



**NGCP**

# **National Grid Corporation's Transmission Plans & Programs in Mindanao Region**

**DOE Investment Forum  
Mindanao**

28 July 2016

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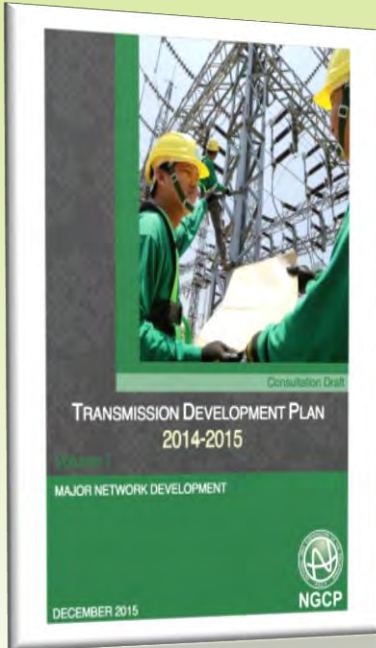
# Transmission Development Plan

Period covered: 2016 to 2025

Vol. 1 – Major Network Development

Vol. 2 – Operations & Maintenance and Metering

Vol. 3 – System Operations

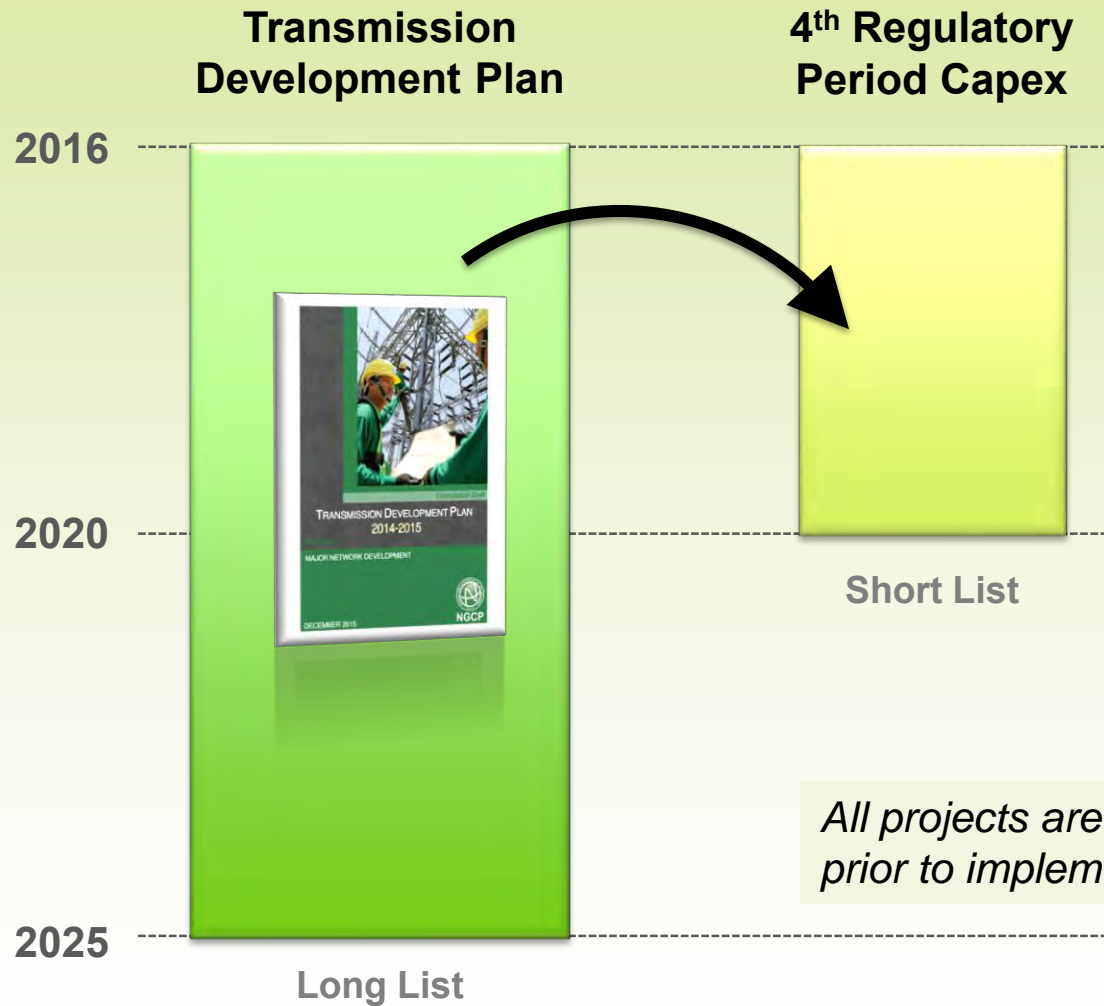


Presenter:

**Mr. Fernando S. Javier**

Head, Mindanao System Planning Division

# Reference Plan for the Regulatory Reset



*All projects are subject to ERC approval prior to implementation.*



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# Outline

## ***Vol.1 – Major Network Development***

1. TDP Preparation Process
2. Major Project Drivers
3. Major Planning Inputs
4. Existing Transmission Network
5. ERC Approved Projects and Future Projects

## ***Vol. 2 – Operations & Maintenance Metering***

## ***Vol. 3 – System Operations***

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# **Vol. 1 – Major Network Development**



# TDP Preparation Process

1. Received inputs from the DOE:
  - a. System Peak Demand Forecast
  - b. Generation Addition Line-up

2. Coordination with Customers and other stakeholders

4. Presentation of the Draft TDP to stakeholders  
DOE, TransCo, GMC, PEMC, DUs, GenCos and other customers/stakeholders

3. Preparation of the TDP updating the system requirements for the next ten (10) years – involves system simulation studies

5. Submission of the TDP Final Report to the DOE for approval and integration to Philippine Energy Plan (PEP)



Planning criteria based on the Philippine Grid Code

# Major Project Drivers

1. Load Growth
2. Generation Entry
3. System Reliability
4. Power Quality
5. Island Interconnection





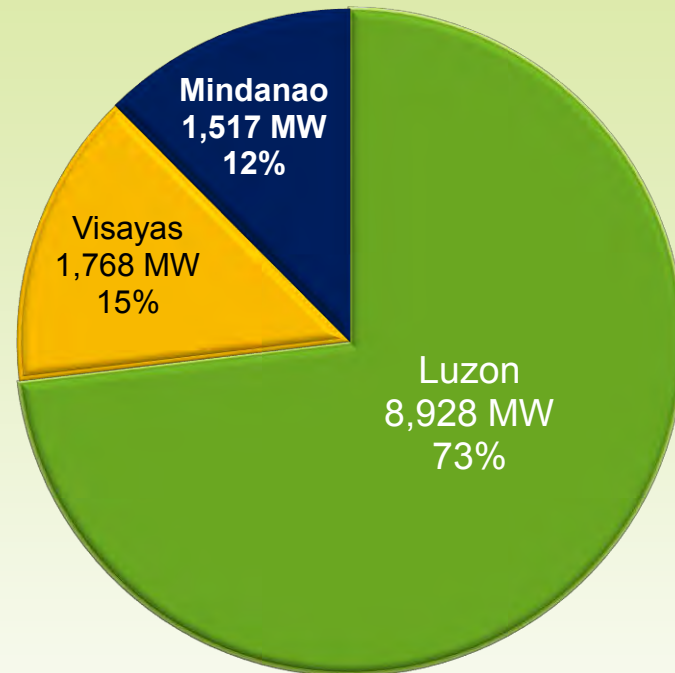
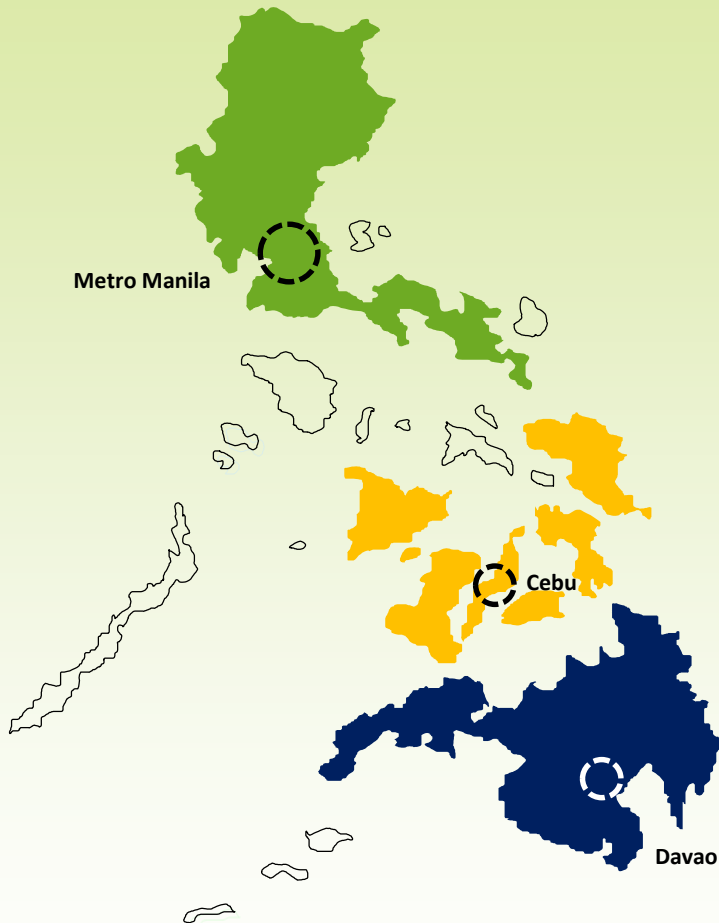
## Major Planning Inputs

