

An aerial night photograph of a city. The central focus is a large, modern building with a facade of vertical slats, illuminated from within. To its right, a multi-lane highway curves through the city, with light trails from cars. In the background, other city buildings and a distant mountain range are visible under a dark blue twilight sky.

Efforts Towards Supply VS Demand and Disaster Resilience

Asia Cooperation Dialogue (ACD)
August 8, 2017

Presentation Outline

- I. The MERALCO Franchise Area
- II. Meralco Energy Supply-Demand Plan
- III. Sourcing Strategy for Supply-Demand Resilience
- IV. Historical Service Reliability Performance
- V. Infrastructure Resiliency: The Key Success Factor
- VI. Typhoon Preparedness and Restoration
- VII. Business Continuity Initiatives
- VIII. MERALCO Participation in Task Force Kapatid



I. The MERALCO Franchise Area



9,685 sq. km. Total land area

- Metro Manila, Bulacan, Rizal, Cavite
- Parts of Laguna, Quezon, Batangas, Pampanga
- 3% of PH land area
- 25% of PH population
- 50% of PH GDP

more than **6 million** customers

6,748 MW peak demand

42,227 GWh energy input

39,583 GWh energy (output) sales

- (75% and 55% of Luzon and PH energy sales)



I. The MERALCO Franchise Area

MERALCO's Distribution Network is Predominantly Overhead – making it susceptible to weather disturbances and foreign objects

97%

Overhead Distribution Facilities

Sub Transmission Lines

- Loop system
- 119 circuits
- 921 circuit kilometers
 - 99.8% OH
 - 0.2% UG
- 115kV, 69kV
- 13,225 poles
- Wood, concrete, steel poles

Substation

- 115 Substations
- 17,198 MVA Substation Capacity

Primary Distribution Lines

- Radial with tie feeders
- 735 circuits
- 17,090.55 km. length
 - 97% OH
 - 3% UG
- 34.5kV, 13.8kV, 6.24kV
- 773,932 poles
- Wood, concrete, steel poles

