY Application

4.1 Battery Storage

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 Energy Storage System (ESS), among others. It recognizes that ESS technologies are applied to serve a 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 Variable Renewable Energy (VRE) 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. In April 2023, considering the need to enhance the ESS policy and regulation to accommodate the development of ESS for RE integration and grid stability, the DOE issued Department Circular No. DC2023-04-0008 entitled, "Prescribing the Policy for Energy Storage System in the Electric Power Industry", that is an enhancement to the operationalization of Department Circular No. DC2019-08-0012.The Battery Energy Storage System (BESS) is one of ESS technologies with various applications for the transmission system, such as provision of AS, transmission facility upgrades deferment, and transmission congestion relief.

The increasing penetration of VRE has the potential to cause significant degradation of the power system performance due to their intermittent nature, which necessitates an increase in the required flexible generation. With a focus on large-scale wind and solar power generation connected to the grid, the rapidly varying power output depending on many factors results 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 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. Furthermore, BESS, when connected to appropriate nodes may defer the need for additional transmission facility upgrades by supplying the peak demand of end-users through BESS. It can also mitigate or eliminate transmission congestion when power demand exceeds the transmission network capability which may lead to a violation of thermal or voltage stability. Thus, BESS appears to offer one of the most flexible providers of AS to the transmission system.

In compliance, NGCP recommended sites and capacities for BESS in various locations in the grid. A total of 450 MW capacities on these recommended sites in Luzon, the Visayas and Mindanao. While there are recommended sites provided by NGCP, there are other BESS all over the Philippines that are being developed. Currently, there is about 468MW of existing BESS total capacity which includes development in the NGCP recommended sites and other locations. Based on the latest DOE Data, there are over 4000 MW of additional proposed capacities (indicative and committed) in the coming years which can support the integration of VREs.

4.1.1 NGCP's Recommended Sites and Capacities for BESS

4.1.1.1 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, taking into consideration the existing transmission capacity and planned upgrading.

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

- No overloading of transmission facilities once the BESS are connected and operating as a load and as a generator
- The resulting voltages are within the PGC prescribed limits
- Substation termination is available.

4.1.1.2 BESS Application

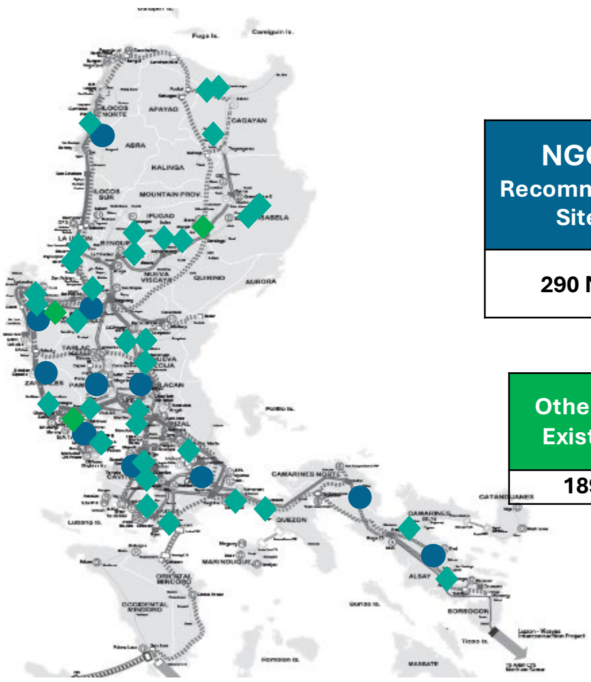
The NGCP initially identified BESS's application as a provision for AS, particularly as a reserve. Considering the forthcoming transition to new AS classifications, i.e., primary, secondary, and tertiary reserves, and with BESS's fast response and flexibility, it is initially seen to be well suited as a primary reserve. Further studies will be conducted to explore other applications of BESS, e.g., transmission congestion solution and transmission facility upgrades deferment.

4.1.1.3 Recommended, Existing, and Proposed Sites and Capacities of BESS

Below are the updates on the recommended BESS as well as the existing and proposed BESS in Luzon, the Visayas and Mindanao Grids based on the DOE data of May 2024. The list and locations of BESS are included in Appendix 9.

Table 4.1: Summary of Recommended, Existing and Proposed BESS

GRID	Site Capacity		Existing BESS (MW)	Proposed BESS (MW)		With SIS Application (MW)
				Indicative	Committed	
LUZON	NGCP Recommended	290 MW	150.80	150.00	370.00	120.00
	Other Sites		189.90	1,574.60	970.00	260.60
VISAYAS	NGCP Recommended	70 MW	74.70	77.50	40.00	70.00
	Other Sites		47.00	789.40	270.00	400.00
MINDANAO	NGCP Recommended	90 MW	24.30	50.00	20.00	20.00
	Other Sites		91.80	68.00	200.00	-
Total		**450 MW**	**578.5**	**2,709.50**	**1,870.00**	**870.60**

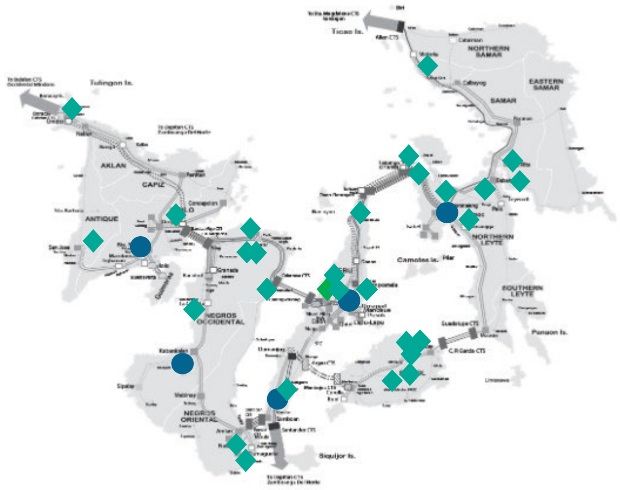


NGCP Recommended Sites	NGCP Recommended Sites Existing BESS	NGCP Recommended Sites Proposed BESS: 520 MW	
		Committed	Indicative
290 MW	150.8 MW	350 MW	170 MW

Other Location Existing BESS	Other Locations Proposed BESS: 2,544.6 MW	
	Committed	Indicative
189.9 MW	970 MW	1,574.60 MW

With SIS Application
380.6 MW

Figure 4.1: Recommended BESS Capacity (MW) and Sites in Luzon

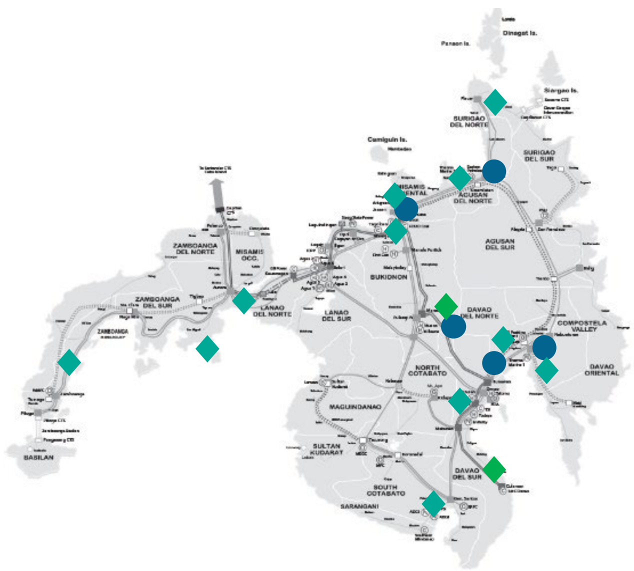


NGCP Recommended Sites	NGCP Recommended Sites Existing BESS	NGCP Recommended Sites Proposed BESS: 117.5 MW	
		Committed	Indicative
70 MW	74.7 MW	40 MW	77.5 MW

Other Location Existing BESS	Other Locations Proposed BESS: 1,059.4 MW	
	Committed	Indicative
47 MW	270 MW	789.4 MW

With SIS Application
470 MW

Figure 4.2: Recommended BESS Capacity (MW) and Sites in Visayas



NGCP Recommended Sites	NGCP Recommended Sites Existing BESS	NGCP Recommended Sites Proposed BESS: 70 MW	
		Committed	Indicative
90 MW	24.3 MW	20 MW	50 MW

Other Location Existing BESS	Other Locations Proposed BESS: 268 MW	
	Committed	Indicative
91.8 MW	200 MW	68 MW

With SIS Application
20 MW

Figure 4.3: Recommended BESS Capacity (MW) and Sites in Mindanao

4.2 Static Synchronous Compensator

Static Synchronous Compensator (STATCOM) is a Flexible AC Transmission System (FACTS) device used as a fast-acting shunt compensator in the power system. Applications of STATCOM include power factor correction, reactive power control, damping of low-frequency power oscillations, active harmonic filtering, flicker mitigation and power quality improvements.

4.2.1 List of Proposed Installations

The NGCP has been conducting studies on the applications of STATCOM to the transmission system, particularly on how this technology will help ensure voltage stability and power quality in the grid. Table 4.2 shows the initial list of proposed STATCOM installations in Luzon, the Visayas and Mindanao Grids.

Table 4.2: Proposed STATCOM Installations

Grid	Substation	Voltage Level	Capacity (MVAr)	Project	ETC
Luzon	Laoag SS	230 kV	75	Northern Luzon 230 kV Loop	Mar 2028*
Visayas	Calbayog SS	138 kV	20	Visayas Voltage Improvement Project 2	Aug 2029*
	Naga SS		40		
	Sta. Barbara SS		40		
Mindanao	Zamboanga SS	138 kV	200	Zamboanga Peninsula Voltage Improvement Project	Apr 2027*

**Regulatory approval is one crucial requirement for meeting the projects' ETC (Estimated Time of Completion) in the TDP. For projects awaiting regulatory approval, it should be noted that the indicated ETC (month-year) assumes that ERC approval was issued in September 2024.*

4.3 Adoption of SMART Grid Technologies

There has been continuing research and development over the years toward the 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 a global trend for power utilities.

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

On 6 February 2020, the DOE promulgated the Department Circular DOE DC 2020-02-0003 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, namely:

- Self-healing grid
- Full implementation of Retail Competition and Open Access (RCOA), Renewable Portfolio Standards (RPS), Green Energy Option (GEOP), and Net Metering
- Full Customer Choice, Demand Response and Peak Load Management
- Optimized Energy Storage Systems (ESS), Energy Management Systems (EMS), and Distribution Energy Resources (DER) Management Systems; Virtual Power Plant Integration
- 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.

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.

Over the past 10 years, NGCP has implemented several smart grid initiatives including the upgrade of Supervisory Control and Data Acquisition-Energy Management System (SCADA-EMS), establishment of the Overall Command Center, implementation of Microprocessor-Based Substation Control (MBSC), time synchronization devices, transient fault recorders in major substations, as well as holistic cyber-security enhancement program.

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

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

The need for Smart Grid is rooted in climate change and the need to move to more sustainable sources of Energy. A Smart Grid is one that incorporates information and communications technology (ICT) into every aspect of electricity generation, delivery, and consumption to minimize environmental impact, enhance markets, improve reliability and service, and reduce costs and improve efficiency."

This translates to improved grid security and information management, efficient integration of the connection between generators and load customers, effective response to the needs of the transmission network, and greater reliability and quality of power transmitted by the grid.

In the other words, a SMART Grid aims to

- Support and integrate renewable energy sources like Solar, Hydro and Wind
- Empower consumers with real-time information about their energy consumption
- Assist utility companies to reduce moves and outages.

The NGCP's Smart and Green Grid Plan will continue to evolve given that the total capacity of the OSW service contracts as of March 2024 is already 65.049 GW and additional contract awards from DOE may be expected in the coming months. It is further noted that the 65.049 GW is on top of the 35 GW generation capacity of wind and solar in the CREZ and on top of other generation capacity addition proposals from hydropower plants, LNG plants, biomass, and other plant technology.

As recommended in the OSW Roadmap for the Philippines Report of World Bank Group in April 2022, the OSW development is for inclusion in the CREZ. This will involve updating of the Capacity Expansion Model (CEM) used in the first CREZ study in the determination of the optimal share per renewable energy technology and other power plant technology to serve the future demand of the grid.

As transmission network provider, NGCP adopts best practices, monitoring and control, data analytics, smart metering, supply reliability, green energy, energy storage integration, security and customer empowerment and satisfaction as shown in Figure 4.4.

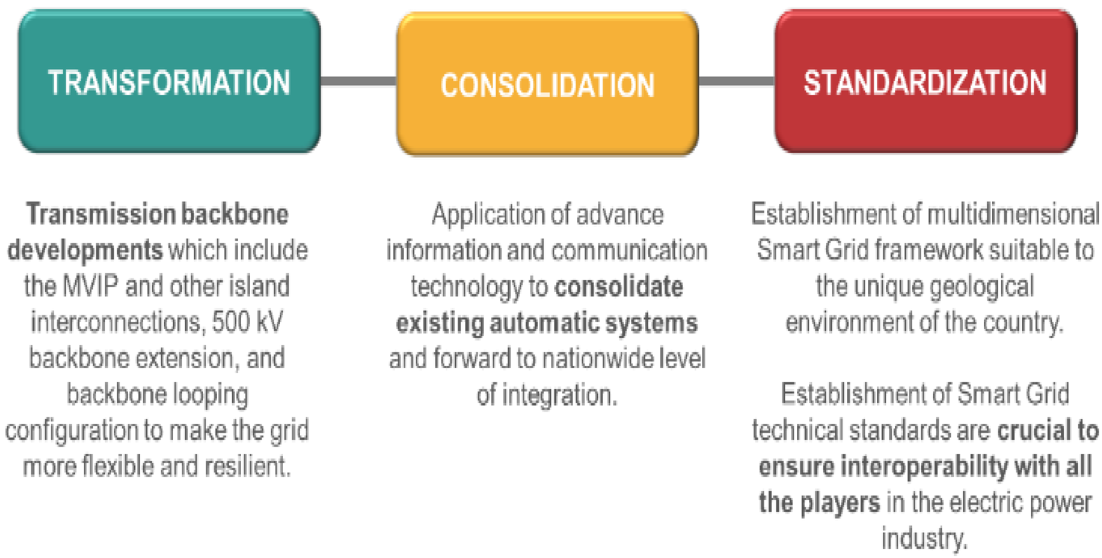
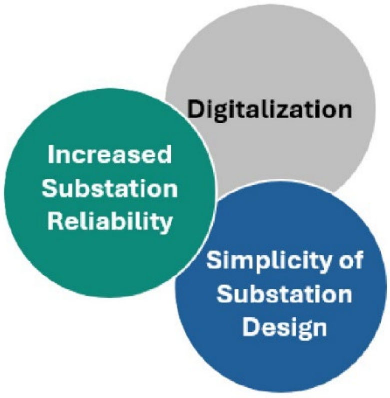


Figure 4.4: Smart Grid Strategies

4.3.1 SMART Substation Technology

NGCP is actively transforming its grid infrastructure to meet the DOE' Smart Grid vision. This modernization effort involves upgrading existing substations and designing new ones to incorporate the following key characteristics:

1. **Digitalization.** Communication medium among secondary devices uses Optical Fiber with less copper cables. Control & monitoring of high voltage equipment and secondary devices are now digital.
2. **Increased Substation Reliability.** Introduction of additional back-up breaker failure relay protection (BFR), new redundant Smart Control Unit (SCUs) to achieve digital control and monitoring including network analyzer in which will avoid enormous conventional hard wiring.
3. **Simplicity of Substation Design.** Interconnection between secondary devices is simple (virtually interconnected through communication IEC 61850 protocol, GOOSE Messaging) and conduct of maintenance testing is straightforward, no need for pre-wiring activities.



Smart Substation Technology requirements include the additional supply and installation of the following equipment and smart devices components:

Additional Equipment:

- Smart Control Units (Main 1 & Main 2, SCU)
- Merging Units (Main 1 & Main 2, MU)
- Network Analyzer
- Breaker Failure Protection System (Main 2, doubled the quantity)
- Bus Protection 69kV (additional Main 2)
- Switch Panel System
- Station Auxiliary Distribution Panel
- Fiber Optic Cables
- Smart Protection devices (Substation & Line Protection System)
- Smart Network Disturbance Monitoring Equipment (NDME) devices

This commitment is reflected in our roadmap for converting existing and new substations into Smart Substations by 2050.

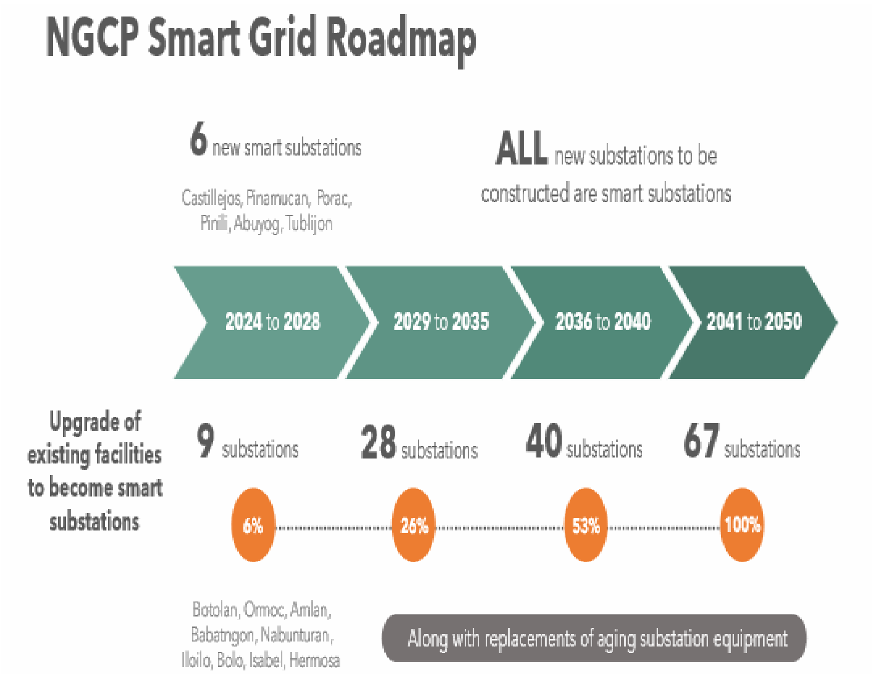


Figure 4.5: NGCP Smart Grid Roadmap

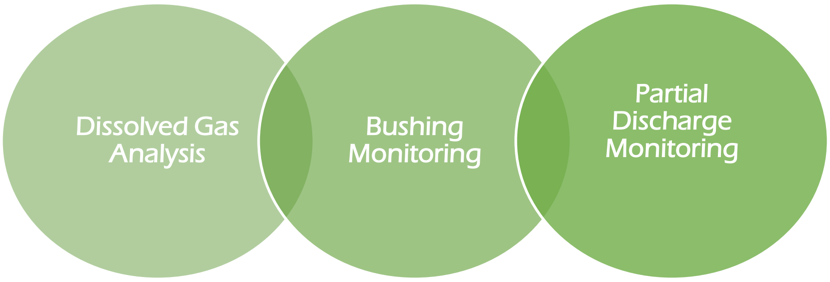
4.4 Other Technologies

The way we inspect transmission lines has been completely transformed by aerial drones. With their cutting-edge cameras and sensors, these unmanned aerial vehicles offer an economical and effective alternative to traditional techniques for inspecting transmission line assets. Aerial drones' capacity to fly at high elevations gives them a thorough perspective of transmission lines, which facilitates the identification and resolution of possible problems. In addition to increasing inspection speed and accuracy, the use of aerial drones in transmission line inspection has also made the procedure safer for line workers.

In 2023, NGCP completed the UAV Corridor Inspection for all its transmission lines. The application of aerial drones has resulted in a 67% reduction in the average number of days for transmission line inspection using the conventional foot patrol. In the first quarter of 2024, more than one hundred designated NGCP drone operators completed their training for Remotely Piloted Aircrafts (RPAs) controller license for the operational usage of these drones for transmission line inspection. With these positive results, NGCP plans to reinforce its drone program with the planned acquisition of additional drones equipped with thermal scanning and LiDAR functionality to be deployed in each transmission line gang for much comprehensive inspection and maintenance.

4.4.1 Online Monitoring of HVEs

To remotely monitor the status of critical transmission assets, NGCP has implemented various online monitoring devices. Transformers were selected as the primary assets for online monitoring as this is the most important asset of the substation. The following are the online monitoring devices installed:



The installation of online monitoring devices will enable technical personnel to remotely assess the condition of critical transmission assets, such as transformers. This capability will enhance the efficiency and effectiveness of maintenance operations by providing real-time data on the condition of the equipment, allowing for proactive measures to prevent potential failures and ensure reliable operation.

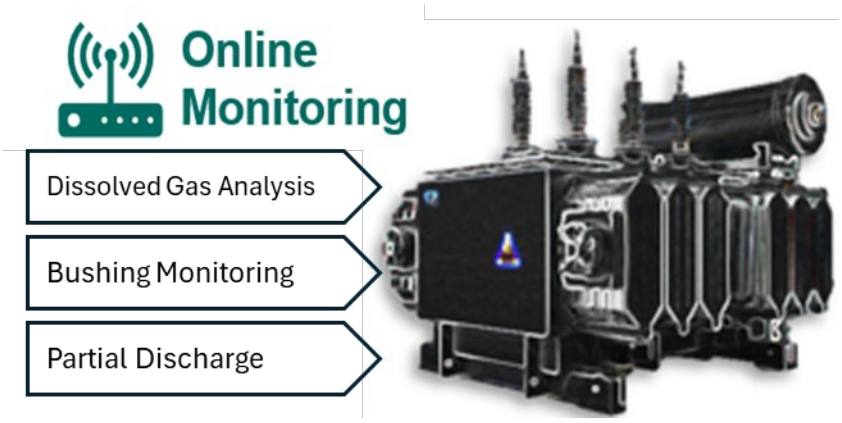


Figure 4.6 Online Monitoring System framework

4.4.2 Central Control and Monitoring System

As part of its continuing drive to uphold its vision, NGCP will be implementing the centralization of operation of its substations. The result of this centralization will be the unmanning of substations across the country. The unmanned substations will be clustered, and the operation management of these clusters will be in one strategically located control center per area. NGCP believes that centralization will improve the operational performance of the substations by simplifying the process coordination and by reducing the manpower involved in monitoring and switching operations. For the project to be realized, the technical requirements must be met: all substations should be MBSC compliant, all manually operated disconnecting/earthing switches (DS/ES) should be replaced with motorized-operated DS/ES, all manually reset lockouts should be replaced with electrical reset lockout relays, and all connections should be properly wired to prevent misoperation.

Significant progress has been made on the Central Control and Monitoring System (CCMS) implementation, with all CCMS stations successfully demonstrating the system's capabilities in monitoring and controlling of primary and secondary devices of the priority substations.

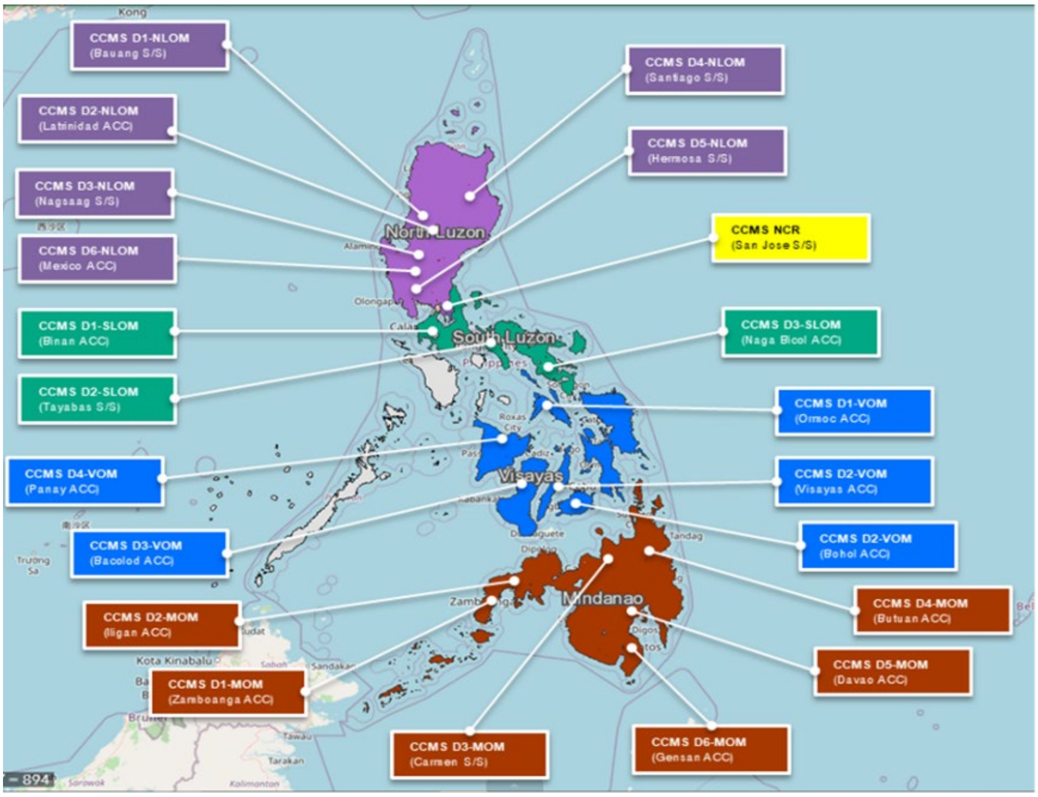


Figure 4.7: CCMS Map with 21 CCMS Stations

4.4.3 LiDAR Applications

With the strict compliance to the policies incumbent upon the government regulators in forest reservations and protected areas, there is a compelling reason to adapt a technology that will align O&M's activity to the said guidelines by properly managing the affected forestland/protected areas. The fact is that some portions of transmission facilities traverse these forestlands/protected areas which cannot be avoided for economic and technical reasons.

Vegetation, specifically hazard trees, is the number one cause of tripping the flow of electric current to customers through transmission lines which NGCP needs to resolve. NGCP is mandated to ensure the reliability of these transmission facilities. As such, NGCP would like to utilize airborne LiDAR (Light Detection and Ranging) to monitor and determine specific trees/obstructions which shall be cleared along the transmission lines.

In this way, pruning and trimming of danger trees could be done accurately and therefore compliant with the policies and guidelines being imposed by the regulators. Power utilities in the world, specifically in the US and Europe have been using LiDAR for some years back since it was made commercially available.

LiDAR is a powerful data collection system that provides 3-D information for an area of interest or a project area for various applications:

- Surface mapping
- Vegetation mapping
- Transportation corridor mapping
- Transmission route mapping
- 3-D building mapping

The accuracy of LiDAR technology is evident and acknowledged by government agencies and the commercial sector. In the future, LiDAR can also assist in wind flow modelling and the pre-construction design for wind farms. LiDAR has the capacity to be a useful laser-based wind profiler device for wind speed measurement and directional data capture, as a tool for resource assessment. LiDAR's remote sensing technology can be utilized for wind mapping applications in the years to come.

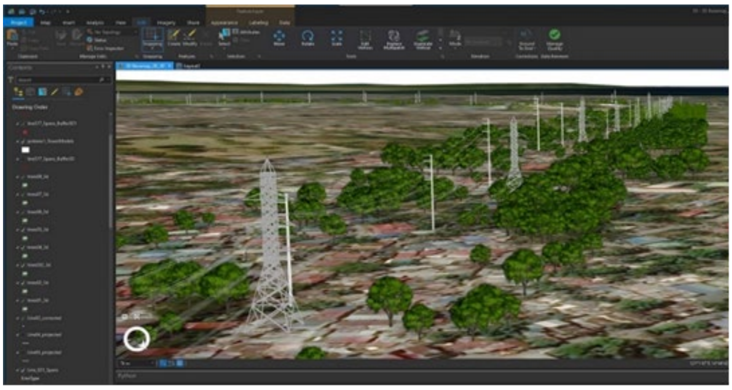


Figure 4.8: LiDAR Applications

4.4.4 Intelligent Remote Surveillance Monitoring for Transmission Lines and Substations

The reliable flow of electricity depends on the health and security of transmission lines and substations. Traditional methods of monitoring these crucial infrastructure elements often involve manual patrols and inspections, which can be time-consuming, expensive, and limited in scope. To further enhance security, efficiency, and reliability, NGCP is prioritizing the implementation of Intelligent Remote Surveillance Monitoring for transmission lines and substations. This innovative system utilizes:

- High-definition cameras and sensors to capture real-time data on the physical condition of our infrastructure.
- Advanced analytics powered by machine learning and artificial intelligence to identify potential threats and abnormalities.
- Automated alerts and actions to notify personnel and take proactive measures in case of issues.

This technology provides several key benefits:

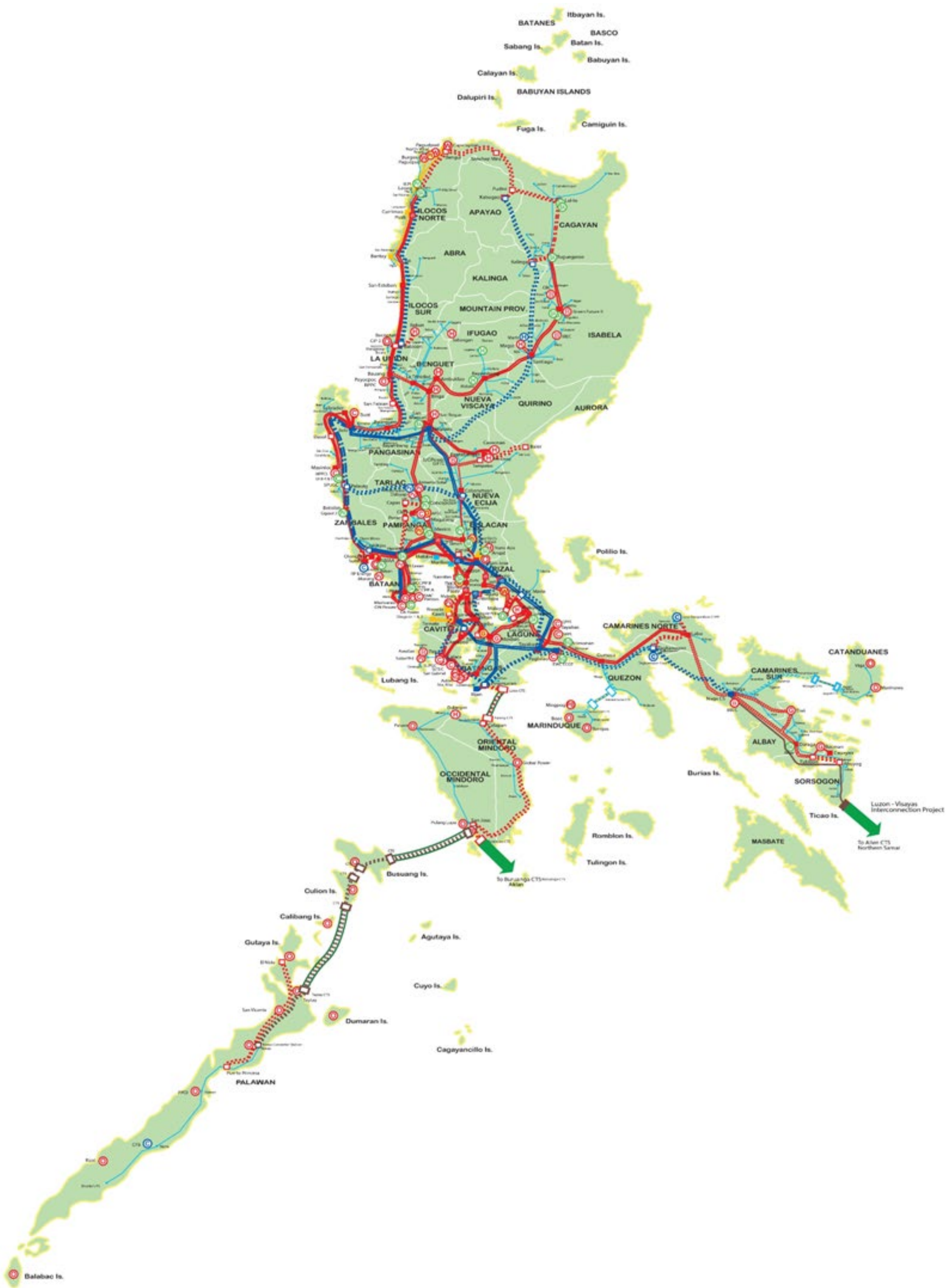
Enhanced Security: By automatically detecting unauthorized access, vandalism, or equipment tampering, NGCP can prevent potential disruptions and ensure the integrity of the grid.
Improved Efficiency: Early identification of potential problems allows for preventative maintenance, minimizing downtime and optimizing resource allocation.
Increased Safety: Proactive detection of environmental hazards like vegetation encroachment or potential wildfires helps prevent accidents and equipment failures.

By implementing Intelligent Remote Surveillance Monitoring, NGCP is demonstrating its commitment to a future-proof and resilient transmission network.

Chapter 5

LUZON Transmission Outlook

The DOE's list of private sector-initiated power projects shows that there are several committed and indicative power plant projects in Luzon Grid, which can 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 Batangas, Quezon, Bataan, and Zambales. This 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 additional bulk generation, the development of the Luzon Grid is geared towards the implementation of new 500 kV transmission facilities that would allow power export from 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 the priority site in Taguig City. Being close to the load center, Taguig is a strategic location, but it has major challenges in the construction of its associated 500 kV TL that traverses the portion of Laguna Lake. Another 500 kV drawdown substation will be constructed in Marilao, Bulacan.

Along with the support given to grid integration of new power plants, NGCP is paying special attention to 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 a great risk both to power quality and supply reliability in the area. In addition, the existing 230/115 kV substations in Metro Manila are heavily loaded already and most have capacity expansion limitation, thus the development of new substations is very important in supporting load growth in the long term.

As one of the major infrastructures supporting the country'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 the right-of-way (ROW) 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 and Marilao 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 to support the load increase in the coming years. Other provinces, on the other hand, will be supported by the installation of additional transformers at existing substations or the development of new substations and reinforcements of the 69 kV TL.

To help improve the 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.

5.1 Luzon Transmission Outlook for 2024-2030

The major transmission projects covering the years 2024-2030 aim to support the adequacy and reliability of power supply to Metro Manila, which is the country's center of commerce and trade, and accommodate bulk generation capacities in the province of Batangas and in Bataan and Zambales area.

Three (3) major 500/230 kV drawdown substations will be developed around Metro Manila to meet its forecasted load growth. These will be in Taguig City, Marilao Bulacan, and Silang Cavite, which will also be complemented by the development of additional 230/115 kV drawdown substations in Antipolo, Navotas, and Pasay. The reliability of power transmission delivery to Metro Manila will be addressed through the development of Taguig–Taytay 230 kV TL.

Outside Metro Manila, several drawdown substations will also be developed to address the forecasted load growth. These are the Lal-lo 230 kV SS (Tuguegarao – Lal-lo 230 kV TL Project) in Cagayan, Pinili 230 kV SS in Ilocos Norte, San Simon and Porac 230 kV SS in Pampanga, Capas 230 kV SS in Tarlac, Kawit 230 kV SS in Cavite, Sampaloc 230 kV SS in Nueva Ecija, Castillejos 230 kV SS in Zambales, Tanauan 230 kV SS in Batangas, and Abuyog 230 kV SS in Sorsogon. In addition to these substations, new 69 kV transmission facilities will also be developed.

In addition, the Tuy 500 kV SS will be developed to accommodate the generation capacities in the province of Batangas. The project involves the implementation of the 500 kV-designed Tuy–Silang 500 kV Transmission Line. It will also be complemented by the development of a new 500 kV transmission corridor from Pinamucan to Tuy 500 kV SS.

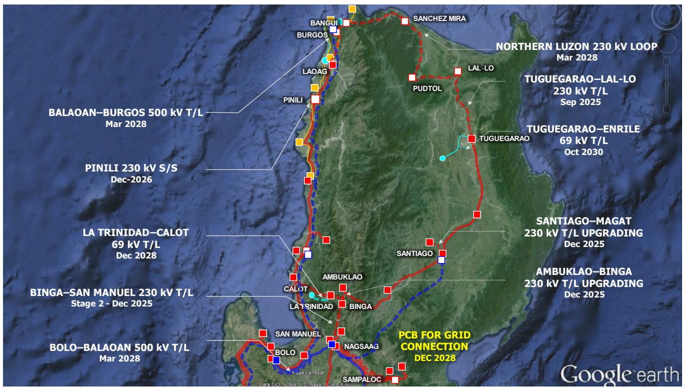


Figure 5.1: North Luzon Transmission Outlook for 2024-2030

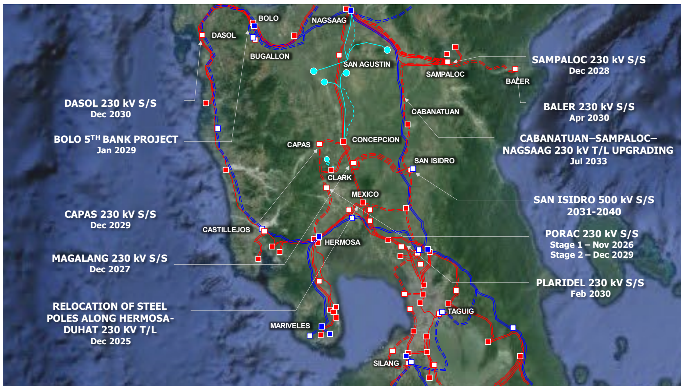


Figure 5.2: Central Transmission Outlook for 2024-2030

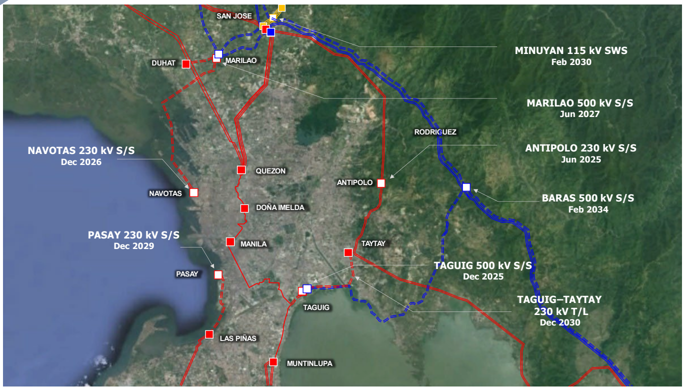


Figure 5.3: Metro Manila Transmission Outlook for 2024-2030

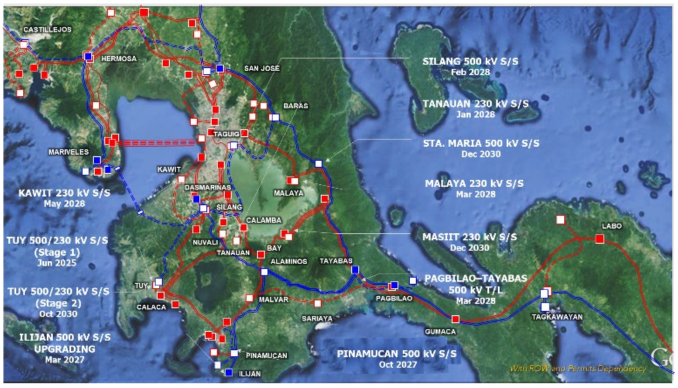


Figure 5.4: South Luzon Transmission Outlook for 2024-2030

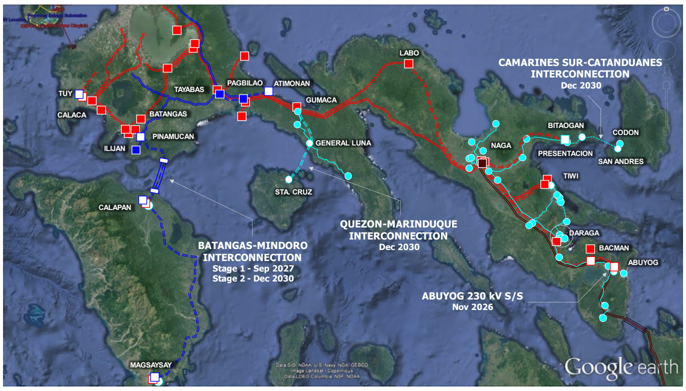
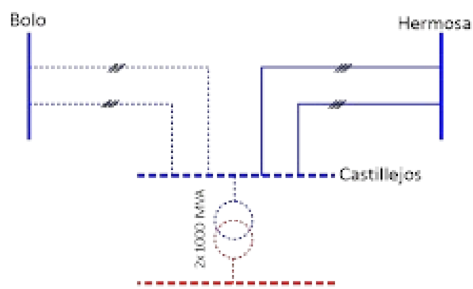
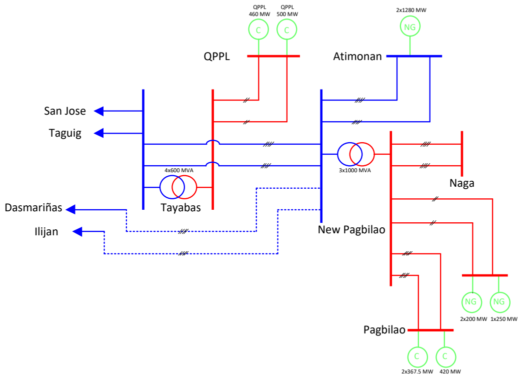
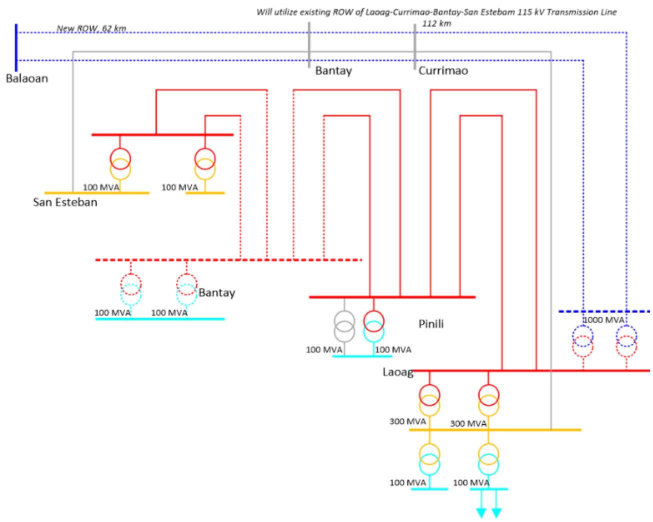


Figure 5.5: Bicol Regional Transmission Outlook for 2024-2030

Table 5.1: List of Luzon transmission projects for the period 2024-2030

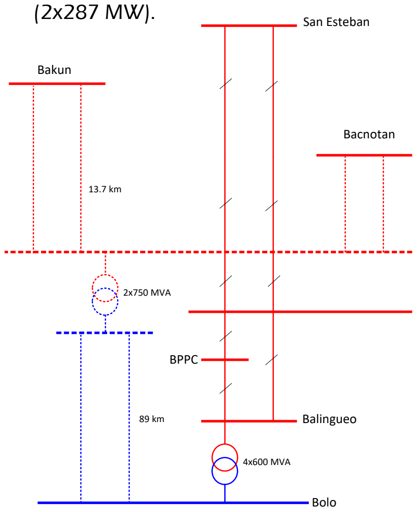
TRANSMISSION LINE					
Project Name and Justification	Project Driver and Status	Project Components		Location	Project Cost (Million Pesos)
		Substation	Transmission Line		ETC *
500 kV PROJECTS					
Bataan – Cavite Transmission Line Feasibility Study • To establish the most feasible submarine cable link between Bataan and Cavite as part of the long-term plan to form a backbone loop system	• Generation Entry • ERC-approved	Power System Study Feasibility Study		• Bataan • Cavite	• 194M • To be assessed
Western Luzon 500 kV Backbone (Stage 2) • To accommodate the incoming bulk generation entry in North Luzon and complement the proposed Balaoan –Laoag (Burgos) 500 kV Line, Bolo – Balaoan 500 kV Line and Santiago –Nagsaag 500 kV Line.	• System Reliability • Awaiting ERC approval	• Castillejos 500 kV SS: 2x1,000 MVA, 500/230 kV Power Transformers 14-500 kV PCB and associated equipment. 2x90 MVAR, 500 kV Shunt Reactor, 2x60 MVAR, 500 kV Line Reactor • Castillejos 230 kV SS: 2x200 MVAR, 230 kV Shunt Capacitor, 4-230 kV PCB and associated equipment Bolo 500 kV SS: 5-500 kV PCB and associated equipment 4-230 kV PCB and associated equipment	• Castillejos – Bolo 500 kV TL: ST-DC, 4-410 mm2 TACSR, 174 km (2x4,234 MW). 	• Pangasinan • Zambales	• 19,270M • Jun 2027

TRANSMISSION LINE

Project Name and Justification	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC *
		• Hermosa 500 kV SS: 4-500 kV PCB and associated equipment			
Pagbilao – Tayabas 500 kV Transmission Line CEPNS • To allow the connection of the 2x1280 MW Atimonan Natural Gas-Fired Combined Cycle Gas Project of Atimonan One Energy Corporation to the Luzon Grid	• Generation Entry • Awaiting ERC approval	• Pagbilao 500 kV SS: 4-500 kV PCB and 4-230 kV PCB and associated equipment, 1x30 MVAR Line Reactor and associated equipment	• Dasmarinas/Ilijan 500 kV TL Extension: ST-DC, 4-795 MCM ACSR, 21 km (2x2,494 MW). • Naga 230 kV TL Extension: ST-DC, 4-795 MCM ACSR, 1.5 km (2x1,148 MW). 	• Quezon Province	• 7,706M • Mar 2028
Balaoan – Laoag (Burgos) 500 kV Transmission Line • To accommodate the entry of wind farm and Solar PV projects in the Province of Ilocos Norte • To accommodate these incoming Renewable Energy (RE) plants	• Generation Entry • Awaiting ERC approval	• Laoag EHV SS: 2x1,000 MVA, 500/230 kV Power Transformer, 3x90 MVAR 500 kV Shunt Reactor, 2x60 MVAR 500 kV Line Reactor, 9-500 kV PCB and associated equipment, 8-230 kV PCB and associated equipment • Laoag 230 kV SS: 2-230 kV PCB and associated equipment • New Bantay 230 kV SS: 2x100 MVA, 230/69 kV Power Transformer, 10-230 kV PCB and Associated equipment, 7-69 kV PCB and associated equipment	• Balaoan – Laoag (Burgos) 500 kV TL: ST-DC, 4-410 mm2 TACSR, 175 km (2x4,234 MW). • Laoag 230 kV Tie Line: ST-DC, 4-795 MCM ACSR, 1 km (2x1,148 MW). • Bantay bus-in 230 kV Line: ST-DC, 1-795 MCM ACSR, 2 km (2x287 MW). 	• La Union • Ilocos Norte	• 40,195M • Mar 2028
Bolo – Balaoan 500 kV Transmission Line	• Generation Entry • Awaiting ERC approval	• Balaoan 500 kV SS: 2x750 MVA 500/230 kV Power Transformers, 20-500 kV PCB and associated equipment, 21-230 kV PCB and associated equipment, 4x90 MVAR, 500 kV Shunt Reactor, 2x60 MVAR, 500 kV Line Reactor, 3x100 MVAR, 230 kV Capacitor	• Bolo – Balaoan 500 kV TL: ST-DC, 4-410 mm^2 TACSR/AS, 89 km (2x4,234 MW). • Balingueo – Balaoan 500 kV TL: ST-DC, 4-410 mm^2 TACSR/AS, 41 km (2x4,234 MW). • Bacnotan – Balaoan 230 kV TL: ST-DC, 4-795 MCM, ACSR, 11 km (2x1,148 MW)	• La Union • Pangasinan	• 33,002M • Mar 2028

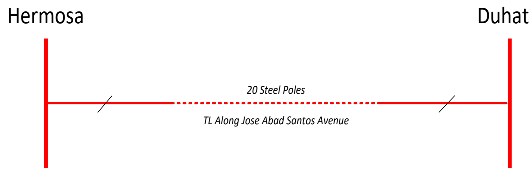
TRANSMISSION LINE

Project Name and Justification	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC *
• To accommodate the entry of the proposed 1,200 MW Luna CFPP in La Union and the 500 MW COHECO Badeo Pumped-Storage HEPP in Benguet • To address the forecasted load growth in Ilocos Region		• Bolo 500 kV SS: 3-500 kV PCB and associated equipment	• Balaoan – Bakun 230 kV TL: ST-DC, 1-795 MCM, ACSR, 13.7 km (2x287 MW) • Balaoan Bus-in Bauang – San Esteban 230 kV TL: ST-DC, 1-795 MCM, ACSR, 2x0.6 km (2x287 MW).		



230 kV PROJECTS

Project Name and Justification	Project Driver and Status	Substation	Transmission Line	Location	Project Cost ETC *
Relocation of Steel Poles along Hermosa – Duhat 230 kV Transmission Line • To eliminate the danger brought by road widening by the remaining steel pole structures as well as to prevent accidents that will cause power interruption to the Hermosa–Duhat 230 kV Line.	• System Reliability • ERC-approved		• Hermosa – Duhat 230 kV TL: 230 kV, SP-SC, 2-795 MCM, 20 steel poles (1x573 MW)	Bataan	• 242M • Dec 2025

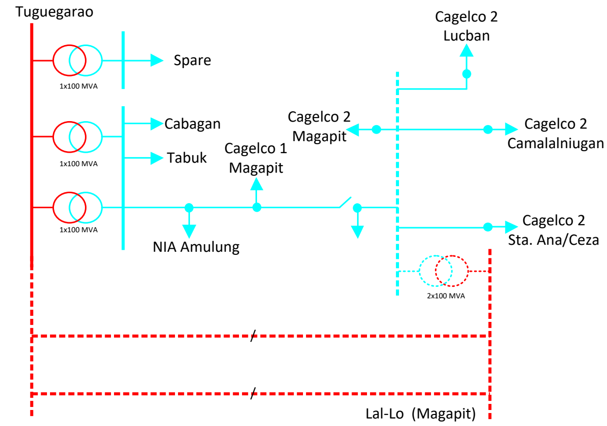


Project Name and Justification	Project Driver and Status	Substation	Transmission Line	Location	Project Cost ETC *
Tuguegarao – Lal-lo 230 kV Transmission Line CEPNS • To address the imminent overloading of the Tuguegarao–Magapit 69 kV Line due to the forecasted load growth in the northern part of Cagayan Province • To improve the power quality and reliability of supply in the area which is presently being served by a 69 kV line	• Power Quality and Load Growth • ERC-approved	• Lal-lo 230 kV SS: 2x100 MVA 230/69-13.8 kV Transformers, 6-230 kV PCB and associated equipment, 8-69 kV PCB and associated equipment • Tuguegarao 230 kV SS: 3-230 kV PCB.	• Tuguegarao – Lal-lo 230 kV TL: ST-DC, 1-795 MCM ACSR, 64 km (2x287 MW).	Cagayan	• 2,555M • Sep 2025

TRANSMISSION LINE

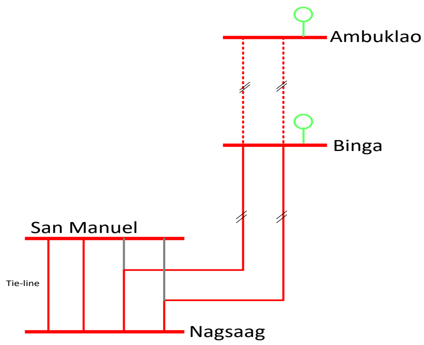
Project Name and Justification	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC *

- The project is 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



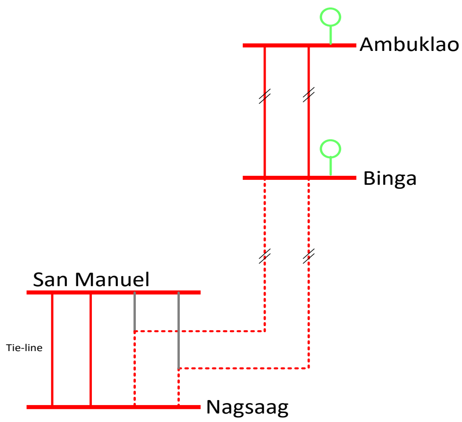
Project Name and Justification	Project Driver and Status	Substation	Transmission Line	Location	Project Cost ETC *
Ambuklao – Binga 230 kV Transmission Line Upgrading Project CEPNS	• System Reliability • ERC-approved	• Ambuklao 230 kV SS: 7-230 kV PCB and associated equipment	• Ambuklao – Binga 230 kV TL: ST/SP-DC, 2-410 mm2 TACSR, 11 km (2x974 MW).	Benguet	• 905M • Dec 2025

- To upgrade the existing line to address its old age condition and 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.
- To prevent the overloading under N-1 contingency conditions, i.e, outage of one 230 kV circuit



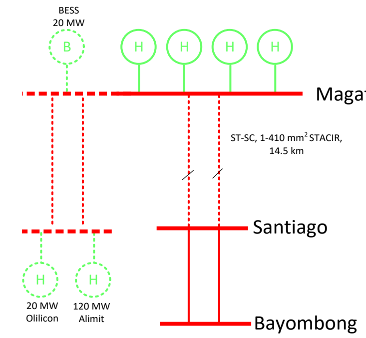
Project Name and Justification	Project Driver and Status	Substation	Transmission Line	Location	Project Cost ETC *
Binga – San Manuel 230 kV Transmission Line CEPNS	• System Reliability and Generation entry • ERC-approved	• San Manuel 230 kV SS: 2-230 kV PCB and associated equipment • Binga 230 kV SS: 1x50 MVA 230/69kV Transformer, 14-230 kV PCB and associated equipment	• Binga–San Manuel 230 kV TL: ST-DC, 2-410 mm2 TACSR, 40 km (2x974 MW).	Benguet	• 2,689M • Dec 2025

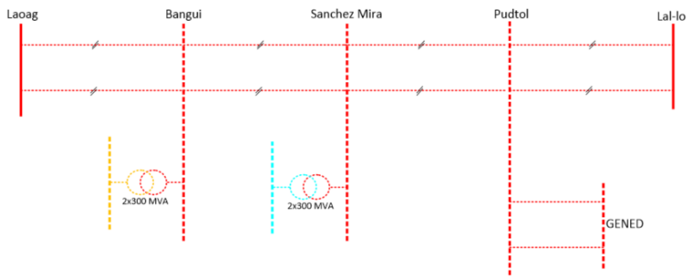
- To provide N-1 contingency during the maximum dispatch of the generating plants, particularly HEPPs, in north Luzon. The existing line, as well as the PCB at Binga SS, which were constructed/installed in 1956, have already surpassed the economic life. Moreover, there are developments in the power plants 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.

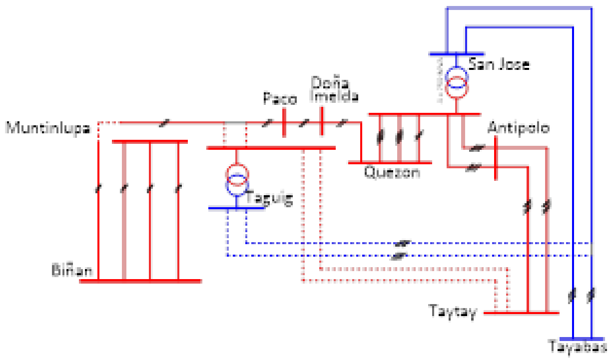


TRANSMISSION LINE

Project Name and Justification	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC *
Santiago – Magat 230 kV Transmission Line Reconductoring • To upgrade the existing Santiago–Magat 230 kV TL to accommodate new generation plants that will be connected in Magat 230 kV Switchyard, such as the ±20 MW Magat BESS, 120 MW Alimit Hydro Plant and the 20 MW Olilicon HEPP.	• Generation Entry • System Reliability and Security	• Santiago 230 kV SS: 3-230 kV PCB and associated equipment • Magat 230 kV SS: 6-230 kV PCB and associated equipment	• Santiago – Magat 230 kV TL, ST-DC, 1-410 mm² STACIR, 14.5 km (2x574 MW)	Isabela	• 3,083M • Dec 2025
Northern Luzon 230 kV Loop • To provide new transmission corridor to accommodate renewable energy and other power plants in the Northern part of Luzon • To ensure the system reliability and operational flexibility in the Ilocos Region and Cagayan Valley through the 230 kV looping	• Generation Entry • Awaiting ERC approval	• Laoag 230 kV SS: ±75MVAR 230 kV STATCOM, 5-230 kV PCB, 25 MVAR 230 kV Capacitor and associated equipment • Bangui 230 kV SS: 2x300 MVA 230/115 kV Power Transformers and Accessories, 14-230 kV PCB and associated equipment, 18-115 kV PCB and associated equipment, 4x50 MVAR 230 kV Shunt Reactor, 4x25 MVAR 115 kV Capacitor • Sanchez Mira 230 kV SS: 2x300 MVA 230/69 kV Power Transformers and Accessories, 18-230 kV PCB and associated equipment, 8-69 kV PCB and associated equipment, 4x25 MVAR 230 kV Shunt Reactor, 4x25 MVAR 230 kV Capacitor • Pudtol 230 kV SS: 10-230 kV PCB and associated equipment • Lal-lo 230 kV SS: 4-230 kV PCB and associated equipment	• Laoag – Bangui 230 kV TL: ST-DC, 2-795 MCM ACSR/AS, 50 km (2x573 MW). • Lal-lo – Pudtol 230 kV TL.: ST-DC, 2-795 MCM ACSR/AS, 38 km (2x573 MW). • Bangui – Sanchez Mira 230 kV TL: ST-DC, 2-795 MCM ACSR/AS, 70 km (2x573 MW) • Pudtol – Sanchez Mira 230 kV TL: ST-DC, 2-795 MCM ACSR/AS, 57 km (2x573 MW).	• Ilocos Norte • Apayao, • Cagayan	• 34,069M • Mar 2028
Taguig – Taytay 230 kV Transmission Line CEPNS • To address the overloading of the Taguig-Paco 230 kV TL segment during N-1 contingency under maximum south generation condition specifically with the incoming generating plants in the provinces of Batangas and Quezon	• Load Growth • System Reliability and Security • Awaiting ERC approval	• Taytay 230 kV SS: 6-230 kV PCB and associated equipment	• Taguig – Taytay 230 kV TL: SP-DC, 2-610 mm2 TACSR, 10 km (2x1,227 MW)	Rizal	• 3,360M • Dec 2030

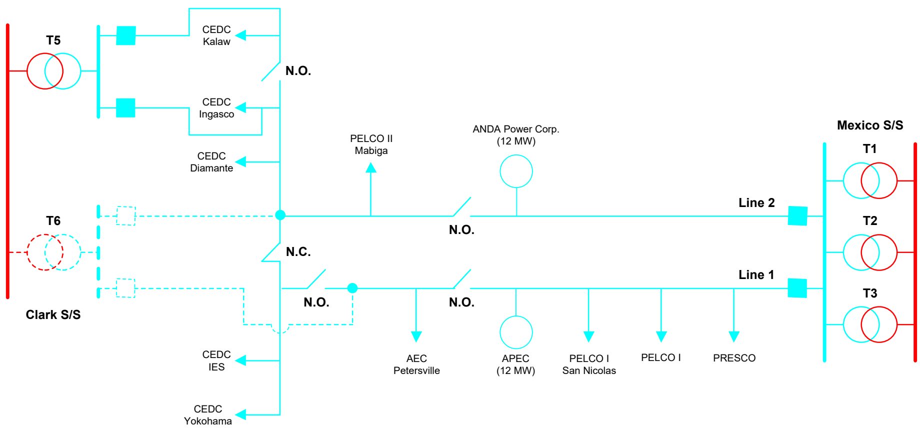




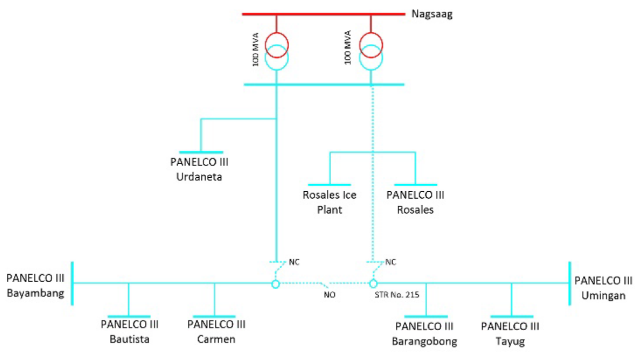


TRANSMISSION LINE

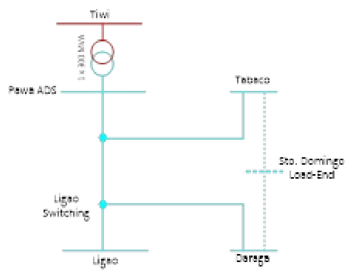
Project Name and Justification	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC *
69 kV PROJECTS					
Clark – Mabiga 69 kV Transmission Line CEPNS • To provide transmission capacity reinforcement to the Mexico–Clark 69 kV Line which is serving Pampanga Rural Electric Service Cooperative, Inc. (PRESCO), Pampanga I Electric Cooperative, Inc. (PELCO I), Pampanga II Electric Cooperative, Inc. (PELCO II), Angeles Electric Corporation (AEC), Quanta Paper Corporation, and Clark Electric Development Corporation (CEDC). • To address the load growth in Angeles and Mabalacat, together with the new industries in Clark Freeport Zone and improve the power quality of supply in the area	• Load Growth • ERC-approved	• Clark 230 kV SS (Expansion): 1x300 MVA 230/69-13.8 kV Transformer, 1-230 kV PCB and associated equipment, and 3-69 kV PCB and associated equipment	• Clark – Mabiga 69 kV TL: 1,600 mm2 Underground Cable System, UC-DC, 6.0 km (2x108 MW).	Pampanga	• 3,389M • Dec 2025



Project Name and Justification	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC *
Nagsaag – Tumana 69 kV Transmission Line CEPNS • To cater to the growing demand of an area in Pangasinan. The existing Nagsaag–Umingan 69 kV TL which delivers power to the loads of Pangasinan III Electric Cooperative (PANELCO III) Urdaneta and Carmen, and Central Pangasinan Electric Cooperative (CENPELCO) Bautista and Bayambang will already be overloaded.	• Load Growth • Awaiting ERC approval	• Nagsaag 69 kV SS: 1-69 kV PCB and associated equipment	• Nagsaag – Tumana 69 kV TL: 69 kV, ST/SP-DC1, 1-795 MCM ACSR, 23 km (1x56 MW).	Pangasinan	• 970M • Jul 2026

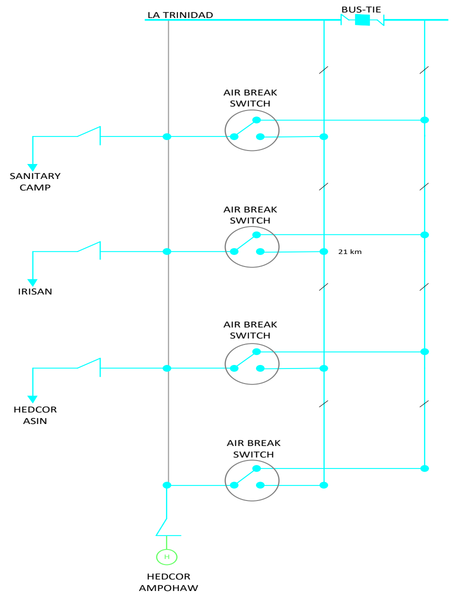


Project Name and Justification	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC *
Eastern Albay 69 kV Line Stage 2 • To provide a more reliable transmission corridor in the eastern coast of Albay to serve the increasing eco-tourism developments in the area which include the Misibis Resort, Estate and Spa in Cagraray Island	• System Reliability • ERC-approved	• Sto. Domingo SS: 2-69 kV PCB and associated equipment.	• Sto. Domingo – Tabaco 69 kV TL: ST-SC, 1-336.4 MCM ACSR, 18 km (1x56 MW).	Albay	• 798M • Apr 2026

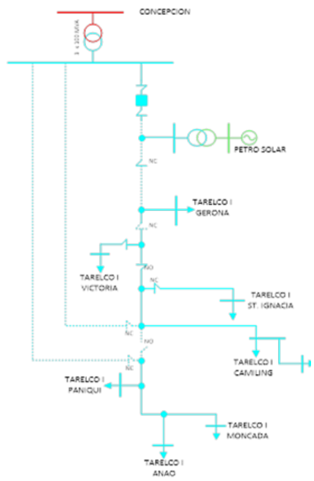


TRANSMISSION LINE

Project Name and Justification	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC *
La Trinidad – Calot 69 kV Transmission Line CEPNS • To improve the reliability and increase the transfer capacity of the 69 kV TL serving the loads of BENECO's Lamut, Sanitary Camp and Irisan LES, and power generations from HEDCOR's Asin and Ampohaw	• Load Growth • ERC-approved	• La Trinidad 69 kV SS: 1-69 kV PCB and associated equipment	• La Trinidad – Calot 69 kV TL: ST/SP-DC, 1-795 MCM ACSR/AS, 17 km (2x86 MW)	Benguet	• 1,726M • Dec 2028



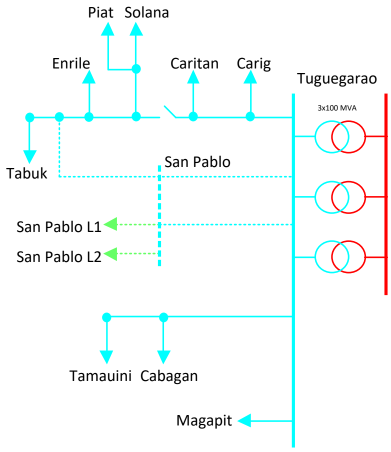
Project Name and Justification	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC *
Concepcion – Sta. Ignacia 69 kV Transmission Line CEPNS • To cater to the growing demand in Tarlac • To address the overloading of the existing Concepcion – Paniqui 69 kV TL by catering the loads of TARELCO Sta. Ignacia, Camiling, Mayantoc, Paniqui, Anao and Moncada	• Load Growth • Awaiting ERC approval		• Concepcion – Sta. Ignacia 69 kV TL: 69 kV, ST-DC, 1-795 MCM ACSR, 33 km (2x86 MW).	Tarlac	• 1,239M • Phase 1 – Jul 2026 • Phase 2 – Oct 2027



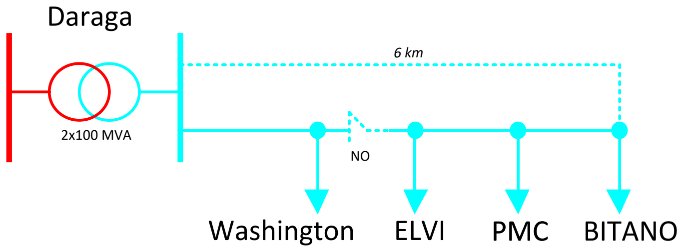
Project Name and Justification	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC *
Tuguegarao – Enrile 69 kV Transmission Line	• Load Growth • Awaiting ERC approval	• Tuguegarao 69 kV SS: 2-69 kV PCB and associated equipment • San Pablo 69 kV SY: 8-69 kV PCB and associated equipment	• Tuguegarao – San Pablo SWS 69 kV TL: SP-DC, 1-795 MCM ACSR, 14 km (2x86 MW). • San Pablo SWS – Enrile 69 kV TL: SP-SC, 1-795 MCM ACSR, 16 km (1x86 MW).	Tuguegarao	• 2,945M • Oct 2030

TRANSMISSION LINE

Project Name and Justification	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC *
• To address the anticipated overloading of the Tuguegarao–Tabuk 69 kV TL brought by the continuous load growth in the franchise area of Cagayan 1 Electric Cooperative, Inc (CAGELCO I) and Kalinga-Apayao Electric Cooperative, Inc. (KAELCO) • To accommodate the connection of 49.4 MW San Pablo Solar Power Project Phase 1					

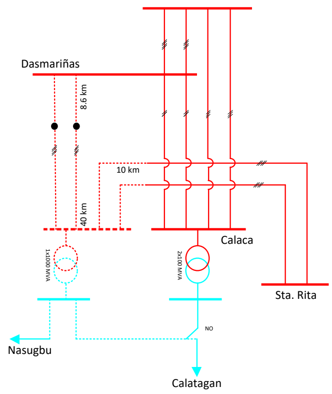


Project Name and Justification	Project Driver and Status	Substation	Transmission Line	Location	Project Cost
Daraga – Bitano 69 kV Transmission Line	• Load Growth • Awaiting ERC approval	• Daraga SS: 2-69 kV PCB and associated equipment	• Daraga–Bitano 69 kV TL: SP-SC, 1-795 MCM ACSR, 6 km (1x86 MW).	Albay	• 760M • Dec 2030
• To cater to the load growth of Albay Electric Cooperative (ALECO) and other directly connected industrial and commercial loads in Albay Province • To address the overloading of the existing Daraga–Washington 69 kV TL					



SUBSTATION

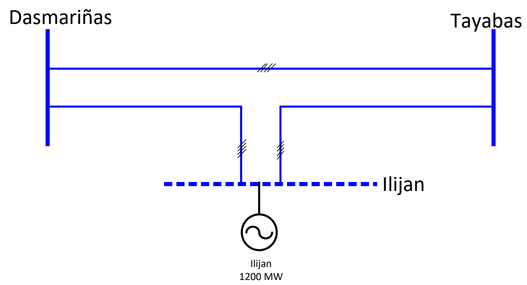
Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
500/ 230 kV PROJECTS					
Tuy 500/230 kV Substation Project (Stage 1)	• Generation Entry • Awaiting ERC approval	• Tuy SS: 1x100 MVA, 230/69-13.8 kV Transformer, 12-230 kV PCB and associated equipment, 3-69 kV PCB and associated equipment. • Dasmariñas SS Expansion: 2-230 kV PCB and associated equipment. • Sta. Rita Switchyard Expansion: Line Protection and Communication System. • Calaca SS: Replacement of Current Transformers and Bus works.	• Tuy – Silang (initially 230 kV-energized), 500 kV: ST-DC, 4-410 mm2 TACSR, 40 km (2x4,234 MW). • Silang – Dasmariñas, 230 kV: ST-DC, 4-410 mm2 TACSR/AS, 8.6 km (2x1,948 MW). • Sta. Rita 230 kV Line Extension: 230 kV, ST-DC, 4-795 MCM ACSR/AS, 10 km (2x1,148 MW) • Calatagan/ Nasugbu Line Extension: 69 kV, SP-DC, 1-795 MCM ACSR/AS, 3.5 km (2x86 MW).	• Batangas • Cavite	• 6,068M • Jun 2025
• To accommodate the connection of the 2x350 MW SRPGC Coal Plant and allow full dispatch of bulk generation capacity additions in Batangas.					

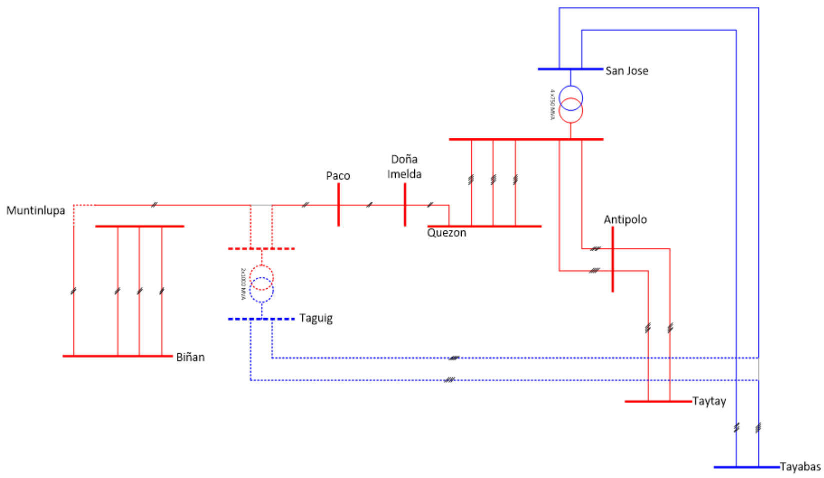


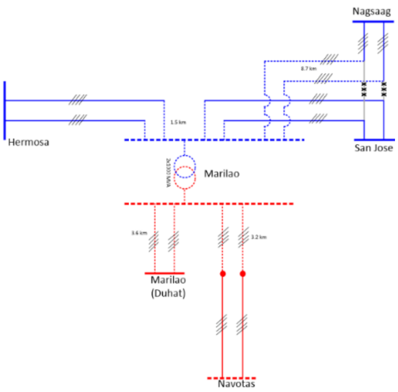
Project Name and Description	Project Driver and Status	Substation	Transmission Line	Location	Project Cost
Ilijan 500 kV Substation Upgrading	• System Reliability • Awaiting ERC approval	• Ilijan 500 kV SS: 4-500 kV PCB and associated equipment (GIS), 6-500 kV PCB and associated equipment (AIS)		Batangas	• 1,989M • Mar 2027

SUBSTATION

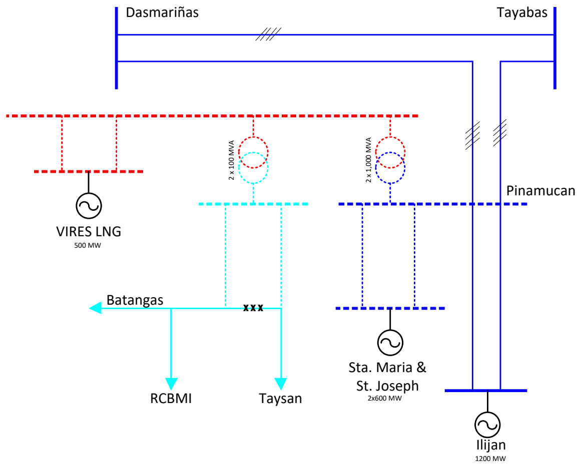
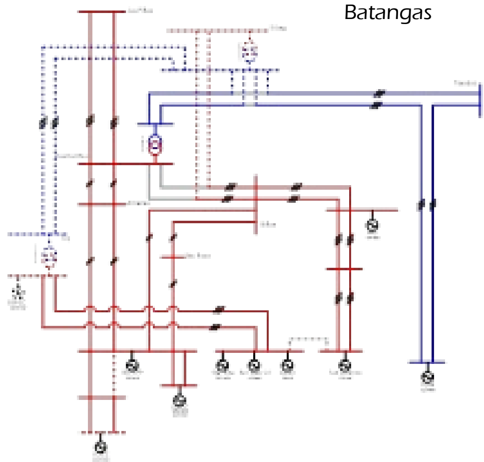
Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
• To accommodate the connection of Excellent Energy Resources Inc.'s (EERI) 1,700 MW Combined-Cycle Gas Turbine Ilijan Expansion Power Plant Project to the switchyard					
Taguig 500 kV Substation Project CEPNS • To address the projected load growth in Metro Manila • To provide an additional 500/230 kV drawdown SS serving metro manila	• Load Growth • ERC-approved	• Taguig 500 kV SS: 2x1,000 MVA, 500/230-13.8 kV Transformers, 1x90 MVAR, 500 kV Shunt Reactor, 3x100 MVAR, 230 kV Capacitor, 8-500 kV PCB (GIS) and associated equiptment,10-230 kV PCB (GIS) and associated equipment.	• Taguig Cut-in to San Jose–Tayabas 500 kV TL: 500 kV, ST-DC, 4-795 MCM ACSR/AS, 37 km (2x2,494 MW). • Taguig bus-in to Muntinlupa–Paco 230 kV TL: 230 kV, SP-DC, 2-410 mm2 TACSR/AS, 2x2.4 km (2x974 MW).	Taguig	• 9,489M • Dec 2025
Marilao 500 kV Substation CEPNS • To provide an additional 500/230 kV drawdown SS to support the increasing demand in Metro Manila along with the increase in bulk power injection to the 500 kV system coming from the new power plants in the grid. • To address the initial line by-pass scheme at San Jose SS under the project Hermosa–San Jose 500 kV TL which is brought about by the GIS expansion limitation at San Jose 500 kV SS. • To reduce the criticality of the ring-bus configured San Jose 500 kV SS as the Marilao SS will now serve as the main node in the grid.	• Load Growth • Awaiting ERC approval	• Marilao 500 kV SS: 2x1000 MVA, 500/230-13.8 kV Power Transformers and Accessories 2x90 MVAR, 500 kV Shunt Reactor and Accessories 2x100 MVAR, 230 kV Capacitor Banks and Accessories 16-500 kV PCB and Associated equipment 12-230 kV PCB and Associated equipment	• Nagsaag – San Jose 500 kV Line Extension to Marilao 500 kV SS, ST-DC, 4-795 MCM ACSR/AS, 8.7 km (2x2,494 MW). • Marilao Bus-in to Hermosa – San Jose 500 kV Line, ST-DC, 4-410 mm2 TACSR/AS, 1.5 km (2x4,234 MW). • Marilao – Duhat 230 kV TL, SP-DC, 2-795 MCM ACSR/AS, 3.2 km (2x573 MW). • Navotas Line Extension to Marilao 230 kV TL, SP-DC, 4-795 MCM ACSR/AS, 3.6 km (2x1,148 MW).	Bulacan	• 7,276M • Jun 2027







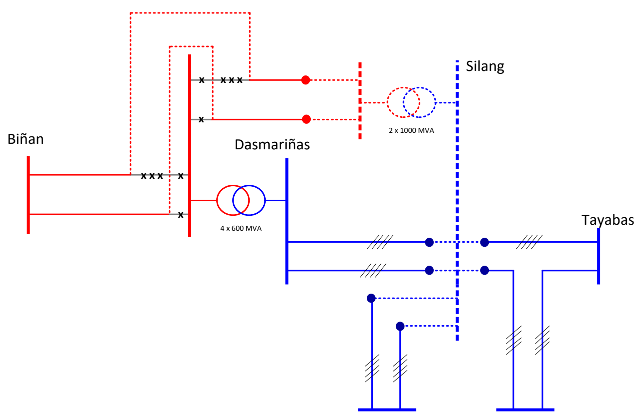
SUBSTATION

Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
Pinamucan 500 kV Substation • To accommodate the connection of new LNG Plants in Batangas City Area • To provide a connection point of other proposed bulk capacity generation in Batangas. In addition, it will also serve as the connection point of Batangas–Mindoro Interconnection and Backbone Project (BMIBP).	• Generation Entry • Awaiting ERC approval	• Pinamucan 500/230 kV SS: 2x1000 MVA, 500/230 kV Power Transformer, 2x100 MVA, 230/69 kV Power Transformer, 14-500 kV PCB and associated equipment, 10-230 kV PCB and associated equipment, 6-69 kV PCB and associated equipment  	• Pinamucan 500 kV bus-in TL: ST-DC, 4-795 MCM ACSR/AS, 1 km (2x2,494 MW). • Pinamucan – Taysan 69 kV TL: SP/ST-DC, 1-795 MCM ACSR/AS, 10 km (2x86 MW).	Batangas	• 5,601M • Oct 2027
Tuy 500/230 kV Substation Project (Stage 2) • To accommodate the entry of bulk generation capacity additions in Batangas	• Generation Entry • Awaiting ERC approval	• Tuy 500 kV SS: 3x1000 MVA 500/230 kV Power Transformer 8-500 kV PCB and associated equipment 1-230 kV PCB and associated equipment. • Silang 500 kV SS: 4-500 kV PCB and associated equipment		Batangas	• 7,442M • Oct 2030
Silang 500 kV Substation • To address the forecasted load growth in Laguna, Cavite, and southern part of Metro Manila • To address the overloading of the Dasmariñas 500/230 kV SS • To serve as the termination of the 500 kV line emanating from the proposed Tuy 500 kV SS, which supports the entry of additional generation capacities in Batangas Area	• Load growth • Awaiting ERC approval	• Silang 500 kV SS: 2x1000 MVA 500/230 kV Power Transformer and accessories, 10-500 kV PCB and associated equipment, 17-230 kV PCB and associated equipment, 230 MVAR, 500 kV Line Reactor 3x100 MVAR, 230 kV Shunt Capacitor	• Silang 500 kV bus-in TL: ST-DC, 4-795 MCM ACSR, 3 km (2x2,494 MW). • Tuy 500 kV TL Diversion: ST-DC, 4-410 mm2 TACSR/AS, 4.5 km (2x4,234 MW). • Biñan 230 kV TL Diversion: ST-DC, 4-410 mm2 TACSR/AS, 4.5 km (2x1,948 MW).	Cavite	• 9,737M • Feb 2028

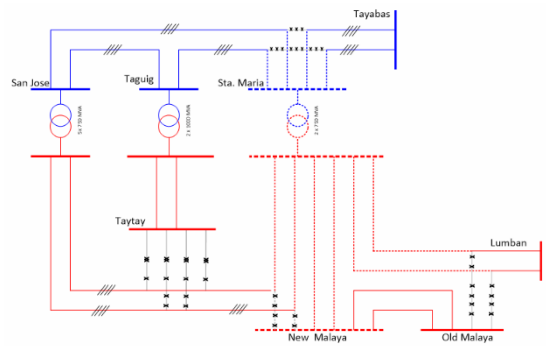
SUBSTATION

Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*

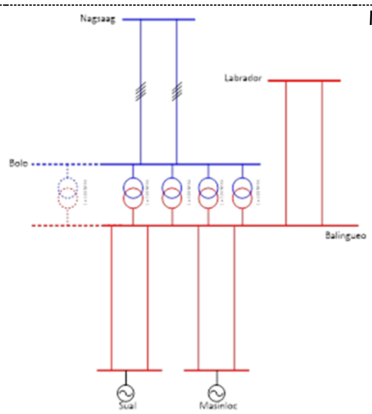
Silang 500 kV Substation



Project Name and Description	Project Driver and Status	Substation	Transmission Line	Location	Project Cost (Million Pesos) ETC*
Sta. Maria 500 kV Substation • To cater an approximately 4,650 MW RE generation capacity in Quezon, Rizal, and Laguna	• Generation Entry • Awaiting ERC approval	• Sta. Maria SS: 2x750 MVA, 500/230 kV, Power Transformers, 18-500 kV PCB and associated equipment • 18-230 kV PCB and Associated equipment • New Malaya SS Expansion: 2-230 kV PCB and associated equipment	• Sta. Maria 'Bus-in' to Tayabas – San Jose 500 kV TL: 500 kV, 4-795 MCM ACSR, ST-DC, 2x 1.0 km (2x2,494 MW). • Sta. Maria – Antipolo 230 kV Line diversion through the Old Malaya – Taytay 230 kV Line and the portion Old Malaya–Lumban 230 kV TL: 230 kV, 4-795 MCM ACSR, ST- DC, 3 km • Swinging of Lines in Malaya and Taytay SS, 230 kV: 4-795 MCM ACSR, ST-DC, 0.5 km (2x1,148 MW). • Sta. Maria – Lumban 230 kV Line diversion through the portion Old Malaya–Lumban 230 kV TL: 230 kV, 4-795 MCM ACSR, ST-DC, 3 km (2x1,148 MW). • Sta. Maria – New Malaya 230 kV TL: 230 kV, 4-410 mm2 TACSR, ST-DC, 13.3 km (2x1,948 MW).	Laguna	• 15,850M • Dec 2030



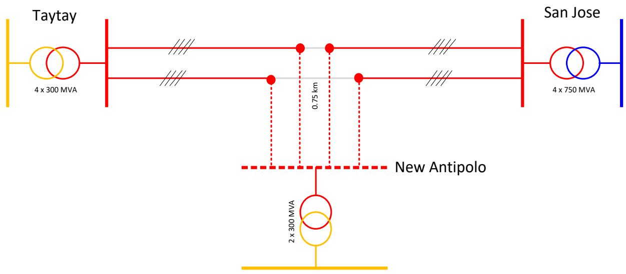
Project Name and Description	Project Driver and Status	Substation	Transmission Line	Location	Project Cost (Million Pesos) ETC*
Bolo 5th Bank • To accommodate the additional generation in the northwestern region of Luzon	• Generation entry • Awaiting ERC approval	• Bolo SS: 1x600 MVA 500/230 kV Transformer and Accessories 22-230 kV PCB and associated equipment		Pangasinan	• 2,521M • Jan 2029



230 kV PROJECTS

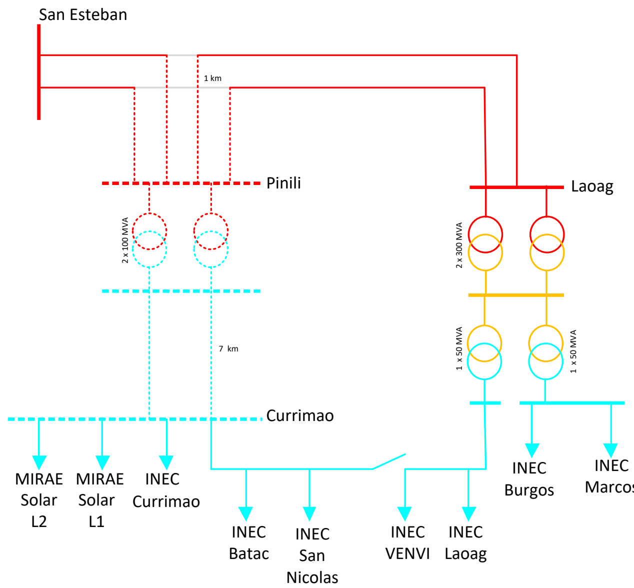
Project Name and Description	Project Driver and Status	Substation	Transmission Line	Location	Project Cost (Million Pesos) ETC*
Antipolo 230 kV Substation	• Load Growth • ERC-approved	• Antipolo 230 kV SS: 12-230 kV PCB and associated equipment, 2x100 MVAR 230 kV Capacitor Banks.	• Bus-in point along San Jose – Taytay 230 kV TL: ST-DC, 4-795 MCM ACSR/AS, 0.75 km (2x1,148 MW).	Rizal	• 1,179M • Jun 2025

SUBSTATION

Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
• To decongest heavily loaded 230 kV delivery substations serving Meralco's 115 kV distribution Substations in Metro Manila. The SS caters to the load growth in the Sector 2 of MERALCO. • To address the forecasted load growth in Meralco Sector 2 • To decongest the existing Taytay 230/115 kV Substation		 			
North Luzon 230 kV Substation Upgrading • 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. • To increase the reliability of the concerned Substations with old and obsolete PCB and associated equipment	• Load Growth and System Reliability • ERC-approved	Stage 1: • Bauang 230 kV SS (Replacement): 1x100 MVA 230/115/69-13.8 kV Transformer, 7-230 kV PCB and associated equipment • Gamu 230 kV SS: 10-230 kV PCB and associated equipment, 3-69 kV PCB and associated equipment • Bayombong 230 kV SS: 5-230 kV PCB and associated equipment., 2-69 kV PCB and associated equipment • Hermosa 69 kV SS: 11-69 kV PCB and associated equipment • Malaya 230 kV SS (Expansion), 1x300 MVA, 230/115-13.8 kV Transformer, 15-230 kV PCB and associated equipment, 1-115 kV PCB and associated equipment • Quezon 230 kV SS (Expansion): 3-230 kV PCB and associated equipment • San Jose 230 kV SS (Expansion): 1x300 MVA, 230/115-13.8 kV Transformer, 1-230 kV PCB and associated equipment, 10-115 kV PCB and associated equipment Stage 2: • Bacnotan 230 kV SS (Expansion): 1x100 MVA 230/69-13.8 kV Transformer, 2-230 kV PCB and associated equipment, 8-69 kV PCB and associated equipment • Balingueo 230 kV SS (Expansion): 1x100 MVA 230/69-13.8 kV Transformer, 5-230 kV PCB and associated equipment, 4-69 kV PCB and associated equipment • Labrador 230 kV SS (Replacement): 1x100 MVA 230/69-13.8 kV Transformer, 5-230 kV PCB, 2-69 kV PCB and associated equipment • San Rafael 230 kV SS (Expansion): 1x300 MVA 230/69-13.8 kV Transformer, 1-230 kV PCB and associated equipment, 2-69 kV PCB and associated equipment.		• La Union • Isabela • Nueva Vizcaya • Bataan • Quezon • Pangasinan • Bulacan	• 4,536M • Stage 1: Sep 2025 • Stage 2: Dec 2024

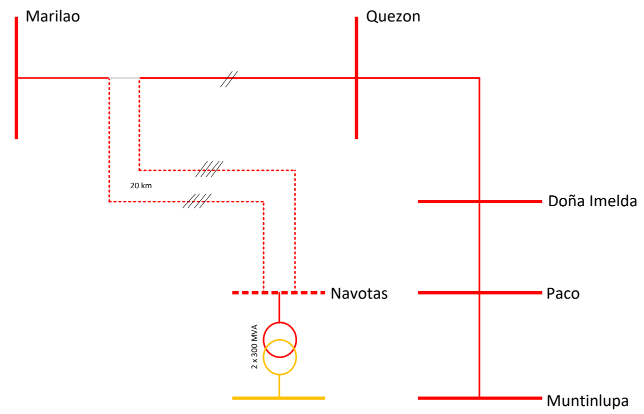
SUBSTATION

Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
Pinili 230 kV Substation CEPNS	• Load Growth • Awaiting ERC approval	• Pinili 230 kV SS (New): 2x100 MVA 230/69-13.8 kV Power Transformer, 10-230 kV PCB and associated equipment, 8-69 kV PCB and associated equipment • Currimao SS: 5-69 kV PCB and associated equipment	• Pinili Bus-in to San Esteban – Laoag 230 kV TL: ST-DC, 1-795 MCM ACSR/AS, 2x1.0 km (2x287 MW). • Pinili – Currimao 69 kV TL: ST-DC, 1-795 MCM ACSR/AS, 7.0 km (2x86 MW).	Ilocos Norte	• 1,844M • Dec 2026
• To address the forecasted load growth in Ilocos region and to provide an alternate connection source for loads connected at Laoag SS during N-1 contingency condition. • To replace the existing Currimao 115 kV SS as it can no longer be expanded due to space constraints. • To serves as a connection point for new renewable energy plants					
South Luzon 230 kV Substation Upgrading	• Load Growth and System Reliability • ERC-approved	Stage 1: • Las Piñas 230 kV SS: 1x300 MVA, 230/115-13.8 kV Power Transformer and Accessories • Lumban 230 kV SS (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 PCB and associated equipment • Naga 230 kV SS (Replacement), 1x300 MVA, 230/69-13.8 kV Power Transformer and Accessories, 1-230 kV PCB and associated equipment, 1-69 kV PCB and associated equipment Stage 2: • Daraga 230 kV SS, 1x100 MVA 230/69-13.8 kV Power Transformer and Accessories, 4-230 kV PCB and associated equipment, 2-69 kV PCB and associated equipment • Gumaca 230 kV SS (Replacement): 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 • Labo 230 kV SS: Busworks, Protection and Control Equipment		• Laguna • Batangas • Albay • Quezon • Camarines Norte	• 1,980M • Stage 1: Aug 2025 • Stage 2: Aug 2025
• To address the overloading of several 69 kV lines in South Luzon					
South Luzon 230 kV Substation Upgrading 2	• Load Growth and Power	• Lumban 230 kV SS (Replacement): 1x100 MVA 230/69-13.8 kV		• Batangas • Laguna, • Quezon	• 7,087M • Apr 2026



SUBSTATION

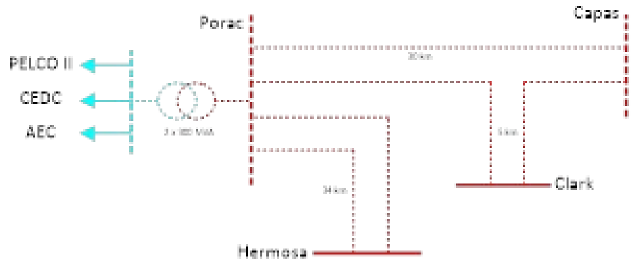
Project Name and Description	Project Driver and Status	Project Components		Location	Project Cost (Million Pesos)
		Substation	Transmission Line		ETC*
• To cater the load growth and provides N-1 contingency to various Substations in NGCP's South Luzon Region in Lumban, Gumaca, Tuy, Labo, and Calaca Substations • To replace defective and upgrade underrated PCBs	Quality and Technology • Awaiting ERC approval	Power Transformer, 1-69 kV PCB and associated equipment • Gumaca 230 kV SS (Replacement): 1x100 MVA 230/69-13.8 kV Power Transformer; 1-69 kV PCB and associated equipment • Tuy 230 kV SS: 1x300 MVA, 230/69-13.8 kV Power Transformer, 2-230 kV PCB and associated equipment, 3-69 kV PCB and associated equipment • Calaca 230 kV SS (Replacement): 2x300 MVA, 230/69-13.8 kV Power Transformer; 2-230 kV PCB and associated equipment, 7-69 kV PCB and associated equipment • Labo 230 kV SS (Replacement): 1x100 MVA, 230/69-13.8 kV Power Transformer; 1-69 kV PCB and associated equipment • Daraga 230 kV SS (Replacement): 3-230 kV PCB and associated equipment • Taytay 230 kV SS: 3x100 MVAR, 230 kV Capacitor Banks, 4-230 kV PCB and associated equipment • Quezon 230 kV SS: 1x100 MVAR, 230 kV Capacitor Banks, 1-230 kV PCB and associated equipment • Biñan 230 kV SS: 5-230 kV PCB and associated equipment, 6-115 kV PCB and associated equipment • Dasmariñas 115 kV SS: 11-115 kV PCB and associated equipment • Naga 69 kV SS: 1-69 kV PCB and associated equipment • Muntinlupa 115 kV SS, 10-115 kV PCB and associated equipment • Daraga 230 kV SS: 3-230 kV PCB and associated equipment • Bay 69 kV SS: 2-69 kV PCB and associated equipment		• Camarines Norte • Albay • Rizal • Metro Manila	
Navotas 230 kV Substation CEPNS • To provide new 230/115 drawdown substation in Metro Manila • To cater to the load growth in Sector 1 of MERALCO and serves as a connection point for power plants in the area such as the TMO and Millennium Power Plants.	• Load Growth and System Reliability and Security • ERC-approved	• Navotas 230 kV SS: 2x300 MVA, 230/115-13.8 kV Transformers, 9-230 kV PCB (GIS) and associated equipment, and 15-115 kV PCB (GIS) and associated equipment	• Navotas – Marilao 230 kV TL, SP/ST-DC, 4-795 MCM ACSR, 20 km	Navotas	• 6,586M • Dec 2026



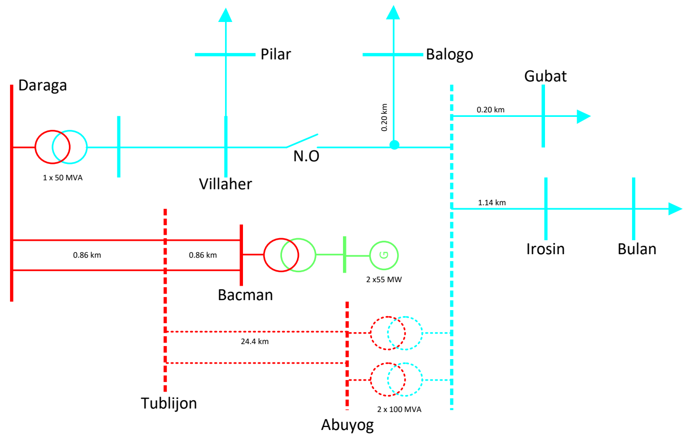
Project Name and Description	Project Driver and Status	Substation	Transmission Line	Location	ETC*
Porac 230 kV Substation	• Load Growth • Awaiting ERC approval	• Porac 230 kV SS: 2x300 MVA 230/69 kV Transformers, 3x100 MVAR, 230 kV Shunt Capacitor,	• Hermosa – Porac 230 kV TL: ST-DC, 4-95 MCM ACSR, 34 km (2x1,148 MW).	Pampanga	• 7,741M • Nov 2026

SUBSTATION

Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
• To support the load growth in Pampanga specifically the development of major loads such as Alviera • To establish the 230 kV backbone loop from Hermosa in Bataan to Concepcion in Tarlac • To provide a more direct access to the generation hub in Bataan		13-230 kV PCB, 19-69 kV PCB and associated equipment. • Hermosa 230 kV SS (Expansion): 2-230 kV PCB and associated equipment • Clark 230 kV SS (Expansion): 2x100 MVAR, 230 kV Shunt Capacitor, 8-230 kV PCB and associated equipment • Capas 230 kV SS (Expansion), 4-230 kV PCB and associated equipment	• Capas – Porac SS: ST-DC 4-795 MCM ACSR, 30 km (2x1,148 MW). • Clark 230 kV TL Extension: ST-DC, 4-795 MCM ACSR, 5 km (2x1,148 MW).		