1. System Peak Forecasted Demand
2. Generation Capacity Additions





# System Peak Demand Distribution among the Main Grids



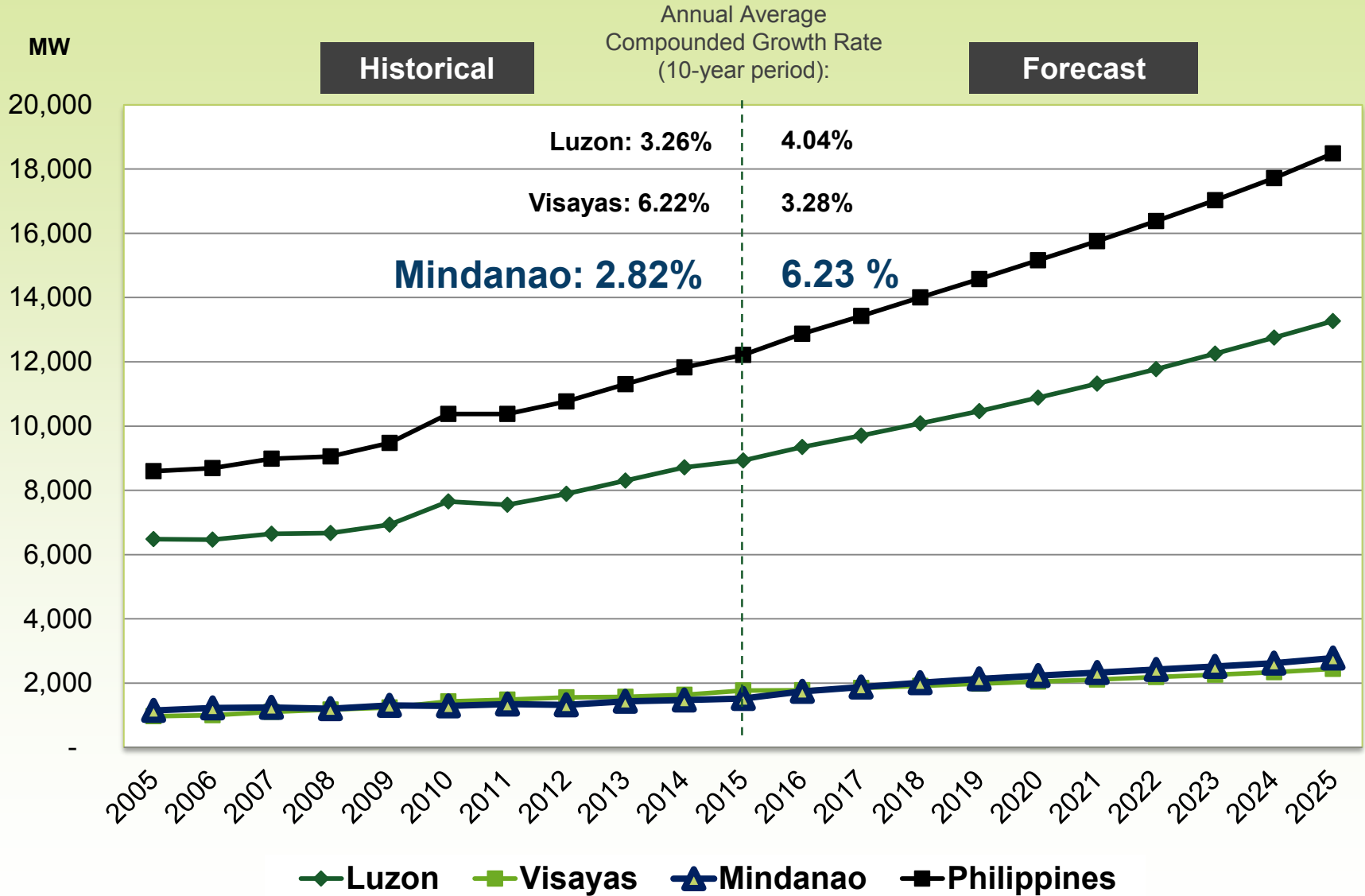
**Year 2015 Total Demand:**  
**12,214 MW**

**Note:** Transparent islands in the above map are not covered by NGCP's present network.

Based on NGCP-SO recorded total demand (non-coincident)

# System Peak Demand

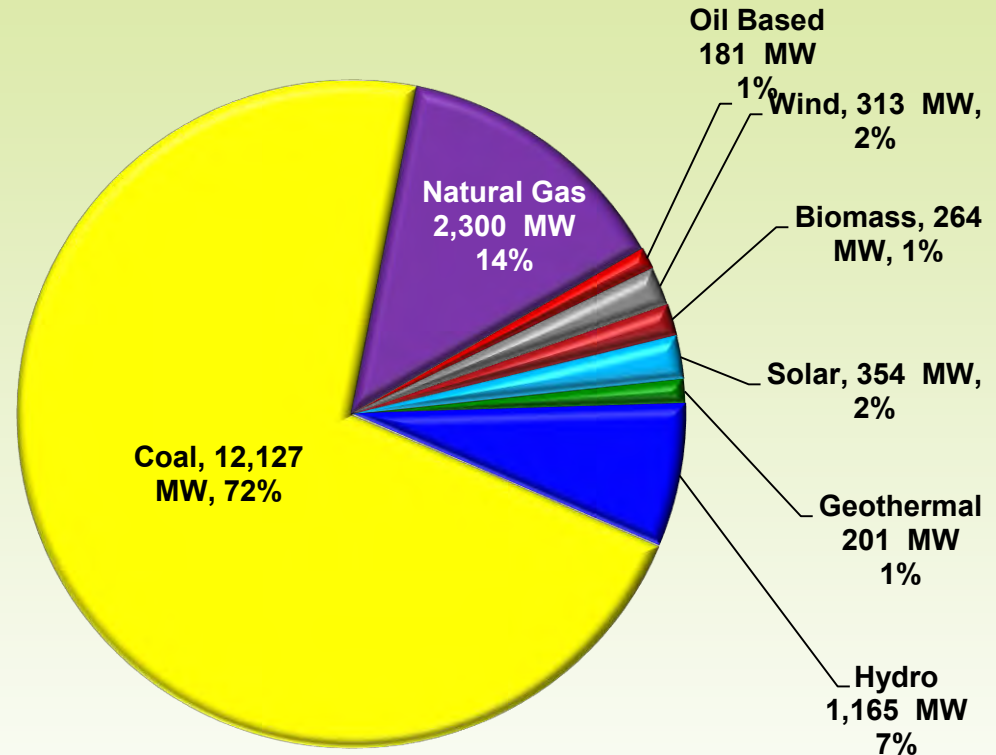
Based on DOE's Forecast as of Sep 11, 2015