Secondary Distribution Lines

- Radial system
- 18,824 km. length
- 460V, 230V
- Line-to-line

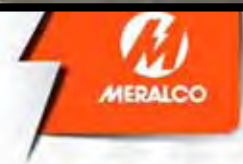


I. The MERALCO Franchise Area



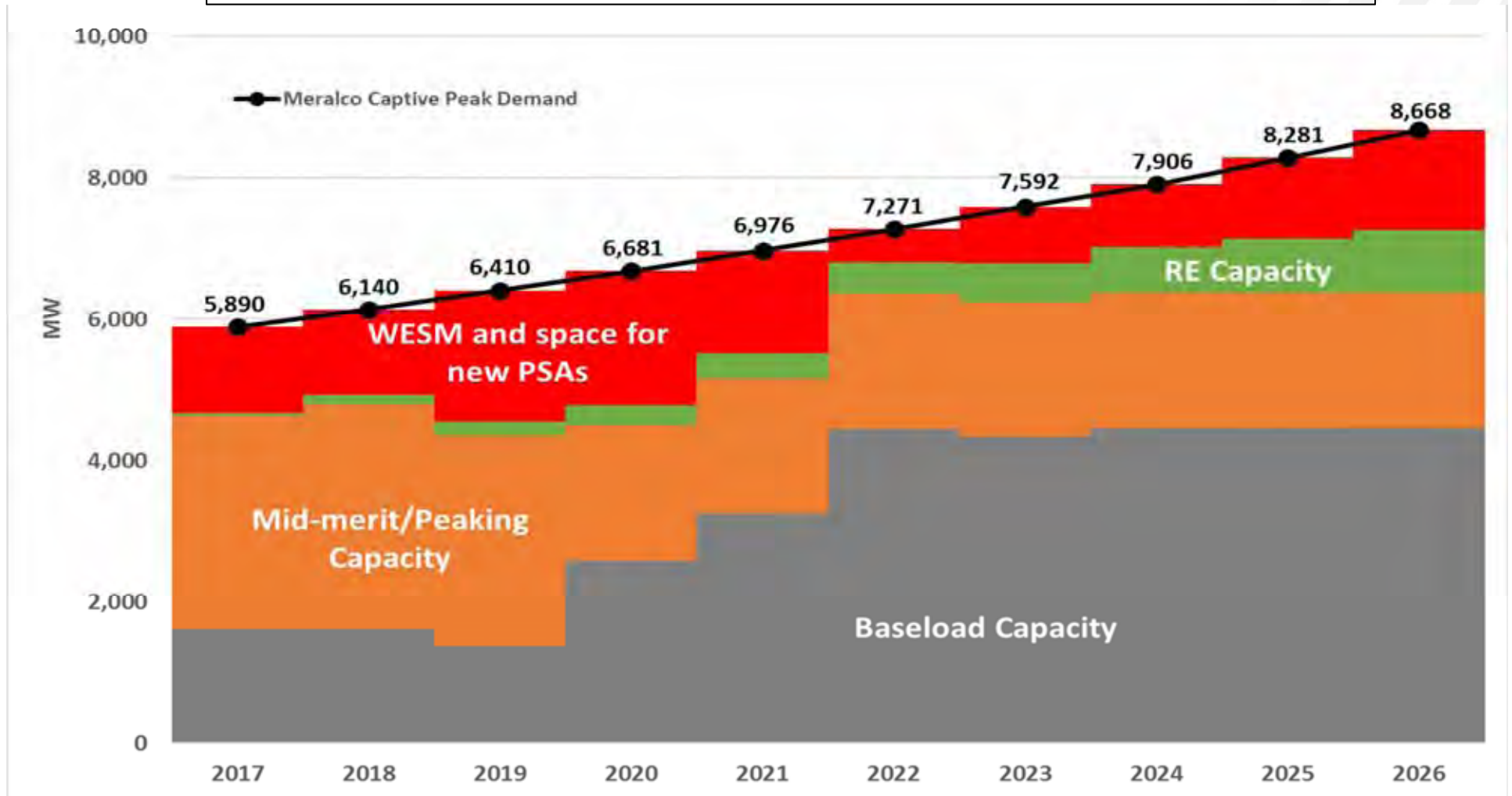
OPERATIONS SET-UP

- System Control Center (Ortigas) **24/7**
 - With emergency back up system (redundancy)
 - Centralized remote monitoring and control through SCADA System.
 - Restoration procedures for total system blackout, major outages, typhoon, etc. – as contingency
- Ten (10) strategically located Operating Centers (Sectors) **24/7**
 - Line maintenance and response to operating troubles
- Call Center Operations **24/7**
- 30 Business Centers



II. Resilience of Meralco Supply-Demand Plan

This chart shows that for the next 9 years (2018-2026), Meralco's supply portfolio will be resilient enough to take care of load growth.



Meralco Peak Demand with 4.4% CAGR; Based on voluntary RCOA (Phase 1 and 2 only)
RE Capacity increases by 1% of Demand every year

II. Resilience of Meralco Supply-Demand Plan

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Meralco Captive Demand ^[1]	5,890	6,140	6,410	6,681	6,976	7,271	7,592	7,906	8,281	8,668
Meralco DU Supply	4,678	4,934	4,619	4,768	5,432	6,632	6,518	6,650	6,650	6,650
Baseload Capacity (Coal)	1,620	1,620	1,370	2,584	3,248	4,448	4,334	4,466	4,466	4,466
QPPL	460	460	460	460	460	460	460	460	460	460
Calaca	250	250	0	0	0	0	0	0	0	0
Masinloc	260	260	260	260	260	260	0	0	0	0
Pagbilao	250	250	250	250	250	250	0	0	0	0
Sual	330	330	330	0	0	0	0	0	0	0
PEDC	70	70	70	70	70	70	70	70	70	70
SBPL	0	0	0	455	455	455	455	455	455	455
GLEDC ^[2]	0	0	0	600	600	600	600	600	600	600
MPGC ^[2]	0	0	0	264	528	528	528	528	528	528
RPE ^[2]	0	0	0	225	225	225	225	225	225	225
SRPGC ^[2]	0	0	0	0	400	400	400	400	400	400
A1E ^[2]	0	0	0	0	0	1,200	1,200	1,200	1,200	1,200
CLPPC ^[2]	0	0	0	0	0	0	396	528	528	528
Mid-merit/Peaking Capacity (Natural Gas/Oil)	3,008	3,179	2,979	1,914	1,914	1,914	1,914	1,914	1,914	1,914
Sta. Rita	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
San Lorenzo	500	500	500	500	500	500	500	500	500	500
Ilijan	1,065	1,065	1,065	0	0	0	0	0	0	0
TMO and IPSAs	443	200	0	0	0	0	0	0	0	0
San Gabriel ^[3]	0	414	414	414	414	414	414	414	414	414
Renewables (Solar)	50	135	270	270	270	270	270	270	270	270
Solar Philippines ^[2]	50	50	135	135	135	135	135	135	135	135
Citicore Solar ^[3]	0	85	85	85	85	85	85	85	85	85
PowerSource ^[2]	0	0	50	50	50	50	50	50	50	50
WESM and space for new PSAs	1,212	1,206	1,791	1,913	1,544	639	1,074	1,256	1,631	2,018

