Grid Developments and Renewable Energy

Environmental, Economical Generation | 20 March 2024

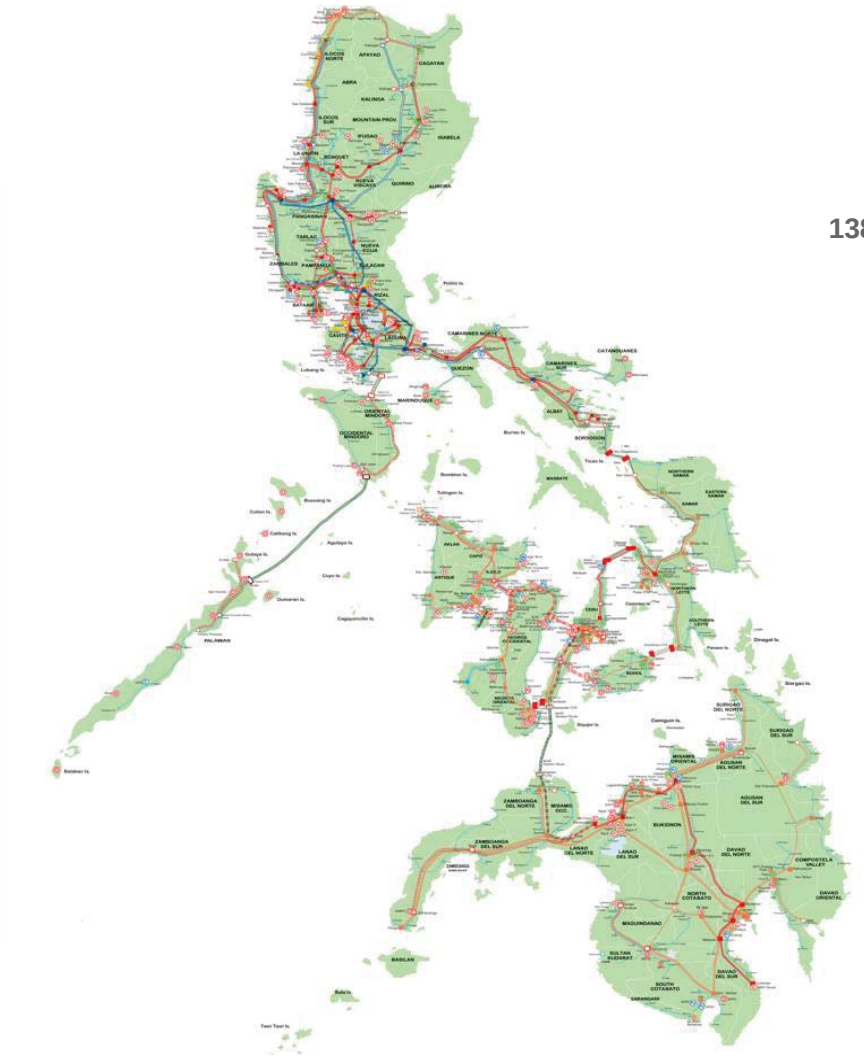


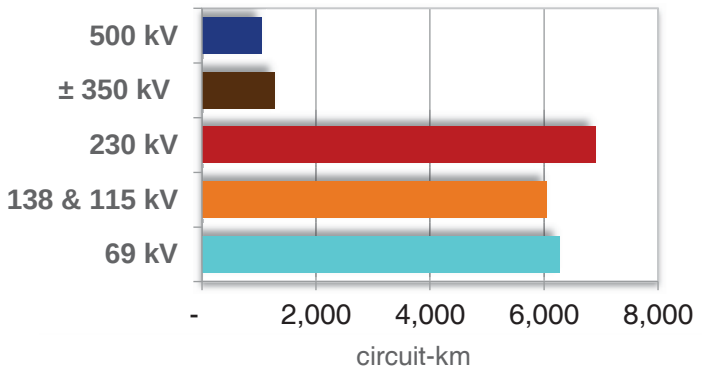
OUTLINE

1. Grid Overview
2. Grid Expansions
3. Renewable Energy

GRID OVERVIEW





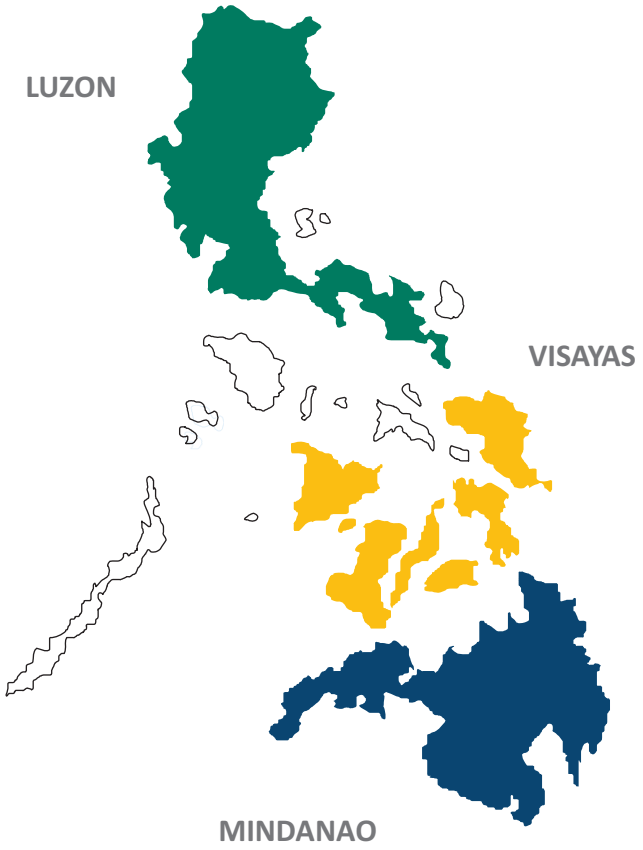


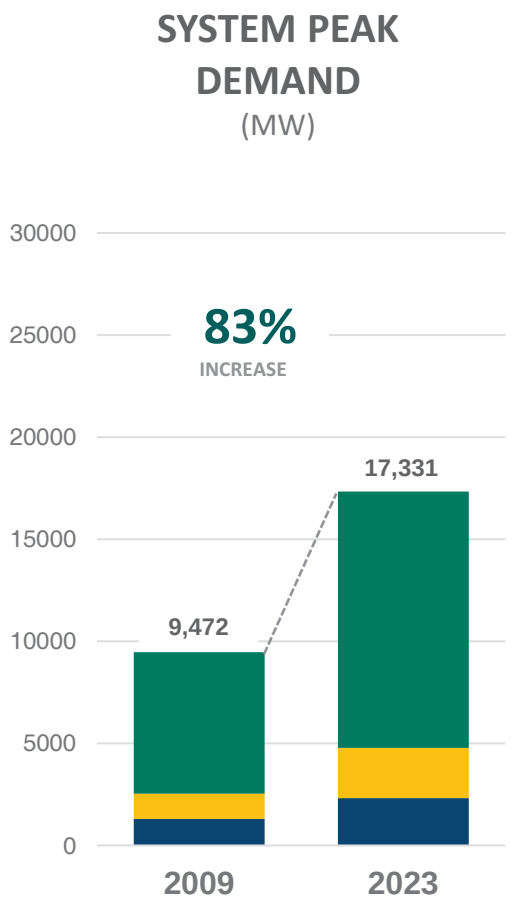
21,542.8 CKM