# Generation Capacity Additions (2015-2025)

## Total Philippines

Type	Committed	Indicative
Coal	3,877	8,250
Nat Gas	550	1,750
Diesel/Oil	31	150
Wind	14	299
Hydro	222	943
Geothermal	10	191
Biomass	93	171
Solar	224	130
Battery	0	40
<b>S. Total</b>	<b>5,021</b>	<b>11,924</b>



**Total: 16,945 MW**

Based on DOE's List of Private Sector Initiated Power Projects - August 15, 2015

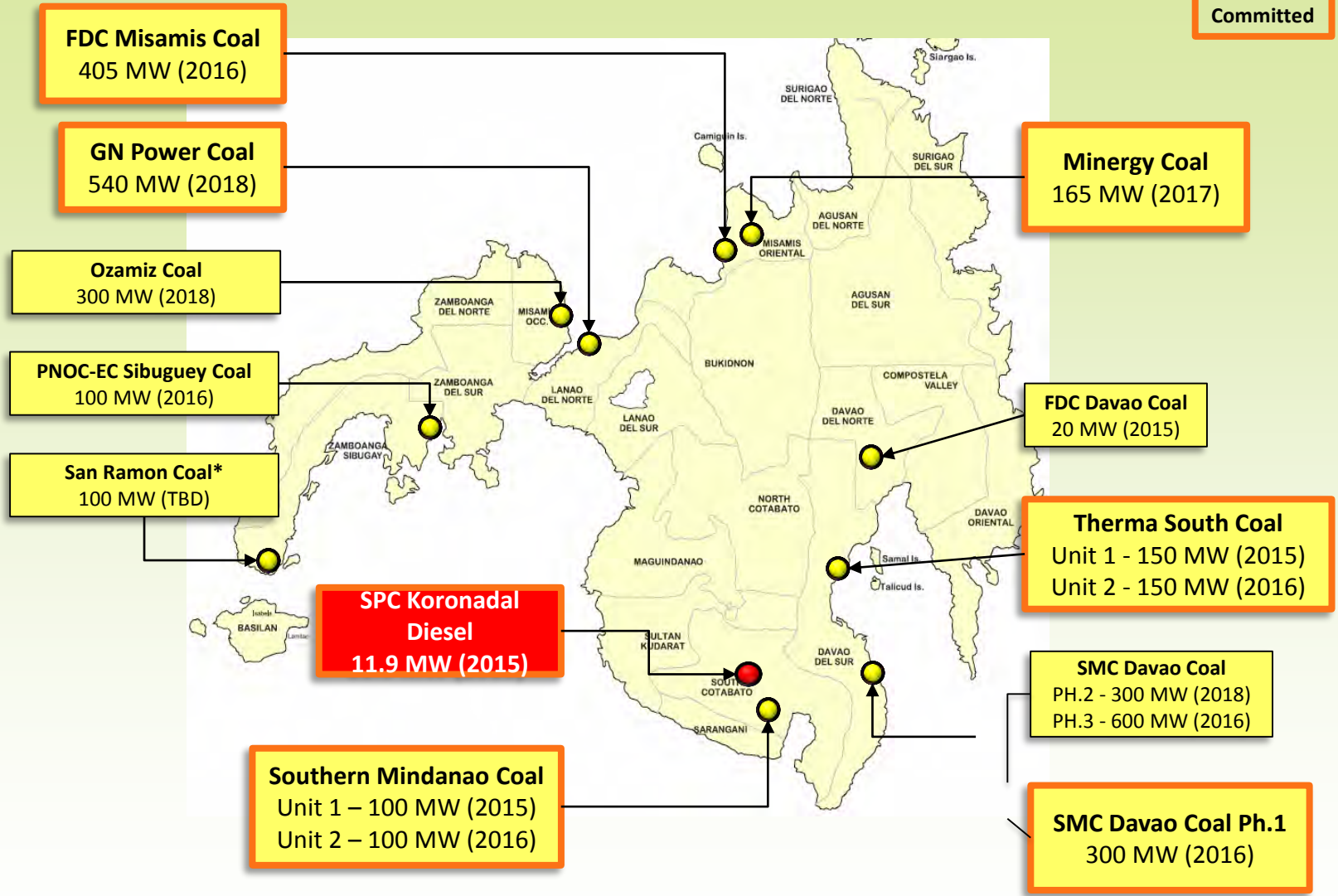
# Generation Capacity Additions (2015-2025)

Based on DOE's List of Private Sector Initiated Power Projects – 15 August 2015

	Type	Luzon	Visayas	Mindanao	TOTAL
<b>Conventional Plants</b>	Coal	8,097	720	<b>3,310</b>	12,127
	Nat Gas	2,300	-	<b>0</b>	2,300
	Diesel/Oil	150	19	<b>12</b>	181
<b>Subtotal</b>		<b>10,547</b>	<b>739</b>	<b>3,322</b>	<b>14,608</b>
<b>RE-Based Plants</b>	Wind	249	64	-	313
	Hydro	583	95	<b>487</b>	1,165
	Geotherm al	111	50	<b>40</b>	201
	Biomass	99	82	<b>84</b>	264
	Solar	116	179	<b>59</b>	354
	Battery		40		40
<b>Subtotal</b>		<b>1,158</b>	<b>510</b>	<b>669</b>	<b>2,297</b>
<b>TOTAL</b>		<b>11,705</b>	<b>1,249</b>	<b>3,991</b>	<b>16,945</b>