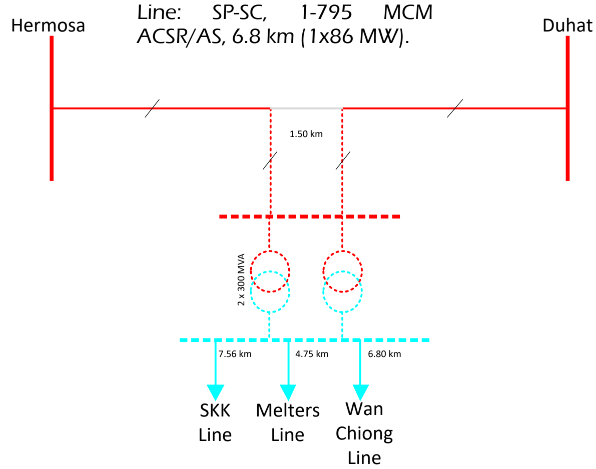
Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
Abuyog 230 kV Substation • To establish a 230 kV drawdown SS closer to the loads in Sorsogon which will address the supply reliability issues, meet the long-term projected demand and address the power quality issues at the LES.	• Load Growth and Generation Entry • Awaiting ERC approval	• Abuyog 230 kV SS: 2x100 MVA 230/69-13.8 kV Transformer, 3x25 MVAR, 230 kV Shunt Capacitor, 3x25 MVAR, 230 kV Shunt Reactor, 12-230 kV PCB and associated equipment, 8-69 kV PCB and associated equipment • Tublijon 230 kV SWS: 10-230 kV PCB and associated equipment	• Tublijon – Abuyog 230 kV TL: 2-795 MCM ACSR/AS, ST-DC, 25.4 km (2x573 MW). • Tublijon – Daraga 230 kV Bus-in TL: 2-795 MCM ACSR/AS, ST-DC, 0.86 km (2x573 MW). • Tublijon – BacMan 230 kV Bus-in TL: 1-795 MCM ACSR/AS, ST-DC, 0.86 km (2x287 MW). • Abuyog – Gubat 69 kV Line Extensions: 1-336.4 MCM ACSR, SP-SC, 0.20 km (1x56 MW). • Abuyog – Balogo 69 kV Line Extensions: 1-336.4 MCM ACSR, SP-SC, 0.20 km (1x56 MW). • Abuyog – Irosin – Bulan 69 kV Line Extensions: 1-336.4 MCM ACSR, SP-SC, 1.14 km (1x56 MW).	Sorsogon	• 3,795M • Nov 2026



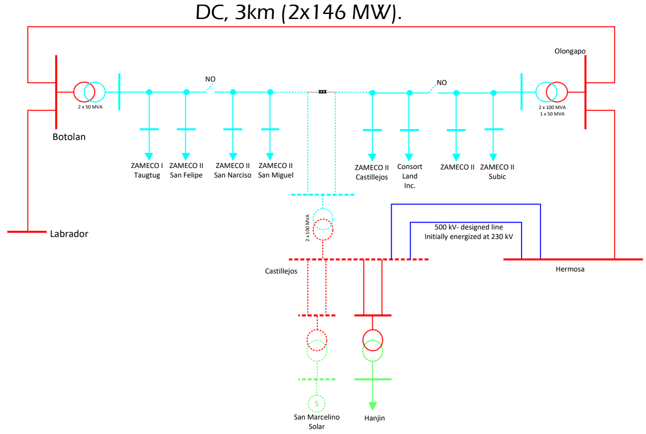
Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
San Simon 230 kV Substation CEPNS	• Load Growth • Awaiting ERC approval	• Mexico 230 kV SS: 8-69 kV PCB and associated equipment • San Simon 230 kV SS: 2x300 MVA 230/69 kV Transformer, 2x100 MVAR 230 kV capacitor, 14-230 kV PCB and associated equipment, 12-69 kV PCB and associated equipment	• San Simon cut-in connection to Hermosa – Duhat-Balintawak 230 kV Line: 2-795 MCM ACSR/AS, SP-DC, 1.5 km (2x573 MW). • Mexico – STR 120D (Calumpit Line Segment) 69 kV Line: SP-SC, 1-410 mm2 TACSR/AS, 12.3 km STR 120D–PELCO 3 (Apalit Tap) 69 kV Line: SP-SC, 1-410	Pampanga	• 4,001M • May 2027

SUBSTATION

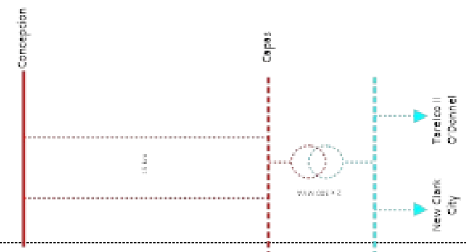
Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
• To accommodate the growing demands of the existing steel mills and directly connected d industries • To support the entry of new steel mills and industrial loads in San Simon, Pampanga southeastern part of the province of Pampanga which is presently being served by the existing Mexico 230 kV SS and underlying 69 kV facilities. • To address the overloading of the 69 kV transmission facilities and serve as an alternate source SS for the loads connected at Mexico SS			mm2 TACSR/AS, 2.52 km (1x146 MW). • San Simon – SKK 69 kV Line: SP-SC, 1-410 mm2 TACSR/AS, 7.56 km (1x146 MW). • San Simon – Melters 69 kV Line: SP-SC, 1-410 mm2 TACSR/AS, 4.75 km (1x146 MW). • San Simon – Wan Chiong 69 kV Line: SP-SC, 1-795 MCM ACSR/AS, 6.8 km (1x86 MW).		



Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
Castillejos 230 kV Substation • To cater the load growth in Zambales and to provide N-1 contingency for Botolan-Castillejos and Olongapo-Cawagan 69 kV TL, as well as for Botolan 50 MVA Transformer • To serve as an alternative source to loads of Botolan and Olongapo 230 kV Substations • To serve as the connection point of San Marcelino Solar and other future bulk generation development in the area	• Load Growth and System Reliability and Security • Awaiting ERC approval	• Castillejos 230 kV SS: 2x100 MVA, 230/69 kV Transformer, 18-230 kV PCB, 6-69 kV PCB and associated equipment.	• Hermosa – Castillejos 500 kV Line Extension: 4-410 mm2 TACSR/AS, ST-DC, 6 km (2x4,234 MW). • Hanjin 230 kV Line Extension: 1-795 MCM ACSR, ST-DC, 7 km (2x287 MW). • Castillejos 69 kV Line Extension: 1-410 mm2 TACSR/AS, SP/ST-DC, 3km (2x146 MW).	Zambales	• 2,752M • Dec 2025

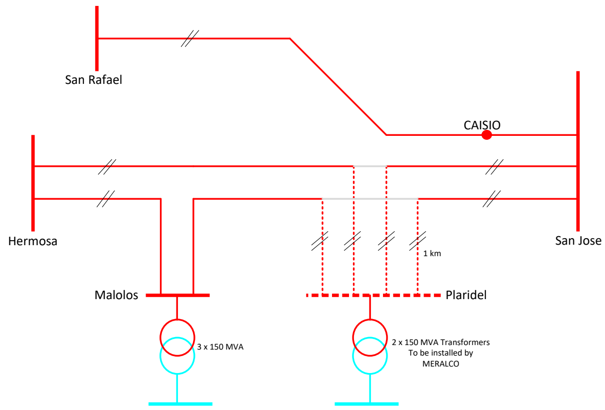


Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
Capas 230 kV Substation • To address the overloading of 230/69 kV transformers in Concepcion SS • To accommodate the connection of New Clark City (a) and cater the loads of TARELCO I, and Tarlac Electric Cooperative II (TARELCO II)	• Load growth and Generation Entry • Awaiting ERC approval	• Concepcion 230 kV SS: 4-230 kV PCB and associated equipment. • Capas 230 kV SS: 2x300 MVA 230/69-13.8 kV power transformers 3x100 MVAR 230 kV capacitors 11-230 kV PCB and associated equipment 14-69 kV PCB and associated equipment	• Concepcion – Capas 230 kV TL ST-DC, 4-795 MCM ACSR, 15 km (2x1,148 MW).	Tarlac	• 6,954M • Dec 2029

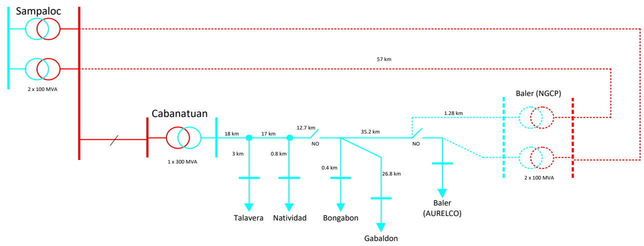


SUBSTATION

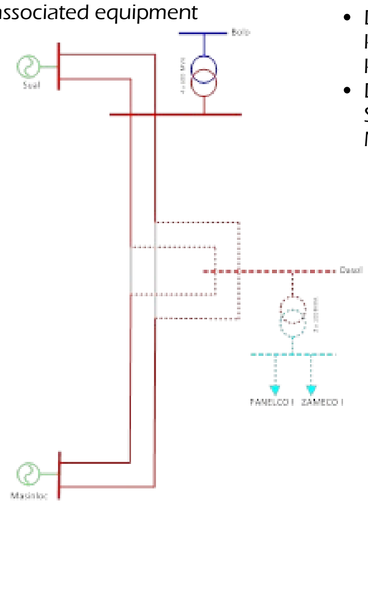
Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
• To address the load growth in the franchise area of TARELCO I, TARELCO II, Tarlac Electric Inc. (TEI) and Shin Clark Power Corporation for the connection of the NCC					
Plaridel 230 kV Substation • To address the continues load growth in MERALCO's Bulacan and provides N-1 contingency provision to the 230/69 kV transformers at San Rafael and Malolos Substations.	• Load Growth • and System • Reliability and Security • Awaiting ERC approval	• Plaridel 230 kV SS: 2x100 MVAR 230 kV capacitors 12-230 kV PCB and associated equipment	• Plaridel 230 kV bus-in 230 kV TL: ST-DC, 2-795 MCM ACSR, 1.0 km (2x573 MW).	Nueva Ecija	• 2,520M • Feb 2030



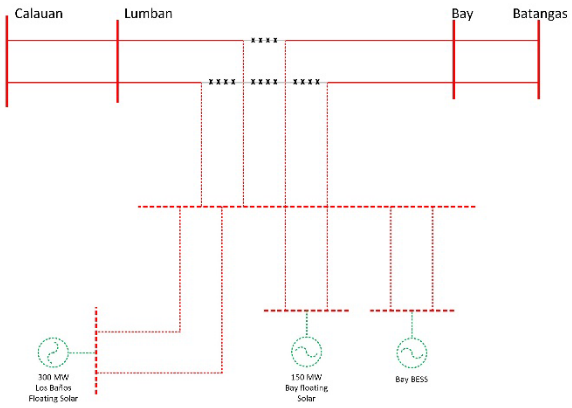
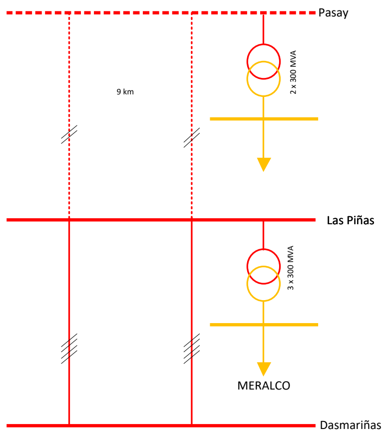
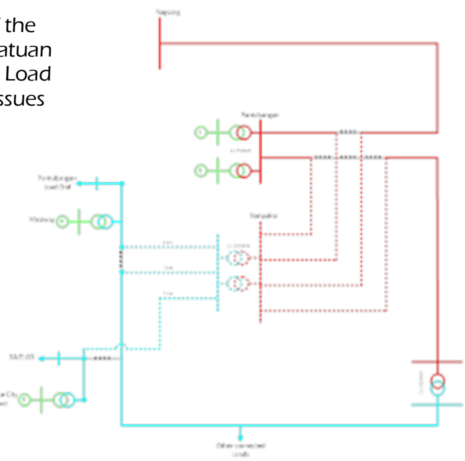
Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
Baler 230 kV Substation • To address the anticipated overloading of the Cabanatuan–Baler 69 kV TL • To provide drawdown substation in the province of Aurora	• Load Growth • Awaiting ERC approval	• Baler kV SS: 2x100 MVA 230/69 kV Power Transformer, 11-230 kV PCB and associated equipment, 4-69 kV PCB and associated equipment, 3x25 MVAR Shunt Capacitor, 2x25 MVAR Shunt Reactor • Sampaloc 230 kV SS: 2-230 kV PCB and associated equipment	• Sampaloc – Baler (NGCP) 230 kV TL: ST-DC, 2-795 MCM ACSR, 57 km (2x573 MW). • Baler (NGCP) – Baler (AURELCO) 69 kV TL: SP-DC, 1-795 MCM CSR, 1.78 km (2x86 MW).	Nueva Ecija, Aurora	• 10,128 • Apr 2030



Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
Dasol 230 kV Substation • To cater to load growth in Pangasinan I Electric Cooperative (PANELCO I) and Zambales I Electric Cooperative (ZAMECO I) franchise areas • To relieve the projected overloading of the Labrador – Bolinao and Botolan – Candelaria 69 kV TL along with the overloading of the transformers in Labrador and Botolan 230 kV Substations • To address the increasing load growth in both PANELCO I and ZAMECO I franchise areas	• Load Growth • Awaiting ERC approval	• Dasol 230 kV SS: 2x100 MVA, 230/69 kV Power Transformers, 10-230 kV PCB and associated equipment, 4-69 kV PCB and associated equipment	• Dasol 'Bus-in' to Masinloc - Kadampat 230 kV TL: ST-DC, 4-795 MCM ACSR, 1x2 km (2x1148 MW). • Dasol – Dasol (PANELCO I) 69 kV TL: SP-SC, 1-795 MCM, 17.7 km (1x86 MW). • Dasol – Sta. Cruz 69 kV TL: SP-SC, 1-795 MCM, 17.3 km (1x86 MW).	Zambales	• 5,241M • Dec 2030



SUBSTATION

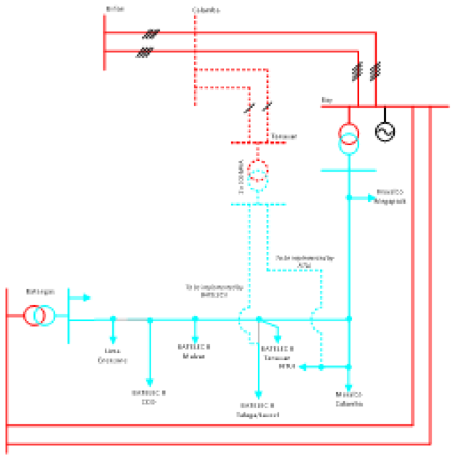
Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
Masiit 230 kV Substation Project • To accommodate the generation capacities in the province. These generation capacities include the proposed Floating Solar Power plants in Laguna Bay, including BESS. • To provide new substation connection for RE plants	• Load Growth • and System Reliability • Awaiting ERC approval	• Masiit 230 kV Collector Station: 16-230 kV PCB and associated equipment	• Masiit 'bus-in' along Lumban – Bay 230 kV TL: 4-795 MCM ACSR, ST-DC, 2x1 km (2x287 MW) • 	Laguna	• 2,792M • Dec 2030
Pasay 230 kV Substation CEPNS • To cater the load growth of MERALCO's load sector 3 which is presently being served by Las Piñas and Muntinlupa Substations • To support the increasing power consumption in the cities of Pasay, Parañaque, Makati and Taguig	• Load Growth • ERC Approved	• Pasay 230 kV SS: 11-230 kV PCB and associated equipment (GIS)	• Las Piñas – Pasay 230 kV TL: DC Underground Cable: 2x2,500 mm2 XLPE (1-core), 9 km (2x1,170 MW). 	• Las Pinas • Pasay	• 19,074M • Dec 2029
Sampaloc 230 kV Substation • To address the forecasted load growth in Nueva Ecija • To relieve the heavy loading of the existing 69 kV line from Cabanatuan going to Fatima (Pantabangan Load End) and address the voltage issues in the area	• Load Growth • Awaiting ERC approval	• Sampaloc 230 kV SS: 2x100 MVA, 230/69 kV Power Transformers, 12-230 kV PCB and associated equipment, 5-69 kV PCB and associated equipment, 2x50 MVAR Shunt Capacitor 	• Sampaloc 'Bus-in' to Cabanatuan – Pantabangan and Nagsaag – Pantabangan 230 kV TL: 1-795 MCM ACSR/AS, 2 km (2x287 MW). ▪ Sampaloc 'cut-in' to Cabanatuan – Fatima 69 kV TL: ST-DC, 1-336 MCM, 1 km (2x56 MW). • Sampaloc – SAJELCO 69 kV TL: SP-SC, 1-410 mm2 TACSR/AS, 7 km (1x146 MW).	Nueva Ecija	• 3,777M • Dec 2028

SUBSTATION

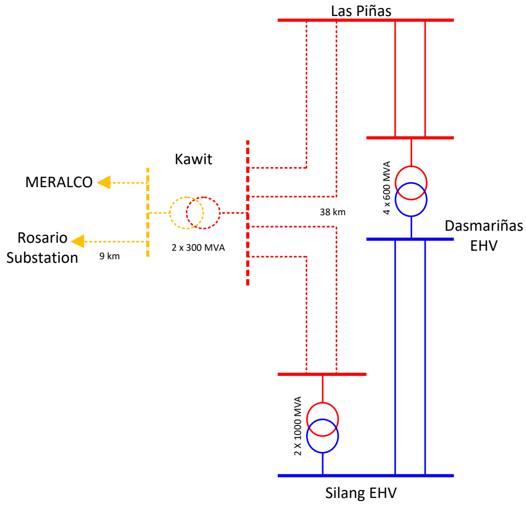
Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
Luzon Primary Equipment Substation Upgrading • To accommodate the connection of several proposed Generating Power Plants in the Luzon Grid • To replace the existing Under-rated PCB and Power Transformers installed on various Luzon Substations • To upgrade the existing HVE at various substations in the Luzon Grid	• Generation entry and System reliability and security • Awaiting ERC approval	• Cabanatuan 230 kV SS: 4-230 kV PCB and associated equipment • Magat 230 kV SS: 1-230 kV Compact Air Insulated Switchgear (CAIS) PCB and associated equipment • Pantabangan 230 kV SS: 2-230 kV PCB and associated equipment • Quezon 230 kV SS: 7-230 kV PCB and associated equipment • Doña Imelda 230 kV SS: 7-230 kV Gas Insulated Substation (GIS) PCB and associated equipment, 12-115 kV GIS PCB and associated equipment • Malaya Collector Station: 4-230 kV PCB and associated equipment • Salong 230 kV SS: 2-230 kV PCB and associated equipment • San Rafael 230 kV SS: 1x300 MVA, 230/69 kV Power Transformer, 2-69 kV PCB and associated equipment • Tuguegarao 69 kV SS: 2-69 kV PCB and associated equipment • Daraga 69 kV SS: 2-69 kV PCB and associated equipment • Bay 69 kV SS: 3-69 kV PCB and associated equipment • Clark 69 kV SS: 3-69 kV PCB and associated equipment • Bacnotan 69 kV SS: 1-69 kV PCB and associated equipment • Lal-lo 69 kV SS: 3-69 kV PCB and associated equipment • Bolo 230 kV SS: 4-230 kV PCB and associated equipment • Laoag 230 kV SS: 2x300 MVA, 230/115 kV Power Transformer 4-230 kV PCB and associated equipment, 1-115 kV PCB and associated equipment, 3-69 kV PCB and associated equipment • Hermosa 69 kV SS: 1x300 MVA, 230/69 kV Power Transformer, 3-69 kV PCB and associated equipment • Tiwi-C 69 kV SS: 2-69 kV PCB and associated equipment • Limay 69 kV SS: 1-69 kV PCB and associated equipment • Tiwi-A SS: 1x100 MVA, 230/69 kV Power Transformer, 3-69 kV PCB and associated equipment • Calamba 230 kV SS: 2-230 kV PCB and associated equipment	• Tiwi-A 'Cut-in' to Tiwi-C – Tabaco 69 kV TL: 69 kV, 1-795 MCM ACSR/AS, SP-DC, 2x1 km (2x86 MW). • Hermosa – BPPI/Calaguiman 69 kV TL: 69 kV, 1-795 MCM ACSR/AS, SP-SC, 1.5 km (1x86 MW).	Various Provinces in Luzon Grid	• 15,285M • Nov 2026
Tanauan 230 kV Substation CEPNS	• Load growth • Awaiting ERC approval	• Tanauan SS: 2x100 MVA, 230/69-13.8 kV 8-230 kV PCB and associated equipment 4-69 kV PCB + associated equipment • Calamba SS: 2-230 kV PCB and associated equipment	• Calamba – Tanauan 230 kV TL: T/SP-DC, 2-795 MCM ACSR, 12 km (2x573 MW).	Batangas	• 5,565M • Jan 2028

SUBSTATION

Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
• To cater the load growth and improve the power quality in Batangas and Laguna, particularly the loads of MERALCO in Calamba, Batangas II Electric Cooperative, Inc. (BATELEC II) and First Industrial Township Utilities, Inc. (FITUI)					



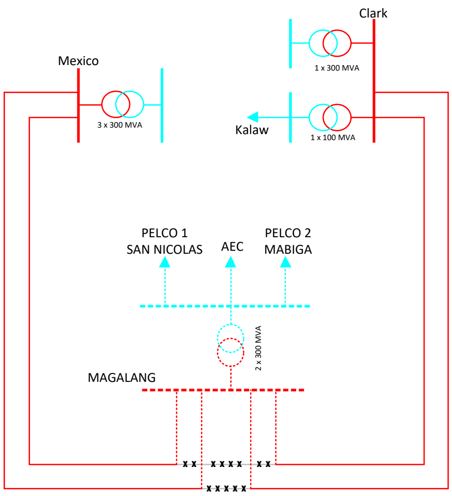
Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
Kawit 230 kV Substation • To cater the load growth in MERALCO's Cavite Sector • To improve the reliability of the Rosario 115 kV SS by upgrading to a double-bus GIS substation and as well as addressing the overloading of Rosario 115/34.5 kV transformers during N-1 contingency • To relieve the overloading of Dasmariñas 3x300 MVA 230/115 kV transformers	• Load Growth and System Reliability and Security • Awaiting ERC approval	• Kawit 230 kV SS: 2x300 MVA 230/115 kV Power Transformers, 12-230 kV PCB and associated equipment, 6-115 kV PCB and associated equipment, 2x100 MVAR, 230 kV Shunt Capacitor • Las Piñas 230 kV SS (Expansion): 4-230 kV PCB and associated equipment • Silang 230 kV SS (Expansion): 4-230 kV PCB and associated equipment • Rosario 115 kV SS Upgrading: 2x100 MVA 115/34.5 kV Power Transformers, 8-115 kV PCB (GIS) and associated equipment, 10-34.5 kV PCB (GIS) and associated equipment.	• Silang – Kawit – Las Piñas 230 kV TL: SP-DC, 4-795 MCM ACSR, 38 km (2x1,148 MW). • Kawit – Rosario 115 kV TL SP/ST-SC, 2-795 MCM ACSR, 9 km (1x573 MW).	• Cavite • Las Piñas	• 15,153M • May 2028



Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
North Luzon 230 kV Substation Upgrading 2 • To cater the load growth and provide N-1 contingency to Substations in NGCP's North Luzon Region	• Load Growth and System Reliability and Security • Awaiting ERC approval	• Laoag SS: 1x100 MVA 115/69 kV Power Transformer and Accessories, 1-115 kV PCB and associated equipment, 10-69 kV PCB and associated equipment • Mexico SS: 18-69 kV PCB and associated equipment • San Manuel SS: 2x300 MVA, 230/69 kV Power Transformer and Accessories, 14-69 kV PCB and associated equipment Nagsaag SS: 1-69 kV PCB and Associated equipment • Pantabangan SS: 4-230 kV PCB and associated equipment • Tuguegarao SS: 1x100 MVA 230/69 kV Power Transformer and Accessories, 1-230 kV PCB		• La Union • Ilocos Norte • Nueva Vizcaya • Isabela • Ilocos Sur • Pangasinan • Cagayan • Tarlac • Pampanga • Zambales • Nueva Ecija • Bataan	• 9,153M • Jul 2028

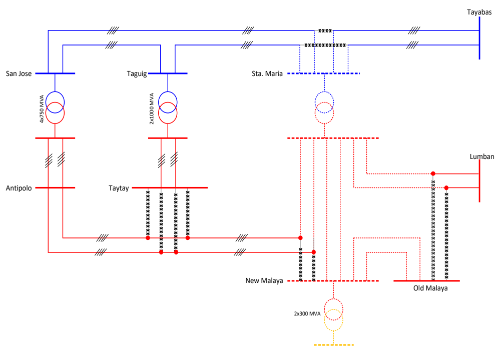
SUBSTATION

Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
		and associated equipment, 1-69 kV PCB and Associated equipment • Balingueo SS: 1x100 MVA 230/69 kV Power Transformer and Accessories, 2-230 kV PCB and associated equipment, 1-69 kV PCB and associated equipment • Bauang SS: 1x100 MVA 230/69 kV Power Transformer and Accessories • Bayombong SS: 2x100 MVA, 230/69 kV Power Transformer and Accessories, 5-230 kV PCB and associated equipment, 14-69 kV PCB and associated equipment • Concepcion SS: 6-69 kV PCB and associated equipment, 2x300 MVA 230/69 kV Power Transformer and Accessories • Santiago SS: 1x100 MVA, 230/69 kV Power Transformer and Accessories, 5-69 kV PCB and associated equipment • Subic SS: 1-230 kV PCB and associated equipment • San Jose SS: 29-230 kV PCB and associated equipment, 12-115 kV PCB and associated equipment • San Esteban SS: 2x100 MVA 115/69 kV Power Transformer and Accessories, 1-69 kV PCB and associated equipment, 1-115 kV PCB and associated equipment • Masinloc SS: 2-230 kV PCB and associated equipment • Bolo SS: 2-230 kV PCB and associated equipment • Hermosa SS: 19-230 kV PCB and associated equipment.			
Magalang 230 kV Substation • To provide an additional drawdown SS in the province of Pampanga • To improve the reliability of the supply of loads in Pampanga to act as another connection point of DU in the area • To accommodate the connection of 96.236 MWac Sapang Balen 1 Solar Power Plant Project and 463.995 MWac Sapang Balen 2 Solar Power Plant Project of Sapang Balen Solar Sustainable Energy Corporation (SBSSEC) • To address the anticipated load growth of AEC, PELCO I, and PELCO II • To accommodate the connection of proposed solar plants in Pampanga	• Generation Entry • Awaiting ERC approval	• Magalang SS: 2x300 MVA 230/69 kV Power Transformer, 12-230 kV PCB and associated equipment, 10-69 kV PCB and associated equipment, 2x100 MVAR, 230 kV Shunt Capacitor	• Magalang 'bus-in' along Mexico – Concepcion 230 kV TL: 230 kV, 2-410 mm2 TACSR, ST-DC, 3 km (2x974 MW).	Pampanga	• 3,911M • Dec 2027
Luzon PCB for Grid Connection	• System Reliability and Security	• Botolan SS: 4-230 kV PCBs, 2-69 kV PCBs and associated equipment	• Hermosa 69 kV Substation Underground Cable Works: 69 kV, XLPE Cables, 1 km	Several Substations in Luzon	• 3,636M • Dec 2028



SUBSTATION

Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
• To accommodate several incoming generating power plants in the Luzon Grid	• For Filing	• Bay SS: 1-230 kV PCBs, 2-69 kV PCBs and associated equipment • San Rafael SS: 1-69 kV PCB and associated equipment • Concepcion SS: 1-69 kV PCB and associated equipment • Castillejos SS: 4-230 kV PCB and associated equipment • Hermosa SS: 1-69 kV PCB and associated equipment • Naga SS: 4-230 kV PCB, 1-69 kV PCB and associated equipment • San Juan SS: 2-230 kV PCB and associated equipment • Labo SS: 1-69 kV PCB and associated equipment • Tuy SS: 4-69 kV PCB and associated equipment • Lumban SS: 4-230 kV PCB and associated equipment • Pinamucan SS: 4-500 kV PCB and associated equipment • Lal-lo SS: 4-230 kV PCB and associated equipment • Laoag SS: 1-115 kV PCB and associated equipment • Pagbilao SS: 4-230 kV PCB and associated equipment • Dasol SS: 8-230 kV PCBs and associated equipment • Tayabas SS: 8-230 kV PCB and associated equipment • Gamu SS: 2-230 kV PCB and associated equipment • Binga SS: 1-69 kV PCB and associated equipment • Sampaloc SS: 4-230 kV PCB and associated equipment • Pinili SS: 4-230 kV PCB and associated equipment • Mariveles SS: 8-500 kV PCB and associated equipment • Calamba SS: 2-230 kV PCB and associated equipment • Bolo SS: 4- 500 kV PCB, 4-230 kV PCB and associated equipment • San Manuel SS: 5-69 kV PCB and associated equipment			
Malaya 230 kV Collector Station • To accommodate incoming RE power plant connections	• Generation Entry • Awaiting ERC approval	Malaya Collector Station: 6-230 kV PCB and Associated equipment, 10-115 kV PCB and associated equipment	Malaya 230 kV Line: ST-DC, 4-795 MCM ACSR, 0.5 km (2x1,148 MW).	Rizal	• 2,673M • Mar 2028

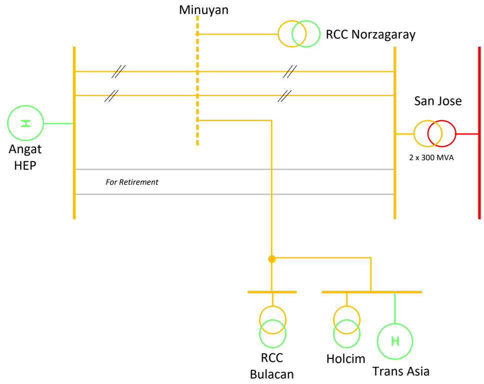


115 kV PROJECTS

Project Name and Description	Project Driver and Status	Substation	Transmission Line	Location	Project Cost ETC*
Minuyan 115 kV Switching Station	• System Reliability	• Minuyan SWS: 11-115 kV PCB and associated equipment	• San Jose 115 kV Line Extension: ST-DC, 2-795 MCM ACSR/AS, 0.5 km (2x286 MW).	Bulacan	• 1,895M • Feb 2030

SUBSTATION

Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
• To provide reliable connection of the industrial loads (cement plants) in the area of Bulacan • To provide flexibility and isolate the fault to prevent power interruption to the other connected customers	• Awaiting ERC approval	• Las Piñas 230 kV SS (Expansion): 4-230 kV PCB and associated equipment.	• Angat 115 kV Line Extension: ST-DC, 2-795 MCM ACSR/AS, 1 km (2x286 MW).		



VOLTAGE IMPROVEMENT

Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
230 kV PROJECTS					
Luzon Voltage Improvement Project 3 • 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 LES in the North Luzon Grid	• System Reliability • ERC-approved	• Baler 69 kV LES: 3x2.5 MVAR, 69 kV Capacitor, 3-69 kV PCB and associated equipment • Pantabangan 69 kV LES: 1x5 MVAR, 69 kV Capacitor, 1-69 kV PCB • Umingan 69 kV LES: 3x5 MVAR 69 kV Capacitor, 3-69 kV PCB and associated equipment • Camiling 69 kV LES: 3x5 MVAR 69 kV Capacitor, 3-69 kV PCB and associated equipment • Mexico SS: 3x100 MVAR, 230 kV Shunt Capacitor, 1-230 kV PCB and associated equipment • San Jose SS: 1x100 MVAR, 230 kV Shunt Capacitor, 1-230 kV PCB and associated equipment • Cabanatuan SS: 2x50 MVAR, 230 kV Capacitor Bank, 1-230 kV PCB and associated equipment, 1-69 kV PCB and associated equipment • Laoag SS: 2x25 MVAR, 230 kV Capacitor Bank, 1x25 MVAR, 230 kV Shunt Reactor, 1x35 MVAR, 230 kV Shunt Reactor, 3-230 kV PCB and associated equipment • Nagsaag SS: 1x90 MVAR, 500 kV Shunt Reactor, 1-500 kV PCB and associated equipment • Tuguegarao SS: 1x25 MVAR, 230 kV Capacitor Bank, 2-230 kV PCB and associated equipment, 1-69 kV PCB and associated equipment, 1x25 MVAR, 230 kV Shunt Reactor • Bantay SS: 1x7.5 MVAR, 115 kV Capacitor Bank, 1-115 kV PCB and associated equipment • San Esteban 230 kV SS: 2x25 MVAR, 230 kV Capacitor, 2-230 kV PCB and associated equipment		• Aurora • Nueva Ecija • Pangasinan • Tarlac • Ilocos Sur • Zambales • Benguet	• 2,560M • Jun 2025

VOLTAGE IMPROVEMENT

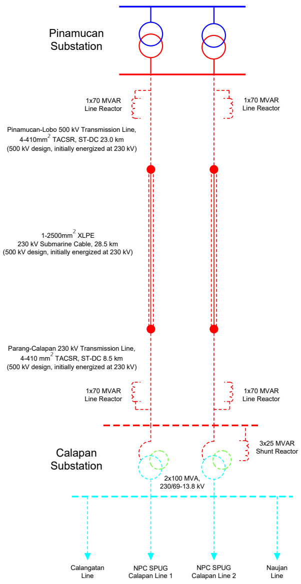
<table>
<tr><th rowspan="2">Project Name and Description</th><th rowspan="2">Project Driver and Status</th><th colspan="2">Project Components</th><th rowspan="2">Location</th><th>Project Cost (Million Pesos)</th></tr>
<tr><th>Substation</th><th>Transmission Line</th><th>ETC*</th></tr>
<tr><td></td><td></td><td>• Botolan 230 kV SS: 1x25 MVAR 230 kV Shunt Reactor, 6-230 kV PCB and associated equipment, 3-69 kV PCB and associated equipment
• Itogon 69 kV LES: 1x7.5 MVAR, 69 kV Capacitor, 1-69 kV PCB and associated equipment
• Antipolo 230 kV SS: 2x100 MVAR, 230 kV Capacitor, 2-230 kV PCB and associated equipment
• Bayamban SS: 3x5 MVAR, 69 kV Capacitor Bank, 4-69 kV PCB and associated equipment</td><td></td><td></td><td></td></tr>
<tr><td>Luzon Voltage Improvement Project 4
• To address the anticipated undervoltage problem during peak load condition at various 69 kV LES in the South Luzon Grid
• To provide additional reactive power support in the network to maintain the system voltage within ±5% of the nominal value during normal and single outage contingencies as prescribed under the PGC</td><td>• Power Quality and Technology
• ERC-Approved</td><td>• Dasmariñas SS: 2x100 MVAR, 230 kV Capacitor Bank, 2-230 kV PCB and associated equipment
• Biñan SS: 2x100 MVAR, 230 kV Capacitor Bank, 2-230 kV PCB and associated equipment
• Ligao SS: 3x5 MVAR Capacitor Bank, 3-69 kV PCB and associated equipment
• Nabua (formerly Iriga) SS: 2x5 MVAR Capacitor, 2-69 kV PCB and associated equipment Irosin (formerly Cuenca) SS: 2x5 MVAR, 69 kV Capacitor Bank, 2-69 kV PCB and associated equipment
• Malvar (formerly San Juan) SS: 3x5 MVAR, 69 kV Capacitor Bank, 3-69 kV PCB and associated equipment
• Rosario (formerly Taysan) SS: 3x7.5 MVAR, 69 kV Capacitor Bank, 3-69 kV PCB and associated equipment
• Tigaon (formerly Lagonoy) SS: 3x5 MVAR, 69 kV Capacitor Bank, 3-69 kV PCB and associated equipment</td><td></td><td>• Sorsogon
• Camarines Sur
• Batangas
• Albay,
• Cavite</td><td>• 1,102M
• Dec 2026</td></tr>
<tr><td>Luzon Voltage Improvement Project 5
• To address the anticipated undervoltage problem during peak load condition at various LES in Cagayan, Tarlac, Nueva Ecija, Pampanga, Zambales, Pangasinan, Batangas, Quirino, Isabela, Nueva Viscaya, and Benguet
• To provide additional reactive power support in the network to maintain the system voltage within ±5% of the nominal value during normal and single outage contingencies as prescribed under the PGC</td><td>• Power Quality and Technology
• ERC-Approved</td><td>• Solana LES: 4x7.5 MVAR 69 kV Capacitor Bank, 5-69 kV PCB and associated equipment
• Bongabon LES: 4x5 MVAR 69 kV Capacitor Bank, 5-69 kV PCB and Associated equipment
• Candelaria LES: 4x2.5 MVAR 69 kV Capacitor Bank, 5-69 kV PCB and Associated equipment
• Bani LES: 4x5 MVAR 69 kV Capacitor Bank, 5-69 kV PCB and Associated equipment
• San Fabian LES: 4x5 MVAR 69 kV Capacitor Bank, 5-69 kV PCB and associated equipment.
• Aglipay LES: 4x5 MVAR 69 kV Capacitor Bank, 5-69 kV PCB and Associated equipment
• Cauayan LES: 4x5 MVAR 69 kV Capacitor Bank, 5-69 kV PCB and associated equipment
• Ilagan LES: 4x2.5 MVAR 69 kV Capacitor Bank, 5-69 kV PCB and associated equipment</td><td></td><td>• Cagayan
• Nueva Ecija
• Zambales
• Pangasinan Quirino
• Isabela</td><td>• 5,554M
• Dec 2030</td></tr>
</table>

VOLTAGE IMPROVEMENT

Project Name and Description	Project Driver and Status	Project Components – Substation	Project Components – Transmission Line	Location	Project Cost (Million Pesos) ETC*
Luzon Voltage Improvement Project 6 • To address the anticipated undervoltage problem during peak load condition at various 69 kV LES in the north and South Luzon Grid • To provide additional reactive power support in the network to maintain the system voltage within ±5% of the nominal value during normal and single outage contingencies as prescribed under the PGC	• Power Quality • Awaiting ERC approval	• Lal-lo 69 kV SS: 3x5 MVAR Shunt Capacitor, 3-69 kV PCB and associated equipment • Tabuk 69 kV SS: 4x2.5 MVAR Shunt Capacitor, 5-69 kV PCB and associated equipment • Libmanan 69 kV SS: 4x2.5 MVAR Shunt Capacitor, 5-69 kV PCB and associated equipment • San Rafael 230 kV SS: 2x100 MVAR Shunt Capacitor, 2-230 kV PCB and associated equipment • Calamba 230 kV SS: 2x100 MVAR Shunt Capacitor, 2-230 kV PCB and associated equipment • San Jose 230 kV SS: 1x100 MVAR Shunt Capacitor, 1-230 kV PCB and associated equipment		• Pangasinan • Cagayan • Tarlac • Zambales • Bulacan • Laguna • Camarines Sur	• 1,620M • Mar 2029

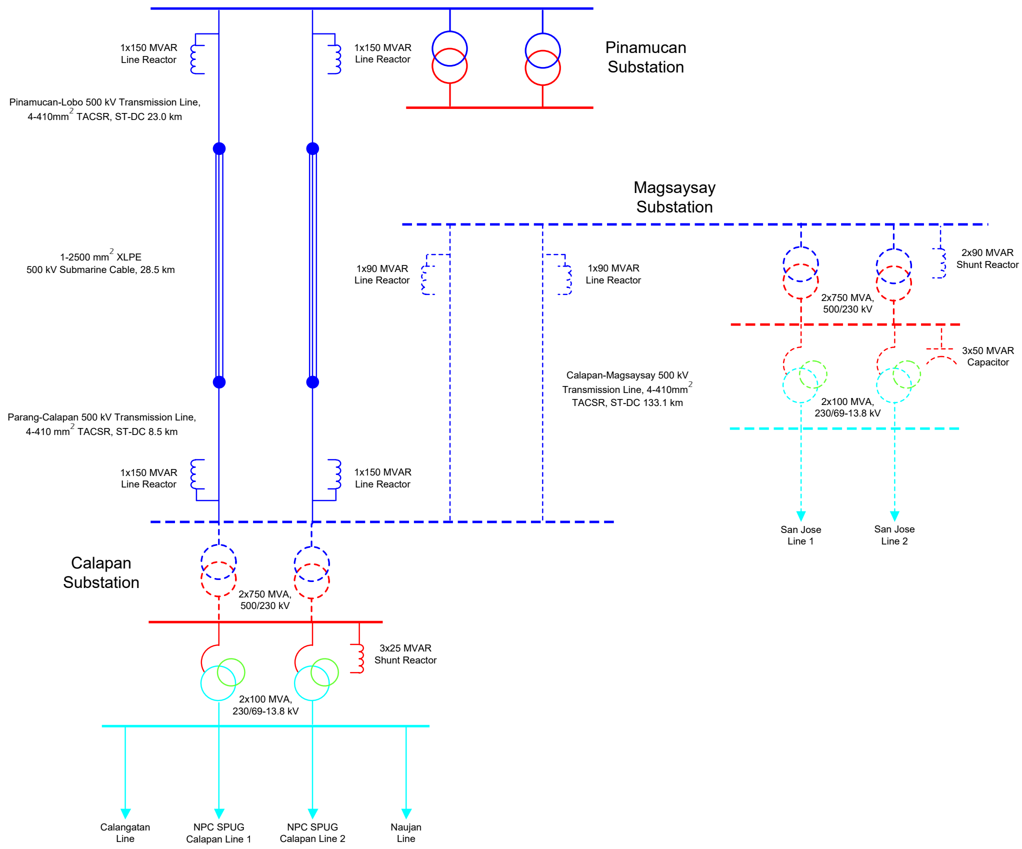
ISLAND INTERCONNECTION

Project Name and Description	Project Driver and Status	Project Components – Substation	Project Components – Transmission Line	Location	Project Cost (Million Pesos) ETC*
Batangas –- Mindoro Interconnection and Backbone Project (Stage 1) • To link the Mindoro Island to the Luzon Grid through a 28.5 km submarine cable and a 31.5 km overhead transmission line	• Island Interconnection • Filed to ERC	• Pinamucan 230 kV SY: 4-230 kV PCB and associated equipment, 2-70 MVAR 230 kV Line Reactors • Calapan 230 kV SY: 2-100 MVA, 230/69-13.8 kV Transformers, 11-230 kV PCB and associated equipment, 3-25 MVAR 230 kV Shunt Reactor, 2-70 MVAR 230 kV Line Reactor, 10- 69 kV PCB and associated equipment	• Pinamucan – Lobo CTS 500 kV TL (initially energized at 230 kV), ST-DC 4-410 mm^2 TACSR, 23 km (2x1,952 MW). • Lobo CTS – Parang CTS 230 kV Submarine Cable, DC, 1-2,500 mm^2 XLPE, 28.5 km (2x600 MW). • Parang CTS – Calapan 230 kV Transmission Line, ST-DC 4-410 mm^2 TACSR, 8.5 km (2x1,952 MW). • Calapan "cut-in" to NPC SPUG Calapan – Calangatan 69 kV Transmission Line, ST-DC 1-795 MCM ACSR, 4.5 km (2x87 MW). • Calapan "cut-in" to NPC SPUG Calapan – Naujan 69 kV Transmission Line, ST-DC 1-795 MCM ACSR, 4.0 km (2x87 MW).	• Batangas • Mindoro	• 45,593.74M • Sep 2027
Batangas – Mindoro Interconnection and Backbone Project (Stage 2)	• Generation Entry	• Pinamucan 500 kV SS: 6-500 kV PCB and associated equipment, 2-150 MVAR 500 kV Line Reactor, 2-90 MVAR 500 kV Shunt Reactor • Calapan 500 kV SS: 2-750 MVA, 500/230 kV Transformer, 15-500 kV PCB and associated equipment, 2-150 MVAR 500 kV Line Reactor, 3-90 MVAR 500 kV Shunt Reactor • Magsaysay 500 kV SS: 2-750 MVA, 500/230 kV Transformer, 2-100 MVA, 230/69-13.8 kV Transformer, 10-500 kV PCB and associated equipment, 9-230 kV PCB and associated equipment, 6-69 kV PCB	• Calapan – Magsaysay 500 kV TL (initially energized at 230 kV), ST-DC 4-410 mm^2 TACSR, 133.1 km (2x4,234 MW). • Magsaysay "cut-in" to San Jose – NPC OMCPC 69 kV Transmission Line, ST-DC 1-795 MCM ACSR, 20.9 km (2x87 MW).	• Batangas • Mindoro	• 45,062.37M • Dec 2030



ISLAND INTERCONNECTION

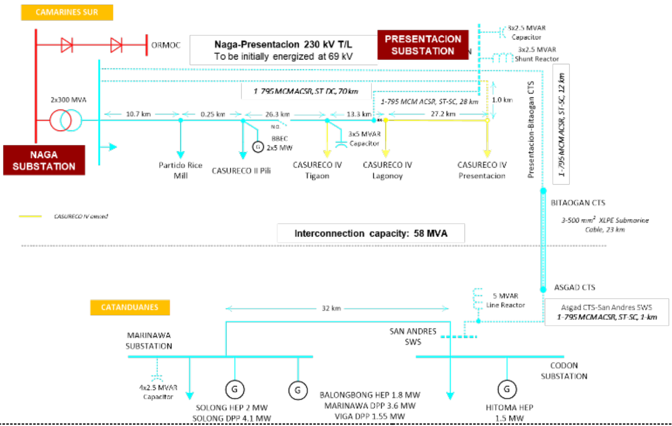
Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
• To provide a higher transfer capacity to the Batangas-Mindoro link, supporting the connection of solar and onshore wind power projects as envisioned in the CREZ, and higher potential of offshore wind projects at the area between Mindoro and Panay as identified from the DOE and WBG roadmap		and associated equipment, 2-90 MVAR 500 kV Line Reactor, 2-90 MVAR 500 kV Shunt Reactor, 3-50 MVAR 230 kV Capacitor			



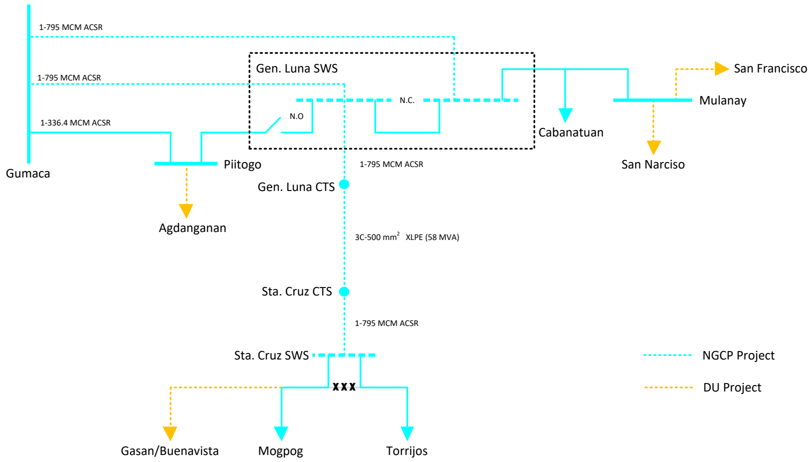
Camarines Sur - Catanduanes Interconnection Project	• Island Interconnection • Filed to ERC	• Naga 69 kV S/S, 2-69 kV PCB • Presentacion 69 kV SWS, 3x2.5 MVAR 69 kV Capacitor, 3x2.5 MVAR 69 kV Shunt Reactor, 12-69 kV PCB • San Andres 69 kV SWS, 1x5 MVAR 69 kV Line Reactor, 6-69 kV PCB • Marinawa 69 kV SS, 3x5 MVAR 69 kV Capacitor, 3-69 kV PCB	• Naga – Presentacion 230 kV Line, ST-DC, 1-795 MCM ACSR, 70 km (2x287 MW) • Presentacion – Bitaogan CTS 69 kV Line, ST-SC, 1-795 MCM ACSR, 12 km (91 MW) • Presentacion – Tigaon 69 kV Line, ST-SC, 1-795 MCM ACSR, 28 km (91 MW) • Asgad CTS – San Andres 69 kV Line, ST-SC, 1-795 MCM ACSR, 1 km (91 MW) • Bitaogan CTS – Asgad CTS 69 kV Line, SC, 3 Core 500 mm² XLPE Submarine Cable, 23 km (50 MW)	• Camarines Sur • Catanduanes	• 9,502.51M • Dec 2030

ISLAND INTERCONNECTION

Project Name and Description	Project Driver and Status	Project Components – Substation	Project Components – Transmission Line	Location	Project Cost (Million Pesos) ETC*
• To provide a reliable power source for Catanduanes Island that will support the fast-growing economic development					



Project Name and Description	Project Driver and Status	Substation	Transmission Line	Location	Project Cost (Million Pesos) ETC*
Quezon – Marinduque Interconnection Project	• Island Interconnection • Filed to ERC	• Gumaca 230 kV SS: 2x300 MVA Power Transformers and 13-69 kV PCB and associated equipment • General Luna SWS: 11-69 kV PCB and associated equipment • Sta. Cruz SWS: 2x2.5 MVAR Line Reactors and 7-69 kV PCB and associated equipment • Gasan 69 kV Load End SS: 4x2.5 MVAR Shunt Capacitors and 4-69 kV PCB and associated equipment	• General Luna – General Luna CTS 69 kV TL, ST-SC, 1-795 MCM ACSR, 1.5 km (1x86 MW). • Sta. Cruz-Sta. Cruz CTS 69 kV TL, ST-SC, 1-795 MCM ACSR, 9 km (1x86 MW). • Gumaca – General Luna 69 kV TL, ST-DC, 1-795 MCM ACSR, 37.5 km (2x86 MW). • General Luna CTS – Sta. Cruz CTS 69 kV XLPE Submarine Cable, 3-Core 500 mm², 22 km (50 MW).	• Quezon • Marinduque	• 5,323.22M • Dec 2030
• To address the expected high electricity demand due to the fast development in Marinduque • To address the increase in loading of the existing Gumaca – Pitogo 69 kV TL					



** Regulatory approval is one crucial requirement for meeting the projects' ETC (Estimated Time of Completion) in the TDP. For projects awaiting regulatory approval, it should be noted that the indicated ETC (month-year) assumes that ERC approval was issued in September 2024.*

5.2 Luzon Transmission Outlook for 2031-2040

Projects filed from 2031 to 2040 will continue to focus on strengthening the transmission corridor within Metro Manila. The development of the Taguig – Silang 500 kV Transmission Line will complete the Metro Manila 500 kV Backbone Loop.

To accommodate bulk generation capacities from conventional and renewable energy sources requires the extension of the 500 kV transmission backbone from Nagsaag to Santiago. Furthermore, new 500 kV Substations in Palauig, Zambales and Tagkawayan, Quezon will be developed.

Lastly, ageing transmission facilities will be upgraded to ensure reliability and adequacy transmission capacity in the Luzon Grid.

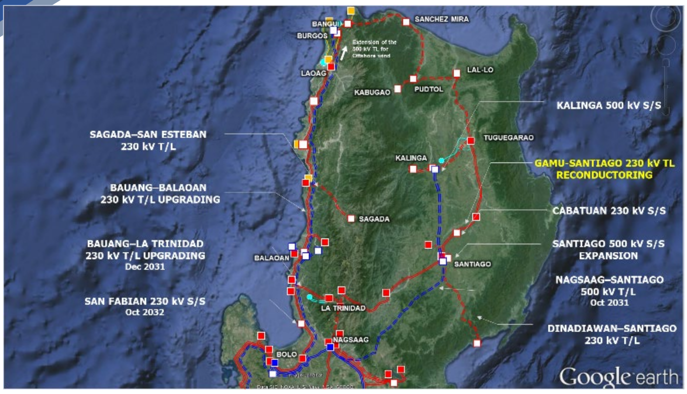


Figure 5.6: North Luzon Transmission Outlook for 2031-2040

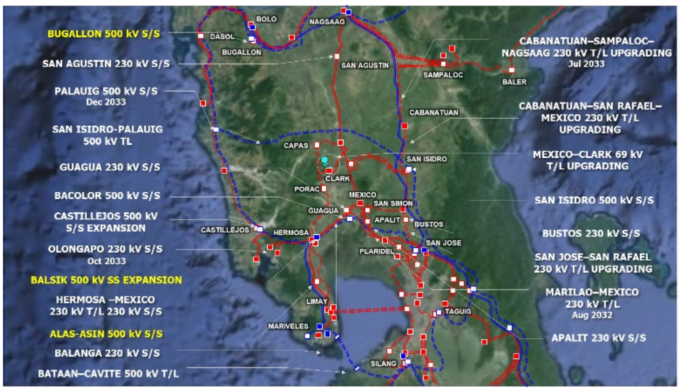


Figure 5.7: Central Transmission Outlook for 2031-2040

Figure 5.8: Metro Manila Transmission Outlook for 2031-2040

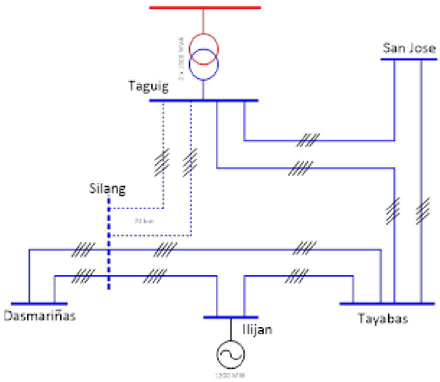
Figure 5.9: South Luzon Transmission Outlook for 2031-2040

Figure 5.10: Bicol Regional Transmission Outlook for 2031-2040

Table 5.2: List of Additional Luzon transmission projects for the period 2031-2040

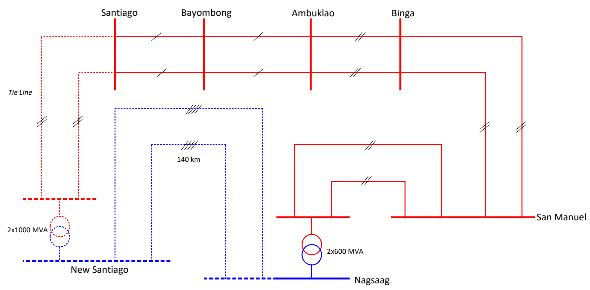
TRANSMISSION LINE

Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
Taguig – Silang 500 kV Transmission Line • To address the overloading of San Jose–Tayabas 500 kV TL and provides new transmission corridor that supplies the loads in Metro Manila • To provide reliability in Metro Manila 500 kV Backbone	• Load Growth • Awaiting ERC approval	• Silang 500 kV SS: 4-500 kV PCB and associated equipment	• Taguig – Silang 500 kV TL: ST-DC, 4-410 mm² TACSR, 72 km (2x4,234 MW).	• Cavite • Metro Manila	• 13,689M • Feb 2031

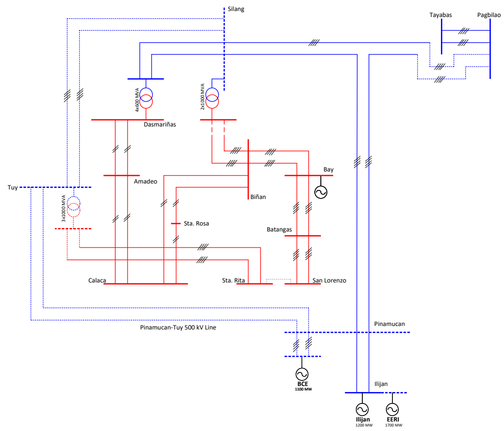


TRANSMISSION LINE

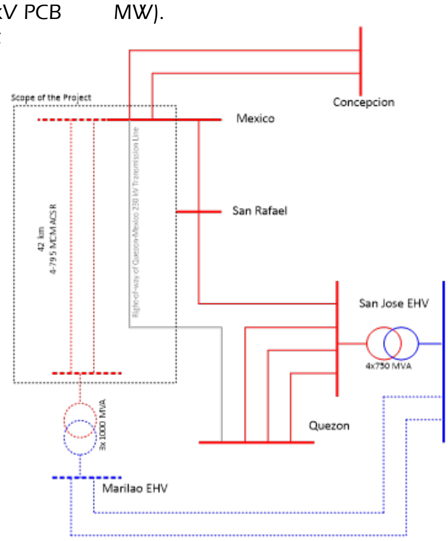
Nagsaag – Santiago 500 kV Transmission Line • To cater the incoming hydro, geothermal, and solar power plant generation capacities in the Provinces of Ifugao, Kalinga, and Apayao • To address the overloading of Santiago–Bayombong–Ambuklao 230 kV TL	• Generation Entry Awaiting ERC approval	• Santiago 500 kV SS: 2x1000 MVA 500/230 kV power transformers, 2x60 MVAR 500 kV line reactors, 2x90 MVAR 500 kV shunt reactors, 2x100 MVAR 230 kV capacitors, 10-500 kV PCB and associated equipment, 22-230 kV PCB and associated equipment • Nagsaag 500 kV SS: 4-500 kV PCB and associated equipment • Old Santiago 230 kV SS, 2-230 kV PCB and associated equipment	• Nagsaag – Santiago 500 kV TL: ST-DC, 4-410 mm² TACSR, 140 km (2x4,234 MW). • New Santiago SS 230 kV tie-line: ST-DC, 4-795 MCM ACSR, 1km (2x1,148 MW).	• Isabela • Pangasinan	• 30,956M • Oct 2031



Pinamucan – Tuy 500 kV Transmission Line • To provide a new transmission corridor that will deliver bulk generation of power from Batangas to Metro Manila • To accommodate the entry of new generation plants that will connect to Pinamucan 500/230 kV SS	• Generation Entry • Awaiting ERC approval	• Pinamucan 500 kV SS: 4-500 kV PCB and associated equipment • Tuy 500 kV SS: 3-500 kV PCB and associated equipment	• Pinamucan – Tuy 500 kV TL: ST-DC, 4-795 MCM ACSR, 60 km (2x2,494 MW).	Batangas	• 16,234M • Dec 2031



Marilao – Mexico 230 kV Transmission Line • To address the overloading of Quezon–Mexico 230 Line during N-1 contingency and maximum generation dispatch and avoid the generation curtailment	• System Reliability and Security • Awaiting ERC approval	• Marilao 230 kV SS: 4-230 kV PCB and associated equipment • Mexico 230 kV SS: 4-230 kV PCB and associated equipment	• Marilao – Mexico 230 kV TL: ST-DC, 4-795 MCM ACSR, 42 km (2x1,148 MW).	• Pampanga • Bulacan	• 5,988M • Aug 2032

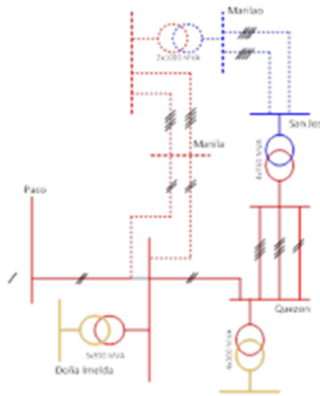


Navotas – Doña Imelda 230 kV Transmission Line CEPNS	• Load Growth and Generation Entry		• Navotas – Doña Imelda 230 kV TL: SP-DC, 2-410 mm² TACSR/AS, 10.0 km (2x974 MW).	Metro Manila	• 3,359M • May 2033

TRANSMISSION LINE

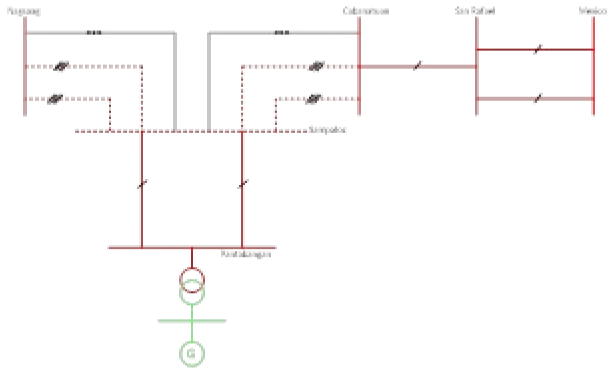
	• Awaiting ERC approval				

• To address overloading of Quezon-Doña Imelda 230 kV TL during single outage contingency and to improve voltage regulation within Met ro Manila



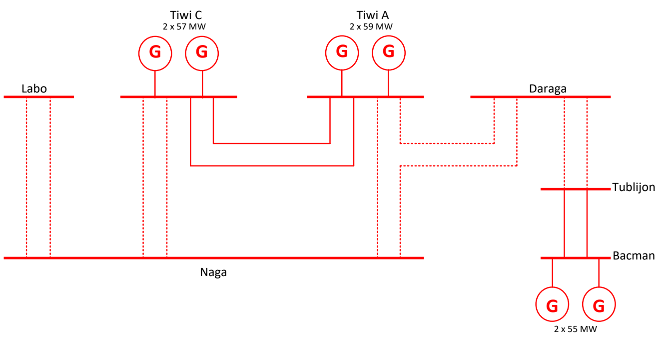
Cabanatuan – Sampaloc – Nagsaag 230 kV Transmission Line	• System Reliability and Security • Awaiting ERC approval	• Sampaloc SS: 4-230 kV PCB and associated equipment • Nagsaag SS: 6-230 kV PCB and associated equipment • Cabanatuan SS: 2-230 kV PCB and associated equipment	• Sampaloc – Nagsaag 230 kV TL: ST-DC, 4-795 MCM ACSR /AS, 68 km (2x1,148 MW). • Cabanatuan – Sampaloc 230 kV TL: ST-DC, 4-795 MCM ACSR/AS, 53 km (2x1,148 MW).	• Nueva Ecija • Pangasinan	• 11,216M • Jul 2033

• To address the overloading and reliability issues of the existing single circuit, Cabanatuan-Sampaloc and Sampaloc-Nagsaag 230 kV TL



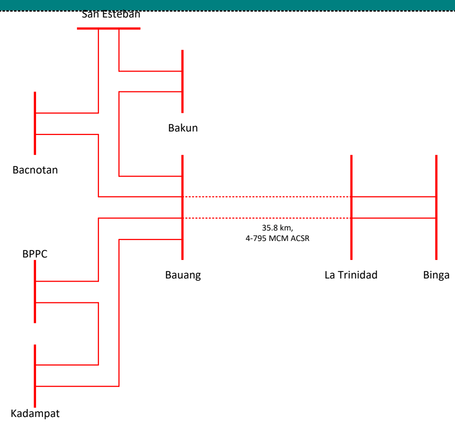
Tower Resiliency of Bicol Transmission Facilities	• System Reliability and Security • Awaiting ERC approval		• Naga – Tiwi A – Daraga 230 kV TL: ST-DC, 1-410 mm^2 STACIR, 105 km (2x574 MW). • Naga – Tiwi C 230 kV TL: ST-DC, 1-410 mm^2 STACIR, 60 km (2x574 MW). • Daraga – Tublijon 230 kV TL: ST-DC, 1-410 mm^2 STACIR, 35 km (2x574 MW). • Naga – Labo 230 kV TL: ST-DC, 1-410 mm^2 STACIR, 98.5 km (2x574 MW).	• Camarines Sur • Camarines Norte • Albay • Sorsogon	• 10,730M • Apr 2034

• To replace all existing steel tower structure of Naga–Tiwi–Daraga, Daraga–Tublijon and Naga–Labo TL which has a 180 kilometer-per-hour windspeed design that cannot withstand strong typhoons
• To ensure the continuity of power supply in Bicol Region even during typhoons

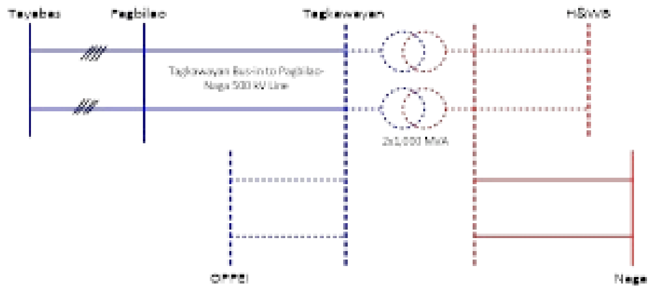
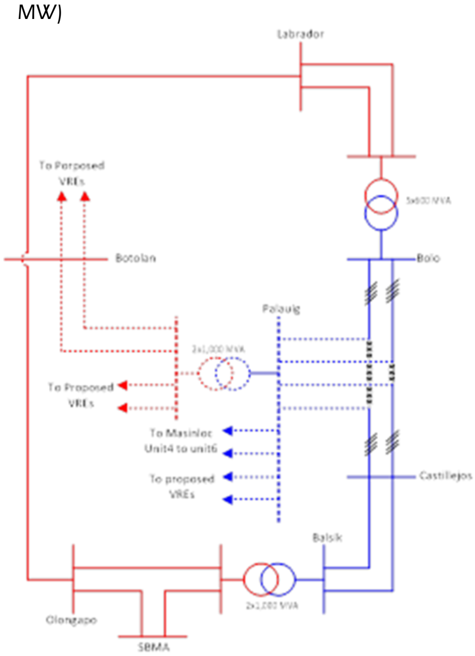


Bauang – La Trinidad 230 kV Transmission Line Upgrading	• Load growth and System Reliability and Security	• La Trinidad 230 kV SS: 9-230 kV PCB and associated equipment, 3-69 kV PCB and associated equipment.	• Bauang – La Trinidad 230 kV TL, ST-DC, 4-795 MCM ACSR, 35.8 km (2x1,148 MW).	• La Union • Benguet	• 5,620M • Dec 2031

TRANSMISSION LINE

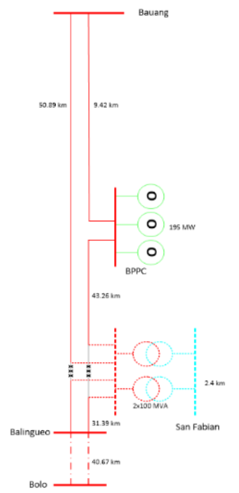
	• Awaiting ERC approval • To resolve the reliability issue of the Bauang-La Trinidad 230 kV TL, which had already exceeded its asset life • To address the reliability issue of the old and underrated PCB at La Trinidad SS		

SUBSTATION

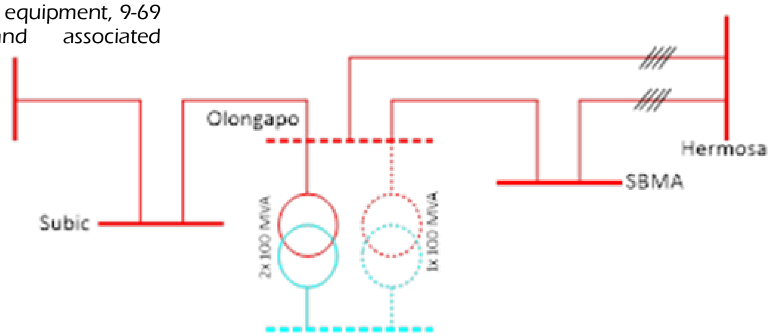
Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
500 kV PROJECTS					
Tagkawayan 500 kV Substation	• Generation Entry • Awaiting ERC approval ▪ To accommodate the proposed Coal-Fired Power Plant projects in the Provinces of Camarines Norte and Quezon	• Tagkawayan 500kV SS: 2x1,000MVA, 500/230kV Power Transformers 2x90 MVAR, 500 kV Shunt Reactor and Accessories 12-500kV PCB and Associated equipment 10-230 kV PCB and associated equipment • Pagbilao 500 kV SS: 2-500 kV PCB and Associated equipment • Tayabas 230 kV SS: 14-230 kV PCB and Associated equipment	• Tagkawayan Bus-in to Pagbilao – Naga 500 kV Line, ST-DC 4-795 MCM ACSR, 1km (2x2,494 MW). 	• Tagkawayan • Quezon Province	• 9,817M • Feb 2033
Palauig 500 kV Substation	• Generation Entry • Awaiting ERC approval • To accommodate the connection of conventional and RE power projects in Western Luzon through the implementation of 2x1,000 MVA 500/230 kV in Palauig, Zambales	• Palauig 500 kV SS: 2x1000 MVA Power Transformer, 18-230 kV PCB and Associated equipment, 2x90 MVAR, 500 MVAR Shunt Reactor • Palauig 230 kV SS: 13-230 kV PCB and Associated equipment, 3x100 MVAR, 230 kV Shunt Capacitor • Botolan 230 kV SS: 2-230 kV PCB and Associated equipment	• Palauig 'bus-in' along Castillejos – Bolo 500 kV TL: ST-DC, 4-410 mm^2 TACSR, 2x1.0 km (2x4,234 MW) • Botolan – Palauig 230 kV TL: ST-DC, 4-795 MCM ACSR, 18.3 km (2x1,148 MW) 	Zambales	• 10,784M • Dec 2033

SUBSTATION

Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
230 kV PROJECTS					
San Fabian 230 kV Substation • To cater the load growth of both Pangasinan and La Union • To address the overloading of Bolo-Balingueo 230 kV Line	• Load Growth • Awaiting ERC approval	• San Fabian 230 kV SS: 2x100 MVA, 230/69 kV Power Transformer, 10-230 kV PCB and associated equipment, 4-69 kV PCB and associated equipment	• San Fabian (NGCP) 'Bus-in' to Bauang–BPPC–Balingueo 230 kV TL: ST-DC 1-795 MCM ACSR/AS, 3.76 km (2x287 MW) • Bolo – Balingueo 230 kV TL (Upgrading): ST-DC, 4-795 MCM, 40.67 km (2x1,148 MW). • San Fabian (NGCP) – San Fabian (LUELCO) 69 kV TL: SP-SC, 1-795 MCM, 1.36 km (1x86 MW)	La Union	• 8,828 M • Oct 2032



Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
Olongapo 230 kV Substation Upgrading • To improve the reliability of the Olongapo substation by allowing the continuous source of power to the load even with the failure of one of its breakers • To address overloading of the transformers during normal and N-1 contingency.	• Load Growth • System Reliability • Awaiting ERC approval	• Olongapo 230 kV SS: 1x100 MVA, 230/69 kV Power Transformer, 8-230 kV PCB (GIS) and associated equipment, 9-69 kV PCB and associated equipment		Zambales	• 2,638M • Oct 2033



ISLAND / OFF-GRID INTERCONNECTION

Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
Palawan – Mindoro Interconnection Project (Stage 1) • To establish the most viable route for laying the submarine cable and establish the appropriate connection scheme	• Island Interconnection • Filed to ERC		• Desktop, System and Feasibility Studies and Hydrographic Survey of the Mindoro-Palawan Interconnection	• Palawan • Mindoro	• 700.51M • Feb 2033

For other projects within 2031 to 2040, these will be focusing on the improvement of system reliability. On the 500 kV network, the Bataan–Cavite 500 kV TL will be implemented. In the northern part of Luzon Grid, the transmission backbone for the province of Aurora will be developed through the Baler–Dinadiawan–Santiago TL Project. The Sagada–San Esteban 230 kV TL will provide transmission corridor in Mountain Province by completing the La Trinidad–Sagada-San Esteban 230 kV transmission loop. Another transmission corridor will also be developed through the proposed Capas–Kadampat 230 kV Line.