of transmission lines

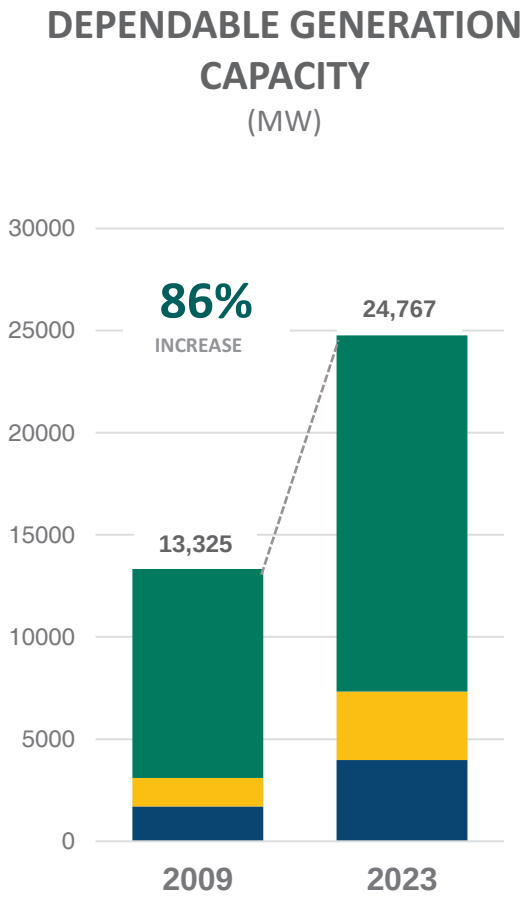
52,428.4 MVA
capacity of substation

Dependable Generation Capacity based on DOE data as of November 2023

Demand & Supply Development

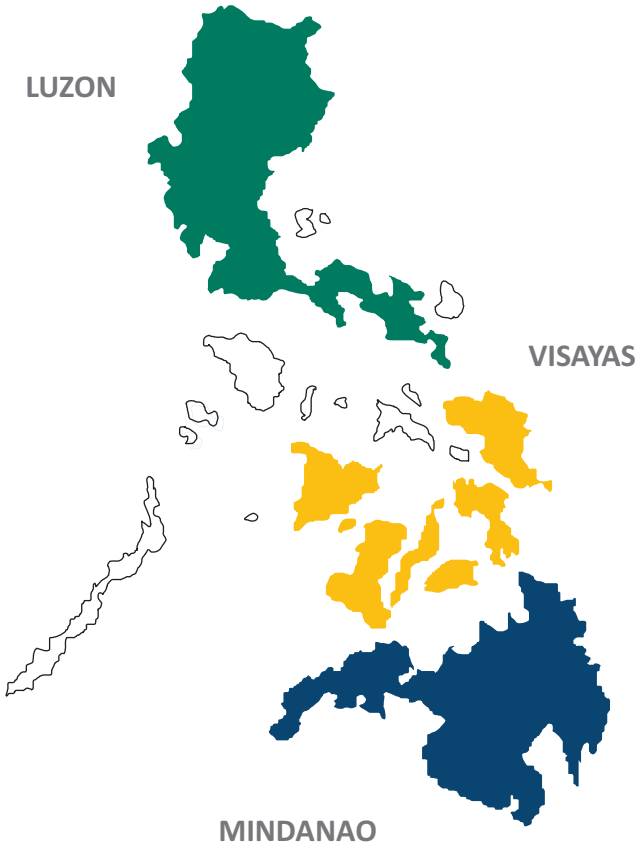






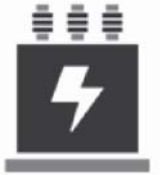
LUZON VISAYAS MINDANAO

Asset Growth





11%
INCREASE

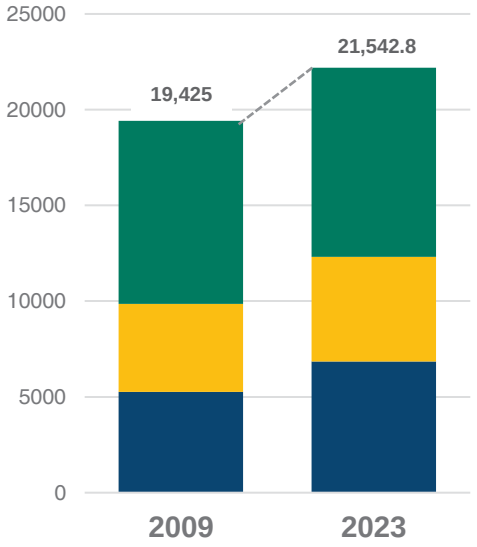