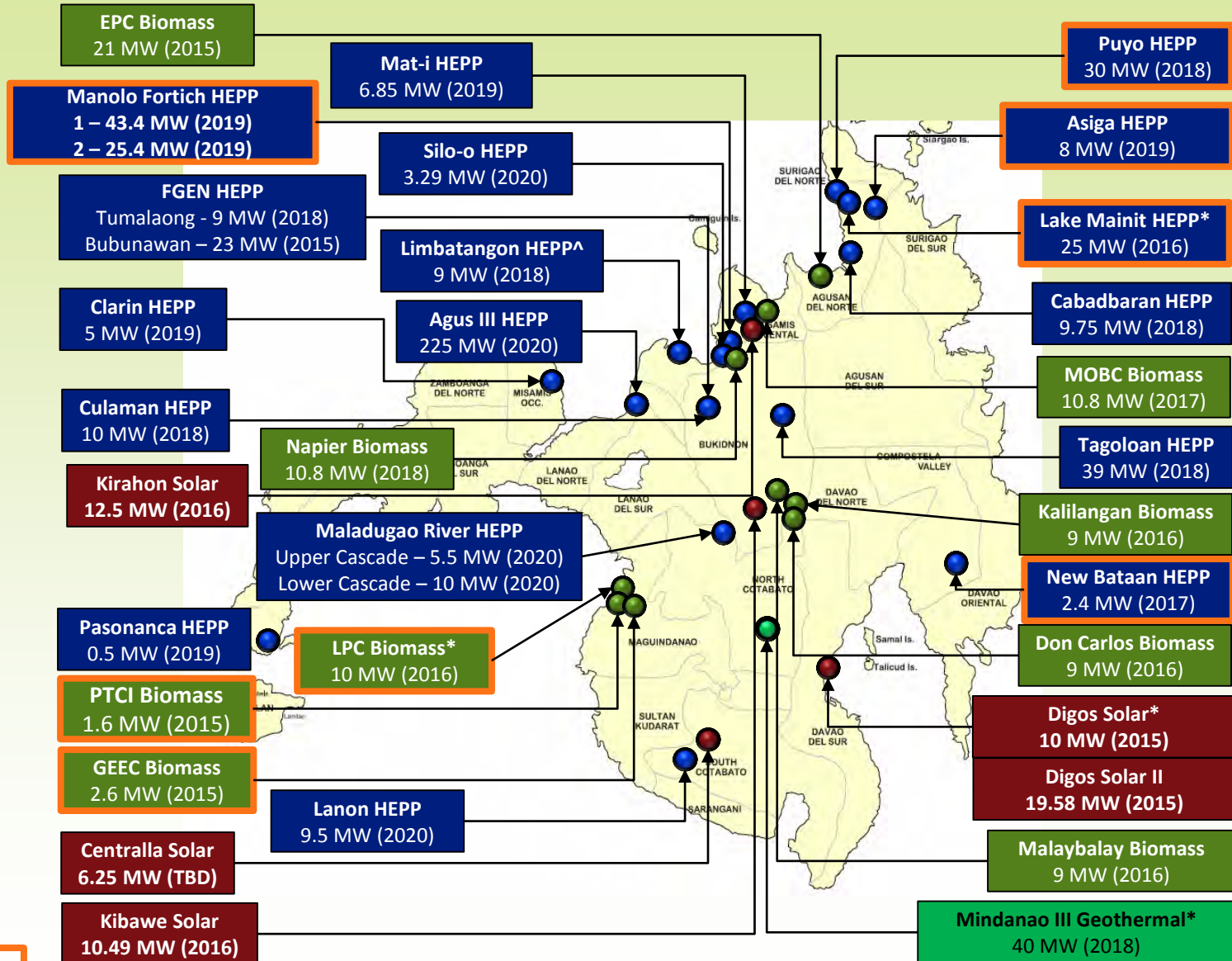
# GENERATION CAPACITY ADDITIONS

Committed



Based on DOE's List of Private Sector Initiated Power Projects - August 15, 2015

# GENERATION CAPACITY ADDITIONS



Committed



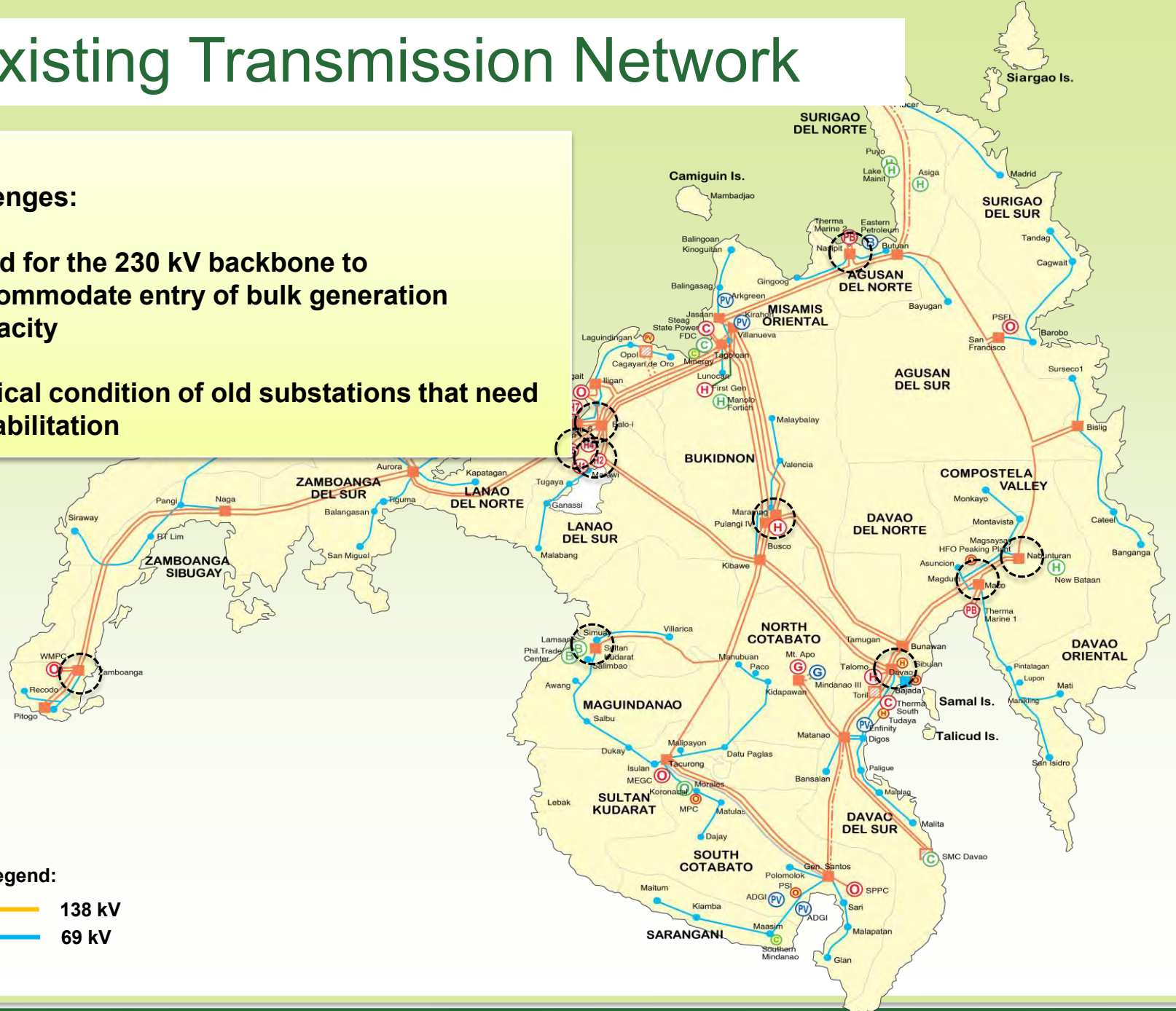
# Existing Transmission Network

## Challenges:

- Need for the 230 kV backbone to accommodate entry of bulk generation capacity
- Critical condition of old substations that need rehabilitation

## Legend:

- 138 kV
- 69 kV





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# ERC Approved Projects and other Future Projects



# ERC-Approved Projects

Load Growth

Generation Associated

Power Quality

System Reliability

Opol 138kV S/S  
(Jun 2016)

Agus 6 SY Upgrading /  
Rehabilitation (Dec 2016)

Sultan Kudarat Capacitor  
Project (Dec 2016)

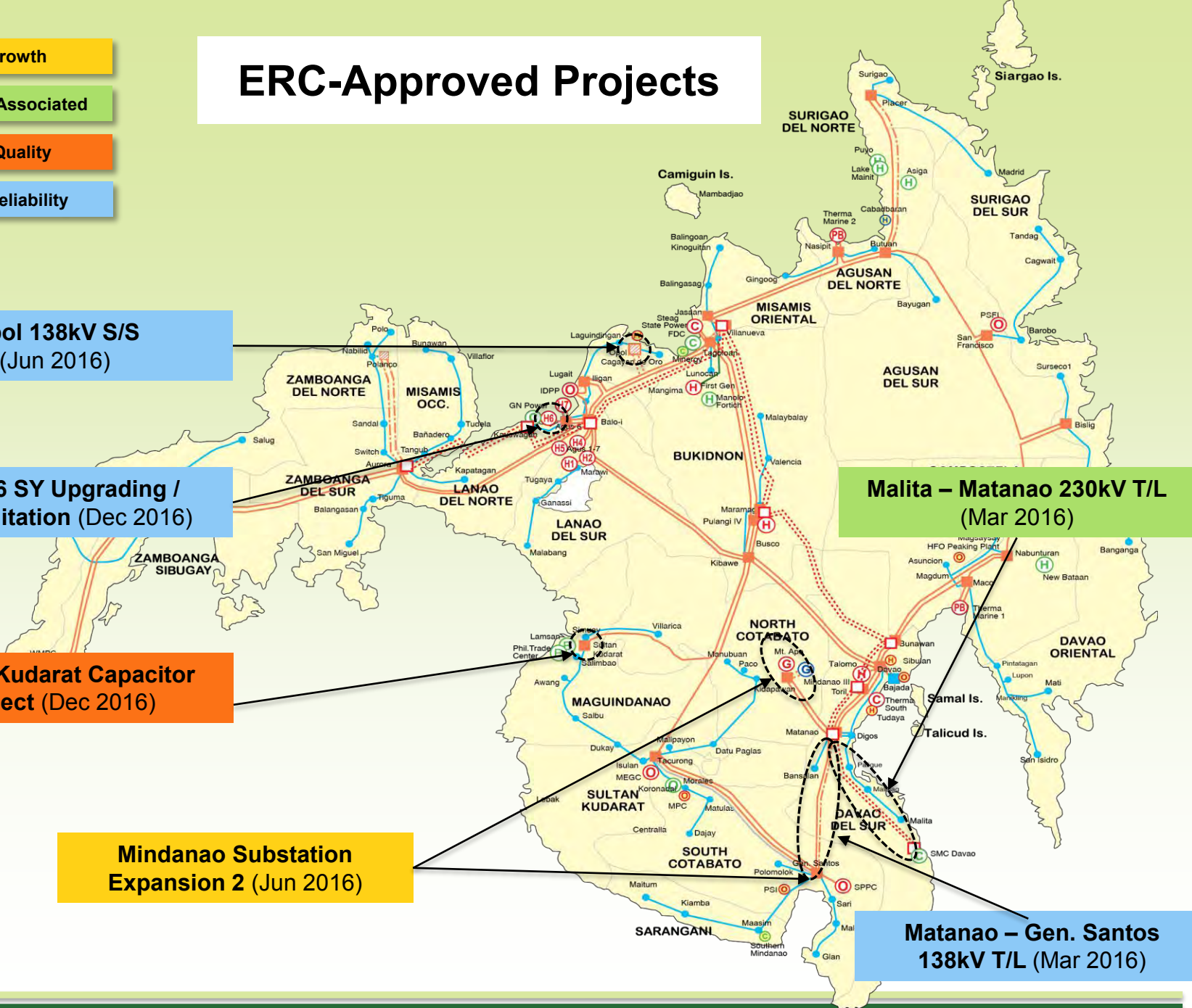
Mindanao Substation  
Expansion 2 (Jun 2016)