^[1] Meralco Captive Peak Demand with 4.4% CAGR; Based on voluntary RCOA with Phase 1 and Phase 2

^[2] Power Supply Agreements (PSAs) awaiting ERC Approval

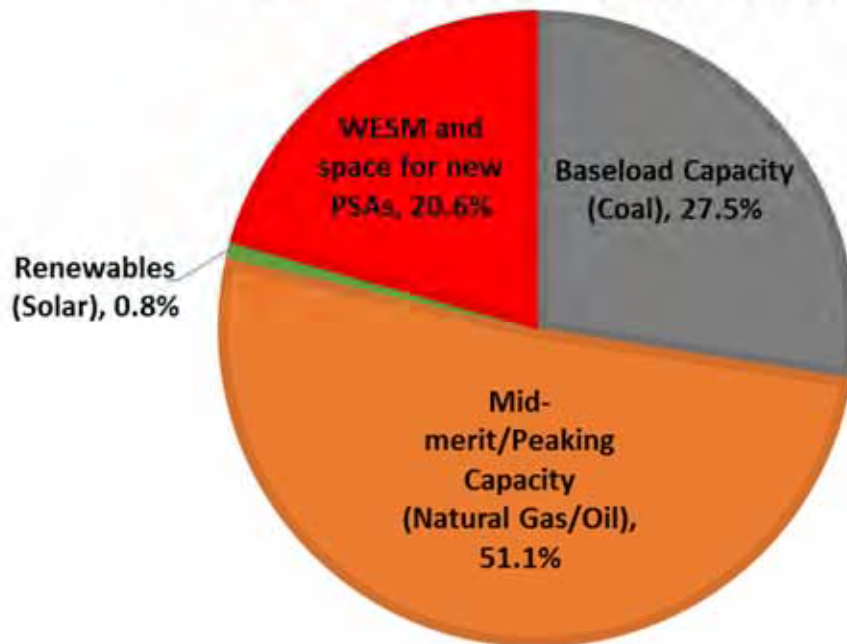
^[3] Undergoing Competitive Selection Process (CSP) before signing its PSA

II. Resilience of Meralco Supply-Demand Plan

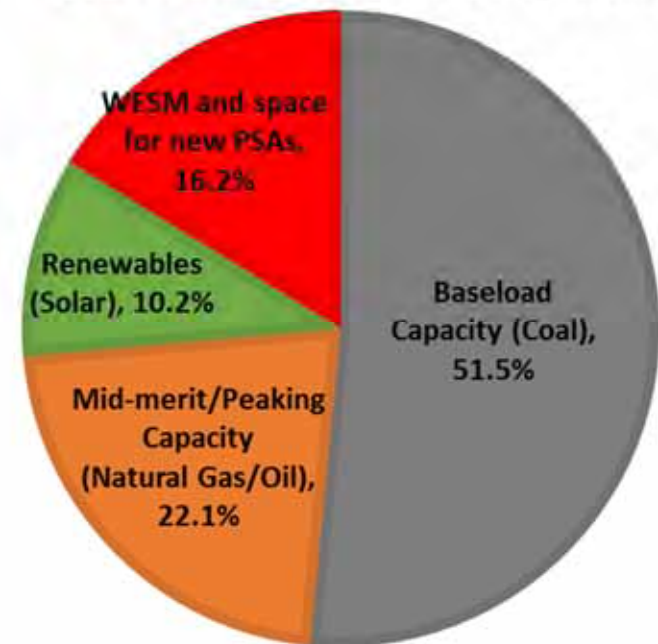
Meralco's supply mix for the next 10 years (2017-2026)