120%
INCREASE

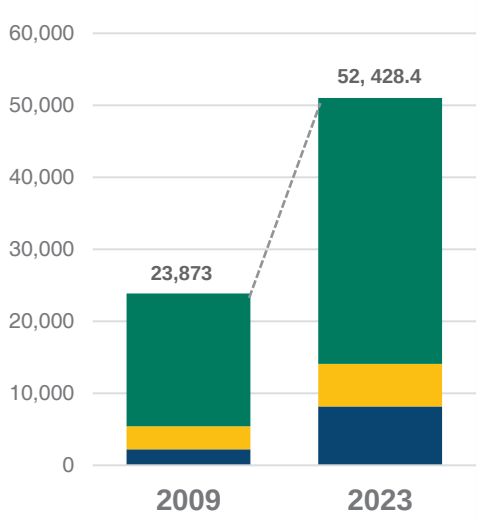


225%
INCREASE

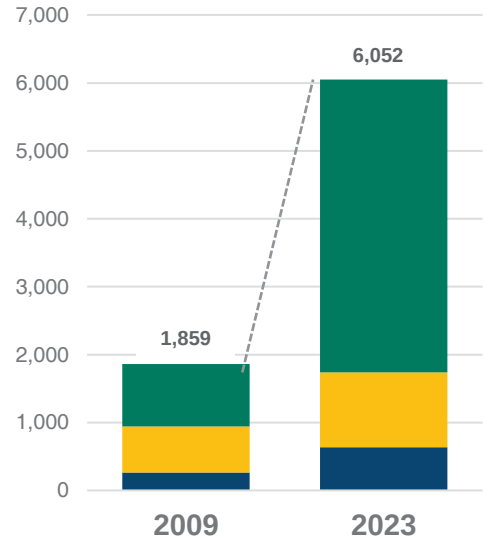
Transmission Line Length circuit-km



Substation Capacity MVA



Capacitors & Reactors MVAR



LUZON VISAYAS MINDANAO

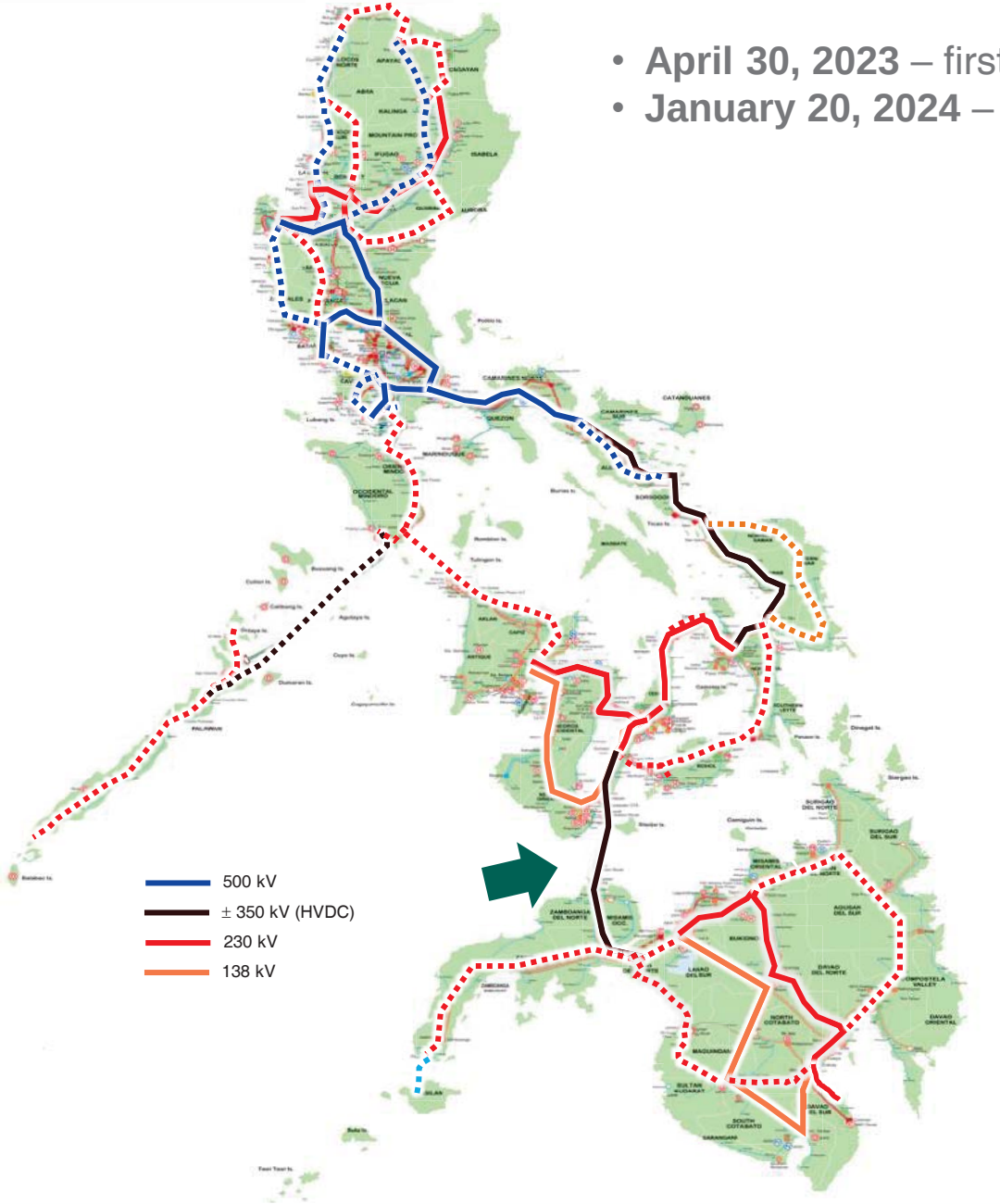
Note: Asset figures are net of decommissioned and replaced facilities