Malita – Matanao 230kV T/L  
(Mar 2016)

Matanao – Gen. Santos  
138kV T/L (Mar 2016)

Legend:

-  230 kV
-  138 kV
-  69 kV



# ERC-Approved Projects

- Load Growth
- Generation Associated
- System Reliability

**Baloi – Kauswagan – Aurora  
230kV T/L (Phase 1) (Aug 2017)**

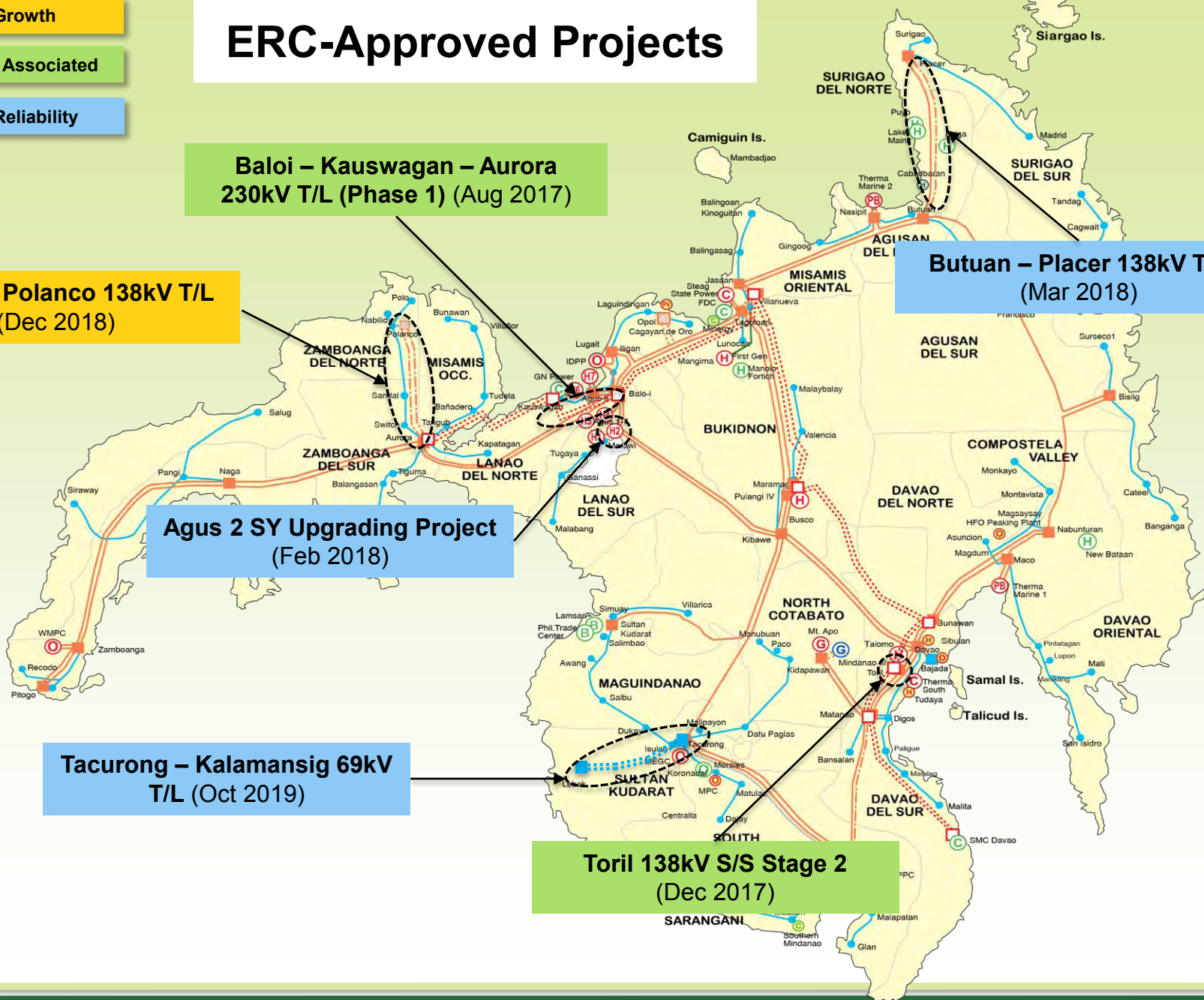
**Aurora – Polanco 138kV T/L  
(Dec 2018)**

**Butuan – Placer 138kV T/L  
(Mar 2018)**

**Agus 2 SY Upgrading Project  
(Feb 2018)**

**Tacurong – Kalamansig 69kV  
T/L (Oct 2019)**

**Toril 138kV S/S Stage 2  
(Dec 2017)**



- Legend:**
- ▬▬▬ 230 kV
  - ▬▬▬ 138 kV
  - ▬▬▬ 69 kV



2020

Generation Associated

# Mindanao 230kV Transmission Backbone (Dec 2018)



- Legend:
- 230 kV
  - 138 kV
  - 69 kV

# Future Projects

2025

Balo-I – Tagoloan – Opol 138kV T/L (Dec 2025)