	<u>2017</u>	<u>2018</u>	<u>2019</u>	<u>2020</u>	<u>2021</u>	<u>2022</u>	<u>2023</u>	<u>2024</u>	<u>2025</u>	<u>2026</u>
% share of Captive Peak Demand										
Baseload Capacity (Coal)	27.5%	26.4%	21.4%	38.7%	46.6%	61.2%	57.1%	56.5%	53.9%	51.5%
Mid-merit/Peaking Capacity (Natural Gas/Oil)	51.1%	51.8%	46.5%	28.6%	27.4%	26.3%	25.2%	24.2%	23.1%	22.1%
Renewables (Solar)	0.8%	2.2%	3.2%	4.2%	5.2%	6.2%	7.2%	8.2%	9.2%	10.2%
WESM and space for new PSAs	20.6%	19.6%	29.0%	28.5%	20.8%	6.3%	10.5%	11.1%	13.8%	16.2%
TOTAL	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

2017 % SHARE OF CAPTIVE DEMAND



2026 % SHARE OF CAPTIVE DEMAND



III. Sourcing Strategy for Supply-Demand Resilience

LIMIT BILATERAL CONTRACTS TO 85%-90%

- Leave enough free/un-contracted volume to take advantage of low WESM prices, both on an hourly and seasonal basis

DIVERSIFY ENERGY PORTFOLIO

- Diversify contracted energy resources among various fuel types (coal, natural gas, RE) to minimize risks that can accrue from supply disruption, shortage or high price in one type of fuel

ENSURE CARVE-OUT AND CARVE-DOWN PROVISIONS IN ALL PSAs

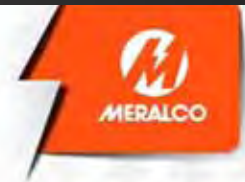
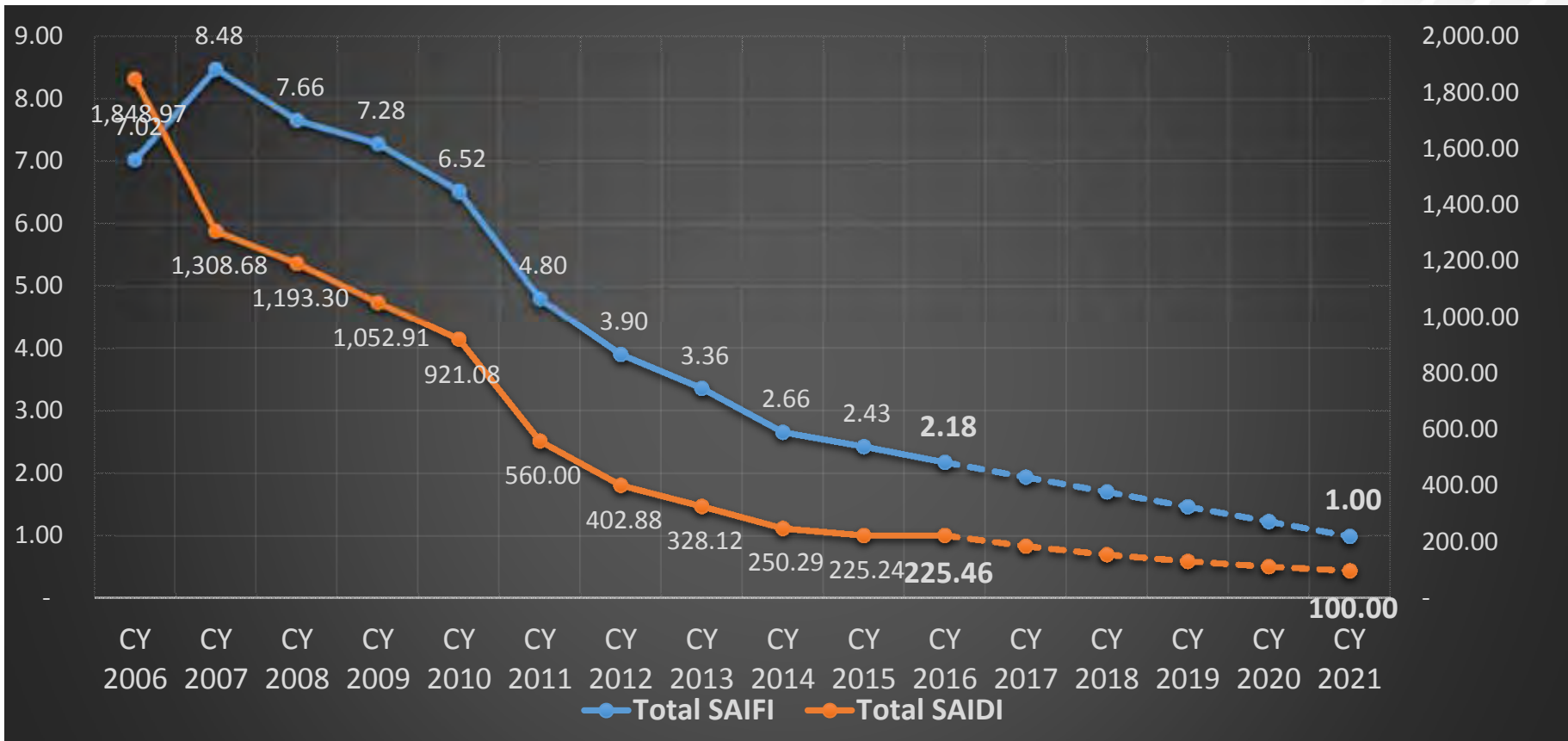
- This will prevent stranded capacity due to the effect of RCOA (customer migration) and RPS (mandated contracting with RE producers)