**Regulatory approval is one crucial requirement for meeting the projects' ETC (Estimated Time of Completion) in the TDP. For projects awaiting regulatory approval, it should be noted that the indicated ETC (month-year) assumes that ERC approval was issued in September 2024.*

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

Table 5.2: List of Additional Proposed Projects in Luzon for the period 2031-2040

TRANSMISSION LINE		
Project Name	Description	Location
500 kV PROJECTS		
Luzon–Visayas HVDC Bipolar operation	• To provide an additional 440 MW transfer capacity between Luzon and Visayas.	Camarines Sur and Leyte
San Isidro 500 kV SS	• To accommodate the bulk renewable energy capacity in Central Luzon	Nueva Ecija, Rizal
Baras – Pinamucan 500 kV Transmission Line	• To support the delivery of bulk generation from Batangas City Area going to Metro Manila.	Rizal, Batangas
Bataan – Cavite 500 kV Transmission Line	• To reinforce the transmission line corridor supplying the loads of Metro Manila.	Bataan, Cavite
San Isidro – Palauig 500 kV TL	• To improve the reliability of the grid by introducing another 500 kV Backbone that will traverse the eastern and western part of Central Luzon	Zambales, Nueva Ecija
230 kV PROJECTS		
San Jose – San Rafael 230 kV Transmission Line Upgrading	• To strengthen the reliability of San Jose — San Rafael 230 kV TL by upgrading the existing SC line to DC lines. And increasing its transmission capacity from 300 MVA to 1,275 MVA.	Bulacan
Bauang – Balaoan 230 kV Transmission Line Upgrading	• To upgrade the single bundle Bauang — Balaoan 230 kV line to 4-795 MCM ACSR to accommodate the generation capacities and increase of demand in La Union.	La Union
Cabanatuan – San Rafael – Mexico 230 kV Transmission Line Upgrading	• To address the low reliability of the existing lines due to the ageing of the conductor cable.	Nueva Ecija, Pampanga, Bulacan
Hermosa – Mexico 230 kV Transmission Line Upgrading	• To address the anticipated overloading of the Hermosa–Mexico 230 kV line due to the increase in the demand of Pampanga Province.	Bataan, Pampanga
Calaca – Salong 230 kV Transmission Line 2	• To provide provision for single outage contingency for the existing single circuit Calaca – Salong 230 kV TL.	Batangas
Taguig – Muntinlupa 230 kV Transmission Line 2	• To strengthen the corridor of the 230 kV TL in Metro Manila due to the continuous increase of loading in Metro Manila. In addition, the proposed additional 230 kV line will improve the reliability of the system as it will provide N-1 contingency.	Metro Manila
Sagada – San Esteban 230 kV Transmission Line	• To provide a new 230 kV transmission corridor in Mountain Province Area by completing the La Trinidad – Sagada – San Esteban transmission loop.	Mountain Province, Ilocos Sur
Dinadiawan – Santiago 230 kV Transmission Line	• To increase the system reliability on the Northeastern side of the Luzon Grid.	Isabela, Aurora
Baler – Dinadiawan 230 kV Transmission Line	• To construct a 52.6 km, ST-DC, 1-795 MCM ACSR/AS 230 kV TL from Baler 230 kV SS to Dinadiawan 230 kV SS	Isabela, Aurora
Gamu – Santiago 230 kV Reconductoring	• To accommodate the connection of RE projects connecting at Gamu 230 kV Substation	Isabela
69 kV PROJECTS		
South Luzon 69 kV Transmission Line Upgrading 1	• To relieve the overloading of various 69 kV TL in NGCP's South Luzon Region, and to prevent load dropping and power interruptions during peak loadings.	Batangas, Camarines Norte, Camarines Sur, Albay
North Luzon 69 kV Transmission Line Upgrading 1	• To mitigate the impending overloading of various 69 kV TL on North Luzon, and to prevent the undervoltage problem on various points along the 69 kV TL.	Ilocos Sur, Benguet, Cagayan, Bataan, Zambales
Mexico–Clark 69 kV Transmission Line Upgrading	• To cater to the growing demands of the loads of PRESCO, AEC, Quanta Paper, Clark Electric, and PELCO I.	Pampanga

SUBSTATION		
Project Name	Description	Location
500 kV PROJECTS		
Marilao 500 kV Substation Expansion	• To cater additional generation capacity in the Northern and Western region and increase the reliability of the 500 kV system of the Luzon Grid by providing a new 500/230 kV drawdown SS for Metro Manila which will relieve the loading of the critical San Jose 500 kV SS..	Bulacan
Baras 500 kV Substation	• To accommodate the entry of power plants in Rizal to supply the demand load of Metro Manila and swill increase the reliability of the 500 kV backbone of the Luzon Gird.	Rizal
San Isidro 500 kV Substation	• To provide a new 500 kV drawdown SS to Central Luzon and accommodate RE power plant connection.	Nueva Ecija, Rizal
Bacolor 500 kV Substation	• To address the load growth in Pampanga area. The 500 kV TL of the proposed Bacolor 500 kV SS will bus-in along Marilao – Hermosa 500 kV TL, on the other hand, the 230 kV will bus-in along Mexico – Guagua 230 kV TL.	Pampanga

SUBSTATION		
Project Name	Description	Location
Dasmariñas 500 kV Substation Upgrading	• To upgrade the existing capacity of Dasmariñas SS to serve the increasing loads of various Substations in the area.	Cavite
Kalinga 500 kV Substation	• To accommodate the entry of power plants in Kalinga • To ensure that the power supply will meet the demand load of Luzon Grid and will increase the reliability of the 500 kV backbone	Kalinga
Taguig EHV Substation Expansion	• To serve the load growth in Metro Manila through the installation of a 3rd 1000 MVA 500/230 kV Transformer bank at Taguig 500 kV SS	Metro Manila
Castillejos 500 kV Expansion	• To accommodate the entry of power plants through the installation of a 3rd 1000 MVA 500/230 kV Transformer bank at Castillejos 500 kV SS	Zambales
Santiago 500 kV Substation Expansion	• To accommodate the entry of power plants through the installation of a 3rd 1000 MVA 500/230 kV Transformer bank at Santiago 500 kV SS	Isabela
Naga 500 kV Substation Expansion	• To accommodate the entry of power plants through the installation of a 3rd 1000 MVA 500/230 kV Transformer bank at Naga 500 kV SS	Camarines Sur
Bugallon 500 kV Substation	• To cater the potential generation capacity in Pangasinan Area	Pangasinan
Alas – Asin 500 kV Substation	• To accommodate several offshore wind power plant projects located at the Manila Bay and offshore of Mariveles	Mariveles
Calatagan 500 kV Substation	• To accommodate several offshore wind power plant projects located at Calatagan Bay and offshore of Northern Mindoro	Batangas
Balsik 500 kV Substation Expansion	• To improve the overall reliability of the 500 kV system upon the completion of the forecasted bulk generation in Zambales	Zambales
Adjustment of Laoag 500 kV Substation	• To shorten the overall transmission line distance of the power plants to their designated connection point	Ilocos
230 kV PROJECTS		
San Agustin 230 kV Substation	• To provide an additional drawdown SS in the province of Tarlac to address the anticipated overloading of the existing 230/69 kV transformers and associated 69 kV TL both in the province of Tarlac and Pangasinan. • To improve the reliability of the supply of loads in Tarlac and Pangasinan acting as another connection point of distribution utilities in the area.	Tarlac
Guagua 230 kV Substation	• To provide an additional drawdown SS in the province of Pampanga. This project will improve the reliability of the supply of loads in Pampanga acting as another connection point of distribution utilities in the area.	Pampanga
Apalit 230 kV Substation	• To provide an additional drawdown SS in the province of Pampanga. This project will improve the reliability of the supply of loads in Pampanga acting as another connection point of distribution utilities in the area.	Pampanga
Iriga 230 kV Substation	• To cater the load growth in the province of Camarines Sur by providing a new drawdown substation in the area.	Camarines Sur
Malvar 230 kV Substation	• To cater the Load Growth of the Province of Batangas.	Batangas
Balanga 230 kV Substation	• To provide an additional drawdown SS in the province of Bataan. This project will improve the reliability of the supply of loads in Bataan since it will act as another connection point of distribution utilities in the area.	Bataan
FBGC 230 kV Substation	• To address the anticipated overloading of the existing 230 kV SS serving Sector 3 of the MERALCO Franchise.	Metro Manila
Valenzuela 230 kV Substation	• To address the anticipated overloading of the existing 230 kV SS serving Sector 1 of the MERALCO Franchise.	Metro Manila
Nuvali 230 kV Substation	• To provide additional drawdown SS in Sta. Rosa, Laguna. This project will improve power quality and the reliability of supply MERLACO's Laguna Sector as another connection point in the area.	Laguna
Cabatuan 230 kV Substation	• To provide additional drawdown SS in the province of Isabela. This project will improve the reliability of supply of loads in Isabela as another connection point of distribution utilities in the area.	Isabela
North Luzon Substation Upgrading 3	• To cater the load growth and provide N-1 contingency to various SS in NGCP's North Luzon Region. Without the project, the customers being served by these Substations will experience load dropping and power interruptions during outage and failure of existing transformers and PCB.	Ilocos Norte, Benguet, Pangasinan, Isabela, Cagayan, Bataan, Zambales, Tarlac, Pampanga, Nueva Ecija
South Luzon Substation Upgrading 3	• To cater the load growth and provide N-1 contingency to various SS in NGCP's South Luzon Region. Without the project, the customers being served by these SS will experience load dropping and power interruptions during outage and failure of existing transformers and PCB.	Batangas, Albay
San Mateo 230 kV Substation	• To provide an additional drawdown SS in San Mateo, Rizal. This project will also improve power quality and the reliability of supply in MERLACO's Sector 2 since it will act as another connection point in the area.	Metro Manila
	• To support the load growth in Bulacan and will help unload the San Rafael 230 kV SS.	Bulacan
Sariaya 230 kV Substation	• To cater the Load Growth of the Province of Quezon and the eastern part of Batangas.	Quezon
Presentacion 230 kV Substation	• To cater the Load Growth in the Eastern part of Camarines Sur. It will utilize the proposed Naga – Presentacion 230 kV TL. The project will	Camarines Sur

SUBSTATION		
Project Name	Description	Location
	also be the connection in the future of the Catanduanes Luzon Island Interconnection.	
North Luzon Substation Upgrading 4	• To cater the load growth and provide N-1 contingency to various SS in NGCP's North Luzon Region. Without the project, the customers being served by these SS will experience load dropping and power interruptions during outage and failure of existing transformers and PCB.	Pangasinan, Cagayan, Zambales, Pampanga, Nueva Ecija
South Luzon Substation Upgrading 4	• To cater the load growth and provide N-1 contingency to various SS in NGCP's South Luzon Region. Without the project, the customers being served by these SS will experience load dropping and power interruptions during outage and failure of existing transformers and PCB.	Batangas, Camarines Sur, Albay, Sorsogon
San Marcelino 230 kV Collector Station **Peninsula, Masiit, and Calamba 230 kV Collection Stations**	• To cater the upcoming generation potential in Zambales • To accommodate the incoming conventional and renewable generating power plants in Laguna	Zambales Laguna

VOLTAGE IMPROVEMENT		
Project Name	Description	Location
230 kV PROJECTS		
Luzon Voltage Improvement Project 7	• The project aims to provide additional reactive power support in the network to maintain the system voltage within ±5% of the nominal voltage during normal and single outage contingencies as prescribed under the PGC. LVIP 7 involves the installation of capacitors and STATCOM in various Luzon 230 kV Substations	Metro Manila, Bulacan, Laguna, Pampanga, Cavite
Luzon Voltage Improvement Project 8	• To provide additional reactive power support in Pampanga, Laguna, and Batangas in order to maintain the system voltage within ±5% of the nominal value during normal and single outage contingencies as prescribed under the PGC. The proposed project involves the installation of capacitors in various 230 kV Substations in Luzon.	Pampanga, Laguna, Batangas

5.3 Luzon Transmission Outlook for 2041-2050

For period of 2041-2050, further extension of the 500 kV network will be implemented to accommodate bulk generation capacities. In the northern part of Luzon, the 500 kV backbone will be extended to Kabugao, Apayao to accommodate proposed hydroelectric power plant capacities. Meanwhile, in the southern part of Luzon, the 500 kV backbone will be extended to Tublijon, Sorsogon to accommodate Onshore and Offshore wind capacities.

Figure 5.11: North Luzon Transmission Outlook for 2041-2050

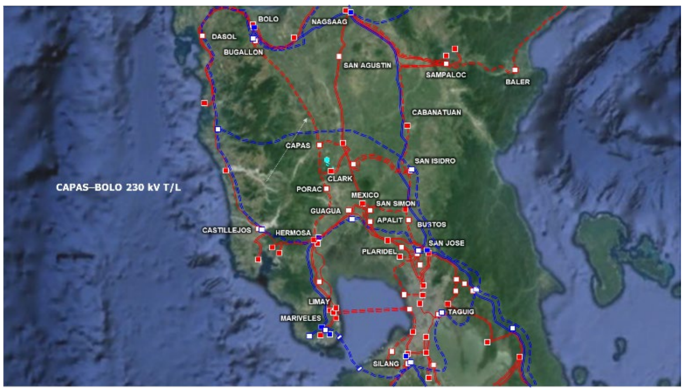


Figure 5.12: Central Transmission Outlook for 2041-2050

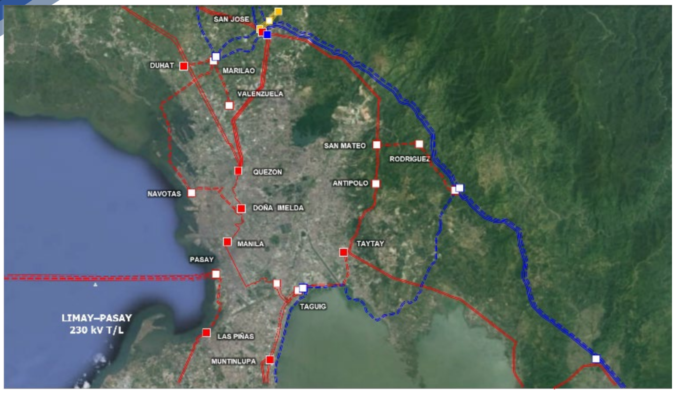


Figure 5.13: Metro Manila Transmission Outlook for 2041-2050

Figure 5.14: South Luzon Transmission Outlook for 2041-2050

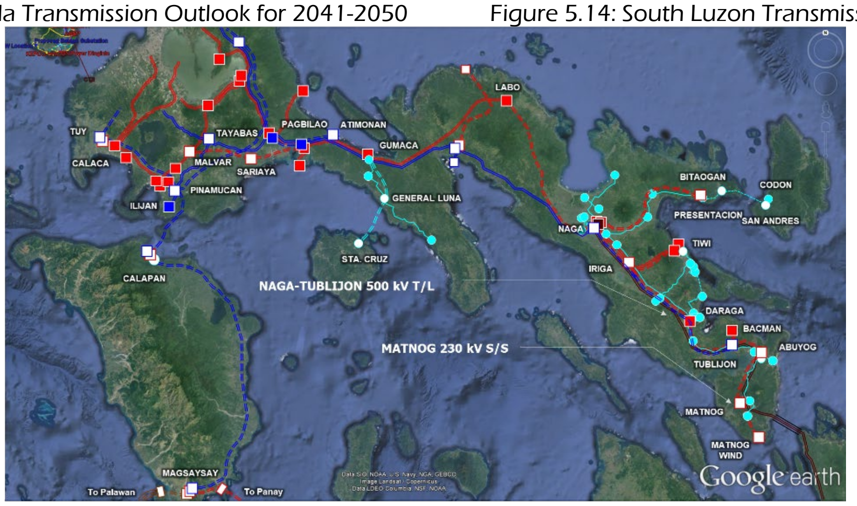


Figure 5.15. Bicol Regional Transmission Outlook for 2041-2050

Table 5.3: List of Additional Proposed Projects in Luzon for the period 2041-2050

Project Name	Description	Location
TRANSMISSION LINE		
500 kV PROJECTS		
Kabugao 500 kV TL	• To accommodate the entry of power plants in Kabugao to ensure that the power supply will meet the demand load of Luzon Grid and will increase the reliability of the 500 kV backbone.	Apayao, Isabela
Naga – Tublijon 500 kV TL Project	• To further strengthen the reliability of the transmission network Bicol Region, the existing 230 kV TL from Naga SS to Bacman SS will be upgraded to 500 kV voltage level. This will also accommodate generation capacity addition in the Southernmost part of the Grid. • To accommodate the entry of power plants in Kabugao to ensure that the power supply will meet the demand load of Luzon Grid and will increase the reliability of the 500 kV backbone.	Camarines Sur Albay, Sorsogon
230 kV PROJECTS		
La Trinidad – Sagada 230 kV Transmission Line	• To accommodate the upcoming HEPP and Wind Farms on Mountain Province	Benguet
Pasay – Limay 230 kV Transmission Line	• To increase the reliability of 230 kV TL supplying Meralco Sector 1 and secure the supply of power in the area	Bataan, Metro Manila
Capas – Bolo 230 kV Transmission Line	• To construct an 80 km, ST-DC, 4-795 MCM ACSR 230 kV TL from Capas 230 kV SS to Bolo 230 kV SS	Tarlac, Pangasinan
SUBSTATION		
500 kV PROJECTS		
Alaminos EHV Substation	• To accommodate the entry of power plants in Batangas and Quezon Province and to supply the demand of South Luzon. This will also increase reliability of the 500 kV backbone of the South Luzon Grid	Laguna
230 kV PROJECTS		
Matnog 230 kV Substation	• To accommodate the entry of power plants in Sorsogon particularly in Matnog to ensure that the power supply will meet the demand load of Luzon Grid.	Sorsogon

Chapter 6

VISAYAS
Transmission Outlook

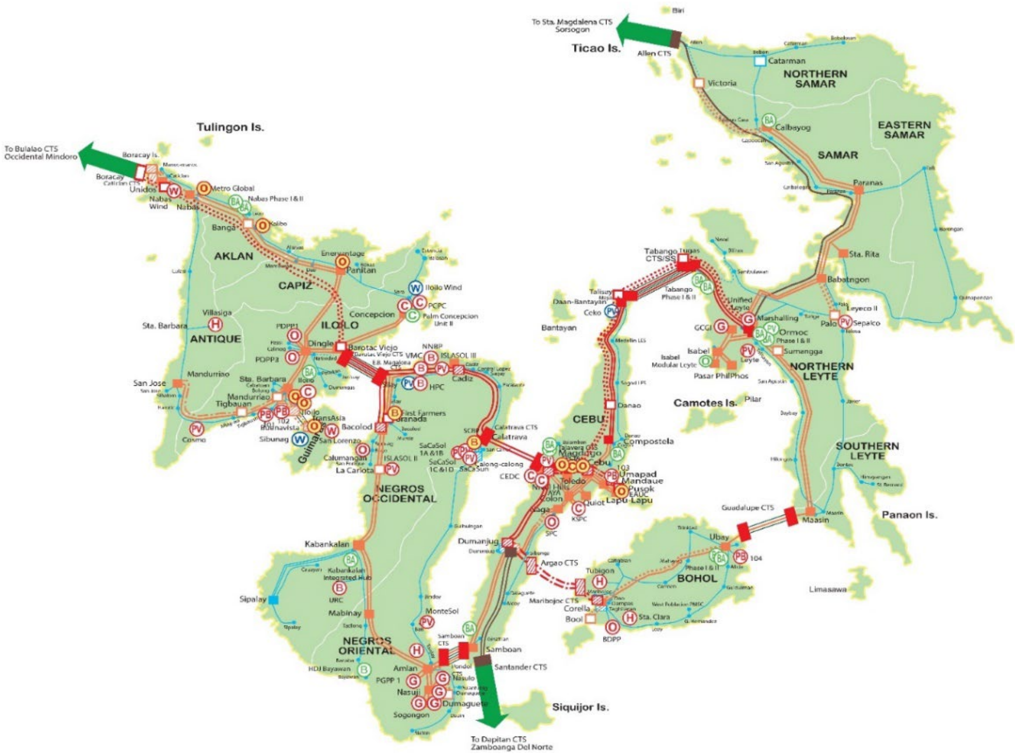
This section will provide the transmission outlook for Visayas grid from 2024 to 2050. It will show the list of ERC-approved projects in various stages of implementation and the other identified transmission projects in the Visayas Grid that are still subject to regulatory approval prior to implementation. The challenge in the transmission development in the Visayas grid is due to its geologic features composed of several islands. Each sub-grid is interconnected via submarine cables, which are costly and have limited transfer capacity compared to overhead transmission lines.

With reference to the DOE list, Cebu and Panay Islands are the main sites for large generation capacity additions specifically for coal-fired power plants. On the other hand, it can be observed that the concentration of renewable power plants mostly solar and wind, is in Negros and Panay Islands. With the recent completion of the Cebu-Negros-Panay 230 kV Backbone Project, there is an additional 800 MW submarine cable capacity between Cebu, Negros, and Panay Island. The said development could pave the way for the entry of the committed power plants and the provision of new connection points for power plants, which will bring room for generation capacity of 1,300 MW in Cebu and 250 MW in Negros and Panay Island.

Cebu Island, being the load center in the Visayas, is still growing in terms of power requirement. The existing 138 kV substations will be insufficient to cater for the growth in the demand in the area. The development of new 230 kV drawdown substations is required to ensure adequate supply in the long term. Similar to other urbanized areas, securing ROW in Cebu is also a major challenge in transmission project implementation.

In Panay Island, 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 to support the load growth in the coming years. Thus, this is one of the areas requiring grid reinforcements through the installation of 138 kV submarine cable under the Nabas – Caticlan – Boracay TL Project. Furthermore, the capacity of the existing 69 kV energized submarine cable will be insufficient to serve the proposed wind power plants in Guimaras Island. Through the Panay – Guimaras 138 kV Interconnection Project and Panay – Guimaras 138 kV Interconnection 2 Project, which provides for the energization of the submarine cable to 138 kV and laying of the 2nd submarine cable between Panay and Guimaras Island, the incoming power plants can be accommodated.

Bohol Island has a power deficiency issue due to limited power sources on the island. It usually sources power from Leyte Island via 138 kV submarine cables with only 90 MW transfer capacity. In 2024, the maximum demand in Bohol has reached 125 MW which necessitated the dispatching of diesel power plants to avoid overloading of the submarine cable. In addition, it can be noted that during the Typhoon Yolanda and recent earthquake incidents which affected the transmission facilities in Ormoc, Leyte area, the supply for Bohol Island was interrupted because there is no alternate source for



the island. The implementation of the Cebu – Bohol 230 kV Interconnection Project provides for the installation of 230 kV submarine cables with a total transfer capacity of 1,200 MW between Cebu and Bohol Island. This would significantly boost the supply reliability to support the load growth and provide reliability in the island as will be brought about by its direct access to the bulk generations located in Cebu and provide new connection points for power plants which will bring room for a capacity of 300 MW in Corella 230 kV and 150 MW in Ubay 138 kV.

The overall plan for Visayas grid is the completion of the transmission backbone loops to provide resiliency and continuity of power even during the occurrence of calamities and disasters. Furthermore, the upgrading of existing substations and development of new drawdown substations are proposed to accommodate the developments in each area.

6.1 Visayas Projects for 2024-2030

Projects filed from 2024 to 2030 aim to cater to the increase in the power supply requirements brought about by the developments in terms of the commercial and industrial sectors in the Visayas Island. To accommodate these developments, upgrading of existing substations and construction of new drawdown substations are proposed in the key cities across the Visayas grid. New submarine cables will be laid in Boracay, Guimaras, and Bohol Island to accommodate the growth in demand and to provide reliability to the customers in the area. Moreover, 138 kV transmission lines that will initially be energized at 69 kV will be constructed in Samar Island to support the developments in Northeastern part of Samar Island. The 230 kV transmission corridor will also be extended from Cebu to Mactan Island to accommodate the increase in demand in Cebu.

Furthermore, new 230 kV submarine cables will be laid between Cebu and Leyte Island to initially utilize the excess generation coming from Leyte and Luzon Island. 138 kV transmission backbones will also be constructed to accommodate the incoming large powerplants in Northern Samar, Northern Panay, and Negros Island.

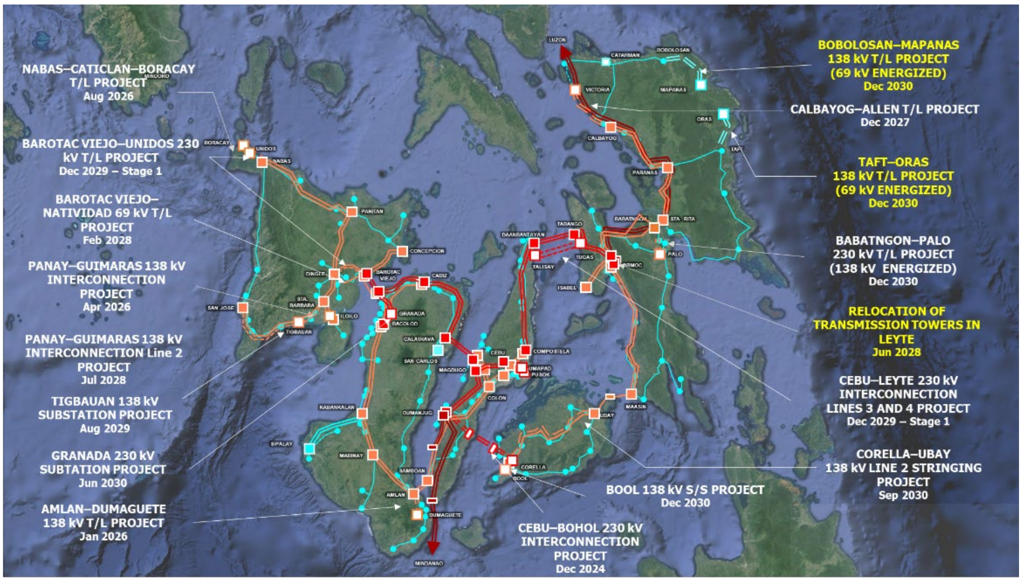


Figure 6.1: Visayas Transmission Outlook for 2024-2030

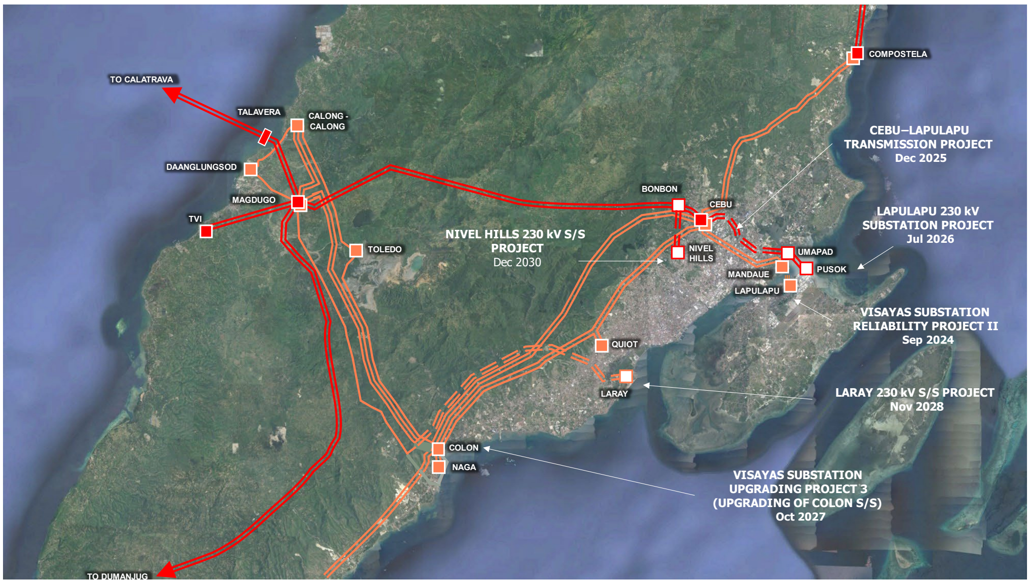
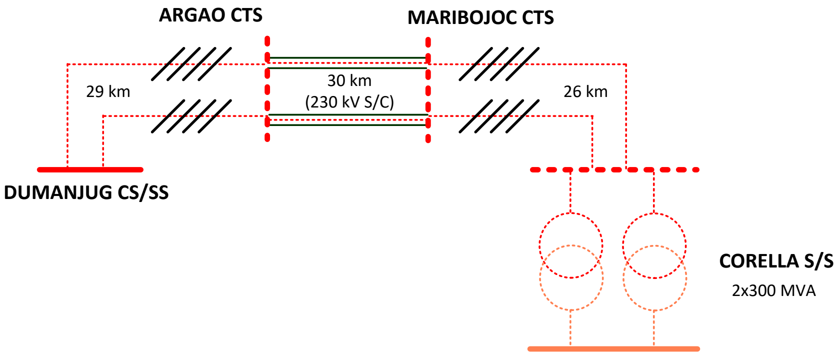


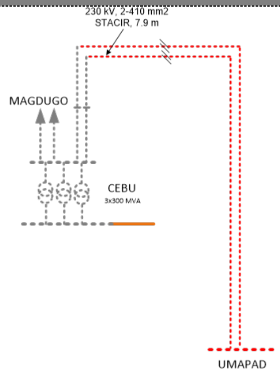
Figure 6.2: Metro Cebu Transmission Outlook for 2024-2030

Table 6.1: List of Visayas transmission projects for the period 2024-2030

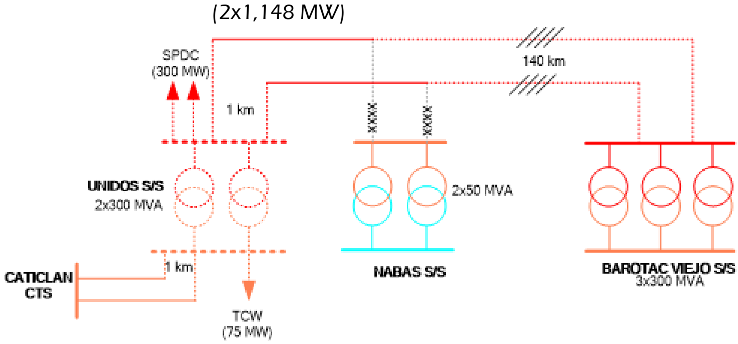
<table>
<tr><th colspan="6">TRANSMISSION LINE</th></tr>
<tr><th rowspan="2">Project Name and Justification</th><th rowspan="2">Project Driver and Status</th><th colspan="2">Project Components</th><th rowspan="2">Location</th><th>Project Cost (Million Pesos)</th></tr>
<tr><th>Substation</th><th>Transmission Line</th><th>ETC*</th></tr>
<tr><td colspan="6">230 kV PROJECTS</td></tr>
<tr><td>Cebu – Bohol 230 kV Interconnection Project
CEPNS</td><td>• Load Growth
• ERC-approved</td><td>• Dumanjug 230 kV SS: 2x70 MVAR 230 kV line reactors, 2-230 kV PCB
• Corella 230 kV SS: 2x300 MVA, 230/138-13.8 kV Power Transformers, 2x70 MVAR 230 kV line reactors, 8-230 kV PCB, 5-138 kV PCB
• Argao CTS (with provision to be SWS)
• Maribojoc CTS (with provision to be SWS)</td><td>• Dumanjug – Argao TL: 230 kV, ST-DC, 4-795 MCM ACSR, 29 km. (2x1,148 MW)
• Maribojoc – Corella TL: 230 kV, ST-DC, 4-795 MCM ACSR, 26 km. (2x1,148 MW)</td><td>• Cebu
• Bohol</td><td>• 16,972M
• Dec 2024</td></tr>
<tr><td colspan="2">• To prevent overloading of the Leyte-Bohol 138 kV Submarine Cable
• To accommodate the increasing demand and provide reliability in Bohol Island
• The project is part of the future 230 kV transmission loop between Cebu, Bohol, and Leyte Island. Completion of the said loop will provide resiliency and reliability between the islands.</td><td colspan="2">Submarine Cable
• Argao – Maribojoc 230 kV S/C, DC submarine cable system with a transfer capacity of 600 MW at 230 kV, 30 km. (with provision for 3rd circuit) (2x600 MW)

</td><td></td><td></td></tr>
<tr><td>Cebu – Lapu-Lapu Transmission Project
CEPNS</td><td>• System Reliability
• ERC-approved</td><td>• Lapu-lapu 138 kV GIS SS: 1-138 kV PCB</td><td>• Cebu – Umapad 230 kV TL: ST/SP-DC, 2-410 mm2 STACIR, 7.9 km. (2x974 MW)</td><td>• Cebu</td><td>• 2,844M
• Dec 2025</td></tr>
</table>

TRANSMISSION LINE

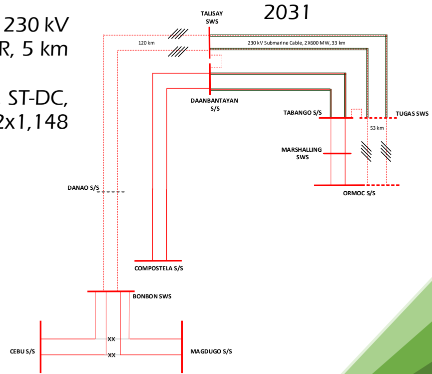
Project Name and Justification	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
• To prevent overloading of the Cebu – Mandaue – Lapu-lapu 138 kV Transmission corridor in Metro Cebu during normal and N-1 conditions • To cater the growing demand, provide operational flexibility, and reliability to the customers in Metro Cebu and Mactan Island					



Project Name and Justification	Project Driver and Status	Substation	Transmission Line	Location	ETC*
Barotac Viejo – Unidos 230 kV Transmission Line Project • To accommodate the incoming power plants in Northern Panay • To prevent overloading of the 138 kV Transmission corridor in Northern Panay during normal and -1 conditions	• Generation Entry • Awaiting ERC approval	Stage 1: • Unidos GIS SS (New): 7-230 kV PCB (GIS) and associated equipment; 6-138 kV PCB (GIS) and associated equipment Stage 2: • Unidos GIS SS (New): 2x300 MVA 230/138-13.8 kV Power Transformers and accessories. • Barotac Viejo SS (Expansion): 4-230 kV PCB and associated equipment	Stage 1: • Bus-in of Unidos SS to Nabas – Caticlan TL (Going to Caticlan): 138 kV TL, ST-DC, 1-795 MCM ACSR, 1 km (2x172 MW) • Bus-in of Unidos SS to Nabas – Caticlan TL (Going to Nabas): 230 kV TL, ST-DC, 4-795 MCM ACSR, 1 km. (2x1,148 MW) • • Upgrading of Barotac Viejo – Dingle 138 kV TL, Stringing of 3rd Circuit with capacity equivalent or higher than 480 MVA, and reconductoring of existing lines 1 and 2 with capacity equivalent or higher than 480 MVA, DC, 53 km. (3x584 MW) Stage 2: • Barotac Viejo – Unidos 230 kV TL (Extension up to Barotac Viejo), ST-DC, 4-795 MCM ACSR, 140 km. (2x1,148 MW)	• Panay	• 16,260M • Stage 1: Dec 2029 • Stage 2: May 2033

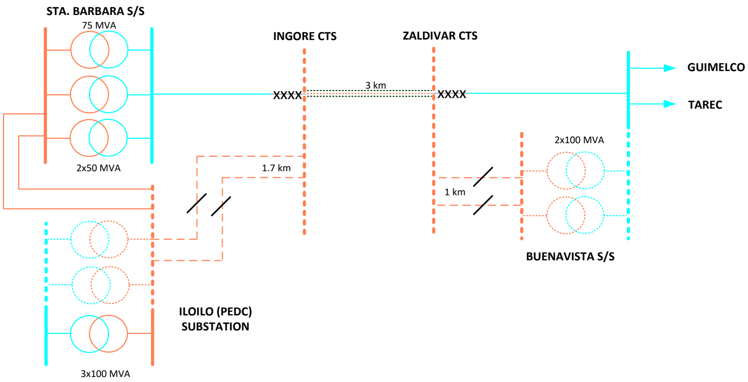


Project Name and Justification	Project Driver and Status	Substation	Transmission Line	Location	ETC*
Cebu – Leyte 230 kV Interconnection Lines 3 and 4 Project	• Generation Entry and System Reliability • Awaiting ERC approval	Stage 1: • Talisay SWS (New): 14-230 kV PCB and associated equipment; 4x70 MVAR Line Reactors • Tugas SWS (New): 14-230 kV PCB and Associated equipment; 4x70 MVAR Line Reactors • Tabango 230 kV SS (Expansion): 1-230 kV PCB and associated. • Daanbantayan 230 kV SS (Expansion): 1-230 kV PCB and associated.	Stage 1: • Talisay – Tugas S/C: 230 kV Submarine Cable, 600-MW per circuit submarine cables, DC 33 km (2x600 MW) • Daanbantayan – Talisay TL: 230 kV TL, ST-DC, 4-795 MCM ACSR, 5 km (2x1,148 MW) • Tugas Bus-in Lines: 23o kV, ST-DC, 4-795 MCM ACSR, 2x3 km (2x1,148 MW)	• Cebu • Leyte	• 44,406M • Stage 1: Dec 2029 • Stage 2: Dec 2031



TRANSMISSION LINE

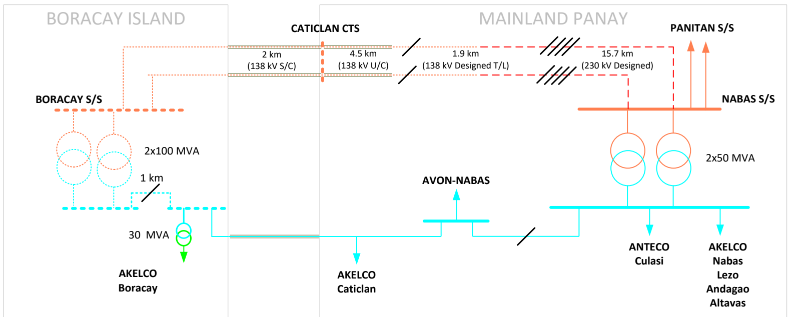
Project Name and Justification	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
• To accommodate the overloading of Daanbantayan – Tabango 230 kV submarine cables • To maximize power interchange between Luzon, Visayas and Mindanao • To increase reliability of the 230 kV backbone between Cebu and Leyte Islands • To accommodate the entry of new power plants in Leyte and Samar Island		Stage 2: • Bonbon 230 kV SS (Expansion): 2-230 kV PCB and associated equipment. • Ormoc 230 kV SS (Expansion): 4-230 kV PCB and associated equipment.	Stage 2: • Bonbon – Talisay TL: 230 kV TL, ST-DC, 4-795 MCM ACSR, 120 km (2x1,148 MW) • Tugas – Ormoc TL: 230 kV TL, ST-DC, 4-795 MCM ACSR, 53 km (2x1,148 MW)		
138 kV PROJECTS					
Panay – Guimaras 138 kV Interconnection Project • To accommodate the full dispatch of proposed and existing power plants in Guimaras Island • To maximize the existing Panay–Guimaras Interconnection by energizing Ingore–Sawang Submarine Cable to 138 kV thus, increasing its capacity from 54 MW to 96 MW.	• Generation Entry • ERC-approved	• Iloilo SS: 3x100 MVA,138/69-13.8 kV Power Transformers, 2-138 kV PCB, 10-69 kV PCB (GIS) • Buenavista 138 kV SS: 1x100 MVA 138/69-13.8 kV Power Transformer, 6-138 kV PCB (GIS), 4-69 kV PCB • Transfer of existing 1x100 MVA 138/69-13.8 kV Power Transformer from Iloilo SS to Buenavista SS	• Iloilo SS – Ingore CTS 138 kV TL Portion: ST-DC, 1-795 MCM ACSR, 1.7 km (2x172 MW) • Iloilo SS – Ingore CTS 138 kV U/G Portion: SC, XLPE cables of 200 MW capacity per circuit, 0.15 km. (1x200 MW) • Iloilo 69 kV U/C: Four circuits, XLPE cables of 100 MW capacity per circuit, 0.25 km (4x100 MW) • Extension of Sta. Barbara–Iloilo 138 kV Line: DC, XLPE cables of 400 MW capacity per circuit, 0.15 km (2x400 MW) • Baldoza 69 kV Line Transfer TL Portion: SP-SC, 1-795 MCM ACSR, 0.07 km (1x86 MW) • Baldoza 69 kV Line Transfer U/G portion: SC, XLPE cable of 100 MW capacity per circuit, 0.38 km (1x100 MW) • PPC & MORE 69 kV Line Transfer TL Portion: SP-SC, 1-795 MCM ACSR, 0.09 km (1x86 MW) • PPC & MORE 69 kV Line Transfer U/G portion: SC, XLPE cable of 100 MW capacity per circuit, 0.37 km (1x100 MW) • Banuyao 69 kV Line Transfer TL Portion: SP-SC, 1-795 MCM ACSR, 0.8 km (1x86 MW) • Banuyao 69 kV Line Transfer U/G portion: SC, XLPE cable of 100 MW capacity per circuit, 0.36 km (1x100 MW) • Buenavista 138 kV U/C two circuits of 200 MW-capacity, 0.15 km (2x200 MW) • Zaldivar CTS – Buenavista SS 138 kV TL: ST-DC, 1-795 MCM ACSR, 1 km (2x172 MW) • Zaldivar Bypass Line: 69 kV TL, ST-SC, 1-336.4 MCM ACSR, 0.7 km. (1x50 MW)	• Guimaras • Iloilo	• 3,011M • Apr 2026



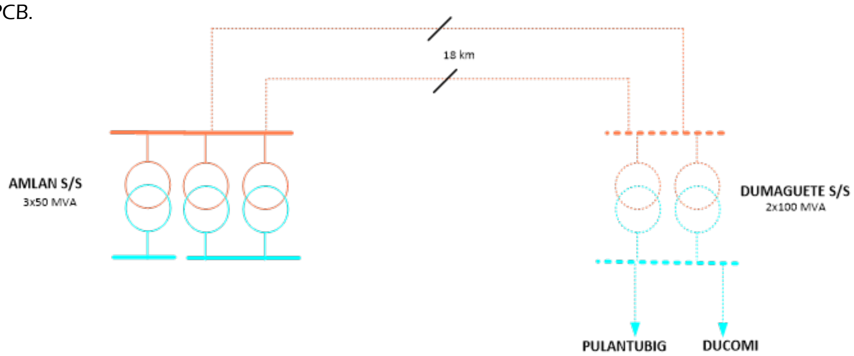
Project Name and Justification	Project Driver and Status	Substation	Transmission Line	Location	ETC*
Nabas – Caticlan – Boracay Transmission Line Project CEPNS	• Load Growth • Awaiting ERC approval	• Boracay 138 kV GIS SS (New), 2x100 MVA 138/69-13.2 kV Power Transformers, 5-138 kV PCB (GIS), 6-69 kV PCB (GIS). • Nabas 138 kV SS (Expansion), 4-138 kV PCB • Nabas Transition Station.	• Nabas – Unidos 230 kV TL (Initially energized at 138 kV), 230 kV, ST/SP-DC, 4-795 MCM ACSR, 15.7 km. (2x1,148 MW) • Unidos – Caticlan 138 kV TL, ST/SP-DC, 138 kV, 1-795 MCM ACSR, 1.9 km (2x172 MW)	• Aklan	• 5,273M • Aug 2026

TRANSMISSION LINE

Project Name and Justification	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) / ETC*
• To prevent overloading of the Nabas – Caticlan – Boracay 69 kV Transmission Corridor • To cater the increasing demand of Boracay and Caticlan • To prevent load curtailment or power interruption • To provide reliability to the customers in Boracay and Caticlan area			• Unidos – Caticlan 138 kV U/G DC, 138 kV Underground Cable System of 180 MW capacity per circuit, 4.5 km. (2x180 MW). • Manoc-Manoc – Boracay Tie Line, 69 kV, SP-SC, 1-336.4 MCM ACSR, 0.375 km (1x50 MW)		
		Submarine Cable: • Caticlan – Boracay S/C, Submarine Cable System, DC of 100 MW capacity at 138 kV, 2 km (2x100 MW) • Caticlan CTS (New), Cable Sealing End.			



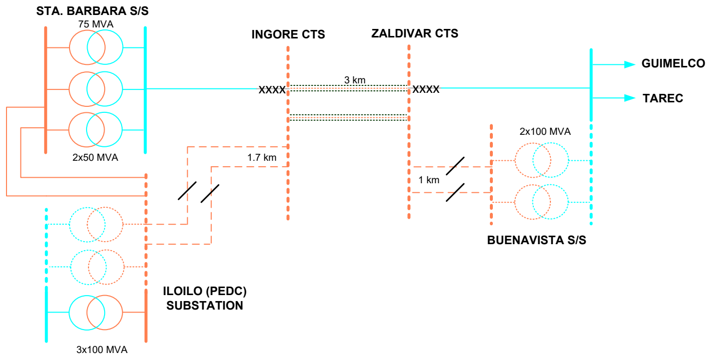
Project Name and Justification	Project Driver and Status	Substation	Transmission Line	Location	Project Cost / ETC*
Amlan – Dumaguete 138 kV Transmission Line Project CEPNS • To prevent overloading of the Amlan-Siaton 69 kV Transmission Line • To cater the growing demand and provide operational flexibility and reliability to the customers in Southern Negros • The project is also part of the ultimate plan of establishing 138 kV transmission loop in southern Negros.	• Load Growth • ERC-approved	• Amlan 138 kV SS: 3-138 kV PCB. • Dumaguete 138 kV SS (New): 2x100 MVA, 138/69-13.8 kV Power Transformer 6-138 kV PCB, 6-69 kV PCB.	• Amlan – Dumaguete 138 kV TL: ST-DC, 1-795 MCM ACSR, 18 km. (2x172 MW)	Negros Oriental	• 2,366M • Jan 2026



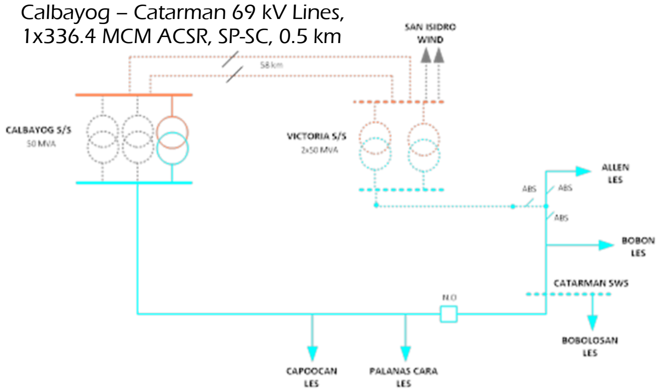
Project Name and Justification	Project Driver and Status	Substation	Transmission Line	Location	Project Cost / ETC*
Panay–Guimaras 138 kV Interconnection Line 2 Project	• System Reliability • Awaiting ERC approval	• Iloilo SS: 1-138 kV PCB and associated equipment	• Ingore–Sawang 138 kV S/C: 3-400 mm2 XLPE, Submarine Cable, Single Circuit, 3 km (1x100 MW) • Sawang CTS–Zaldivar 138 kV U/C: XLPE U/C, 0.8 km (1x100 MW)	• Guimaras • Iloilo	• 3,828M • Jul 2028

TRANSMISSION LINE

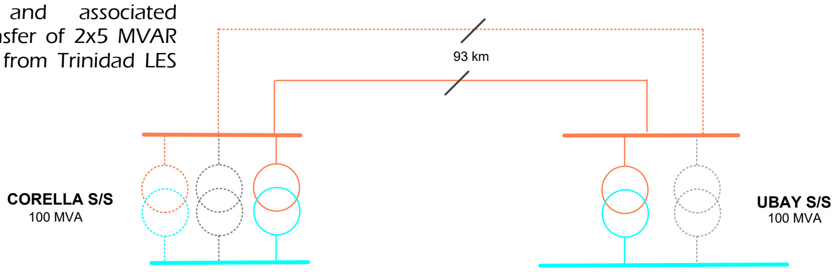
Project Name and Justification	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
• To provide reliability to the existing and future power plants and load customers in Guimaras Island					



Project Name and Justification	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
Calbayog – Allen Transmission Line Project • To accommodate the growth in demand and improve the reliability of power delivery in the Northern Samar • To accommodate the entry of proposed generation entries in the area	• Generation Entry and System Reliability • ERC-approved	• Calbayog SS: 3-138 kV PCB and associated equipment • Victoria GIS: 2x50 MVA Power Transformers and accessories (Redeployment of Power Transformers from Paranas SS and Panitan SS), 11-138 kV PCB and associated equipment; 4 - 69 kV PCB and associated equipment. • Catarman SWS: 5-69 kV PCB and associated equipment	• Calbayog – Victoria 138 kV TL, ST-DC, 2-795 MCM ACSR, 53 km (2x344 MW) • Victoria – Allen 69 kV TL, SP-SC, 1-795 MCM ACSR, 12.5 km (1x86 MW) • Victoria 138 kV XLPE U/G, 1C x 1000mm2 XLPE U/G, 0.12 km • Rerouting of Paranas – Calbayog & Calbayog – Catarman 69 kV Lines, 1x336.4 MCM ACSR, SP-SC, 0.5 km	• Samar Island	• 8,897M • Dec 2027



Project Name and Justification	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
Corella – Ubay 138 kV Line 2 Stringing Project • To accommodate and provide reliability to the existing and future power plants connected in Ubay area	• Generation Entry and System Reliability • Awaiting ERC approval	• Corella SS (Expansion): 1-138kV PCB and associated equipment • Ubay SS (Expansion): 3-138kV PCB and associated equipment, 2-138kV PCB and associated equipment, transfer of 2x5 MVAR Capacitor Bank from Trinidad LES to Ubay	• Corella – Ubay 138 kV TL 2 138 kV TL, ST-DC2, 1-795 MCM ACSR, 93 km (1x 172 MW)	• Bohol	• 2,121M • Sep 2030

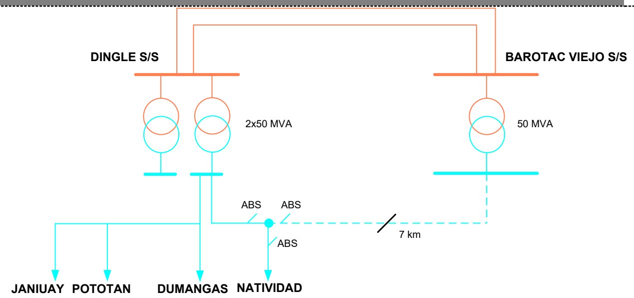


69 kV PROJECTS

Project Name and Justification	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
Barotac Viejo – Natividad 69 kV Transmission Line Project	• System Reliability • Awaiting ERC approval		• Barotac Viejo – Natividad 69 kV TL, SP-SC, 1x795 MCM ACSR, 7 km (1x86 MW)	• Iloilo	• 406M • Feb 2028

TRANSMISSION LINE

Project Name and Justification	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) / ETC*
• To provide operational flexibility and reliability to the customers in Natividad area					

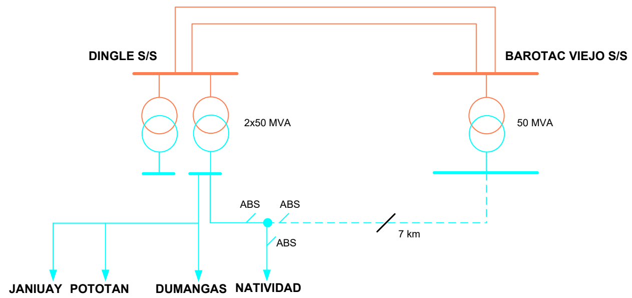


Project Name and Justification	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) / ETC*
Visayas 69 kV Transmission Line Upgrading Project • To avoid overloading in various 69 kV transmission lines during normal conditions • To prevent load curtailment within these lines that may affect power customers in the said areas	• System Reliability • Awaiting ERC approval		• Reconductoring of Ormoc – Lemon 69 kV Line portion, 1-795 MCM ACSR, 20 km (1x86 MW) • Reconductoring of Ormoc – Simangan 69 kV Line portion, 1-795 MCM ACSR, 6 km (1x86 MW) • Reconductoring of Babatngon – Abucay 69 kV Line portion, 1-795 MCM ACSR, 16 (1x86 MW) • Reconductoring of Corella – Tagbilaran 69 kV Line portion, 1-795 MCM ACSR, 6 km (1x86 MW) • Reconductoring of Sta. Barbara – Bolong portion 69 kV Line, 1-795 MCM ACSR, 6 km (1x86 MW)	• Leyte • Iloilo • Bohol	• 2,820M • Dec 2025

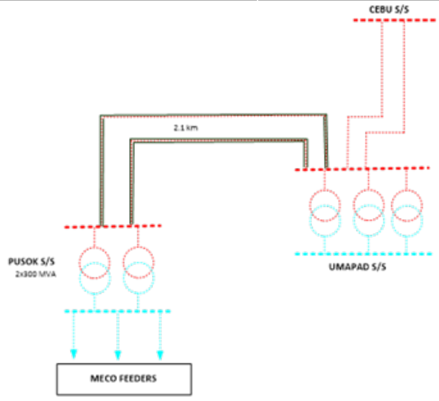
Regulatory approval is one crucial requirement for meeting the projects' ETC (Estimated Time of Completion) in the TDP. For projects awaiting regulatory approval, it should be

SUBSTATION

Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) / ETC*
230 kV PROJECTS					
Visayas Substation Upgrading Project • To accommodate the projected demand and avoid overloading of the transformer during N-1	• System Reliability • Awaiting ERC approval	Cebu: • Daanbantayan SS: 150 MVA 230/69-13.8 kV Power Transformer, 1-230 kV PCB, 4-69 kV PCB. Leyte: • Tabango SS: 1x50 MVA 230/69-13.8 kV Power Transformer, 1-230 kV PCB, 3-69 kV PCB. • Maasin SS: 1x50 MVA 138/69-13.8 kV Power Transformer, 4-138 kV PCB, 8-69 kV PCB. Samar: • Calbayog SS: 50 MVA 138/69-13.8 kV Power Transformer, 1-138 kV PCB, 2-69 kV PCB.		• Southern Leyte • Leyte • Samar • Cebu	• 1,317M • Feb 2025



Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) / ETC*
Lapu-Lapu 230 kV Substation Project • To unload the Cebu–Mandaue–Lapu-lapu 138 kV Transmission Corridor and Lapu-lapu GIS Substation • To cater the growing demand of Mactan Island	• Load Growth • Awaiting ERC approval	• Pusok 230 kV GIS SS (New), 2x300 MVA 230/69-13.8 kV Power Transformers, 8-230 kV PCB (GIS), 10-69 kV PCB (GIS). Submarine Cable • Umapad–Pusok 230 kV S/C, 600 MW per circuit, DC, 2.1 km. (2x600 MW)		• Cebu	• 3,935M • Jul 2026

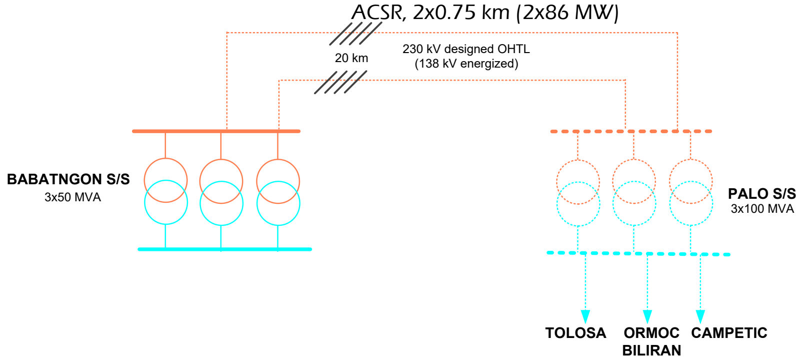
Project Name and Description	Project Driver and Status	Project Components		Location	Project Cost (Million Pesos)
		Substation	Transmission Line		ETC*
• To provide operational flexibility and reliability to the customers in the area					
Visayas Substation Upgrading Project 2 • To cater to the load growth in the area and to provide N-1 contingency to the Substations. Replaced transformers will either be redeployed to other Substations or refurbished • To cater to the growth in demand in each area and to provide reliability to the customers being served by the substations	• System Reliability • Awaiting ERC approval	Stage 1: Leyte: • Isabel SS: 1x50 MVA 138/69-13.8 kV Power Transformer (1x50 MVA transformer transferred from Calong-calong SS), 3-138 kV PCB, 2-69 kV PCB. (Additional), 9-138 kV PCB, 2-69 kV PCB. (Replacement), Centralized Control Building (CCB), Full upgrading of secondary devices. • Tabango SS: 1x50 MVA 230/69-13.8 kV Power Transformer, 2-230 kV PCB, 2-69 kV PCB, CCB, Full upgrading of secondary devices. • Maasin SS: 1x50 MVA 138/69-13.8 kV Power Transformer, 3-138 kV PCB, 9-69 kV PCB, Expansion of Control Room. Samar: • Paranas SS: 2x100 MVA 138/69-13.8 kV Power Transformer (Replacement of 30 MVA and 50 MVA transformers), 9-69 kV PCB, CCB, Full upgrading of secondary devices • Calbayog SS, 1x50 MVA 138/69-13.8 kV Power Transformer, 5-138 kV PCB, 7-69 kV PCB, Full upgrading of secondary devices, CCB. Cebu: • Compostela SS: 2x100 MVA 138/69-13.8 kV Power Transformer (Replacement of 2x50 MVA transformers), 2-230 kV PCB, 3-69 kV PCB, and Relocation of Warehouse • Samboan SS: 4-138 kV PCB, 2-69 kV PCB, CCB and Full upgrading of secondary devices • Toledo SS: 3x100 MVA 138/34.5-13.8 kV Power Transformer (Replacement of 3x40 MVA transformers), Transfer of termination of various TL, and CCB • Daanbantayan SS: 1x150 MVA 230/69-13.8 kV Power Transformer, 2-69 kV PCB, CCB. Bohol: • Ubay SS: 1x100 MVA 138/69-13.8 kV Power Transformer, 10-138 kV PCB, 11-69 kV PCB, CCB, and 69 kV line extensions • Corella SS: 1x100 MVA 138/69-13.8 kV Power Transformer, 2-138 kV		• Visayas Island	• 14,420M • Stage 1: Dec 2025 Stage 2: Jun 2027

SUBSTATION

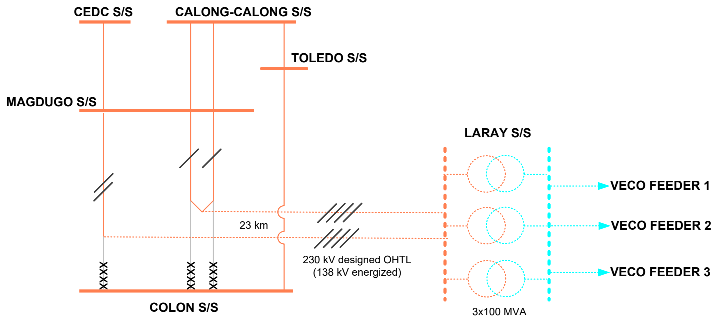
Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
		PCB, 8-69 kV PCB and 69 kV line extensions. Negros: • Kabankalan SS: 2x100 MVA 138/69-13.8 kV Power Transformer (Replacement of 30 and 50 MVA Transformers), 3-138 kV PCB, 4-69 kV PCB, CCB and Telecom Shelter, , and Full upgrading of secondary devices • Mabinay SS: 1x50 MVA 138/69-13.8 kV Power Transformer, 4-138 kV PCB, 5-69 kV PCB, CCB and Telecom Shelter, and Full upgrading of secondary devices. Panay: • San Jose SS: 2x50 MVA 138/69-13.8 kV Power Transformer, 6-138 kV PCB, 5-69 kV PCB, Expansion of Control Building • Dingle SS: 2x100 MVA 138/69-13.8 kV Power Transformer (Replacement of 2x50 MVA Transformers), 3-138 kV PCB, 9-69 kV PCB, CCB and Telecom Shelter, and Full upgrading of secondary devices • Barotac Viejo SS: 50 MVA 138/69-13.8 kV Power Transformer (50 MVA Transformer transferred from Iloilo SS), 2-138 kV PCB, 2-69 kV PCB, • Sta. Barbara SS: 1x75 MVA 138/69-13.8 kV Power Transformer (Spare), Upgrading of Secondary Equipment. Cable Stage 2: • Panitan SS: 3x100 MVA 138/69-13.8 kV Power Transformer (Replacement of 2x30 and 50 MVA transformers), 7.5 MVAR Capacitor Bank, 8-138 kV PCB (GIS), 10-69 kV PCB (GIS), CCB and Container Van and Dismantling of existing 69 kV Switchyard • Concepcion SS: 1x100 MVA 138/69-13.8 kV Power Transformer, 1-138 kV PCB • Calong-calong SS, 3x100 MVA 138/69-13.8 kV Power Transformer (Replacement of 2x50 MVA transformers), 2-138 kV PCB, 13-69 kV PCB, Full upgrading of secondary devices, CCB, Dismantling of existing 69 kV Switchyard, and Calong-calong 69 kV feeder line extensions			
Visayas Substation Upgrading Project 3 • To accommodate the projected demand and avoid overloading of the transformer in Cadiz and Colon Substation • To increase the substation capacity and provide reliability during N-1 condition or outage of one transformer	• Load Growth, Generation Entry, System Reliability • Awaiting ERC approval	• Cadiz SS (expansion) 2x100 MVA 138/69-13.8 kV Power Transformers, 10-69 kV PCB and associated equipment. • E.B. Magalona 230 kV SS (expansion) 2-230 kV PCB and associated equipment • Sta. Barbara 138 kV SS (expansion): 2-138 kV PCBs, 2-69 kV PCBs, and associated equipment • Naga 138 kV SS (expansion) 3-138 kV PCB and associated equipment • Colon 138 kV SS (expansion): 2x100 MVA 138/69-13.8 kV Power Transformers and accessories 1-138 kV PCB and associated equipment 2-69 kV PCBs and associated equipment.		• Negros Occidental • Iloilo • Cebu • Samar	• 4,517M • Oct 2027

SUBSTATION

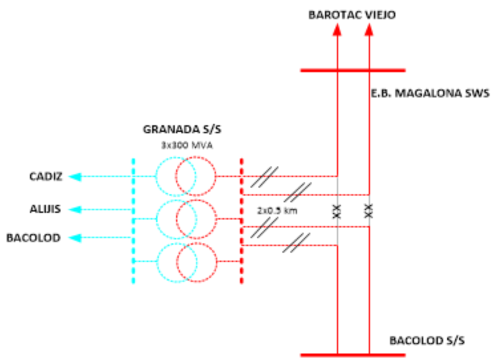
Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
• To accommodate the incoming generation in each area		• Calbayog 69 kV SS (expansion): 1-69 kV PCB and associated equipment			
Babatngon – Palo 230 kV Transmission Line Project (Initially energized at 138 kV) CEPNS • To cater the growing demand and provide operational flexibility and reliability to the customers in Eastern Leyte • To improve the voltage quality in the area	• Load Growth, System Reliability • Awaiting ERC approval	• Palo SS: 3x100 MVA Power Transformers and accessories; 8-230 kV PCB and associated equipment; 9-69 kV PCB and associated equipment. • Babatngon SS:, 3-138 kV PCBs and associated equipment	• Babatngon – Palo 230 kV TL, ST-DC, 4x795 MCM ACSR, 20 km (2x1,148 MW) • Palo – Alang-Alang 69 kV TL, SP-SC, 1-795 MCM ACSR, 0.5 km (1x86 MW) • Palo – Tolosa & Palo – Campetik 69 kV TL, SP-DC, 1-795 MCM ACSR, 2x0.75 km (2x86 MW)	• Leyte	• 6,002M • Dec 2030



Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
Laray 230 kV Substation Project (Initially energized at 138 kV) CEPNS • To provide a new drawdown substation in the area of Metro Cebu • To prevent the overloading of Quiot SS and Cebu SS during normal condition and to ensure the reliability of power delivery in Metro Cebu through load shifting between substations during N-1 contingency. • To accommodate future developments and will provide new terminations for customers in the area	• Load Growth, System Reliability • Awaiting ERC approval	• Laray GIS SS (New) 3x100 MVA 138/69-13.8 kV Power Transformers and accessories, 10-230 kV PCB (GIS) and associated equipment, 7-69 kV PCB GIS and associated equipment	• OHTL from Laray to Tapping Point along Magdugo – Colon 138 kV Lines (in the area of Naga), ST/SP-DC, 2-610 mm2 TACSR, 4-795 MCM ACSR, 23 km (2x1,148 MW)	• Cebu	• 6,410M • Nov 2028



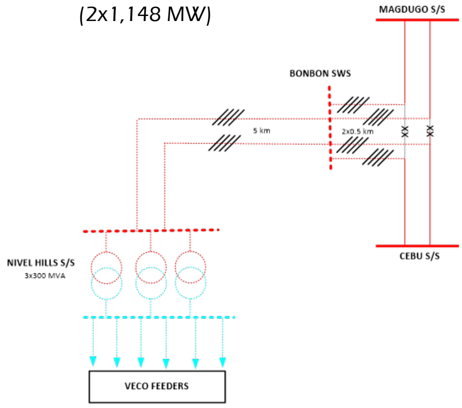
Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
Granada 230 kV Substation Project • To address overloading of power transformers in Bacolod Substation • To provide new connection point for power customers in Negros Occidental	• Load Growth • Awaiting ERC approval	• Granada SS: 3x300 MVA, 230/69-13.8 kV Power Transformers, 12-230 kV PCB and associated equipment, 10-69 kV PCB and associated equipment	• Granada 230 kV Bus-in Lines, ST-DC, 2-795 MCM ACSR, 2x0.50 km (2x573 MW)	• Negros Occidental	• 4,032M • Jun 2030



Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
Nivel Hills 230 kV Substation Project	• Load Growth and	• Nivel Hills GIS SS (New): 3x300 MVA 230/69-13.8 kV Power Transformers and accessories; 6-230 kV PCB (GIS)	• Nivel Hills SS – Bonbon SWS: 230 kV, 4-795 MCM ACSR, ST-DC, 5 km (2x1,148 MW)	• Cebu	• 6,867M • Dec 2030

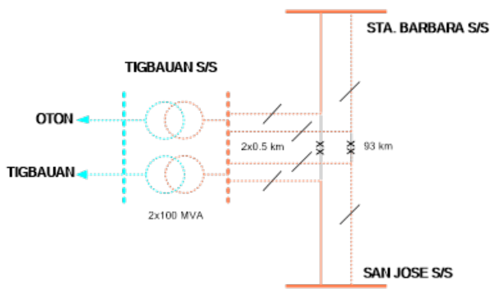
SUBSTATION

Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
• To prevent overloading of Cebu and Quiot Substation • To cater the growing demand and to provide operational flexibility and reliability to the customers in Metro Cebu	System Reliability • Awaiting ERC approval	and associated equipment; 10-69 kV PCB (GIS) and associated equipment • Bonbon SWS (New): 10-230 kV PCB (GIS) and associated equipment	• Bus-in of Bonbon SWS to Cebu – Magdugo OHTL 230 kV, 4-795 MCM ACSR, ST-DC, 2x0.5 km (2x1,148 MW)		



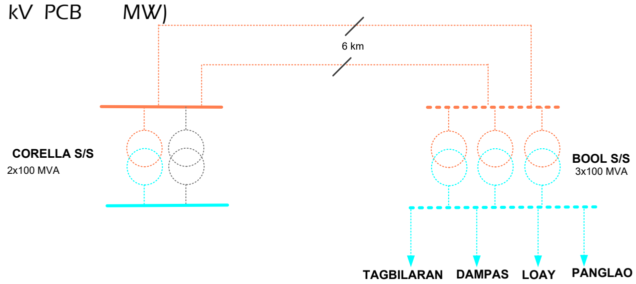
138 kV PROJECTS

Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
Visayas Substation Reliability Project II • To address the overloading during n-1 condition or outage of one transformer • To ensure the reliability of the substations and comply with the n-1 provision of the PGC	• System Reliability • ERC-approved	• Mandaue 138 kV SS Expansion: 1x100 MVA 138/69-13.8 kV Power Transformer, 1-138 kV GIS Switch Bay, 1-69 kV GIS Switch Bay • Lapu-Lapu 138 kV SS Expansion: 1x100 MVA 138/69-13.8 kV Power Transformer, 1-138 kV GIS Switch Bay, 1-69 kV GIS Switch Bay • Ormoc SS: 1-100 MVA 138/69-13.8 kV Power Transformer, 3-69 kV PCB and associated equipment • Sta. Barbara SS: 2-50 MVA 138/69-13.8 kV Power Transformer, 2-138 kV and 5-69 kV PCB and associated equipment • Sta. Rita SS: 1-50 MVA 138/69 kV-13.8 Power Transformer (transferred from Ormoc SS), 2-69 kV PCB (transferred from Babatngon and Ormoc SS) and 1-69 kV Air Break Switch (transferred from Bagolibas SS) • Babatngon SS: 1-50 MVA 138/69-13.8 kV Power Transformer, 1-138 kV and 1-69 kV PCB and associated equipment		• Visayas Island	• 1,038M • Dec 2024
Tigbauan 138 kV Substation Project • To address overloading along Sta. Barbara–San Jose 69 kV TL and to maximize the full capacity of Sta. Barbara–San Jose 138 kV Transmission Corridor. • To cater the growing demand and provide operational flexibility and reliability to the customers in Southern Panay	• Load Growth • Awaiting ERC approval	Stage 2 • Tigbauan 138 kV SS: 2x100 MVA 138/69-13.8 kV Power Transformer, 10-138 kV PCB, and 4-69 kV PCB • Sta. Barbara SS: 1-138 kV PCB, and 2-69 kV PCB • San Jose SS: 2-138 kV PCB	Stage 1 • Portion of the Stringing of Sta. Barbara – San Jose 138 kV Line 2, ST-DC2, 4.6 km, 1-795 MCM ACSR (energized at 69 kV) (1x172 MW) Stage 2 • Tigbauan 138 kV Bus-in Line, ST-DC, 1-795 MCM ACSR, 2x0.50 km (2x172 MW) • Tigbauan 69 kV Cut-in Line, SP-DC, 1-795MCM ACSR, 0.5 km. (2x86 MW) • Stringing of Sta. Barbara – San Jose 138 kV Line 2, ST-DC2, 1-795 MCM ACSR, 93 km. (1x172 MW)	• Iloilo	• 4,197M • Stage 1: Energized at 69 kV Stage 2: Aug 2029



SUBSTATION

Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
Visayas Regional PCB Replacement Project • The project involves the replacement of the existing PCB in various substations in Visayas Island due to old age and underrated capacity. • To provide reliability to the equipment in various substations in Visayas	• System Reliability • Awaiting ERC approval	• Cebu SS: 1-69kV, PCB, 8-138 kV PCB and associated equipment. • Pajo LES, 1-69 kV PCB and associated equipment • Garcia Hernandez LES, 1-69 kV PCB and associated equipment • Bacolod SS: 6-69 kV PCB, 1-138 kV PCB and associated equipment • Amlan SS: 3-69 kV PCB and associated equipment • Sta. Barbara SS: 1-69 kV PCB and associated equipment		• Cebu • Bohol • Negros Occidental • Iloilo	• 2,645M • Dec 2026
Bool 138 kV Substation Project • To unload the existing Corella-Tagbilaran 69 kV transmission line and Corella Substation • To cater to the growing demand in Panglao and Tagbilaran area • To provide operational flexibility and reliability to the customers in Bohol Island	• Load Growth and System Reliability • Awaiting ERC approval	• Bool 138 kV SS: 3x100 MVA Power Transformers and accessories; 8-138 kV PCB and associated equipment; 9-69 kV PCB and associated equipment • Corella SS: 2-138 kV PCB and associated equipment; 1-69 kV PCB and associated equipment	• Corella – Bool138 kV TL, ST-DC, 1x795 MCM ACSR, 6 km (2x172 MW) • Bool 69 kV Cut-in Lines, SP-DC, 1x795 MCM ACSR, 1 km (2x86 MW)	• Bohol	• 4,047M • Dec 2030



VOLTAGE IMPROVEMENT

Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
138 kV PROJECTS					
Visayas Voltage Improvement Project 2 • To improve the power quality in different areas in Visayas. These voltage issues are primarily due to the load growth in the area including the load end substations that are currently served by long 69 kV transmission lines. Furthermore, STATic synchronous COMpensators (STATCOM) are proposed to be installed in Sta. Barbara, Naga, and Calbayog Substation in order to improve the voltage stability per area.	• Power Quality • Awaiting ERC approval	Stage 1: • Calbayog 138 kV SS: ±20 MVAR 138 kV STATCOM, 2-138 kV PCB • Naga 138 kV SS: ±40 MVAR 138 kV STATCOM, 2x20 MVAR Capacitor, 4-138 kV PCB • Sta. Barbara 138 kV SS: ±40 MVAR 138 kV STATCOM, 1-138 kV PCB • Baybay 69 kV LES: 2x5 MVAR 69 kV Capacitor Bank, 2-69 kV PCB • Sipalay 69 kV LES: 2x5 MVAR 69 kV Capacitor Bank, 2-69 kV PCB • San Jose 69 kV LES: 3x5 MVAR 69 kV Capacitor Bank, 3-69 kV PCB Stage 2: • Roxas 69 kV LES: 2x5 MVAR 69 kV Capacitor Bank, 2-69 kV PCB • Quinapondan 69 kV LES: 5 MVAR 69 kV Capacitor Bank, 1-69 kV PCB		• Visayas Island	• 8,713M • Stage 1: Dec 2025 Stage 2: Aug 2029

VOLTAGE IMPROVEMENT					
Project Name and Description	Project Driver and Status	Project Components		Location	Project Cost (Million Pesos)
		Substation	Transmission Line		ETC*
		• Balamban 69 kV LES: 2x5 MVAR 69 kV Capacitor Bank, 2-69 kV PCB • Carmen 69 kV LES: 2x5 MVAR 69 kV Capacitor Bank, 2-69 kV PCB • Valladolid 69 kV LES: 5x5 MVAR 69 kV Capacitor Bank, 5-69 kV PCB • Bayawan 69 kV LES: 1x5 MVAR 69 kV Capacitor Bank, 1-69 kV PCB • Estancia 69 kV LES: 2x5 MVAR 69 kV Capacitor Bank, 2-69 kV PCB			
Visayas Mobile Capacitor Bank Project • To improve the power quality in different areas in Visayas while awaiting the needed transmission backbone to be completed. These voltage issues are primarily due to the load growth in the area including the load end substations that are currently served by long 69 kV transmission lines. Without any transmission reinforcements, these substations will be experiencing low voltage occurrences. As the demand grows, these occurrences will worsen which may lead to load shedding and possible voltage collapse in the area.	• Power Quality • Awaiting ERC Approval	• Dauin 69 kV LES: 3x5 MVAR 69 kV Mobile Capacitor, 3-69 kV PCB • Tigbauan 69 kV LES: 1x5 MVAR 69 kV Mobile Capacitor, 1-69 kV PCB. • SEPALCO 69 kV: 2x5 MVAR Mobile Capacitor, 2-69 kV PCB.		• Iloilo • Negros Oriental • Leyte	• 1,164M • May 2026

**Regulatory approval is one crucial requirement for meeting the projects' ETC (Estimated Time of Completion) in the TDP. For projects awaiting regulatory approval, it should be noted that the indicated ETC (month-year) assumes that ERC approval was issued in September 2024.*

Future developments in terms of the commercial and industrial sectors in the Visayas would result in an increase in the power supply requirements. Additional projects proposed within 2024 to 2030 aim to accommodate these developments by upgrading the existing substations in Visayas Island. Furthermore, customers in Samar Island requested to expedite the completion of 138 kV transmission lines that will initially be energized at 69 kV in Northeastern Samar to accommodate the future LES of the electric cooperatives thereby supporting the developments in each area in Samar Island.

Moreover, expansion of various substations is needed to accommodate the terminations of the proposed power plants and enable recent developments of new power plants which are not part of the committed list of the DOE throughout Visayas Island.

Table: 6.2 List of Additional Proposed Projects in the Visayas for the period 2024-2030

TRANSMISSION LINE		
Project Name	Description	Location
138 kV PROJECTS		
Taft – Oras 138 kV Transmission Line Project (Initially energized at 69 kV)	• The project involves the construction of 138 kV-designed overhead transmission line that will be initially energized at 69 kV from Taft to Oras. The project aims to accommodate the future loads of Eastern Samar in Oras area. This will be the connection point for the future load-end substations of ESAMELCO. The project is also part of the ultimate plan of establishing 138 kV transmission loop in Samar Island.	Samar
Bobolosan – Mapanas 138 kV Transmission Line Project (Initially Energized at 69 kV)	• The project involves the construction of 138 kV-designed overhead transmission line that will be initially energized at 69 kV from Bobolosan to Mapanas. The project aims to accommodate the future loads of Northern Samar in Mapanas area. This will be the connection point for the future load-end substations of NORSAMELCO. The project is also part of the ultimate plan of establishing 138 kV transmission loop in Samar Island.	Samar
Relocation of Transmission Towers in Leyte Project	• The project involves the relocation of 6 tower structures of Isabel – Tongonan 138 kV Transmission Line to accommodate the expansion of Ormoc Airport as requested by Civil Aviation Authority of the Philippines (CAAP).	Leyte

SUBSTATION		
Project Name	Description	Location
230 kV PROJECTS		
Visayas Substation Upgrading Project 4	• The project involves the upgrading or expansion of various substations in Visayas Island either through installation of additional transformer or replacement of existing transformer with a new higher capacity transformer. This is to accommodate the projected demand and avoid overloading of the substation during N-1.	Negros Oriental, Bohol, Iloilo, Capiz, Aklan, Cebu, and Leyte
Visayas PCB for Grid Connection Project	• The project involves the expansion of various NGCP Substations in the Visayas region that is intended for the termination of proposed power plants. This project will enable the generation facilities to be connected to the grid and to be energized.	Cebu, Panay, Leyte, Negros and Bohol

6.2 Visayas Projects for 2031-2040

Projects filed from 2031 to 2040 aim to cater the projected entry of large powerplants in Panay, Leyte, and Samar Island. The main transmission backbone will be extended towards Northern Panay and Leyte Island. New 230 kV submarine cables with a total of 1200 MW transfer capacity will be laid between Cebu and Leyte Island to utilize the excess generation coming from Leyte, Samar, and Luzon Island. Moreover, the HVDC system between Luzon and Visayas will be upgraded to double its transfer capacity to 880 MW in sharing excess generation among Luzon, Visayas and Mindanao grids.

Furthermore, future developments in terms of the commercial and industrial sector in the Visayas would result in an increase in the power supply requirements. To accommodate these developments, new drawdown substations are proposed in the key cities across the Visayas grid.

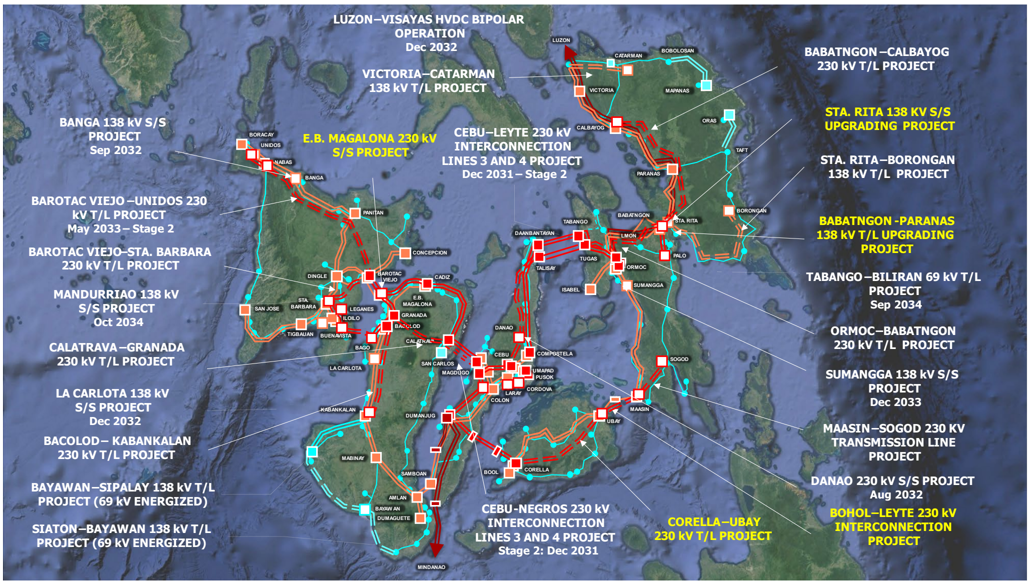


Figure 6.4: Visayas Transmission Outlook for 2031-2040

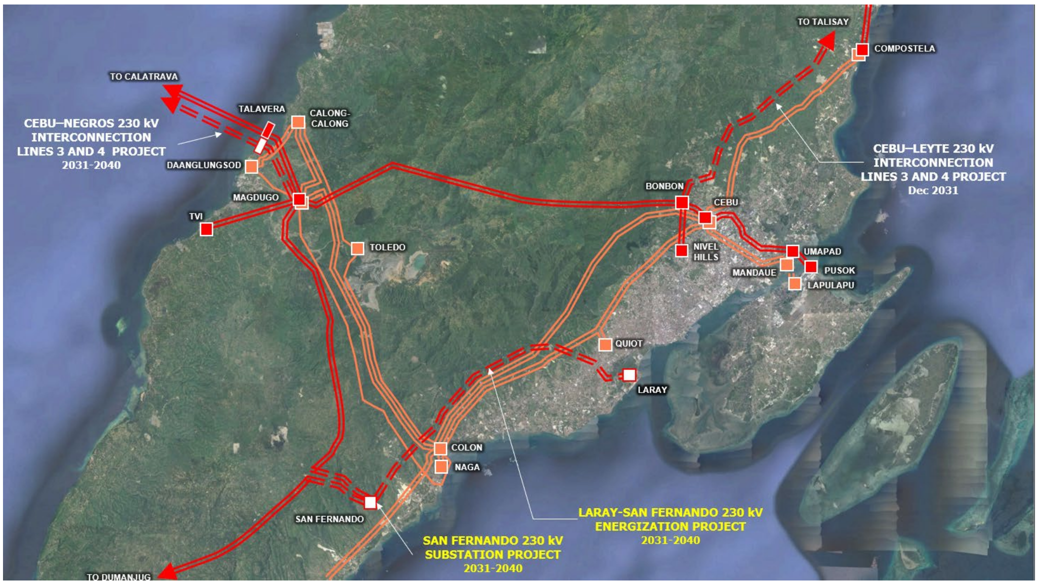
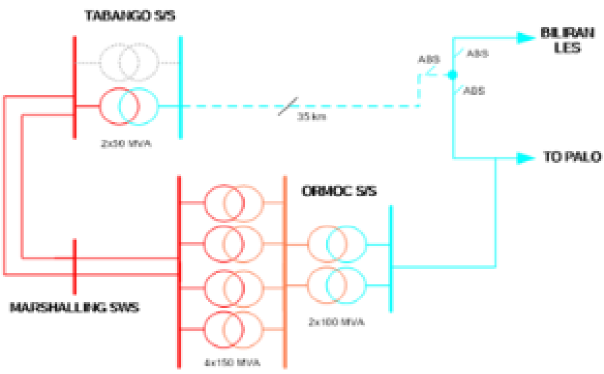


Figure 6.5: Metro Cebu Transmission Outlook for 2031-2040

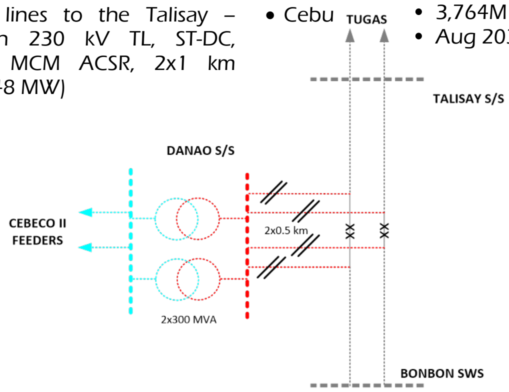
Table 6.3: List of Additional Visayas transmission projects for the period 2031-2040

TRANSMISSION LINE					
Project Name and Description	Project Driver and Status	Project Component		Location	Project Cost (Million Pesos)
		Substation	Transmission Line		ETC*
500 kV Projects					
Luzon – Visayas HVDC Bipolar Operation Project • To provide an additional transfer capacity of 440 MW between Luzon and Visayas Island upon completion of the project • To accommodate additional excess generation, and to maximize the power interchange between Luzon, Visayas, and Mindanao	• Generation Entry • Awaiting ERC approval	• Naga Converter Station (Expansion) 3x172 MVA single phase converter transformers; 1300A – 576 Thyristor, 96 Modules, 3 Quadruples rated at 172.1kV thyristor valves; AC filters 1x78MVAR AC high pass filter; 240mH smoothing reactor. • Ormoc Converter Station (Expansion) 3x172 MVA single phase converter transformers; 1300A – 576 Thyristor, 96 Modules, 3 Quadruples rated at 172.1kV thyristor valves; AC filters 3x35MVAR filter banks; 240mH smoothing reactor. • Naga SS (Expansion) 2x1000 MVA Power transformers and accessories, 2x90 MVAR 500 kV Line Reactor, 2x100 MVAR 230 kV Shunt Capacitor, 8-500 kV PCB, 2- 230 kV PCB and associated equipment. Pagbilao SS 2-500 kV PCB and associated equipment		• Leyte • Naga	• 22,463M • Dec 2032
69 kV Projects					
Tabango – Biliran 69 kV Transmission Line Project • To provide operational flexibility and reliability for the customers connected to the line • To improve the voltage quality in the area	• Load Growth and System Reliability • Awaiting ERC approval	• Tabango SS: 1-69 kV PCB and associated equipment • Biliran LES, 3-69 kV Air-Break Switch	• Tabango – Biliran 69 kV TL ST-SC, 1-795 MCM ACSR, 35 km (1x86 MW)	• Northern Leyte	• 1,724M • Sep 2034

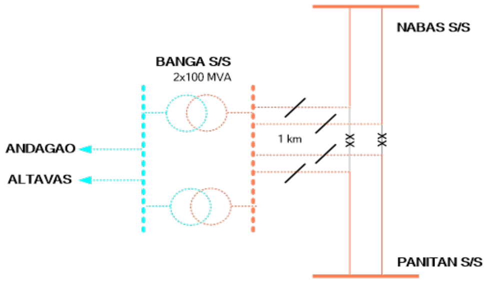


SUBSTATION

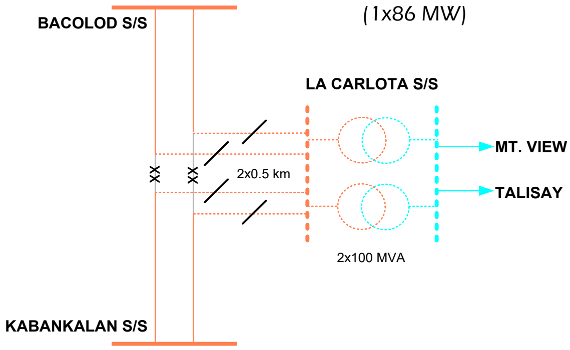
Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
230 kV PROJECTS					
Danao 230 kV Substation Project • To unload the existing Compostela and Daanbantayan Substations • To cater the growing demand and to provide operational flexibility and reliability to the customers in Northern Cebu	• Load Growth and System Reliability • Awaiting ERC approval	• Danao 230 kV SS: 2x300 MVA, 230/69 kV Power Transformers and accessories; 10-230 kV PCB and associated equipment; 8-69 kV PCB and associated equipment	• Bus-in lines to the Talisay – Bonbon 230 kV TL, ST-DC, 4x795 MCM ACSR, 2x1 km (2x1,148 MW)	• Cebu	• 3,764M • Aug 2032



Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
138 kV PROJECTS					
Banga 138 kV Substation Project • To unload the existing Panitan and Nabas Substation • To cater to the growing demand and to provide operational flexibility and reliability to the customers in Northern Panay • To improve the voltage quality in the area	• Load Growth and System Reliability • Awaiting ERC approval	• Banga 138 kV SS: 2x100 MVA Power Transformers and accessories; 10-138 kV PCB and associated equipment; 5-69 kV PCB and associated equipment	• Bus-in to the Panitan – Nabas 138 kV TL, ST-DC, 1x795 MCM ACSR, 2x1 km (2x172 MW) • Banga 69 kV Cut-in Lines, SP-DC, 1x795 MCM ACSR, 1 km (1x86 MW)	• Aklan	• 2,621M • Sep 2032

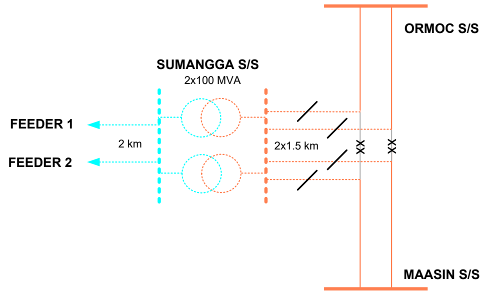
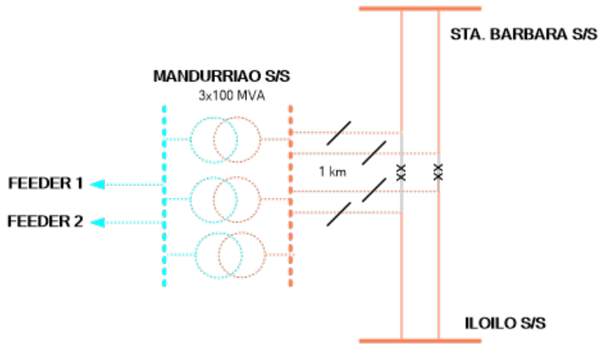


Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
La Carlota 138 kV Substation Project • To unload the existing Bacolod-San Enrique 69 kV Transmission Line and Bacolod Substation • To cater to the growing demand and to provide operational flexibility and reliability to the customers in Negros Occidental The project will serve as connection points to accommodate new power plants.	• Load Growth • Awaiting ERC approval	• La Carlota SS: 2x100 MVA, 138/69-13.8 kV Power Transformers; 10-138 kV PCB and associated eqpt; 4-69 kV PCB and associated eqpt.	• La Carlota 138 kV Bus-in Lines, ST-DC, 1-795 MCM ACSR, 2x0.50 km (2x172 MW) • La Carlota 69 kV Cut-in Lines, SP-DC, 1-795 MCM ACSR, 1.5 km (1x86 MW)	• Negros Occidenta l	• 4,022M • Dec 2032



Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
Sumangga 138 kV Substation Project	• Load Growth and System Reliability	• Sumangga 138 kV SS: 2x100 MVA Power Transformers and accessories; 10-138 kV PCB and associated equipment; 5-69 kV PCB and associated equipment	• Bus-in to the Ormoc – Maasin 138 kV TL, ST-DC, 1x795 MCM ACSR, 2x1.5 km (2x172 MW) • Sumangga 69 kV Cut-in Lines, SP-DC, 1x795 MCM ACSR, 1 km (2x86 MW)	• Leyte	• 3,978M • Dec 2033

SUBSTATION

Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
• To unload the existing Ormoc-Simangan 69 kV Transmission Line and Ormoc Substation • To cater to the growing demand and to provide operational flexibility and reliability to the customers in Western Leyte • To improve the voltage quality in the area	• Awaiting ERC approval	• Ormoc 138 kV SS: 6-69 kV PCB and associated equipment 			
Mandurriao 138 kV Substation Project • To unload the existing Iloilo Substation • To cater the growing demand and to provide operational flexibility and reliability to the customers in Iloilo City	• Load Growth and System Reliability • Awaiting ERC approval	• Mandurriao 138kV SS: 3x100 MVA, 138/69-13.8 kV Power Transformer and accessories; 8-69 kV PCB and associated equipment; 11-138 kV PCB and associated equipment 	• Bus-in to the Sta. Barbara – Iloilo 138 kV TL, 1-610 mm2 TACSR, 2x1 km, ST-DC	• Iloilo	• 3,210M • Oct 2034

**Regulatory approval is one crucial requirement for meeting the projects' ETC (Estimated Time of Completion) in the TDP. For projects awaiting regulatory approval, it should be noted that the indicated ETC (month-year) assumes that ERC approval was issued in September 2024.*

Additional projects proposed within 2031 to 2040 aim to cater to the entry of large powerplants in the identified CREZ areas in Panay, Negros, Samar, and Bohol Island. This will require extending the main backbone towards Southern Panay, Negros Occidental, Leyte to Northern Samar, and from Bohol to Leyte. Reinforcements of the 230 kV backbone lines are also proposed to accommodate the entry of these indicative power plants. Furthermore, upgrading of the existing substations and construction of 138 kV transmission lines that will initially be energized at 69 kV will provide reliability and support the developments in Negros and Samar Island.