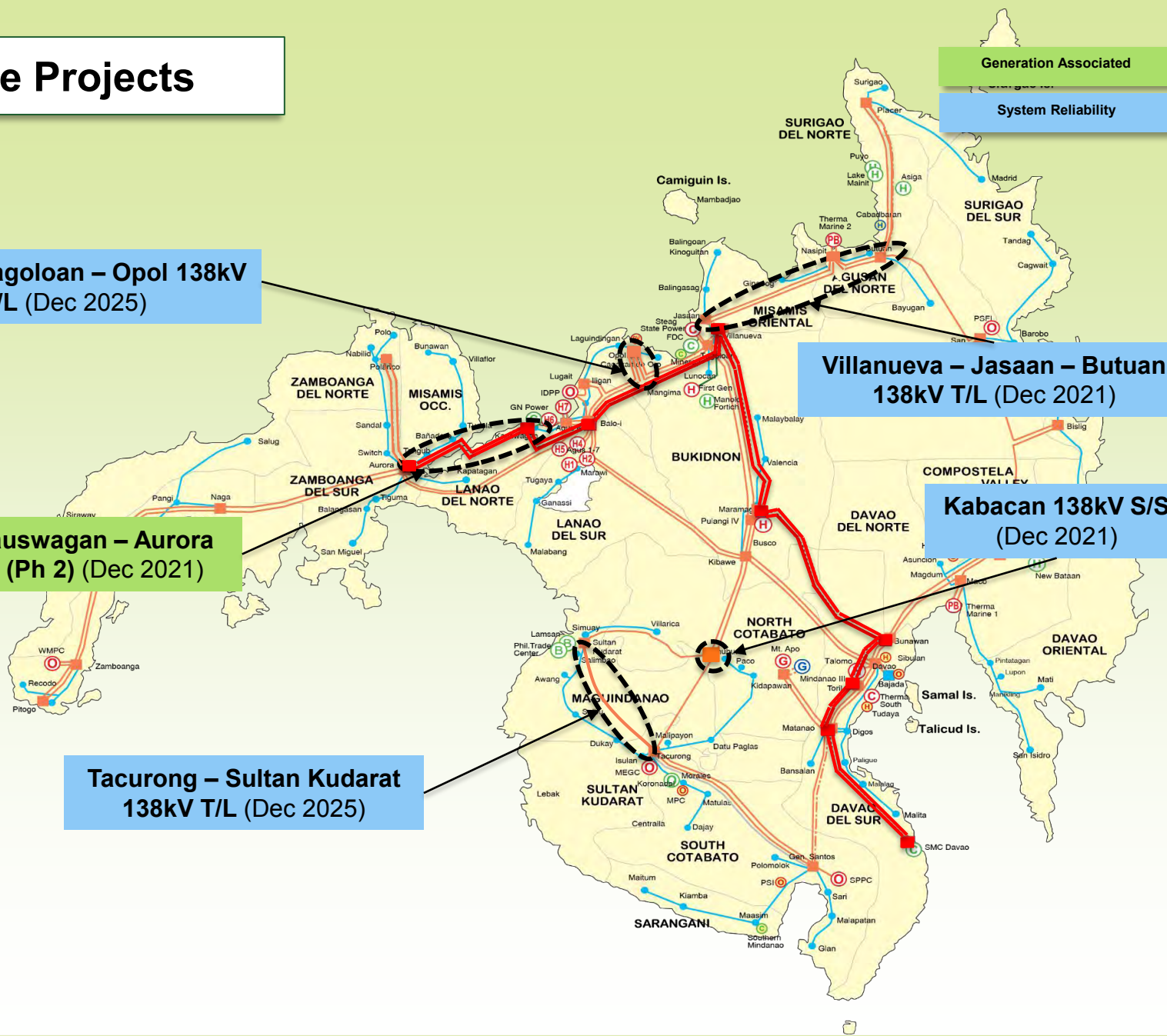
Balo-I – Kauswagan – Aurora 230kV T/L (Ph 2) (Dec 2021)

Tacurong – Sultan Kudarat 138kV T/L (Dec 2025)

Villanueva – Jasaan – Butuan 138kV T/L (Dec 2021)

Kabacan 138kV S/S (Dec 2021)

- Legend:
- 230 kV
  - 138 kV
  - 69 kV



Generation Associated

System Reliability

# Future Projects

2025

Load Growth

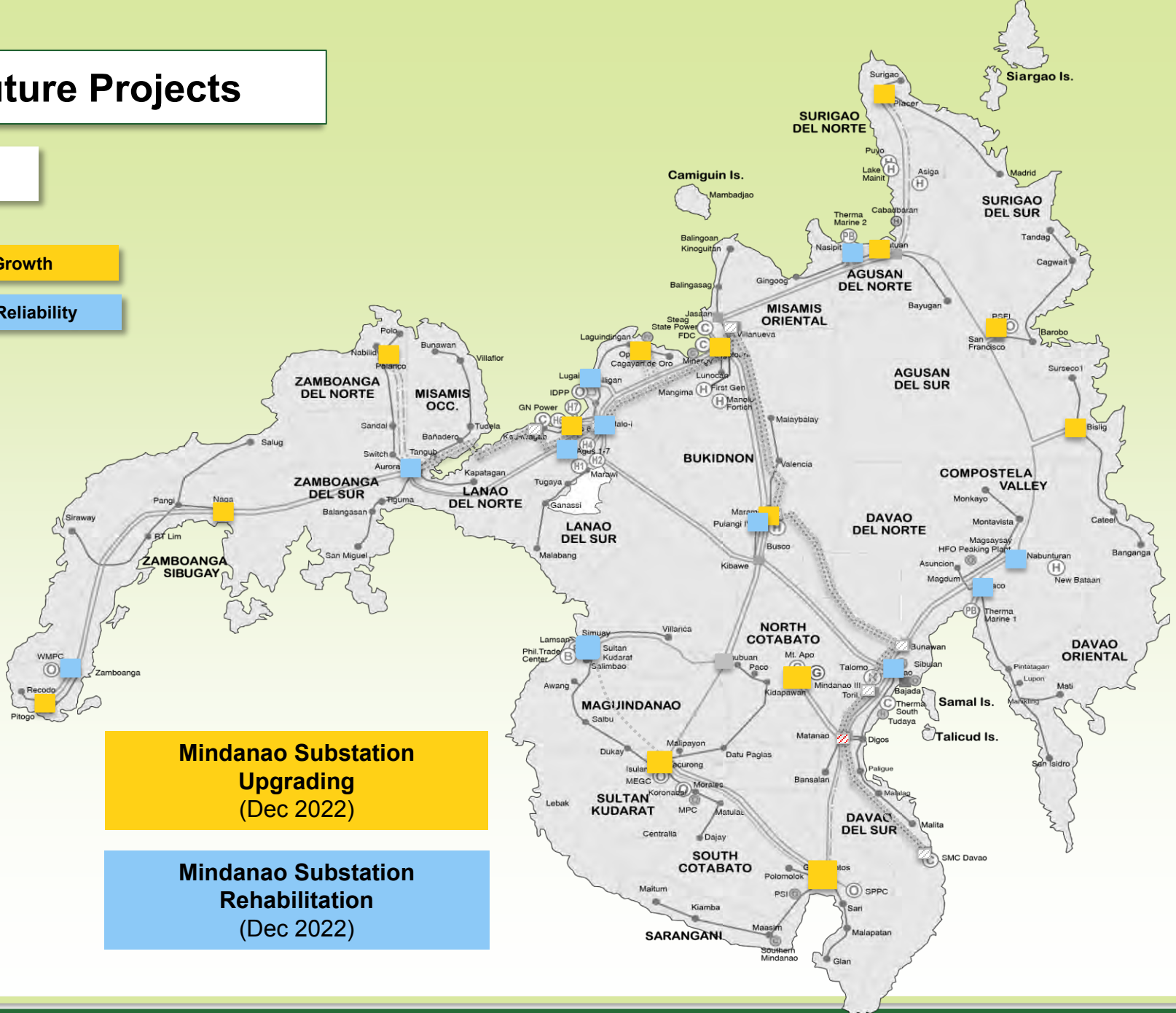
System Reliability

Mindanao Substation  
Upgrading  
(Dec 2022)

Mindanao Substation  
Rehabilitation  
(Dec 2022)

Legend:

-  230 kV
-  138 kV
-  69 kV





# Visayas-Mindanao Interconnection Project (VMIP)

Eastern Route

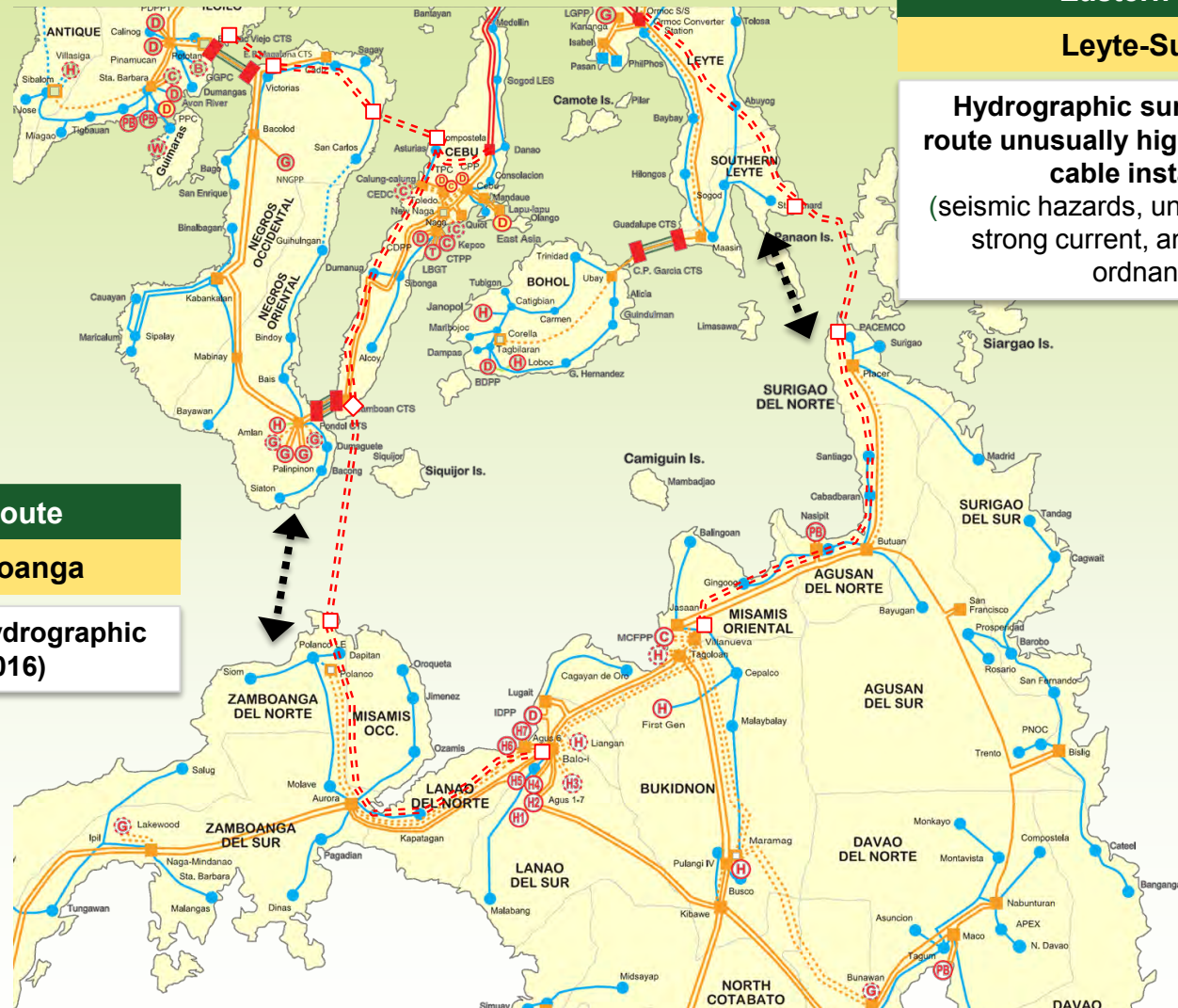
Leyte-Surigao

Hydrographic survey found this route unusually high risks for power cable installation (seismic hazards, unstable rock slabs, strong current, and unexploded ordnances)

Western Route

Cebu-Zamboanga

For conduct of hydrographic survey (2016)



Volume 2 (Part 1)  
– **Operation &  
Maintenance**





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## O&M MAJOR PROGRAMS

1. Installation, replacement, rehabilitation, relocation and acquisition of spares for HV equipment.
2. Installation, replacement ,& acquisition of spares for protection & secondary devices.
3. Construction of slope protection, rehabilitation, & acquisition of spares for TL and Sub-TL.
4. Replacement and acquisition of test & measuring equipment, tools and service vehicles
5. Construction & rehabilitation of substation & support facilities that will:
  - control and mitigate the effects of fire and flood;
  - preserve and protect the environment; and
  - enhance emergency preparedness by construction of district command centers.





## Volume 2 (Part 2) – **Metering**



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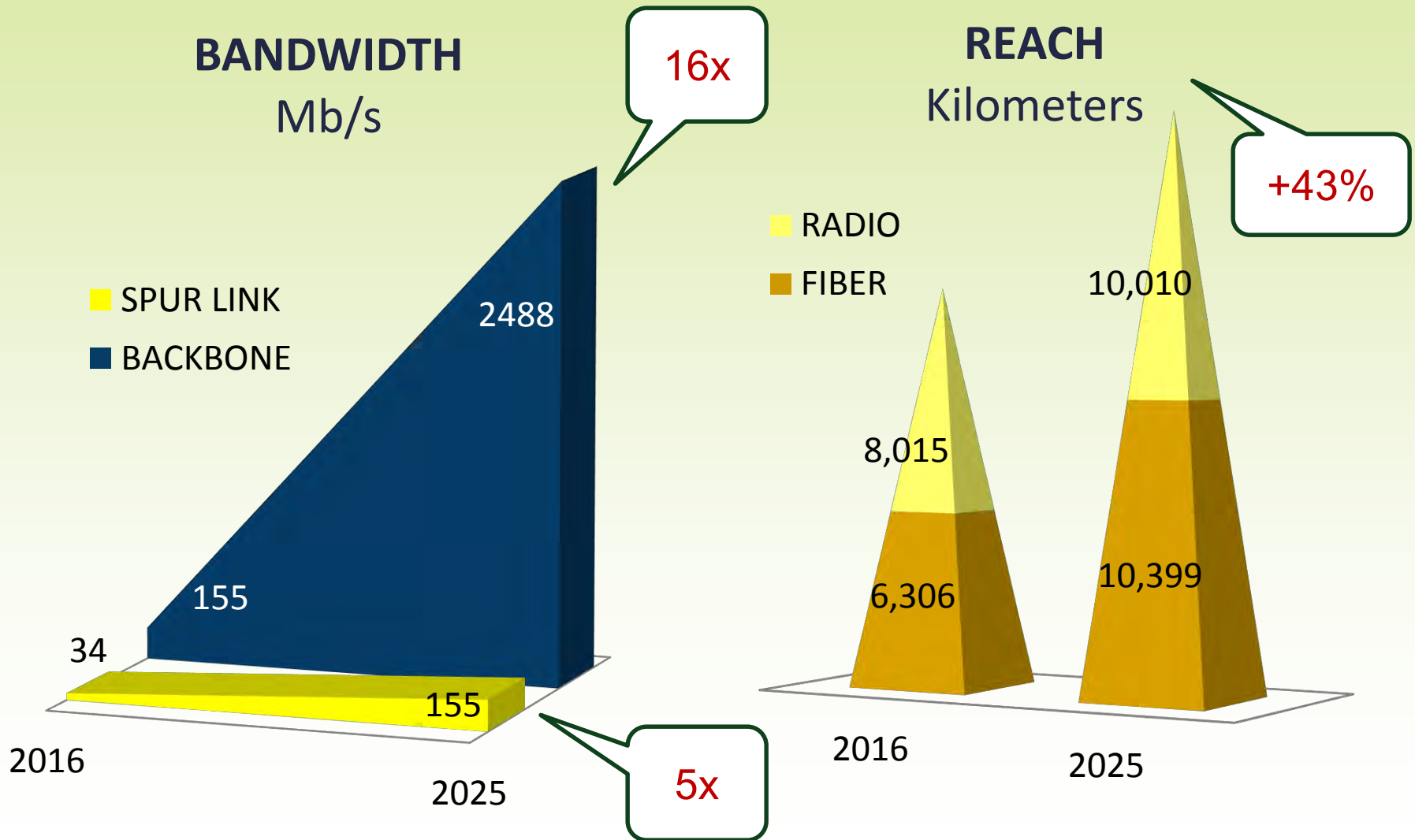
# METERING MAJOR PROGRAMS

1. New metering facilities for generators and loads
    - Full metering
    - Meter only
  2. Replacement and upgrading of installed metering assets due to:
    - Fully aged metering equipment/asset
    - Non-compliant metering equipment/facilities
    - Increase/decrease of load/capacity
  3. Relocation of metering points due to:
    - Divestment of sub-transmission assets
    - Metering points inconsistency with connection point/asset boundary.
  4. Substation consumption metering upgrade
  5. Procurement of spares
-