Mindanao-Visayas Interconnection is Completed

- **April 30, 2023** – first energization
- **January 20, 2024** – at full **450 MW capacity**

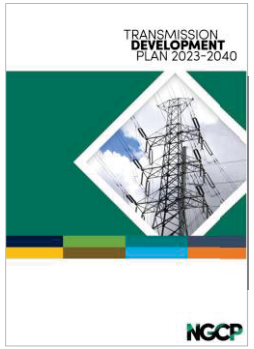






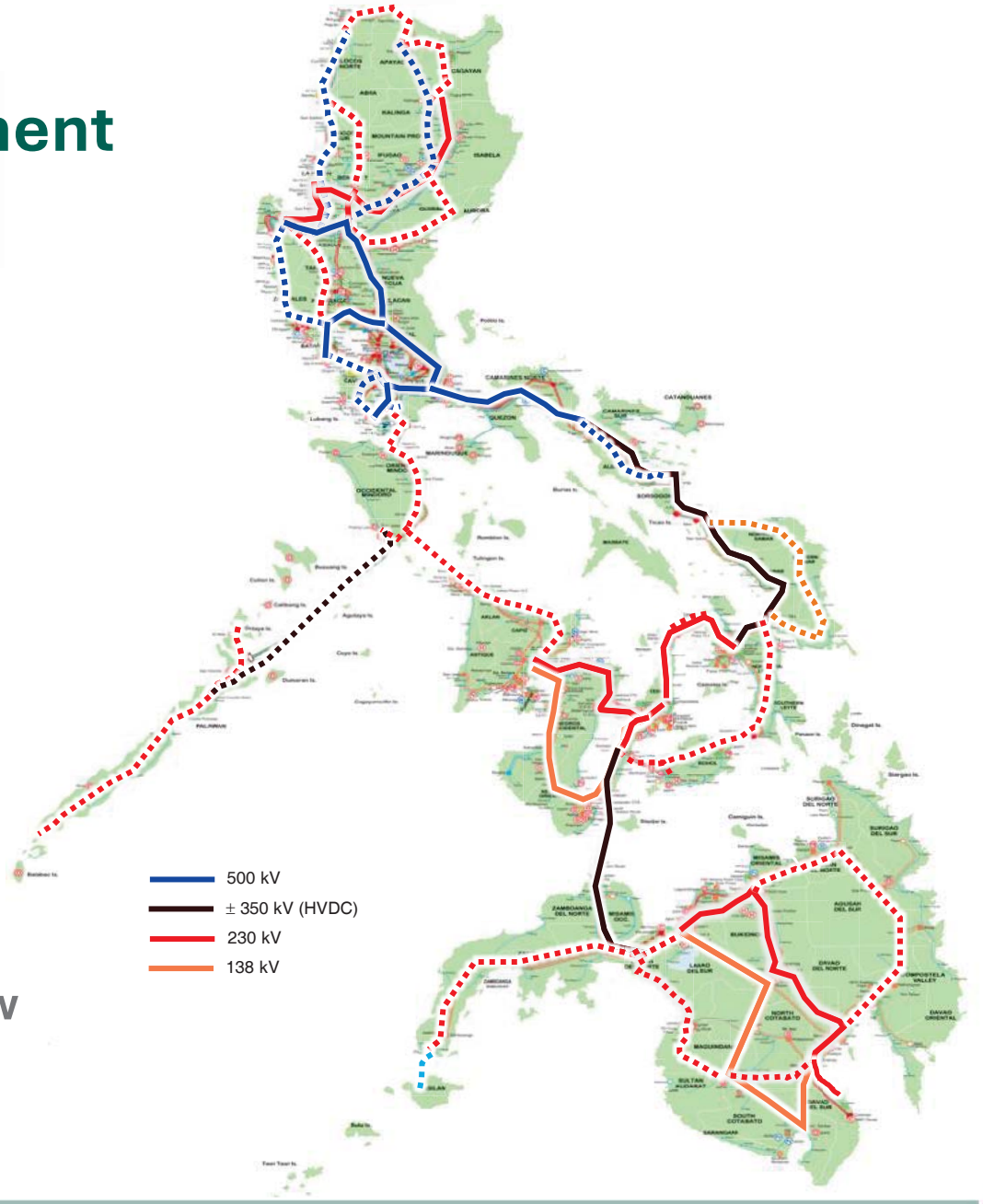






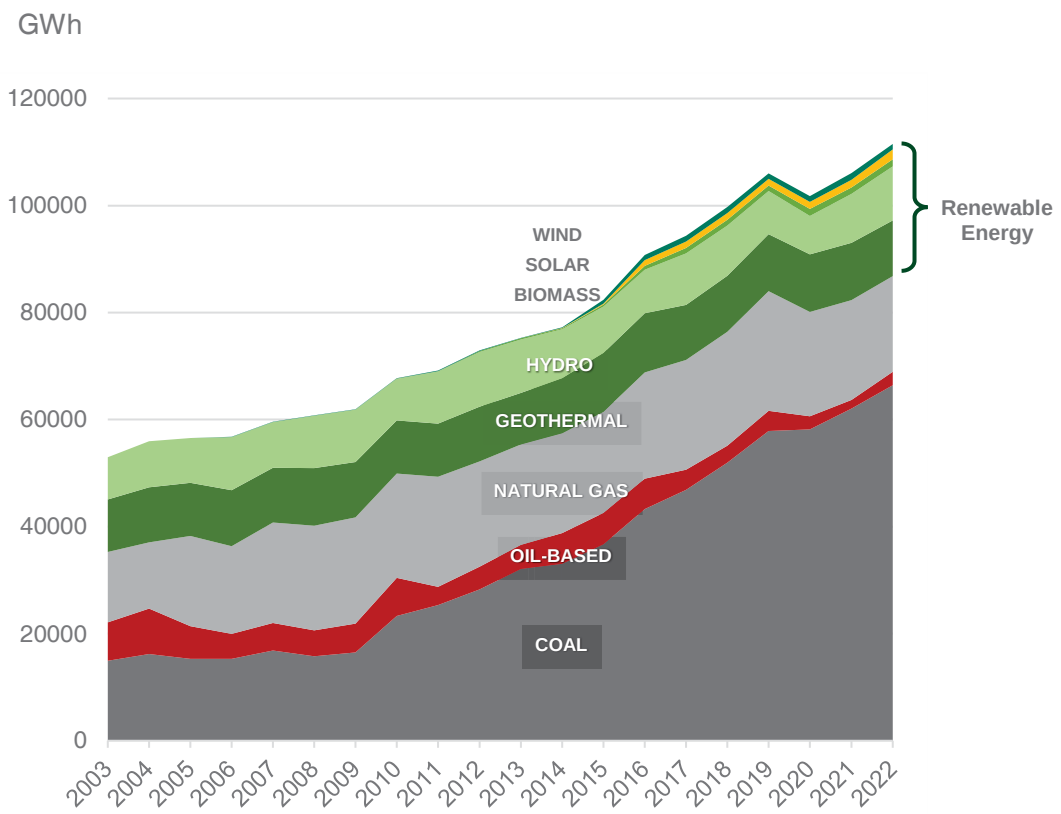
Transmission Development Plan 2023-2040

- ✓ New transmission backbones and extensions to support generation developments
- ✓ New substations and substation expansions for load growth