NEGOTIATE FOR THE LEAST OUTAGE ALLOWANCE IN PSAs

- This will minimize increase in the DU's generation cost during times of plant outages when Meralco is most vulnerable to WESM price spikes

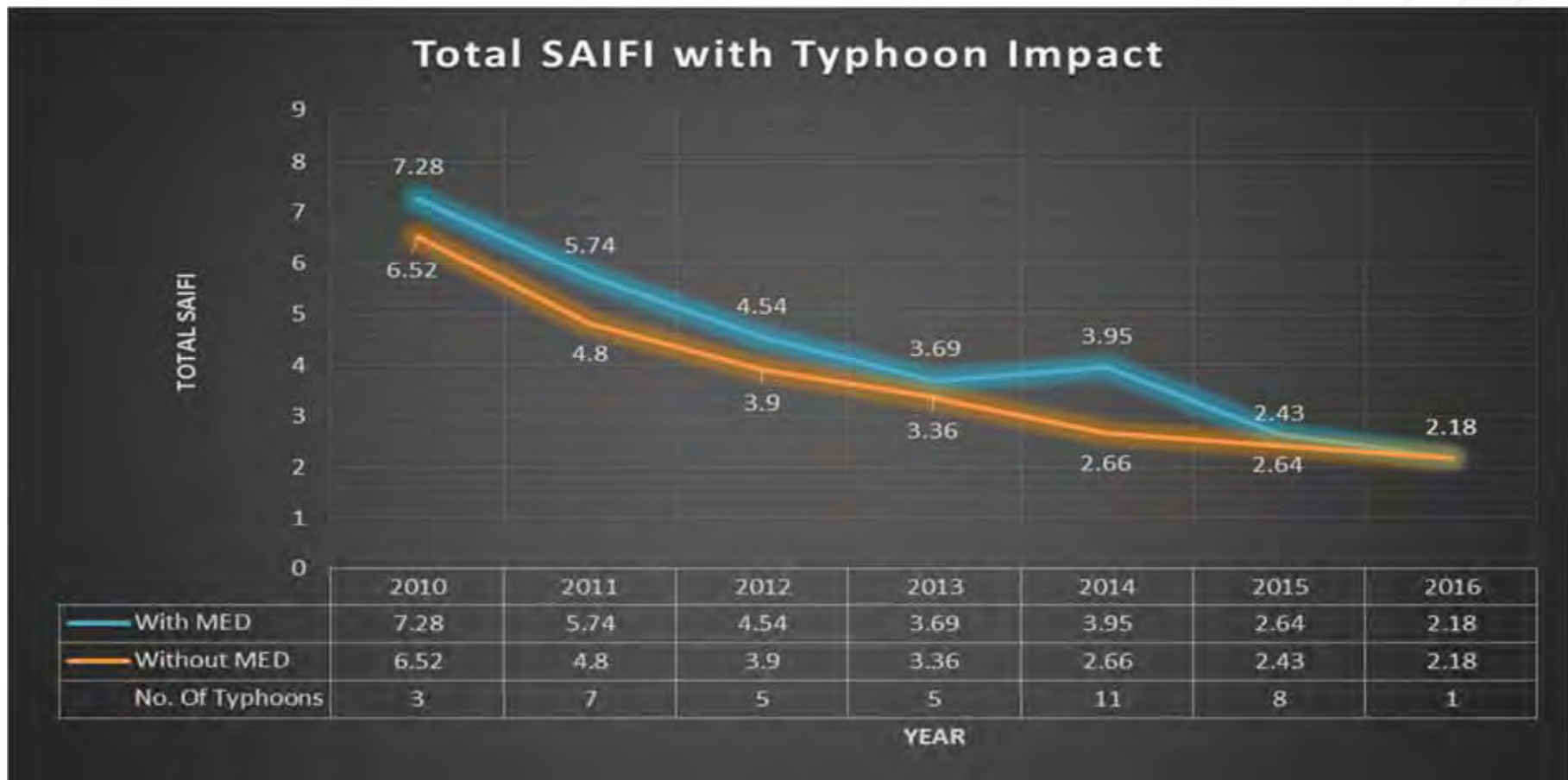
IV. Historical Service Reliability Performance