Table 6.3: List of Additional Visayas Transmission Projects for the Period 2031-2040

TRANSMISSION LINE

Project Name	Description	Location
230 kV PROJECTS		
Babatngon – Calbayog 230 kV Transmission Line Project	• The project involves extending the 230 kV backbone in Samar Island. A 230 kV Transmission will be constructed from Babatngon going to Calbayog Substation. It aims to accommodate the entry of power plants under CREZ and the projected offshore wind powerplants in the area. This will provide system reliability and resiliency in between Leyte and Samar Island.	Leyte and Samar
Bacolod – Kabankalan 230 kV Transmission Line Project	• The project involves the extension of the 230 kV transmission backbone from Bacolod to Kabankalan area. The project will provide additional termination points and will accommodate the entry of future powerplants under CREZ in the area.	Negros Occidental
Barotac Viejo – Sta. Barbara 230 kV Transmission Line Project	• The project involves extending the 230 kV backbone in Southern Panay. A 230 kV Transmission Line will be constructed from Barotac Viejo going to Sta. Barbara Substation. It aims to accommodate the entry of powerplants under CREZ and	Panay

TRANSMISSION LINE

Project Name	Description	Location
	the projected offshore wind powerplants in the area. This will provide system reliability and resiliency in Southern Panay.	
Bohol – Leyte 230 kV Interconnection Project	• The project involves the development of a 230 kV backbone from Bohol to Leyte Island. It involves laying of a double circuit 230 kV submarine cables that will be laid from Tugas to Guadalupe with a transfer capacity of 600 MW per circuit. The project aims to accommodate the proposed power plants in Ubay area. Furthermore, the project is also part of the future 230 kV Transmission loop between Cebu, Bohol, and Leyte Island. Completion of the said loop will provide resiliency and reliability between the islands.	Bohol and Leyte
Calatrava – Granada 230 kV Transmission Line Project	• With the entry of generation through CREZ in Negros, Panay and Guimaras power will flow going to Cebu and the E.B Magalona – Cadiz – Calatrava 230 kV Backbone Line will be overloaded. It involves the construction of a 230 kV Transmission line that will traverse from Granada to Calatrava SS. The project will complete the future 230 kV Transmission loop in Negros Island. Completion of the said loop will provide resiliency and reliability in the island.	Negros Occidental
Cebu – Negros 230 kV Interconnection Line 3 and 4 Project	• The Interconnection project involves the laying of the 3rd and 4th submarine cable between Negros and Cebu Island. It also involves the construction of transmission lines and switching stations in Cebu and Negros Island. The project aims to accommodate the excess generation from Panay and Negros Island going to Cebu.	Cebu and Negros
Corella – Ubay 230 kV Transmission Line Project	• The project involves extending the 230 kV backbone in Bohol Island. A 230 kV transmission line will be constructed from Corella going to Ubay Substation. The project aims to accommodate the numerous proposed power plants in Ubay area. Furthermore, the project is also part of the future 230 kV Transmission loop between Cebu, Bohol, and Leyte Island. Completion of the said loop will provide resiliency and reliability between the islands.	Bohol
Laray – San Fernando 230 kV Energization Project	• The project involves the energization of Laray GIS Substation to 230 kV level. The 230 kV transmission line will be extended from Naga to San Fernando area. A new 230 kV switching station will be constructed in San Fernando area that will bus-in in the existing Magdugo – Dumanjug 230 kV Transmission Line. The project aims to accommodate the growth in demand in the area of SRP. The project is needed to energize the Laray – Cordova 230 kV Interconnection Project that will benefit Mactan Island. The project is also part of the ultimate plan of establishing 230 kV transmission loop in Metro Cebu. Completion of the transmission loop will provide resiliency and reliability to the customers in Cebu Island.	Cebu
Maasin – Sogod 230 kV Transmission Line Project	• The project involves the extension of the 230 kV transmission backbone from Maasin to Sogod area. It also involves the construction of a new drawdown substation in Sogod. The project aims to cater to the growing demand and provide operational flexibility and reliability to the customers in Southern Leyte. Moreover, completion of the project will improve the voltage quality in the area. Furthermore, the project is also part of the future 230 kV Transmission loop between Cebu, Bohol, and Leyte Island. Completion of the said loop will provide resiliency and reliability between the islands.	Leyte
Negros – Guimaras 230 kV Backbone Project	• This project involves developing a 230 kV Transmission Loop between Negros, Panay, and Guimaras Island. It involves laying of double circuit submarine cables from Negros to Guimaras Island. A new 230 kV switching station will also be constructed in the area of Leganes to serve as a connection point for proposed power plants in the area. The project aims to accommodate the upcoming powerplant under CREZ in the area of Negros and Guimaras Island. It will also provide reliability and resiliency to Negros, Panay, and Guimaras Island.	Negros and Guimaras
Panay – Guimaras 230 kV Backbone Project	• This project involves developing a 230 kV Transmission Loop between Panay, Negros, and Guimaras Island. It involves laying of double circuit submarine cables from Panay to Guimaras Island. A new 230 kV switching station will also be constructed in the area of Bago to serve as a connection point for proposed power plants in the area. The project aims to accommodate the upcoming powerplant under CREZ in the area of Panay and Guimaras Island. It will also provide reliability and resiliency to Negros, Panay, and Guimaras Island.	Panay and Guimaras
Ormoc – Babatngon 230 kV Transmission Line Project	• The project involves the extension of the 230 kV backbone from Ormoc to Babatngon Substation. The project aims to accommodate the excess generation from Samar Island. Furthermore, the project is also part of the future 230 kV Transmission loop between Cebu, Bohol, and Leyte Island. Completion of the said loop will provide resiliency and reliability between the islands.	Leyte
138 kV PROJECTS		
Sta. Rita – Borongan 138 kV Transmission Line Project	• The Paranas-Borongan-Quinapondan 69 kV Line serves loads of the Eastern Samar through ESAMELCO's LES. The existing 69 kV line serving the said area has a length of more than 190 km which is prone to long outages and tedious to maintain. The project involves the extension of the 138 kV transmission backbone from Sta. Rita to Borongan area. The project aims to cater the growing demand, provide operational flexibility, and improve the power quality of the • customers in Eastern Samar. The project is also part of the ultimate plan of establishing 138 kV transmission loop in Samar Island. Completion of the transmission loop will provide resiliency and reliability to the customers in Samar Island.	Samar

TRANSMISSION LINE

Project Name	Description	Location
Babatngon – Paranas 138 kV Transmission Line Upgrading	• The project involves the upgrading of a portion of the existing Babatngon–Paranas 138 kV line along San Juanico Strait and the construction of Sta. Rita SS, which will bus-in to the said transmission corridor. The project will increase the transfer capacity between Samar and Leyte Island. Thus, will accommodate the entry of the wind powerplants in Samar Island.	Leyte and Samar
Bayawan – Sipalay 138 kV Transmission Line Project (Initially energized at 69 kV)	• The project involves the construction of 138 kV-designed overhead transmission line that will be initially energized at 69 kV from Bayawan to Sipalay. The project aims to provide operational flexibility and reliability to the customers in Southern Negros. The project is also part of the ultimate plan of establishing 138 kV transmission loop in southern Negros.	Negros Oriental
Siaton – Bayawan 138 kV Transmission Line Project (Initially energized at 69 kV)	• The project involves the construction of 138 kV-designed overhead transmission line that will be initially energized at 69 kV from Siaton to Bayawan LES. The project aims to provide operational flexibility and reliability to the customers in Southern Negros. The project is also part of the ultimate plan of establishing 138 kV transmission loop in southern Negros.	Negros Oriental
Victoria – Catarman 138 kV Transmission Line Project	• The project involves the extension of the 138 kV backbone from Victoria to Catarman and developing a new drawdown substation in Catarman area. The project aims to cater the growing demand and provide operational flexibility and reliability to the customers in Northern Samar. Furthermore, completion of the project will improve the voltage quality in the area. The project is also part of the ultimate plan of establishing 138 kV transmission loop in Samar Island. Completion of the transmission loop will provide resiliency and reliability to the customers in Samar Island.	Samar

SUBSTATION

Project Name	Description	Location
230 kV PROJECTS		
E.B. Magalona 230 kV Substation Project	• The proposed project involves the upgrading of the E.B. Magalona SWS to a drawdown substation. 69 kV Cut-in lines will be constructed along the Bacolod-Cadiz 69 kV transmission line. The project aims to accommodate the entry of new powerplants and load customers along the Bacolod-Cadiz 69 kV transmission line. Furthermore, it will provide operational flexibility and reliability to the customers in Negros Occidental.	Negros Occidental
San Fernando 230 kV Substation Project	• The project involves the upgrading of the San Fernando SWS to a drawdown substation. The project aims to cater to the growing demand, provide operational flexibility and reliability to the customers in Southern Cebu.	Cebu
Visayas Substation Upgrading Project 5	• The proposed project involves the expansion of the various substations in Cebu and Negros Occidental to increase the transformer capacity, provide connection points for generation and load customers. The project aims to support the load growth and provide reliability to customers in various areas in Visayas Island.	Cebu, Panay, Leyte, Negros and Bohol
Visayas Regional PCB Replacement Project 2	• The projects involve the replacement of the existing PCB in various substations in the Leyte, Cebu, and Iloilo due to old age and underrated capacity.	Leyte, Cebu, and Iloilo
138 kV PROJECTS		
Sta. Rita 138 kV Substation Upgrading Project	• The project involves the upgrading of the existing Sta. Rita Substation to provide reliability and new connection points for the customers in the area	Samar

VOLTAGE IMPROVEMENTS

Project Name	Description	Location
230 kV PROJECTS		
Visayas Voltage Improvement Project 3	• Various areas in Visayas are experiencing low voltage occurrences due to long 69 kV transmission lines and high concentration of load. These low voltages, if not addressed, will result in load curtailment. The project involves the installation of voltage compensation devices in various areas in Visayas Island. The project will address the projected undervoltage and improve the power quality in each area.	Southern Leyte, Samar, Negros Occidental, Iloilo, and Cebu

6.3 Visayas Projects for 2041-2050

Projects proposed from 2041 to 2050 aim to provide a stronger and reliable transmission system for Visayas grid. 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 and 138 kV backbone in Visayas, the looping of the 230 kV and 138 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. 230 kV transmission loops will be completed in Metro Cebu, between Cebu, Bohol, and Leyte Island, and between Negros, Guimaras, and Panay Island while 138 kV transmission loops will be completed in Samar, Negros, and Panay Island. Moreover, interconnection to Mindoro Island from Panay Island will be established to enable sharing of excess generation between islands.

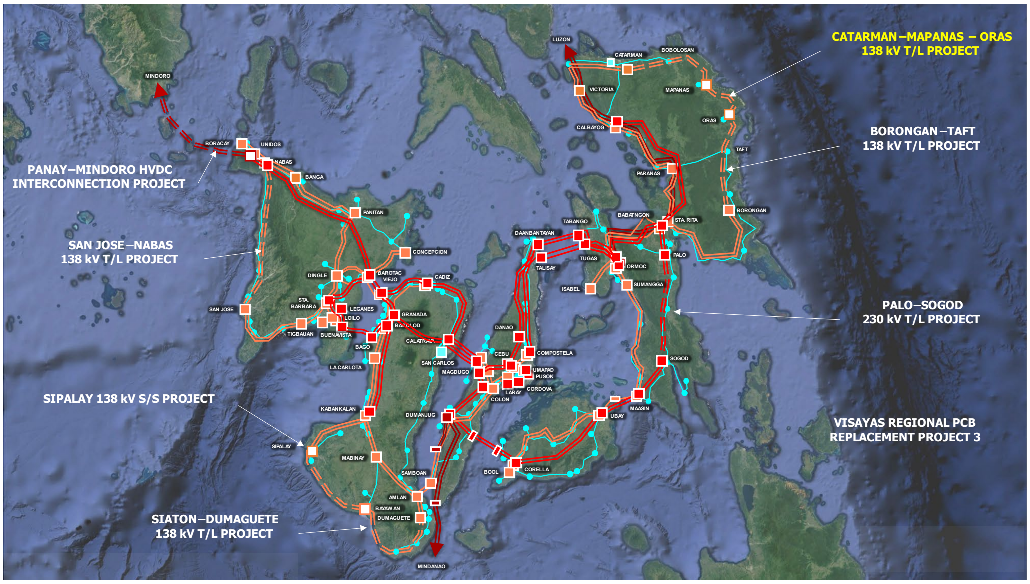


Figure 6.6: Visayas Transmission Outlook for 2041-2050

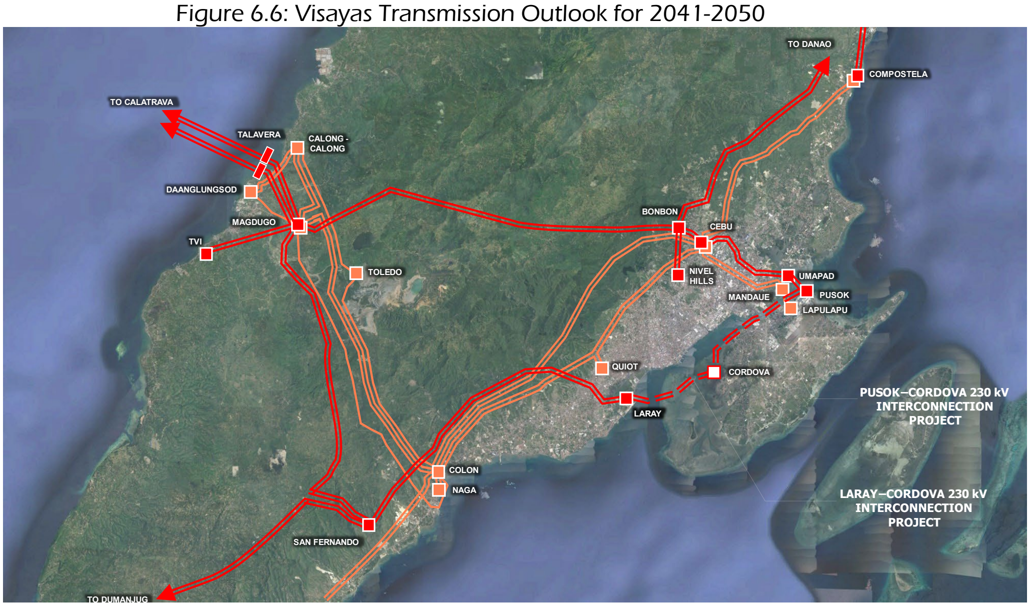


Figure 6.8: Metro Cebu Transmission Outlook for 2041-2050

Table: 6.4: List of Additional Proposed Projects in the Visayas for the Period 2041-2050

TRANSMISSION LINE		
Project Name	Description	Location
230 kV PROJECTS		
Palo – Sogod 230 kV Transmission Line Project	• The project aims to complete the ultimate plan of creating a 230 kV loop between Cebu, Bohol, and Leyte Islands. It involves the extension of the 230 kV transmission line from Palo going to Sogod substation. This will strengthen the transmission reliability and will provide resiliency in the Cebu, Leyte, and Bohol Island.	Leyte
Laray – Cordova 230 kV Interconnection Project	• The project involves the construction of a new drawdown substation within the area of Cordova City in Mactan Island. It will be connected to Laray 230 kV SS in Mainland Cebu crossing to Cordova Island via submarine cables. The project aims to cater to the growing demand and to provide operational flexibility and reliability to the customers in Mactan Island. The project is also part of the ultimate plan of establishing 230 kV transmission loop in Metro Cebu. Completion of the transmission loop will provide resiliency and reliability to the customers in Cebu Island.	Cebu
Pusok – Cordova 230 kV Interconnection Project	• The project aims to complete the ultimate plan of creating a 230 kV loop in Metro Cebu. It involves laying of the 230 kV submarine cables from Pusok going to Cordova substation. This will strengthen the transmission reliability and will provide resiliency in the Metro Cebu area.	Cebu

TRANSMISSION LINE

Project Name	Description	Location
138 kV PROJECTS		
Catarman – Mapanas – Oras 138 kV Transmission Line Project	• The project aims to energize the Mapanas – Bobolosan TL and Taft – Oras TL to 138 kV line in Northern Samar. New Substations will be constructed in Mapanas and Oras area to cater the growing demand, provide operational flexibility and reliability to the customers in the area. The project is also part of the ultimate plan of establishing 138 kV transmission loop in Samar Island. Completion of the transmission loop will provide resiliency and reliability to the customers in Samar Island.	Samar
Borongan – Taft 138 kV Transmission Line Project	• The project aims to complete the ultimate plan of creating a 138 kV loop on Samar Island. It involves the extension of the 138 kV transmission line from Borongan to Taft area. This will strengthen the transmission reliability and will provide resiliency in Samar Island.	Samar
Siaton – Dumaguete 138 kV Transmission Line Project	• The project aims to complete the 138 kV Backbone loop in the Southern Negros area. It involves the extension of the 138 kV transmission line from Siaton going to Dumaguete substation. This will strengthen the transmission reliability and will provide resiliency in the Negros Island.	Negros Oriental
San Jose – Nabas 138 kV Transmission Line Project	• The project aims to complete the ultimate plan of creating a 138 kV loop in Panay Island. It involves the extension of the 138 kV transmission line from San Jose going to Nabas Substation which is approximately 125 km. This will strengthen the transmission reliability and will provide resiliency in Panay Island.	Antique

SUBSTATION

Project Name	Description	Location
138 kV PROJECTS		
Visayas Regional PCB Replacement Project 3	• The projects involve the replacement of the existing PCB in various substations in the Visayas Island due to old age and underrated capacity. This project aims to provide reliability to the equipment in various substations in Visayas.	Leyte, Cebu, Negros Occidental, and Iloilo
Sipalay 138 kV Substation Project	• The proposed project involves the upgrading of the existing Sipalay 69 kV SWS to a 138 kV Substation. This project will serve as a new drawdown substation to cater the growth in demand and provide operational flexibility to customers in Southern Negros. Furthermore, the project is also part of the ultimate plan of establishing 138 kV transmission loop in Southern Negros. Completion of the transmission loop will provide resiliency and reliability to the customers in Southern Negros Island.	Negros

VOLTAGE IMPROVEMENTS

Project Name	Description	Location
230 kV PROJECTS		
Visayas Voltage Improvement Project 4	• The project aims to address the undervoltage problems in Cebu and Negros Islands. The installation of Capacitor in Granada, La Carlota, and Cordova SS will address the projected undervoltage in each area.	Negros Occidental and Cebu

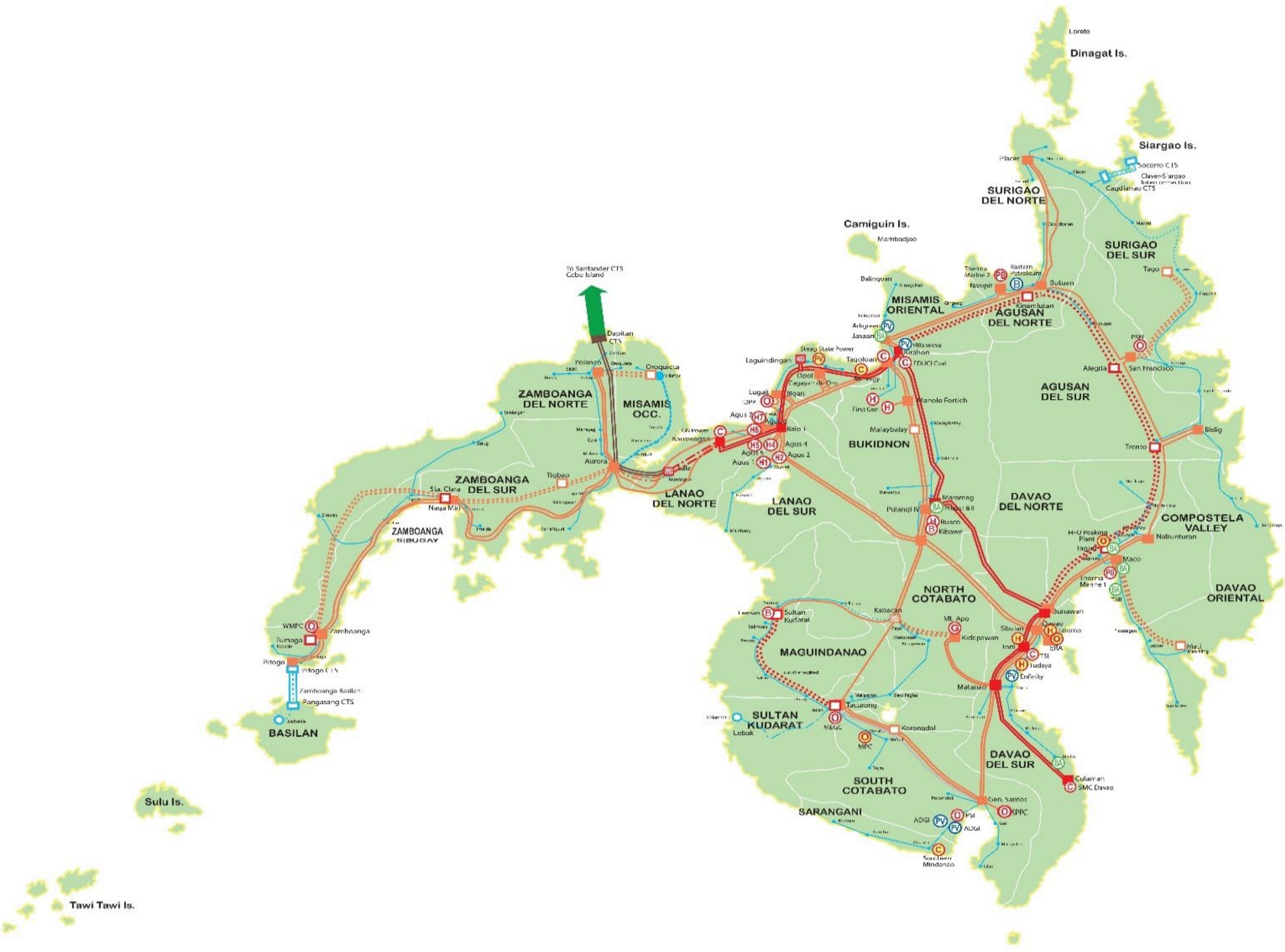
Chapter 7

MINDANAO Transmission Outlook

The power supply deficiency experienced in Mindanao for the past years, especially during the dry season, has been averted by the entry of bulk generation capacity additions from several coal-fired power plant projects. The energization of the backbone to its desired 230 kV voltage level allows the integration of the power plant projects into the Mindanao Grid. Further, the proponents of the coal-fired power plant projects have plans to expand their capacity in the future, potentially reaching a total of 600 MW to 1,200 MW of power generation capacity at each site. The completion of the interconnection between Mindanao and Visayas paved the way for more opportunities for power exchange amongst the major grids.

In terms of transmission system configuration, Mindanao is a relatively robust grid. However, security issues on the island remain a serious concern, thus NGCP is still facing major challenges in implementing its operations and constructing key transmission projects. Notably, another vital issue in the Mindanao grid is the looming low voltage issue in Zamboanga Peninsula and CARAGA region due to the lack of power plants locally located in the concerned areas relative to the continuous increase in demand. In this case, for a long-term solution, a power plant should be constructed in the area and/or for a short-term solution the installation of reactive compensating devices to balance the essential reactive requirement of the system will be necessary.

Meanwhile, to cater to the other requirements of the Mindanao Grid, the reinforcements of the existing 138 kV substations, the extension of some of the existing 230 kV and 138 kV transmission lines, and the looping of some 69 kV transmission systems, as well as power quality projects, are necessary for load growth and system reliability improvement.

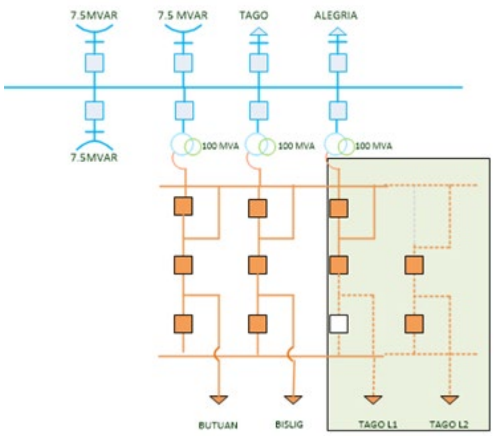


7.1 Mindanao Projects for 2024-2030

From the period 2024 to 2030, the development plan will focus on the extension of 138 kV and 69 kV transmission corridors, namely the Maco – Mati 138 kV TL, San Francisco – Tago 138 kV TL, as well as Tacurong – Kalamansig 69 kV TL. Also, in this horizon, the upgrading and expansion of several substation projects will also be implemented. To accommodate huge spot loads, the Koronadal 138 kV SS will be developed to cater to the entry of the planned mining operation of Sagittarius Mining Inc. and the possible connection of local electric cooperatives. In northern Mindanao, the Laguindingan 230 kV SS is being constructed to serve the power requirement of the Laguindingan Economic Zone and other loads of Misamis Oriental Electric I Cooperative. The completion of the Kabacan substation located in North Cotabato is underway to address the power demand requirement of the customers in the said province and the nearby provinces of Sultan Kudarat, Maguindanao del Sur and Maguindanao del Norte. Meanwhile, to support the other requirements for load growth and system reliability of the Mindanao Grid, the reinforcement of the existing 138 kV substations, the extension of some of the existing 230 kV and 138 kV transmission lines, the looping of some 69 kV transmission systems, as well as the implementation of power quality projects are necessary.

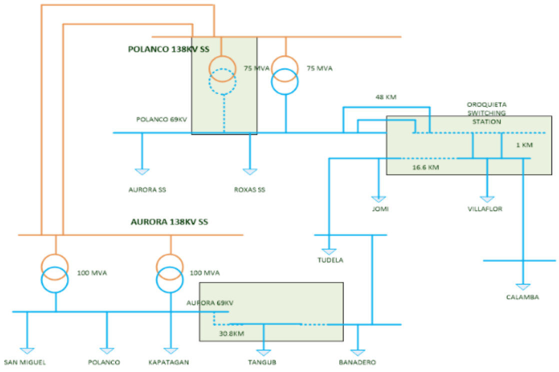
Table 7.1: List of Mindanao transmission projects for the period 2024-2030

TRANSMISSION LINE

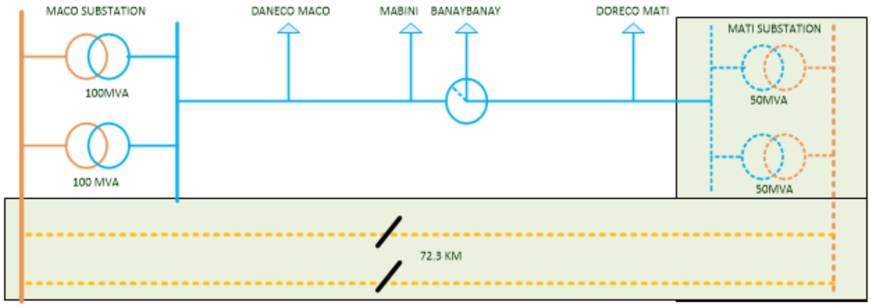
Project Name and Justification	Project Driver and Status	Project Components		Location	Project Cost (Million Pesos)
		Substation	Transmission Line		ETC*
138 kV PROJECTS					
San Francisco – Tago 138 kV Transmission Line Project CEPNS	• Load Growth, System Reliability • Awaiting ERC approval	• San Francisco 138 kV SS: 2-138 kV PCB • Tago 138 kV SS: 1x50 MVA 138/69 kV Power Transformer, 6-138 kV PCB, 8-69 kV PCB	• San Francisco – Tago 138 kV TL, ST-DC, 1-795 MCM ACSR/AS, 91 km. (2 x 172 MW) • Madrid – Tago 69 kV TL, SP-SC, 1-795 MCM ACSR/AS, 60 km. (1 x 86 MW)	• Agusan del Sur • Surigao del Sur	• 5,596M • Mar 2027
• To allow the switching of loads during line outages and to solve the power quality and reliability problems in the area • To address the growing demand in Surigao del Sur as well as to provide a more stable and reliable supply to the area including the island of Siargao					
Polanco – Oroquieta 138 kV Transmission Line Project (Initially energized at 69 kV)	• Load Growth • Awaiting ERC approval	• Polanco 138 kV SS: 4-10 MVAR Shunt Capacitors 4-138 kV PCB • Oroquieta 69 kV SWS (New) 2-7.5 MVAR Shunt Capacitors 8 -69 kV PCB • Aurora 69 kV SS: 2-69 kV PCB • Bañadero 69 kV SS: 2-7.5 MVAR Shunt Capacitor 2-69 kV PCB • Villaflor 69 kV SS: 2-7.5 MVAR	• Polanco – Oroquieta 138 kV Line (New), ST-DC, 1-795 MCM ACSR, 48 km (2 x 172 MW) • Oroquieta – Villaflor 69 kV Line (New), ST-DC, 1-795 MCM ACSR, 1 km (2 x 172 MW) • Aurora–Villaflor 69 kV Line (Upgrading), SP-SC, 1-795 MCM ACSR, 84 km (1 x 86 MW)	• Misamis Occidental	• 8,742M • Feb 2028

TRANSMISSION LINE

Project Name and Justification	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
• To provide an alternate source of power to Misamis Occidental area through the new 138 kV designed transmission line from Polanco SS to Oroquieta SWS • To upgrade the existing 84 km 69 kV TL from Aurora SS to MOELCI I's Villaflor SS • To cater to the entry of BESS Project in Aurora SS					

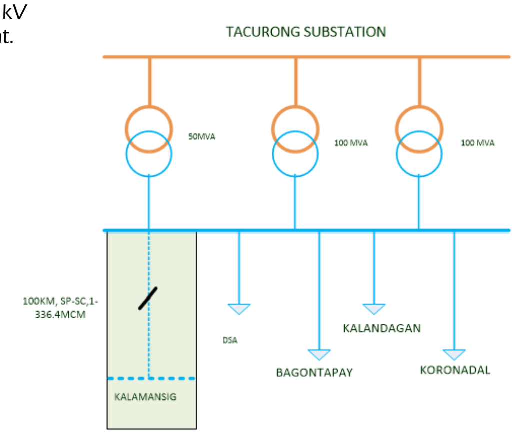


Project Name and Justification	Project Driver and Status	Substation	Transmission Line	Location	Project Cost ETC*
Maco–Mati 138 kV Transmission Line Project CEPNS • To address the growing demand in Davao Oriental area • To address the anticipated low voltage in the area • To provide the continuous and reliable power delivery during normal and N-1 conditions	• Load Growth • Awaiting ERC approval	• Maco 138 kV SS: 4-138 kV PCB and associated equipment • Mati 138 kV SS: 1x50 MVA 138/69 kV Power Transformer 6-138 kV PCB and associated equipment 5-69 kV PCB and associated equipment.	• Maco–Mati 138 kV Line, ST-DC, 1-795 MCM ACSR, 72.3 km (2 x 172 MW)	• Davao Del Norte • Davao Oriental	• 7,684M • Dec 2028



69 kV PROJECTS

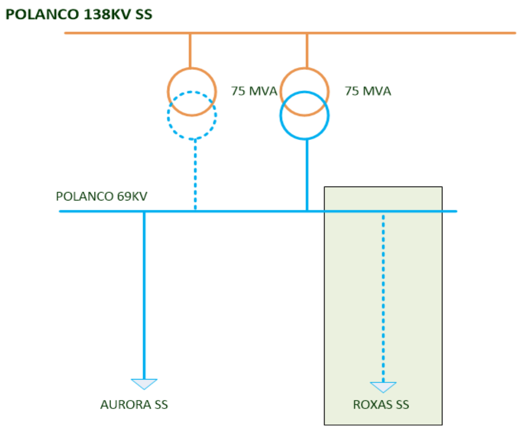
Project Name and Justification	Project Driver and Status	Substation	Transmission Line	Location	Project Cost ETC*
Tacurong–Kalamansig 69 kV Transmission Line Project CEPNS • To allow the towns of Lebak, Kalamansig, Bagumbayan, and Senator Ninoy Aquino in the province of Sultan Kudarat to enjoy cheaper and reliable electricity from the grid • To end the dependency of consumers from the power generated by diesel power plant of SPUG.	• Load Growth • ERC-approved	• Tacurong 138 kV SS: 1-69 kV PCB and associated equipment. • Kalamansig 69 kV SwS: 1x7.5 MVAR 69 kV Capacitor, 3-69 kV PCB and associated equipment.	• Tacurong-Kalamansig 69 kV TL, ST/SP-SC, 1-336.4 MCM ACSR, 100 km. (1 x 57 MW)	• Sultan Kudarat	• 2,349M • Jun 2025



TRANSMISSION LINE

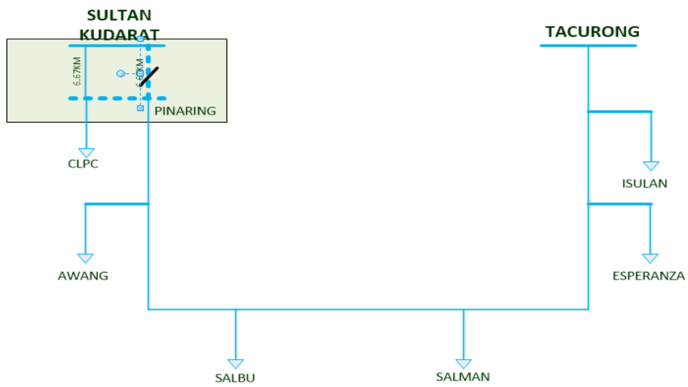
Project Name and Justification	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
Polanco–Roxas 69 kV Transmission Line	• Load Growth • System Reliability and Security • For filing (PA)	• Polanco 138 kV SS: 1-138 kV PCB and associated equipment.	• Polanco–ZANECO Polanco 69 kV TL (Upgrading), SP-SC, 1-795 MCM ACSR, 10.21 km. (1 x 86 MW) • Polanco–Magangon 69 kV TL (Upgrading), SP-SC, 1-795 MCM ACSR, 4.0 km. (1x86 MW) • Polanco–ZANECO Polanco 69 kV TL (New), SP-SC, 1-795 MCM ACSR, 6.21 km. (1x86 MW)	• Zamboanga del Norte	• Dec 2026

- To construct new transmission line from Polanco Substation to effectively separate the line serving Zamboanga del Norte with N-1 contingency
- To upgrade the existing 10.21 km Polanco–ZANECO Polanco 69 kV line segment of Polanco–Roxas 69 kV Line to a 1-795 MCM ACSR



Project Name and Justification	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
Sultan Kudarat–Pinaring 69 kV Transmission Line Upgrading	• Load Growth, System Reliability and Security • Awaiting ERC approval	• Sultan Kudarat 69 kV SS: 2-69 kV PCB and associated equipment • Pinaring 69 kV SWS: 6-69 kV PCB and associated equipment	• Sultan Kudarat–Pinaring 69 kV TL, SP-SC (Upgrading), 1-795 MCM ACSR, 6.67 km (1 x 86 MW) • Sultan Kudarat–Pinaring 69 kV TL, SP-SC (New), 1-795 MCM ACSR, 6.67 km (1 x 86 MW)	• Maguindanao	• 2,249M Jun 2028

- To construct new transmission line from Sultan Kudarat SS to Cotabato City that will effectively serve customers of Cotabato Light even during N-1 contingency
- To upgrade the existing 6.67 km Sultan Kudarat–Pinaring 69 kV line segment of Sultan Kudarat-DSA-Tacurong 69 kV Line to 1-795 MCM ACS



SUBSTATION

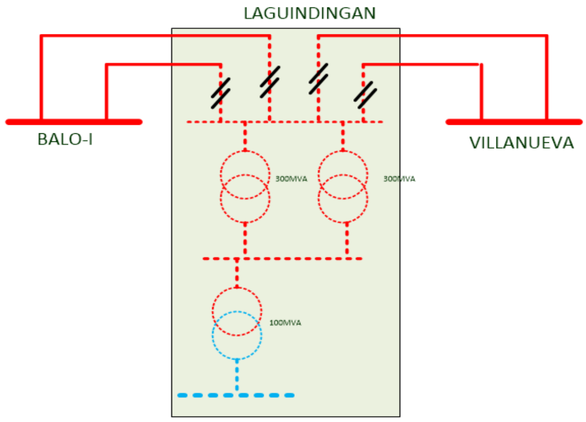
Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
230 kV PROJECTS					
Mindanao Substation Upgrading 2 Project (MSU2P) • To install additional substation capacity to address the growing demand in various substations in the Mindanao grid	• System Reliability and Security	• Jasaan SS: 1-100 MVA, 138/69 kV Power Transformer, 2-138 kV PCB, 3-69 kV PCB and associated equipment. • Kibawe SS: 1-50 MVA, 138/69 kV Power Transformer, 5-138 kV PCB, 2-69 kV PCB and associated equipment. • Butuan SS: 1-100 MVA, 138/69 kV Power Transformer, 1-138 kV PCB, 1-69 kV PCB and associated equipment.		• Lanao Del Norte • Bukidnon • Agusan Del Norte • Misamis Oriental • Davao Del Sur • Sultan Kudarat	• 7,264.54M • Jul 2028

SUBSTATION

Project Name and Description	Project Driver and Status	Project Components		Location	Project Cost (Million Pesos)
		Substation	Transmission Line		ETC*
• To install PCB for the connection of BESS projects in Jasaan, Maramag and Toril Substations and for the entry of Power Plant projects such as South Pulangi 255 MW HEPP at Kibawe SS, 3.6 MW Mt. Apo Geothermal Power Plant at Kidapawan SS and 28 MW Sangali Diesel Power Plant at Zamboanga SS..		• Davao SS: 2-150 MVA, 138/69 kV Power Transformer, 3-138 kV PCB, 7-69 kV PCB and associated equipment. • Toril SS: 2-100 MVA, 138/69 kV Power Transformer, 2-138 kV PCB, 7-69 kV PCB and associated equipment. • Bunawan SS: 1-300 MVA 230/138 kV Power Transformer, 2-100 MVA, 138/69 kV Power Transformer, 3-230 kV PCB, 10-138 kV PCB, 5-69 kV PCB and associated equipment. • Kidapawan SS: 1-100 MVA, 138/69 kV Power Transformer, 1-69 kV PCB and associated equipment. • General Santos SS: 2-150 MVA, 138/69 kV Power Transformer, 4-138 kV PCB, 4-69 kV PCB and associated equipment. • Maramag Substation: 1-69 kV PCB and associated equipment. • Zamboanga Substation: 1-69 kV PCB and associated equipment. • Aurora Substation: 1-100 MVA 138/69 Power Transformer, 2-138 kV PCB, 5-69 kV PCB and associated equipment. • Balo-I S/S Approval 89.09% complete, 1-100MVA 138/69kV Transformer 1/1-100MVA , 3-138-KV PCB 3-138-KV, 6-69kV PCB		• Zamboanga Del Sur • Surigao Del Sur	
Mindanao Substation Expansion 3 Project (MSE3P) • To maintain the normal thermal capacity of the substation and secure their continuous operation even during N-1 conditions to comply with the criteria of the PGC	• Load Growth • Awaiting ERC Approval	• Placer 138 kV SS: 1x100 MVA 138/69 kV Power Transformer, 2-138 kV PCB, 2-69 kV PCB and associated equipment. • San Francisco 138 kV SS: 1x100 MVA 138/69 kV Power Transformer, 2-138 kV PCB, 1-69 kV PCB and associated equipment. • Matanao 138 kV SS: 1x100 MVA 138/69 kV Power Transformer, 2-138 kV PCB, 1-69 kV PCB and associated equipment. • Lala 230 kV SS: 1x50 MVA 230/138 kV Power Transformer, 2-230 kV PCB, 2-138 kV PCB and associated equipment. • Pitogo 138kV SS: 1-138kV PCB, 1-69kV PCB, 1-100MVA 138/69kV Transformer. • Lala S/S, 1x150 MVA, 230/138 kV Power Transformer and accessories, 2-230 kV PCB, 2-138 kV PCB and associated equipment.		• Zamboanga del Sur • Surigao del Norte • Agusan del • Sur • Davao del Sur	• 1,465M • Jun 2027
Mindanao Substation Rehabilitation Project (MSRP) • To replace the defective, deteriorated, obsolete, and low fault level PCB in various substations will	• Power Quality and System Reliability	• Balo-I SS: 13-138 kV PCB PCB and associated equipment. • Lugait SS: 5-138 kV PCB, 1-69 kV PCB and associated equipment. • Tagoloan SS: 4-138 kV PCB, 1-69 kV PCB and associated equipment. • Maramag (Pulangi 4) SS: 10-138 kV PCB, 3-69 kV PCB		• Lanao Del Norte • Misamis Oriental • Bukidnon • Agusan Del Norte • Davao Del Sur	• 3,047.13M • Dec 2024

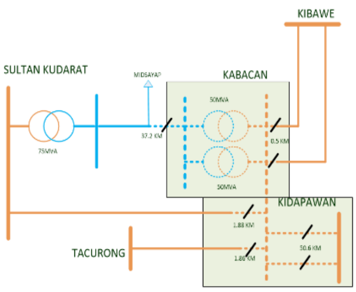
SUBSTATION

Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
provide system reliability and power quality to the grid. • To install two definite-purpose circuit breakers for the connection of capacitor bank in Sultan Kudarat SS		• Nasipit SS: 2-138 kV PCB and associated equipment. • Davao SS: 4-138 kV PCB, 2-69 kV PCB and associated equipment. • Bunawan SS: 5-138 kV PCB and associated equipment. • Sultan Kudarat SS: 6-69 kV PCB and associated equipment. • Maco SS: 1-7.5 MVAR, 69 kV, 2-69 kV PCB and associated equipment. • Nabunturan SS: 1x7.5 MVAR, 69 kV, 3-138 kV PCB, 4-69 kV PCB and associated equipment.		• Davao Del Norte • Davao de Oro • Agusan Del Sur	
Laguindingan 230 kV Substation Project • To extend the power supply requirement to the abrupt industrial and commercial developments in the area • To provide a stable supply and efficient delivery of bulk power	• Load Growth • Awaiting ERC Approval	• Laguindingan 230 kV SS: 2x300 MVA 230/138 kV and 1x100 MVA 138/69 kV Power Transformers, 10-230 kV PCB, 7-138 kV PCB, 3-69 kV PCB equipment and associated equipment. • Tagoloan 138 kV SS: 4-138 kV PCB and associated equipment.	• Laguindingan SS: Bus-in to Balo-i–Villanueva 230 kV TL, ST-DC, 2-795 MCM ACSR/AS, 6.3 km (2 x 573 MW)	• Misamis Oriental	• 2,606M • Feb 2026



138 kV PROJECTS

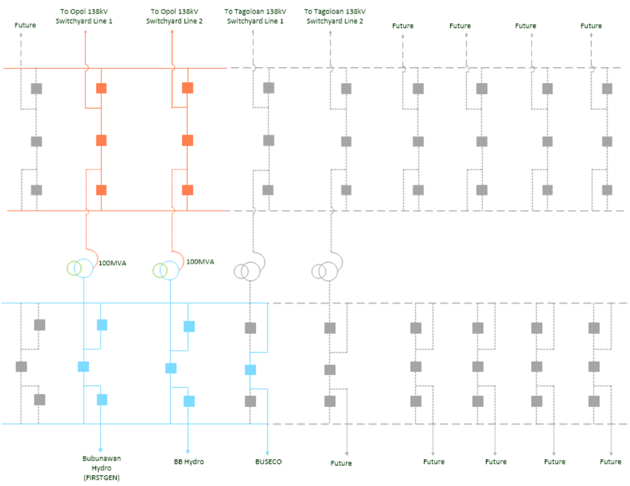
Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
Kabacan 138 kV Substation Project CEPNS Phase 1 – Substation Phase 2 – Transmission Line • To provide power supply security to the provinces of Sultan Kudarat, North Maguindanao, South Maguindanao, North Cotabato, and South Cotabato during contingency condition • To provide flexibility and additional reliability to the transmission system ensuring the continuity of power supply in the concerned areas	• System Reliability • Awaiting ERC Approval	Phase 1 • Kabacan 138 kV SS: 1x50 MVA 138/69 kV Power Transformer, 11-138 kV PCB, 3-69 kV PCB and associated equipment. • Kidapawan 138 kV SS: 2-138 kV PCB and associated equipment. • Gen. Santos 138 kV SS: 4-138 kV PCB and associated equipment.	Phase 2 • Kabacan – Kidapawan 138 kV TL, ST-DC, 1-795 MCM ACSR/AS, 50.6 km (2 x 172 MW) • Kabacan – Villarica 69 kV TL, SP-SC, 1-336.4 MCM ACSR/AS, 37.2 km (1 x 57 MW) • Kibawe 138 kV Line Extension, ST-DC, 1-795 MCM ACSR/AS, 0.5 km (2 x 172 MW) • Tacurong 138 kV Line Extension, ST-SC, 1-795 MCM ACSR/AS, 1.86 km (1 x 172 MW) • Sultan Kudarat 138 kV Line Extension, ST-SC, 1-795 MCM ACSR/AS, 1.88 km (1 x 172 MW)	• Cotabato	• 4,978M • Jan 2029



Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
Gango 138 kV Substation	• Load Growth • Generation entry • For filing (PA)	• Gango 138 kV SS: 2 x 100 MVA Power Transformer, 10-138 kV PCB, 8-69 kV PCB and associated equipment.	Balo-i–Tagoloan 138 kV Line Bus-in to Gango SS, ST-DC, 1-795 MCM ACSR, 2-0.5 km. (2 x 172 MW)	• Bukidnon • Misamis Oriental	• 2,539M • Dec 2027

SUBSTATION

Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
• To accommodate the incoming hydroelectric power plants in the area • To address the increasing demand of the Distribution Utilities by providing new drawdown substation in the area					



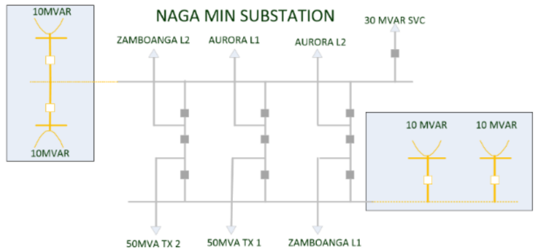
Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
Mindanao Substation Expansion 4 Project (MSE4P)	• Load Growth • Awaiting ERC Approval	• Pitogo SS: 1x100 MVA 138/69 kV Power Transformer, 1-138 kV PCB ,1-69 kV PCB and associated equipment. • Naga Min SS: 1x100 MVA 138/69 kV Power Transformer, 2-138 kV PCB, 2-69 kV PCB and associated equipment.		• Zamboanga Del Sur • Zamboanga Del Norte • Lanao Del Norte	• 2,968M • Apr 2026
• To install additional substation capacity to address the growing demand in various locations in the Mindanao grid • To comply with the N-1 criterion of the PGC		• Polanco SS: 1x100 MVA 138/69 kV Power Transformer, 2-138 kV PCB, 2-69 kV PCB and associated equipment. • Agus 6 SS: 1x100 MVA 138/69 kV Power Transformer, 2-138 kV PCB, 2-69 kV PCB and associated equipment. • Maramag SS: 1x100 MVA, 138/69 kV Power Transformer, 2-138 kV PCB, 2-69 kV PCB and associated equipment. • Maco SS: 1x100 MVA 138/69 kV Power Transformer,2-138 kV PCB, 2-69 kV PCB and associated equipment. • Culaman SS: 1x50 MVA, 230/69 kV Power Transformer, 2-230 kV PCB, 2-69 kV PCB and associated equipment. • Sultan Kudarat SS: 2-100 MVA, 138/69 kV Power Transformer, 4-138 kV PCB, 4-69 kV PCB and associated equipment. • Nasipit SS: 1-100 MVA 138/69 kV Power Transformer, 2-138 kV PCB, 2-69 kV PCB and associated equipment.		• Bukidnon Davao Del Norte • Davao Occidental • Maguindanao Del Norte Agusan del Norte	

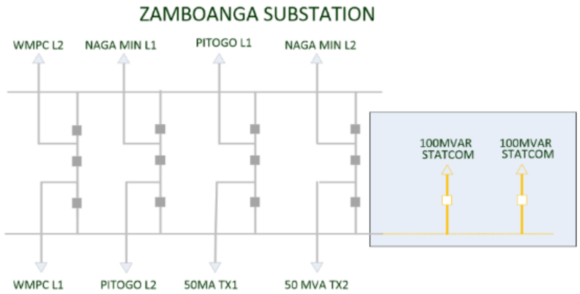
VOLTAGE IMPROVEMENTS

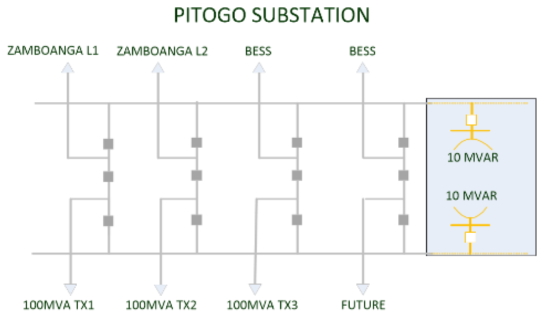
Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
138 kV PROJECTS					
Zamboanga Peninsula Voltage Improvement Project (ZPVIP)	• Power Quality • Awaiting ERC approval	• Zamboanga SS: 1x200 MVAR Statcom, 3-138 kV PCB, 1-69 kV PCB and associated equipment. • General Santos SS: 3x30 MVAR Capacitors, 3-138 kV PCB and associated equipment.	:	• Sultan Kudarat • South Cotabato	• 1,925M • Apr 2027

VOLTAGE IMPROVEMENTS

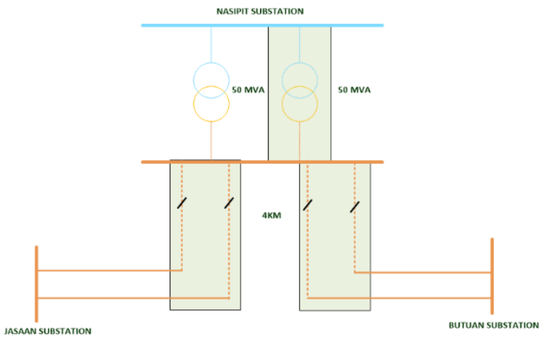
Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
• To ensure that the voltage level is within the prescribed limits of PGC despite the absence of a local baseload generator in Zamboanga Peninsula • To install voltage compensating devices in the area of Tacurong and Gen. Santos. These will alleviate the imminent voltage problem brought about by the growing demand in the area • To install power circuit breakers intended for the entry of Battery-Energy Storage System		• Tacurong SS: 2x30 MVAR Capacitors, 2-138 kV PCB and associated equipment. • Naga Min SS: 4x10 MVAR Capacitors, 4-138 kV PCB and associated equipment. • Pitogo SS: 2x10 MVAR Capacitors, 6-138 kV PCB and associated equipment.			







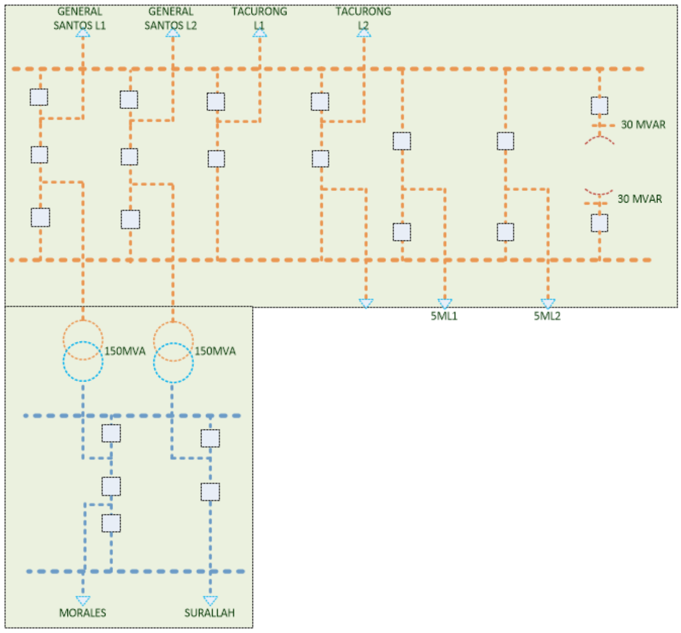
Project Name and Description	Project Driver and Status	Substation	Transmission Line	Location	Project Cost ETC*
Nasipit Substation Bus-in Project CEPNS • To maintain the normal voltage in the Northeastern Mindanao following an outage of the Nasipit-Butuan 138 kV Single Circuit line segment • To ensure the continuous supply of electricity to CARAGA Region even during N-1condition to comply with the PGC requirement	• Power Quality and System Reliability • Awaiting ERC Approval	• Nasipit SS: 1-100 MVA Power Transformer 8-138 kV PCB, 3-69 kV PCB and associated equipment.	• Jasaan – Butuan Bus-in Line, ST-DC, 1-795 MCM ACSR, 4 km (2 x 172 MW) • Swinging of TM2 Lines, ST-DC, 2-795 MCM ACSR, 0.5 km (2 x 344 MW)	• Agusan del Norte	• 816M • Oct 2026



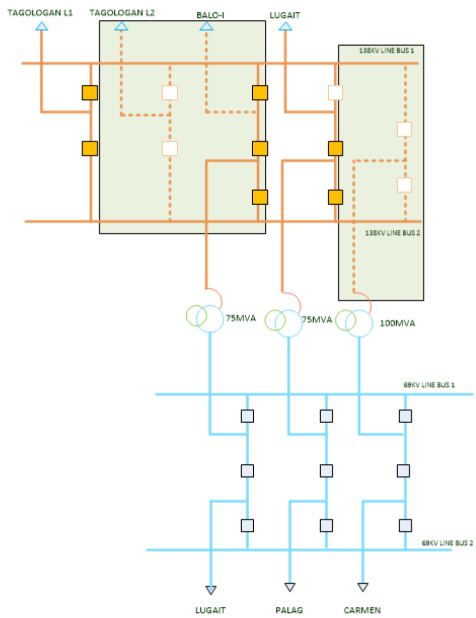
Project Name and Description	Project Driver and Status	Substation	Transmission Line	Location	Project Cost ETC*
Eastern Mindanao Voltage Improvement Project (EMVIP)	• Power Quality • Awaiting ERC Approval	• Butuan SS: 3x10 MVAR Shunt Capacitor, 3-138 kV PCB and associated equipment. • San Francisco SS: 3x10 MVAR Shunt Capacitor, 3-138 kV PCB and associated equipment. • Nabunturan SS: 3x10 MVAR Shunt Capacitor, 3-138 kV PCB and associated equipment. • Maco SS: 3x10 MVAR Shunt Capacitor, 3-138 kV PCB and associated equipment.		• Agusan del Norte • Agusan del Sur • Davao de Oro • Davao del Norte	• 868M • Jul 2028

VOLTAGE IMPROVEMENTS

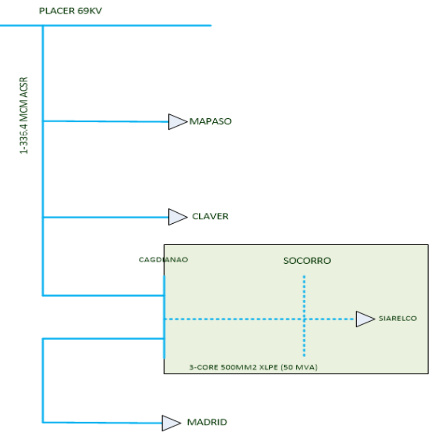
Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
Koronadal 138 kV Substation Project	• Load Growth • Awaiting ERC Approval	• Koronadal 138 kV SS, 2x150 MVA 138/69 Power Transformers, 14-138 kV PCB and associated equipment., 6-69 kV PCB and associated equipment.	• Koronadal SS Bus-in to Tacurong – General Santos 138 kV TL, ST-DC, 1-795 MCM ACSR, 0.5 km. (2 x 172 MW)	• South Cotabato	• 2,539M • Jun 2026
• To accommodate the power demand requirements of SOCOTECO 1, SOCOTECO 2 and Sagittarius Mines Inc. (SMI)					



Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
Opol Substation Bus-in Project	• System Reliability • Awaiting ERC Approval	• Opol 138 kV SS: 1x100 MVA Power Transformer, 5-138 kV PCB, 1-69 kV PCB and associated equipment.	• Opol SS Bus-in to Balo-I – Tagoloan 138 kV Line, ST-DC, 1-795 MCM ACSR/AS, 4 km (2 x 172 MW) • Opol – Carmen 69 kV Line Re-routing, SP-SC, 1-336.4 MCM ACSR/AS, 0.5 km (1 x 57 MW)	• Misamis Oriental	• 1,274M • Sep 2027
• To string the second circuit of the existing transmission towers towards Opol Substation. To install additional transformer in the said substation • To improve the system voltage within the franchise area of Misamis Oriental I Electric Cooperative (MORESCO I) and CEPALCO • To comply with the N-1 criterion of the PGC					



ISLAND INTERCONNECTION					
Project Name and Justification	Project Driver and Status	Project Components		Location	Project Cost (Million Pesos)
		Substation	Transmission Line		ETC*
69 kV PROJECTS					
Claver - Siargao 69 kV Interconnection Project • To provide a 69 kV interconnection facility that increases the power transfer towards Siargao Island • To improve the voltage within the franchise area of SIARELCO	▪ Island Interconnection ▪ Awaiting ERC approval	• Cagdianao 69 kV SWS (new), 5-69 kV PCB and associated equipment. • Socorro 69 kV SWS (new), 7-69 kV PCB and associated equipment, 4x2.5 MVAR Shunt Capacitor	• Cagdianao – Socorro 69 kV Submarine Cable, 3-Core 500 mm^2 XLPE, 22 km (1 x 50MW)	• Siargao • Surigao Del Sur	• 9.531M • Dec 2028



**Regulatory approval is one crucial requirement for meeting the projects' ETC (Estimated Time of Completion) in the TDP. For projects awaiting regulatory approval, it should be noted that the indicated ETC (month-year) assumes that ERC approval was issued in September 2024.*

7.2 Mindanao Projects for 2031-2040

From the year 2031 to 2040, most of the projects will concentrate on improving system reliability. During this period, the following 230 kV line segments of the grid will be implemented: the Villanueva – Kinamlutan 230 kV TL, Bunawan – Tagum 230 kV Transmission Line and the Eastern Mindanao 230 kV Transmission Line. These projects will complete the 230 kV loop in the eastern part of the Mindanao grid. The said developments in eastern Mindanao are expected to escalate within this period, requiring but will be initially energized at 138 kV voltage level.

Additionally, the Lala – Sta. Clara –Tumaga 230 kV Transmission Line Project (formerly Lala-Naga-Zamboanga 230 kV Transmission Line Project) will be constructed to provide a high-voltage power line emanating from Lanao del Norte towards Zamboanga City to further improve the reliability of power transmission towards the Zamboanga Peninsula. Several substation projects, such as the Tigbao SS, Tumaga SS, and Malaybalay SS, will also be implemented during this period to accommodate load demand requirements in their respective locations.

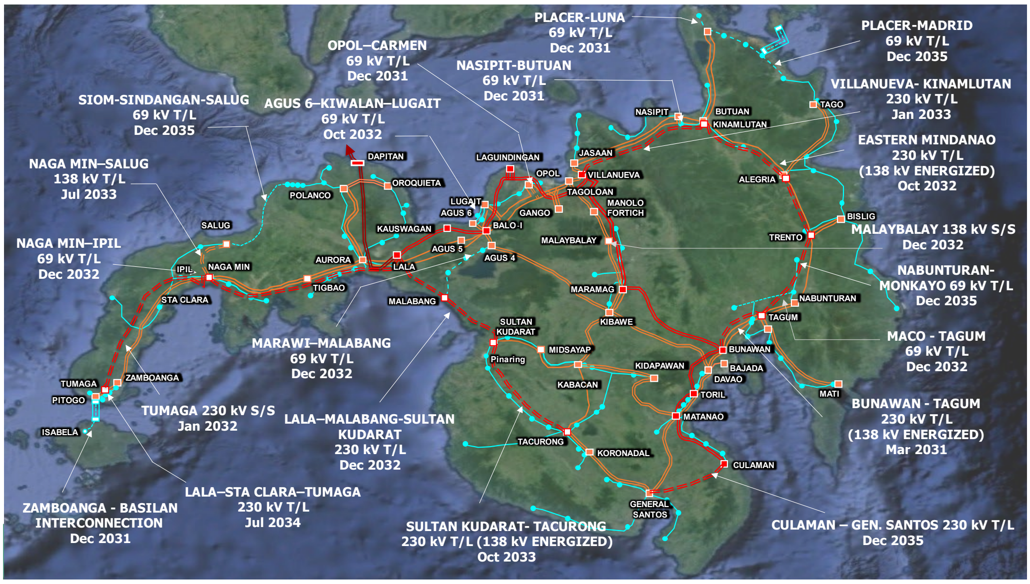


Figure 7.2 Mindanao transmission projects for the period 2031-2040

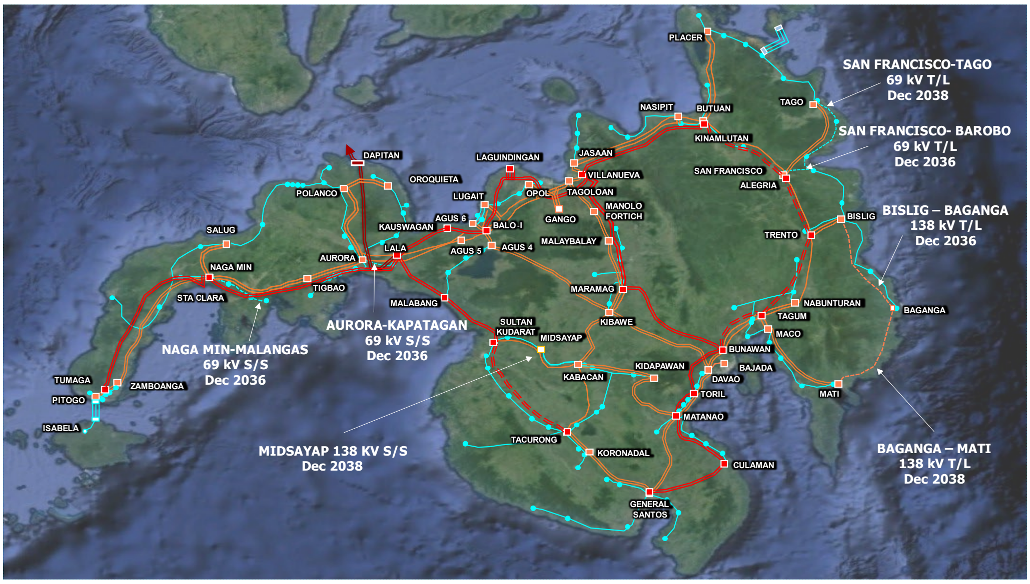


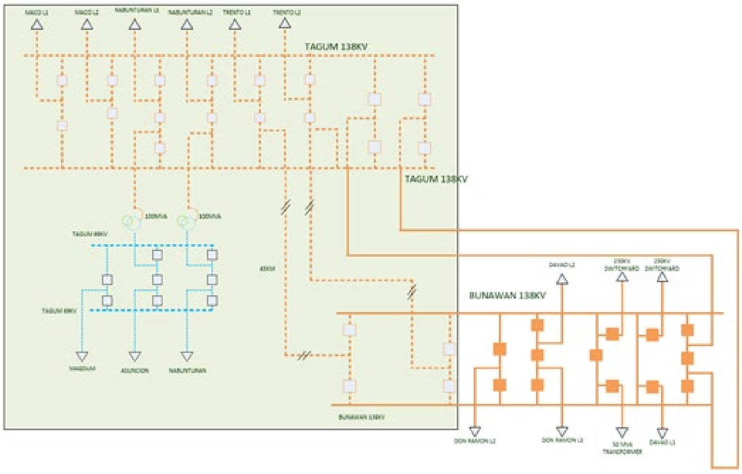
Figure 7.3 Mindanao transmission projects for the period 2031-2040

Table 7.2 List of Additional Mindanao Transmission Projects for the period 2031-2040

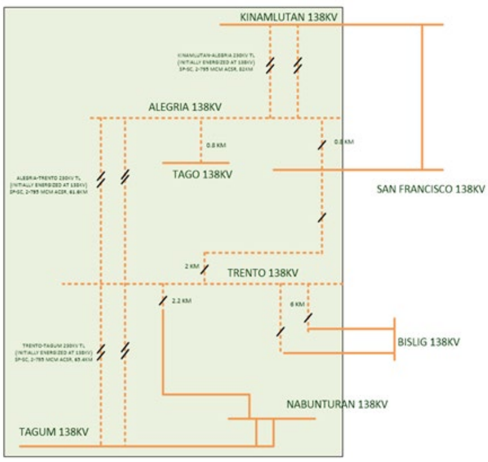
TRANSMISSION LINE					
Project Name and Justification	Project Driver and Status	Project Components		Location	Project Cost (Million Pesos)
		Substation	Transmission Line		ETC*
230 kV PROJECTS					
Bunawan–Tagum 230 kV Transmission Line Project (Initially energized at 138 kV) • To provide a new transmission corridor that mitigates the anticipated thermal overloading of the Bunawan–Nabunturan and Bunawan–Maco–Nabunturan 138	▪ Generation Entry ▪ Load Growth ▪ Awaiting ERC approval	• Tagum 230 kV SS: 2 x 100 MVA Power Transformer, 20-138 kV PCB, 8-69 kV PCB and associated equipment. • Bunawan 138 kV SS: 4-138 kV PCB and associated equipment.	• Bunawan – Tagum 230 kV TL, ST-DC, 2-795 MCM ACSR, 45 km (2 x 17 MW) • Tagum – Bunawan 138 kV Line Extension, ST-DC, 1-795 MCM ACSR, 1.5 km (2 x 172 MW) • B Tagum – Nabunturan 138 kV Line Extension, ST-DC, 1-795 MCM ACSR 1.5 km (2 x 172 MW • Tagum – Magdum 69 kV TL, SP-DC, 1-795 MCM ACSR, 3 km (2 x 86 MW)	• Davao del Sur • Davao Del Norte • Davao de Oro	• 10,624.87 M • Mar 2031

TRANSMISSION LINE

Project Name and Justification	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
kV TL during an outage of one of the circuits • To strengthen the transmission corridor from Davao City going to the province of Davao de Oro • To accommodate the Asuncion LES of Northern Davao Electric Cooperative (NORDECO) which is currently connected to Nabunturan 138 kV Substation • To reinforce the Maco–Tagum 69 kV Line during N-1 condition			• Tagum – Maco 138 kV Line Extension, ST-DC, 1-795 MCM ACSR, 0.5 km (2 x 172 MW) • Magdum – Asuncion 69 kV TL, SP-SC, 1-795 MCM ACSR, 17 km (1 x 86 MW) • Tagum Cut-in Line to Nabunturan – Asuncion 69 kV TL, SP-SC, 1-795 MCM ACSR, 0.5 km (1 x 86 MW)		



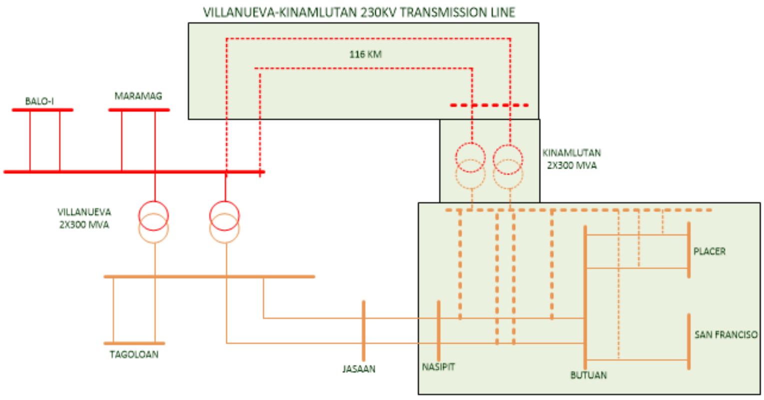
Project Name and Justification	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
Eastern Mindanao 230 kV Transmission Line Project (Initially energized at 138 kV) • To extend the 230 kV backbone from Agusan del Norte to Agusan del Sur and from Davao del Sur to Davao de Oro • To strengthen the transmission corridor in Eastern Mindanao that is currently in a single-circuit 138 kV configuration • To support the booming economy of Eastern Mindanao which can be attributed to the mining/quarrying industry and manufacturing establishments • To anticipate the Competitive RE Zone in Agusan del Sur	▪ Generation Entry ▪ System Reliability and Security ▪ Awaiting ERC approval	• Alegria 230 kV SS: 12-138 kV PCB and associated equipment. Trento 230 kV SS: 12-138 kV PCB and associated equipment.	• Kinamlutan – Alegria – Trento – Tagum 230 kV TL, ST-DC, 2-795 MCM ACSR, 209 km (2 x 573 MW) • Bislig – Trento 138 kV Line Extension, ST-DC, 1-795 MCM ACSR, 6 km. (2 x 172 MW) • Alegria – San Francisco 138 kV Line Extension, SP-SC, 1-795 MCM ACSR, 0.8 km (1 x 172 MW) • Tago – Alegria 138 kV Line Extension, SP-SC, 1-795 MCM ACSR, 0.8 km (1 x 172 MW) • San Fancisco – Bislig 138 kV Line Bus-in to Trento SS, ST-SC, 1-795 MCM ACSR, 2 km (1 x 172 MW) • Bislig – Nabunturan 138 kV Line Bus-in to Trento Substation, ST-SC, 1-795 MCM ASR, 2.2 km (1 x 172 MW)	• Agusan del Sur • Agusan del Norte • Davao del Sur • Davao de Oro	• 41,839M • Oct 2032



TRANSMISSION LINE

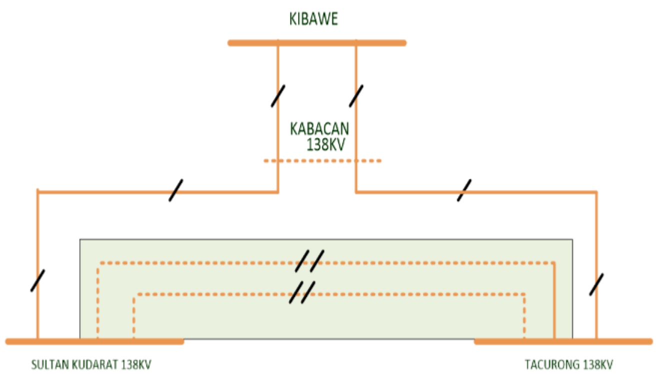
Project Name and Justification	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
Villanueva – Kinamlutan 230 kV Transmission Line Project	▪ System Reliability ▪ Load Growth ▪ Awaiting ERC Approval	• Kinamlutan 230 kV SS: 3x300 MVA Power Transformers, 10-230 kV PCB, 19-138 kV PCB and associated equipment. • Villanueva 230 kV SS: 4-230 kV PCB and associated equipment., 5-138 kV PCB and associated equipment., 2-100 ohms Series Reactor	• Villanueva – Kinamlutan 230 kV TL: ST-DC, 2-795 MCM ACSR, 152.5 km (2 x 573 MW) • Kinamlutan SS Bus-in to Nasipit – Butuan 138 kV Line 1: ST-DC, 1-795 MCM ACSR, 0.85 km (2 x 172 MW) • Villanueva – Jasaan 230 kV TL: ST-DC, 2-795 ACSR, 5 km (initial segment from the Villanueva–Kinamlutan 230 kV TL) • Kinamlutan SS Bus-in to Nasipit – Butuan 138 kV Line 1: ST-DC, 1-795 MCM ACSR, 0.85 km (2 x 172 MW) • Placer SS 138 kV Line Extension to Kinamlutan SS: ST-DC, 1-795 MCM ACSR, 0.7 km (2 x 172 MW) • San Francisco SS 138 kV Line Extension to Kinamlutan SS: ST-DC, 1-795 MCM ACSR, 0.7 km (2 x 172 MW)	• Misamis Oriental • Agusan Del Norte	• 23,512M • Jan 2033

- To increase the power transfer capacity to the existing transmission line
- To provide a reliable transmission corridor serving customers of eastern Mindanao.
- To accommodate the anticipated load demand due to the progressive development triggered by the mining industries in Caraga Region



Project Name and Justification	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
Sultan Kudarat – Tacurong 230 kV Transmission Line Project (Initially energized at 138 kV)	• System Reliability and Security • Awaiting ERC Approval	• Sultan Kudarat SS: 5-230 kV PCB, 3-138 kV PCB and associated equipment. • Tacurong SS: 5-230 kV PCB ,3-138 kV PCB and associated equipment.	• Sultan Kudarat – Tacurong 230 kV TL, ST-DC, 2-795 MCM ACSR, 101 km. (2 x 573 MW) • Sultan Kudarat 230 kV – Sultan Kudarat 138 kV Tie Line, SP-SC, 1-795 MCM ACSR, 1 km (1 x 287 MW)	• Maguindanao del Norte • Sultan Kudarat	• 11,587M • Oct 2033

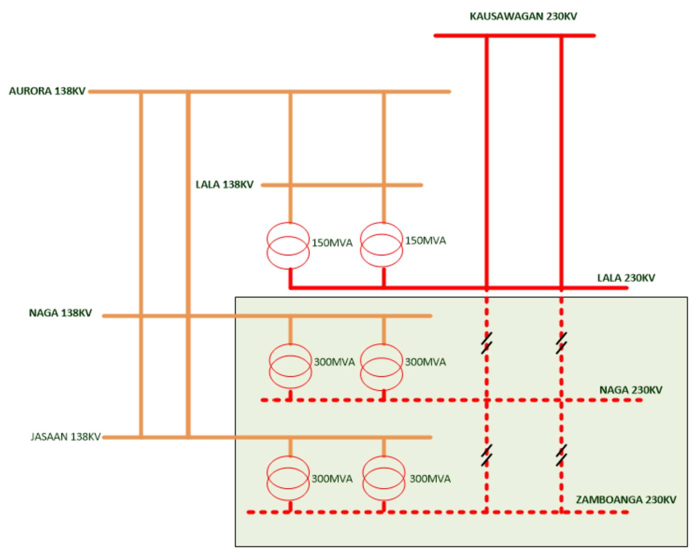
- To provide the immediate need for a reliable power delivery service for southwestern Mindanao area through a looped transmission network
- To reinforce the single-circuit Kabacan–Sultan Kudarat 138 kV line by creating a network that can accommodate the anticipated load demand in the Maguindanao Province
- To extends and loop the Mindanao 230 kV backbone in southwestern area.



Project Name and Justification	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
Lala – Sta. Clara – Tumaga 230 kV Transmission Line Project (formerly Lala-Naga-Zamboanga 230 kV Transmission Line Project)	▪ System Reliability and Security ▪ Awaiting ERC Approval	• Lala 230 kV SS: 4-230 kV PCB and associated equipment. • Sta Clara (Naga) 230 kV SS: 2x300 MVA Power Transformer, 6-230 kV PCB, 6-138 kV PCB and associated equipment. • Tumaga 230 kV SS: 2x300 MVA Power Transformer, 6-230 kV	• Lala – Sta Clara – Tumaga 230 kV TL: 2-795 MCM ACSR, STDC, 260 km (2 x 573 MW)	• Lanao del Norte • Zamboanga Sibugay • Zamboanga del Sur	• 18,011M • Jul 2034

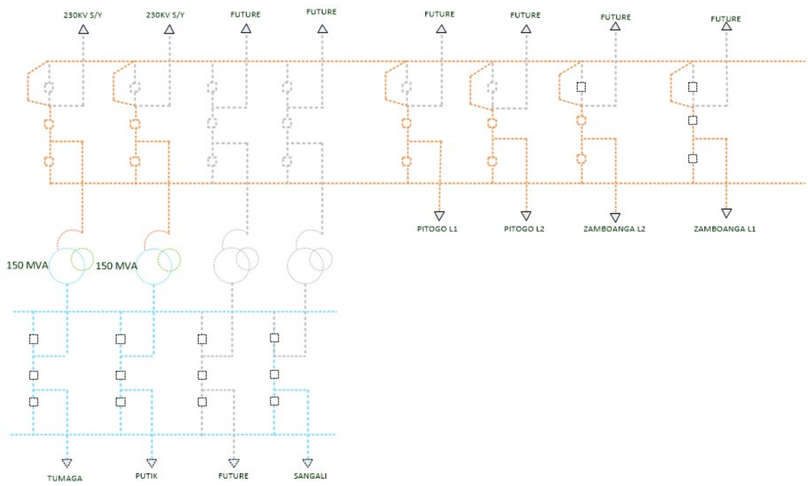
TRANSMISSION LINE

Project Name and Justification	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
• To offer operational stability by having another transmission corridor with a higher power transfer capacity towards the Zamboanga Peninsula which is needed to cater to the expected load growth. • To improve the overall power quality in Northwestern Mindanao Area • To provide more reliable high voltage transmission corridor in order to accommodate large scale power plants in Zamboanga Peninsula		PCB, 6-138 kV PCB and associated equipment.			



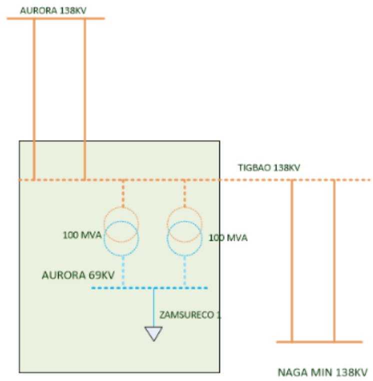
SUBSTATION

Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
230 kV PROJECTS					
Tumaga 230 kV Substation Project • To upgrade 69 kV TL from the Tumaga 138 kV SS to Zamboanga City Electric Cooperative, Inc. (ZAMCELCO's) Tumaga and Putik LES • To accommodate the growing demand of Zamboanga City attributed to the industrial facilities such as canning factories, shipyards, ports, warehouses, manufacturing plants, and airports • To address the imminent thermal overloading of the Zamboanga–Tumaga – Pitogo 69 kV network in Zamboanga City by upgrading the Tumaga – Pitogo 69 kV TL • To complement the implementation of the Lala – Sta Clara – Tumaga 230 kV TL that offers operation stability by having another transmission corridor with a higher power transfer capacity	• System Reliability and Security • Awaiting ERC Approval	• Tumaga 230 kV SS: 2x150 MVA Power Transformer, 12-138 kV PCB, 8-69 kV PCB and associated equipment.	• Tumaga Bus-in Line to Zamboanga 138 kV, ST-DC, 1-795 MCM ACSR, 0.5 km (2 x 172 MW) • Tumaga Bus-in Line to Pitogo 138 kV, ST-DC, 1-795 MCM ACSR, 0.5 km (2 x 172 MW) • Tumaga – Putik/ Tumaga LES 69 kV, SP-DC, 1-410 mm2 TACSR, 5 km (2 x 146 MW) • Pitogo – Tumaga 69 kV Line, SP-SC, 1-410 mm2 TACSR, 13 km (1 x 146 MW) • Tumaga – Zamboanga Cut-in 69 kV Line, SP-DC, 1-795 MCM ACSR, 0.5 km (2 x 86 MW)	• Zamboanga del Sur	• 3,665M • Jan 2032

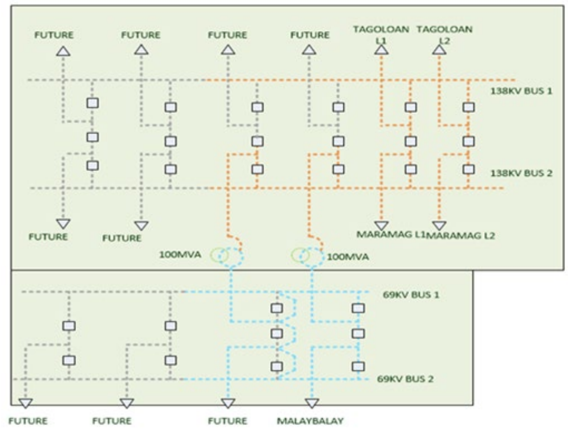


SUBSTATION

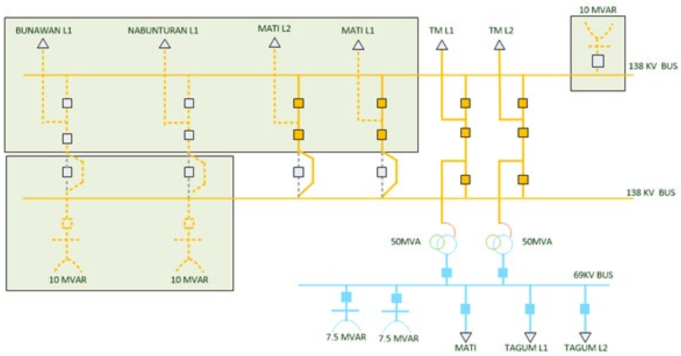
Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
230 kV PROJECTS					
Tigbao 138 kV Substation Project • To address the thermal overloading of the Aurora 138 kV SS by providing Zamboanga del Sur Electric I Cooperative (ZAMSURECO I) another connection facility from the grid • To accommodate the increasing demand in the area which will inherently overload the existing Aurora 138 kV SS during N-1 condition. However, development inside the said SS is infeasible due to space restrictions.	• Load Growth • Awaiting ERC Approval	• Tigbao 138 kV SS: 2 x 100 MVA Power Transformer, 10-138 kV PCB, 6-69 kV PCB and associated equipment.	• Aurora – Naga Min 138 kV Line Bus-in to Tigbao SS, ST-DC, 1-795 MCM ACSR, 2-1.7 km. (2 x 172 MW)	• Zamboanga del Sur	• 2,164M • Sep 2032



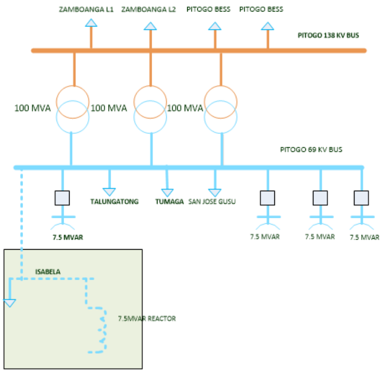
Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
Malaybalay 138 kV Substation Project • To mitigate imminent thermal overloading of the local distribution utility's existing 69 kV line and the voltage issues it has been experiencing	• Load Growth • Awaiting ERC Approval	• Malaybalay 138 kV SS: 2x100 MVA Power Transformer, 10-138 kV PCB, 5-69 kV PCB and associated equipment.	• Malaybalay Bus-in Line to Manolo Fortich, 138 kV TL, ST-DC, 1-795 MCM ACSR, 0.5 km (2 x 172 MW) • Malaybalay Bus-in Line to Maramag, 138 kV TL, ST-DC, 1-795 MCM ACSR, 0.5 km (2 x 172 MW)	• Bukidnon	• 2,473M • Dec 2032



Project Name and Description	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
69 kV PROJECTS					
Maco – Tagum 69 kV Substation Project • To upgrade the existing 69 kV transmission line and to construct a new line that directly connects Tagum City to the nearest substation • To solve the imminent overloading of the existing line due to rapid increase in demand of Tagum City • To provide continuous supply of power and operational flexibility even during N-1 condition	• System Reliability and Security • Awaiting ERC approval	• Maco 138 kV SS: 2-69 kV PCB and associated equipment.	• Maco – Tagum 69 kV TL (New), SP-SC, 1-795 MCM ACSR/AS, 7.7 km (1 x 86 MW) • Maco – Tagum 69 kV TL (Upgrading), SP-SC, 1-795 MCM ACSR/AS, 31.3 km (1 x 86 MW)	• Davao del Norte	• 2,088M • Dec 2032



Project Name and Justification	Project Driver and Status	Project Components: Substation	Project Components: Transmission Line	Location	Project Cost (Million Pesos) ETC*
ISLAND INTERCONNECTION					
69 kV PROJECTS					
Zamboanga – Basilan 69kV Interconnection Project • To connect the island of Basilan to the Mindanao Grid cheaper source of electricity • To give the province a reliable and efficient power service	▪ Island Interconnection ▪ Awaiting ERC approval	• Pitogo 69 kV SS: 1-69 kV PCB and associated equipment. • Isabela 69 kV SWS, 4-69 kV PCB and associated equipment., 1x7.5 MVAR Shunt Reactor	• Pitogo SS – Pitogo CTS, SP-SC, 336.4 MCM ACSR, 2 km (1 x 57 MW) • Pitogo CTS – Pangasang CTS, 3-Core 500 mm2 XLPE, 27 km (1 x 50 MW) • Pangasang CTS – Isabela Switching Station, SP-SC, 336.4 MCM ACSR, 9.5 km (1 x 57 MW)	• Zamboanga • Basilan Island	• 6,672M • Dec 2031



**Regulatory approval is one crucial requirement for meeting the projects' ETC (Estimated Time of Completion) in the TDP. For projects awaiting regulatory approval, it should be noted that the indicated ETC (month-year) assumes that ERC approval was issued in September 2024.*

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 transmitted power towards southwestern Mindanao. Likewise, the various 69 kV transmission line projects such as the Siom – Sindangan – Salug 69 kV line in Zamboanga Del Norte and the upgrading of the Placer – Madrid 69 kV line in the CARAGA Region provide flexibility in supplying power to customers in that part of Mindanao. Two new substation facilities, namely the Salug and Midsayap Substations, are to be constructed for the growing demand in the provinces of Zamboanga del Norte and Cotabato, respectively.

In the long term, the installation of transformers in the Matanao 230 kV facility ensures adequate substation capacity and improves the voltage profile for customers in Davao del Sur. Finally, the implementation of the Zamboanga – Basilan and Davao-Samal Interconnection projects significantly boosts the supply reliability supporting the load requirements of Basilan and Samal islands.