- ✓ Stage-by-stage backbone loop configuration for resiliency
- ✓ Grid interconnection upgrades and new island interconnections

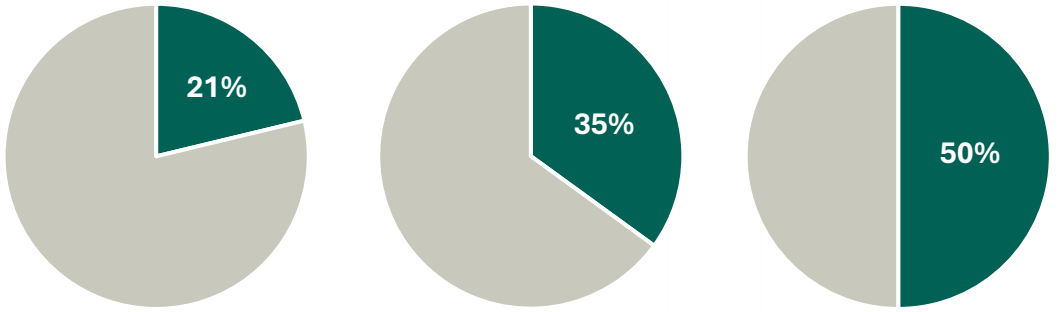


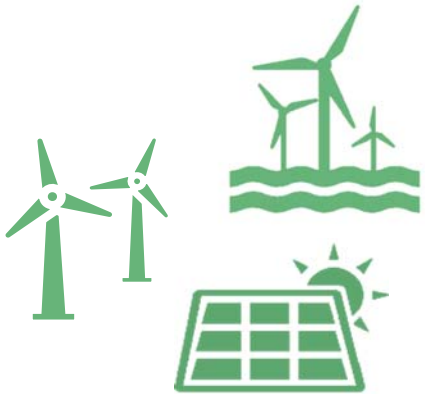
Renewable Energy – Targets

Historical Generation Mix



RE Share in the Energy Mix

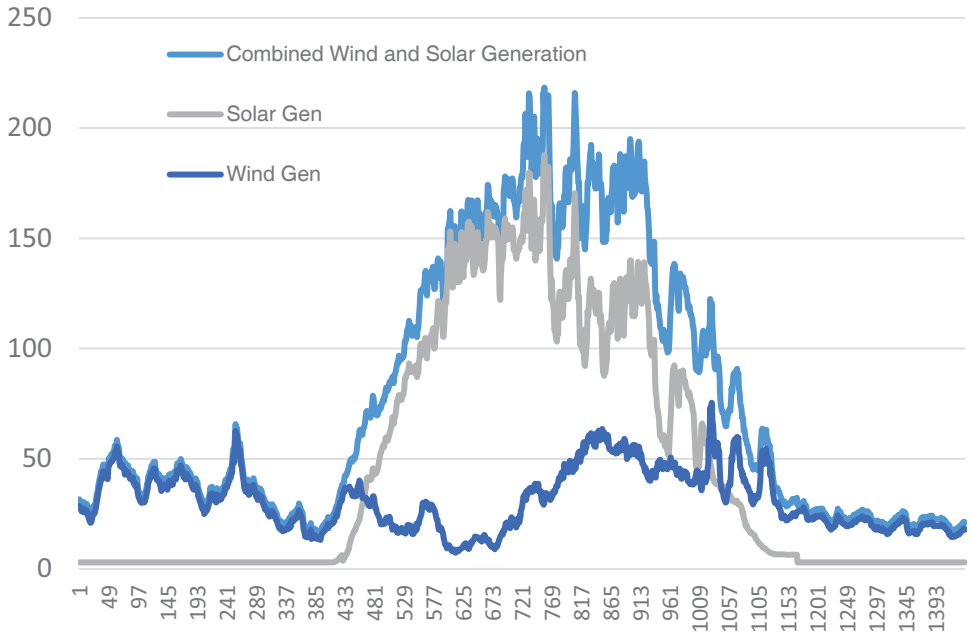




Variable Renewable Energy (VRE) Plants

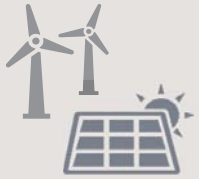
expected as main contributors to achieve the RE targets