# Volume 3 – System Operations



# Telecoms—Existing vs. Planned



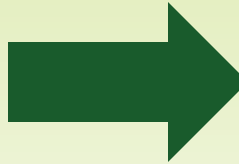
# Telecom Backbone

## EXISTING (2016)

6,306 Fiber Optic KM  
229 MW Radio Hops

## PLANNED (2025)

10,399 Fiber Optic KM  
286 MW Radio Hops



LA TRINIDAD

MEXICO

LRCC

BIÑAN

NAGA

STA. BARBARA

BACOLOD

ORMOC

VRCC

TAGBILARAN

BUTUAN

MRC

ILIGAN

DAVAO

ZAMBOANGA

GEN SANTOS

LA TRINIDAD

MEXICO

LRCC

BIÑAN

NAGA

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ILIGAN

DAVAO

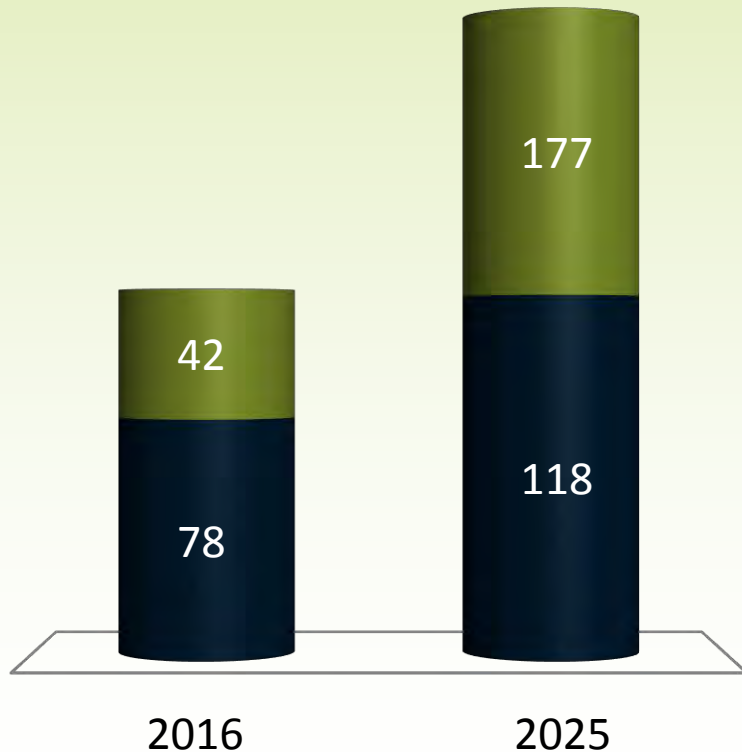
ZAMBOANGA

GEN SANTOS

# SCADA System—Existing vs. Planned Improved Automation in Supervisory Control

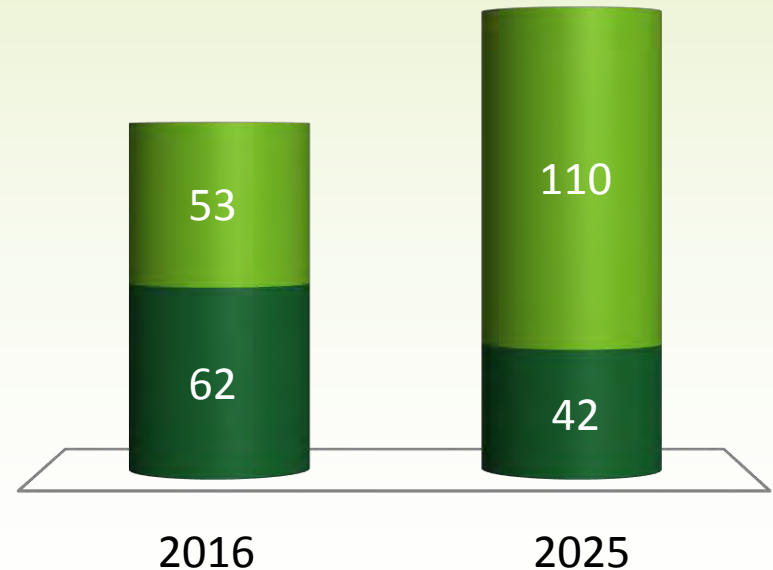
## Monitored Generators

■ Direct-Connected ■ Embedded

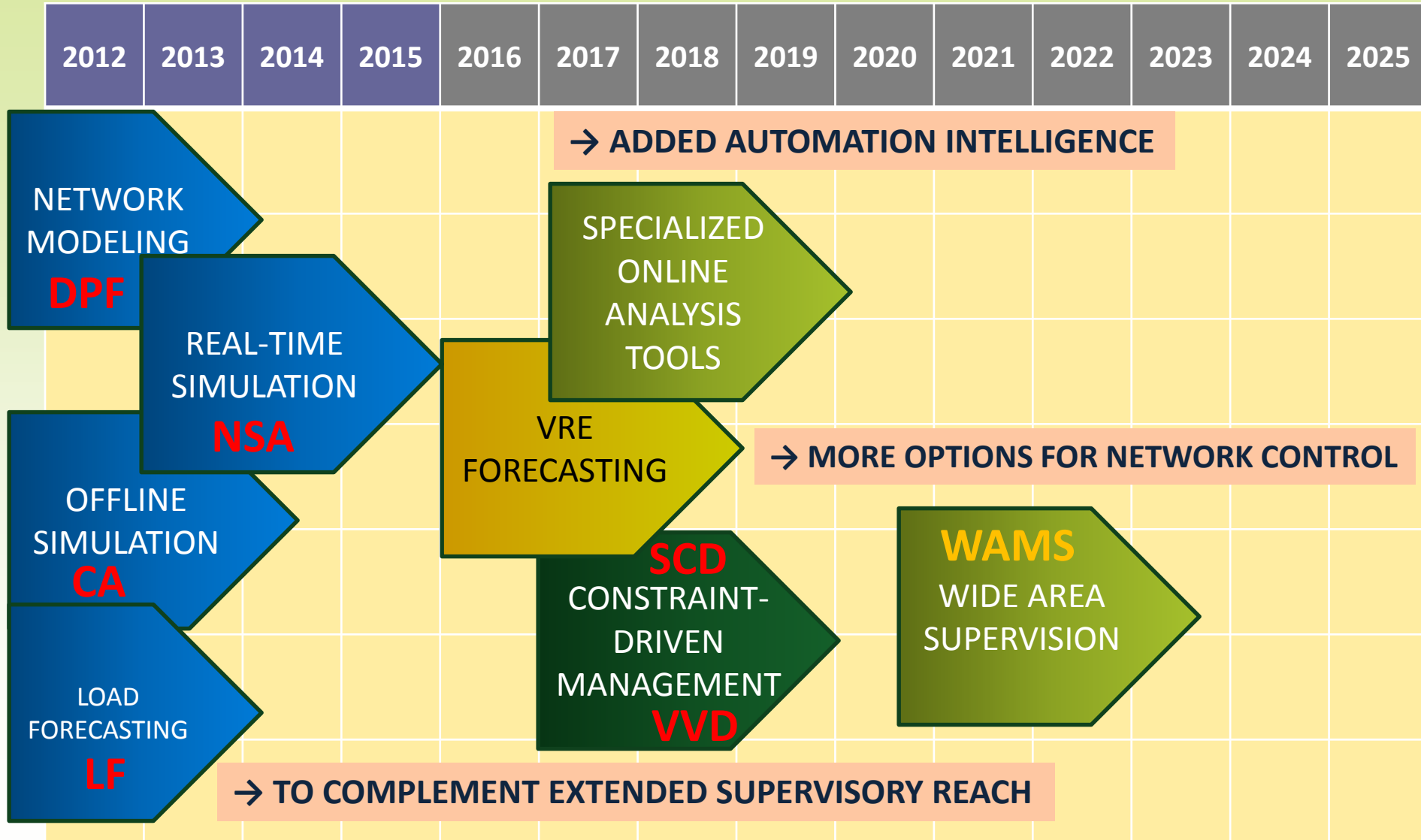


## Substations

■ Legacy ■ SAS-based



# EMS Enhancement Plan





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# End of Presentation

Draft Reports available for download:  
*<http://www.ngcp.ph/transmission-development-plan.asp>*