Table 7.3: List of Additional Proposed Projects in Mindanao for the period 2031-2040

Project Name	Description	Location
TRANSMISSION LINE		
230 kV PROJECTS		
Lala – Malabang – Sultan Kudarat 230 kV Transmission Line Project (Initially energized at 138 KV)	• To provide a new transmission corridor that will complete the 230 kV loop in the western part of Maguindanao Island. • To ensure system reliability and operational flexibility in the province of Lanao del Sur and Maguindanao.	Lanao del Norte, Lanao del Sur, Maguindanao
Culaman – General Santos 230 kV Transmission Line Project	• To provide a 230 kV transmission corridor towards General Santos City, South Cotabato. General Santos City is one of the major load centers in Mindanao and its demand will exceed the MW capacity of the embedded coal plants and the power flowing through Matanao – General Santos 138 kV TL.	Davao Occidental, South Cotabato
138 kV PROJECTS		
Naga Min – Salug 138 kV Transmission Line Project	• To provide a high voltage transmission corridor towards the Municipality of Salug, Zamboanga del Norte for a more reliable and efficient energy supply	Zamboanga Sibugay, Zamboanga del Norte

Project Name	Description	Location
Bislig – Baganga 138 kV Transmission Line Project	• To provide a high voltage transmission corridor towards the Municipality of Baganga, Davao Oriental for a more reliable and efficient energy supply.	Surigao del Sur, Davao Oriental
Baganga – Mati 138 kV Transmission Line Project	• To loop the 138 kV backbone from the municipality of Baganga to the city of Mati, Davao, Oriental. • To provide a stable and reliable power supply of loads in Davao Oriental	Davao Oriental
69 kV PROJECTS		
Placer – Luna 69 kV Transmission Line Project	• To relieve the overloading of the existing TL; to prevent load dropping and power interruptions during peak loading.	Surigao del Norte
Opol – Carmen 69 kV Transmission Line Project	• To relieve the overloading of the existing TL; to prevent load dropping and power interruptions during peak loading.	Misamis Oriental
Davao – Toril 69 kV Transmission Line Project	• To relieve the overloading of the existing TL; to prevent load dropping and power interruptions during peak loading.	Davao del Sur
Maco – Mati 69 kV Transmission Line Project	• To relieve the overloading of the existing TL; to prevent load dropping and power interruptions during peak loading.	Davao de Oro, Davao Oriental
Agus 6 – Kiwalan – Lugait 69 kV Transmission Line Project	• The existing Agus 6 – Kiwalan – Lugait 69 kV TL, serving a rapidly increasing demand, reaching its full thermal capacity. • To prevent imminent overloading which might entail load curtailment. Also, the additional load due to the possible outage of Agus6 – Mapalad – Lugait 69 kV TL cannot be catered by Agus 6 – Kiwalan – Lugait due to capacity constraints.	Lanao del Norte, Misamis Oriental
Naga Min – Ipil 69 kV Transmission Line Project	• To relieve the overloading of the existing TL; to prevent load dropping and power interruptions during peak loading.	Zamboanga Sibugay
Marawi – Malabang 69 kV Transmission Line Project	• To relieve the overloading of the existing TL; to prevent load dropping and power interruptions during peak loading.	Lanao del Sur
Nabunturan – Monkayo 69 kV Transmission Line Project	• To relieve the overloading of the existing TL; to prevent load dropping and power interruptions during peak loading.	Davao de Oro
Placer – Madrid 69 kV Transmission Line Project	• To relieve the overloading of the existing TL; to prevent load dropping and power interruptions during peak loading.	Surigao del Norte
SIOM – Sindangan – Salug 69 kV Transmission Line Project	• To loop the 69 kV lines serving the municipalities of Zamboanga del Norte for operational flexibility and improved reliability.	Zamboanga del Norte
San Francisco – Barobo 69 kV Transmission Line 2 Project	• To relieve the overloading of the existing TL; to prevent load dropping and power interruptions during peak loading.	Agusan del Sur, Surigao del Sur
San Francisco – Tandag 69 kV Transmission Line Project	• To relieve the overloading of the existing TL; to prevent load dropping and power interruptions during peak loading.	Surigao del Sur
Naga Min – Malangas 69 kV Transmission Line Project	• To relieve the overloading of the existing TL; to prevent load dropping and power interruptions during peak loading.	Zamboanga del Sur
Aurora – Kapatagan 69 kV Transmission Line Project	• To relieve the overloading of the existing TL; to prevent load dropping and power interruptions during peak loading.	Zamboanga del Sur, Lanao del Norte
Bislig – Barobo 69 kV Transmission Line Project	• To relieve the overloading of the existing TL; to prevent load dropping and power interruptions during peak loading.	Surigao del Sur
Tumaga – Pitogo 69 kV Transmission Line Project	• To relieve the overloading of the existing TL; to prevent load dropping and power interruptions during peak loading.	Zamboanga del Sur
SUBSTATION		
230 kV PROJECTS		
Matanao 230/138 kV Transformer Project	To interconnect the 230 kV and 138 kV switchyards of Matanao SS; to avoid possible overloading of the existing transmission corridors towards northern Davao Region.	Davao del Sur

Project Name	Description	Location
138 kV PROJECTS		
Mindanao SS Expansion 5 Project (MSEP5)	• To cater to the load growth and to provide N-1 to various SS in Mindanao. Without the project, there can be power interruptions during outage and failure of the existing transformers and PCB.	Various Substations in Mindanao
Mindanao Substation Expansion 6 Project (MSEP6)	• To cater to the load growth and provide N-1 to various SS in NGCP's south Mindanao. Without the project, load dropping and power interruptions can happen during outage and failure of existing transformers and PCB.	Various Substations in Mindanao
Mindanao Substation Expansion 7 Project (MSEP7)	• To cater to the load growth and provide N-1 to various SS. Without the project, load dropping and power interruptions can be experienced in the area during outage and failure of the existing transformers and PCB.	Various Substations in Mindanao
Midsayap 138 kV Substation Project	• To support the load growth in North Cotabato and to help in unloading the Sultan Kudarat SS.	North Cotabato

7.3 Mindanao Projects for 2041-2050

During this period, transmission lines initially energized at lower voltages will be upgraded to their designed voltage levels to accommodate load development on the island. With the completion of these projects, the long-awaited 230 kV transmission line looping will be realized, enabling seamless power transfer from bulk generation sites to load centers across the Mindanao Grid. Additionally, the completion of 138 kV transmission facilities within this timeframe will provide a reliable power supply to meet growing demand. Voltage improvement projects are also planned for installation during this period to maintain desirable voltage levels.

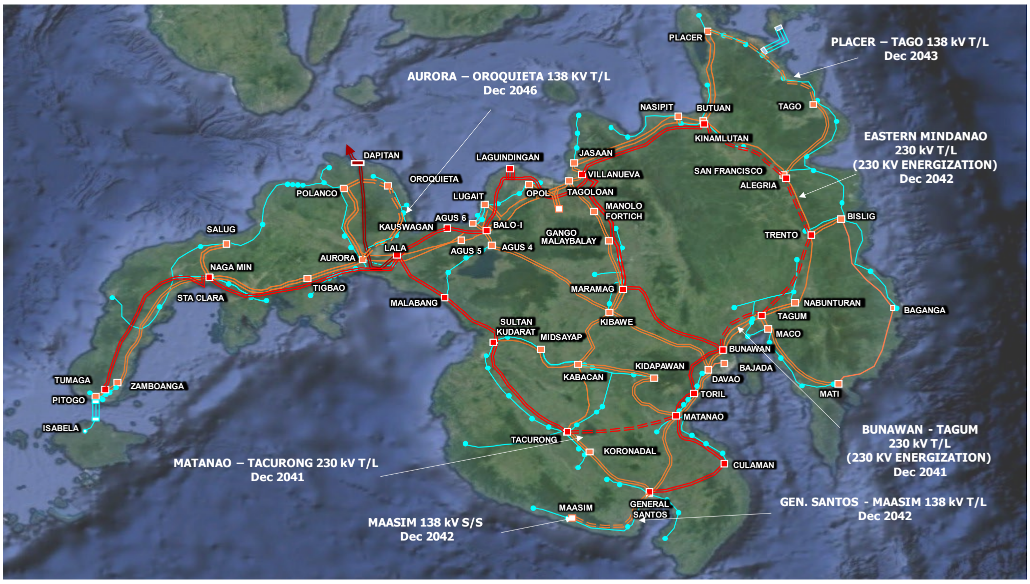


Figure 7.3 List of Mindanao transmission projects for the period 2041-2050

Table 7.4: List of Additional Proposed Projects in Mindanao for the period 2041-2050

Project Name	Description	Location
TRANSMISSION LINE		
230 kV PROJECTS		
Lala – Malabang – Sultan Kudarat 230 kV Transmission Line Project (230 KV Energization)	• To provide a new transmission corridor that will complete the 230 kV loop in the western part of Maguindanao Island. • To ensure system reliability and operational flexibility in the province of Lanao del Sur and Maguindanao.	Lanao del Norte, Lanao del Sur, Maguindanao
Sultan Kudarat – Tacurong 230 kV Transmission Line Project (230 KV Energization)	• To energize to a higher voltage the transmission line that was initially energized to a lower voltage level. • To accommodate the growing demand and will further complete the 230 kV loop in the Mindanao grid.	Sultan Kudarat, Maguindanao
Matanao – Tacurong 230 kV Transmission Line Project	• To directly connect the bulk generation of the Davao Region to the SS in southwestern Mindanao thru a new 230 kV corridor.	Sultan Kudarat, Davao del Sur

Project Name	Description	Location
Bunawan – Tagum 230 KV Transmission Line Project (230 KV Energization)	• To energize to a higher voltage the transmission line that was initially energized to a lower voltage level. • To accommodate the growing demand and will further complete the 230 kV loop in the Mindanao grid.	Davao del Sur, Daval del Norte
Eastern Mindanao 230 KV Transmission Line Project (230 KV Energization)	• To energize to a higher voltage the transmission line that was initially energized to a lower voltage level. • To accommodate the growing demand and will further complete the 230 kV loop in the Mindanao grid.	Surigao del Sur, Agusan del Sur, Davao de Oro.
138 kV PROJECTS		
Polanco – Oroquieta 138 kV Transmission Line Project (138 kV Energization)	• To energize to a higher voltage to accommodate the growing demand	Zamboanga del Norte, Misamis Occidental
Aurora – Oroquieta 138 kV Transmission Line Project	• To provide a high voltage transmission corridor towards the Cities of Ozamis and Oroquieta, Misamis Occidental. To complete the 138 kV loop in the province for a more reliable and efficient energy supply.	Zamboanga del Sur, Misamis Occidental
Placer – Tago 138 kV Transmission Line Project	• To provide a high voltage transmission corridor towards the Municipality of Tago, Surigao del Sur • To complete the 138 kV loop in the province for a more reliable and efficient energy supply.	Surigao del Norte, Suigao del Sur
Gen. Santos – Maasim 138 kV Transmission Line Project	• To provide a higher transmission corridor towards the province of Saranggani • To provide a stable and reliable power supply of loads in Saranggani	South Cotabato, Saranggani
SUBSTATION		
138 kV PROJECTS		
Mindanao SS Expansion 8 Project (MSEP8)	• To cater to the load growth and provide N-1 to various SS in Mindanao. Without the project, load dropping and power interruptions can happen during outage and failure of the existing transformers and PCB.	Various Substations in Mindanao
Mindanao Substation Expansion 9 Project (MSEP9)	• To cater the load growth and provide N-1 to various SS in NGCP's South Mindanao Region. Without the project, load dropping and power interruptions during outage and failure of existing transformers and PCB.	Various Substations in Mindanao
Maasim 138 kV Substation Project	• To support the load growth in South Cotabato and will help unload the General Santos SS. • To provide new connection points to the customers in the province of Saranggani.	South Cotabato

Chapter 8 ISLAND and OFF-GRID Interconnection

8.1 Island Off-Grid Interconnection

One of the challenges in improving the system reliability and reducing the reserve requirements without adding a new generation is the interconnection of two or more islands using an undersea cable. Major considerations in the implementation of such a project yield high reliability and long life of more than 30 years with minimal maintenance are the required investment. The Philippine archipelago with more than 7,100 islands, NGCP's concession is challenged and confronted to energize and interconnect several islands to the main grid.

In pursuit of its goal of building unified grid, NGCP continues to embark on major interconnection projects to realize this vision. Upon completion of its goal, this will prepare the entire Philippine grid to integrate to the proposed ASEAN Power Grid (APG), an era when the country can already share its power resources with the rest of Southeast Asian neighbors because of interconnected power transmission system.

These are some of the salient benefits of island/off-grid interconnections:

- Provide additional power supply like a generator having the ability to import power when required.
- More efficient dispatch to meet demands across different grids while optimizing the most efficient generator.
- Reduce power curtailment by means of exporting power when there is surplus from one island to another: and
- Renewable and indigenous energy sources, such as wind, hydro and geothermal potential sites suitable for energy generation can be optimized, while providing clean and sustainable sources of energy that may become attractive for development by generation proponents.

Detailed studies should be undertaken to quantify the overall benefits to the receiving island. In the long run, considering these salient and many intangible benefits, the island/off-grid interconnections will become more economically attractive.

8.1.1 Existing Island Interconnections

The Philippines has seven major undersea island interconnection systems: seven High Voltage Alternating Current (HVAC) and two High Voltage Direct Current (HVDC). These are the

- Leyte – Luzon ± 350 kV HVDC
- Mindanao – Visayas Interconnection ± 350 kV HVDC
- Leyte – Cebu 230 kV Interconnection
- Negros – Panay 138 kV and 230 kV Interconnection
- Cebu – Negros 138 kV Interconnection and 230 kV Interconnection
- Leyte – Bohol 138 kV Interconnection
- Cebu – Lapu-Lapu 138 kV HVAC Interconnection
- Panay – Boracay 69 kV AC Interconnection facilities
- Panay – Guimaras 138 kV Interconnection (69 kV Energized)

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 monopolar operation since 1998. Its maximum transmission capacity is 440 MW with provision for upgrade to 880 MW through the implementation of Luzon – Visayas HVDC Bipolar Operation Project. The Leyte – Cebu interconnection is a 33-km double circuit 230 kV submarine cable, with a transfer capacity of about 400 MW. The first and second circuits were energized in 1997 and 2005, respectively. The double circuit Cebu-Negros Interconnection enables power-sharing of the 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 85MW. In 2016, an additional 230kV-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.

For a detailed discussion on recently completed Cebu – Negros – Panay 230 kV Interconnection and Mindanao – Visayas Interconnection Projects in 2024, please refer to Chapter 1.

8.2 Transmission Backbone and Major Island Interconnection Projects

To ensure a transmission network that can support growth and competitive electricity prices, NGCP envisioned its goal of unified grid through the implementation of the Transmission Backbone and Major Island Interconnections. Guided by NGCP's vision to build the strongest power grid in Southeast Asia and contribute to the social and economic development of the country and to satisfy its stakeholders' needs. NGCP program a significant upgrade in its facilities to expand the transmission backbone to meet the forecasted demand, entry of new and various generating facilities that will allow market competition.

The creation of an interconnected Philippine Grid creates a more open, liberalized and competitive market, since Luzon, the Visayas and Mindanao Grids are already interconnected, the consumers in the grid can now participate freely in Wholesale Electricity Spot Market.

Figure 8.1 and Figure 8.2 respectively show the development of transmission backbones and island interconnections as well as the existing and future Philippine network topology of an interconnected grid. 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.

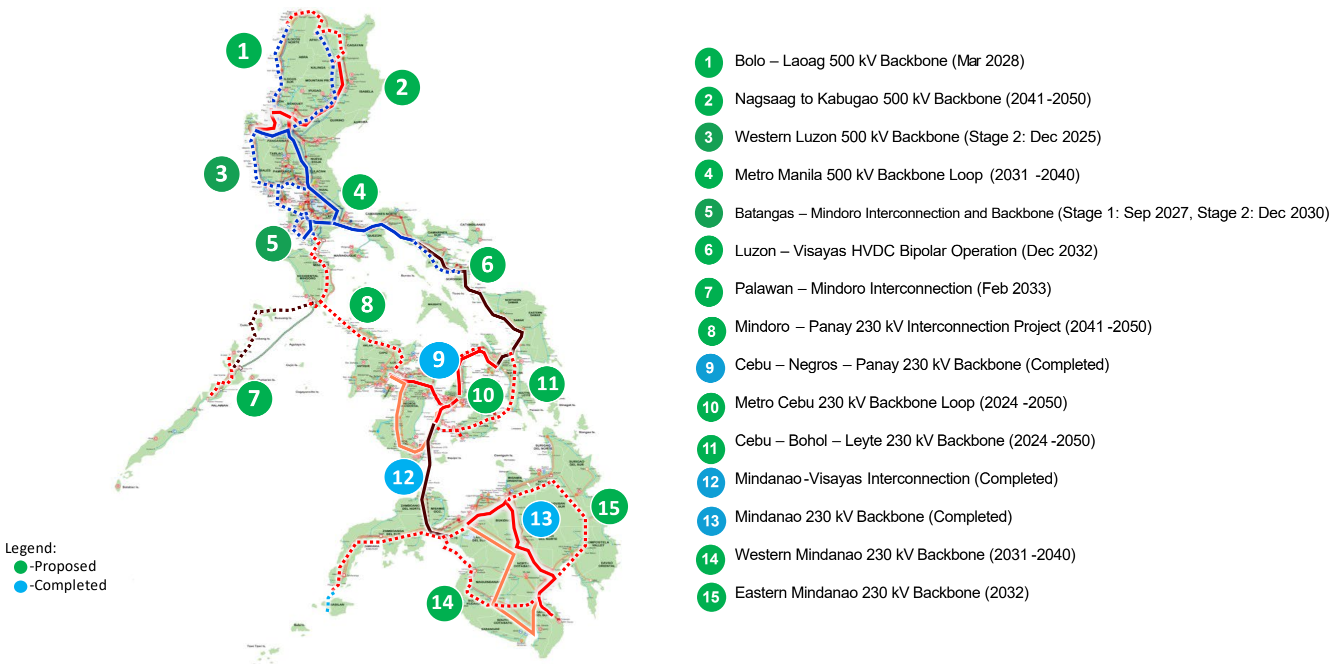
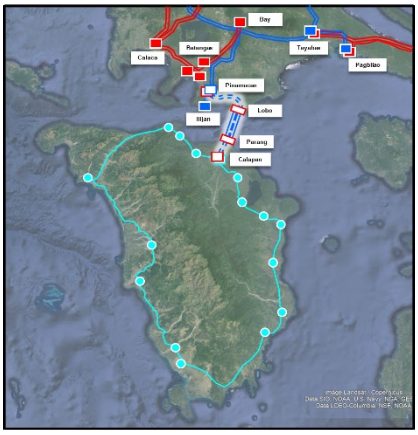
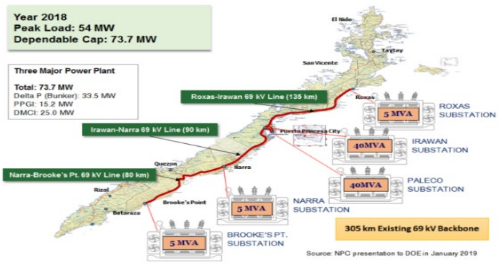
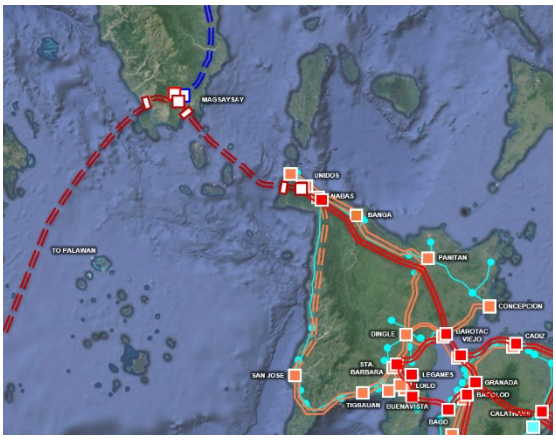


Figure 8.1: Transmission Outlook

Table 8.1 Transmission Backbone and Major Island Interconnections

Project Name	Project Description	ETC
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, Ilocos Sur, and Ilocos Norte. 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 TL during N-1 contingency event.	Mar 2028*

Project Name	Project Description	ETC
Nagsaag to Kabugao 500 kV Backbone	Composed of Nagsaag–Santiago and Santiago–Kabugao 500 kV TL that will traverse the provinces of Pangasinan, Isabela, Kalinga, and Apayao. This is to support the generation developments in Cagayan Valley and the Cordilleras. Furthermore, it also intends to augment and relieve the overloading of the Santiago–Bayombong and Bayombong–Ambuklao 230 kV TL.	2041-2050
Western Luzon 500 kV Backbone	Subdivided in two stages: (a) Stage 1 is the construction of Castillejos – Hermosa 500 kV TL (initially energized at 230 kV), which provides a transmission facility to connect the Renewable Energy plants [MFL1] to the Luzon Grid through Hermosa Substation; and (b) Stage 2 is the construction of a 174 km DC 500 kV line from Bolo 500 kV SS to Castillejos. It will also involve the implementation of the Castillejos 500 kV SS to accommodate bulk generation capacities. The Western Luzon 500 kV Backbone will traverse the provinces of Pangasinan and Zambales.	Stage 1: Completed Stage 2: Jun 2027*
Metro Manila 500 kV Backbone Loop	The development of Metro Manila 500 kV Backbone Loop involves the implementation of the Silang 500 kV SS, which will bus-in to the existing Dasmariñas – Tayabas 500 kV TL; the implementation of Taguig 500 kV SS, which will initially cut-in to the existing San Jose – Tayabas 500 kV TL; the construction of the Silang – Taguig 500 kV TL; and the development of the Baras 500 kV SS, which will bus-in to the existing San Jose – Taguig – Tayabas 500 kV TL. 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 TL Project.	2031-2040
Batangas – Mindoro Interconnection and Backbone	The Batangas – Mindoro Interconnection and Backbone Project – Stage 1 (BMIBP Stage 1) aims to link Mindoro Island to the Luzon Grid through a 28.5 km submarine cable and a total of 31.5 km overhead transmission Line. BMIBP Stage 1 will also involve the development of a 230/69 kV Substation in Calapan, Oriental Mindoro, with a total transformer capacity of 2x100 MVA that will connect to the existing 69 kV transmission network in Mindoro through a total of 8.5 km overhead transmission line. The submarine cable and the overhead transmission lines will be designed at 500 kV voltage level but will be initially energized at 230 kV in preparation for the Stage 2 project which aims to cater the full development of bulk renewable energy (Onshore and Offshore) projects on the island. In addition, The Batangas – Mindoro Interconnection and BackboneProject – Stage 2 (BMIBP Stage 2) aims to develop a more robust transmission network on Mindoro Island. The project involves the energization from 230 kV voltage level to 500 kV to enable higher transfer capacity of the Stage 1 Batangas – Mindoro link. This energization will involve the development of the Calapan 500 kV Substation with transformer capacity of 2x750 MVA. BMIP Stage 2 also will involve the development of the 133.1 km Calapan – Magsaysay 500 kV Transmission Line backbone and the Magsaysay 500/230/69 kV Substation in southern Occidental Mindoro with transformer capacity of 2x750 MVA. The Magsaysay 230/69 Substation with transformer capacity of 2x100 MVA will connect through a 20.9 km overhead transmission line to the existing 69 kV transmission network of Mindoro to provide further support. BMIBP Stage 2 aims to encourage the full development of bulk renewable energy projects on the island, increase the transfer capacity between Mindoro and Luzon Grid, and provide further support to the existing 69 kV transmission network of Mindoro. The Magsaysay Substation will also serve as a connection point for the future interconnection of Palawan and Panay islands to the Luzon Grid.  Figure 8.2: Batangas – Mindoro Interconnection and Backbone Project (Stage 1)  Figure 8.3: Batangas – Mindoro Interconnection and Backbone Project (Stage 2)	Stage 1: Sep 2027 Stage 2: Dec 2030
Luzon – Visayas HVDC Bipolar Operation	The project will provide an additional 440 MW transfer capacity between Luzon and Visayas. It involves the construction of Naga 500 kV SS with 2x1000 MVA, 500/230-13.8 kV Power Transformers as well as upgrading of the Naga and Ormoc Converter/Inverter Stations in order to provide an additional transfer capacity between Luzon and Visayas. Upgrading of the 230 kV network between Cebu and Leyte is a requirement in order to fully utilize the transfer capacity of the Luzon – Visayas HVDC System.	Dec 2032*
Palawan – Mindoro Interconnection Project (Stage 1)	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	Feb 2033*

Project Name	Project Description	ETC
	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. 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 Project (PMIP), and • Stage 2 will involve the actual implementation of the PMIP. The design and scheme of the PMIP will be dependent on the results of the study in the PMIP Stage 1. 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. The 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.  Figure 8.4: Palawan – Mindoro Interconnection Project  Figure 8.5: Palawan – Mindoro Hydrographic Survey	
Mindoro – Panay Interconnection Project	The Project creates a new interconnection between Luzon and Visayas Grids via Mindoro Island in the western region of the Philippines. It increases the power transfer capability of the system as this new transmission corridor accommodates the power generation in Luzon and Visayas especially power plants that are located within Competitive Renewable Energy Zones.  Figure 8.6: Mindoro-Panay Interconnection Project	2041-2050
Cebu – Negros – Panay 230 kV Backbone	The project involves the construction of a 230 kV transmission backbone between the Cebu, Negros and Panay Islands. It will 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: • Stage 1 involves the development of transmission corridor composed of submarine cable system and overhead TL from Barotac Viejo SS in Panay to Bacolod SS in Negros • Stage 2 involves the construction of 230 kV facilities in the existing Cebu 138 kV SS and harmonize its capacity with the 230 kV transmission backbone; and • Stage 3 involves the construction of 230 kV facilities from Barotac Viejo SS to Cebu SS.	Completed
Metro Cebu 230 kV Backbone Loop	The project 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	2024-2050

Project Name	Project Description	ETC
	customers. This long-term plan is the basis of the transmission projects in Metro Cebu spread within the 2040 planning horizon namely: • Cebu – Lapu-Lapu Transmission Project • Cebu – Negros–Panay 230 kV Backbone Project Stages 2 and 3 • Mindanao – Visayas Interconnection Project (MVIP) • Laray 230 kV Substation Project (Initially energized at 138 kV) • Lapu-Lapu 230 kV Substation Project • Laray – San Fernado 230 kV Energization Project • Laray – Cordova 230 kV Interconnection Project • Pusok – Cordova 230 kV Interconnection Project	
Cebu–Bohol–Leyte 230 kV Backbone	The project involves the construction of a 230 kV transmission backbone between the Cebu, Bohol and Leyte Islands. It increases 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: • Cebu – Bohol 230 kV Interconnection Project • Babatngon – Palo 230 kV TL Project (Initially Energized at 138 kV) • Ormoc – Babatngon 230 kV TL Project • Cebu – Leyte 230 kV Interconnection Lines 3 and 4 Project • Corella – Ubay 230 kV Transmission Line Project • Maasin – Sogod 230 kV TL Project • Palo – Sogod 230 kV TL Project • Bohol – Leyte 230 kV Interconnection Project	2024-2050
Negros – Guimaras – Panay 230 kV Backbone	This project will involve the laying of double circuit submarine cables from Negros to Guimaras and to Panay. This is to ensure to accommodate the upcoming generation under CREZ in the area of Negros, Panay and Guimaras. This will also provide reliability to the Negros–Panay interconnection. This long-term plan is the basis of the transmission projects in Metro Cebu spread within the 2040 planning horizon namely: • Cebu – Negros – Panay 230 kV Backbone Project Stage 1 and Stage 3 • Granada 230 kV Substation Project • Negros – Guimaras 230 kV Interconnection Project • Panay – Guimaras 230 kV Interconnection Project • Barotac Viejo – Sta. Barbara 230 kV Transmission Line Project • Calatrava – Granada 230 kV Transmission Line Project	2024-2050
Mindanao – Visayas Interconnection CEPNS	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.	Completed – 450 MW Expansion – 450 MW 2031-2035

The Mindanao – Visayas Interconnection Project was previously known as Visayas-Mindanao Interconnection Project (VMIP). The change to MVIP indicates the importance and priority given to Mindanao Grid which has long been isolated. Luzon and the Visayas Grid have already been interconnected since 1998 and with the electricity market in operation since 2006 and 2011, respectively. The name MVIP indicates further support to boost the development of the country's electricity market to include the Mindanao Grid.

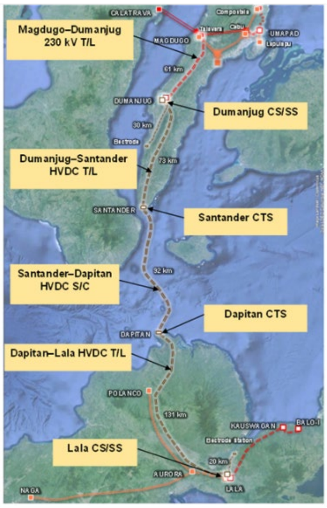


Figure 8.7 Connection Configuration of MVIP

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

- Sharing of system reserve
- Lesser investment in power generation in either the Visayas or Mindanao to maintain the one-day Loss of Load Probability (LOLP)
- Reduction of operating cost due to economic dispatch of generators

The intangible benefits in the implementation of MVIP:

- Attractiveness of MVIP to power generation investments due to the bigger market through an interconnected power network
- From a technical standpoint, MVIP will provide benefits to the system in terms of added supply security, improved system reliability and improvement in the quality of power supply
- Optimized utilization of indigenous energy sources, such as natural gas in Luzon, geothermal in the Visayas and hydro in Mindanao as well as, this will reduce the overall generation of pollution and dependency on the importation of fossils fuel, where its availability and price are sensitive to the price in the world market.

Project Name	Project Description	ETC
Mindanao 230 kV Transmission Backbone CEPNS	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.	Completed
Western Mindanao 230 kV Backbone	The project completes the envisioned 230 kV transmission extension and looping at the western side of the island. It provides an alternate transmission corridor to far-flung and radially connected areas for much reliable power supply.	2041-2050
Eastern Mindanao 230 kV Backbone	The Eastern Mindanao 230 kV Backbone loops 230 kV transmission corridor in the eastern side of Mindanao. It increases the power transfer capacity of the grid between CARAGA and Davao Region. In addition, its new transmission corridor serves as reinforcement to the existing Butuan – San Francisco – Bislig – Nabunturan 138 kV SC line.	Oct 2032*
North Luzon 230 kV Backbone Loop	The project aims to complete the 230 kV loop in the Northern part of Luzon, while also providing a new transmission corridor to accommodate the integration of renewable energy sources and other power plants within the region	Mar 2028*

**Regulatory approval is one crucial requirement for meeting the projects' ETC (Estimated Time of Completion) in the TDP. For projects awaiting regulatory approval, it should be noted that the indicated ETC (month-year) assumes that ERC approval was issued in September 2024.*

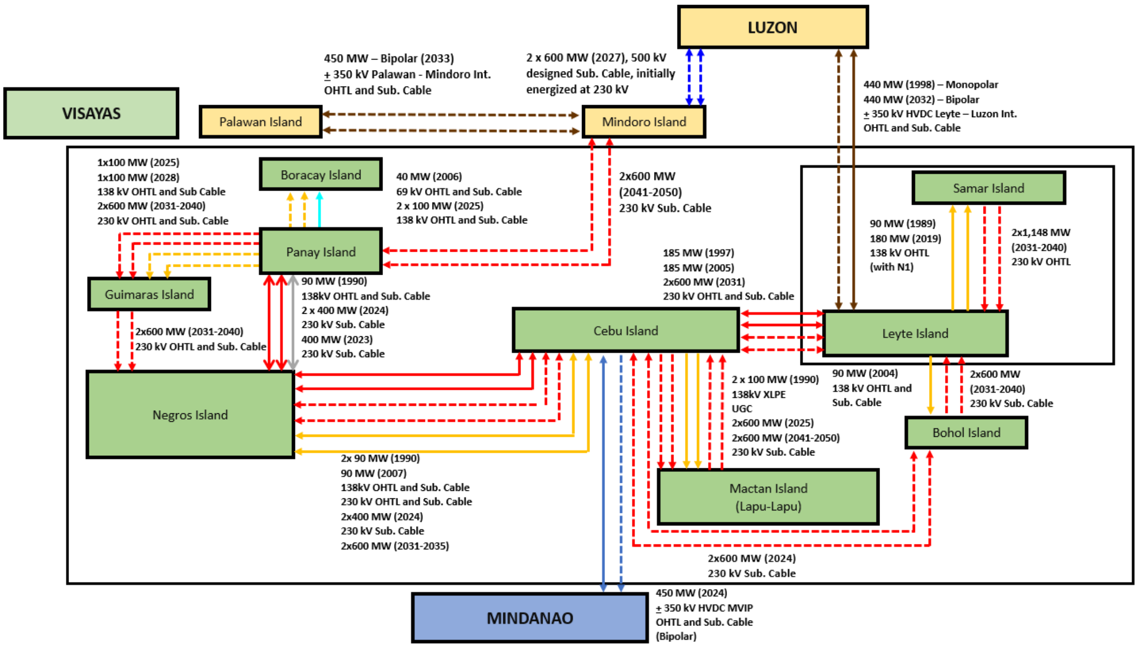


Figure 8.8: Existing and Future Philippine Network Topology

8.3 Small Island / Off-Grid Interconnection

As part of the country's power transmission 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" with the following objectives:

- Improve the reliability and adequacy of power supply
- Reduce power rates
- Lead to the graduation of UC-ME subsidy

NGCP through its endeavor will undertake the conduct and overall due diligence to shortlist island/off-grid areas to be interconnected to the grid and document a Techno-Economic Feasibility Study (Techno-Eco FS) for the shortlisted island/off-grid areas. Further, NGCP will submit an annual program for the interconnection of off-grid areas to the network that will be included in project prioritization and annual updating of the TDP in compliance to Rule 9 of the said DOE Circular.

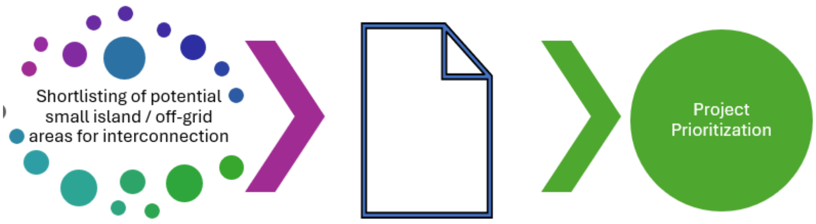
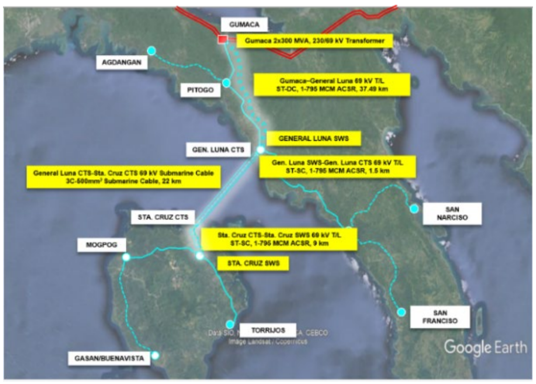


Figure 8.9: Small Island / Off-Grid Prioritization Process

Project Name	Status	Project Description	ETC
Quezon – Marinduque Interconnection Project (QMIP)	Awaiting ERC approval	• The proposed QMIP aims to address the expected long-term development in the island province of Marinduque. This project enables the province to have access to a more reliable and competitive generation sources in the Luzon Grid. In addition, the current energy mix in the province, which is mainly oil-based, is seen to improve due to the access of power supply from various generation sources in the Luzon Grid.  Figure 8.10: Quezon-Marinduque Interconnection	Dec 2030*
Camarines Sur – Catanduanes Interconnection Project (CCIP)	Awaiting ERC approval	• The CCIP aims to link the Catanduanes Island to the Luzon Grid and provide Catanduanes access to a more reliable and competitive generation sources. Presently, the island of  Figure 8.10: Camarines Sur – Catanduanes Interconnection Project Catanduanes is being served by the First Catanduanes Electric Cooperative, Inc. (FICELCO). On the other hand, the transmission system is being supervised by the NPC. The island's transmission system has a total existing line length of 47.0 circuit-kilometers and an existing SS capacity of 20 MVA.	Dec 2030*
Claver – Siargao 69kV Interconnection	Awaiting ERC approval	• Siargao Electric Cooperative (SIARELCO) is currently connected to the Mindanao Grid thru tap connection of their 20 MVA Cagdianao Substation to NGCP Placer – Madrid 69 kV line. Then, 34.5 kV energized submarine cables and overhead line link the island of Bucas Grande and Siargao. As tourism is booming in Siargao, the capacity of the existing power transformer in Cagdianao and 34.5 kV lines will not be sufficient to accommodate the increasing demand. This project aims to provide a 69 kV interconnection facility that increases the power transfer towards the islands and improve the voltage within the franchise area of SIARELCO.	Dec 2028*
Zamboanga – Basilan 69kV Interconnection	Awaiting ERC approval	• The power requirement of Basilan is being served by NPC-SPUG through missionary electrification. NPC-SPUG utilizes Basilan Diesel Power Plant and Power Barge 119. The Zamboanga – Basilan interconnection is	Dec 2031*

Project Name	Status	Project Description	ETC
		• envisioned to give the province a reliable and efficient power service. Also, this project counts out Basilan from the subsidy recipients of Universal Charge – Missionary Electrification.	

**Regulatory approval is one crucial requirement for meeting the projects' ETC (Estimated Time of Completion) in the TDP. For projects awaiting regulatory approval, it should be noted that the indicated ETC (month-year) assumes that ERC approval was issued in September 2024.*

8.4 Potential Small Island Interconnections

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. Some of these small islands were initially considered for further assessment. Shown in Table 8.2 below are the potential small island interconnections indicating the length of the required facilities. Further details for the potential small island interconnection and other small island and off-grid areas will be discussed on the succeeding TDP issuance:

Table 8.2 Potential Small Island Interconnections

Island	Interconnection Point	Length (km)		
		Submarine	Overhead	Total
LUZON				
Ticao	Abuyog	20	35	55
Masbate	San Jacinto	16	16	32
Tablas	San Jose	61	36	97
Lubang	Calaca	54	20	74
Busuanga	San Jose	84	52	136
VISAYAS				
Bantayan	Medellin	21	24	45
Siquijor	Bacong	20	24	44
Camotes	Isabel	18	8	26
Semirara	San Jose	33	0	33
MINDANAO				
Dinagat	Canlanipa	30	15	45
Camiguin	Esperanza	30	37	67
Siasi	Parang	43	32	75
Sulu	Taberlongan	100	34	134
Tawi-Tawi	Pagatpat	84	60	144

Chapter 9 Operations and Maintenance

NGCP's directive is to maintain, operate, expand, and advance the high voltage backbone transmission system and facilities throughout the Philippines. This chapter contains the Operations and Maintenance (O&M) Capital Expenditures (CAPEX) programs for the years 2024 to 2050 with the purpose of increasing the reliability of the grid and improving the transmission system and facilities throughout the country for reliable, adequate, secure, and stable service for all users of the nationwide electricity transmission system.

NGCP has an appraised total of around **173,925** operational assets. These assets vary from substation primary equipment, secondary devices to transmission line towers, poles and other structures. To evaluate the condition of these assets, proper asset management must be observed.

The 27-year operation and maintenance program cover the major categories of expenditures enumerated below:

- Installation, replacement, rehabilitation, and relocation of High Voltage Equipment
- Acquisition, installation and replacement of Protection and Secondary Devices
- Rehabilitation of Transmission Lines and Sub-Transmission Lines, which were not divested.
- Acquisition and replacement of Test and Measuring Equipment, Maintenance Tools and Maintenance Vehicles.
- Acquisition of Spares for High Voltage Equipment, Transmission Lines, and Secondary Devices
- Construction and rehabilitation of substations and support facilities that include projects to:
  - Control and mitigate the effects of Fire and Flood
  - Preserve and Protect the Environment
  - Resiliency Projects

9.1 CAPEX Program

Aim to provide a reliable Grid Operation with the realization of the Performance Incentive Scheme (PIS) targets set forth by ERC, several O&M projects will be implemented through CAPEX programs. These programs will also be filed with ERC for each regulatory period.

9.1.1 Substation Reliability Program (SRP)

SRP comprises of acquisition, installation, and replacement works for high voltage equipment, protection, and secondary devices, substation upgrading/automation, and operation resiliency plans to safeguard the reliable operation of the power grid. The prioritization of every equipment is dependent on planning criteria on asset health, as well as its risk assessment of the equipment discussed in Chapter 4.

In addition, with the DOE's initiative on the adoption of Resiliency Planning and Program in the Energy Industry, NGCP has identified and proposed risk reduction programs to ensure the reliable operation of the grid during times of disastrous events. Furthermore, the foreseen adverse effects brought by disasters will be addressed in the most timely and efficient manner.

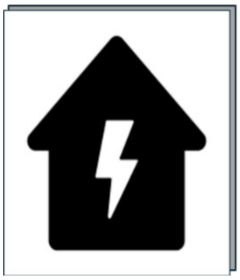
Program Scope. Ensuring the reliability of substation based on the planning criteria requires specific programs that will facilitate the replacement/ installation/ acquiring of the following equipment

a. Replacement of Substation High Voltage Equipment

Figure 9.1: High Voltage Equipment Components

b. Replacement of Protection and Secondary Devices

- ❑ Power Transformer Protections
- ❑ Capacitor Bank Protections
- ❑ Shunt Reactor Protections
- ❑ Bus Protections
- ❑ Breaker Fail Protections
- ❑ System Integrity Protection Scheme (SIPS) Relays
- ❑ Power Transformer Fire Protections



- ❑ IED Meters
- ❑ Battery Banks
- ❑ Battery Chargers
- ❑ Bus Protections
- ❑ Uninterruptible Power Supply (UPS)
- ❑ Back-up Generator Set

Figure 9.2: Protection and Secondary Devices Components

c. Substation Automation Program

Figure 9.3: Substation Automation Program Components

d. **Resilient Operation**

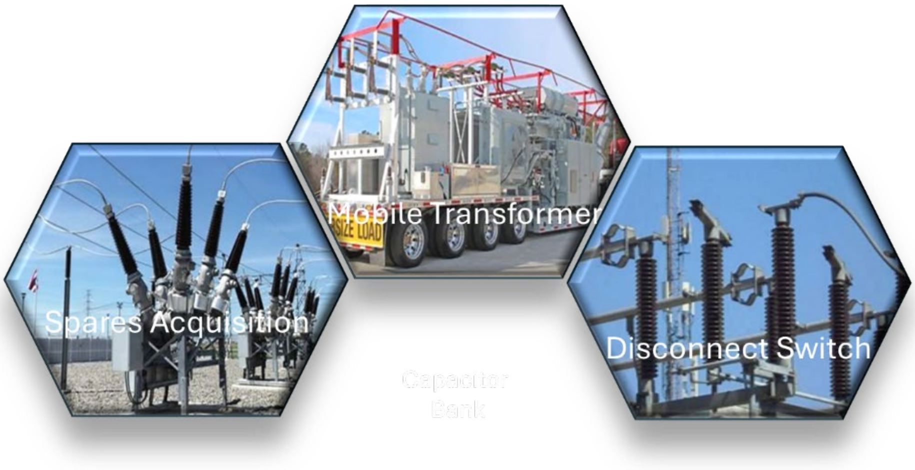


Figure 9.4: Resilient Operation Components

Program Disbursement. These projects will extend within the next 27 years and will have a total estimated cost of 55.561 Bn.

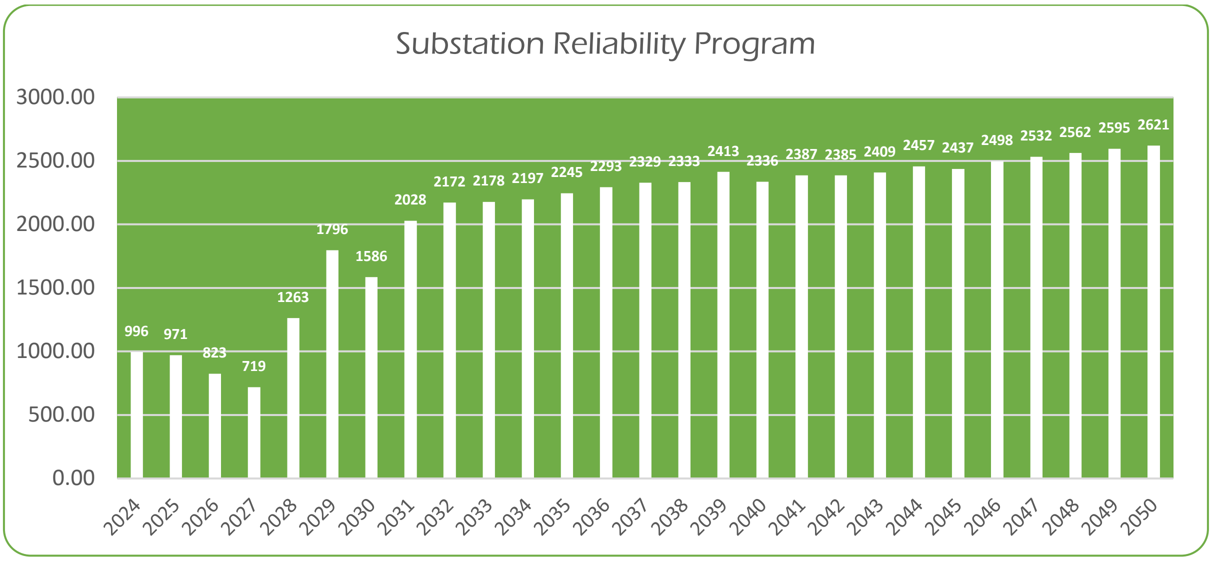


Figure 9.5; Substation Reliability Program Disbursement (in Mn Php)

9.1.2 Transmission Line Reliability Program (TLRP)

The TLRP consists of replacement of line-associated high voltage equipment, secondary devices and other accessories that are classified as transmission assets. All Transmission Lines which are subject to maintenance will entail a shutdown schedule, and materials dependent on the type of project.

NGCP has identified transmission line assets that require rehabilitation works such as replacement of wood pole, cross-arms, insulators, conductor and OHGW, etc. due to period of service, natural wear and tear and exposure to harsh environment.

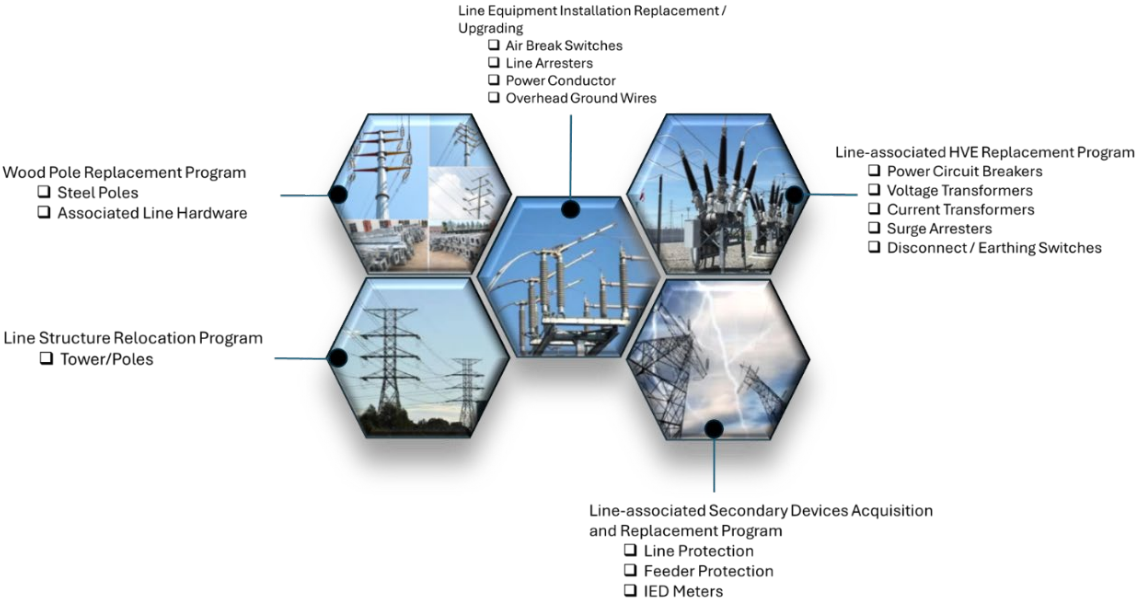


Figure 9.6: Transmission Line Reliability Program Components

Program Disbursement. These projects will extend within the next 27 years and have a total estimated cost of 13.777 Bn.

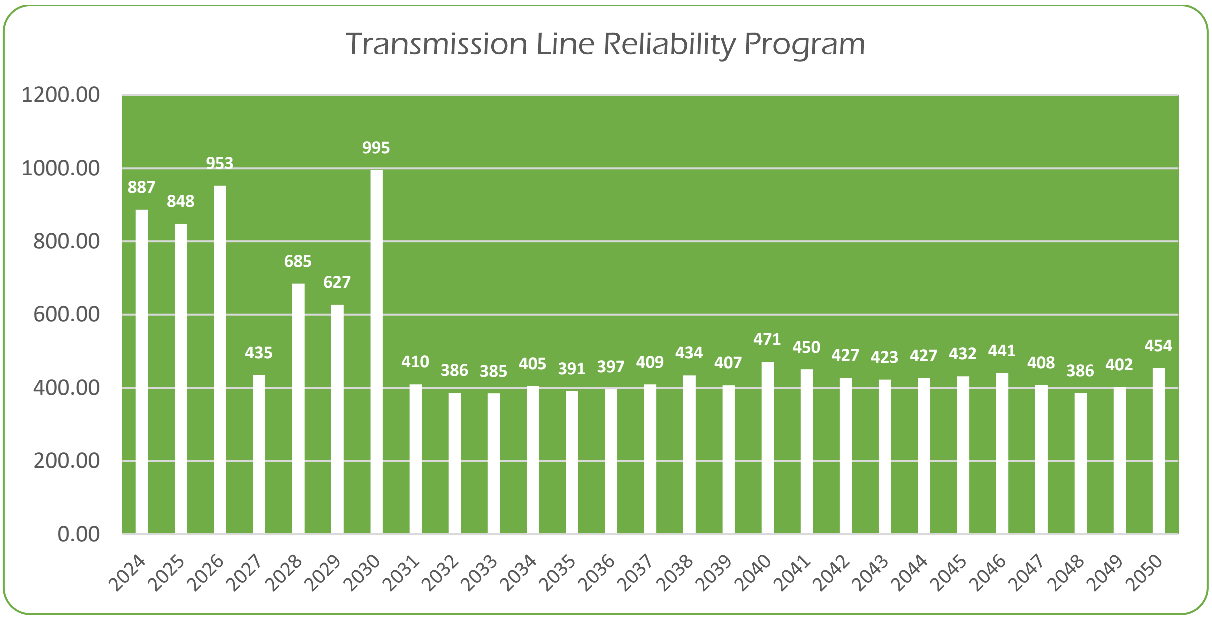


Figure 9.7: Transmission Line Reliability Program Components

9.1.3 Sub-transmission Line Reliability Program (STLRP)

STLRP incorporates acquisition, installation and replacement of associated high voltage equipment, secondary devices and other accessories that are classified as sub-transmission assets. Sub-transmission assets are demarcated as facilities related to the power delivery service below the transmission voltages.

NGCP has identified sub-transmission assets that require rehabilitation works due to prolonged period of service, natural wear and tear exposure to harsh environment and compliance with safety and environmental mandate.

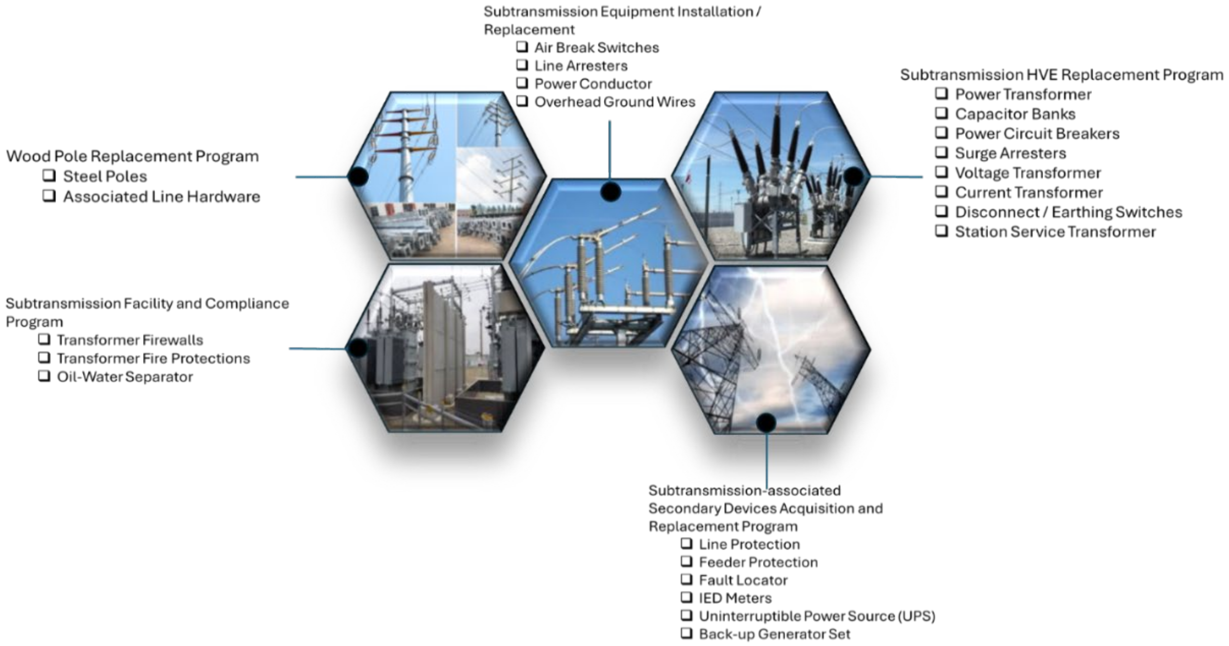


Figure 9.8: Sub-transmission Line Reliability Program Components

Program Disbursement. These projects will extend within the next 27 years and have a total estimated cost 3.927 Bn.

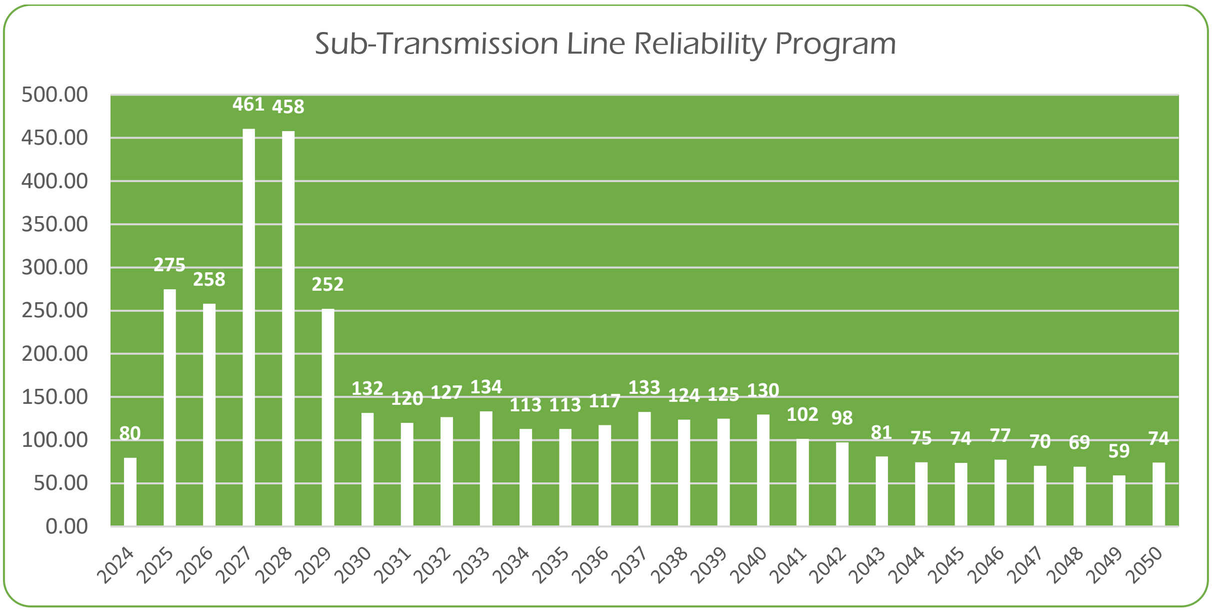


Figure 9.9: Sub-transmission Line Reliability Program Disbursement (in Mn Php)

9.1.4 Tools and Equipment Acquisition Program (TEAP)

In concurrence with the standard test for all equipment, the following group of test equipment are being replaced & augmented:

Figure 9.10: Tools and Equipment Acquisition Program Components

Program Disbursement. These projects will extend within the next 27 years and have a total estimated cost of 12.112 Bn.

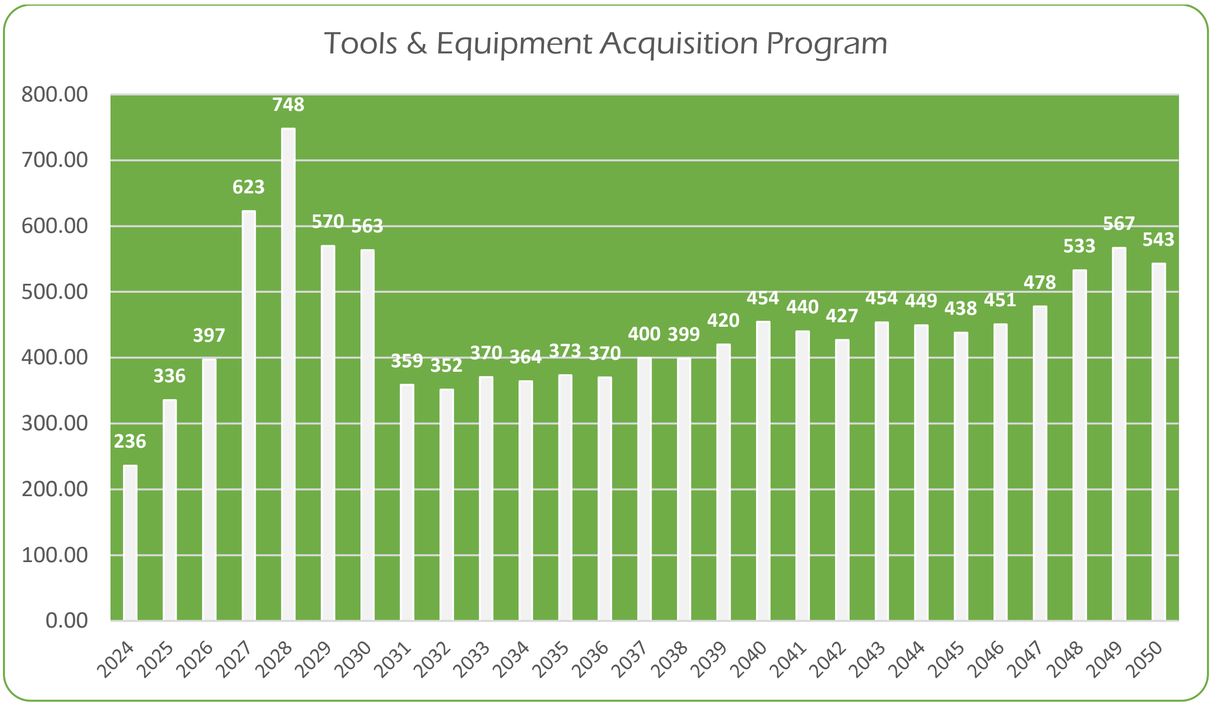


Figure 9.11: Tools and Equipment Acquisition Program Disbursement (in Mn Php)

9.1.5 Improvement of Substation Facilities and Non-Network Assets Program

NGCP facilities and buildings were built several years ago which requires improvement. Security and safety standards were different back then, which necessitates upgrading. To comply with the IMS Certification, additional security and safety standards must be implemented.

Also, from the time that NGCP took over the operation of the transmission network, additional equipment was utilized to cope up with the fast technological advancements in the field which require additional facilities or extension of existing
buildings for proper storage and to provide the personnel with a good working environment.

In addition to these improvements, NGCP shall construct facilities to comply with environmental standards, regulations and practices under Philippine Environmental Laws and Regulations, and NGCP's Integrated Management System (IMS) such as oil catch basin, water separator for generator set, transformers, station service and shunt reactors, hazardous waste storage facilities, etc.

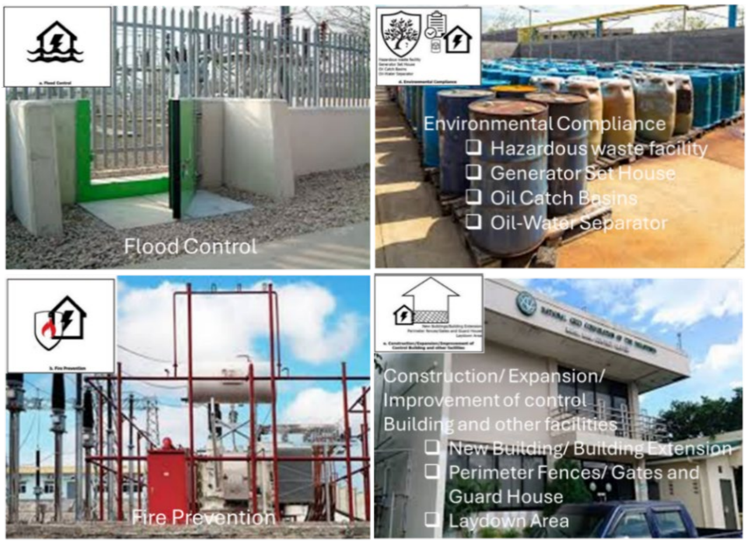


Figure 9.12: Improvement of Substation Facilities and Non-Network Assets Program Components

Program Disbursement. These projects will extend within the next 17 years. The project has a total estimated cost of 1.271 Bn.

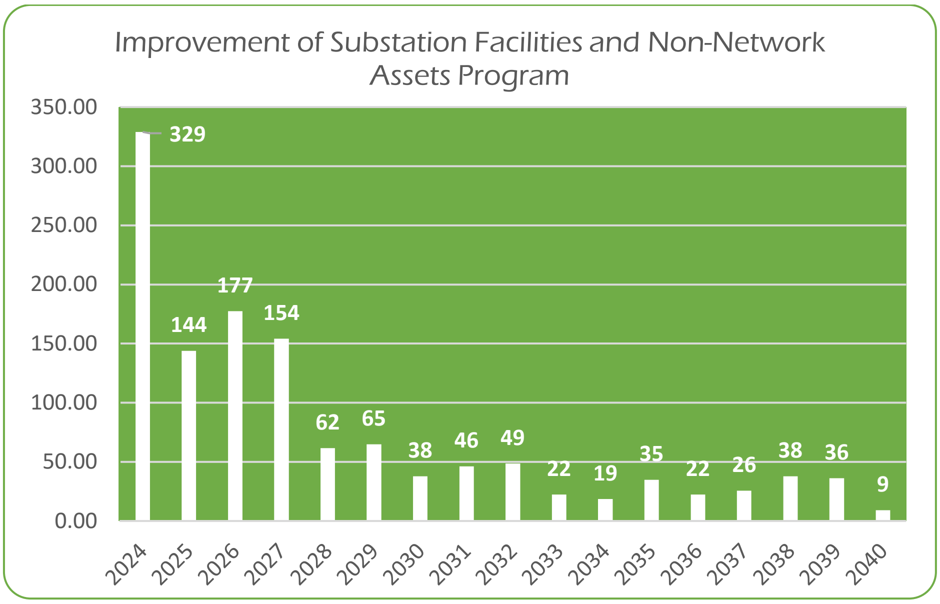


Figure 9.13: Improvement of Substation Facilities and Non-Network Assets Program Disbursement (in Mn Php)

9.1.6 Summary of 2024 - 2050 CAPEX Budget Requirements

The appraised CAPEX Budget for the TDP 2024-2050 is shown in Table 9.1.

Table 9.1 Budget Requirements

TDP 2024-2050 O&M PROJECTS	Asset Replacement	Compliance to Standards	Technology Installation	Maintenance Equipment	Resilient Operation	TOTAL
Substation Reliability Program	46,686.26	436.44	1,311.66	-	7,126.29	**55,560.65**
Transmission Line Reliability Program	9,283.11	2,120.76	283.86	-	2,088.98	**13,776.72**
Sub-transmission Line Reliability Program	2,852.30	1,036.28	20.40	-	18.37	**3,927.37**
Improvement of Substation Facilities and Non-Network Assets Program	3.05	1,126.67	-	-	141.15	**1,270.87**
Tools & Equipment Acquisition Program	-	-	106.58	12,005.09	-	**12,111.67**
Total	58,824.73	4,720.16	1,722.50	12,005.09	9,374.80	**86,647.28**

Program Disbursement. These projects will extend within the next 27 years. The project has a total estimated cost of 86.647 Bn.

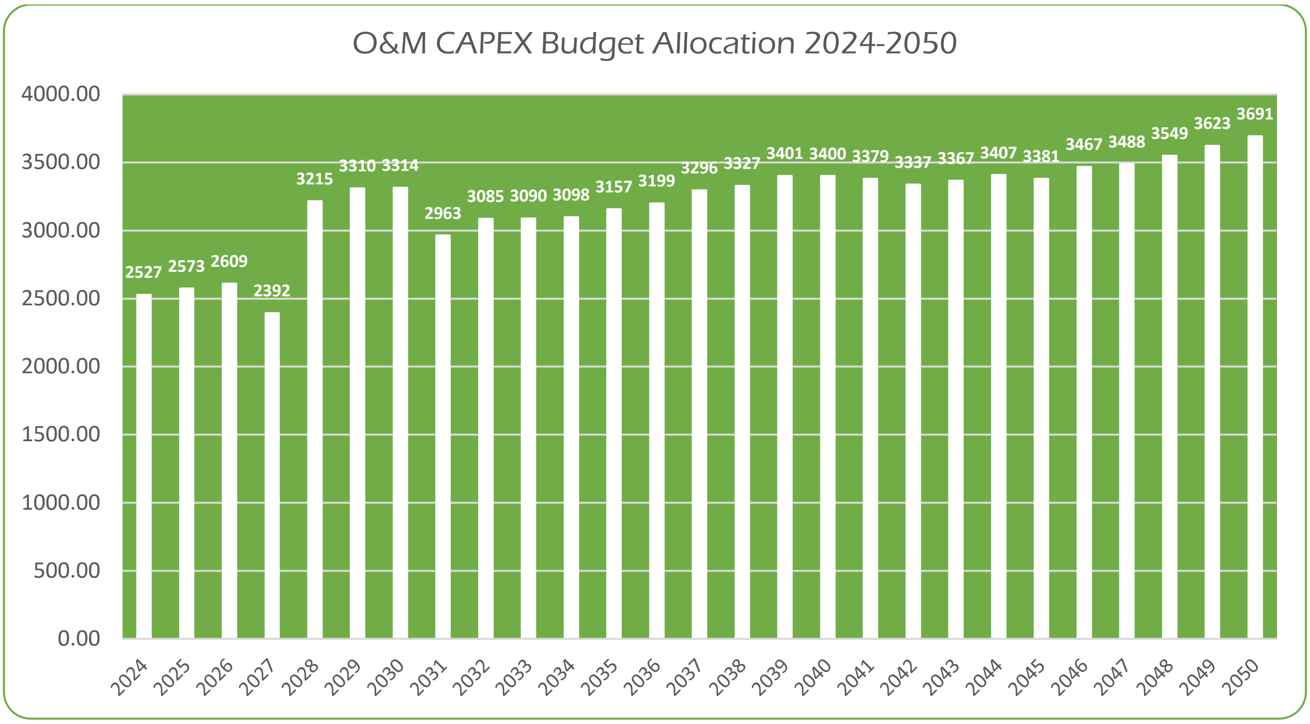


Figure 9.14 Operations & Maintenance Program Disbursement (in Mn Php)

The O&M CAPEX Program also includes the Grid Protection Relay Replacement Project or GPRRP. The project involves the replacement of protection relays in Luzon, the Visayas and Mindanao Grids to ensure safe, secure, reliable system operations. The protection relay replacements also include other protection associated equipment, such as control system, auxiliary system, tele-protection system, construction of control buildings, which are necessary to operate the protection relays efficiently and properly.

9.2 Metering Facilities

9.2.1 Obligations of Metering Service Provider for the Wholesale Electricity Spot Market

The NGCP, authorized by the ERC with a Certificate of Authority as a WESM Metering Service Provider (WMSP), is tasked with ensuring that Grid-connected Facilities adhere to the metering requirements outlined in the OATS Rules, WESM Rules, Metering Manual, PGC, PEC, and other relevant laws and guidelines issued by the ERC and DOE. This duty is specified under Article III of ERC Resolution 28 Series of 2006.

Per the ERC Resolution, only an ERC-licensed WMSP can enter into a contract with a WESM Trading Participant and provide metering services, which include the installation, operation, and maintenance of metering facilities.

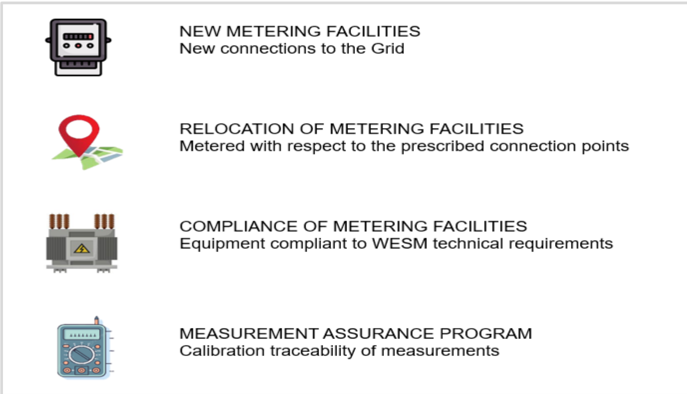
Additionally, the PGC 2016 Edition stipulates that a metering facility can be deemed ready for revenue metering service only when regulatory conditions are met and certified by the WMSP.

a. Revenue Metering Capital Projects

To fulfill these obligations, NGCP must consistently carry out metering capital projects, which are divided into two major categories:

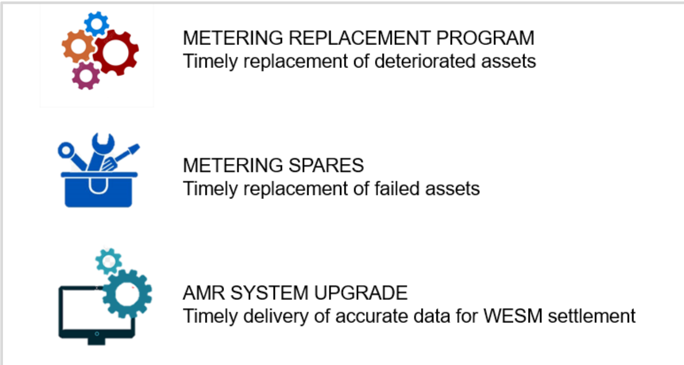
Regulatory Requirements Compliance Projects

The primary drivers for this project category are compliance with the metering requirements specified by the applicable WESM rules and manuals. This project group is divided into four sub-categories:



Metering Systems Reliability Projects

The primary drivers for this project category are ensuring the security and reliability of metering facilities to maintain compliance with regulatory requirements. This project group is divided into three sub-categories:



b. Revenue Metering Capital Assets

The following outlines the rationale for NGCP's metering capital projects and the essential revenue metering capital assets needed to implement these projects.

1. **New Metering Facilities**
   - I. Generators
   - II. Load Customers
2. **Relocation of Metering Facilities**
   - I. Transmission Customers
   - II. NGCP Station Services
3. **Compliance of Metering Facilities**
   - I. Non-compliant HVE
   - II. Conversion to Full metering
4. **Measurement Assurance Program**
   - I. Laboratory Standards
   - II. Field Test Instruments
   - III. Other Tools & Equipment
5. **Metering Replacement Program**
   - I. High Voltage Equipment
   - II. Meters & Accessories
6. **Metering Spares**
   - I. High Voltage Equipment
   - II. Meters & Accessories
7. **AMR Service Operation**
   - I. Hardware

II. Software

Table 9.2: Metering Capital Asset Requirements

NEW METERING FACILITES	RELOCATION OF METERING FACILITIES	COMPLIANCE OF METERING FACILITIES	MEASUREMENT ASSURANCE PROGRAM	METERING REPLACEMENT PROGRAM	METERING SPARES	AMR SYSTEM UPGRADE
Meters Combined Instrument Transformers Current Transformers Voltage Transformers Lightning Arresters Communication Devices Meter Enclosure Test Switches Cablings Grounding System Conduit System Mounting Structures Concrete Foundations Metering Perimeter	Meters Combined Instrument Transformers Current Transformers Voltage Transformers Lightning Arresters Communication Devices Meter Enclosure Test Switches Cablings Grounding System Conduit System Mounting Structures Concrete Foundations Metering Perimeter	Meters Combined Instrument Transformers Current Transformers Voltage Transformers Lightning Arresters Concrete Foundations	CMCL Standards Multi-meters Clamp Meters CT/PT Test Sets Meter Test Sets Insulation Testers Earth Testers Thermal Scanners Tools & Equipment	Meters Combined Instrument Transformers Current Transformers Voltage Transformers Lightning Arresters Meter Enclosures Meter Test Switches	Meters Combined Instrument Transformers Current Transformers Voltage Transformers Lightning Arresters Communication Devices	AMR Servers (Main and Back-up) AMR Workstations AMR Softwares Communication Devices

Table 9.3: Governing Rules

NEW METERING FACILITES	RELOCATION OF METERING FACILITIES	COMPLIANCE OF METERING FACILITIES	MEASUREMENT ASSURANCE PROGRAM	METERING REPLACEMENT PROGRAM	METERING SPARES	AMR SYSTEM UPGRADE
OATS Rules • E2.1 • E3.2 • E11.1 • E11.3 • F(AIII) 3 WESM Metering Manual • 2.3.1 PGC 2016 Edition • GRM 9.2.2.3 • GRM 9.2.4.3 ERC Resolution 23 S2016 • Sec. 6.0	OATS Rules • E2.1 • E3.2 • E11.1 • E11.3 • E11.7 • F(AIII) 3 WESM Metering Manual • 2.2 • 2.3.1 PGC 2016 Edition • GRM 9.2.1 • GRM 9.2.2.3 ERC Resolution 23 S2016 • Sec. 6.0 DOE DC 2018-05-0015 • (c) WESM Rules Clause 3.2.2.2 DOE DC2016-05-0007 Sec. 2	OATS Rules E3.2 E11.3 F(AIII) 3 WESM Metering Manual 2.3.1 2.4-2.11 PGC 2016 Edition GRM 9.2.2, GRM 9.2.3 DOE DC2016-05-0007 Sec. 1	OATS Rules • E5.1 (a) WESM Metering Manual • 2.5.4.4 (a) PGC 2016 Edition • GRM 9.2.4.1 • GRM 9.2.4.2 • GRM 9.2.5 • ERC Resolution 28 S2006 • 2.2.2.3 • 2.2.2.4 DOE DC2016-05-0007 • Sec. 1	OATS Rules • E3.2 • E11.3 PGC 2016 Edition • GRM 9.2.4.1 (e) (f) (g) • GRM 9.2.4.3 • GRM 9.2.8.4 ERC Resolution 23 S2016 • Sec. 6.0 ERC Resolution 28 S2006 • 3.4.5	OATS Rules • E3.2 • E11.3 PGC 2016 Edition • GRM 9.2.4.1 (e) (f) (g) • GRM 9.2.4.3 • GRM 9.2.8.4 • ERC Resolution 23 S2016 • Sec. 6.0 • ERC Resolution 28 S2006 • 3.4.5	OATS Rules • E6.2 • F(AIII) 3 WESM Metering Manual • 2.9.2 • Sec. 5 PGC 2016 Edition • GRM 9.3.2 ERC Resolution 28 S2006 • 2.2.2.3.4 • 2.2.2.4.3.8

9.2.2 Requirement Analysis

The metering capital project requirements, which translate to revenue metering capital assets, were derived from the technical and commercial obligations of a Metering Service Provider. These obligations were defined by the authorities governing WESM Metering through the OATS Rules, WESM Metering Manual, PGC, and guidelines issued by the ERC or DOE.

a. New Metering Facilities

This project involves the installation of Metering Facilities for new Generator and/or Load Customer connections to the Grid.

According to the newly released 2022 Edition of the OATS Rules, the Meter Only option, where Transmission Customers provided some of the metering equipment except for the meters, is no longer available. The responsibility for providing all the necessary WESM metering equipment now lies solely with the Metering Service Provider. This requirement aligns with ERC Resolution 23 Series of 2016, which excludes metering equipment used for Metering Services from the connection assets of Transmission Customers and mandates that Transmission Customers dispose of or transfer transmission-related assets to the Transmission Provider.

The list of new metering facilities is established according to the following considerations:

- Requirements for new metering facilities for Transmission Customers, which have already been conveyed to NGCP through requests for facilities study and similar means.
- Private Sector Initiated Power Projects as published at the DOE Website.
- Growth forecast for new load customer connections.

b. Relocation of Metering Facilities

This project involves the relocation of Metering Facilities to the prescribed connection point/s.

As per the PGC and WESM Metering Manual, the Metering Point must be situated at the Connection Point or Market Trading Node. Additionally, DOE DC2018-05-0015 provides further clarification, stipulating that the metering equipment for the market trading node should be installed within a maximum distance of 500 meters from the connection point. Conversely, ERC Resolution 23 Series of 2016 redefined the connection point based on the functionality of assets, irrespective of ownership.

These requirements, along with the updated definition of the connection point, form the foundation for the subsequent project classifications within the Relocation of Metering Facilities category:

Transmission Customer Metering – metering points currently located away from the designated connection point will either be transferred to or consolidated at the prescribed connection point.
NGCP Station Service Metering – permanent metering facilities will be installed at the prescribed connection points using WESM compliant metering equipment.

The list of metering facilities for relocation is established according to the following considerations:

- Connection point/s as defined by ERC Resolution 23 Series of 2016.
- Metering points located more than 500 meters from the connection points.
- Existing NGCP Station Service Transformers and corresponding locations of temporary metering points.

c. Compliance of Metering Facilities

This project will address non-compliances of installed metering equipment against the standards prescribed by PGC and WESM Metering Manual such as, but not limited to, the following:

- Metering Equipment or Facilities not meeting required specifications.
- Metering Equipment not used exclusively for WESM revenue metering purposes.

As per the WESM Metering Manual, persistent non-compliance with metering installations may incur sanctions or penalties. To ensure complete adherence to this mandate, NGCP will proceed with procuring replacement assets, irrespective of the ownership of the current equipment.

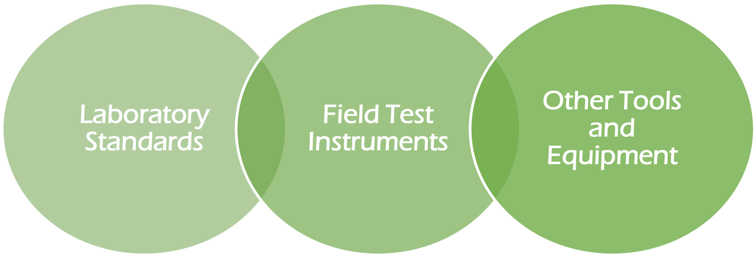
In addition to the non-compliances mentioned above, the conversion of existing Meter Only metering to Full Metering facilities, not addressed by other metering project groups, will be integrated into this project category. Aligned with the OATS Rules 2022 Edition, mandating the WESM MSP to provide all Metering Equipment, NGCP will procure or replace all customer-supplied Instrument Transformers based on negotiation outcomes with the equipment owner.

The list of metering facilities for compliance is established based on the following audit results:

- NGCP Internal audit results
- External audit results by PEMC, ERC and others

d. Measurement Assurance Program

This project entails acquiring Tools and Equipment to uphold compliance with the Measurement Assurance System requirements:



The ERC mandates the WMSP to manage and uphold a measurement assurance system, which includes protocols, meter calibration standards, testing equipment, and a central meter calibration laboratory. The objective is to guarantee the traceability of metering equipment measurements to the National Institute of Standards or any reputable international standard body.

The list of Laboratory Standards and Field Test Instruments is established based on the following considerations:

- Calibration traceability requirements for field test instruments and installed metering equipment.
- Operational requirements per field metering offices (existing vs. required test instruments and tools).
- Triggers such as end of asset life, obsolescence, asset condition and failures.

e. Metering Replacement Program

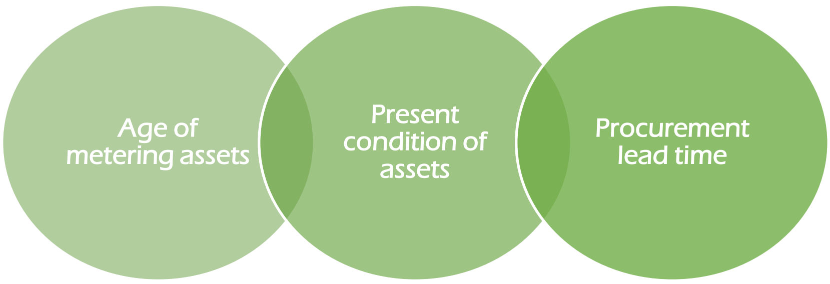
This project involves the procurement of replacements for metering equipment to handle the following scenario:

- End of Asset Life.

Considering the increased probability of older equipment failure due to natural deterioration, NGCP has integrated the replacement of aging assets into its asset management system in alignment with ERC policies.

Considering the recently released 2022 edition of OATS Rules, which mandates the WESM Metering Service Provider to own all metering equipment, and ERC Resolution 23 Series of 2016, which excludes metering equipment from the customer connection assets of Transmission Customers, NGCP will proceed with replacing fully aged assets, including those supplied by the transmission customer. Consequently, meter-only metering facilities will be converted to full metering upon the replacement of their equipment with NGCP-owned assets.

The metering replacement program is established based on the following considerations:



f. Metering Spares

This project involves the procurement of spares for metering equipment to handle the following scenario:

- Equipment Failure.

Metering equipment which fails the accuracy test or malfunctions must be promptly replaced. NGCP will procure metering spares, including requirements for transmission customer-owned equipment, to facilitate immediate replacements of failed metering assets. Consequently, meter-only metering facilities will be converted to full metering upon the replacement of their equipment with NGCP-owned assets. This is consistent with the provisions of the OATS Rules 2022 Edition and ERC Resolution 23 Series of 2016.

The metering spares levels are established based on the following considerations:

- Present asset conditions.
- Historical failure rates.
- Procurement lead time.
- Geographic locations of spares storage facilities.
- Installed equipment specifications.

g. AMR System Upgrade/Operation

This project involves replacing and/or upgrading Automatic Meter Reading (AMR) systems, which consist of hardware, software, and communication infrastructures essential for delivering settlement-ready meter data to WESM according to the prescribed schedules.

The timelines and activities are established based on the following considerations:

- Age and conditions of AMR system hardware.
- Maintenance contract with the AMR system provider.
- Availability of alternative AMR system in the market.
- Availability of new communication technologies in the market.

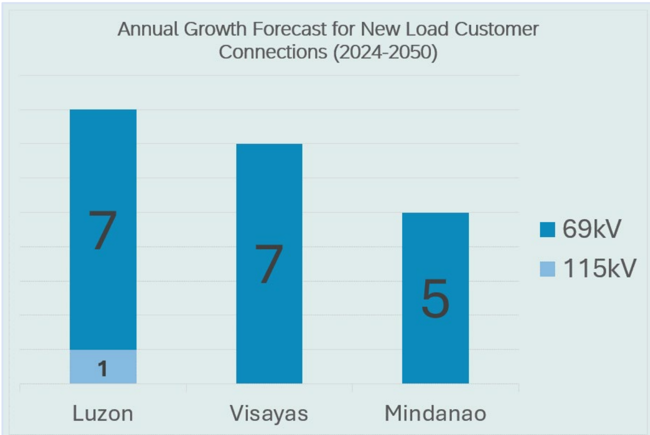
9.2.3 Project Development

New Metering Facilities

The accuracy of the proposed project list for new metering facilities heavily relies on the accuracy and promptness of the information received by NGCP regarding incoming grid connections.

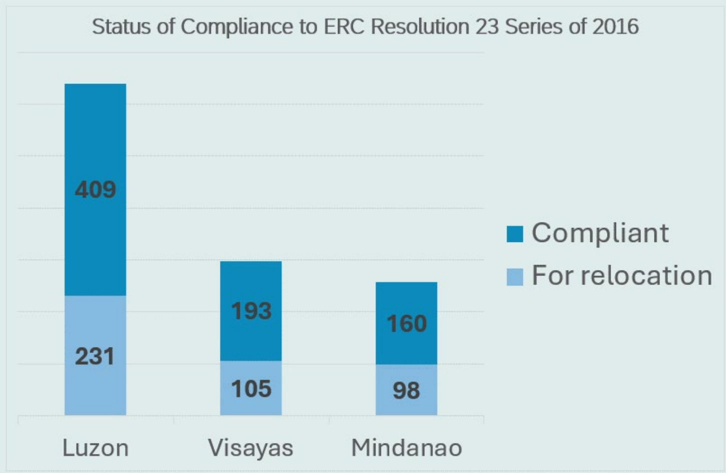
For incoming generators, the list of committed and indicative Private Sector Initiated Power Projects obtained from the DOE website, along with requests for facilities study and operational assessments received by NGCP, serve as valuable references for the proposed projects.

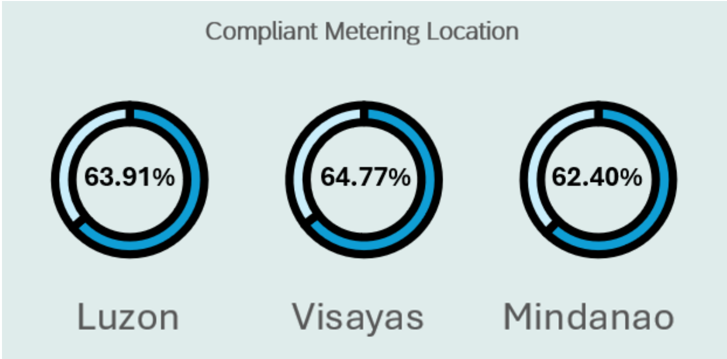
NGCP has recently begun receiving load growth forecasts from Trading Participants for incoming load customer connections. However, the quantity of planned connections submitted for reference is still relatively low. Therefore, it remains necessary to estimate the annual requirements for new load customer metering facilities. The following bar chart provides estimates of new load customer connections per year to the transmission grids, based on historical averages of annually commissioned Metering Facilities. These estimates serve as a reference for the anticipated metering points for load customers proposed in this TDP 2024-2050.