Renewable Energy – Requirements for High Levels of VRE



VRE Challenges:

- Intermittent Operation
- Grid Inertia Reduction
- Voltage Fluctuation

NETWORKS	Transmission Expansion 
SYSTEM OPERATIONS	VRE Forecasting Enhancements Grid Codes 
SYSTEM FLEXIBILITY	Flexible Generation 
	Energy Storage 

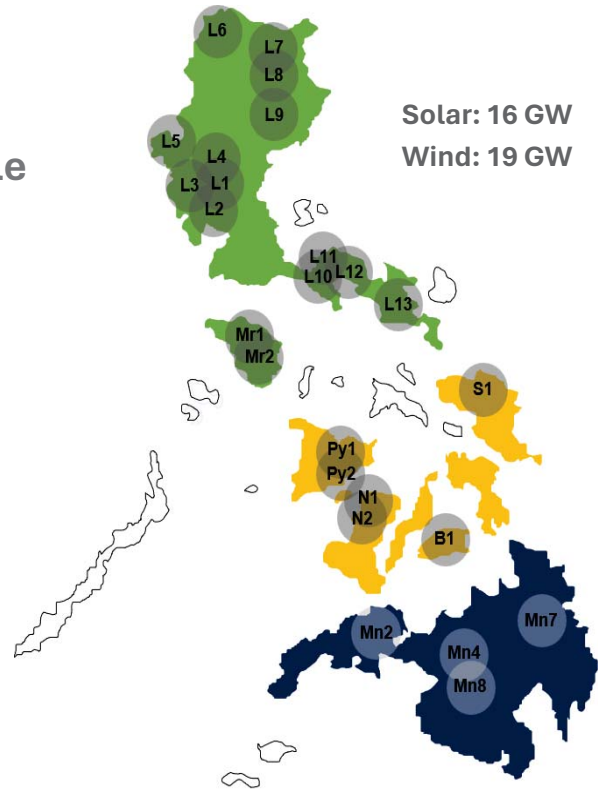
Renewable Energy – Potentials

Competitive Renewable Energy Zones (CREZ)

Total Capacity:

35 GW

Based on Year 2040 Capacity Expansion Model (CEM)



Solar: 16 GW
Wind: 19 GW

"CEM is used to study how wind and solar resources in the CREZ, along with other plants, contributed to the **least-cost grid build-out to meet future demand**."

– from CREZ Report

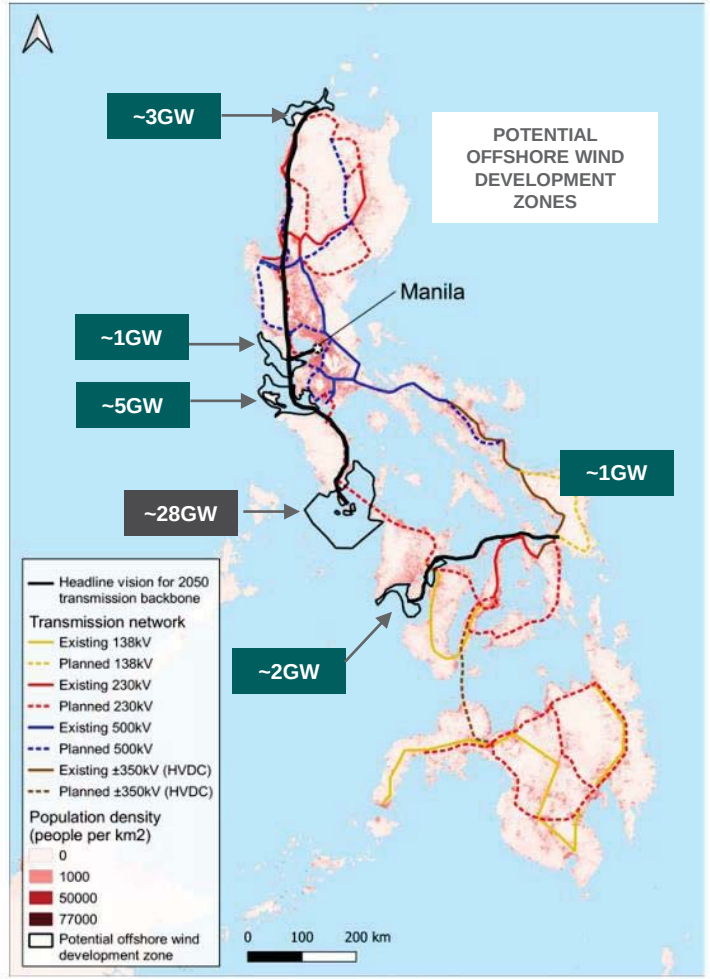
Offshore Wind

Total Capacity:

63.36 GW

From **82** Service Contracts as of November 2023

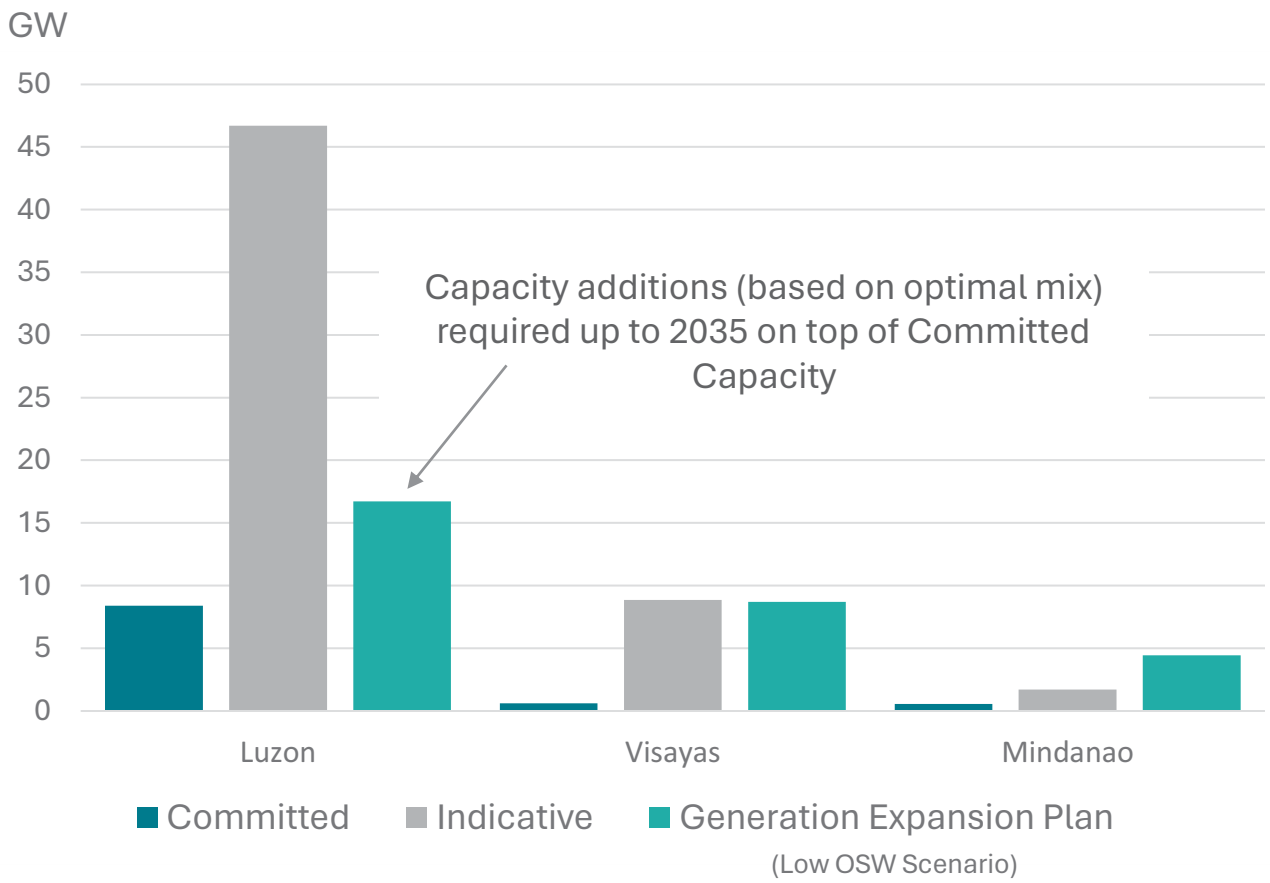
Offshore Wind Roadmap Report recommended the **inclusion of offshore wind in the CREZ**

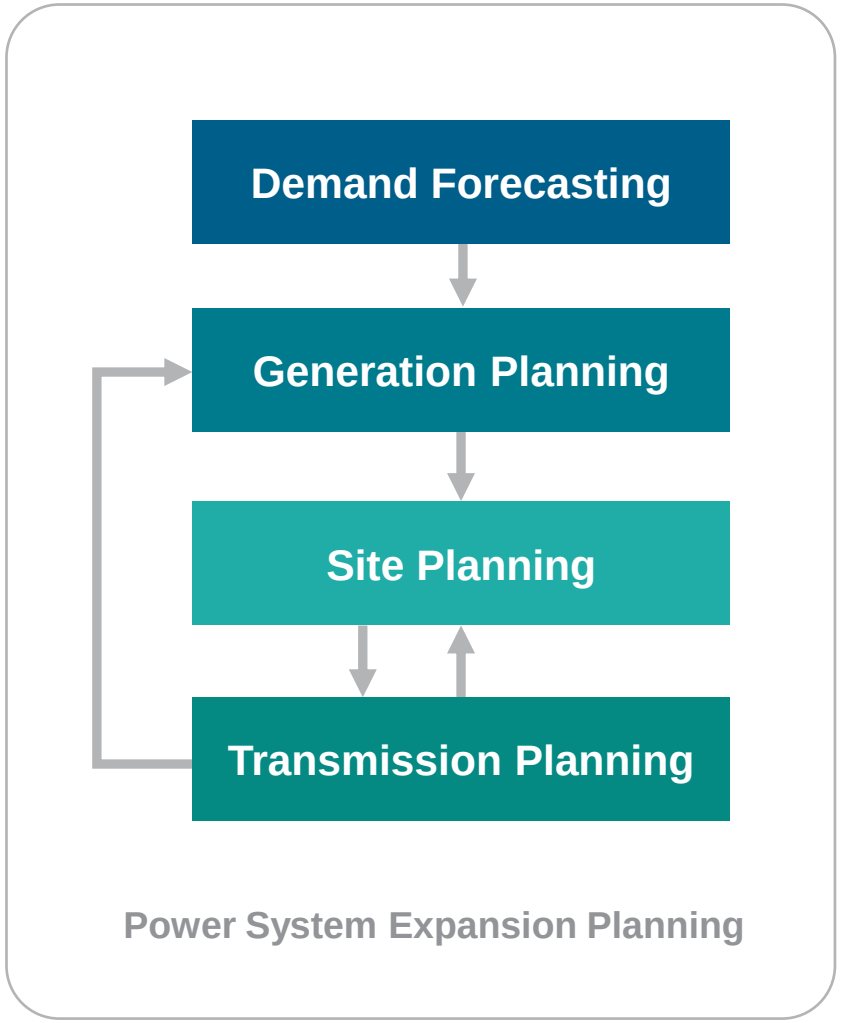


Map Source: Figure 18.12 of the OFFSHORE WIND ROADMAP FOR THE PHILIPPINES Report by World Bank Group, **April 2022**