Meralco's 11-year Historical Reliability Performance and 2021 Target (SAIFI = 1 & SAIDI = 100)



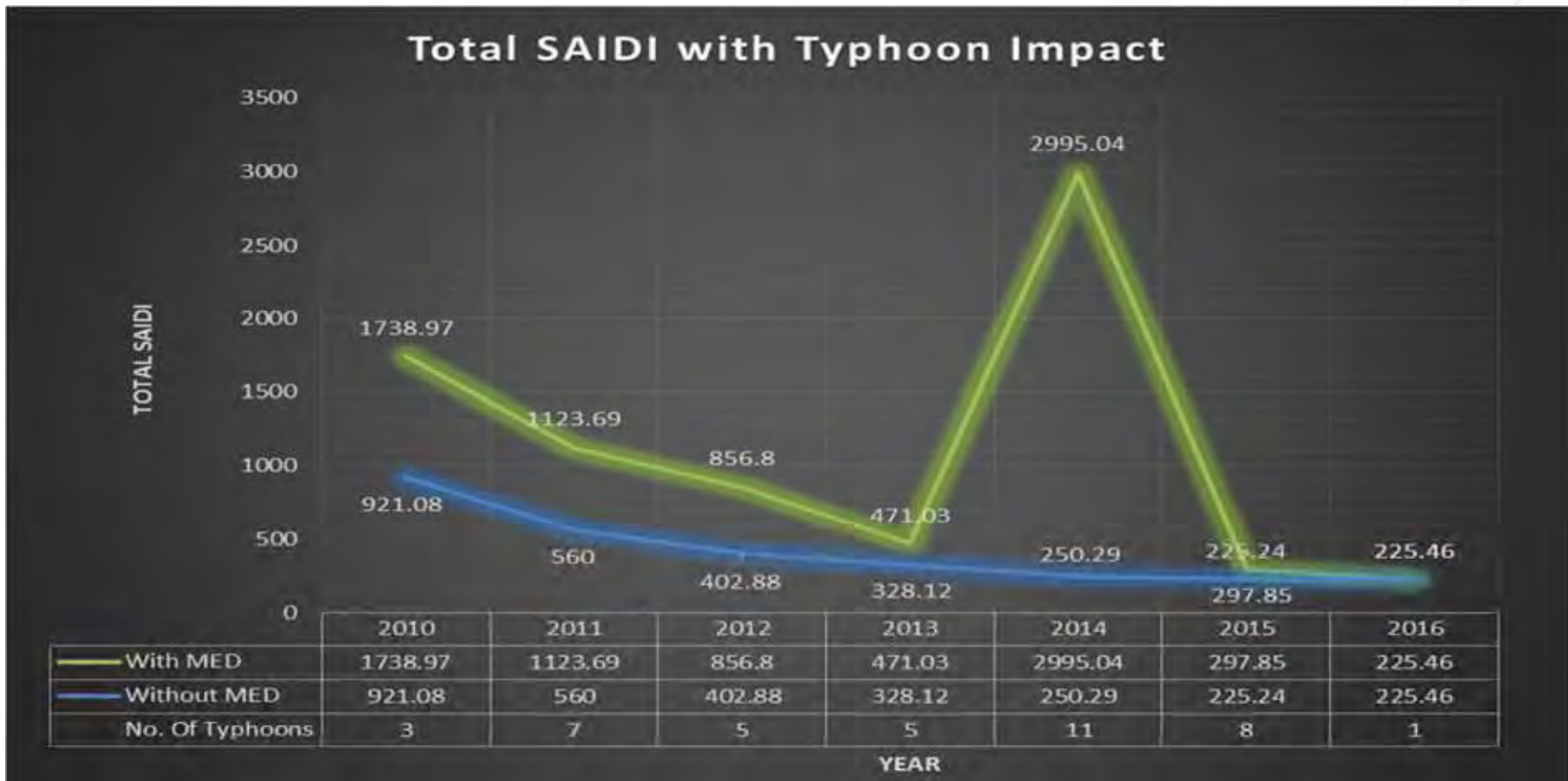
IV. Historical Service Reliability Performance