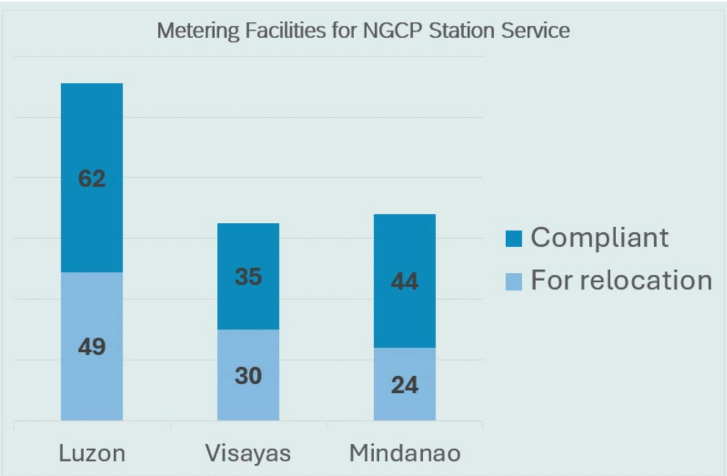
Relocation of Metering Facilities

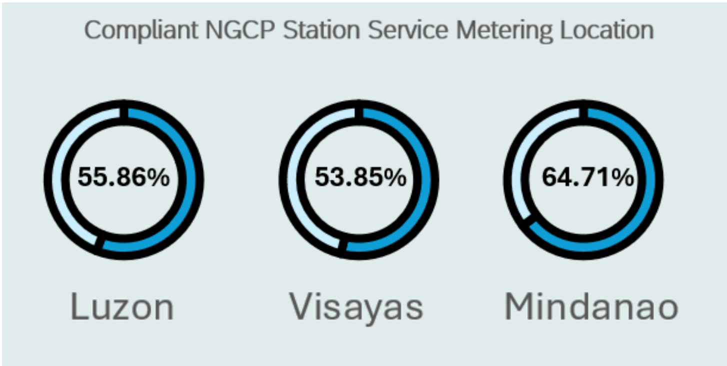
Transmission Customers: The following data show the compliance status of existing metering points with the DOE DC2018-05-0015 and ERC Resolution 23 Series of 2016's definition of connection points. These statistics serve as a reference for the relocation projects outlined in the TDP 2024-2050. NGCP aims to complete relocation projects by 2027 unless space and security constraints hinder progress at the designated connection points.





NGCP Station Service: Currently, many of NGCP Substations' station service consumptions are metered using temporary WESM meters installed in series with the statistical meters of the substations. This project aims to relocate the metering to the appropriate connection points, which are at the 13.8kV tertiary winding of the main transformer. The following data provide the status of metering for Station Service Transformers, serving as a reference for the NGCP Station Service Permanent Metering proposed in this TDP 2024-2050. NGCP plans to initiate and complete relocation projects by 2027 unless space constraints at the designated connection points pose significant challenges.

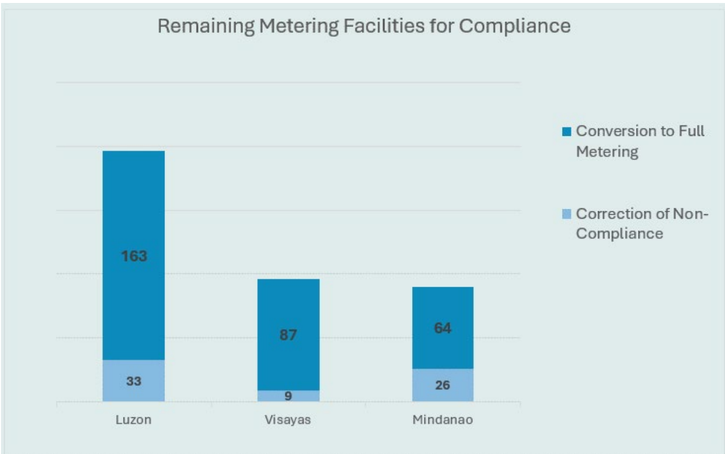




Compliance of Metering Facilities

Every three years, the Philippine Electricity Market Corp. (PEMC) conducts a Review of Metering Installation Arrangements, encompassing approximately 30% of Metering Points in Luzon and Visayas. The purpose of the audit is to assess NGCP's compliance as the Metering Service Provider with the standards established by WESM.

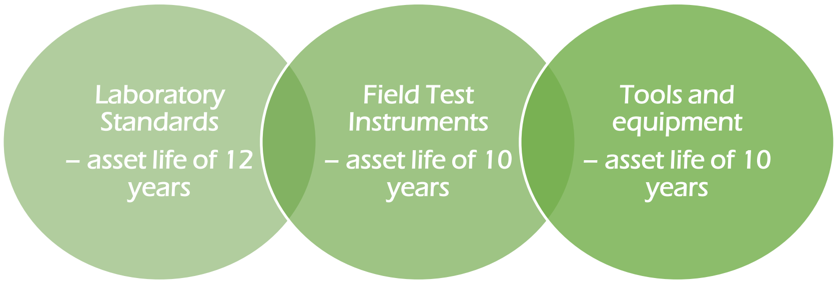
Metering Facilities identified as non-compliant with WESM standards require rectification by the Metering Service Provider (MSP). Some audit findings from 2016 have been addressed, while others have compliance plans in place. These plans may involve replacing non-compliant metering equipment, reorganizing metering equipment to align with WESM requirements, and related rules.



In preparation for the Metering Arrangement Review, NGCP routinely conducts internal audits to develop compliance plans. The following data include statistics on Metering Points with Non-compliances identified in audit reports. Additionally, the figure shows statistics on meter-only facilities programmed for conversion to full metering, as mandated by OATS Rules 2022. These figures serve as reference for the compliance projects outlined in the TDP 2024-2050. NGCP aims to complete compliance projects for both Full and Meter Only Metering Facilities by 2027.

Measurement Assurance Program

Laboratory standards, field test instruments, tools and equipment bought during the 2nd, 3rd and 4th regulatory period will reach the end of their asset life by the 5th, 6th and 7th regulatory period:

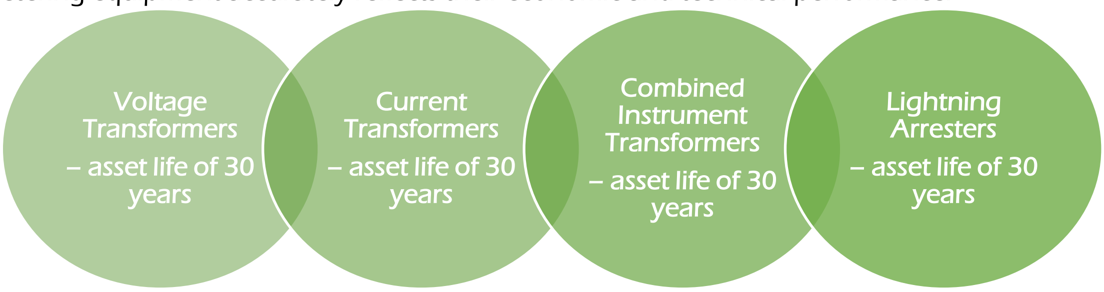


Existing instruments are scheduled for replacement upon reaching the end of their asset life and demonstrating declining performance. NGCP's proactive asset management system aligns with ERC policies, which monitor asset age and conditions to develop a viable replacement program. Although NGCP acknowledges both factors as significant triggers, asset conditions hold greater importance than asset age. The run-to-failure approach is applied to fully aged but still serviceable instruments, which are utilized for redundancy purposes.

The additional instruments outlined in this proposal aim to fulfill operational, maintenance, and automation needs, in accordance with regulatory obligations of the MSP. These obligations encompass testing, calibration, and maintenance of metering installations, as specified in PGC 2016 and further clarified by DOE DC2016-05-0007.

Metering Replacement Program

Metering assets are subject to normal wear and tear. Our experience indicates that the established asset life for the following metering equipment accurately reflects their economic and technical performance:



However, electronic meters and modems, which have an assigned asset life of 10 years, tend to fail earlier than expected. Additionally, obsolescence is a significant consideration for these types of assets.

These items will be replaced as they near the end of their assigned asset life or show signs of impending failure. Information on asset age and condition has been the primary reference for the replacement program for installed metering equipment included in this TDP 2024-2050.

Metering Spares

Maintaining an optimal level of metering spares is crucial for ensuring the continuous and reliable operation of metering systems. The previously used standard of 3% of installed metering equipment to determine spares requirements has proven inadequate for fully meeting NGCP's operational needs due to the following scenarios:

- Unexpected failure of some metering equipment (meters and modems) prior to assigned asset life.
- Transmission customers' failure to provide spares for customer-owned metering facility in case of equipment defect.
- Unplanned metering requirements e.g., new grid connections, new regulatory guidelines.

To partially address the scenarios, NGCP had to utilize not only its limited spares, but also other metering equipment originally allocated for different projects.
To resolve this issue, NGCP has made several improvements to the spares program to better support its operational requirements.

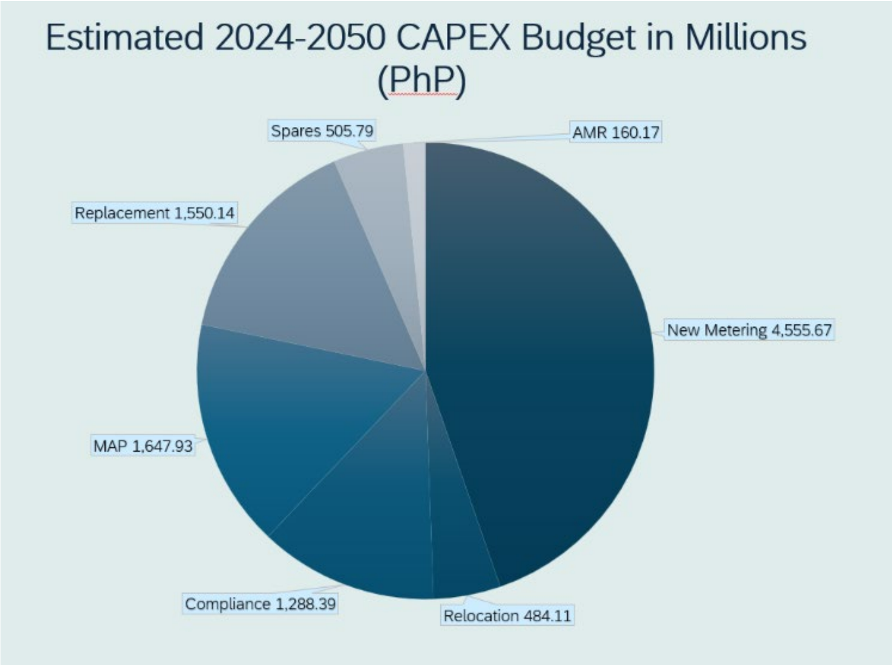
AMR System Upgrade/Operation

The proposal for this TDP 2024-2050 project sub-category will include:

- **AMR System Hardware:** will be replaced as they reach their assigned Asset Life or when they become obsolete or fail in service.
- **AMR System Software (currently the MV-90 System):** will be replaced or upgraded as they reach their assigned Asset Life (5-years) or when they become obsolete or fail in service.
- **AMR System communication infrastructure:** will be replaced as they reach their assigned Asset Life (5-years) or when they become obsolete or fail in service.

9.2.4 Summary of 2024-2050 CAPEX Budget Requirements

The estimated CAPEX Budget for the TDP 2024-2050 is shown below:



Chapter 10 SYSTEM OPERATIONS

10.1 Developmental Objectives

The development plan for the SCADA, telecommunication and protection components of the Power Grid is characterized by the need to cope with the market-driven demand for consolidation of enterprise and operations applications in the energy management systems (EMS), subsequent necessity for bandwidth and interoperability in the communications network and indispensability of redundancy, i.e., N-1 in the protection systems. The importance of integrating embedded variable renewable sources of energy into the Grid has also made it a point to provision readiness in both the SCADA-EMS and telecommunication systems for addressing connectivity and data organization and for the protection system to be able to handle the peculiar power quality management issues.

The following are the objectives of the developmental program for the 2024–2050 planning horizon and the respective major CAPEX issues of interest.

Migration to Efficient Technologies

- Shift to IP-based transport/network
- Completion of optical telecom backbone
- Adoption of Smart Grid model; implementation of IEC 61850 standard
- Use of hybrid power supplies
- Supervision/monitoring functions employing public infra

Address Deficiencies that Prevent Optimized Network Performance

- Completion of network synchronization system
- Integration of telecom network management systems
- Securing RCC interfacing to HVDC control system
- Equipping RTUs with IP interfaces

Sustenance of Systems to Maximize Economic Lives

- Stagger the retirement/replacement of systems running through obsolescence
- Technological prudence: specified functions and upgradability should be realized within expected service life
- Manage maintenance and replenishment of battery banks
- Employ remote fiber monitoring systems for quick detection of damaging factors

Compliance with Grid Code and Regulatory Direction

- Monitoring and control of embedded generators
- VRE forecasting
- Consistency with Protection, SCADA and Telecommunication Philosophies
- Meeting power quality and system availability requirements
- Grid resiliency measures
- Real-time monitoring and control at connection points
- Cyber Security

Prioritization of Infra Expansion/Upgrade to Areas of Most Benefits at Least Cost

- Enhanced EMS applications, with emphasis on VRE management
- OPGW retrofitting to enable access to bandwidth
- Upgrade of power supply systems and other support infra
- Compliance with data center standards

10.2 Situational Analysis

10.2.1 Telecommunications

As the pace of development vis-à-vis geographic peculiarities of the electricity grids in Luzon, Visayas and Mindanao varies significantly, the characteristics of the respective telecommunication systems and facilities differ appreciably among each other. On a nationwide scale, backbone infrastructure is dependent on the continuity of transmission-line-embedded fibers—for this matter, relatively-recent transmission line segments without OPGW must be retrofitted to interconnect the already-fiber-embedded lines in the new installations.

From the register of our existing telecom facilities, we define:

- The need to replace part of the installed base already without spare parts support as well as the program for replenishments of equipment upon obsolescence
- Required upgrades or replacements to address capacity/bandwidth issues resulting from a particular element's deficiency
- Additional facilities that will provide element and path redundancy in compliance with our N-1 philosophy
- Additional network management components to consolidate remote control capability over telecom network elements.

On the network level, as the open market integrates, the respective characteristics of the telecommunication networks in Luzon, Visayas and Mindanao become more similar as common performance parameters are adopted and the same operating philosophies are shared. Further, the requirement for more backbone bandwidth (and the subsequent need to reinforce synchronization of the high-speed transport network) is nonetheless increasingly and universally felt, catering to the demands of the now-mainly-IP-based applications. The 2024–2050 CAPEX projects identified in this volume reflect this trend as an integrated NGCP telecommunication network develops over the course of the planning horizon.

Following is an illustration of the geographic extent of the optical infrastructure on which basis the collective performance of NGCP's operations and business applications are founded on:

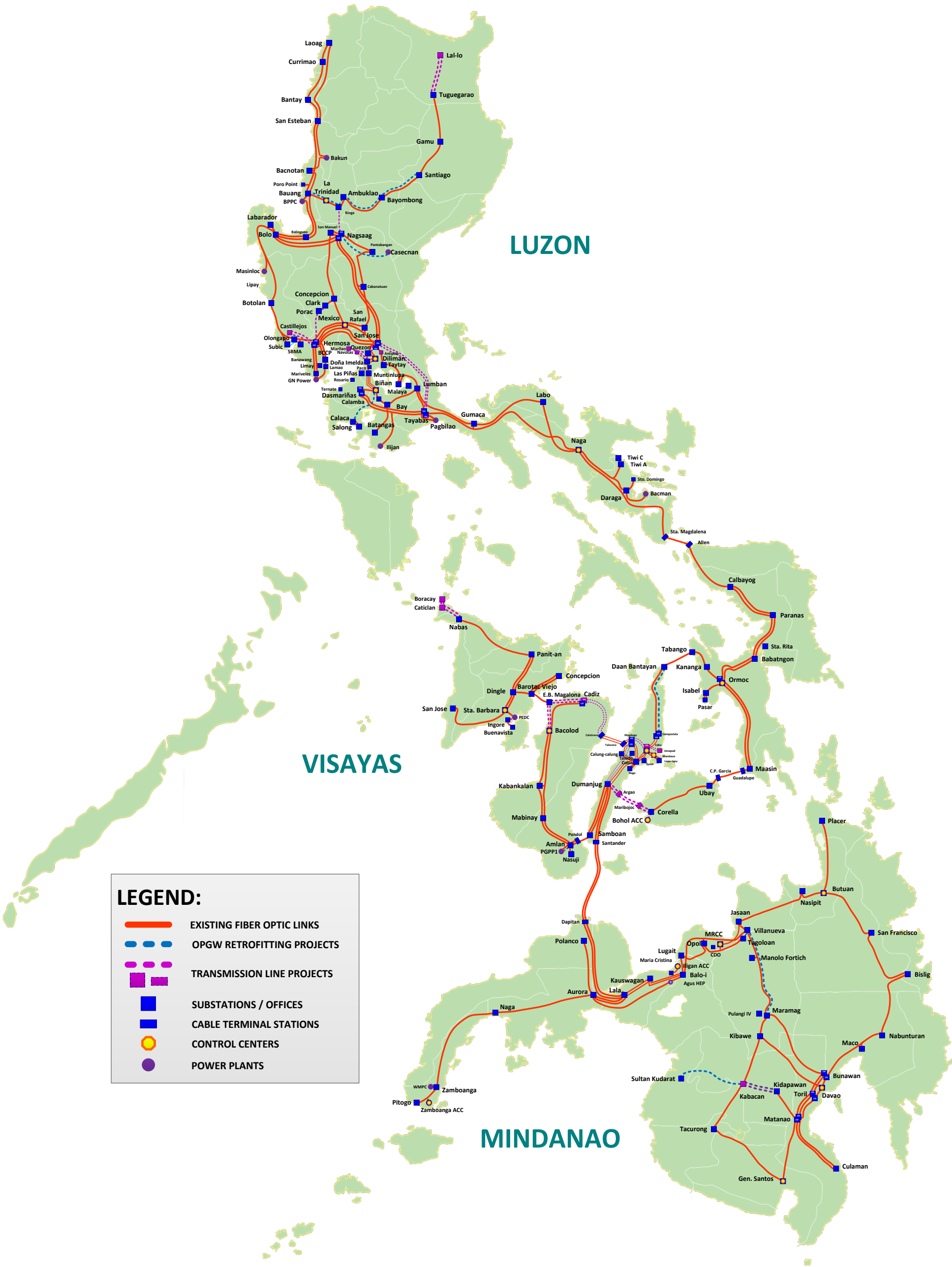


Figure 10.1: Fiber Optic Network

10.2.2 SCADA EMS

NGCP's Regional Control Centers (RCCs) are responsible for monitoring and control of the transmission systems in each of the three power grids: Luzon, Visayas and Mindanao. Backup RCCs were also established to take over the functionalities of RCCs during contingency events. Several Area Control Centers (ACCs) are situated in each Region to supervise other parts of the transmission network not directly managed by the RCCs and to coordinate with the customers in their respective areas of responsibility.

The entry into the Electricity Market of Visayas and Mindanao has resulted in significantly more complex operations in the regions. The need for comprehensive SCADA/EMS coverage has also been made more difficult by the rapid changes in Grid configuration brought about by the integration of new players.

The major issues for improvement of the existing SCADA/EMS arrangement are characterized below:

- The responsiveness of the existing SCADA system to the requirements of VRE integration as well as to the 5-minute real-time dispatch mechanism depends on enhanced computing resources as well as improved accuracy of the telemetry system.
- Inadequacies in auxiliary support facilities for some of the control centers should be addressed to avoid unreliable SCADA operations and accelerated equipment ageing and failure.
- Exposure of the SCADA-EMS system to cyber security risks has become more prominent as threats grow alongside technology-driven commerce.
- There is limited infrastructure reach to readily address supervision of embedded generators.

The development of the Grid in response to Market demand in terms of capacity growth, geographic expansion and challenges in dispatching generators of renewable energy has manifested itself in the SCADA-EMS system through the consolidation and standardization of data collection and management processes and the employment of specialized modeling and analytical applications as part of EMS. The 2024–2050 CAPEX projects are in line with this development trend.

Figure 10.2 is an illustration of the pertinent SO-MO process flow involving NGCP's SCADA-EMS and its interface to the Market.

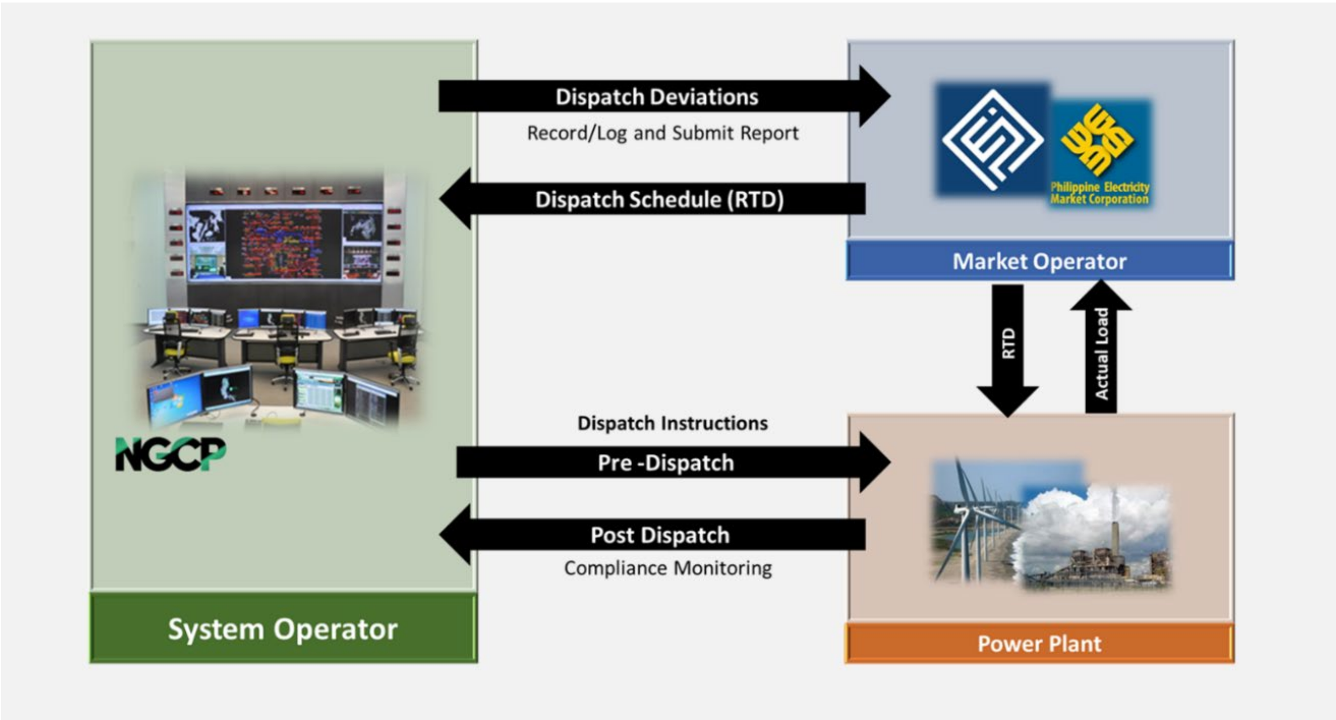


Figure 10.2: SO-MO Process Flow

10.2.3 Protection Systems

A resilient Power Grid made possible through an effective protection system is a requisite for the realization of the Smart Grid environment. However, the existing protection facilities are significantly lagging in terms of compliance with the Network Protection Philosophy, especially in Mindanao where complementary telecommunication facilities to support path redundancy requirements are still under development.

The challenges presently faced by the existing protection system are described by the following needs:

- Replacement of obsolete protection equipment—which has no more manufacturer support and lacks modern communication features—must be accelerated to minimize equipment failures as well as to consolidate (remote) management and maintenance.
- Redundancy requirements to meet the N-1 objective necessitate the addition of relay equipment where no Main 2's are present and upgrading of existing relays where the required philosophies governing Main 1 and Main 2 modes have not yet been realized.
- Strategic deployment of NDME and PQA to ensure quick and accurate diagnostics of network disturbances and power quality issues in compliance with PGC requirements.
- The present state of stability still requires continued employment of SIPS in strategic areas of the Grid. SIPS would eventually be migrated to a Wide Area Measurement Protection and Control (WAMPAC) to have precise and advanced automation in response to thermal overloads and system instability arising from the loss or unanticipated behavior of network elements.

While programmed substation upgrades address the above needs through the accompanying upgrading of the secondary equipment attributed to the transmission lines (radiating from the substation), such substation upgrades would not significantly cover the deficiencies in due time given the respective implementation schedules. Thus, the 2023–2050 CAPEX for protection builds up on relay, NDME, and PQA equipment—the lack of which compromises NGCP's performance objectives.

10.3 Summary of CAPEX Costs

CAPEX Costs 2021–2050 (In Million Pesos)

Table 10.1 CAPEX Proportion by Function

Function	Replenishments	Rehab/Upgrades	Expansions	Total
Telecoms	12,826	849	5128	18,803
SCADA	6,720	972	5,661	13,353
Protection (NDME/PQA)	3,271	108	200	3,579
Connection Point Monitoring/Control	0	0	3,666	3,666
TOTAL	**22,817**	**1,929**	**14,656**	**39,402**

Table 10.2: Telecom Projects According to Nature of Facilities

Function	Replenishments	Rehab/Upgrades	Expansions	Total
Luzon	10,171	584	5,913	16,668
Visayas	5,572	890	3,768	10,229
Mindanao	7,075	455	4,975	12,505
TOTAL	**22,817**	**1,929**	**14,656**	**39,402**

Table 10.3: Telecom Projects According to Nature of Facilities

Telecom Facilities	Luzon	Visayas	Mindanao	Total
Fiber Optics and OPGW	2,727	1,411	3,262	7,399
Microwave Radio	386	263	457	1,106
Network Management and Synchronization	790	917	711	2,418
Teleprotection Equipment	212	147	179	538
WAN and Access Equipment	948	398	1,014	2,361
Power Supply and Auxiliary	1,561	775	1,351	3,687
Cyber Security	704	83	155	942
Mobile Radio Network	130	52	86	268
Test Equipment	103	94	82	279
TOTAL	**7,561**	**4,141**	**7,297**	**18,999**

Table 10.4: SCADA/EMS Projects Categorized by Component Function

SCADA/EMS Components	Luzon	Visayas	Mindanao	Total
SCADA	4,137	2,482	3,010	9,630
EMS Applications	0	7	69	76
Cyber Security	1,017	801	427	2,244
WAMS	409	447	547	1,403
TOTAL	**5,563**	**3,737**	**4,053**	**13,353**

10.4 Strategies

Sustenance of Assets Against Technology Shifts. System Operations' primary asset management objective—and the main CAPEX driver—is to optimize the serviceability of its existing facilities, i.e., maximizing service lives up to the extent that the costs of ownership vis-à-vis strategic benefits justify continued maintenance. Therefore, given SO's dependence on software and electronics, rapid technological advances in either field increases the need for frequent reassessment of the relevance of such assets to SO's functional objectives. Technologies and applications approaching obsolescence should be retired—albeit on an optimized schedule—and replaced with more efficient ones for the sake of improved performance and economics. Thus, we are reducing and eventually ending acquisition of spares and maintenance support for the assets due for retirement and investing on their replacements, as follows:

Table 10.5: CAPEX Proportion by Function

Decreasing Functionality	Current Paradigm
• Power Line Carriers (PLCs) cannot be used to provide *differential* line protection and cannot be used as a redundant backbone access channel given the bandwidth requirements of current business and operations applications. PLC is also quite expensive for stations which have ready access to fiber-embedded transmission lines.	Fiber is the preferred media for line protection offering both the best bandwidth and reliability. All new transmission lines are already embedded with fiber and existing lines continue to be retrofitted with OPGW. Optical terminals are cheaper to acquire and maintain and protection relays can be outfitted with optical transceivers enabling "direct fiber" line protection setups.
• Microwave radio shall be limited to spur link applications and backup routes where no transmission lines can be used to establish optical transport.	Retrofitted fiber is much cheaper in addressing backbone needs given the exponential bandwidth growth.
• There would be less use of TDM channel multiplexers as service access is shifted to IP.	Routers and Ethernet switches shall begin to displace TDM multiplexers along the service access points as applications migrate towards IP communication.
• SDH transport facilities are already being migrated to packet-switched networks.	IP-based transport facilities shall gradually replace SDH networks that are now reaching obsolescence.
• PABX equipment shall be totally phased out as circuit-switched arrangements become obsolete.	Telephony and other multimedia services shall run through the IP network not unlike other applications using networked servers.
• RTUs for Power Grid SCADA shall become less relevant as automation and data communication is integrated into substation and power plant design.	Remote data collection requirements shall be reduced to compliance with supervisory and communication protocol and hardware limited to intermediary access terminal for security purpose.
• User owned telecommunication facilities to reach remote IPPs will be less favored especially when no tele protection complement is required.	Less CAPEX-involved public infrastructure to establish access among IPPs (especially embedded ones) shall be taken advantage of but cyber security arrangements shall be given due attention.
• Use of Distance Relays shall be limited only to areas where differential protection cannot be applied on account of bandwidth limitation.	Differential Relays (with direct-fiber interfaces) shall displace more and more Distance Relays as fast communication interfaces through fiber and radio become pervasive.

Timing of Projects. Given the interdependence of technology and infrastructure—as well as the role of organizational evolution adapting to market trend—in defining developmental direction, outlined below are the implementation sequence of major projects for the purpose of validation and prioritization. It is also the purpose of this development plan to make rescheduling of projects convenient when faced with limited budget or implementation resources. Optimization demands that just enough infrastructure is ready to accommodate the applications as they come and that the right applications are chosen to take advantage of the minimum infrastructure components in place at the time of need.

CAPEX Priorities. As shown in the above schedule, 58% of projected CAPEX is allocated for sustenance of existing facilities and the rest for programs to address current deficiencies and new requirements. This does not mean that the same apportionment would be observed in case of budget constraints. While sustenance would ideally be the priority, the new facilities are also meant to address deficiencies in existing service areas. Should CAPEX limits be apparent as a result of transmission regulation, prevailing demand for pertinent applications shall be prioritized.

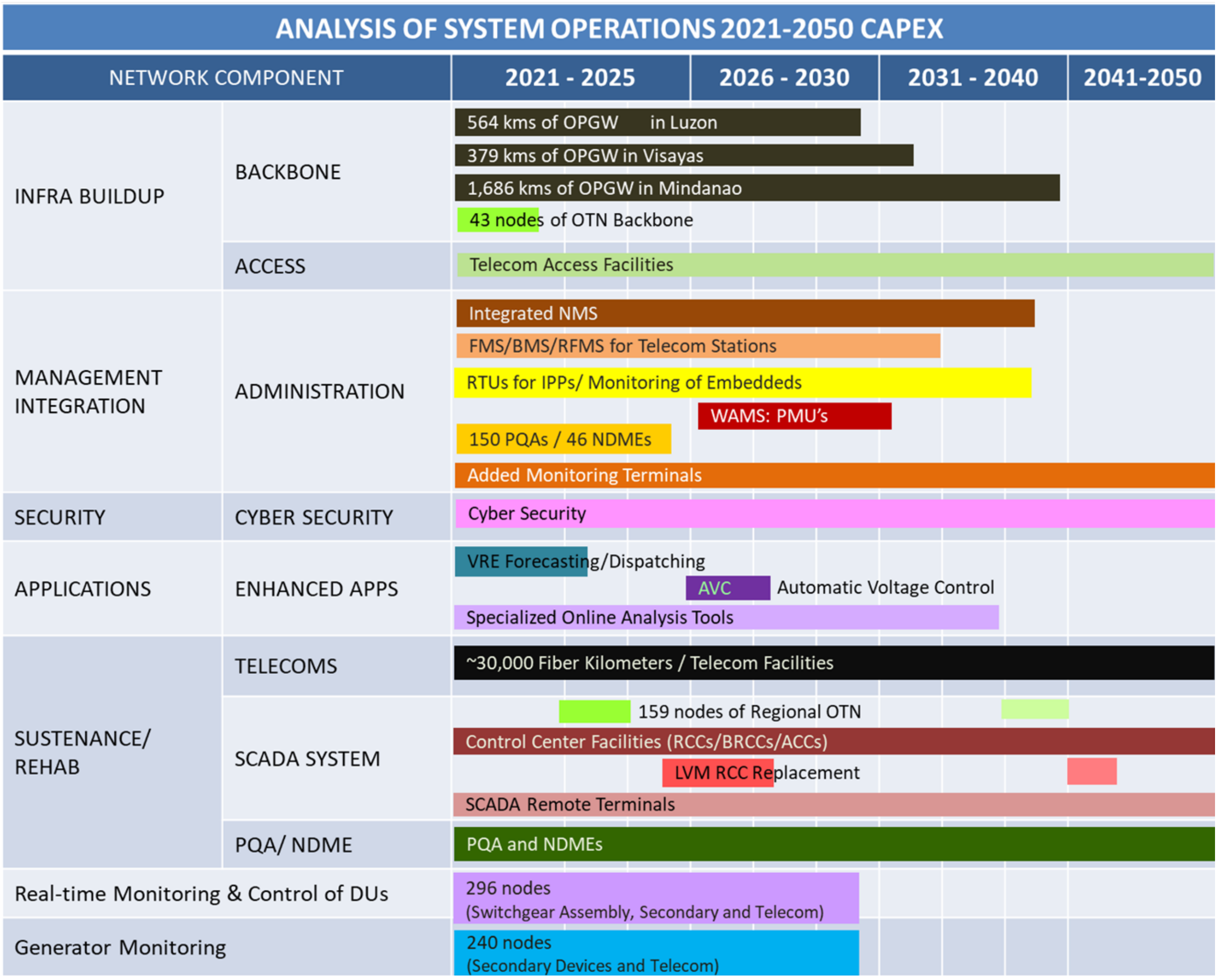


Figure 10.3: Analysis of SO 2021-2050 CAPEX

As an example, EMS enhancements for the purpose of improving SO response to Grid dynamics and maximizing access to energy sources according to market conduct are lined up for implementation through the 4th and 5th regulatory periods. Projects for either infrastructure reinforcement or sustenance/upgrade programs would hence depend on the relative significance of the affected network elements or sections in support of said EMS applications. Prominent in this respect are the VRE forecasting and modeling applications.

Imperative also during the early years is putting in place the pertinent synchronization mechanisms and enforcing communication protocols which govern the building blocks of our automation and control systems.

Finally, given the increasing dependence of SO on IT and communications systems—amid the growing pervasiveness of the internet in the business environment—the need to protect System Operations against cyber threats has manifested itself as an indispensable determinant in development planning and engineering design.

Table10.6: CAPEX Summary

PROJECT LIST			5th REG								
	2021	2022	2023	2024	2025	2026	2027	2028-2030	2031-2040	2041-2050	2041-2045
Fiber Optic and Microwave Radio Equipment Replacement	22.8545	12.3037	61.6879	435.9948	191.1676	65.5000	32.0000	366.1000	1,751.4000	1,663.9000	1,409.3000
Teleprotection Equipment Replacement	21.0759	17.9038	32.4931	11.3389	4.5900	9.0000	10.2000	60.7000	190.7000	179.8000	115.9000
Telecom Access and Remote Management Component Replacement	61.8956	28.7138	34.6695	46.3255	21.0500	127.2185	222.5500	613.3400	1,621.2320	1,403.8820	540.4120
Power Supply and Auxiliary Equipment Replenishment	88.8214	77.4067	154.8108	255.9599	112.9658	190.4450	153.7711	333.0650	1,347.5522	1,142.8882	515.3862
Infra and IT Support Facilities Replacement	66.2418	103.4089	82.4500	95.3018	49.5308	121.0700	118.5700	339.5331	867.6311	426.9285	129.7341
SCADA/EMS Facilities Replacement	44.3011	93.9742	138.8524	864.6717	416.1003	140.3000	363.3500	853.6750	1,259.8206	1,434.5000	874.5000
NDME and PQA Replacement	43.7534	72.5377	46.3797	48.8443	20.6110	98.6749	54.2836	360.2847	1,178.3761	1,455.0288	628.8504
SCADA Expansion—Added RTUs and Monitoring Points	105.6217	23.5966	43.2030	42.1011	48.3900	149.1190	108.3880	232.5380	403.4580	360.4296	176.5900
Telecom Access for Added Locations, Subscribers and Application Points	39.6701	82.3567	69.7989	32.9308	30.9500	39.2000	26.2400	29.1000	100.1000	77.4000	36.7000
Fiber Optic and Microwave Radio Expansion	519.2612	351.0874	104.8720	220.0571	284.3260	177.7800	110.0000	671.3500	1,030.0000	361.0000	357.0000
Submarine Fiber Optic Link	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Cyber Security	97.3150	53.5300	145.3362	86.7790	238.0691	212.9352	170.6380	459.8863	765.5985	542.5005	262.8643
Network and Facilities Management System and IT Support Facilities	56.0890	192.7975	110.3892	82.9820	24.3118	34.5600	68.7500	0.0000	0.0000	0.0000	10.7500
EMS Enhancements	2.4901	-0.3492	0.0000	0.0000	0.0000	5.0000	0.0000	53.6000	157.2000	23.6000	0.0000
Wide Area Measurement System (WAMS)	0.0000	0.0000	0.0000	0.0000	0.0000	54.0000	57.0000	12.0000	57.0000	0.0000	0.0000
NDME and PQA Expansion Program	51.6408	21.8006	49.8817	6.8364	7.6080	6.8354	4.7590	785.0000	507.0000	0.0000	0.0000
Monitoring and Control of DUs	60.8599	4.4343	1.6886	318.9000	478.3500	914.1800	754.7300	29.0722	21.9814	0.0000	0.0000
Generator Monitoring	0.0000	0.0000	0.0000	365.1899	152.6440	97.8499	103.0919	382.6800	0.0000	0.0000	0.0000
TOTAL	1,281.8914	1,135.5025	1,076.5129	2,914.2132	2,080.6644	2,443.6678	2,358.3216	5,581.9242	11,259.0499	9,071.8577	5,057.9869
					10,873.3798						

10.5 Telecommunications

10.5.1 Fiber Optic Network Expansion

The following are diagrams for the 2024–2050 programmed additions for the Fiber Optic network. The expansions include optical fiber links resulting from new transmission line projects as well as OPGW retrofitting on existing TL programmed in this section:

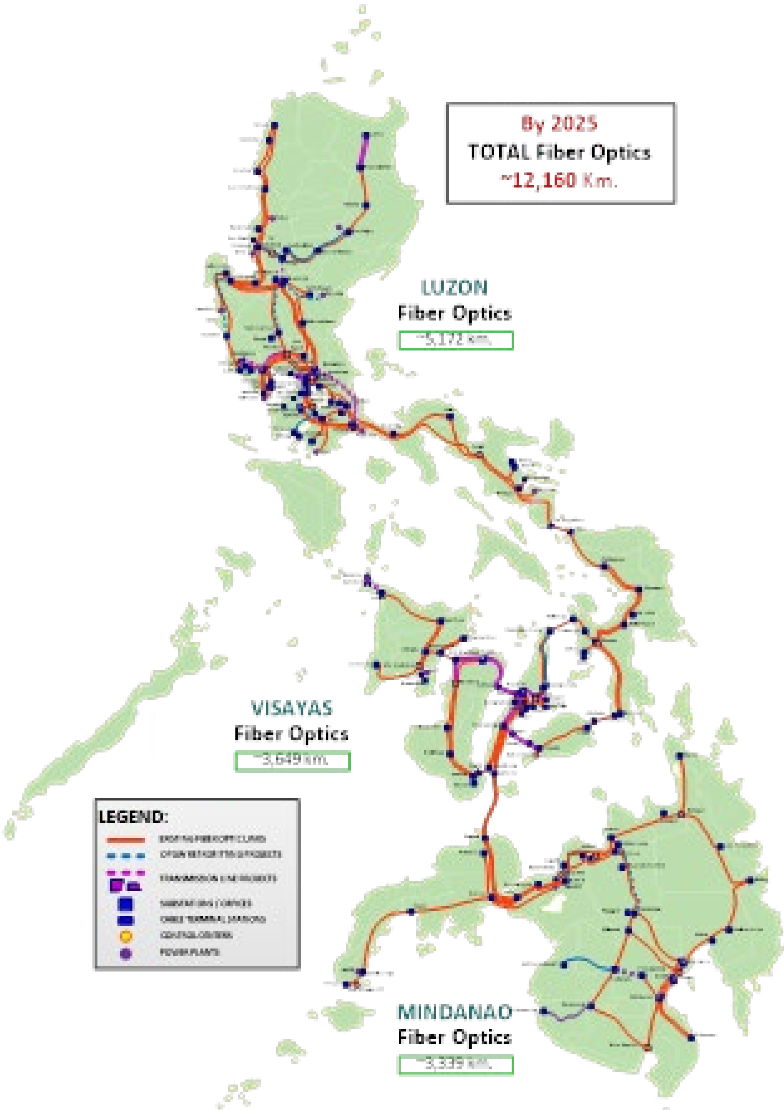


Figure 10.4: FO Network by 2025

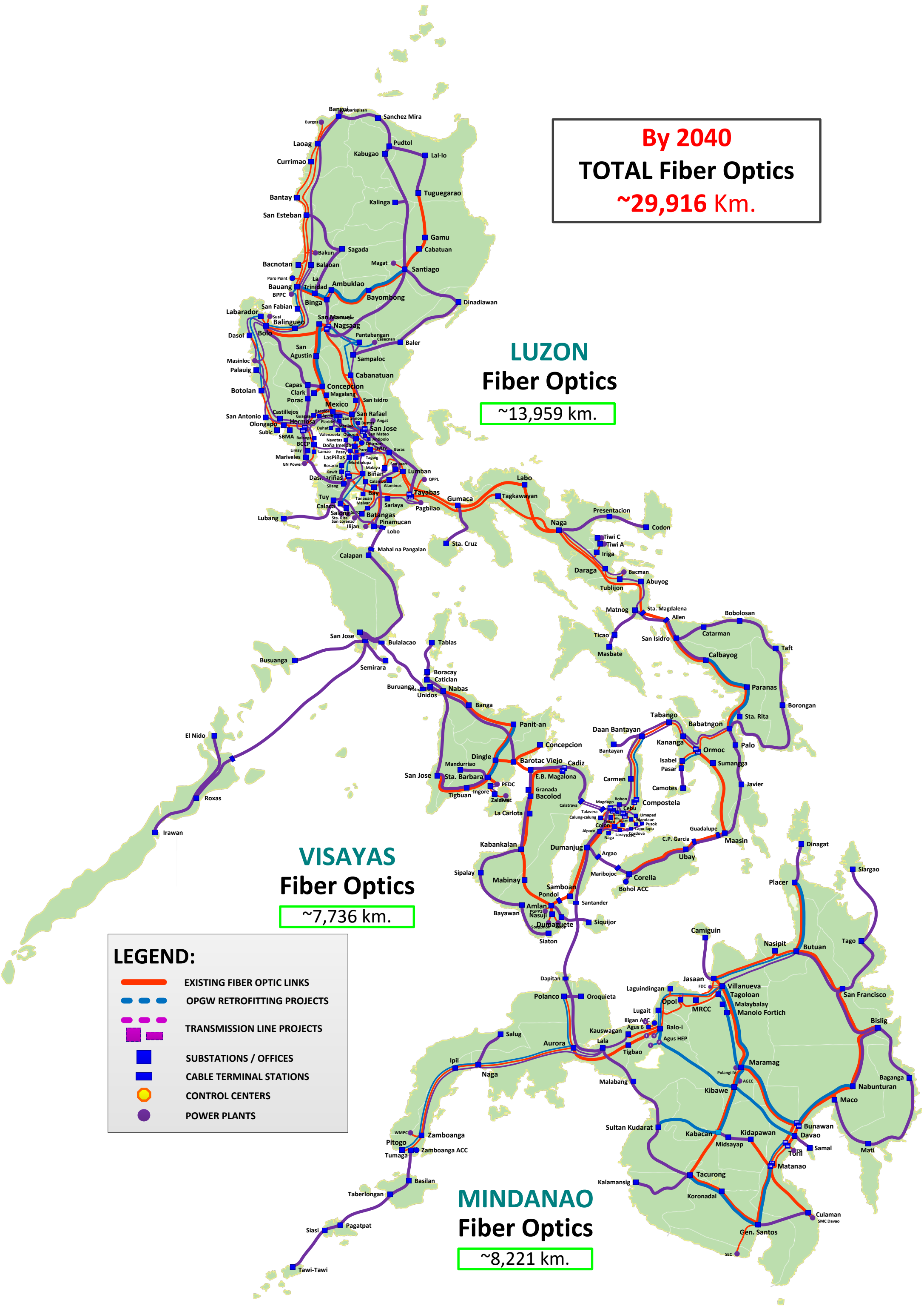


Figure 10.5: FO Network by 2040

10.5.2 IP Transport Network Implementation

The need to adopt a high capacity and purely-IP-based telecommunication infrastructure calls for a phased implementation of the telecommunication transport system migration to optimize the life of existing TDM/SDH equipment. The cost for migration has been outweighed by the cost of sustaining and provisioning legacy equipment whose respective O&M efficiencies have been surpassed by modern technology. Thus, the current SDH transport network would be sustained only up to the elements' economic lives where feasible and legacy TDM applications would be run on emulated mode (over IP) until such time that the applications themselves have migrated into their respective IP modes. New application requirements which demand for high bandwidth and secure telecommunication network render SDH transport system obsolete for obvious capacity limitation. The fairly mature Optical Transport Network (OTN) technology is preferred to address the new mission-critical network requirements. It offers the advantages of being flexible, open technology, scalable, and cost-effective long-term infrastructure solution. It is aimed to increase network performance by lowering latency, increasing network manageability, and paving the way for the network to embrace purely IP-based networks and Software-Defined Networking as planned.

The acquisition of new IP-based transport appliances, therefore, should be complemented by the choice of the adequate transport protocols, reinforcement of the network management centers and putting in place of appropriate out-of-band network probes to ensure that performance thresholds are met.

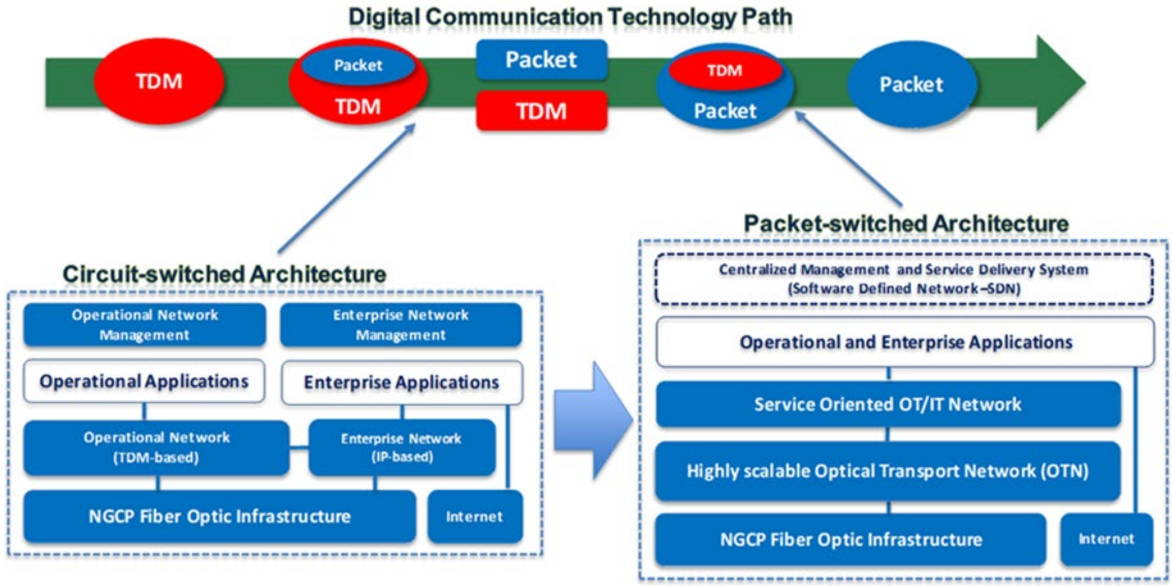


Figure 10.6: NGCP ICT Infrastructure Migration Path

10.5.3 Network Synchronization

The following NGCP network elements require a common reference clock—i.e., they need to be synchronized—for reasons peculiar to their respective functions and nature of operations:

- **Telecommunications**—High-speed digital transmission technology requires synchronous telecommunication nodes
- **SCADA/EMS**—Data monitoring/recording especially those from synchro phasor measurements, for purpose of power flow analysis and eventual automated control, must be synchronized
- **Grid Protection**—Protection relays and event/waveform recorders require accurate time stamps for network performance analysis and post-event diagnostics
- **Metering**—Accurate billing information requires standard time reference

On a national scale, a synchronized timing system is also necessary to coordinate events and activities among the various collaborating government agencies and public utilities. Republic Act No. 10535, also known as The Philippine Standard Time Act of 2013, orders the synchronization of all clocks in the country under the Philippine Standard Time (PST).

Such need for synchronization is especially relevant as NGCP prepares for Smart Grid. Precise timing is necessary if coordinated supervisory control and quick reaction to fast changes in real-time data would be realized to meet Smart Grid standards.

A unified synchronization system with stratum 1 traceability to a primary reference clock source has been established for NGCP to provide synchronization requirements to all the installed based network elements. This shall cover all telecommunications, SCADA, protection, metering, enterprise data network and other substation devices. The sync system shall continue to provide legacy timing protocols such as IRIG-B, 1PPS and 1PPM to old but functional network elements requiring such.

The installation of synchronization clocks at 138kV, 230kV and 500kV substations has been completed (refer to Appendix 10) and all network elements are currently being integrated for unified clock reference.

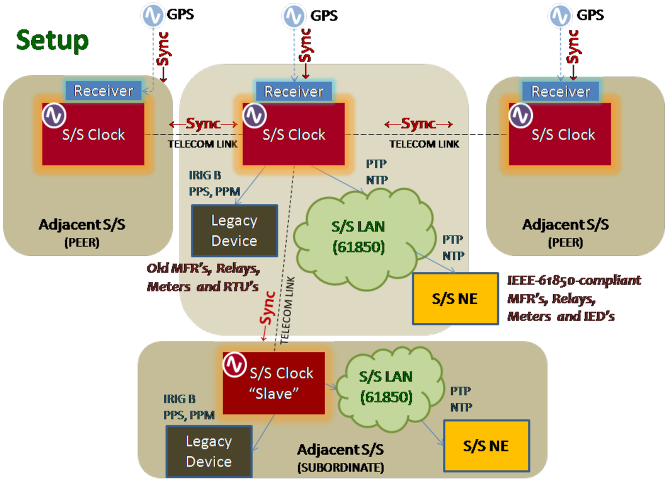


Figure 10.7: Network Synchronization

10.6 SCADA Programs

10.6.1 National System Operations

With the interconnection via HVDC transmission system of the Visayas and Mindanao Grids, there would be a holistic view of the Philippine Grid as a single interconnected network. In consonance with this concept, a centralized monitoring and control is envisioned to be established to support the integrated operation of the transmission system and dispatch of all generation in the Philippines. The National System Operations (NSO) would be responsible for the whole grid operations of the interconnected Luzon, Visayas and Mindanao grids. Moreover, the replacement of the near obsolete SCADA/EMS System should be timely in anticipation of the integration of the WESM operation among Luzon, Visayas and Mindanao to ensure continuous exchange of information between a unified SO and the Market Operator.

The replacement/upgrade of SCADA/EMS for the three RCCs will realize the implementation of a National SO – the control center of which would be co-located with Luzon's. These replacement programs are harmonized with the implementation timeline of the MVIP towards the planned unification of the Philippine Grid against a nationwide resource-optimization objective.

The National System Operations (NSO) would be responsible to carry out the following Grid-management lookouts:

- Supervise, monitor and control all interconnection of the three Regions (Luzon, Visayas and Mindanao)
- Monitor and control HVDC interconnection system during normal and emergency conditions
- Manage the respective transmission backbones of the three regions (i.e. 500kV of Luzon, Visayas interconnection and 230kV of Mindanao
- Conduct of simulation studies for the whole grid necessary for decision making
- Supervise the implementation of Planned Activity Notice (PAN) of HVDC interconnection and the transmission backbone
- Supervise the operations of the three Regional Control Centers
- Coordinate with the Market Operator for the implementation of the RTD schedules of the three Regions
- Forecast week ahead and day ahead of the three Regions

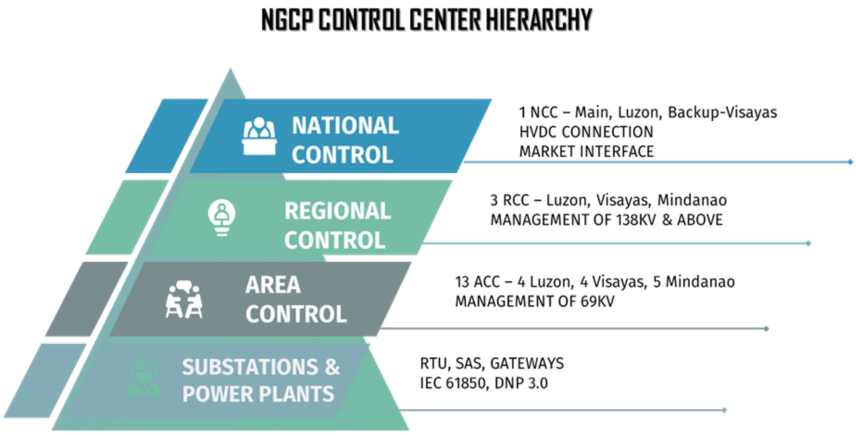


Figure 10.8: SCADA-EMS Hierarchical Framework

The backup RCC's would continue to operate using the existing platform in parallel operation with the upgraded SCADA-EMS systems to serve as redundant control center facilities for the purpose of business continuity.

10.6.2 EMS Advanced Applications

Computer-aided EMS technology has been around since the 1980s and works in conjunction with SCADA systems to optimize generation and transmission resources. EMS advanced applications (software) are automation tools employed by electric power utilities designed for specialized tasks at hand within the realm of such resource optimization. NGCP EMS enhancement project involves the acquisition of preferred EMS advanced applications intended to:

- Meet Current Market Demands
    - The rapidly growing number of network elements—especially by the integration of embedded generators into the Market—requires more management attention and faster reaction.
    - Integration of more VRE into the supply pool requires quicker anticipation and more automated control
    - Efficient dispatch means less cost of electricity
- Adapt to and Take Advantage of New Technology
    - Lower cost of electronics means faster processing—an opportunity to pack more intelligence and automation into EMS
    - Greater bandwidth and less latency in IP communications afford access to more network elements, thereby facilitating greater control
    - Improve Performance should tap all available tools within the bounds of economics which will allow us to ensure that service availability and power quality are within performance thresholds
    - EMS is the brain behind an automated Grid management system—there is always room for more intelligence

NGCP's EMS enhancement program was started during the 3rd Regulatory Period driven by the above considerations—following is the development road map.

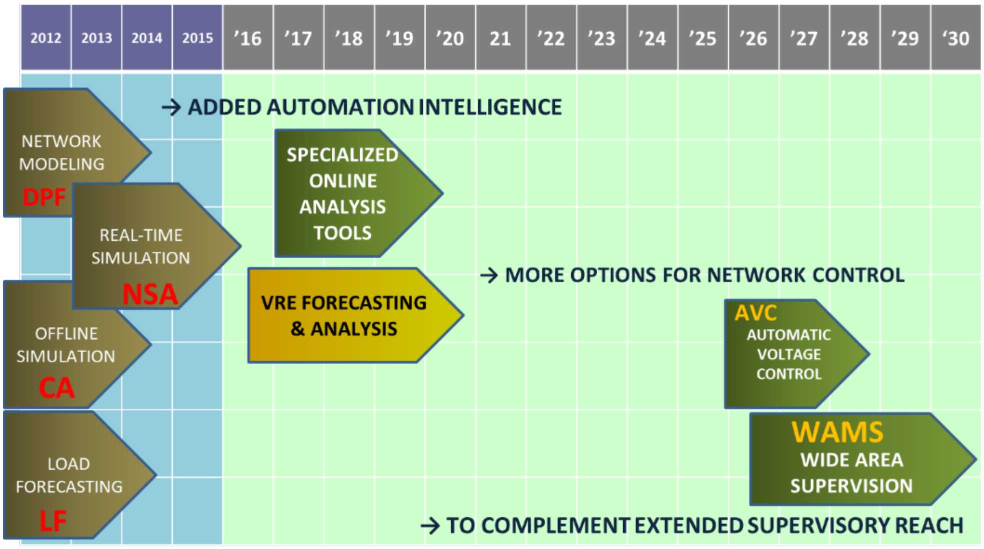


Figure 10.9: EMS Development Road Map

10.6.3 Cyber Security

As SCADA and substation automation systems increasingly play a vital role in NGCP as it works towards efficient operations, the need to protect these network elements from unauthorized access and threats becomes an increasingly significant task. The risks of security breaches are great if not attended to properly. Securing these systems, however, is not so simple: these systems are always exposed to access by a multitude of personnel and the need for data exchange with other systems requires interconnection to external networks. A comprehensive cyber-security system should be employed to address all possible threats to the system and cyber-security principles shall be considered in all aspects from planning and design to operations and maintenance.

The continuous cyber security implementation and improvement aims to enhance protection of NGCP's facilities from internal and external cyber threats and to prevent unauthorized access of SCADA facilities to ensure utmost degree of security for a more reliable power grid. This is also in compliance with the Department of Information and

Communications Technology (DICT) National Cyber Security Plan 2022 wherein Critical Infostructure (CII), including the energy sector, should assure continuous operation and implement cyber resiliency measures to enhance the ability to respond to threats before, during, and after attacks.

Figure 10.10 illustrates the SO ICS architecture and security measures implemented based on layered security level, while Figure 10.11 shows the Cyber Security Framework Functions:

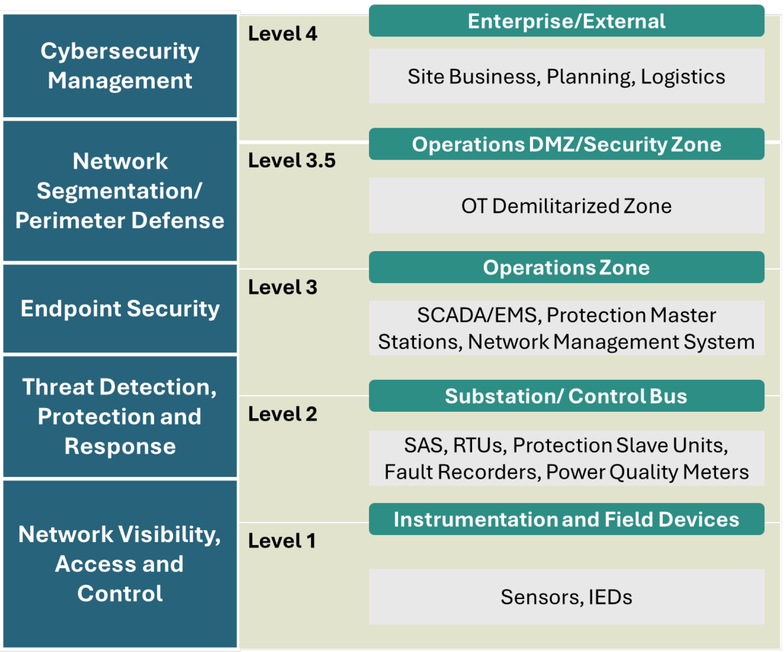


Figure 10.10: SO OT Architecture

Figure 10.11 Cyber-Security Framework Functions

The NIST defined OT as "programmable systems or devices that interact with the physical environment (or manage devices that interact with the physical environment). Examples include industrial control systems, building management systems, fire control systems, and physical access control mechanisms." The SCADA/EMS system, substation automation system (SAS), telecom management system, protection management system (PMS), network disturbance monitoring system and power quality monitoring system are among those qualified OT systems that are critical to the operations and safety of the grid.
Threats to OT system can come from numerous sources including hostile governments, terrorist groups, disgruntled employees, malicious intruders, complexities, accidents, and natural disasters.
Following are the major objectives for cyber security implementation in OT system:

a. Control of logical access to the network
b. Restrictions of physical access to the network
c. Protect OT equipment from exploitation and possible penetration
d. Detection of events and incidents
e. Maintain functionality during emergency condition
f. Recover and restoration after an abnormal or emergency condition

10.6.4 Real-time Monitoring and Control for Distribution Utilities

The project to install Real-Time Monitoring and Control Equipment for DUs in compliance with DOE's request for its inclusion in NGCP's 4th Regulatory Period CAPEX program. This in compliance with the implementation of DOE's Circular No. DC2012-030994 and DC No.2010-08-0010, entitled, "Addressing Power Supply Situation including rationalization of Available Capacities in Mindanao Grid" and "Prescribing the Implementing Rules and Procedures for Department Circular No. DC2010-05-006, entitled, Terminating the Default Wholesale Supplier Arrangement for Philippine Wholesale Electricity Spot Market (WESM) and Declaring a Disconnection Policy", respectively.

At present, control of NGCP's load customers is up to the substation level only which—while adequate for managing load limits to sustain system stability and power quality—would not allow SO's selective control over the customers connected to one feeder.

Following is an illustration of the proposed installation at each DU's connection point.

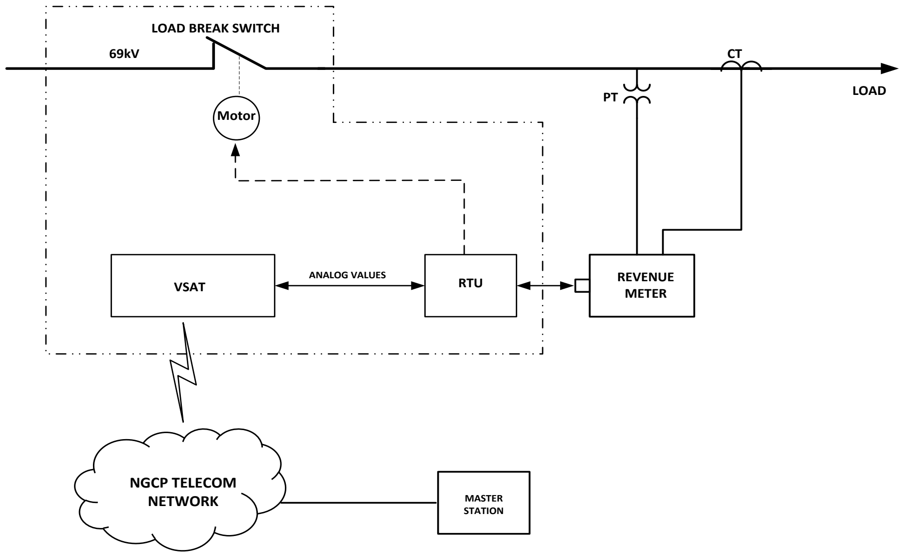


Figure 10.12: Connection Diagram for DUs

The connection diagram shows the wiring linkages of the new system facility including the telecommunication component. These will be remotely monitored and controlled by the master station located in NGCP's control center. The figure below is an illustration of the physical setup at the customer side.

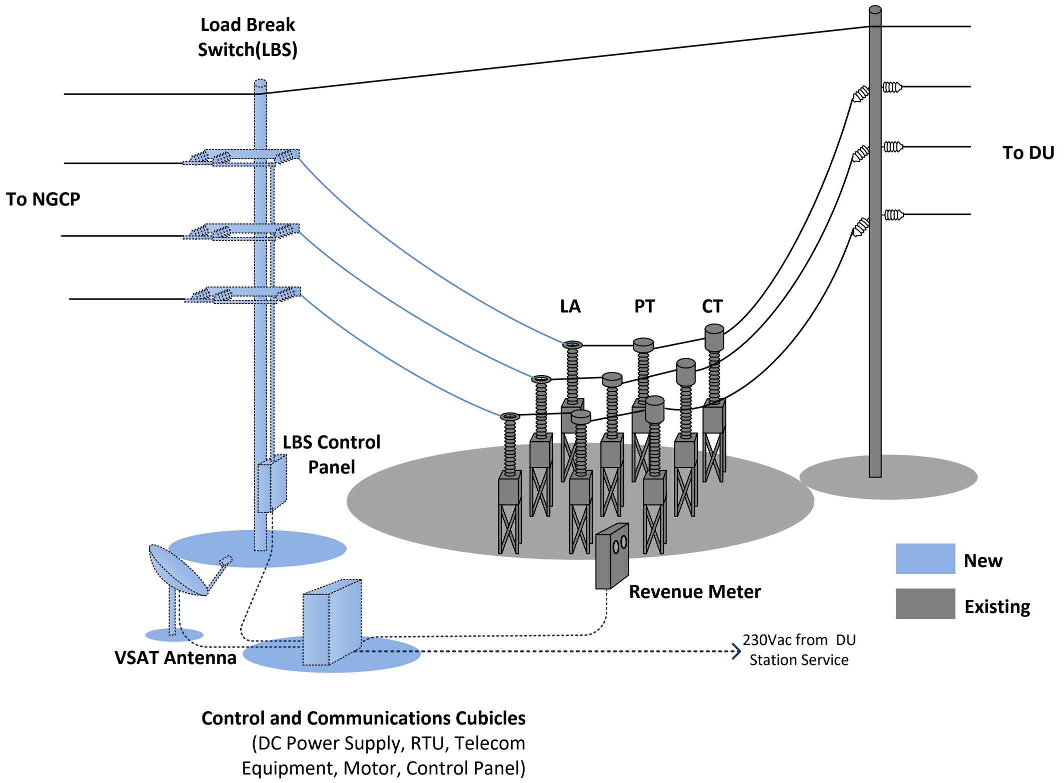


Figure 10.13: Physical Setup for DU Monitoring and Control

10.7 Network Protection and Power Quality

10.7.1 Network Disturbance Monitoring Equipment and Power Quality Analyzer Program

The undesired tripping of transmission lines and high voltage equipment in the grid are sometimes caused by non-operation or malfunction of the fault clearance system. The delay in the resolution of the cause of network failure and subsequent correction of network deficiencies is on account of the non-availability of fault data due to the lack of functional NDME's. Obsolescence and degradation because of age have also lessened the effectiveness of existing NDME's. Sustenance of NDME effectiveness should therefore be addressed through a replenishment program meant to meet outstanding deficiencies in this respect.

Power quality issues are prevalent in connection points along long multi-tap feeders, those subjected to significant supply-demand incongruence between peak and off-peak periods, lines with dynamic power flows, areas with connected inverters such as those used by VRE's and battery energy storage systems as well as nodes which are connected to large non-linear time-varying loads (e.g., steel mills).

NGCP's previous plan was to install PQAs at all NGCP customer connection points. However, an alternate less-costly compliance plan was formulated where PQAs will be installed at the secondary side of transformer which would cover the monitoring of all the connected feeders—reducing the total PQAs for installation. The proposed monitoring scheme is shown in Figure 10.14. The use of portable PQAs for deeper investigation into the customer side would complement this arrangement.

Hand-in-hand with the installation of PQAs is the establishment of a centralized Power Quality Management System (PQMS). With the growing number of installed PQAs, manual processing of PQ data will require extensive effort and become time-consuming. To address this, the proposed PQMS shall be able to manage bulk, raw data coming from different brands of PQAs and will automate report generation in accordance with PGC PQ parameters.

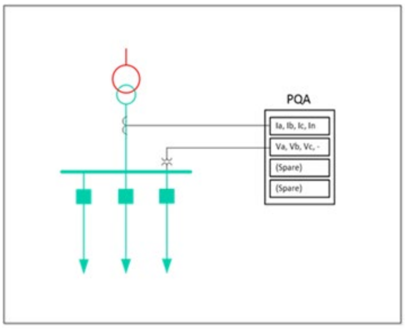


Figure 10.14: PQA installation at the secondary side of transformer

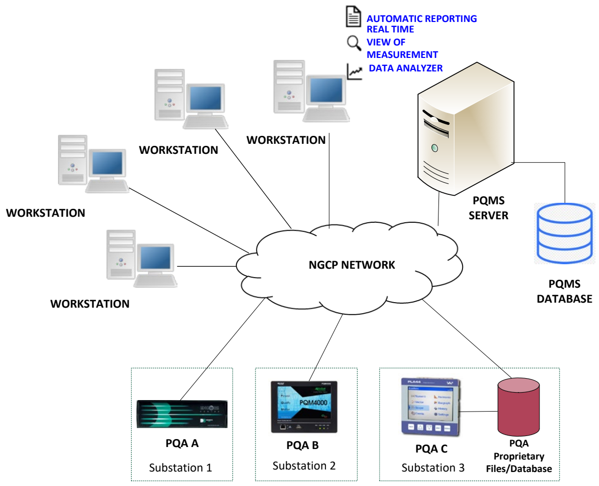


Figure 10.15: Proposed System Architecture

10.7.2 Protection Relay Replacement Program

To meet PGC security and reliability objectives, the fault clearance system needs to be enhanced through the replacement/upgrading of obsolete and defective protective devices and equipment as well as the installation of new protection systems. Aligned with the Smart Grid model, protective relays with enhanced communication systems and more interfacing options shall be incorporated to cover protection of all network elements which include transmission line, transformer, bus, and breaker-fail components. A relay replacement program prioritized according to results of risk assessment is as follows.

Table10.7 Overall Priority Table for Replay Replacement Program

Category of Replacement	Line Protection	Transformer Protection	Bus Protection	Breaker Fail Protection	Feeder Protection	Reactor Protection	Total
No Main 1	0	0	4	17	0	0	21
No Main 2	0	28	31	n/a	0	0	59
Non-Compliant	169	33	32	39	0	0	273
Obsolete	361	78	52	384	2	10	887
Defective	7	0	0	0	0	0	7
Total	537	139	119	440	2	10	1,247

Appendix 1

Project Clustering

North Luzon 500/230 kV Transmission Projects for Reliability 1

- Bataan 230 kV Grid Reinforcement Project 2
- Castillejos 230kV SS
- Dasol 230kV SS
- Hermosa–San Jose 500kV TL
- Luzon Voltage Improvement Proj 3
- Mariveles–Hermosa 500kV TL
- Olongapo 230kV SS
- Palauig 500 kV Substation Project
- Western 500 kV Backbone Stage 1
- Western Luzon 500kV Backbone Stage 2
- San Isidro 500 kV Substation Project

North Luzon 500/230 kV Transmission Projects for Reliability 2

- Ambuklao–Binga 230 kV TL
- Baler 230kV SS
- Binga–San Manuel 230 kV TL
- Bolo 5th Bank Project
- Cabanatuan–Sampaloc–Nagsaag 230kV TL
- La Trinidad–Calot 69kV TL
- Luzon Voltage Improvement Project
- Nagsaag–Santiago 500kV TL
- Sampaloc 230kV SS
- Sampaloc–Baler 230kV TL
- San Manuel-Nagsaag 230kV TL Project
- Luzon PCB for grid connection

North Luzon 500/230 kV Transmission Projects for Reliability 3

- Balaoan–Laoag (Burgos) 500kV TL
- Bauang–La Trinidad 230kV TL Upgrading
- Bolo–Balaoan 500kV TL
- Luzon Primary Equipment SS Upgrading Project
- Luzon Voltage Improvement Project 3
- North Luzon SS Upgrading Project
- Northern Luzon 230kV Loop
- Pinili 230kV SS
- San Fabian 230kV SS Project
- Santiago-Magat 230 kV TL Reconductoring Project
- Tuguegarao–Lal-lo 230kV TL
- Tuguegarao–Enrile 69kV TL

North Luzon 230kV/115 kV Transmission Projects for Reliability

- Capas 230 kV SS
- Clark–Mabiga 69kV TL
- Concepcion–Sta. Ignacia 69 kV TL
- Luzon Voltage Improvement Project 5
- Magalang 230 kV Substation Project
- Minuyan 115 kV Switching Station
- Nagsaag–Tumana 69 kV TL
- North Luzon SS Upgrading Project II
- San Rafael-San Jose 230kV TL
- Plaridel 230kV SS
- Porac 230 kV SS
- San Simon 230kV SS

South Luzon 500/230 kV Backbone Project for Resiliency and System Reliability

- Batangas-Mindoro Interconnection and Backbone
- Calaca-Dasmarinas 230kV TL
- Calamba 230kV SS
- Calaca-Salong 230kV TL 2 Project
- Ilijan 500 kV Substation Upgrading Project
- Kawit 230kV SS
- Luzon Voltage Improvement Project 6
- Masiit 230 kV Substation Project
- Pagbilao EHV SS
- Pagbilao–Tayabas 500kV TL
- Palawan- Mindoro Interconnection Project (Stage 1)
- Pinamucan 500kV SS
- Pinamucan-Tuy 500kV TL Project
- Silang 500kV SS
- Sta. Maria 500 kV Substation Project
- Quezon-Marinduque Interconnection Project
- Tanauan 230kV SS
- Tuy 500/230kV SS (Stage 1)
- Tuy 500/230kV SS (Stage 2)
- Tagkawayan 500 kV SS

South Luzon 230/115 kV Transmission Project for Resiliency and System Reliability

- Abuyog 230kV SS
- Camarines Sur-Catanduanes Interconnection Project
- Daraga–Bitano 69kV Line
- Eastern Albay 69kV TL
- Luzon Voltage Improvement Project 4
- Luzon Voltage Improvement Project 5
- Luzon–Visayas HVDC Bipolar Operation Project
- Permanent Restoration of Tower Damaged by Typhoon Tisoy
- Salvacion-Sta. Misericordia 69kV TL
- South Luzon SS Upgrading Project Stage 1
- South Luzon SS Upgrading Project Stage 2
- Tiwi SS Upgrading
- Tower Resiliency of Bicol Transmission Facilities

Metro Manila Backbone (North) Projects for Resiliency System Reliability and Smart Grid Development

- Marilao 500kV SS
- Marilao–Mexico 230kV TL
- Marilao-Navotas 230kV TL (Associated component of Navotas SS)
- Navotas–Dona Imelda 230kV TL

Metro Manila Backbone (South) Projects for Resiliency System Reliability and Smart Grid Development

- Antipolo 230kV SS
- Baras 500kV SS
- Luzon Voltage Improvement Project 3
- Malaya 230 kV Collector Station Project
- Manila (Navotas) 230kV SS
- Pasay 230kV SS
- Silang–Taguig 500kV TL
- South Luzon SS Upgrading Project Stage 1
- Taguig 500kV SS
- Taguig-Taytay 230kV TL

Projects for Resiliency, System Reliability and Island Interconnection

- Cebu-Negros-Panay 230 kV Backbone Stage 2
- Cebu-LapuLapu Transmission Project
- Cebu-Negros-Panay 230 kV Backbone Stage 3
- Laray 230 kV Substation Project (Initially energized at 138 kV)
- Nivel Hills 230 kV Substation Project
- Cebu-Bohol 230 kV Interconnection Project
- Naga Substation Project

Leyte, Samar and Bohol 230/138 kV Backbone Projects for Resiliency, System Reliability, and Island Interconnection

- Babatngon–Paranas 138 kV TL Upgrading
- Sta. Rita 138 kV Substation Upgrading Project
- Babatngon–Palo 230 kV TL Project (Initially energized at 138 kV)
- Bool 138kV SS Project
- Calbayog-Allen TL Project
- Cebu-Leyte 230kV Interconnection Lines 3 and 4 Project
- Corella-Ubay 138kV Line 2 Stringing Project
- Ormoc-Babatngon 230kV TL Project

Negros and Panay 230/138 kV Backbone Projects for Resiliency, System Reliability, and Island Interconnection

- Amlan–Dumaguete 138 kV TL Project
- Banga 138kV SS Project
- Barotac Viejo–Natividad 69 kV TL Proj
- Bayawan–Sipalay 138 kV TL (Initially energized at 69 kV)
- Cebu–Negros–Panay 230 kV Backbone - Stage 1
- Granada 230 kV SS Project
- La Carlota 138 kV SS Project
- Nabas–Caticlan–Boracay TL Project

Northeastern Mindanao 230/138 kV Backbone Project for Resiliency, System Reliability, and Island Interconnection

- Eastern Mindanao 230 kV TL Project
- Mindanao SS Expansion 4 Project
- Mindanao SS Rehabilitation Project
- Mindanao SS Upgrading 2 Project
- Mindanao SS Upgrading Project
- San Francisco–Tago 138 kV TL Project
- Gango SS Project

Appendix 1

- Colon-Samboan Upgrading Project 1
- Visayas Substation Upgrading Proj 1
- Danao 230 kV Substation Project
- Laray-San Fernando 230 kV Substation Project
- Laray-Cordova 230 kV Interconnection Project
- Lapu-lapu 230 kV Substation Project
- Mindanao-Visayas Interconnection Project
- Visayas Voltage Improvement (Stage 1)
- Cebu-Negros-Panay 230 kV Backbone Stage 1
- Visayas Voltage Improvement Project 2 (Stage 1)
- San Fernando 230 kV Substation Project
- Pusok-Cordova 230 kV Interconnection Project
- Sumangga 138 kV SS Project
- Tagbilaran 69kV SS
- Typhoon Ursula Restoration Project
- Visayas SS Upgrading Project 2
- Visayas Voltage Improvement Project (Stage 2)
- Visayas Voltage Improvement Project 2 (Stage 2)
- Visayas 69 kV Transmission Line Upgrading Project
- Tabango–Biliran 69 kV TL Project
- Bohol–Leyte 230 kV Interconnection Project
- Corella-Ubay 230 kV Transmission Line Project
- Maasin–Sogod 230 kV TL Project
- Palo–Sogod 230 kV TL Project
- Taft–Oras 138 kV TL Project (Initially energized at 69 kV)
- Bobolosan–Mapanas 138 kV TL Project (Initially energized at 69 kV)
- Catarman–Mapanas–Oras 138 kV TL Project
- Victoria–Catarman 138 kV TL Project
- Babatngon–Sta. Rita 138 kV TL Project
- Borongan–Taft 138 kV TL Project
- Relocation of Transmission Towers in Leyte Project
- Babatngon–Calbayog 230 kV TL Project
- Visayas Regional PCB Replacement Project
- Negros–Panay 230 kV Interconnection L2 Project
- Tigbauan 138 kV SS Project
- Panay–Guimaras 138 kV Interconnection Project
- Panay–Guimaras 138 kV Interconnection Project Line 2
- Siaton–Bayawan 138 kV TL (Initially energized at 69 kV)
- Sipalay 138 kV SS Project
- Visayas SS Upgrading Project 2
- Visayas SS Upgrading Project 3
- Visayas SS Upgrading Project 4
- Visayas Mobile Capacitor Bank Project
- Barotac Viejo–Unidos 230 kV TL Project
- Mandurriao 138 kV SS Project
- Bacolod–Kabankalan 230 kV TL Project
- Cebu–Negros 230 kV Interconnection Lines 3 and 4
- Barotac Viejo–Sta. Barbara 230 kV TL Project
- Negros–Guimaras 230 kV Backbone Project
- Panay–Guimaras 230 kV Backbone Project
- Calatrava–Granada 230 kV TL Project
- Siaton–Dumaguete 138 kV TL Project
- San Jose–Nabas 138 kV TL Project
- Cebu-Negros-Panay 230kV Backbone Stage 3
- E.B. Magalona 230 kV Substation Project
- Visayas PCB for Grid Connection Project

Northwestern Mindanao 230/138 kV Backbone Project for Resiliency, System Reliability, and Island Interconnection

- Agus 6–Kiwalan–Lugait 69 kV TL Project
- Balo-i-Kauswagan-Aurora 230 kV TL
- Kauswagan-Lala 230kV TL
- Lala – Sta. Clara –Tumaga 230 kV Transmission Line Project (formerly Lala-Naga-Zamboanga 230 kV Transmission Line Project)
- Laguindingan 230kV SS Project
- Mindanao SS Upgrading 2 Project (MSU2P)
- Mindanao - Visayas Interconnection Project
- Naga (Min) –Salug 138 kV TL Project
- Mindanao SS Expansion 4 Project
- Mindanao SS Rehabilitation Project
- Mindanao SS Upgrading 2 Project
- Mindanao SS Upgrading Project
- Oroquieta 69 kV Switching Station Project
- Polanco-Oroquieta 138kV TL Project
- Tigbao 138kV SS Project
- Polanco – Roxas 69 kV TL Project
- Tumaga 138kV SS Project
- Zamboanga Peninsula Voltage Improvement Project (ZPVIP)

Southeastern Mindanao 230/138 kV Backbone Project for Resiliency, System Reliability, and Island Interconnection

- Eastern Mindanao Voltage Improvement Project
- Maco–Tagum 69 kV TL Project
- Maco–Mati 138 kV TL
- Mindanao SS Expansion 4 Project
- Mindanao SS Rehabilitation Project
- Mindanao SS Upgrading Project
- Bunawan-Tagum 230 kV TL Project
- Culaman – Gen. Santos 230 kV TL Project

Southwestern Mindanao 230/138 kV Backbone Project for Resiliency, System Reliability, and Island Interconnection

- Kabacan SS
- Koronadal 138kV SS Project
- Mindanao SS Rehabilitation Project
- Mindanao SS Upgrading Project
- Tacurong–Kalamansig 69 kV TL Project
- Mindanao SS Expansion 4 Project
- Sultan Kudarat (Nuling) Capacitor
- Sultan Kudarat-Tacurong 230kV TL Project 2

Prospective Power Plants

Proponent	Projects	Total Capacity (MW)	Proposed Year of Entry [5]	Location
Luzon				
Pristine Green Fuel Solutions Corp.	10 MW Sunshine Solar Power Project	10	2022	Bulacan
2 Barracuda Energy Corp. (2BEC)	150 MW Bay Floating Solar	150	2024	Laguna
4 Barracuda Energy Corp. (4BEC)	200 MW Calamba Floating Solar Plant Project	200	2023	Laguna
AC Laguna Solar, Inc.	250 MW Rizal Floating Solar	250	2024	Rizal
ACX3 Capital Holdings Inc. (ACX3)	600 MW Lubang and Looc Island Wind Power Project	600	2027	Batangas
Alternergy Tanay Wind Corporation (ATWC)	49 MW Alabat Wind Power Project	49	2025	Quezon
Angat Hydroelectric Corp	218 MW Angat Hydro Rehab Project	218	2022	Bulacan
Angat Hydroelectric Corp	Angat HEPP AUX 4 AND AUX 5 Rehabilitation Project	26.571	2025	Bulacan
Arcana Wind Energy Corp. (AWEC)	400 MW Quezon-Camarines Norte Wind Power Project	400	2033	Quezon
Bataan 2020, Inc. (B2020)	25 MW Coal Cogeneration Power Plant Project	25	2020	Bataan
Bicol Ancillary Services Inc. (BASI 2)	50 MW Namantao Diesel	50	2021	Albay
Bicol Ancillary Services Inc. (BASI)	100 MW Kiwalo Diesel	100	2021	Albay
Bimaka Renewable Energy and Development Corp. (Bredco)	7 MW Besao 2 Hydroelectric Power Plant Project	7	2024	Benguet
Camsur II Wind Energy Corp. (CWEP II)	±50 MW Bay Energy Storage Project	±50	2024	Laguna
Cell Power Energy Corporation (CPEC)	20 MW Bay BESS	20	2022	Laguna
Citicore Power Inc. (CPI)	45 MW Bato Solar	45	2023	Zambales
Citicore Power, Inc. (CPI)	25.7 MW Ilaguen 3A Hydro Electric Power Plant	25.7	2020	Isabela
Citicore Renewable Energy Corp. (CREC)	51.55 MWAC Tuy Batangas 4 Solar Power	51.55	2023	Batangas
Citicore Solar Quezon Inc (CSQI)	70 MW Pagbilao 1 Solar Power Project	70	2024	Quezon
Citicore Solar Quezon, Inc. (CSQI)	37.801MWP/27.000 MWAC Pagbilao 2 Solar Power Project	27	2024	Quezon
Cleantech Global Renewables Inc. (CTGRI)	125 MW Kalayaan 4 South Wind Energy Project	125	2024	Laguna
Cleantech Global Renewables Inc. (CTGRI)	150 MW Tayabas South Wind Energy Project	150	2025	Quezon
Cleantech Global Renewables Inc. (CTGRI)	330 MW Bulalacao One Onshore Wind Energy Project - Phase 1	144	2027	Oriental Mindoro
Cleantech Global Renewables Inc. (CTGRI)	330 MW Bulalacao One Onshore Wind Energy Project - Phase 2	186	2028	Oriental Mindoro
Cleantech Global Renewables, Inc. (CLEANTECH)	22 MWP (19 MWAC) Bulacan Solar Power Plant Project	22	2020	Bulacan
Domhain Earth Corporation	1830 MW Calatagan Offshore Wind Farm	1830	2030	Batangas
Earth Sol Power Corp. (ESPC)	300 MW Bagac Onshore Wind Project	300	2028	Bataan
Earth Sol Power Corp. (ESPC)	500 MW Bagac Offshore Wind Project	500	2027	Bataan
East Cost Fas Renewable Energy and Industrial Corporation (ECOFAS)	Sta. Maria Solar Power Plant Project	30		Cagayan
EMCRII Resource, Inc.	Pilipinas Einstein Solar PV Power Plant	50		Pangasinan
EMCRII Resource, Inc.	Pilipinas Newton Solar PV Power Plant	50		Pangasinan
Energence	35 MW Clark Solar Power Plant	35	2024	Pampanga
Energy Development Corp	100 MW EDC Burgos 3 Wind Power Project	100	2026	Ilocos Norte
Energy Development Corporation (EDC)	177 Matnog Wind Power Plant Project	60	2022	Albay
Energy Logics Ph Inc (ELPI)	130 MW Pasuquin Wind Power Project	130	2024	Ilocos Norte
EPBWC / Energy Development Corp	120 MW EBBWPC Burgos 2 Wind Power Project	120	2026	Ilocos Norte
Exa Wind Energy Corp. (EWEC)	500 Bicol Wind Power Project	500	2033	Quezon
First Gen Ecopower Solutions, Inc. (FGEPS)	2X630 MW Santa Maria Combined-Cycle Power Plant Project - NATGAS	1260	2023	Batangas
First Gen Visayas Energy Inc. (FGVEI)	100 MW Balayan Bay Wind Power Project	100	2030	Batangas
First Gen Visayas Energy Inc. (FGVEI)	100 MW Laguna - Quezon Wind Power Project	100	2030	Laguna
First Gen Visayas Energy Inc. (FGVEI)	100 MW Zambales Wind Power Project	100	2030	Zambales
First Maxpower International Corporation (FMIC)	50 MW Sanchez Mira Wind Power Plant Project	50	2020	Cagayan
Fuego Renewable Energy Corp. (FREC)	555 MW Offshore Wind Luzon E-1 Wind Power Project	555	2030	Leyte
Giga Ace 6, Inc.	387 MW Real Ace Wind Power Project	387.5	2027	Laguna
Giga Ace 7, Inc.	1020 MW Calatagan Offshore Wind Power Project	1020	2028	Batangas