Significance of Generation Expansion Plan in Generation-Transmission Plan Alignment

Based on DOE's Power Development Plan (2023-2050) released in December 2023



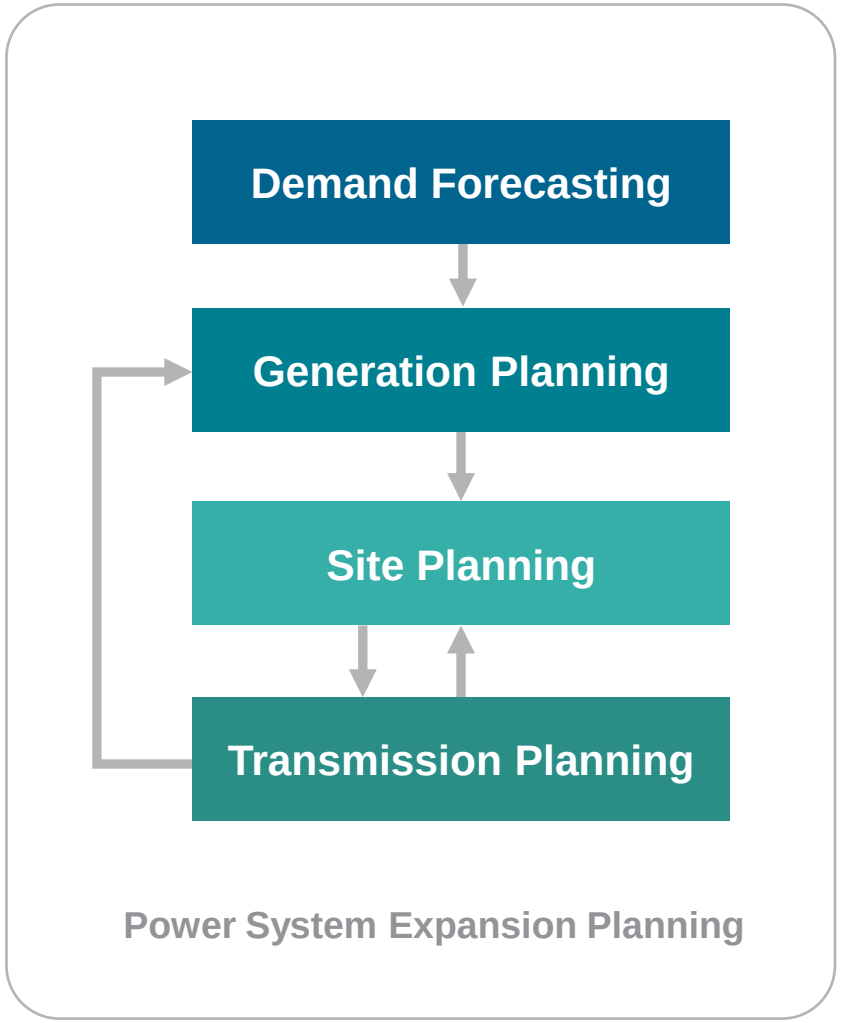


Significance of Generation Expansion Plan in Generation-Transmission Plan Alignment

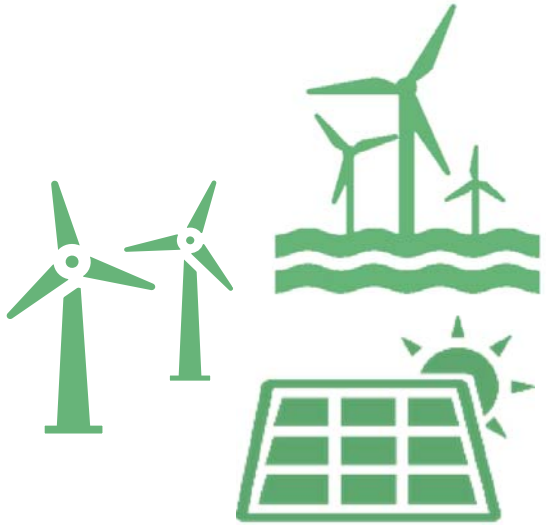
Based on DOE's Power Development Plan (2023-2050) for **LUZON GRID** released in December 2023

	2025	2030	2035	2040	2045	2050	Total
New Coal	-	-	-	-	-	-	**-**
New Natural Gas	-	-	-	-	1,580	2,516	**4,096**
New Oil	-	-	-	-	-	-	**-**
New Nuclear	-	-	1,500	-	-	2,400	**3,900**
New Biomass	50	-	-	-	-	-	**50**
New WTE	12	34	-	-	-	-	**46**
New Geothermal	-	-	10	290	-	-	**300**
New Ground-Mounted Solar	1,437	737	4,500	7,500	5,786	6,000	**25,960**
New Floating Solar	-	-	900	1,010	-	-	**1,910**
New BTM Solar	-	-	90	120	60	90	**360**
New Hydro + ROR	-	-	315	1,000	800	915	**3,030**
New Impounding Hydro	-	-	-	-	-	-	**-**
New Pumped Hydro	-	1,100	-	-	-	-	**1,100**
New Wind	500	550	2,750	2,750	5,000	3,000	**14,550**
New OSW	-	2,000	-	3,300	8,700	5,500	**19,500**
New Battery	-	-	295	3,000	4,360	4,191	**11,846**

- Capacities in addition to the **8,395 MW** Committed Plants in Luzon as of May 2023
- Low Offshore Wind Scenario



Key Takeaways



Importance of Generation Expansion Plan in Generation-Transmission Alignment



Continue grid expansions – need for regulatory approval, support in ROW and permitting



Need for energy storage facilities for high levels of variable renewable energy in the grid

NGCP