Total SAIFI with Typhoon Effect



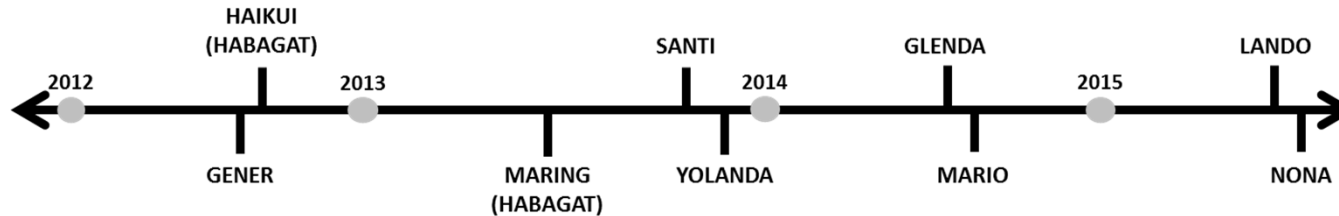
IV. Historical Service Reliability Performance

Total SAIDI with Typhoon Effect



IV. Historical Service Reliability Performance

The MERALCO Franchise has likewise been affected by severe weather conditions



Date	Typhoon	Wind Speed	Circuits Affected	Customers Affected
July 2012	Typhoon Gener	130 kph (Cat 2)	262	26%
August 2012	Habagat (Haikui)	Massive Flooding	69	10%
August 2013	Habagat (Maring)	Massive Flooding	49	5.5%
October 2013	Typhoon Santi	140 kph (Cat 3)	35	2.61%
November 2013	Typhoon Yolanda	230 kph (Cat 5)	79	7.95%
July 2014	Typhoon Glenda	165 kph (Cat 5)	627	87.5%
September 2014	Typhoon Mario	85 kph (Tropical Storm)	91	7.49%
October 2015	Typhoon Lando	185 kph (Cat 4)	129	12.06%
December 2015	Typhoon Nona	175 kph (Cat 4)	10	0.28%

Longest Circuit Level Restoration:

227.98 Hours

In 2016, we are fortunate to be spared from typhoon disturbance





IV. Historical Service Reliability Performance

Top Causes of Forced Interruption During Typhoon

Fallen Trees / Soil Erosion and the damages they brought..



IV. Historical Service Reliability Performance

Top Causes of Forced Interruption During Typhoon

Billboards and Other Foreign Objects



IV. Historical Service Reliability Performance

Top Causes of Forced Interruption During Typhoon Flooded Substations



V. Infrastructure Resiliency: The Key Success Factor

11/20/13 05:44 AM GST

Based on Tropical Cyclone Risk Model (TCRM), the impact of severe wind varies considerably between structures at various locations because of