[5] Based on SIS Applications

Appendix 2

Proponent	Projects	Total Capacity (MW)	Proposed Year of Entry [6]	Location
Giga Ace 8 Ac Energy	79.051 MWAC GIGA ACE 8 Solar Power Plant Project	79.051	2024	Zambales
Global Luzon Energy Development Corporation (GLEDC)	2X335 MW Pulverized Coal (PC) Supercritical Power Plant Project	670	2021	Pangasinan
Greencore Power Solutions 2 Inc. (GPS2I)	75 MW Bolbok 2 Solar Power Project	75	2024	Batangas
Hedcor, Inc.	20 MW Kabayan 1 and 27 MW Kabayan 3 Hydroelectric Power Plant	47		Benguet
Himaya Offshore Energy Corp. (HOEC)	600 MW Basiad Bay Offshore Wind Power Project	600	2028	Quezon
Ingrid Power Holdings, Inc. (IPHI)	300 MW Modular Diesel Power Plant Project	300	2021	Rizal
Island Wind Energy Corp. (IWEC)	200 MW Talim Wind Power Project	200	2024	Rizal
Joy-Nostalg Solaris Incorporated (JNSI)	4 MW Naic Rooftop Solar Power Project	4	2024	National Capital Region
KEPCO Philippines Corporation (KEPCO)	2X500 MW KEPCO Pangasinan Coal-Fired Power Plant Project	1000	2023	Pangasinan
Limay Power Generation Corporation (LPGC)	± 20 MW Concepcion Battery Energy Storage System (BESS) Project	±20	2020	Tarlac
Linde Philippines Inc. (LPI)	3.1 MW Linde Solar	3.1	2023	Pampanga
Mariveles Power Inc.	1200 MW Mariveles LNG	1200	2025	Bataan
Megawatt Solutions Inc	±40 MW Enerhiya Sur II Battery Energy Storage Project	±40	2024	Laguna
Megawatt Solutions, Inc. (MSI)	40 MW Enerhiya Sur I Battery Energy Storage Project	40	2025	Batangas
Millennium Energy Inc. (MEI)	100 MW Millennium Gas Turbine Power Plant (GTPP) Project	100	2021	National Capital Region
Millennium Energy Inc. (MEI)	342 Millennium Gas Turbine Power Project	342	2024	National Capital Region
Mirus Wind Energy Corp. (MWEC)	250 MW Camarines Norte Wind Power Project	250	2027	Quezon
Newasia Power Energy Corp	131.789 MWP Cabuyao 4 Floating PV Power Plant	131.789	2026	Laguna
Newasia Power Energy II Corp	131.789 MWP Cabuyao 5 Floating PV Power Plant	131.789	2026	Laguna
Nortesol	250 MWP (202.8 MWAC) San Pedro Floating Solar Project	202.8	2023	Laguna
Nortesol Incorporated	107.078 MWP Calamba Floating PV Power Plant	107.078	2026	Laguna
Nortesol Incorporated	131.789 MWP Cabuyao 2 Floating PV Power Plant	131.789	2026	Laguna
Nortesol IV, Inc.	131.789 MWP Cabuyao 3 Floating PV Power Plant	131.789	2026	Laguna
Nortesol IV, Inc.	131.789 MWP Victoria 1 Floating PV Power Plant	131.789	2026	Laguna
Northern Palawan Power Generation Corporation	145 MW Cawag Solar Power Project	145	2025	Zambales
Nuevo Solar Energy Corp.	60 MWDC (40 MWAC) Currimao 2 Solar	40	2021	Ilocos Norte
Nuevo Solar Energy Corporation (NSEC)	Additional 8MWAC For Currimao 2 Solar	8	2022	Ilocos Norte
Oneglobal Energy Inc. (OGEI)	±40 MW OGEI Hermosa Battery Energy Storage System (BESS)	±40	2023	Bataan
Oneglobal Energy Inc. (OGEI)	±40 MW OGEI San Manuel Battery Energy Storage System (BESS)	±40	2022	Pangasinan
Oneglobal Energy, Inc. (OGEI)	± 40 MW OGEI Bauang Battery Energy Storage System (BESS) Project	±40	2022	La Union
Pan Pacific Renewable Power Philippines Corp. (PASN PACIFIC)	150 MW Gened 1 Hydro Electric Power Plant (HEPP) Project	150	2023	Apayao
Pan Pacific Renewable Power Phils. Corp (PPRPPC)	220 MW Calanasan 2 Hydroelectric Power Plant	220	2029	Apayao
Pangasinan UPC Asia Corp. (PUAC)	300 MW Puac Laguna Bay 2 Solar Power Plant Project	300	2021	Rizal
Pangasinan UPC Asia Corporation	300 MW Laguna Bay 2 Solar Power Plant Project	300	2028	Rizal
Petrogreen Energy Corporation (PGEC)	19.62 MW San Jose Solar Power Plant	19.62	2025	Nueva Ecija
Quezon Power Phil Limited (QPPL)	1200 MW San Francisco Combined Cycle Power Plant - NATGAS	1200	2026	Quezon
Raslag Corporation	13.6 MW RASLAG 3 Solar Power Plant Project	13.6	2022	Pampanga
Real Wind Energy Inc. (RWEI)	250 MW Real Wind Energy Project Phase 3	250	2025	Laguna
Real Wind Energy Inc. (RWEI)	45 MW Real Wind Energy Project Phase 1	45	2023	Laguna
Real Wind Energy, Inc. (RWEI)	205 MW Real Wind Energy Project Phase 2	205	2024	Laguna
Roxas Green Energy Corporation (RGEC)	30 MW Roxas Solar Plant Project	30		Batangas
San Lorenzo Ruiz Builders and Developers Group Inc. (SLRBD)	12 MW Sampaloc River Hydroelectric Power Plant (HEPP) Project	12	2020	Nueva Ecija
San Miguel Electric Corp. (SMELC)	850 MW Navotas LNG Project	850	2025	National Capital Region
Satrap Power Corporation (SPC)	10 MW Santa Biomass Project	10		Ilocos Sur

[6] Based on SIS Applications

Appendix 2

Proponent	Projects	Total Capacity (MW)	Proposed Year of Entry [6]	Location
SMC Global Light and Power Corp (SGLPC)	178 MW Lucanin Hybrid	178	2023	Bataan
Sn Aboitiz Power Group (SNAP)	±24 MW Magat BESS	±24	2023	Isabela
Solana Solar Alpha, Inc.	SOLANA Solar Power Project	20	2024	Bataan
Solar Philippines	1200 MW Capas Hybrid	1200	2024	Tarlac
Solar Philippines	1200 MW Iba-Palauig Hybrid	1200	2025	Zambales
Solar Philippines	1200 MW Tuy Hybrid	1200	2024	Batangas
Solar Philippines	300 MW Botolan Hybrid System	300	2023	Zambales
Solar Philippines	600 MW Calamba Solar Power Plant Project	600	2025	Laguna
Solar Philippines Commercial Rooftop Projects Inc. (SPCRPI)	300 MW San Ildelfonso Solar Power Plant Project	300	2020	Bulacan
Solarace1 Energy Corporation (SOLARACE1)	120 MWP (89 MWAC) Alaminos Solar Power Plant Project	120	2020	Laguna
Solarace2 Energy Corp. (SOLARACE2)	120 MWAC SOLARACE2 Solar Power Project	120	2024	Zambales
Solus Wind Energy Corp. (SWEC)	300 MW Sorsogon Onshore Wind Power Project	300	2026	Leyte
SP New Energy Corporation (SPNEC)	3500 MWP (2500 MWAC) With 4500 MWH BESS Nueva Ecija 2 Solar-Battery Power Project	2500	2026	Nueva Ecija
Sunwest Water & Electric Co., Inc. (SUWECO)	50 MW Estanza Diesel Power Plant Project	50	2020	Albay
Sunwest Water & Electric Co., Inc. (SUWECO)	50 MW Anislag Diesel Power Plant Project	50	2020	Albay
Sunwest Water & Electric Co., Inc. (SUWECO)	50 MW Sto. Domingo Diesel Power Plant Project	50	2020	Albay
Tera Renewables 3 Corp Cleantech	140 MWAC Infanta 1 Solar Power Project	140	2024	Pangasinan
Therma Mobile, Inc. (TMO)	242 MW Navotas Power Barge Project	242	2020	National Capital Region
Therma Subic, Inc. (TSU)	1310 MW Pagbilao 4 & 5 CCGT Power Plant – Coal	1310	2028	Quezon
Universal Power Solutions, Inc. (UPSI)	± 40 MW Bataan Battery Energy Storage System (BESS) Project	±40	2020	Bataan
Vind Energy Corp	3,038 MW NOMFL1 Offshore Wind Project	3038	2032	Batangas
Vind Energy Corp	994 MW Cavite Offshore Wind Project	994	2030	Cavite
Vires Energy Corporation (VIRES)	450 MW Natural Gas Power Plant	450	2026	Batangas
Zestpower Corporation (ZPZ)	1x660 MW ZPC Coal-Fired Power Plant Project	660	2020	Bataan
5 Barracuda Energy Corp. (5BEC)	300 MW Laguna Lake-Los Baños Solar	300	2024	Laguna
GRM Cagayan Valley, Inc.	48 MW Cagayan Valley Solar Power Project	48	2023	Isabela
Samal Solar Renewable Energy Corporation (SSREC)	48 MW Samal Solar Power Plant	48	2023	Bataan
Alsons Energy Development Corporation	55 MW Bunker C Fired Diesel Power Plant Project	55	2020	Samar
Cleantech Global Renewable Inc.	62 MW Pandan Wind Power Project	62	2027	Aklan
Earth Sol Power Corp (ESPC)	510 MW Oton Bank Offshore WPP	510	2027	Iloilo
Earth Sol Power Corp (ESPC)	588 MW San Lorenzo Wind Power Project	588	2028	Negros Occidental
Magallanes Solar Energy Corp.	175 MW Barotac Viejo Solar Power Plant	175	2025	Iloilo
Reliance Energy Development Inc. (REDI)	300 MW San Carlos Combined Cycle Gas Turbine Power Plant	300	2024	Negros Occidental
Samar II Electric Cooperative, Inc.	1MW Samelco II - Paranas Solar Power Project	1	2023	Samar
South Cleanergy Inc.	171.11 MW Luna Solar Power Project	171.11	2028	Negros Occidental
SPC Island Power Corporation	PB 104 2.0 MW BESS Expansion	32	2022	Bohol
SPC Island Power Corporation	PDPP 1 1.85 MW BESS Expansion	22	2022	Iloilo
SPC Island Power Corporation	PDPP 3 2-7.5 MW BESS Expansion	7.5	2022	Iloilo
The Blue Circle Philippines Cebu Corp. (TBC)	80.6 MW Ibajay Wind Energy Project	80.6	2027	Aklan
Tri-Conti Elements Corporation (TCEC)	600 MW Guimaras Strait I Wind Power Project	600	2025	Negros Occidental
Triconti ECC Renewables Corporation (TERC)	50 MW Bohol 2 (Anda) Wind Power Plant Project	50	2021	Bohol
Tri-Conti Elements Corporation (TCEC)	82.8 MW AC Wind Power Plant Project	82.8	2022	Bohol
Visayas Cleanergy Inc.	297 MW Daga Solar Power Project	297	2028	Negros Occidental
Agusan Power Corporation (APC)	25 MW Lake Mainit Hydro Power Plant Project	25	2020	Agusan Del Norte
Cabanglasan Hydropower Corporation (CHC)	15 MW Pulanai Hydroelectric Power Plant Project	15	2025	Bukidnon
Cell Power Energy Corp (CPEC)	20 MW Toril Energy Storage Project	20	2023	Davao Del Sur
Crystal Sugar Company, Inc.	14.9 MW Bagasse-Fired Cogeneration Power Plant Project	14.9	2020	Bukidnon
Crystal Sugar Company, Inc.	14.9 MW Biomass Cogeneration Plant	14.9	2024	Bukidnon
Energy Development Corporation (EDC)	25 MW Mindanao Binary Power Plant Project	25	2021	North Cotabato
FDC Misamis Power Corporation (FDCMPC)	2x135 MW CFB Coal-Fired Power Plant Expansion Project	270	2024	Misamis Oriental

Proponent	Projects	Total Capacity (MW)	Proposed Year of Entry [6]	Location
FDC Misamis Power Corporation (FDCMPC)	3x135 MW CFB Coal-Fired Power Plant Expansion Project	405	2022	Misamis Oriental
Fort Pilar Energy, Inc. (FPEI)	±20 MW Aurora Battery Energy Storage System (BESS)	±20	2021	Zamboanga Del Sur
Fort Pilar Energy, Inc. (FPEI)	±20 MW Sangali Battery Energy Storage System (BESS)	±20	2020	Zamboanga Del Sur
Fort Pilar Energy, Inc. (FPEI)	±60 MW Pitogo Battery Energy Storage System (BESS)	±60 MW	2020	Zamboanga Del Sur
Giga Ace 9 Inc. (GA9I)	30 MW Davao Battery Energy Storage System	30	2022	Davao Del Sur
Greenlight Solar Farms Tapian Corporations (GSFTC)	50 MW Solar Power Plant Project	50	2020	Sultan Kudarat
Kind Energy Generation, Inc. (KEGI)	20 MW Maramag BESS (KEGI)	20	2021	Bukidnon
King Energy Generation Inc.	8.433 MW MOPP4 Diesel Power Plant	8.433	2021	Zamboanga Del Sur
King Energy Generation Inc. (KEGI)	±20 MW Maramag BESS	±20	2024	Bukidnon
Libertad Power and Energy Corporation (LPEC)	1x6.0MW (5.0MW Net) Biomass Power Plant	6	2023	Zamboanga Del Sur
Limay Power Generation Corporation (LPGC)	±40 MW Villanueva Battery Energy Storage System (BESS)	±40	2020	Misamis Oriental
Lumino Biomass Power Incorporation (LBPI)	50 MW Lumino Cogen Biomass Power Plant Project	50	2025	Surigao Del Sur
Malita Power Inc. (MPI)	28 MW Sangali Diesel Project Phase 2	28	2024	Zamboanga Del Sur
Mangima Hydro Power Corporation (MHPC)	12 MW Mangima Hydro Electric Power Project	12	2025	Bukidnon
Philnew River Power Corporation (PRPC)	3.7 MW Malitbog & 3.7 MW Silo-O Hepp	7.4	2025	Misamis Oriental
Pulangi Hydro Power Corporation (PHPC)	250 MW Pulangi Hydro Electric Power Project	250	2025	Bukidnon
Sarangani Energy Corp. (SEC)	Interconnection Of Sec 1 & Sec 2 - Coal	234	2021	Sarangani
Sarangani Energy Corporation (SEC)	118.5 MW Sec Phase 2 Coal-Fired Power Plant Project	118.5	2020	South Cotabato
Siguil Hydro Power Corporation (SHPC)	14.5 MW Siguil Hydro Electric Power Plant	14.5	2023	South Cotabato
Sukelco Inc.	1 MW Embedded Solar Power Project	1	2023	Sultan Kudarat
Therma Marine, Inc. (TMI)	Integration Of Battery Energy Storage System	48	2022	Davao De Oro
Therma Marine, Inc. (TMI)	48 MW Nasipit Hybrid Battery Energy Storage System	48	2024	Agusan Del Norte
Total Power, Inc. (TPI)	80 MW AC Solar Power Plant Project	80	2020	South Cotabato
Universal Power Solutions, Inc. (UPSI)	±10 MW Tagum Integrated Renewable Power Facility Hub (R-Hub)	±10	2021	Davao De Oro
Universal Power Solutions, Inc. (UPSI)	±20 MW Jasaan Integrated Renewable Power Facility Hub (R-Hub)	±20	2021	Misamis Oriental

Appendix 3

Private Sector Initiative Power Projects

Table 1: Luzon Committed Power Projects

Proposed Major Power Plants	Capacity (MW)	Target Commercial Operation	Connection Point	Associated Transmission Project	ETC/ Completion Date
COAL	**1,850.00**				
Mariveles CFPP Phase I - Unit 2 w/ SIS	150.000	Jul 2024	Mariveles (Alas-asin) 500 kV SS	Mariveles–Hermosa 500 kV TL Hermosa–San Jose 500 kV TL	Completed
Mariveles CFPP Phase I - Unit 3 w/ SIS	150.000	Sep 2024			
Mariveles CFPP Phase I - Unit 4 w/ SIS	150.000	Oct 2024			
Mariveles CFPP Phase I - Unit 5 w/ SIS	350.000	Mar 2028			
Mariveles CFPP Phase I - Unit 6 w/ SIS	350.000	Sep 2028			
Masinloc Power Plant - Unit 4 w/ SIS	350.000	Aug 2025	Castillejos 500 kV SS (interim) Palauig 500 kV SS	Western 500 kV Backbone Stage-2 (Masinloc-Castillejos TL as Ph. 1 in 2024)	Jun 2027*
Masinloc Power Plant - Unit 5 w/ SIS	350.000	Apr 2026			
OIL-BASED	**11.040**				
SPC – Capas Bunker C-Fired DPP w/ SIS	11.04	Jul 2024	TARELCO II Facility	None	N/A
NATURAL GAS	**6,070.00**				
Batangas Combined Cyle Power Plant - Phase 1, Unit 1 w/ SIS	440.000	Sep 2024	Ilijan 500 kV Switchyard	None	N/A
Batangas Combined Cyle Power Plant - Phase 1, Unit 2 w/ SIS	440.000	Dec 2024	Pinamucan 500 kV SS	Pinamucan 500 kV SS Project	Oct 2027*
Batangas Combined Cyle Power Plant - Phase 1, Unit 3 w/ SIS	440.000	Dec 2024	Pinamucan 500 kV SS	Pinamucan 500 kV SS Project	Oct 2027*
Natural Gas-Fired Power Plant	1100.000	Jan 2029	Pinamucan 500 kV SS	Pinamucan-Tuy 500 kV TL	Dec 2031*
Energy World Corporation 650 MW Gas Fired Combined Cycle Power Plant w/ SIS	650.000	TBD	Pagbilao 230 kV SS	Pagbilao 500 kV SS	Completed
Batangas Combined Cyle Power Plant - Phase 2	440.000	TBD	Pinamucan 500 kV SS	Pinamucan 500 kV SS Project	Oct 2027*
Natural Gas-Fired Combined Cycle Gas Turbine Power Plant Project Phase 1 - Unit 1 (formerly AOE Coal-Fired Power Plant Unit 1)	640.000	TBD	Pagbilao 500 kV SS	Pagbilao-Tayabas 500 kV Transmission Line Project	Mar 2028*
Natural Gas-Fired Combined Cycle Gas Turbine Power Plant Project Phase 1 - Unit 2 (formerly AOE Coal-Fired Power Plant Unit 2)	640.000	TBD	Pagbilao 500 kV SS	Pagbilao-Tayabas 500 kV Transmission Line Project	Mar 2028*
Natural Gas-Fired Combined Cycle Gas Turbine Power Plant Project Phase 2 - Unit 1	640.000	TBD	Pagbilao 500 kV SS	Pagbilao-Tayabas 500 kV Transmission Line Project	Mar 2028*
Natural Gas-Fired Combined Cycle Gas Turbine Power Plant Project Phase 2 - Unit 2	640.000	TBD	Pagbilao 500 kV SS	Pagbilao-Tayabas 500 kV Transmission Line Project	Mar 2028*
GEOTHERMAL	**67,573**				
Palayan Binary Power Plant w/ SIS	29.000	Jul 2024	Bacman 230 kV SS	None	N/A
Tiwi Geothermal Binary Power Plant	17.000	Sep 2024	Tiwi-C 69 kV SS	None	
Tanawon Geothermal Project w/ SIS	21.573	Dec 2024	Bacman 230 kV SS (through Palayan 230 kV Switchyard)	None	N/A
HYDRO	**653.171**				
Matuno Hydroelectric Power Project w/ SIS	8.661	Jul 24	Bayombong–Lagawe 69 kV TL	None	N/A
Labayat River (Lower Cascade) Hydroelectric Power Project w/ SIS	1.400	May 24	Lumban–FAMY-Infanta 69 kV TL	None	N/A

Appendix 3

Proposed Major Power Plants	Capacity (MW)	Target Commercial Operation	Connection Point	Associated Transmission Project	ETC/ Completion Date
Colasi Hydroelectric Power Project	4.000	Aug 24	CANORECO Facility	None	N/A
Ibulao Hydroelectric Power Project w/ SIS	4.500	Jul 24	Bayombong–Lagawe 69 kV TL	None	N/A
Laguio (Laginbayan) Malaki 1 Hydroelectric Power Project	1.600	Jul 24	MERALCO Facility	None	N/A
Mariveles Hydroelectric Power Project	0.600	TBD	PENELCO Facility	None	
Dupinga Hydroelectric Power Project	4.800	Dec 24	NEECO II A2 Facility	None	N/A
Asin-Hungduan Hydroelectric Power Project	9.800	2025	Bayombong SS 69 kV Network	None	
Ibulao 1 Hydroelectric Power Project	7.600	Mar 2025	Bayombong SS 69 kV Network	None	N/A
Tumauini Hydroelectric Power Project	11.300	2025			
Sablan 1 Hydroelectric Power Project GEA-1 w/ SIS	20.000	Nov 25	La Trinidad-Calot 69 kV TL	None	N/A
Daet Hydroelectric Power Project	5.000	Dec 25	CANORECO Facility	None	N/A
Dipalo Hydroelectric Power Project	4.150	Dec 25	Nagsaag-Umingan 69 kV TL	None	N/A
Rangas Hydroelectric Power Project	2.400	Dec 25	CASURECO IV Facility	None	N/A
Wawa Pumped Storage 1 Hydroelectric Power Project w/ SIS	500.000	2030	San Mateo 230 kV SS		
Likud 2 Hydroelectric Power Project	0.560	Jul 2024	IFELCO Facility	None	N/A
Biyao Hydroelectric Power Project	0.800	TBD	KAELCO Facility	None	N/A
Lalawinan Hydroelectric Power Project w/ SIS	3.000	TBD	Lumban–FAMY-Infanta 69 kV TL	None	N/A
Kapangan Hydroelectric Power Project GEA-1 w/ SIS	60.000	TBD	Bacnotan 69 kV SS	None	N/A
Tignoan River (Upper Cascade) Hydroelectric Power Project w/ SIS	1.500	TBD	Lumban–FAMY-Infanta 69 kV TL	None	N/A
Tubao Hydroelectric Power Project	1.500	TBD	LUELCO Facility	None	N/A
BIOMASS	**6.282**				
FQBC Biogas	1.200	Jul 2025	MERALCO Facility	None	N/A
Trustpower Biomass	5.082	Jul 2024	Mexico-Clark 69 kV TL	None	N/A
SOLAR	**4,420.844**				
Cagayan North Solar Power Project	100	Aug 2024	Lal-lo 69 kV SS	Tuguegarao - Lal-lo 230 kV Transmission Line Project	Sep 2025
Cayanga-Bugallon Solar Power Project w/ SIS	75.088	Sep 2024	Bolo 230 kV SS	Bolo-Balaoan 500 kV TL	Mar 2028*
San Marcelino Solar Power Project (Phase 1)	224	Sep 2024	Castillejos 230 kV SS	Western Luzon 500 kV Backbone - Stage 1	Completed
San Marcelino Solar Power Project (Phase 2)	79.6	Sep 2024	Castillejos 230 kV SS	None	
Laoag Solar Power Project - Phase 1 w/ SIS	57.8	Dec 2024	Bolo 230 kV SS	Bolo 5th Bank Project	Jan 2029*
Laoag 2 Solar Power Project - Phase 2 w/ SIS	71.4	Dec 2024	Bolo 230 kV SS	Bolo 5th Bank Project	Jan 2029*
Subic New PV Solar Power Plant Project	86.199	Oct 2024	SBMA 230 kV SS	None	N/A
PAVI Green Orion Solar Power Plant Project	16.2	Aug 2024	Limay 69 kV SS	None	N/A
Calabanga Solar Power Plant w/ SIS	54.4	Sep 2024	Naga-Tinambac 69 kV TL	None	N/A
Ilocos Norte Solar Power Project w/ SIS	87.594	Sep 2024	Laoag 115 kV SS	None	N/A
Maragondon Solar Power Plant Project	48.118	Jun 2024	Dasmarinas 115 kV SS	South Luzon Substation Upgrading Project 2	Apr 2026*
Tanauan Solar Power Plant Project	48.118	Jun 2024	Calamba 230 kV SS	LVIP 8 LPESUP LVIP6 Tanauan 230 kV SS	2031-2040 Nov 2026* Mar 2029* Jan 2028*
Santo Domingo Solar Power Project	44.2	Sep 2024	San Manuel 69 kV SS	NLSUP 2 (San Manuel SS)	Jul 2028*
Palauig Solar Power Project w/ SIS	49.5	Aug 2024	Botolon-Candelaria 69 kV TL	None	

Proposed Major Power Plants	Capacity (MW)	Target Commercial Operation	Connection Point	Associated Transmission Project	ETC/ Completion Date
Lumbangan Solar Power Project	90	Oct 2024	Tuy 69 kV SS	Bolo 5th Bank Project	Jan 2029*
Sapang Balen Solar 2 Power Project	246.604	Dec 2026	Magalang 230 kV SS	Magalang 230 kV SS	Dec 2027*
RASLAG IV Solar Power Project	26.4	Oct 2024	Mexico-Clark 69 kV TL	None	
Pinugay Solar Power Project	67.5	Dec 2024	Tap connection along the MERALCO-owned Dolores–Teresa–Malaya 115kV Sub-TL which is radially connected to NGCP's Taytay SS	None	N/A
Bongabon Solar Power Project GEA-2 w/ SIS	30.933	Dec 2024	Cabanatuan-Baler 69 kV TL	None	N/A
Bongabon Solar Power Project GEA-2	18.375	Dec 2024	Cabanatuan-Baler 69 kV TL	None	N/A
Gamu Solar Power Project GEA-2 w/ SIS	41.244	Dec 2024	Gamu-Roxas 69 kV TL	None	N/A
Tuy Batangas 4 Solar Power Project GEA-2 w/ SIS	50	Dec 2024	Tuy 69 kV SS	Tuy 500 kV SS Project (Stage 1)	Jun 2025*
Bolbok 2 Solar Power Project GEA-2 w/ SIS	75	Dec 2024	Tuy 69 kV SS	Tuy 500 kV SS Project (Stage 1)	Jun 2025*
Arayat 3A Solar Power Project GEA-2	30.000	Dec 2024	Mexico-Clark 69 kV TL	Nagsaag–Tumana 69 kV TL	Jul-2026*
Pagbilao 1 Solar Power Project GEA-2	70.000	Dec 2024	Pagbilao 230 kV SS	None	N/A
Pagbilao 2 Solar Power Project GEA-2	27.000	Dec 2024	Pagbilao 230 kV SS	None	N/A
Sta. Barbara 1 Solar Power Project GEA-2	90.000	Dec 2024	Balingueo 69 kV SS	None	N/A
Binalonan Solar Power Project (San Manuel 1 Solar Power Project) GEA-2	80.100	Dec 2024	San Manuel 69 kV SS	NLSUP 2 (San Manuel SS)	Jul 2028*
Talugtug Solar Power Project w/ SIS GEA-1	99.980	Mar 2025	Nagsaag 230 kV SS	Nagsaag–Tumana 69 kV TL	Jul-2026*
Santa Rosa Nueva Ecija 2 Solar Power Project Phase 1A	33.348	Aug 2025	San Isidro 500 kV SS	None	N/A
Labrador Solar Power Plant Project GEA-2	200.000	Oct 2025	Bolo 230 kV SS	Bolo 5th Bank	Jan 2029*
Santa Rosa Nueva Ecija 2 Solar Power Project Phase 1B GEA-1	108.400	Dec 2025	Nagsaag 230 kV SS	Cabanatuan - Sampaloc - Nagsaag 230 kV TL Upgrading	Jul 2033*
Santa Rosa Nueva Ecija 2 Solar Power Project Phase 2 GEA-1	171.600	Dec 2025	Nagsaag 230 kV SS	Cabanatuan - Sampaloc - Nagsaag 230 kV TL Upgrading	Jul 2033*
PAVI Green Naga Solar Power Plant Project GEA-1 w/ SIS	40.400	Dec 2025	Naga-Lagonoy 69kV TL	None	N/A
Concepcion Tarlac 2 Solar Power Project GEA-1	200.000	Dec 2025	Concepcion 230 kV SS	Marilao–Mexico 230 kV Tl Upgrading	Aug 2032*
Tayabas Solar Power Project GEA-1	450.000	Dec 2025	Tayabas 230 kV SS	Taguig-Silang 500 kV TL	Feb 2031*
Sapang Balen Solar 1 Power Project (Phase 1)	79.200	Dec 2025	Magalang 230 kV SS	Magalang 230 kV SS	Dec 2027*
Sapang Balen Solar 1 Power Project (Phase 2)	79.200	Dec 2025	Magalang 230 kV SS	Magalang 230 kV SS	Dec 2027*
PAVI Green San Vicente Solar Power Plant Project	28.600	Dec 2025	Labo 69 kV SS	None	N/A
Development of 50MW Ground Mounted Solar Power Plant GEA-2	50.000	Dec 2025	No SIS Application	None	N/A
San Pablo Solar Power Project Phase 1 GEA-2	49.400	Dec 2025	Tuguegarao 69 kV SS	Tuguegarao - Enrile 69 kV TL Project	Oct 2030*
Cordon Solar Power Project GEA-2	49.000	Dec 2024	Santiago-Aglipay 69 kV TL	None	N/A
Limbauan Solar Power Project GEA-2	28.000	Dec 2025	Tuguegarao-Cabagan 69 kV TL	None	N/A
Bugallon Solar Power Project GEA-2	18.560	Dec 2025	No SIS Application	None	N/A

Proposed Major Power Plants	Capacity (MW)	Target Commercial Operation	Connection Point	Associated Transmission Project	ETC/ Completion Date
Samal Solar Power Project	48.118	Dec 2025	Hermosa 69 kV SS	Mariveles – Hermosa 500 kV TL Hermosa – San Jose 500 kV TL	Completed
Pasuquin-Burgos 100MW Solar Power Plant GEA-2	49.000	Jun 2026	Laoag 115 kV SS	Balaoan – Laoag (Burgos) 500 kV TLP	Mar 2028*
Ixus Bugallon Solar Power Project GEA-2	274.735	Dec 2026	Bolo 500 kV SS	Bolo-Balaoan 500 kV TLP Bugallon 500 kV SS Project	
San Pablo Solar Power Project Phase 2 GEA-2	79.040	Dec 2026	No SIS Application	-	
Santa Rosa Nueva Ecija 3 Solar Power Project GEA-2	20.000	Dec 2026	Nagsaag 230 kV SS	None	N/A
Linglingay Solar Power Project GEA-2	70.140	Dec 2026	Gamu 69 kV SS	None	N/A
NKS One Floating Solar Power Project GEA-2	90.000	Dec 2026	Lumban 230 kV SS	None	N/A
Opus Solar Power Project GEA-2 w/ SIS	149.950	Dec 2026	Pinili 230 kV SS	Pinili 230 kV SS Project	Dec 2026*
Luntal-Bayudbod Solar Power Project w/ SIS	50.000	2027	Tuy 69 kV SS	Tuy 500 kV SS Project (Stage 1) South Luzon Substation Upgrading Project 2	Jun 2025* Apr 2026*
YH Pangasinan Norte Solar Power Project	6.900	Dec 2026	Waived SIS / Embedded – PANELCO III Facility	None	N/A
YH Camarines Norte Solar Power Plant	8.000	Dec 2027	Waived SIS / Embedded – CANORECO Facility	None	N/A
WIND	**1,547.74**				
Balaoi and Caunayan Wind Power Project GEA-1	160.000	Jun 2024	Laoag 115 kV SS	Bolo–Balaoan 500 kV TL Balaoan–Laoag 500 kV TL	Mar 2028*
Talim Wind Power Project w/ SIS	218.750	Jun 2025	Taguig 230 kV SS	Taguig 500 kV Substation Project Taguig-Taytay 230 kV	Dec 2025 Dec 2030*
Tanay Wind Power Project GEA-2 w/ SIS	85.800	Nov-2025	Baras 230 kV SS	Baras 500 kV SS Project	Feb 2034
Alabat Wind Power Project GEA-2	62.400	Nov-2025	Gumaca-Tagkawayan 69 kV TL	None	
Rizal Wind Power Project GEA-2 w/ SIS	90.000	Dec-2025	Baras 230 kV SS	Baras 500 kV SS Project	Feb 2034
Calatagan Wind Power Project GEA-1	30.000	Dec 2025	Tuy 230 kV SS	Tuy 500/230 kV SS - Stage 1	Jun 2025*
Caparispisan II Wind Power Project GEA-1	70.000	Dec 2025	Laoag 115 kV SS	Bolo–Balaoan 500 kV TL Balaoan–Laoag 500 kV TL	Mar 2028*
Quezon Wind Power Project GEA-2 w/ SIS	239.990	Dec-2026	Baras 500 kV SS	Baras 500 kV SS Project	Feb 2034
Camarines Sur Wind Power Project GEA-2	49.999	Dec-2026	Naga-Libmanan 69 kV TL	None	N/A
Isla Wind Power Project GEA-2 w/ SIS	230.000	Dec-2026	Lumban 230 kV SS	None	N/A
Pangasinan CW 2 Wind Power Project GEA-2	80.000	Dec-2026	No SIS Application		
Bataan-Zambales CW Wind Power Project	100.000	Dec-2026	No SIS Application		
Camarines Sur CW Wind Power Project	30.000	Dec-2026	No SIS Application		
Kalayaan 2 Wind Power Project w/ SIS	100.800	Dec-2027	San Juan 230 kV SS	South Luzon Substation Upgrading Project	Aug 2025

*Regulatory approval is one crucial requirement for meeting the projects' ETC (Estimated Time of Completion) in the TDP. For projects awaiting regulatory approval, it should be noted that the indicated ETC (month-year) assumes that ERC approval was issued in September 2024.

Table 2: Visayas Committed Power Projects

Proposed Major Power Plants	Capacity (MW)	Target Commercial Operation	Connection Point	Associated Transmission Project	ETC/ Completion Date
COAL	**135.000**				
Palm Concepcion Coal-Fired Power Plant Unit II w/ SIS	135	Jun 2026	Direct connection to Concepcion 138 kV SS	Cebu-Negros-Panay 230 kV Backbone Project - Stage 3	Completed
OIL-BASED	**103.700**				
Sulzer Diesel Power Plant	5.500	Sep 2024	Lapu-lapu 69 kV Lines	None	N/A
Caterpillar Diesel Power Plant	2.000	Sep 2024	Lapu-lapu 69 kV Lines	None	N/A
Cummins Diesel Power Plant	1.000	Sep 2024	Lapu-lapu 69 kV Lines	None	N/A
Bohol In-Island Diesel Power Plant	95.200	TBD	Direct connect to Ubay 138 kV SS	Visayas PCB for Grid Connection Project	2024-2030
GEOTHERMAL	**83.645**				
Biliran Geothermal Plant Project (Phase 1)	2.000	May 2024	Tap connection along Ormoc-Biliran 69 kV line	Cebu–Leyte 230 kV Interconnection Lines 3 and 4 Project	Stage 1: Dec 2029* Stage 2: Dec 2031*
Bago Binary Geothermal Power Plant (formerly Northern Negros Geothermal Project)	5.645	Dec 2024	Direct connect to Bacolod 138 kV SS	Cebu-Negros-Panay 230 kV Backbone Project - Stage 3	Completed
Biliran Geothermal Plant Project (Phase 2)	6.000	Oct 2024	Tap connection along Ormoc-Biliran 69 kV line	Cebu–Leyte 230 kV Interconnection Lines 3 and 4 Project	Stage 1: Dec 2029* Stage 2: Dec 2031*
Mahanagdong Geothermal Brine Optimization Power Plant	28.000	Sep 2025	No SIS Application		
Biliran Geothermal Plant Project (Phase 3)	42.000	2027	Tap connection along Ormoc-Biliran 69 kV line	Cebu–Leyte 230 kV Interconnection Lines 3 and 4 Project	Stage 1: Dec 2029* Stage 2: Dec 2031*
HYDRO	**29.560**				
Upper Taft Hydroelectric Power Project w/ SIS	14.160	Jun 2024	Tap connection along Paranas-Taft 69 kV TL	Cebu–Leyte 230 kV Interconnection Lines 3 and 4 Project	Stage 1: Dec 2029* Stage 2: Dec 2031*
Bao Hydroelectric Power Project	2.000	Jul 2025	Tap connection along Ormoc-Biliran 69 kV line	Cebu–Leyte 230 kV Interconnection Lines 3 and 4 Project	Stage 1: Dec 2029* Stage 2: Dec 2031*
Igbulo (Bais) Hydroelectric Power Project w/ SIS	8.100	Oct 2024	Tap connection along Sta. Barbara-San Jose 69 kV TL	Cebu-Negros-Panay 230 kV Backbone Project - Stage 3	Completed
Binalbagan 1	5.300	2028	No SIS Application		
BIOMASS	**44.000**				
8 MW Biomass Cogeneration Plant (Expansion Project)	8.000	Dec 2024	Tap connection along Dingle-Passi 69 kV TL	Cebu-Negros-Panay 230 kV Backbone Project - Stage 3	Completed
3 MW Biomass Cogeneration Power Plant Project (3 MW Phase 1) w/ SIS	3.000	Dec 2024	Tap connection along Mabinay-Bayawan 69 kV TL	Cebu-Negros-Panay 230 kV Backbone Project - Stage 3	Completed
3 MW Biomass Cogeneration Plant Project (Phase 2: 3MW) w/ SIS	3.000	Dec 2024	Tap connection along Mabinay-Bayawan 69 kV TL	Cebu-Negros-Panay 230 kV Backbone Project - Stage 3	Completed
70-MW Biomass Cogeneration Plant (30-MW Expansion Project) w/ SIS	30.000	May 2025	Tap connection along Bacolod-Cadiz 69 kV TL	Cebu-Negros-Panay 230 kV Backbone Project - Stage 3	Completed
SOLAR	**739.842**				
Kananga-Ormoc Solar Power Project w/ SIS GEA-1	300.000	Dec 2025	Direct connect to Ormoc 230 kV SS	Cebu–Leyte 230 kV Interconnection Lines 3 and 4 Project	Stage 1: Dec 2029* Stage 2: Dec 2031*
Victoria Solar Power Project w/ SIS (formerly San Isidro Solar Power Poject)	226.842	Jun 2025	Interim connection - Direct connection to NGCP's existing	Cebu-Leye 230 kV Interconnection Lines 3 and 4 Project	Stage 1: Dec 2029*

Proposed Major Power Plants	Capacity (MW)	Target Commercial Operation	Connection Point	Associated Transmission Project	ETC/ Completion Date
			Tabango 230 kV Substation Final connection - Direct connection to NGCP's proposed Tugas 230 kV Switching Station		Stage 2: Dec 2031*
Ajuy 1 Solar Power Plant Project GEA-2	14.000	Nov 2026	Tap connection along Concepcion-Estancia 69 kV TL	Cebu-Negros-Panay 230 kV Backbone Project - Stage 3	Completed
Luca Solar Power Project GEA-2	80.000	Sep 2026	Direct connect to Barotac Viejo 138 kV SS	Cebu-Negros-Panay 230 kV Backbone Project - Stage 3 Visayas PCB for Grid Connection Project	Completed 2024-2030
Silay 2b Solar Power Project GEA-2	20.000	Dec 2026	Direct connect to Granada 69 kV SS	Cebu-Negros-Panay 230 kV Backbone Project - Stage 3 Granada 230 kV Substation Project	Completed Jun 2030*
Toledo Solar Power Project GEA-2	49.000	Dec 2026	Direct connect to Calong-Calong 69 kV SS	Cebu-Negros-Panay 230 kV Backbone Project - Stage 3 Visayas PCB for Grid Connection Project	Completed 2024-2030
Silay 2a Solar Power Project GEA-2	30.000	Dec 2026	Tap connection along Bacolod-Silay 69 kV TL	Cebu-Negros-Panay 230 kV Backbone Project - Stage 3	Completed
Silay Solar Power Project GEA-2	20.000	Dec 2026	Tap connection along Bacolod-Silay 69 kV TL	Cebu-Negros-Panay 230 kV Backbone Project - Stage 3	Completed
WIND	**515.200**				
13.2MW Nabas-2 Wind Power Project GEA-1	13.200	May 2025	Tap connection along Nabas – Caticlan 69 kV TL	Cebu-Negros-Panay 230 kV Backbone Project - Stage 3	Completed
Gemini Wind Power Project GEA-2 w/ SIS	200.000	Dec 2026	Direct connection to NGCP's proposed Victoria 138 kV Substation	Calbayog-Allen Transmission Project Cebu–Leyte 230 kV Interconnection Lines 3 and 4 Project	Dec 2027 Stage 1: Dec 2029* Stage 2: Dec 2031*
Bago City Wind Power Project GEA-2	150.000	Dec 2026	Direct connection to NGCP's proposed La Carlota 138 kV Substation	La Carlota 138 kV Substation Project Cebu-Negros-Panay 230 kV Backbone Project - Stage 3	Dec 2032* Completed
Iloilo CW 1 Wind Power Project GEA-2	152.000	Dec 2026	No SIS Application		

*Regulatory approval is one crucial requirement for meeting the projects' ETC (Estimated Time of Completion) in the TDP. For projects awaiting regulatory approval, it should be noted that the indicated ETC (month-year) assumes that ERC approval was issued in September 2024.

Table 3: Mindanao Committed Power Projects

Proposed Major Power Plants	Capacity (MW)	Target Commercial Operation	Connection Point	Associated Transmission Project	ETC/ Completion Date
COAL	**270.000**				
Misamis Oriental 2 x 135 MW Circulating Fluidized Bed Coal Fired Thermal Power Plant w/ SIS	270.000	Mar 2027	Villanueva 138 kV SS	None	N/A
OIL-BASED	**56.000**				
Sangali Diesel Power Plant Phase 1 w/ SIS	28.000	Apr 2025	Zamboanga 69 kV SS	None	N/A
Sangali Diesel Power Plant Phase 2	28.000	Jun 2025	Zamboanga 69 kV SS	None	N/A

Proposed Major Power Plants	Capacity (MW)	Target Commercial Operation	Connection Point	Associated Transmission Project	ETC/ Completion Date
HYDRO	**114.380**				
Liangan Hydroelectric Power Project w/ SIS	18.000	Jul-24	Agus 6-Kauswagan 69 kV Line	None	N/A
Siguil Hydroelectric Power Project w/ SIS	14.500	Jul-24	SOCOTECO 2 Facility	None	N/A
Maladugao River (Upper Cascade) Hydroelectric Power Project w/ SIS	8.400	Jun-25	BSTC Facility	None	N/A
Mangima Hydroelectric Power Project w/ SIS	12.000	Feb-25	BSTC Facility	None	N/A
Malitbog Hydroelectric Power Project GEA-1	3.700	Nov-25	Villanueva 69 kV SS	None	N/A
Silo-o Hydroelectric Power Project GEA-1	3.700	Nov-25	Villanueva 69 kV SS	None	N/A
Mat-i 1 Hydroelectric Power Project GEA-1	4.850	Nov-25	No SIS Application	None	N/A
Clarin Hydroelectric Power Project GEA-1	6.900	Nov-25	No SIS Application	None	N/A
Bubunawan Hydroelectric Power Project	32.000	2030	Gango 138 kV SS	None	N/A
Sipangpang Hydroelectric Power Plant	1.800	TBD	No SIS Application	None	N/A
Tagpangi Hydroelectric Power Project	1.700	TBD	No SIS Application	None	N/A
Osmeña Hydroelectric Power Project	1	TBD	No SIS Application	None	N/A
Gakaon Hydroelectric Power Project	2.230	TBD	No SIS Application	None	N/A
Titunod Hydroelectric Power Project	3.600	TBD	No SIS Application	None	N/A
BIOMASS	**10.000**				
10 MW Biomass Cogeneration Plant GEA-1	10.000	Dec 2024	Waived SIS Embedded - COTELCO Facility	None	N/A
SOLAR	**168.000**				
General Santos Solar Power Project GEA-1 w/ SIS	120.000	Dec 2025	General Santos 138 kV SS	None	N/A
Butuan City 1 Solar Power Project GEA-2	8.000	Dec 2025	No SIS Application	None	N/A
Tantangan Solar Power Project GEA-2	40.000	Dec 2026	Tacurong 69 kV SS	None	N/A

Table 4: Luzon Indicative Power Projects

Proposed Generation Facility / Name of the Project	Rated Capacity (MW)	Location	Target Commercial Operation
	INDICATIVE POWER PLANTS		
COAL	1400		
SRPGC Coal-Fired Power Plant Project w/ SIS	350.000	Brgy. San Rafael, Calaca, Batangas	TBD
SRPGC Coal-Fired Power Plant Project	350.000	Brgy. San Rafael, Calaca, Batangas	TBD
H & WB PCB Supercritical Coal-Fired Power Plant - Unit 1 w/ SIS	350.000	Jose Panganiban, Camarines Norte	Sep 2027
H & WB PCB Supercritical Coal-Fired Power Plant - Unit 2 w/ SIS	350.000	Jose Panganiban, Camarines Norte	TBD
OIL-BASED	60		
Malaya 2 x 30 Diesel Power Plant	60	Malaya, Pililla, Rizal	Sep 2024
NATURAL GAS	8,048		
Combined Cycle Gas-fired Turbine San Francisco Power Plant w/ SIS	1,200	Barangays Cagsiay 1 and Cagsiay 2, Mauban, Quezon Province	2028
Quezon Combined Cycle Power Plant	1,200	Barangay Laurel, Tagkawayan, Quezon	Dec 2028
VIRES Natural Gas Floating Power Plant	450	Barangay Simlong, Batangas City, Batangas	Dec 2029
Pagbilao 4 & 5 CCGT Power Plant w/ SIS	1,310	Barangay Ibabang Polo, Pagbilao Quezon	Feb 2028
Mambulao Bay LNG-CCGT Power Plant	300	Barangay Osmena, Jose Panganiban, Camarines Norte	2030
GNPower Sisiman LNG Combined Cycle Power Plant	1,200	Barangays Alas-asin and Sisiman, Mariveles, Bataan	Dec 2029
GLEDC Luna LNG-Fired Combined Cycle Power Plant	1,128	Barangays Nalvo Sur and Carisquis, Luna, La Union	2030

Appendix 3

Proposed Generation Facility / Name of the Project	Rated Capacity (MW)	Location	Target Commercial Operation
Santa Maria Natural Gas-Fired Combined Cycle Power Plant w/ SIS	1,260	Brgy. Santa Rita, Batangas City	TBD
GEOTHERMAL	345		
Labo Geothermal Power Project	105	Tagkawayan, Labo, San Vincente, San Lorenzo Ruiz, Del Gallego (Quezon/Camarines Norte&Sur)	2027
Maibarara 3 Geothermal Project	20	Laguna/Batangas	2028
Mt. Malinao Geothermal Project	50	Tiwi, Malinao, Malilipot, Polangui, Tabaco City and Buhi (Albay/Camarines Sur)	2028
Kalinga Geothermal Project w/ SIS	120	Lubuagan, Pasil and Tinglayan, Kalinga	2032
Bacman 4 Botong - Rangas Geothermal Project	20	Bacon District, Sorsogon, Sorsogon City	TBD
Kayabon Geothermal Project	30	Manito, Albay	TBD
HYDROELECTRIC	6,125.558		
Kabayan 2 Hydroelectric Power Project w/ SIS	52	Kabayan, Benguet	2026
Tinglayan Hydroelectric Power Project	22.5	Tinglayan, Kalinga	2026
Saltan D River Hydroelectric Power Project	49	Balbalan and Pinukpuk, Kalinga	2026
Lamut Hydroelectric Power Project w/ SIS	6.8	Asipulo, Ifugao	2027
Piapi River Hydroelectric Power Project	4.5	Real, Quezon	2027
Camiling 1 Hydroelectric Power Project	7	Mayantoc, Tarlac	2027
Lower Siffu Hydroelectric Power Project	3	Natonin, Mt. Province	2027
Upper Siffu Hydroelectric Power Project	2.75	Natonin, Mt. Province	2027
Matuno 1 Hydroelectric Power Project w/ SIS	7.4	Ambaguio, Nueva Vizcaya	2027
Matuno 2 Hydroelectric Power Project w/ SIS	15	Ambaguio, Nueva Vizcaya	2027
Ibulao 2 Hydroelectric Power Project w/ SIS	7.4	Kiangan, Ifugao	2027
Coto 1 Hydroelectric Power Project w/ SIS	9	Masinloc, Zambales	2027
Olilicon Hydroelectric Power Project w/ SIS	20	Ilagan, Ifugao	2027
Chico River Hydroelectric Power Project w/ SIS	52	Tabuk, Kalinga	2027
Tignoan (Lower) Hydroelectric Power Project w/ SIS	8	Real, Quezon	2027
Pampang Hydroelectric Power Project w/ SIS	26	Santa Fe, Nueva Vizcaya	2027
Tinoc 1 Hydroelectric Power Project	3	Tinoc, Ifugao	2027
Tinoc 2 Hydroelectric Power Project	6.5	Tinoc, Ifugao	2027
Tinoc 3 Hydroelectric Power Project	5	Tinoc, Ifugao	2027
Ilaguen Hydroelectric Power Project w/ SIS	19	San Mariano & San Guillermo, Isabela	2027
Bacolan Hydroelectric Power Project	3	San Clemente, Tarlac & Mangatarem, Pangasinan	2027
Coto 2 Hydroelectric Power Project w/ SIS	3.5	Masinloc, Zambales	2027
Camiling River 3 Hydroelectric Power Project	4.2	Mayantoc, Tarlac	2027
Boga Hydroelectric Power Project	1	Bauko, Mt. Province	2027
Upper Chico Hydroelectric Power Project	2	Bauko, Mt. Province	2027
Lower Chico Hydroelectric Power Project	2.1	Bauko, Mt. Province	2027
Calanan Hydroelectric Power Project w/ SIS	60	Tabuk City, Kalinga	2027
Dalimuno Hydroelectric Power Project w/ SIS	58	Tabuk City, Kalinga	2027
ARIIS 2 (NIA Stn 5+437.50) Hydroelectric Power Project	0.75	San Manuel, Pangasinan	2027
ARIIS 3 (NIA Stn 5+898.50) Hydroelectric Power Project	0.5	San Manuel, Pangasinan	2027
ARIIS 1 (NIA Station 4+283) Hydroelectric Power Project	0.9	San Manuel, Pangasinan	2027
ARIIS 4 (Stn 4+808) Hydroelectric Power Project	0.67	San Manuel, Pangasinan	2027
Tumauini (Upper Cascade) Hydroelectric Power Project	11.3	Tumauini, Isabela	2027
Kibungan 2 Hydroelectric Power Project	40	Sugpon, Ilocos Sur	2027
Ilaguen 2 Hydroelectric Power Project w/ SIS	14	Echague, Isabela	2027
Alimit Hydroelectric Power Project w/ SIS	120	Lagawe, Ifugao	2027
Nabuangan River Hydroelectric Power Project	10	Conner, Apayao	2027
Matuno 2 Hydroelectric Power Project w/ SIS	7.9	Bambang, Nueva Vizcaya	2027
Tamdagan Hydroelectric Power Project	7.4	Vintar, Ilocos Norte	2027
Tamdagan 2 Hydroelectric Power Project	5.15	Vintar, Ilocos Norte	2027
Camiling 2 Hydroelectric Power Project	4	Mayantoc, Tarlac	2027
Chico Hydroelectric Power Project	150	Tabuk, Kalinga	2027
Aya Pumped Storage Hydroelectric Power Project	120	Pantabangan, Nueva Ecija	2027

Appendix 3

Proposed Generation Facility / Name of the Project	Rated Capacity (MW)	Location	Target Commercial Operation
Tublay 1 Hydroelectric Power Project	1.9	Tublay & La Trinidad, Benguet	2027
Tublay 2 Hydroelectric Power Project	6	Tublay, Benguet	2027
Tublay 3 Hydroelectric Power Project	1	Tublay, Benguet	2027
Kennon Hydroelectric Power Project	5	Tuba, Benguet	2027
Pasil B Hydroelectric Power Project w/ SIS	15.684	Pasil, Kalinga	2027
Pasil C Hydroelectric Power Project w/ SIS	9.754	Pasil, Kalinga	2027
Pakil Pumped Storage Hydroelectric Power Project w/ SIS	1400	Pakil, Laguna	2027
Gened 2 Hydroelectric Power Project w/ SIS	250	Kabugao, Apayao	2028
Kibungan Pumped-Storage Hydroelectric Power Project	500	Kibungan, Benguet	2029
Masiway 2 Hydroelectric Power Project	9	Pantabangan, Nueva Ecjia	2029
Pantabangan (Pump Storage) Hydroelectric Power Project w/ SIS	600	Pantabangan, Nueva Ecija	2029
Saltan River Site E Hydroelectric Power Project	45	Balbalan and Pinukpuk, Kalinga	2029
Wawa Pumped Storage 3 Hydroelectric Power Project	50	Rodriguez, Rizal	2030
Wawa Pumped Storage 2 Hydroelectric Power Project	100	Rodriguez, Rizal	2030
Alimit-Pumped Storage Hydroelectric Power Project	250	Lagawe & Mayoyao, Ifugao	2030
San Roque Upper East Pumped Storage Hydroelectric Power Project	600	Itogon, Benguet	2030
San Roque West Pumped Storage Hydroelectric Power Project	400	Itogon, Benguet	2030
Dingalan Pumped-Storage Hydroelectric Power Project	500	Dingalan, Aurora	2030
San Roque Lower East Pumped-Storage Hydroelectric Power Project	400	Itogon, Benguet	2030
Calanasan 1 Hydroelectric Power Project w/ SIS	30	Calanasan, Apayao	2031
BIOMASS	14.4		
12-MW Waste-to-Energy Power Plant Project	12	Pampanga	Aug 2024
2.4 MW Biogas Power Plant Project	2.4	Apalit, Pampanga	Aug 2023
SOLAR POWER PROJECT	8,909.389		
San Marcelino Solar Power Project (Phase 3) w/ SIS	96.900	San Marcelino, Zambales	Dec 2024
Luntal Solar Power Project	50.000	Tuy, Batangas	Oct 2024
Ramon Solar Power Project	5.000	Ramon & Santiago, Isabela	Dec 2024
Cordon Solar Power Project	50.000	Cordon, Isabela	Dec 2024
Concepcion 1 Solar Power Project (Phase 3)	12.000	Concepcion, Tarlac	Dec 2024
Concepcion 1 Solar Power Project (Phase 4)	30.000	Concepcion, Tarlac	Dec 2024
Maragondon Solar Power Plant Project	48.118	Maragondon, Cavite	Dec 2024
Tanauan Solar Power Plant Project	48.118	Tanauan City, Batangas	Dec 2024
Santa Rosa Nueva Ecija 2 Solar Power Project Phase 1A	33.348	Penaranda, Nueva Ecija	Dec 2024
Armenia Solar Power Project	35.200	Tarlac City and San Jose, Tarlac	Feb 2025
65MW Pililla Solar Power Project	53.760	Pilillia, Rizal	Feb 2025
San Ildefonso Solar Power Project w/ SIS	44.000	San Ildefonso, Bulacan	Mar 2025
GIGA ACE 8 Solar Power Plant Project	237.600	Palauig, Zambales	Mar 2025
Bato (formerly applied as Bulawen) Solar Power Project	28.400	Palauig, Zambales	Apr 2025
San Marcelino Solar Power Project w/ SIS	96.900	San Marcelino, Zambales	Jun 2025
Infanta 2 Solar Power Project	147.791	Infanta, Pangasinan	Jun 2025
Cabangan Solar Project	43.750	Brgy. Mabanglit, Cabangan, Zambales	Sep 2025
Capas Solar Power Project w/ SIS	31.250	Clark Green City, Capas, Tarlac	Sep 2025
Cawag Solar Power Project	120.600	Subic, Zambales	Sep 2025
Olongapo Solar Power Project w/ SIS	171.850	Olongapo, Zambales	Oct 2025
Sual Solar Power Project w/ SIS	49.500	Sual, Pangasinan	Nov 2025
Astra Solar Power Project w/ SIS	56.250	Curimao, Ilocos Norte	Nov 2025
Trust Solar Power Project	20.622	Mabalacat, Pampanga	Dec 2025
Samal Solar Power Project	48.118	Gugo and San Juan, Samal, Bataan	Dec 2025
GIGASOL1 Solar Power Plant Project	185.898	Botolan, Zambales	Dec 2025
Pantabangan Floating Solar Power Project w/ SIS	463.995	Pantabangan, Nueva Ecija	Dec 2025
Gamu Solar Power Project	59.840	Gamu and Naguilian, Isabela	Dec 2025
Isabela Ground Mounted Solar PV Project w/ SIS	336.826	City of Ilagan, Isabela	Feb 2026

Appendix 3

Proposed Generation Facility / Name of the Project	Rated Capacity (MW)	Location	Target Commercial Operation
CSFirst Green Infanta Solar Power Project Note: With BESS Component at 107.320 MW	180.540	Infanta and Mabini, Pangasinan	Feb 2026
San Manuel Solar Power Plant w/ SIS	67.070	San Manuel, Pangasinan	Mar 2026
SolarAce3 Solar Power Plant Project	200.000	Buguey, Cagayan	Mar 2026
Magat Floating Solar Power Project	54.080	Magat Reservoir, Alfonso Lista and Aguinaldo in Ifugao; and Santiago City and Ramon in Isabela	May 2026
Bongabon Solar Power Project	18.375	Bongabon, Nueva Ecija	Jun 2026
Pasuquin-Burgos Solar Power Plant w/ SIS	96.500	Pasuquin and Burgos, Ilocos Norte	Jun 2026
INARA SOLAR POWER PROJECT PHASE 3	48.825	Tanauan City, Batangas	Aug 2026
Inara Solar Power Project Phase 2	39.375	Tanauan, Batangas	Aug 2026
Burgos Pangasinan Solar Power Project	50.100	Burgos, Pangasinan	Oct 2026
TITAN I Solar Power Project w/ SIS	480.000	Cambitala and San Juan, Pantabangan, Nueva Ecija	Dec 2026
Maragondon 1 Solar Power Project	44.681	Maragondon and General Emilio Aguinaldo, Cavite	Dec 2026
Cabuyao 4 Floating Solar PV Power Plant w/ SIS	105.600	Laguna de Bay	Dec 2026
Calamba Floating Solar Power Project w/ SIS	82.500	Laguna de Bay	Dec 2026
Fuego Solar Power Plant Project	75.173	Pagbilao, Quezon	Dec 2026
Pagbilao Floating Solar Power Plant Project	98.700	Offshore of Pagbilao, Quezon	Dec 2026
Cabuyao 3 Floating Solar PV Power Plant w/ SIS	105.600	Laguna de Bay	Dec 2026
Cabuyao 2 Floating PV Power Plant w/ SIS	105.600	Laguna De Bay	Dec 2026
Cabuyao 5 Floating Solar PV Power Project w/ SIS	105.600	Laguna De Bay	Dec 2026
Victoria 1 Floating PV Power Plant w/ SIS	105.600	Laguna de Bay	Dec 2026
Sta. Rosa Floating PV Power Plant	105.600	Laguna de Bay	Dec 2026
Cabuyao 1 Floating PV Power Plant	105.600	Laguna de Bay	Dec 2026
Bay 2 Floating PV Power Plant	105.600	Laguna de Bay	Dec 2026
Bay 1 Floating PV Power Plant	105.600	Laguna de Bay	Dec 2026
Terra Solar Project (Phase 1)	1785.714	Gapan City, General Tinio & Peneranda, Nueva Ecija and San Miguel & Doña Remedios Trinidad, Bulacan	Feb 2026
Terra Solar Project (Phase 2)	714.286	Gapan City, General Tinio & Peneranda, Nueva Ecija and San Miguel & Doña Remedios Trinidad, Bulacan	Feb 2027
Balayan Solar Power Project	480.000	Balayan and Calaca, Batangas	Jan 2027
Botolan Solar PV Power Plant	57.200	Botolan, Zambales	Feb 2027
San Roque Solar Power Project	152.000	San Manuel and San Nicolas, Pangasinan and Itogon, Benguet	Mar 2027
Bagac 1 Solar Power Project	121.500	Brgy. Quinawan, Bagac, Bataan	Jun 2027
Cabaio Solar Power Project	261.043	Cabiao, Nueva Ecija	Jun 2027
YH Palawan Solar Power Project	8.000	Puerto Princesa City, Palawan	Aug 2027
San Marcelino Floating Solar Power Project	120.295	San Marcelino, Zambales	Oct 2027
Hermosa Solar Power Project	22.398	Hermosa, Bataan	Dec 2027
Lal-lo Solar Power Project w/ SIS	95.000	Brgy. Maxingal, Lal-lo, Cagayan	Jan 2028
WIND	**34,960.28**		
Sanchez Mira Wind Power Project	50.000	Sanchez Mira, Cagayan	Feb 01, 2025
Koala Wind Power Project w/ SIS	150.000	Pakil; Jala-Jala, Laguna and Rizal	Mar 01, 2025
Panda Wind Power Project w/ SIS	150.000	Pililla and Jala-Jala; Mabitac and Pangil , Rizal and Laguna	Mar 01, 2025
Tayabas North Wind Energy Project	96.000	Tayabas City and Lucban, Quezon	Sep 01, 2025
Tayabas South Wind Energy Project w/ SIS	150.000	Tayabas, Pagbilao, Quezon	May 01, 2026
Sembrano Wind Power Project w/ SIS	80.400	Pililla, Rizal; Mabitac and Pakil, Laguna	Jun 30, 2026
Quezon II Plaridel Wind Power Project	50.000	Plaridel and Atimonan, Quezon	Dec 01, 2026
Sorsogon Wind Power Project	300.000	Matnog, Bulan, Irosin and Magdalena, Sorsogon	Dec 01, 2026
Lubang and Looc Island Wind Power Project	800.00	Province of Occidental Mindoro	Jan 01, 2027
San Miguel Bay Wind Power Project w/ SIS	600.000	Provinces of Camarines Sur and Camarines Norte	Jan 01, 2027
Albay Wind Power Project	100.000	Guinobatan and Ligao City, Albay	Sep 01, 2027
Dalupiri Island Wind Power Project	300.000	Onshore and Offshore of Dalupiri Island, Calayan, Cagayan	Oct 01, 2027

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Proposed Generation Facility / Name of the Project	Rated Capacity (MW)	Location	Target Commercial Operation
Aurora Offshore Wind Power Project	600.000	Province of Aurora	Oct 31, 2027
Presentacion 2 Wind Power Project w/ SIS	54.000	Presentacion, Camarines Sur	Dec 01, 2027
Pangasinan CW 1 Wind Power Project	50.000	San Manuel, Sison, and Binalonan, Pangasinan	Dec 31, 2027
Prieto Diaz Wind Farm Project	150.000	Prieto Diaz, Sorsogon City, and Gubat, Sorsogon	Dec 31, 2027
Tinambac Wind Farm Project	50.000	Tinambac, Camarines Sur	Dec 31, 2027
Aguilar Wind Power Project	99.000	Bugallon and Aguilar, Pangasinan	May 01, 2028
Kalayaan 4 Wind Energy Project	303.800	Famy, Siniloan, Pakil, and Pangil, Laguna; and Real, Quezon	Jun 01, 2028
San Miguel Bay Wind Power Project	500.000	Offshore of Camarines Sur	Jun 01, 2028
Dagupan Offshore Wind Power Project	350.000	Provinces of Pangasinan and La Union	Jun 30, 2028
San Miguel Bay Offshore Wind Power Project	1000.000	Provinces of Camarines Norte and Camarines Sur	Jun 30, 2028
Romblon Wind Power Project	0.900	Romblon, Romblon	Aug 22, 2028
Frontera Bay Wind Power Project w/ SIS	450.000	Provinces of Bataan and Cavite	Dec 01, 2028
Bongabon Wind Power Project	84.500	Rizal and Bongabon, Nueva Ecija	Dec 31, 2028
Taysan Wind Farm Project	50.000	Taysan, Rosario, and Lobo, Batangas	Dec 31, 2028
Pasacao-San Fernando Wind Farm Project	300.000	Pasacao, San Fernando, Minalabac, Pamplona and Bula, Camarines Sur	Dec 31, 2028
Lucena Wind Power Project w/ SIS	475.000	Offshore and Onshore of Quezon	Jun 01, 2029
Bangui 2 Wind Power Project	132.000	Bangui and Dumalneg, Ilocos Norte	Oct 24, 2029
Bugallon Wind Power Project	86.630	Bugallon, Pangasinan	Nov 22, 2029
Burgos 4 Wind Power Project w/ SIS	100.000	Burgos, Ilocos Norte	Dec 01, 2029
Ilocos Wind Power Project	144.000	Burgos, Pasuquin, Ilocos Norte	Dec 01, 2029
Pasuquin Wind Power Project	90.000	Pasuquin, Ilocos Norte	Dec 01, 2029
Manila Bay Wind Power Project w/ SIS	1248.000	Provinces of Bataan, Cavite, and Batangas	Dec 01, 2029
Calatagan Offshore Wind Power Project w/ SIS	1024.000	Offshore and Onshore of Batangas	Dec 01, 2029
Real Ace Wind Power Project w/ SIS	387.500	Mauban and Real, Quezon	Dec 01, 2029
Tayabas Bay Wind Power Project w/ SIS	275.000	Province of Quezon	Dec 01, 2029
Presentacion Wind Power Project	42.000	Presentacion and Garchitorena, Camarines Sur	Dec 01, 2029
Calatagan Offshore Wind Farm w/ SIS	1400.000	Provinces of Batangas and Occidental Mindoro	Apr 01, 2030
Sual Wind Power Project	100.000	Sual, Mabini, and Labrador, Pangasinan	Feb 19, 2030
Bustos Wind Power Project	100.000	Bustos, Angat, and San Rafael, Bulacan	Feb 24, 2030
Laguna-Quezon Wind Power Project	100.000	Lumban and Cavinti, Laguna; Sampaloc and Mauban, Quezon	Feb 26, 2030
Zambales Wind Power Project	100.000	San Antonio and Subic, Zambales	Mar 03, 2030
Mariveles Offshore Wind Farm	1500.000	Provinces of Bataan, Cavite, and Batangas	Jun 01, 2030
Doña Remedios Trinidad Bulacan Wind Farm Project	200.000	Doña Remedios, Trinidad, Bulacan	Jun 30, 2030
Lian Wind Farm Project	50.000	Lian, Tuy, and Balayan, Batangas	Jun 30, 2030
Mulanay Wind Farm Project	50.000	Mulanay and Catanauan, Quezon	Jun 30, 2030
Labrador Wind Power Project	100.000	Labrador, Pangasinan	Aug 07, 2030
Balayan Bay Wind Power Project w/ SIS	100.000	Lemery, Batangas	Aug 18, 2030
Nasugbu Bay Wind Power Project	100.000	Offshore of Batangas	Aug 19, 2030
Nueva Ecija Wind Power Project	100.000	San Jose City, Carranglan, and Pantabangan, Nueva	Aug 28, 2030
Laguna Wind Power Project	100.000	Kalayaan and Lumban, Laguna; Mauban, Quezon	Aug 28, 2030
Northern Luzon Offshore Wind Power Project	2000.000	Offshore of Ilocos Norte	Dec 01, 2028
Ilocos Norte Offshore Wind Power Project	900.000	Province of Ilocos Norte	Dec 31, 2030
Zambales South Wind Power Project	200.000	San Felipe, San Narciso and San Marcelino , Zambales	Jan 11, 2031
San Nicolas 1 Wind Power Project	100.000	San Nicolas, Pangasinan	Feb 01, 2031
Cavite Offshore Wind Project w/ SIS	994.000	Province of Cavite	Oct 01, 2031
Maragondon Wind Energy Project	55.000	Maragondon, Cavite	Oct 06, 2031
Bulalacao Bay Offshore Wind Power Project w/ SIS	1200.000	Offshore and Onshore of Oriental Mindoro and Antique	Oct 06, 2031
Claveria Offshore Wind Farm	1755.000	Provinces of Ilocos Norte and Cagayan	Apr 01, 2030
Infanta-Dasol Wind Power Project	380.000	Infanta-Dasol, Pangasinan	Apr 21, 2032

Proposed Generation Facility / Name of the Project	Rated Capacity (MW)	Location	Target Commercial Operation
Banahaw Wind Power Project	247.000	Sariaya and Tayabas City, Quezon	Aug 01, 2032
Tagkawayan Wind Farm Project	300.000	Tagkawayan, Quezon	Sep 30, 2032
East Ecija Wind Power Project	420.000	Laur, Gabaldon, and General Tinio, Nueva Ecija	Nov 25, 2032
Aparri Bay Wind Power Project	600.000	Aparri, Cagayan	Dec 01, 2032
132 MW Wind Power Project	132.500	Vintar, Bangui, Pasuquin, Ilocos Norte	Jan 26, 2033
Bulalacao Wind Power Project	85.500	Bulalacao, Oriental Mindoro	Feb 01, 2032
Balayan Bay Offshore Wind Energy Project	750.000	Province of Batangas	Feb 02, 2033
Pangasinan-Zambales Wind Power Project	100.000	Aguilar, Bugallon, and Infanta, Pangasinan; Santa Cruz, Zambales	Feb 03, 2033
Calatagan Onshore Wind Power Project	130.000	Calatagan and Balayan, Batangas	Mar 01, 2033
Basiad Bay Offshore Wind Power Project w/ SIS	600.000	Province of Camarines Norte	Mar 01, 2033
Camarines Norte Wind Power Project w/ SIS	250.000	Capalonga and Jose Panganiban, Camarines Norte	Mar 07, 2033
Pasacao Wind Power Project	300.000	Pasacao, Libmanan, and Pamplona, Camarines Sur	Mar 07, 2033
Diwata 2 Wind Power Project	500.000	General Nakar and Real, Quezon	Mar 24, 2033
Quezon - Camarines Norte Wind Power Project w/ SIS	400.000	Guinayangan and Tagkawayan, Quezon; Santa Elena and Labo, Camarines Norte	May 12, 2033
Camarines Sur Wind Power Project w/ SIS	500.00	Province of Camarines Sur	May 23, 2033
Offshore Wind Luzon E-1 w/ SIS	555.000	Offshore of Sorsogon	May 23, 2033
Bicol Wind Power Project w/ SIS	500.000	Provinces of Quezon, Camarines Sur and Camarines Norte	Jun 08, 2033
Pagbilao Offshore Wind Power	300.000	Offshore of Quezon	Jun 08, 2033
Tayabas Bay Wind Power Project	500.000	Province of Quezon	Jun 14, 2033
Bulalacao Offshore Wind Farm Project	3100.000	Province of Oriental Mindoro	Aug 01, 2030
Sison Wind Power Project	100.000	Sison and San Manuel, Pangasinan	Aug 03, 2033
Ilocos Norte CW Wind Power Project	120.000	Vintar, Piddig, Sarrat, Dingras, Marcos, Laoag City, and Batac City, Ilocos Norte	Sep 20, 2033
Ombra Wind Power Project	312.500	Dingalan, Aurora; Doña Remedios Trinidad, Bulacan; and Palayan City, Laur, General Tinio, and Gabaldon, Nueva Ecija	Sep 29, 2033
Baao Wind Energy Project	210.800	Baao, Iriga City, Ocampo, and Bula, Camarines Sur	Nov 24, 2033
Pantabangan Wind Power Project	156.250	Pantabangan, Nueva Ecija	Nov 29, 2033
Pagsanjan Wind Project	200.000	Pagsanjan, Lumban, Kalayaan, Cavinti and Luisiana, Laguna	Dec 22, 2033
Calabanga Wind Project	200.000	Calabanga and Tinambac, Camarines Sur	Dec 22, 2033
Gubat Wind Project	190.000	Casiguran and Gubat. Sorsogon	Dec 22, 2033
Mindoro Wind Power Project	500.000	Rizal and San Jose, Occidental Mindoro and Bulalacao, Mansalay and Bongabong, Oriental Mindoro	Dec 29, 2033
Pagudpud Wind Power Project	84.000	Pagudpud, Ilocos Norte	Apr 01, 2034
Burgos 1 Wind Power Project w/ SIS	60.000	Burgos , Ilocos Norte	Feb 27, 2035
BATTERY	1,724.60		
Cruz na Daan (CND) Battery Energy Storage System w/ SIS	40.600	Balagtas Bypass Road, Mabalasbalas, San Rafael Bulacan	Sep 2025
Bugallon Energy Storage Project	200.000	Bugallon , Pangasinan	Mar 2024
Ambuklao Battery Energy Storage System	40.000	Brgy. Ambuklao, Bokod, Benguet	Mar 2027
Binga Battery Energy Storage System	40.000	Itogon, Benguet	Jun 2026
Magat Battery Energy Storage System Phase 2	16.000	Ramon, Isabela	Jun 2026
Enerhiya Central Battery Energy Storage Project w/ SIS	40.000	Concepcion, Tarlac	Dec 2025
Enerhiya Sur II Battery Energy Storage Project w/ SIS	40.000	Lumban, Laguna	Dec 2025

Proposed Generation Facility / Name of the Project	Rated Capacity (MW)	Location	Target Commercial Operation
Enerhiya Sur I Battery Energy Storage Project w/ SIS	40.000	Lemery and Tuy, Calaca, Batangas	Dec 2025
Enerhiya Sur 3 Energy Storage Project	40.000	Sta. Rosa, Laguna	Mar 2026
Enerhiya Sur 4 Energy Storage Project	40.000	Cabuyao, Laguna	Mar 2026
Enerhiya Sur 5 Energy Storage Project	40.000	Calamba, Laguna	Mar 2026
Labo Energy Storage Project w/ SIS	20.000	Labo, Camarines Norte	TBD
Lumban Battery Energy Storage	20.000	Lumban, Laguna	TBD
TMO Energy Storage System Project	100.000	Navotas Fishport Complex, Baradero St., North Bay Boulevard, Navotas City	TBD
Cawag Battery Energy Storage System	28.000	Barrio Cawag, Redondo Peninsula, Subic Bay Freeport Zone, Provice of Zambales	Jun-25
Malaya Battery Energy Storage System	20.000	Malaya, Pililla, Rizal	Dec-25
Nagsaag Battery Energy Storage	20.000	Nagsaag, Pangasinan	2025
Lumban Battery Energy Storage w/ SIS	20.000	Lumban, Laguna	2025
Laoag Battery Energy Storage w/ SIS	20.000	Laoag, Ilocos Norte	2025
Concepcion Battery Energy Storage w/ SIS	20.000	Concepcion, Tarlac	2026
Labrador Battery Energy Storage	20.000	Labrador, Pangasinan	2026
Currimao Energy Storage Project w/ SIS	50.000	Currimao, Ilocos Norte	Dec 2027
Pililla Energy Storage Project	50.000	Pililia, Rizal	Mar 2027
Bay Energy Storage Project w/ SIS	50.000	Calauan, Laguna	Jun 2027
Panda Energy Storage Project	150.000	Pililla, Rizal	Jul 2027
Angat Optimization Project	160.000	Brgy. San Lorenzo, Norzagaray, Bulacan	Mar 2028
San Roque Optimization Project	400.000	Brgy. Narra, Municipality of San Manuel and Brgy. San Felipe West, Municipality of San Nicolas, Province of Pangasinan	Jul 2028
TOTAL INDICATIVE	**61,587.227**		
TOTAL INDICATIVE W/O BESS	**59,862.627**		

Table 5: Visayas Indicative Power Projects

Proposed Generation Facility / Name of the Project	Rated Capacity (MW)	Location	Target Commercial Operation
VISAYAS INDICATIVE POWER PLANTS			
COAL	169		
Therma Visayas, Inc. Coal - Fired Power Plant Expansion Project w/ SIS	169	Sitio Looc, Barangay Bato, Toledo City, Cebu	Jun 2027
GEOTHERMAL	40		
Dauin Geothermal Project	40	Dauin, Negros Oriental	2025
HYDROELECTRIC	401.6		
Malugo Hydroelectric Power Project	6	Silay City, Negros Occidental	2027
Lower Himogaan Hydroelectric Power Project	4	Sagay City, Negros Occidental	2027
Ilog Hydroelectric Power Project w/ SIS	21.6	Mabinay, Negros Oriental	2027

Proposed Generation Facility / Name of the Project	Rated Capacity (MW)	Location	Target Commercial Operation
Maslog Hydroelectric Power Project w/ SIS	40	Maslog, Eastern Samar	2028
Lower Buhid Hydroelectric Power Project	20	Maydolong, Eastern Samar	2028
Casapa River Hydroelectric Power Project w/ SIS	10	Maslog, Eastern Samar	2029
Aklan Pumped-Storage Hydroelectric Power Project w/ SIS	300	Malay, Aklan	2030
SOLAR POWER PROJECT	2,008.537		
Biliran Solar Power Project	20.000	Biliran, Biliran	Dec 2024
Victorias Solar Power Project w/ SIS	85.925	Victorias City, Negros Occidental	Mar 2024
Manapla Solar Power Project w/ SIS	120.295	Manapla, Negros Occidental	Mar 2024
Bohol Solar Power Project	17.500	Ubay, Bohol	Jun 2024
Bacolod Solar Power Project w/ SIS	130.050	Bacolod City and Brgy. Tabunan, Bago City	Aug 2024
San Miguel Solar Power Project w/ SIS	80.000	San Miguel, Leyte	Dec 2024
Medellin Solar Power Plant w/ SIS	240.000	Medellin, Cebu	Dec 2024
Cadiz City Solar Power Project w/ SIS	56.000	Cadiz City, Negros Occidental	Dec 2024
Vista Alegre Solar Power Project w/ SIS	41.600	Bacolod City, Negros Occidental	Jan 2025
Calatrava Solar Power Project w/ SIS	137.480	Calatrava, Negros Occidental	Dec 2025
Ubay Solar Power Project w/ SIS	137.480	Ubay, Bohol	Dec 2025
Barotac Viejo Solar Power Plant	175.287	Barotac Viejo, Iloilo	Dec 2025
SAGAY SOLAR ON WATER PV POWER PLANT	101.200	Sagay City, Negros Occidental	Sep 2026
All Home All Builders Bacolod Solar Power Project	0.240	Negros Occidental, Bacolod, Mandalagan	Dec 2026
Dagohoy Solar Power Project	20.622	Dagohoy, Bohol	Dec 2027
Sikatuna Solar Power Plant	37.884	Sikatuna and Balilihan, Bohol	Dec 2027
Luna Solar Power Project	171.110	Cadiz City, Negros Occidental	Mar 2028
Daga Solar Power Project	297.264	Cadiz City, Negros Occidental	Mar 2028
Ubay Solar Power Project	138.600	Ubay, Bohol	Dec 2028
WIND	12,842.1		
San Isidro Wind Power Project w/ SIS	150.000	San Isidro, Northern Samar	Feb 28, 2025
Sibunag Wind Power Project	103.500	Sibunag, Guimaras	Apr 01, 2025
Pulupandan Wind Power Project w/ SIS	50.000	Pulupandan, Negros Occidental	Feb 01, 2026
Aklan Wind Power Project	75.600	Nabas, Malay, Aklan	Jun 18, 2026
East Panay Offshore Wind Power Project	500.000	Provinces of Iloilo and Guimaras	Oct 01, 2026
Tanjay Wind Power Project w/ SIS	45.000	Bais, Bayawan, Tanjay, Pamplona, Negros Oriental	Jan 01, 2027
Sibonga Wind Farm Project	50.000	Sibonga, Barili, and Dumanjug, Cebu	Dec 31, 2027
Caluya Wind Power Project	967.000	Offshore and Onshore of Caluya, Antique	Dec 01, 2028
Samar Norte Offshore Wind Power Project	650.000	Provinces of Northern Samar	Dec 30, 2028
Negros Occidental Wind Farm Project	300.000	Manapla, Victorias City, E.B. Magalona, and Cadiz City, Negros Occidental	Dec 31, 2028
Bohol Wind Power Project w/ SIS	100.000	Ubay and San Miguel, Bohol	Nov 01, 2029
Guimaras 1 Offshore Wind Power Project	582.000	Province of Guimaras	Dec 01, 2029
Guimaras Onshore Wind Power Project	100.000	Buenavista, San Lorenzo, Sibunag, and Nueva Valencia, Guimaras	Dec 01, 2029
Guimaras-Negros Occidental Offshore Wind Power Project	600.000	Provinces of Guimaras and Negros Occidental	Dec 01, 2029
Iloilo-Guimaras Offshore Wind Power Project	1000.000	Provinces of Iloilo, Guimaras and Negros Occidental	Dec 01, 2029
Buenavista Wind Power Project	100.000	Buenavista, Guimaras	Jan 11, 2030
Concepcion Wind Power Project	100.000	Concepcion, Iloilo	Feb 19, 2030
Iloilo Strait Wind Power Project	100.000	Provinces of Iloilo and Guimaras	Feb 19, 2030
Kabankalan Wind Power Project	100.000	Kabankalan City, Negros Occidental; Ayungon, Negros Oriental	Feb 26, 2030
Negros Wind Power Project	100.000	City of Himamaylan and Binalbagan, Negros Occidental; La Libertad, Jimalalud, Tayasan, and Ayungon, Negros Oriental	Mar 14, 2030
Ajuy Wind Farm Project	200.000	Ajuy, Barotac Viejo, and Lemery, Iloilo	Jun 30, 2030
Bais Wind Power Project	100.000	Bais and Tanjay, Negros Occidental	Aug 18, 2030
Guimaras Strait Wind Power Project	100.000	Offshore of Ajuy and Concepcion, Iloilo	Sep 03, 2030
Guimaras Strait II Wind Power Project w/ SIS	600.000	Provinces of Negros Occidental and Iloilo	Dec 01, 2030
Malay Wind Power Project	500.000	Malay and Buruanga, Aklan	Dec 31, 2030
Bohol 2 Anda Wind Power Project	50.000	Anda, Candijay and Guildulman, Bohol	Jun 03, 2031
San Enrique Bank Offshore Wind Project	420.000	Provinces of Guimaras and Negros Occidental	Sep 28, 2031
GS4 Offshore Wind Power Project w/ SIS	910.000	Province of Iloilo	Oct 01, 2031
GS1 Offshore Wind Project w/ SIS	574.000	Province of Guimaras	Oct 15, 2031
GS2 Offshore Wind Power Project w/ SIS	728.000	Province of Guimaras	Jun 01, 2032

Appendix 3

Proposed Generation Facility / Name of the Project	Rated Capacity (MW)	Location	Target Commercial Operation
Tambobo Bay Wind Energy Project	922.000	Offshore and Onshore of Negros Oriental	Nov 14, 2032
Haraya IV - Negros Occidental Offshore Wind Project	1215.000	Province of Negros Occidental	May 10, 2033
Guimbal Wind Power Project	200.000	Guimbal, Miagao, Igbaras, Tubungan and Tigbauan, Iloilo	May 16, 2033
Highlands Guimaras Wind Project	100.000	Sibunag, San Lorenzo and Jordan, Guimaras	Jul 13, 2033
Aklan Wind Power Project	100.000	Ibajay, Tangalan, Makato, and Malinao, Aklan	Jul 28, 2033
Bais Wind Project	150.000	Bais City, Mabinay and Manjuyod, Negros Oriental	Nov 24, 2033
Lavezares Wind Project	200.000	Lavezares, Rosario, Victoria and Allen, Northern Samar	Dec 22, 2033
BATTERY	866.9		
Enerhiya Delas Islas I Battery Energy Storage Project	40.000	Amlan, Negros Oriental	Dec 2025
Enerhiya Delas Islas II Battery Energy Storage Project w/ SIS	40.000	Ormoc, Leyte	Dec 2025
Enerhiya Delas Islas III Battery Energy Storage Project	40.000	Compostela, Cebu	Dec 2025
Compostela Battery Energy Storage System	7.500	Compostela, Cebu	2025
Toledo Battery Energy Storage System	20.000	Toledo City, Cebu	2026
Tabango Battery Energy Storage System	7.500	Tabango City, Leyte	2027
Dingle Battery Energy Storage System	20.000	Dingle City, Iloilo	2027
Ubay Battery Energy Storage System	20.000	Ubay City, Bohol	2027
Sta. Barbara Battery Energy Storage System Project	20.000	Sta. Barbara, Iloilo	TBD
Tinampa-an Energy Storage	50.000	Brgy. Tinampa-an, Cadiz City, Negros Occidental	Jun 2027
Cadiz Energy Storage Project w/ SIS	50.000	Cadiz City, Negros Occidental	Jan 2027
Ormoc Energy Storage Project w/ SIS	50.000	Ormoc, Leyte	Apr 2027
San Isidro Energy Storage Project w/ SIS	200.000	Brgy. Palanit, San Isidro, Northern Samar	Dec 2026
Panay Battery Energy Storage Power Plant	49.900	Brgy. Tabugon, Dingle, Iloilo City	Mar 2026
Calbayog Energy Storage Power Plant	30.000	Calbayog, Samar	TBD
Daanbantayan Energy Storage Power Project	20.000	Daanbantayan, Cebu	TBD
Padayon (CPPC) Energy Storage Project	20.000	Brgy. Ermita, Cebu City, Cebu	TBD
Naga (Pandora) Battery Energy Storage w/ SIS	20.000	Naga City, Cebu	Sep 2025
Pandora 2 Integrated Energy Storage Project w/ SIS	42.000	Barangay Colon, Naga City, Cebu	TBD
Santander Energy Storage Project	30.000	Santander Cebu	TBD
Santa Rita Energy Storage Project	30.000	Santa Rita, Samar	TBD
Tabango Energy Storage Project	30.000	Tabango, Leyte	TBD
Bohol Battery Energy Storage Power Plant	30.000	Brgy. Dampas, Tagbilaran City, Bohol	Mar 2026
TOTAL INDICATIVE	16,328.137		
TOTAL INDICATIVE W/O BESS	15,461.237		

Appendix 3

Table 6: Mindanao Indicative Power Projects

Proposed Generation Facility / Name of the Project	Rated Capacity (MW)	Location	Target Commercial Operation
MINDANAO INDICATIVE POWER PLANTS			
COAL	120		
San Ramon Power, Inc. Coal-Fired Power Station	120.000	ZamboEcozone, Brgy. Talisayan, Zambanga City	Jun 2027
NATURAL GAS	600		
GNPower Kauswagan LNG Combined Cycle Power Plant	600.000	Barangay Tacub, Kauswagan, Lanao del Norte	Dec 2029
HYDROELECTRIC	788.96		
Pulanai River Hydroelectric Power Project w/ SIS	15.000	Valencia, Bukidnon	2027
Maladugao River (Lower Cascade) Hydroelectric Power Project	15.700	Kalilangan & Wao, Bukidnon	2027
Cateel Hydroelectric Power Project w/ SIS	16.000	Baganga, Davao Oriental	2027
Bubunawan Hydroelectric Power Project	32.000	Baungon, Bukidnon	2027
Culaman Hydroelectric Power Project w/ SIS	10.000	Manolo Fortich, Bukidnon	2027
Limbatangon Hydroelectric Power Project	9.000	Cagayan de Oro City, Misamis Occidental	2027
Casauman Hydroelectric Power Project w/ SIS	34.000	Manay, Davao Oriental	2027
Davao Hydroelectric Power Project	140.000	Davao City, Davao City	2027
Agus III Hydroelectric Power Project	225.000	Pantar, Lanao del Norte & Baloi/Saguiara, Lanao del Sur	2027
South Pulangi Hydroelectric Power Project w/ SIS	250.000	Damulog, Bukidnon	2030
Magpet 2 Hydroelectric Power Project	9.500	Magpet, North Cotabato	2027
Magpet 1 Hydroelectric Power Project	18.000	Magpet, North Cotabato	2027
Bacolod Hydrolectric Power Project	8.620	Bacolod, Lanao del Norte	2033
Dimarao Hydrolectric Power Project	6.140	Bacolod, Lanao del Norte	2033
BIOMASS	62		
12 MW Biomass Power Plant Project	12.000	Manolo Fortich, Bukidnon	Dec 2023
50 MW Biomass Power Plant Project	50.000	Surigao del Sur	Jun 2026
SOLAR	251.115		
Hayes Solar Power Project w/ SIS	21.600	Villanueva, Misamis Oriental	Dec 2024
1.212-MWp SUKELCO Solar Power Plant	1.000	Tacurong CIty, Sultan Kudarat	Dec 2024
Zamboanga del Norte Solar Power Project	5.100	La Libertad and Dapitan, Zamboanga del Norte	Jun 2025
The Ark Solar Power Project	99.000	Claveria, Misamis Oriental	Jun 2025
Misamis Solar Power Project	9.375	Tagoloan, Misamis Oriental	Dec 2025
Tantangan Solar Power Project	80.000	Tantangan, South Cotabato	Dec 2026
Gumalang Solar Power Project	35.040	Gumalang, Calinan, Davao	Jun 2027
WIND	636		
Caraga Wind Power Project Phase 1	36.000	Surigao City, San Francisco, Malimono, Sison, Placer and Mainit, Surigao del Norte	Sep 01, 2026
Mainit Wind Power Project w/ SIS	100.000	Mainit, Surigao del Norte	Dec 01, 2029
Lake Mainit Wind Power Project w/ SIS	200.000	Malimono and Mainit; Jabonga, Agusan del Norte and Surigao del Norte	Dec 23, 2029
Lanao del Norte Wind Power Project	100.000	Matungao and Balaoi, Lanao del Norte	Feb 24, 2030
General Santos Wind Power Project	100.000	General Santos City, South Cotabato	Apr 21, 2032
Camiguin Onshore Wind Power Project	100.000	Guinsiliban, Sagay, and Mahinog Camiguin	Jul 13, 2033
BATTERY	118		
Nasipit Hybrid Energy Storage System Project w/ SIS	48.000	Lawis, Sta. Ana, Nasipit, Agusan del Norte	Mar 2026
Kibawe Energy Storge Project	50.000	Kibawe, Bukidnon	Jul 2027
Toril Energy Storage System w/ SIS	20.000	Toril, Davao	TBD
TOTAL INDICATIVE	2,576.075		
TOTAL INDICATIVE W/O BESS	2,458.075		

Appendix 4

List of Offshore Wind Projects

Table 1: Luzon OSW Projects

Item	Project Name	Year of Entry	Location	Connection Point	Associated Transmission Projects
1	500 MW San Miguel Bay Offshore Wind	2027	Camarines Sur	Direct connection to NGCP's existing Naga 230 kV Substation	• Luzon-Visayas HVDC Bipolar Operation Project
2	475 MW Lucena Wind Power Plant Project	2027	Sariaya and Lucena, Quezon	Direct connection to NGCP's Tayabas 230 kV Substation	• Tayabas 230 kV Substation Expansion • Tuy 500/230 kV Substation (Stage 2) Project • Pinamucan-Tuy 500 kV Transmission Line Project • Taguig-Silang 500 kV Transmission Line Project
3	275 MW Tayabas Bay Wind Power Plant Project	2027	Quezon Province	Direct connection to NGCP's New Pagbilao 230 kV Substation	• New Pagbilao 230 kV Substation Expansion • Tuy 500/230 kV Substation (Stage 2) Project • Pinamucan-Tuy 500 kV Transmission Line Project • Taguig-Silang 500 kV Transmission Line Project
4	600 MW San Miguel Bay Wind Power Plant Project	2027	Camarines Norte and Camarines Sur	Direct connection to NGCP's Naga 230 kV Substation	• Luzon-Visayas HVDC Bipolar Operation Project
5	450 MW Frontera Bay Wind Power Project	2030	Manila Bay (Cavite and Bataan)	Direct connection to NGCP's Mariveles 500 kV Substation	• Expansion of Mariveles 500 kV Substation • Marilao 500 kV Substation Project • Marilao 500 kV Substation Expansion Project
6	600 MW Aparri Bay Wind Power Project	2030	Aparri and Buguey, Province of Cagayan	Direct connection to NGCP's new Kabugao 500 kV Substation	• Santiago-Kabugao 500 kV Transmission Line Project • Nagsaag-Santiago 500 kV Transmission Line Project
7	500 MW Bagac Offshore Wind Power Project	2027	Bataan	Direct connection to NGCP's Mariveles 500 kV Substation	• Expansion of Mariveles 500 kV Substation • Marilao 500 kV Substation Project • Marilao 500 kV Substation Expansion Project
8	1245 MW Manila Bay Offshore Wind	Ph1-2028; Ph2-2030	Cavite and Bataan	Direct connection to NGCP's Mariveles 500 kV Substation	• Expansion of Mariveles 500 kV Substation • Marilao 500 kV Substation Project • Marilao 500 kV Substation Expansion Project
9	1020 MW Calatagan Offshore Wind Power Project	Ph1-2028; Ph2-2030	Batangas	Direct connection to NGCP's Tuy 500 kV Substation	• Pinamucan 500 kV Substation Project • Silang 500 kV Substation Project • Tuy 500/230 kV Substation Project (Stages 1 & 2) • Pinamucan-Tuy 500 kV Transmission Line Project • Taguig-Silang 500 kV Transmission Line Project
10	600 MW Lubang and Looc Island Wind Power Project	2027	Lubang and Looc Island, Occidental Mindoro	Direct connection to NGCP's Tuy 500 kV Substation	• Pinamucan 500 kV Substation Project • Silang 500 kV Substation Project • Tuy 500/230 kV Substation Project (Stages 1 & 2) • Pinamucan-Tuy 500 kV Transmission Line Project • Taguig-Silang 500 kV Transmission Line Project.
11	2 GW Northern Luzon Offshore Wind Power Plant	2028	Ilocos Norte	Direct connection to the proposed NGCP's Laoag 500 kV Substation	• Bolo-Balaoan 500 kV Transmission Line • Balaoan-Laoag 500 kV Transmission Line
12	1830 MW Calatagan Offshore Wind Farm	2030	Batangas	Direct connection to NGCP's Tuy 500 kV Substation	• Pinamucan 500 kV Substation Project • Silang 500 kV Substation • Tuy 500/230 kV Substation Project (Stages 1 & 2) • Pinamucan-Tuy 500 kV Transmission Line • Taguig-Silang 500 kV Transmission Line
13	600 MW Basiad Bay Offshore Wind Power Project	2028	Camarines Norte	Direct connection to Proposed Tagkawayan 500 kV Substation	• Tagkawayan 500 kV Substation
14	1200 MW Bulalacao Bay Offshore Wind Energy Project - Phase 1	2028	Oriental Mindoro	Direct connection to the proposed NGCP's Southern Mindoro Substation	• Augmentation of capacity of the Batangas-Mindoro Interconnection and Backbone • Calapan-Southern Mindoro Transmission Line Project • Pinamucan 500 kV Substation Project • Tuy 500/230 kV Substation Project (Stages 1 & 2) • Pinamucan-Tuy 500 kV Transmission Line Project
15	1200 MW Bulalacao Bay Offshore Wind Energy Project - Phase 2	2029			

Item	Project Name	Year of Entry	Location	Connection Point	Associated Transmission Projects
16	1200 MW Bulalacao Bay Offshore Wind Energy Project - Phase 3	2030			
17	994 MW Cavite Offshore Wind Project	2030	Cavite	Direct connection to the proposed NGCP Silang 230 kV	• Silang 500 kV Substation Project • Taguig EHV Substation Project
18	3,038 MW NOMFL1 Offshore Wind Project	2031	Occidental Mindoro and Batangas	Direct Connection to the Proposed NGCP's Pinamucan 500 kV Substation	• Pinamucan 500 kV Substation Project • Silang 500 kV Substation Project • Tuy 500/230 kV Substation Project (Stages 1 & 2) • Pinamucan–Tuy 500 kV Transmission Line Project • Taguig–Silang 500 kV Transmission Line Project
19	600 MW Aurora Offshore Wind Power Project	2030	Aurora	Direct connection to the proposed NGCP's Baler 230 kV Substation	• Sampaloc 230 kV Substation • Baler 230 kV Substation
20	1000 MW San Miguel Bay Offshore Wind Power Project	2028	Camarines Norte and Camarines Sur	Direct connection to the proposed NGCP's Naga 500 kV Substation	• Luzon-Visayas Bipolar Operation Project
21	350 MW Dagupan Offshore Wind Power Project	2028	Pangasinan	Direct connection to NGCP's proposed Bugallon 230 kV Substation	•Bugallon 500 kV Substation
22	1,500 MW Mariveles Offshore Wind Farm	2030	Cavite and Bataan	Direct connection to NGCP's Mariveles 500 kV Substation	• Expansion of Mariveles 500 kV Substation • Marilao 500 kV Substation Project
23	555 MW Offshore Wind Luzon E-1 Wind Power Project	2030	Sorsogon	Direct connection to proposed NGCP's Tublijon 230 kV Switching Station	• Abuyog 230 kV Substation Component: Tublijon 230 kV Switching Station • Tower Resiliency of Bicol Transmission Facilities

Table 2: Visayas OSW Projects

Item	Project Name	Year of Entry	Location	Connection Point	Associated Transmission Projects
1	600 MW Guimaras Strait I Wind Power Project	2025	Silay City and the municipalities of E. B. Magalona, Victorias and Manapla	Direct Connection to NGCP's E.B. Magalona 230kV Switching Station	• Cebu–Negros–Panay 230 kV Backbone Project Stage 3 • Cebu–Negros 230 kV Interconnection Lines 3 and 4 Project • Granada 230 kV Substation Project • Calatrava–Granada 230 kV Transmission Line Project
2	510 MW Oton Bank Offshore Wind Project	2027	Oton, Iloilo	Direct Connection to Barotac Viejo 230 kV Substation	• Barotac Viejo–Sta. Barbara 230 kV Transmission Line Project • Negros–Guimaras–Panay 230 kV Backbone Project • Negros–Panay 230 kV Interconnection Line 2 Project
3	500 MW San Enrique Offshore Wind Project	2027	Southern section of the Guimaras Strait	Direct Connection to Bacolod 230 kV Substation	• Cebu–Negros–Panay 230 kV Backbone Project – Stage 3 (CNP3) • Granada 230 kV Substation Project • Calatrava–Granada 230 kV Transmission Line Project • Cebu–Negros 230 kV Interconnection Lines 3 and 4 Project
4	600 MW Guimaras Strait II Wind Power Project	2030	Northern section of the Guimaras Strait	Direct connection to the NGCP E.B. Magalona 230 kV Switching Station (SWS)	• Cebu–Negros–Panay 230 kV Backbone Project Stage 3 • Cebu–Negros 230 kV Interconnection Lines 3 and 4 Project • Granada 230 kV Substation Project • Calatrava–Granada 230 kV Transmission Line Project
5	588 MW San Lorenzo Wind Power Project	2028	Central section of the Guimaras Strait	Direct Connection to E.B. Magalona 230 kV Switching Station	• Cebu–Negros–Panay 230 kV Backbone Project – Stage 3 (CNP3) • Granada 230 kV Substation Project • Calatrava–Granada 230 kV Transmission Line Project • Cebu–Negros 230 kV Interconnection Lines 3 and 4 Project
6	731.225 MW GS2 Offshore Wind Project	2030	Guimaras	Direct Connection to NGCP's Proposed Granada 230 kV Substation	• Cebu–Negros–Panay 230 kV Backbone Project – Stage 3 (CNP3) • Granada 230 kV Substation Project • Calatrava–Granada 230 kV Transmission Line Project

Item	Project Name	Year of Entry	Location	Connection Point	Associated Transmission Projects
7	574 MW GS1 Offshore Wind Project	2031	Guimaras	Direct Connection to NGCP's Bacolod 230 kV Substation	• Cebu-Negros 230 kV Interconnection Lines 3 and 4 Project • Cebu-Negros-Panay 230 kV Backbone Project - Stage 3 (CNP3) • Granada 230 kV Substation Project • Calatrava-Granada 230 kV Transmission Line Project
8	910 MW GS4 Offshore Wind Project	2031	Guimaras	Direct Connection to NGCP's Proposed Sta. Barbara 230 kV Substation	• Cebu-Negros 230 kV Interconnection Lines 3 and 4 Project • Barotac Viejo-Sta. Barbara 230 kV Transmission Line Project • Negros-Guimaras-Panay 230 kV Backbone Project • Negros-Panay 230 kV Interconnection Line 2 Project
9	650 MW Samar Norte Offshore Wind Power Project	2028	Northern Samar	Direct connection to NGCP's proposed Calbayog 230 kV Substation	• Babatngon-Calbayog 230 kV Transmission Line Project • Ormoc-Babatngon 230 kV Transmission Line Project
10	100 MW Iloilo Strait Wind Power Project	2030	Iloilo & Guimaras	Direct connection to the NGCP's Sta. Barbara 138 kV Substation	None

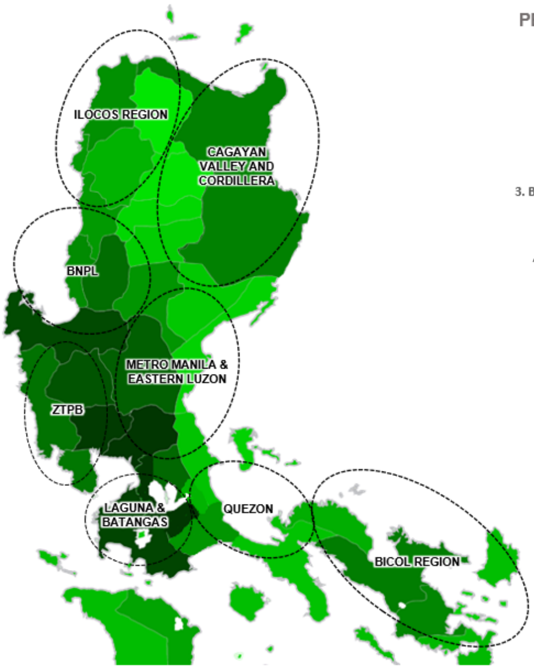
Appendix 5

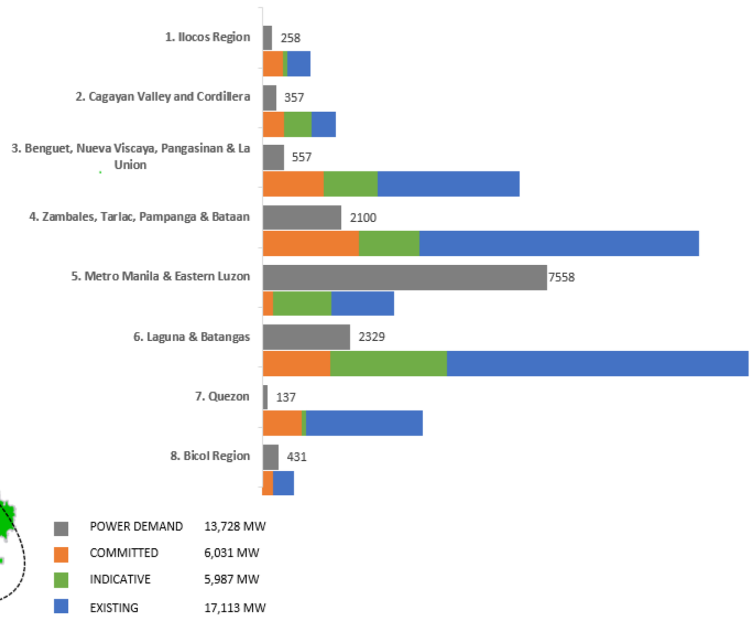
Generation and Load Distribution Per Grid

2025 Luzon Generation and Load Distribution

13,728 MW
PEAK POWER DEMAND

17,160 MW
REQUIRED GENERATION CAPACITY

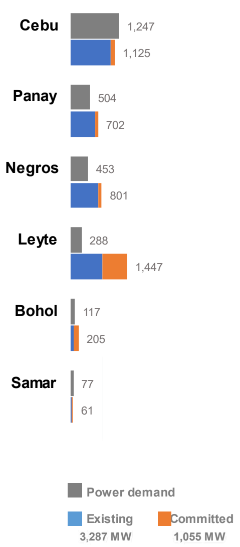


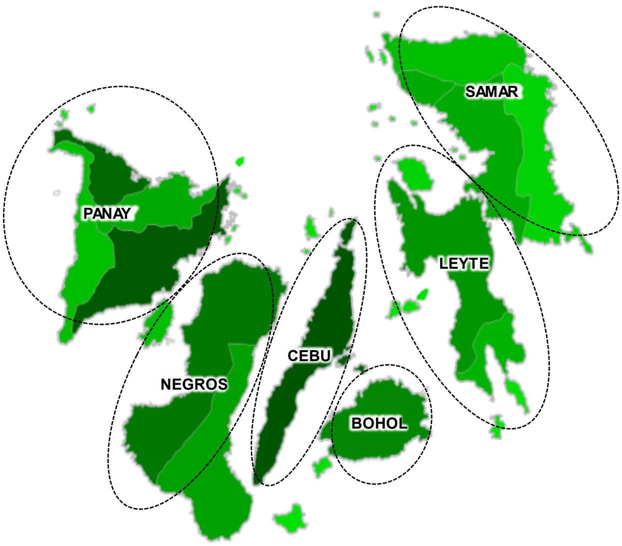


2025 Visayas Generation and Load Distribution

2,687 MW
PEAK POWER DEMAND

3,359 MW
GENERATION CAPACITY

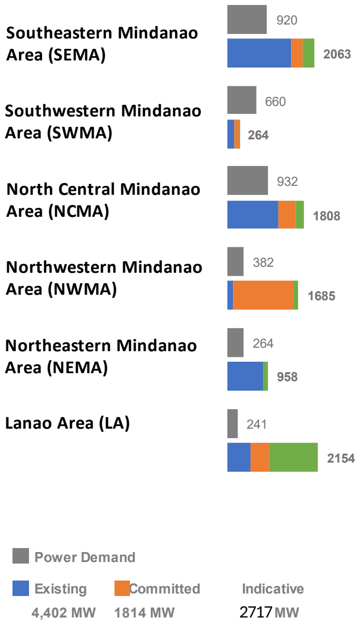


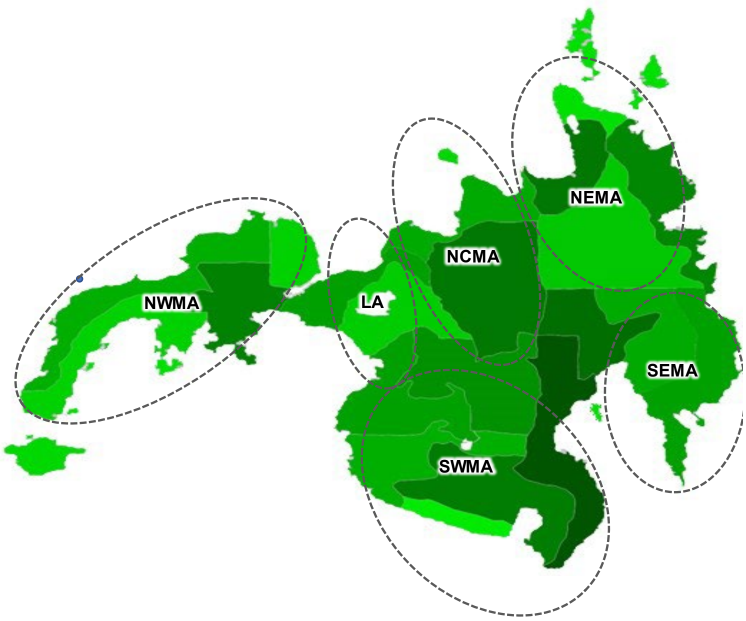


2025 Mindanao Generation and Load Distribution

3,401 MW
PEAK POWER DEMAND

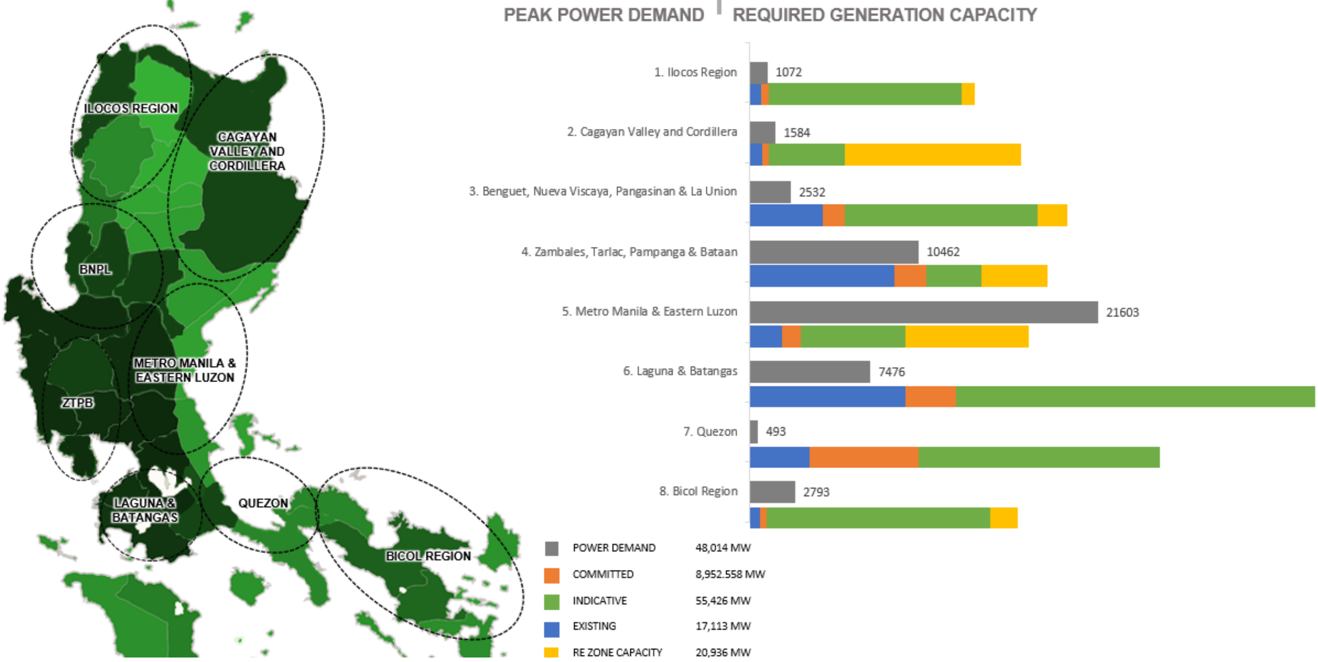
4,531 MW
REQUIRED GENERATION CAPACITY





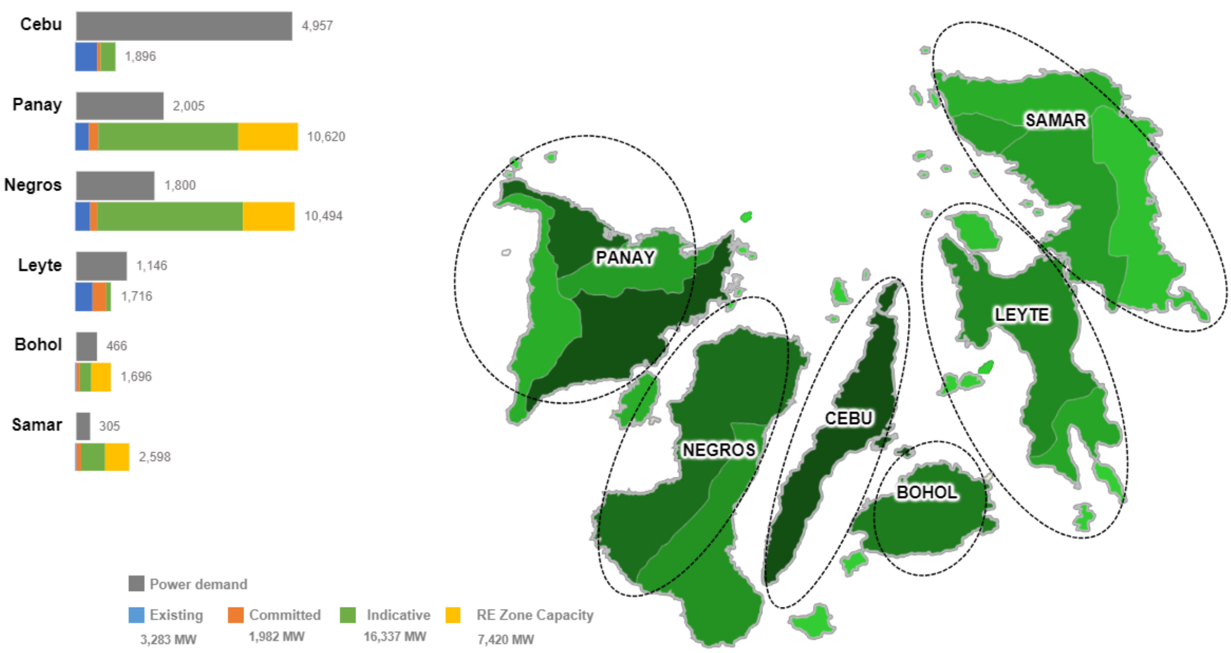
2050 Luzon Generation and Load Distribution

48,014 MW PEAK POWER DEMAND | **60,018 MW** REQUIRED GENERATION CAPACITY



2050 Visayas Generation and Load Distribution

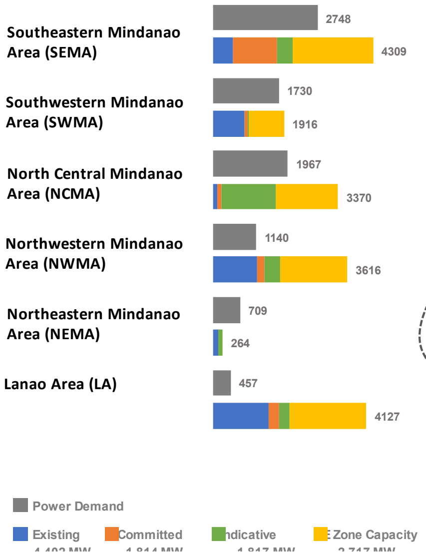
10,678 MW PEAK POWER DEMAND | **13,348 MW** GENERATION CAPACITY

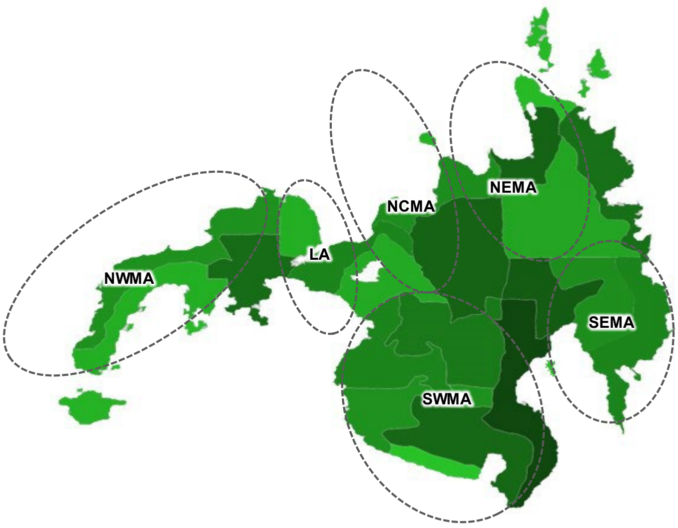


2050 Mindanao Generation and Load Distribution

8,751 MW
PEAK POWER DEMAND

13,098 MW
REQUIRED GENERATION CAPACITY





Appendix 6

Ancillary Service Agreement Procurement Plan

a. Background: State of Ancillary Services in the Grid

As System Operator, NGCP determines the levels of Ancillary Services (AS) required for each grid based on the results of assessment and simulation studies. These AS levels which are variable according to network dynamics are meant to meet PGC-prescribed grid reliability and security requirements.

To qualify as provider of AS the prospective provider should undergo the certification process defined by the PGC and technical criteria. Subsequently, a certified AS provider would be subject to verification testing no more than once (1) every two (2) years except when there are reasonable grounds to surmise that the prevailing characteristics of the generating unit departs from the as-tested-and-certified values.

Table 1 lists the plants with the existing Ancillary Service Procurement Agreement (ASPA); Table 2 lists all AS-certified power plants that have no Firm ASPA and may offer their capacities in the Reserve Market.

Table 1: List of Existing ASPA as of May 31, 2024

Company	Plant Name	AS Type	ERC Case No.
Luzon			
National Power Corporation	Kalayaan Pump Storage Plant	RR, CR, DR, RPS, BSS	2009-029 RC
Prime Meridian Power Corporation	Avion Natural Gas-Fired Power Plant	RR, BSS	2019-051 RC
Pagbilao Energy Corporation	Pagbilao Coal-Fired Power Plant 3	RPS	2020-037 RC
Therma Luzon, Inc.	Pagbilao Coal-Fired Power Plant 1 & 2	RPS	2020-033 RC
		CR	2023-049 RC
BacMan Geothermal, Inc.	110 MW BacMan I Geothermal Plant	BSS	2023-059 RC
First Gen Hydro Power Corporation	Pantabangan Hydroelectric Power Plant	RPS, BSS	2023-060 RC
Bulacan Power Generation Corp.	Bulacan Diesel Power Plant	DR	2023-062 RC
Giga Ace 4, Inc.	Alaminos Battery Energy Storage System	RR	2023-063 RC
Masinloc Power Partners Co. Ltd.	Advancion Energy Storage Array (Phase 1)	CR	2023-064 RC
Therma Mobile, Inc.	Navotas Power Barges	DR, RPS	2023-065 RC
One Subic Power Generation Corp.	Subic Bunker C-Fired Power Plant	DR	2023-066 RC
SN Aboitiz - Magat, Inc.	Magat Hydroelectric Power Plant	CR, DR	2023-054 RC
		RPS	2019-016 RC
SN Aboitiz – Benguet, Inc.	Ambuklao Hydroelectric Power Plant	CR, DR	2023-089 RC
		RPS	2019-014 RC
SN Aboitiz – Benguet, Inc.	Binga Hydroelectric Power Plant	CR, DR	2023-090 RC
		RPS	2019-015 RC
SMGP BESS Power, Inc. (formerly Universal Power Solutions, Inc.)	San Manuel Battery Energy Storage System	RR, CR	2023-067 RC
	Lamao Battery Energy Storage System	RR, CR	2023-070 RC
	Bataan Battery Energy Storage System	RR	2023-086 RC
	Concepcion Battery Energy Storage System	CR	2023-091 RC
Ingrid Power Holdings, Inc.	Pililla Diesel Power Plant	CR	2023-051 RC
CIP II Power Corporation	Subic Bunker C-Fired Power Plant	DR	2023-071 RC
Visayas			
Panay Power Corporation	Nabas Diesel Power Plant	DR, RPS	2018-108 RC
Toledo Power Corporation	Carmen Diesel Power Plant	DR, RPS, BSS	2018-109 RC
SPC Island Power Corporation	Power Barge 104	DR, BSS	2019-011 RC
Central Negros Power Reliability, Inc.	Calumangan Diesel Power Plant	DR, RPS	2019-024 RC
SMGP Kabankalan Power Co. Ltd. (formerly SMCGP Phils. Energy Storage Co. Ltd.)	Kabankalan Battery Energy Storage System	RR	2021-056 RC
Isabel Ancillary Services. Co. Ltd	80 MW Modular Diesel Power Plant	RR, CR, RPS	2023-039 RC
Therma Visayas, Inc.	CFB Coal-Fired Power Plant	CR, RPS	2023-050 RC
Meridian Power, Inc. (formerly Cebu Private Power Corporation)	Bunker C-Fired Diesel Power Plant	DR, RPS, BSS	2023-057 RC
More Power Barge, Inc.	Power Barge 101	BSS	2023-061 RC
SMGP BESS Power, Inc. (formerly Universal Power Solutions, Inc.)	Ubay Battery Energy Storage System	CR	2023-068 RC
	Ormoc Battery Energy Storage System	CR	2023-069 RC
	Toledo Battery Energy Storage System	CR	2023-074 RC
East Asia Utilities Corporation	Bunker C-Fired Diesel Power Plant	RPS, BSS	2023-075 RC
Therma Power Visayas, Inc.	Bunker C-Fired Diesel Power Plant	RPS, BSS	2023-077 RC

SPC Island Power Corporation	Panay Diesel Power Plant 3	DR, BSS	2023-078 RC
Mindanao			
National Power Corporation	Pulangi 4 Hydroelectric Power Plant	RR, CR, RPS, BSS	2009-029 RC
	Agus 1, 2 & 5 Hydroelectric Power Plants	CR, RPS	
	Agus 4 & 5 Hydroelectric Power Plants	RR, CR, RPS	
	Agus 6 & 7 Hydroelectric Power Plants	CR	
King Energy Generation, Inc.	Surigao del Sur Power Plant	DR	2021-058 RC
King Energy Generation, Inc.	Misamis Occidental Power Plant 2	DR, RPS	2023-083 RC
King Energy Generation, Inc.	Misamis Occidental Power Plant 3	DR, RPS	2023-084 RC
SMGP BESS Power, Inc. (formerly Universal Power Solutions, Inc.)	Jasaan Battery Energy Storage System	CR	2023-072 RC
	Malita Battery Energy Storage System	RR	2023-073 RC
	Maco Battery Energy Storage System	RR	2023-079 RC
Therma Marine, Inc.	Bunker C-Fired Diesel Power Plant (Mobile 1)	CR, RPS, BSS	2023-052 RC
Therma Marine, Inc.	Bunker C-Fired Diesel Power Plant (Mobile 2)	DR, RPS, BSS	2023-085 RC
Mapalad Power Corporation	Bunker C-Fired Diesel Power Plant	DR	2023-087 RC
GN Power Kauswagan, Ltd. Co.	Kauswagan Coal-Fired Power Plant	CR	2023-048 RC
Western Mindanao Power Corp.	Bunker -C Fired Diesel Power Plant	DR, RPS, BSS	2023-088 RC

Table 2: List of AS-Certified Power Plants without ASPA as of May 31, 2024

Company	Plant Name	AS Type
Luzon		
1590 Energy Corp.	Bauang Diesel Power Plant	DR
GNPower Dinginin Co. Ltd.	Dinginin Coal-Fired Power Plant	CR
GNPower Mariveles Co. Ltd.	Mariveles Coal-Fired Power Plant	CR
Panasia Energy Inc.	Bataan Combined-Cycle Thermal Power Plant	RR, CR, DR, RPS
Prime Meridian Power Corp.	San Gabriel Gas Turbine PP	RR
SN Aboitiz Power-Magat, Inc.	Magat BESS	CR
Visayas		
Green Core Geothermal Inc.	Palinpinon II Geothermal Power Plant	RR
GT-Energy Corp.	Calbayog Bunker Diesel Power Plant	DR, RPS
Palm Concepcion Power Corp.	Palm Concepcion Coal-Fired Power Plant	RR
Taft Hydroenergy Corp.	Tubig Hydroelectric Power Plant	BSS
Mindanao		
Peakpower Bukidnon Inc.	Peakpower Diesel/bunker Power Plant	DR
Sarangani Energy Corp.	SEC Coal-Fired Power Plant	CR
Strategic Energy Development Inc.	Bunker-C Fired Diesel Power Plant	DR
SMGP BESS Power, Inc.	Villanueva BESS	RR, CR
Therma South, Inc.	Davao Coal-Fired Power Plant	CR, RPS

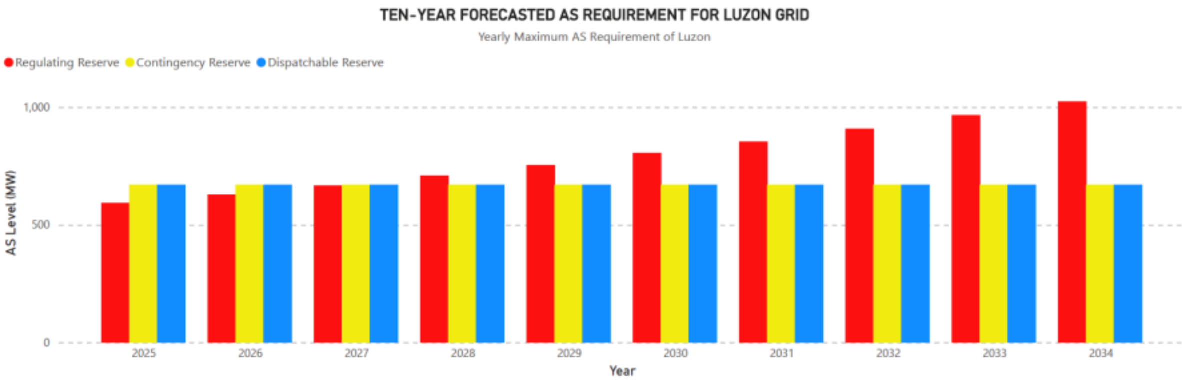
IV. Plans for the Procurement of Ancillary Services

Because of the limited number of AS-certified power plants, as well as restrictions from available generator capacities and response times of these providers, the Grid's AS level requirements to sustain reliability objectives are not yet being met.

In 2023, the first Competitive Selection Process for the procurement of AS(AS-CSP) was conducted consistent with the Department of Energy (DOE) Circular No. 2021-10-0031,and resulted to thirty-six (36) new ASPAs with Firm arrangements. Further, with the recent commercial operations of the Reserve Market on 26 January 2024, AS-certified plants without ASPAs were able to provide its AS capacity at market prices. The new ASPAs, along with the Reserve Market scheduled capacities, have improved the AS availability in the grid.

Figures below presents the ten-year simulated projection acquisition plan of AS requirement by the Grid as outlined in the 2025- 2034 ASAPP based on the DOE demand projection and committed generating plants coming in within the next ten years.

TEN-YEAR FORECASTED AS REQUIREMENT FOR LUZON GRID

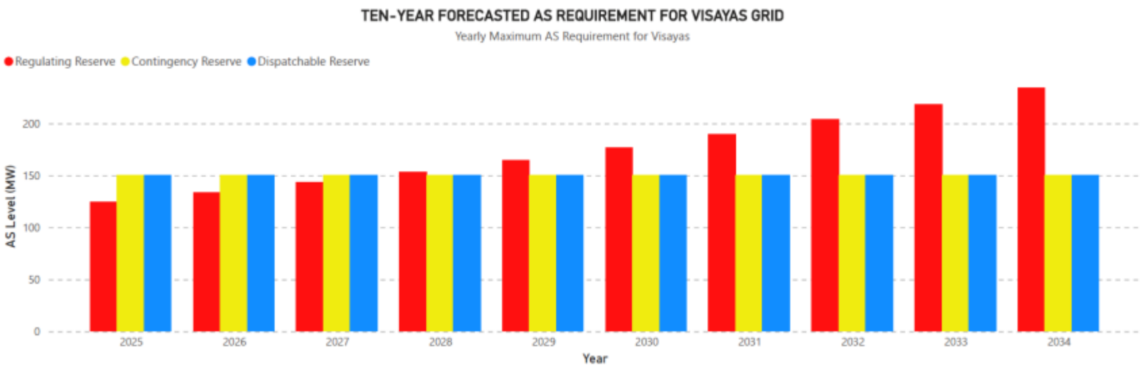


Reserve Type	Maximum AS Requirement of Luzon									
	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Regulating Reserve	591	627	667	709	754	803	854	908	964	1023
Contingency Reserve	668	668	668	668	668	668	668	668	668	668
Dispatchable Reserve	668	668	668	668	668	668	668	668	668	668

Note: RR Requirement is equivalent to 4% of Plexos Demand projection based on DOE's 2020-2040 Annual Peak Demand Projections for Luzon, Visayas and Mindanao Grids, dated 24 August 2020. While CR and DR are based on Gross Capacity of highest generating unit for the succeeding years, taking into consideration the DOE list of private sector initiated power projects (committed) and the capacity limits for prospective power generating plants per ERC Resolution No. 18 Series of 2017.

Figure 2 - Ten-Year Forecasted as Requirement for Luzon Grid

TEN-YEAR FORECASTED AS REQUIREMENT FOR VISAYAS GRID

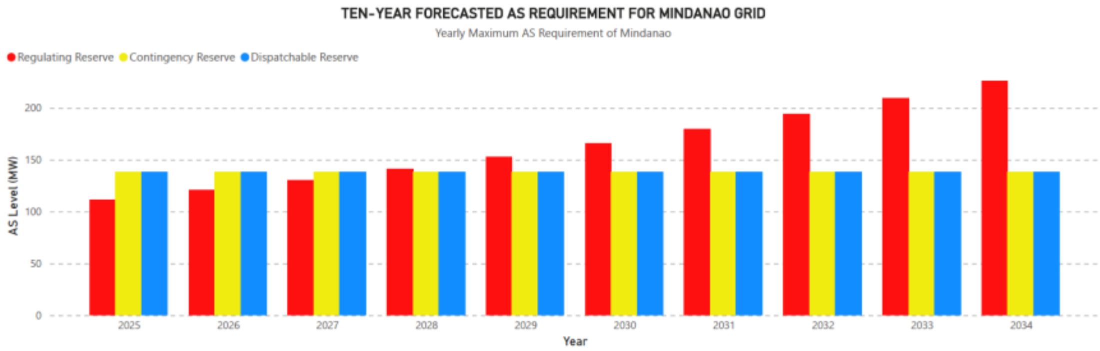


Reserve Type	Maximum AS Requirement of Visayas									
	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Regulating Reserve	124	134	143	154	165	177	190	204	219	234
Contingency Reserve	150	150	150	150	150	150	150	150	150	150
Dispatchable Reserve	150	150	150	150	150	150	150	150	150	150

Note: RR Requirement is equivalent to 4% of Plexos Demand projection based on DOE's 2020-2040 Annual Peak Demand Projections for Luzon, Visayas and Mindanao Grids, dated 24 August 2020. While CR and DR are based on Gross Capacity of highest generating unit for the succeeding years, taking into consideration the DOE list of private sector initiated power projects (committed) and the capacity limits for prospective power generating plants per ERC Resolution No. 18 Series of 2017.

Figure 3 Ten-Year Forecasted as Requirement for Visayas Grid

TEN-YEAR FORECASTED AS REQUIREMENT FOR MINDANAO GRID



Reserve Type	Maximum AS Requirement of Mindanao									
	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Regulating Reserve	112	121	130	141	153	166	179	194	209	226
Contingency Reserve	138	138	138	138	138	138	138	138	138	138
Dispatchable Reserve	138	138	138	138	138	138	138	138	138	138

Note: RR Requirement is equivalent to 4% of Plexos Demand projection based on DOE's 2020-2040 Annual Peak Demand Projections for Luzon, Visayas and Mindanao Grids, dated 24 August 2020. While CR and DR are based on Gross Capacity of highest generating unit for the succeeding years, taking into consideration the DOE list of private sector initiated power projects (committed) and the capacity limits for prospective power generating plants per ERC Resolution No. 18 Series of 2017.

Figure 4. Ten-Year Forecasted as Requirement for Mindanao Grid

Also, NGCP as the System Operator, conscious of its mandate, ensures that procurement of Ancillary Service is conducted in the least-cost manner. While co-optimization of offered reserves in the energy market would make for efficient energy dispatch, a secondary price cap for reserves—approved by the ERC—would be a welcome cost-control measure.

For the contracting of Reactive Power Support (RPS) and Black Start Service (BSS), NGCP has been proposing to the DOE to allow direct contracting for such AS types as these are non-competitive and not available in the Reserve Market. The nature of RPS and BSS are locational, and utilization is only when needed by the grid. Further, the ERC-approved cost recovery for RPS and BSS is on a per-occurrence basis only, without a fixed monthly charge. Nonetheless, with the plans to conduct a second AS-CSP this 2024, these AS types will be included while awaiting the approval of the DOE for direct contracting.

V. The AS Rules

The ERC issued the OATS Rules 2022 and replaced the requirement of the submission of NGCP to the ERC of the annual AS Procurement Plan with the AS Rules. The AS Rules shall among others; describe the AS in sufficient details so that the prospective providers of the service can determine whether they have the capability to provide the service, describe the test that NGCP as the System Operator shall use to verify that the plant and Equipment meet the technical requirement and ***specify the manner of NGCP's procurement of AS***. However, the ERC has yet to issue the AS Rules to date.

Power Restoration Highway

System blackout occurred when all generation in the grid has ceased, and the entire power system has shutdown. The process of recovery from total system blackout using a generating unit with the capability to start and synchronize with the power system without an external power supply is called Black Start. Power plants that serve as Black Start Provider must have a black start capability or the ability to go from a shutdown condition to an operating condition within a specified period without feedback power from the grid and to start delivering power to the sections of the grid such as generating plants and critical loads.

Black start generators must be capable of starting themselves quickly without the need for external power supply from the grid, with sufficient real (MW) and reactive power (MVAR) to energize transmission lines and restart other generators. They must also be able to control frequency as well as a voltage which can sustain a self-reliant operation for at least 12 hours and extend power within 30 minutes.

Luzon, Visayas and Mindanao have five (5) sub-grids. Luzon sub-grids are Metro Manila sub-grid (LRCC), Northern Luzon sub-grid (NLACC), Central Luzon sub-grid (CLACC), and Southern Tagalog sub-grid (STACC), Bicol sub-grid (BACC). In Visayas, these includes Panay, Negros, Cebu, Bohol, Leyte-Samar, while in Mindanao, these are Zamboanga ACC, Iligan Cagayan ACC, Butuan ACC, Davao ACC and General Santos ACC. Each sub-grid has its own designated power restoration highway and must have at least two black start service providers, in case the other fails to operate. However, at present there are sub-grids that have a deficiency in Black Start Providers, hence, NGCP continuously encourages other generating units to participate as Black Start Providers for the improvement of the restoration time.

It is also crucial to monitor and ensure the health of the breakers as well as protective relays which are connected to all restoration highways (substation/power plant). Similarly, setting and proper coordination of power plant protection relays and grid protection relays could prevent any undesired tripping during occurrence of system disturbance.

Furthermore, installation of NDMEs is also necessary for real-time monitoring, recording of system disturbance and retrieving of fault data remotely particularly in these critical substations as part of the restoration highway. Similarly, installation of PQAs could be used effectively for online monitoring of power quality problems such as generating current/voltage harmonics beyond power system network limits, voltage imbalance and fluctuation and harmonic resonance in the substations and power plant which are part of the power restoration highway.

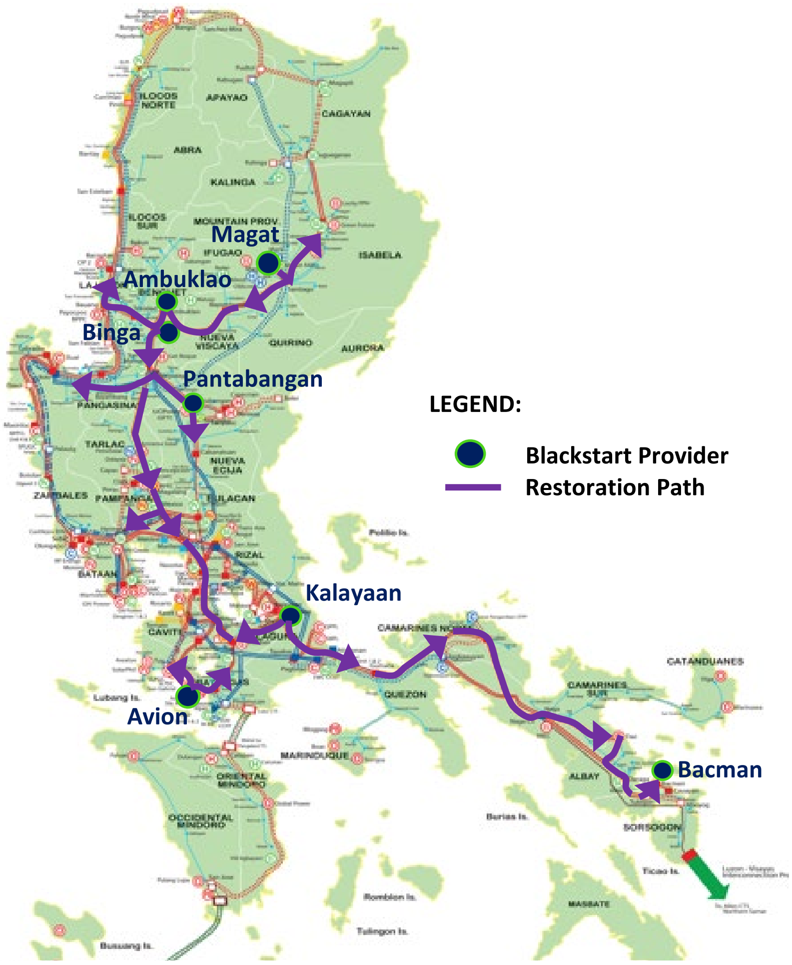


Figure 1: Luzon Power Restoration Highway

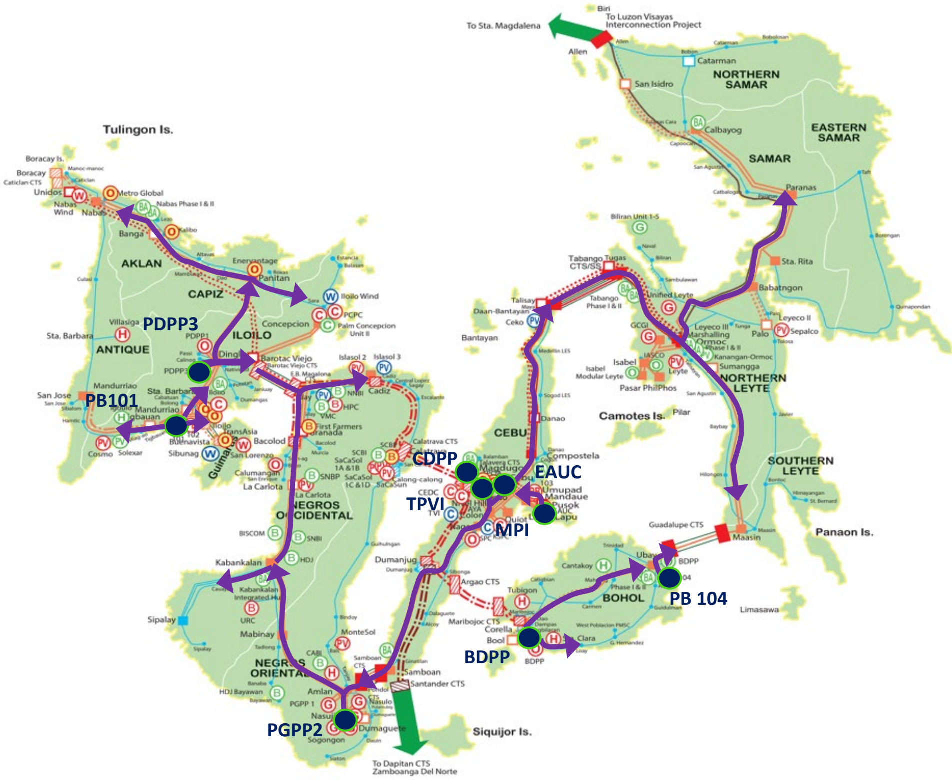


Figure 2 Visayas Power Restoration Highway

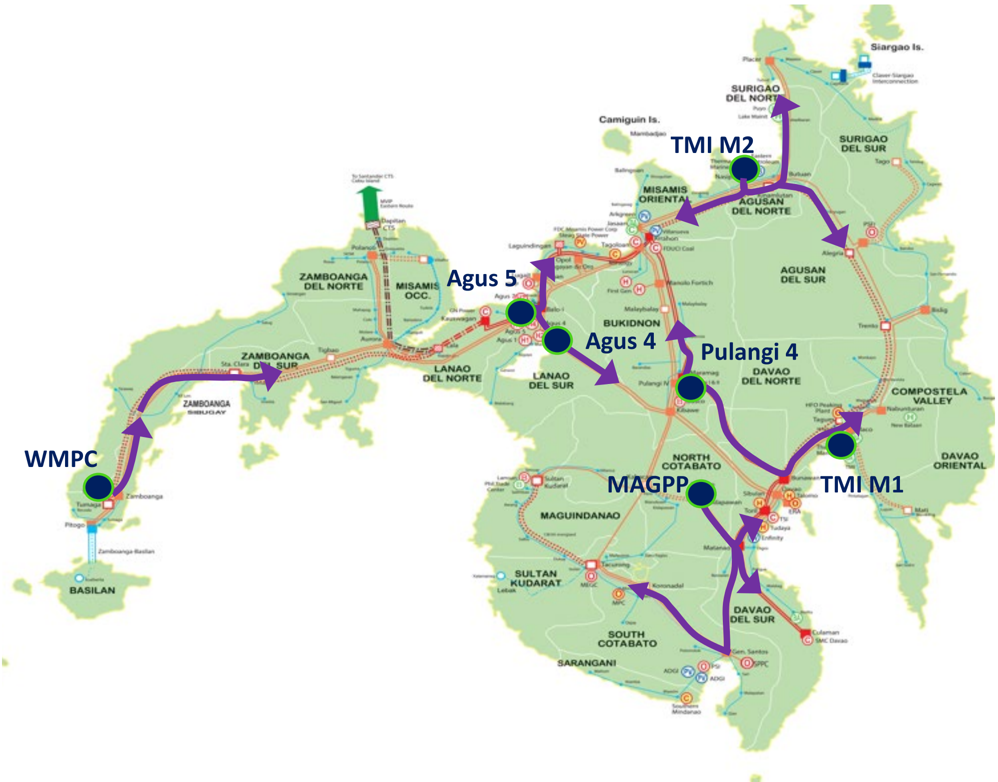


Figure 3 Mindanao Power Restoration Highway

Appendix 8

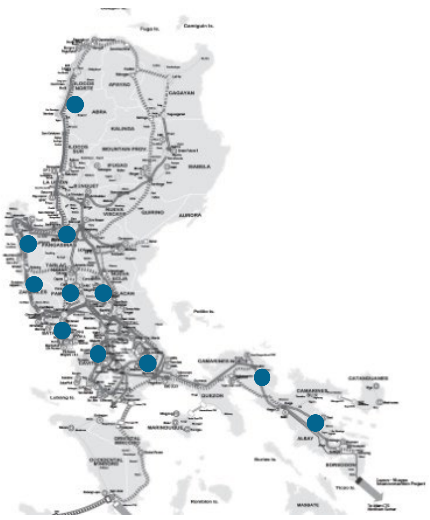
Summary Asset Lives

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	40	
	Outdoor switch bays	40	500 kV, 230 kV, 138/115 kV, 69 kV outdoor assemblies (see Note 1)
Outdoor Substations – Individual equipment	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	

Appendix 9

Updates on Battery Energy Storage System

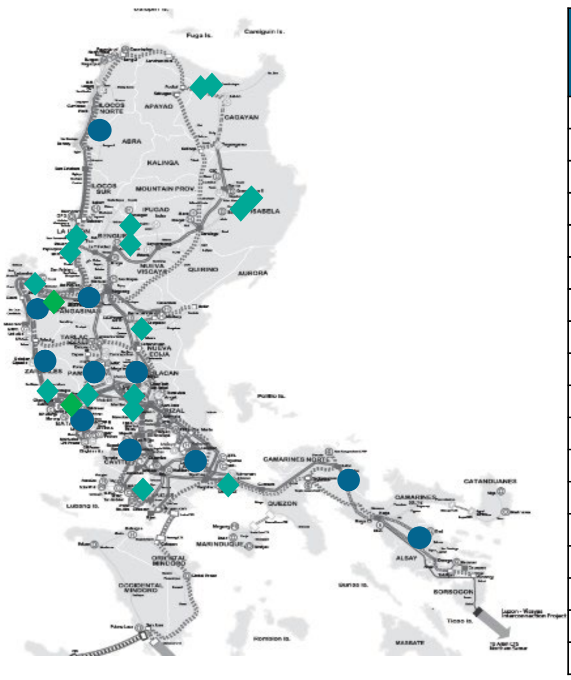
Existing and Proposed BESS at NGCP Recommended Sites



Substation	NGCP Recommended		Existing BESS Installed			Proposed BESS		
	Voltage	Capacity (MW)	Voltage	Capacity (MW)	Ancillary Service Type	Voltage	Committed Capacity (MW)	Indicative Capacity (MW)
Masinloc	69 kV	20	230 kV	12.4	RR, CR	-	-	
Daraga	69 kV	40	-	-	-	69 kV	40*	
Laoag	69 kV	40	-	-	-	69 kV	40*	
			-	-	-	69 kV	-	20*
San Rafael	69 kV	20	-	-	-	-	40	
Labo	69 kV	20	-	-	-	-	40	
			-	-	-	69 kV		20*
Mexico	69 kV	20	-	-	-	-	90	
San Manuel	69 kV	20		68.5	RR, CR	-	-	
Bay	69 kV	20	-	-	-	-	20	
			-	-	-	-		50
Labrador	69 kV	20	-	-	-	-	40	
			-	--	-	-		20
Lamao	230 kV	30		69.9	RR, CR	-	-	
Lumban	69 kV	40	-	-	-	-	60	
			-	-	-	-		40
TOTAL	**290 MW**		**150.8 MW**			**-**	**370**	**150**
						520 MW		

** - With SIS Application*

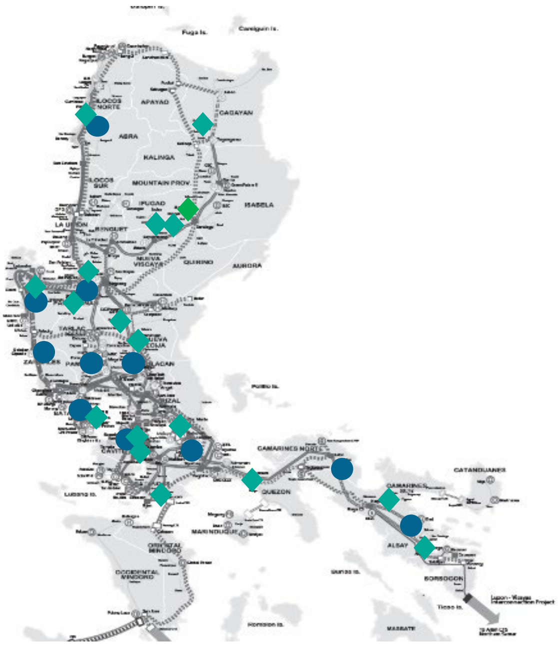
Existing and Proposed BESS at other sites



Substation/ Project	Existing BESS		Proposed BESS		
	Voltage	Capacity (MW)	Voltage	Committed Capacity (MW)	Indicative Capacity (MW)
Alaminos	69 kV	60	-	-	
Bataan	69 kV	47.5	-	-	
Gamu	-	-	-	20	
Gamu Phase 2	-	-	-	20	
Magapit	-	-	-	20	
Magapit Phase 2	-	-	-	20	
Concepcion	69 kV	20	69 kV		20*
Concepcion Phase 2	69 kV	30	-		
Mahabang Parang	-	-	-	40	
Bauang	-	-	-	40	
Cabanatuan	-	-	-	40	
Hermosa	-	-	-	40	
Navotas	-	-	-	40	
Pagbilao	-	-	-	40	
Bacnotan	-	-	-	40	
Subic	-	-	-	40	
San Jose del Monte	-	-	-	40	
Bolo	-	-	-	40	

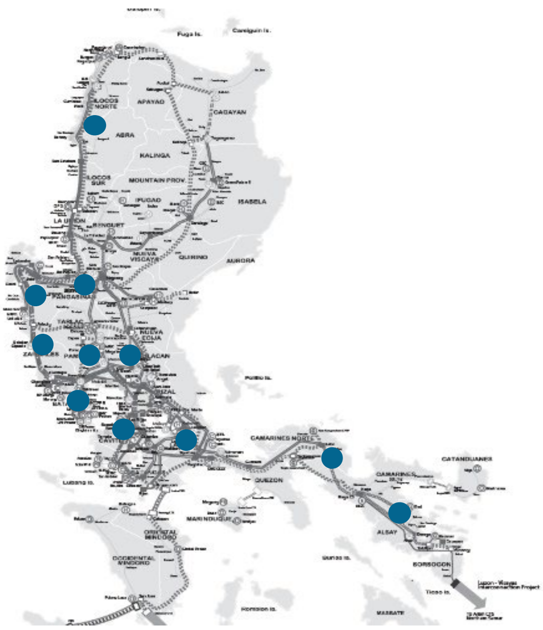
** - With SIS Application*

Appendix 9



Substation/ Project	Existing BESS		Proposed BESS		
	Voltage	Capacity (MW)	Voltage	Committed Capacity (MW)	Indicative Capacity (MW)
Tuguegarao	-	-	-	40	
Bayombong	-	-	-	40	
Calamba	-	-	-	40	
Naga	-	-	-	40	
Bac-Man	-	-	230 kV	30*	
Sual	-	-	-	60	
Urdaneta	-	-	-	40	
Dasmarinas	-	-	-	40	
Ilijan	-	-	-	40	
Gumaca	-	-	-	40	
La Trinidad	-	-	-	40	
BCCP Limay Project Phase 2	-	-	-	20	
Angat Project	-	-	-	20	
Angat Optimization	-	-	-	-	160
Magat	230 kV	32.4	-	-	
Cruz na Daan (CND)	-	-	69 kV	-	40.6*
Currimao	-	-	69 kV	-	50*
Pililla	-	-	-	-	50
Panda	-	-	-	-	150

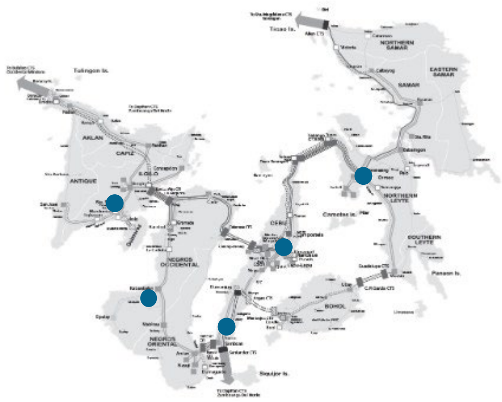
** - With SIS Application*



Substation/ Project	Existing BESS		Proposed BESS		
	Voltage	Capacity (MW)	Voltage	Committed Capacity (MW)	Indicative Capacity (MW)
Bugallon	-	-	-		200
Ambuklao	-	-	-		40
Enerhiya Central Project	-	-	69 kV		40*
Enerhiya Sur II Project	-	-	69 kV		40*
Enerhiya Sur I Project	-	-	69 kV		40*
Enerhiya Sur 3	-	-	-		40
Enerhiya Sur 4	-	-	-		40
Enerhiya Sur 5	-	-	-		40
TMO	-	-	-		100
Cawag	-	-	-		28
Malaya	-	-	-		20
Nagsaag	-	-	-		20
Binga	-	-	-		40
Magat Phase 2	-	-	-		16
San Roque Optimization					400
TOTAL	**189.9 MW**		**-**	**970 MW**	**1574.6 MW**
			2,544.60 MW		

** - With SIS Application*

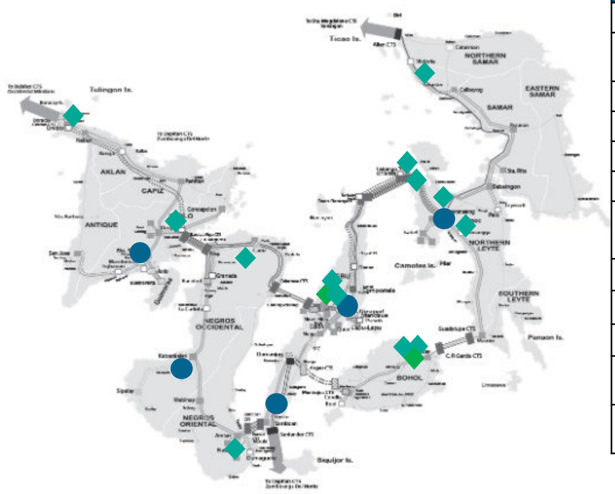
Existing and Proposed BESS at NGCP Recommended Sites



Substation	NGCP Recommended		Existing BESS Installed			Proposed BESS		
	Voltage	Capacity (MW)	Voltage	Capacity (MW)	Ancillary Service Type	Voltage	Committed Capacity (MW)	Indicative Capacity (MW)
Kabankalan	138 kV	10	138 kV	34.7	RR, CR	-	-	
Ormoc	69 kV	20	69 kV	40	-	69 kV	-	50*
Samboan	69 kV	10	-	-	-	69 kV	20	
Sta. Barbara	138 kV	10	-	-	-	138 kV		20*
Compostela	230 kV	20	-	-	-	69 kV	20	7.5
TOTAL	**70 MW**		**74.7 MW**				**40 MW**	**77.5 MW**
						117.5 MW		

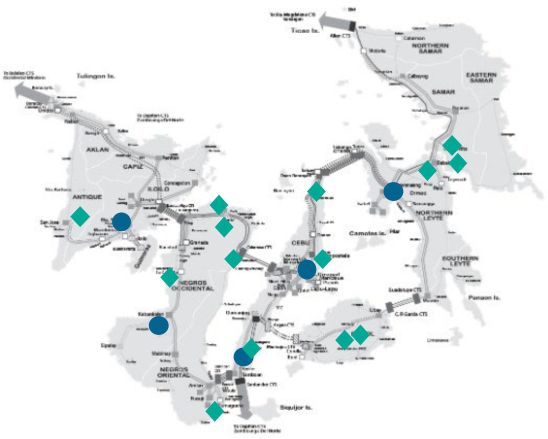
** - With SIS Application*

Existing and Proposed BESS at other sites



Substation/ Project	Existing BESS		Proposed BESS		
	Voltage	Capacity (MW)	Voltage	Committed Capacity (MW)	Indicative Capacity (MW)
Toledo	69 kV	23.7	-		20
Calong-Calong (Toledo Phase 2)	-	-	69 kV	20	
Ubay	69 kV	23.3	-		20
Ubay Phase 2	-	-	-	20	
Tabango	-	-	69 kV	20	37.5
Tabango Phase 2	-	-	-	20	
Dingle	-	-	138 kV	20	20
Nabas	-	-	69 kV	20	
Calbayog	-	-	69 kV	20	30
Tongonan	-	-	138 kV	30*	
Nasuji (Southern Negros)	-	-	138 kV	30*	
NNGPP (Northern Negros)	-	-	138 kV	30*	

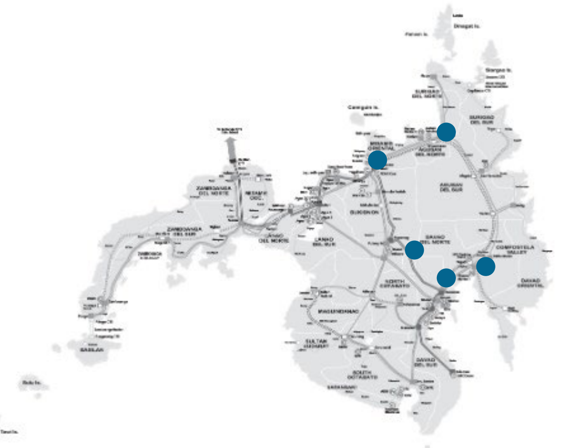
** - With SIS Application*



Substation/ Project	Existing BESS		Proposed BESS		
	Voltage	Capacity (MW)	Voltage	Committed Capacity (MW)	Indicative Capacity (MW)
Calatrava (San Carlos)	-	-	69 kV	20	
Pusok (Mactan)	-	-	69 kV	20	
Tinampa -an	-	-	-		50
Cadiz	-	-	69 kV		50*
San Isidro	-	-	138 kV		200*
Enerhiya Delas Islas I	-	-	-		40
Enerhiya Delas Islas II	-	-	-		40*
Enerhiya Delas Islas III	-	-	-		40
Daanbantayan	-	-	-		20
Padayon	-	-	69 kV		20*
Pandora (Naga)	-	-	-		20
Pandora 2 Integrated					42
Panay	-	-	-		49.9
Santander	-	-	-		30
Sta Rita	-	-	-		30
Bohol	-	-	-		30
TOTAL	**47 MW**			**270 MW**	**789.4 MW**
			1059.4 MW		

** - With SIS Application*

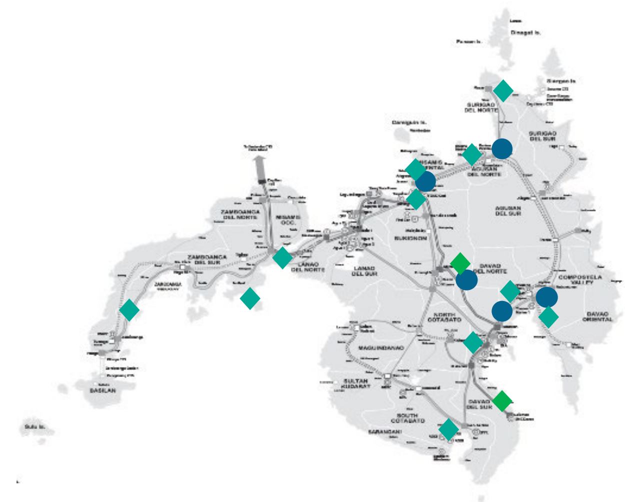
Existing and Proposed BESS at NGCP Recommended Sites



Substation	NGCP Recommended		Existing BESS Installed			Proposed BESS		
	Voltage	Capacity (MW)	Voltage	Capacity (MW)	Ancillary Service Type	Voltage	Committed Capacity (MW)	Indicative Capacity (MW)
Villanueva	138 kV	10	-	-	-	138 kV	20*	
Davao	69 kV	20	-	-	-	-	-	
Maco	69 kV	20	69 kV	24.3	RR, CR	-	-	
Kibawe	69 kV	20	-	-	-	-		50
Butuan	69 kV	20	-	-	-	-	-	
							20 MW	**50 MW**
TOTAL	**90 MW**		**24.3 MW**			**70 MW**		

Existing and Proposed BESS at other sites

** - With SIS Application*



Substation/ Project	Existing BESS		Proposed BESS		
	Voltage	Capacity (MW)	Voltage	Committed Capacity (MW)	Indicative Capacity (MW)
Malita	138 kV	22.8	-	-	
Maco	138 kV	49	-	-	
Pitogo	-	-	138 kV	60	
Zamboanga (Sangali)	-	-	69 kV	20	
Jasaan	69 kV	20	-	-	
Tagum	-	-	-	20	
Aurora	-	-	69 kV	20	
Tagoloan Phase 2	-	-	-	20	
Placer	-	-	-	20	
Maramag	-	-	-	20	
Gen San	-	-	-	20	
Toril	-	-	-		20
Nasipit	-	-	-		48
				200 MW	**68 MW**
TOTAL	**91.8 MW**		**268 MW**		

** - With SIS Application*

Network Synchronization Program Installation Status

Luzon	With Clock Installation
San Jose 500KV SS	Installed
Mexico SS	Installed
Nagsaag SS	Installed
Bolo SS	Installed
La Trinidad SS	Installed
Biñan SS	Installed
Dasmariñas SS	Installed
Tayabas SS	Installed
Naga SS	Installed
Bay SS	Installed
Malaya SS	Installed
Cabanatuan SS	Installed
San Manuel 230kV SS	Installed
Currimao SS	Installed
SBMA SS	Installed
Botolan SS	Installed
Olongapo SS	Installed
Subic SS	Installed
Gamu SS	Installed
Hermosa SS	Installed
San Jose 230kV SS	Installed
Bauang SS	Installed
San Esteban SS	Installed
Lumban SS	Installed
Batangas SS	Installed
Gumaca SS	Installed
Labo SS	Installed
Taytay SS	Installed
Quezon SS	Installed
Doña Imelda SS	Installed
Muntinlupa SS	Installed
Las Piñas SS	Installed
Calaca SS	Installed
Tuguegarao SS	Installed
Santiago SS	Installed
Bayombong SS	Installed
Bacnotan SS	Installed
Naga HVDC SS	Installed
Daraga SS	Installed
Labrador SS	Installed
Lamao SS	Installed
Navotas SS	Installed
Laoag SS	Installed
Bantay SS	Installed
San Rafael SS	Installed
Limay SS	Installed
Concepcion SS	Installed
Clark SS	Installed
Rosario SS	Installed
Pagbilao SS	Installed
Ambuklao SS	Installed
Binga SS	Installed
Balingueo SS	Installed
Salong SS	Installed
Balsik	Installed
Mariveles	Installed
BCCP SS	Installed
Calamba SS	Installed
Tiwi A	Installed
Tiwi C	Installed

Visayas	With Clock Installation
Bacolod SS	Installed
Sta Barbara SS	Installed
Ormoc SS	Installed
Cebu SS	Installed
Quiot SS	Installed
Daan Bantayan SS	Installed
Colon SS	Installed
Calong-Calong SS	Installed
Tabango SS	Installed
Kabankalan SS	Installed
Mabinay SS	Installed
Cadiz SS	Installed
Ubay SS	Installed
Dingle SS	Installed
Kananga SS	Installed
Isabel SS	Installed
Panit-an SS	Installed
Compostela SS	Installed
Toledo SS	Installed
Samboan SS	Installed
Amlan SS	Installed
Corella SS	Installed
Barotac Viejo SS	Installed
San Jose SS	Installed
Nabas SS	Installed
Maasin SS	Installed
Babatngon SS	Installed
Paranas SS	Installed
Calbayog SS	Installed
Mandaue SS	Installed
Lapu-Lapu SS	Installed
Magdugo SS	Installed

Mindanao	With Clock Installation
General Santos SS	Installed
Butuan SS	Installed
Balo-i SS	Installed
Jasaan SS	Installed
Villanueva SS	Installed
Maramag SS	Installed
Bunawan SS	Installed
San Francisco SS	Installed
Kibawe SS	Installed
Davao SS	Installed
Tagoloan SS	Installed
Aurora SS	Installed
Nasipit SS	Installed
Bislig SS	Installed
Nabunturan SS	Installed
Maco SS	Installed
Tacurong SS	Installed
Matanao SS	Installed
Toril SS	Installed
Zamboanga SS	Installed
Tumaga SS	Installed
Sultan Kudarat SS	Installed
Kidapawan SS	Installed
Iligan SS	Installed
Polanco SS	Installed
Lugait SS	Installed
Cagayan de Oro SS	Installed
Naga Mindanao SS	Installed
Pitogo SS	Installed
Placer SS	Installed
Culaman SS	Installed
Manolo Fortich SS	Installed
Opol SS	Installed
Lala SS	Installed

Abbreviations and Acronyms

Development Plans

DDP	Distribution Development Plan
ESMAP	Energy Sector Management Assistance Program
GEAP	Green Energy Auction Program
NREP	National Renewable Energy Program
PDP	Power Development Program
PEP	Philippine Energy Plan
TDP	Transmission Development Plan

Electricity Market

IEMOP	Independent Electricity Market Operator of the Philippines
PEMC	Philippine Electricity Market Corporation
WESM	Wholesale Electricity Spot Market

Government Agencies

ERC	Energy Regulatory Commission
DICT	Department of Information and Communications Technology
DENR	Department of Environmental and Natural Resources
DOE	Department of Energy
LLDA	Laguna Lake Development Authority
MGB	Mines and Geosciences Bureau
NEDA	National Economic & Development Authority

Government-owned and Controlled Corporation and other Government Agencies

NPC	National Power Corporation
PSALM	Power Sector Assets & Liabilities Management
TransCo	National Transmission Corporation
SPUG	Small Power Utilities Group

Legal, Environmental and Other Requirements

BCMS	Business Continuity Management System
EMS	Environmental Management System
EPIRA	Electric Power Industry Reform Act
IMS	Integrated Management System
ISMS	Information Security and Management System
ISO	International Organization for Standardization
IRR	Implementing Rules and Regulation
OHSMS	Occupational Health and Safety Management System
PGC	Philippine Grid Code
QMS	Quality Management System
RE Law	Renewable Energy Law

Other Companies

BEI	Bohol Enterprises, Inc.
BSTC	Bukidnon Sub transmission Corporation
IFC	International Finance Corporation
NREL	National Renewable Energy Laboratory
USAID	United States Agency for International Development

Power Generating Companies

CEDC	Cebu Energy Development Corporation
EERI	Excellent Energy Resources Inc.
EWC	Energy World Corporation
FGHPC	First Gen Hydro Power Corporation
GN Power	General Nakar Power
GNKEILCO	KEPCO Ilijan 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
SCPC	Sta. Clara Power Corporation

Power Plants

CCPP	Combined Cycle Power Plant
CFPP	Coal-Fired Power Plant
BPP	Biomass 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
SPP	Solar Power Plant
Solar PV	Solar Photovoltaic
VRE	Variable Renewable Energy

Private Distribution Utilities

APEC	Power and Energy Corporation
AEC	Angeles Electric Corporation
CEPALCO	Cagayan Electric Power & Light Company
CEDC	Clark Electric Distribution Corporation
DLPC	Davao Light and Power Company
MERALCO	Manila Electric Company
TEI	Tarlac Electric Inc.
VECO	Visayan Electric Company, Inc.

Regions/Areas

CALABARZON	Cavite, Laguna, Batangas, Rizal, and Quezon
CBD	Central Business District
LA	Lanao Area
NCC	New Clark City
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, Sarangani & Gen Santos
SRP	South Road Properties
SWMA	South Western Mindanao Area

Regulatory

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

Appendix 11

Supply-Demand and Investment	
AACGR	Annual Average Compounded Growth Rate
CAPEX	Capital Expenditures
CR	Contingency Reserve
DR	Dispatchable Reserve
GDP	Gross Domestic Product
GRDP	Gross Regional Domestic Product
LoLp	Loss of Load Probability
SPD	System Peak Demand
Transmission Network Provider	
NGCP	National Grid Corporation of the Philippines
Unit of Measure	
ckm	Circuit-kilometer
km	kilometer
kV	kilo-Volt
MVA	Mega-Volt Ampere
MVAR	Mega-Volt Ampere Reactive
MW	Mega-Watt
UTS	Ultimate Tensile Strength
Electric Cooperatives	
ALECO	Albay Electric Cooperative, Inc.
ABRECO	Abra Electric Cooperative, Inc.
AKELCO	Aklan Electric Cooperative, Inc.
BATELEC II	Batangas II Electric Cooperative, Inc.
BENECO	Benguet Electric Cooperative, Inc.
CAGELCO I	Cagayan 1 Electric Cooperative, Inc.
CASURECO IV	Camarines Sur IV Electric Cooperative, Inc.
CENPELCO	Central Pangasinan Electric Cooperative, Inc.
DORELCO	Don Orestes Romualdez Elect Cooperative, Inc.
ESAMELCO	Eastern Samar Electric Cooperative, Inc.
FICELCO	First Catanduanes Electric Cooperative, Inc.
ILECO II	Iloilo II Electric Cooperative, Inc.
ILECO III	Iloilo III Electric Cooperative, Inc.
INEC	Ilocos Norte Electric Cooperative, Inc.
ISECO	Ilocos Sur Electric Cooperative, Inc.
KAELCO	Kalinga-Apayao Electric Cooperative, Inc.
LEYECO II	Leyte II Electric Cooperative, Inc.
LUELCO	La Union Electric Cooperative, Inc.
MORESCO I	Misamis Oriental I Electric Cooperative
MOELCI	Misamis Occidental I Electric Cooperative, Inc.
IMORESCO I	Misamis Oriental I Electric Cooperative, Inc.
NEECO II A2	Nueva Ecija II Electric Cooperative, Inc. – Area 2
NORECO II	Negros Oriental II Electric Cooperative, Inc.
OMECO	Occidental Mindoro Electric Cooperative, Inc.
ORMECO	Oriental Mindoro Electric Cooperative, Inc.
PANELCO I	Pangasinan I Electric Cooperative
PANELCO III	Pangasinan III Electric Cooperative, Inc.
PELCO I	Pampanga I Electric Cooperative, Inc.
PELCO II	Pampanga II Electric Cooperative, Inc.
PRESCO	Pampanga Rural Electric Service Cooperative, Inc.
SAJELCO	San Jose City Electric Cooperative, Inc.
SIARELCO	Siargao Electric Cooperative, Inc.
SOCOTECO I	South Cotabato I Electric Cooperative, Inc.
TARELCO I	Tarlac I Electric Cooperative, Inc.
TARELCO II	Tarlac II Electric Cooperative, Inc.
ZAMECO I	Zambales I Electric Cooperative
ZAMSURECO I	Zamboanga del Sur Electric Cooperative
ZAMCELCO	Zamboanga City Electric Cooperative, Inc.
Transmission System/Projects	
AACGR	Average Annual Compounded Growth Rate
ACC	Area Control Center
ACSR	Aluminum Cable Steel Reinforced
ACSR/AS	Aluminum Cable Steel Reinforced/Aluminum-clad Steel
AIS	Air Insulated Switchgear
APG	ASEAN Power Grid
AS	Ancillary Service
ASPA	Ancillary Service Procurement Agreement
ASPP	Ancillary Services Procurement Plan
AVC	Automatic Voltage Control
BESS	Battery Energy Storage System
BMS	Battery Monitoring System
BRCC	Backup Regional Control Center
CAES	Compressed Air Energy Storage
CBM	Condition-Based Maintenance
CCMS	Central Control and Monitoring System
COMS	Centralized Online Monitoring System
CREZ	Competitive Renewable Energy Zone
CTS	Cable Terminal Station
CS	Converter Station
DC	Double Circuit
DC1	Double Circuit Transmission Line First Stringing
DC2	Double Circuit Transmission Line Second Stringing
DER	Distribution Energy Resources
DS/ES	Disconnecting/Earthing Switches
DU	Distribution Utility
EAM	Enterprise Asset Management
EHV	Extra High Voltage
EMS	Energy Management System
ERS	Emergency Restoration System
ES	Electrode Station
ESS	Energy Storage System
ETC	Estimated Time of Completion
ICT	Information and Communications Technology
FACTS	Flexible AC Transmission System
FESS	Flywheel Energy Storage System
FMS	Facilities Management System
GEOP	Green Energy Option
GIS	Gas Insulated Switchgear
HVE	High Voltage Equipment
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current
ICT	Information and Communications Technology
IP	Internet Protocol
IPP	Independent Power Producer
LES	Load-End Substations
MBSC	Microprocessor-Based Substation Control
MCM	Thousand Circular Mills
NDME	Network Disturbance Monitoring Equipment
NMS	Network Management System
OHTL	Overhead Transmission Line
O & M	Operation and Maintenance
OPGW	Optical Power Ground Wire
OTN	Optical Transport Network
PABX	Private Automatic Branch Exchange
PSIPP	Private Section Initiated Power Projects
PAN	Planned Activity Notice
PCB	Power Circuit Breaker
PLC	Powerline Carrier
PMU	Phasor Measurement Unit
PQA	Power Quality Analyzer
PQMS	Power Quality Management System
PSH	Pumped-Storage Hydropower
PST	Philippine Standard Time
RPA	Remotely Piloted Aircraft
RCC	Regional Control Center
RCOA	Retail Competition and Open Access
RFMS	Remote Fiber Monitoring System
ROW	Right-of-Way
RPS	Renewable Portfolio Standards
RTD	Real-time Dispatch
RTU	Remote Terminal Unit
TACSR	Thermal Resistant Aluminum Alloy Conductors Steel Reinforced
TNP	Transmission Network Provider
STATCOM	Static Synchronous Compensator
SACS	Substation Automation Control System
SCADA	Supervisory Control and Data Acquisition
SDH	Synchronous Digital Hierarchy
SIPS	Systems Integrity Protection Scheme
SIS	System Impact Study
SO	System Operations

SO-MO	System Operator-Market Operator
SPD	System Peak Demand
SPS	Special Protection System
SP-SC	Steel Pole Single Circuit
SP-DC	Steel Pole Double Circuit
SS	Substation
ST-SC	Steel Tower Single Circuit
ST-DC	Steel Tower Double Circuit
SWS	Switching Station
TL	Transmission Line
UAV	Unmanned Aerial Vehicle
WSD	Wind Speed Design
ZWG	Zone Working Group

Contact Details

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

Eufemio C. Buluran, Jr.
Transmission Planning Senior Manager
Luzon System Planning Division
Planning and Engineering
ecbuluran@ngcp.ph

Michael R. Baylosis
Transmission Planning Manager
Visayas System Planning Division
Planning and Engineering
mrbaylosis@ngcp.ph

Fernando S. Javier
Transmission Planning Senior Manager
Mindanao System Planning Division
Planning and Engineering
fsjavier@ngcp.ph

Vicente N. Loria
Transmission Development Senior Manager
Transmission Development Division
Planning and Engineering
vnloria@ngcp.ph

Germiniano S. Caseria III
O&M Planning Manager
O&M Planning Division
Operation and Maintenance
gscaseria@ngcp.ph

Armando C. Nicdao
Metering Assets and Services Management Manager
Metering Assets and Services Management Division
Operation and Maintenance
acnicdao@ngcp.ph

Mark Angelo A. Silvala
Infrastructure and Integrated Development Manager
Infrastructure and Integrated Development Division
System Operations
masilvala@ngcp.ph