TOPOGRAPHY

Wind Speed increases as it goes up the mountains or other elevated areas



3 Local Wind multipliers

TERRAIN

The more high rise trees, the more roughness occur, so the wind speed decreases

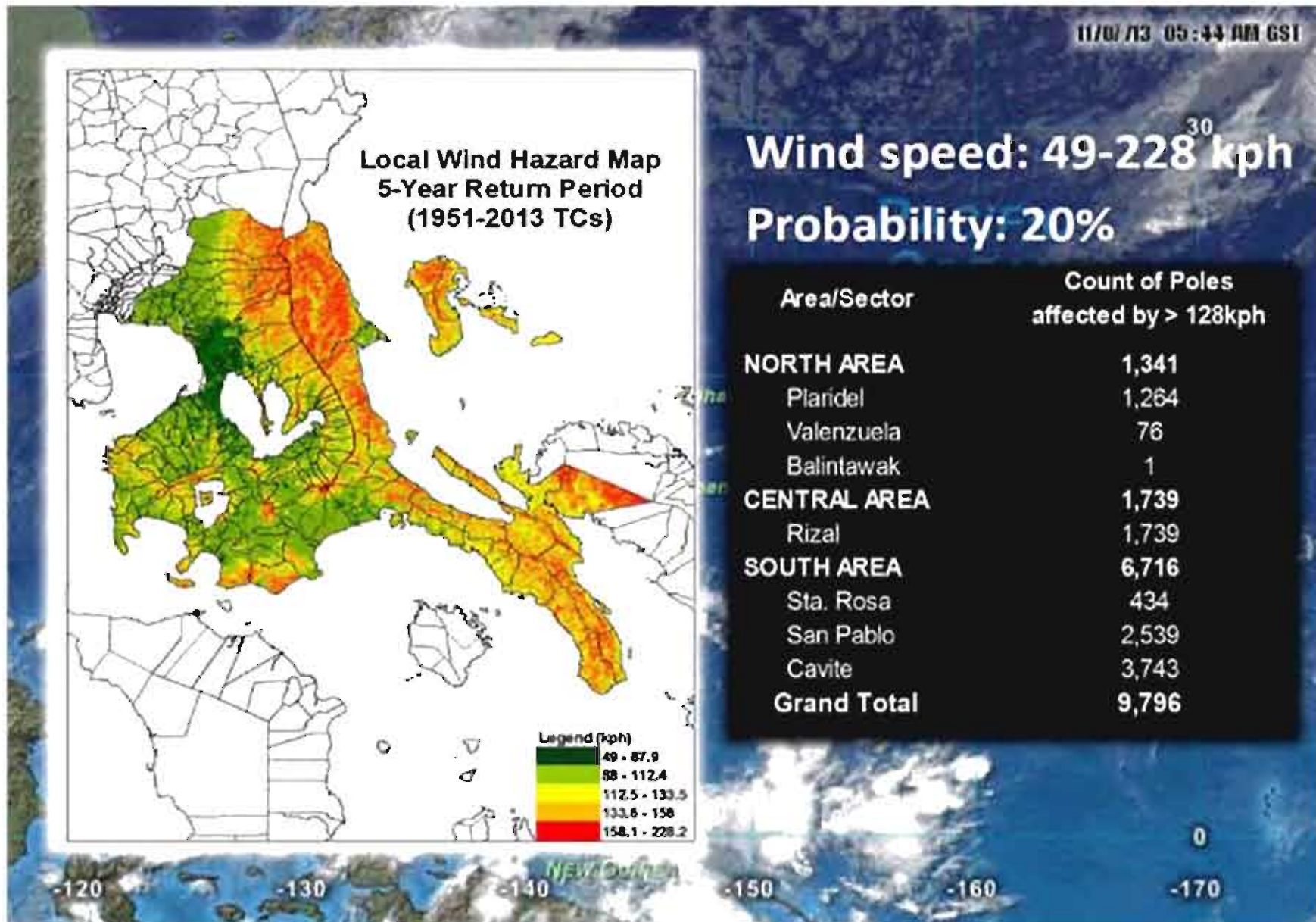


SHIELDING

Taller building reduces the wind speed towards the lower buildings



V. Infrastructure Resiliency: The Key Success Factor



V. Infrastructure Resiliency: The Key Success Factor

MERALCO Resilient Infrastructure

Wood pole replacement program

Taller and stronger Poles
Replacement of wood with concrete / steel

Relocation of facilities

Relocation from cross country, railroad tracks and waterways

Vegetation management (Periodic Tree Trimming)

Line re-insulation and conductor shielding

Reconductoring to covered conductor, spacer cable system and spun cable
Replacement of bare with covered primary lead wire
Installation of insulator, conductor, and equipment cover
Replacement of cross-arm from wood to steel / fiberglass

Lightning protection improvement program

Sectionalizing and fault mapping (inst'n of smart devices)

RCLR, RCLS, etc.
Fault Circuit Indicator

Foreign attachment management

Telecom infrastructure (redundancy)



VI. Typhoon Preparedness and Restoration



VI. Typhoon Preparedness and Restoration

Alert and State of Emergency Procedures

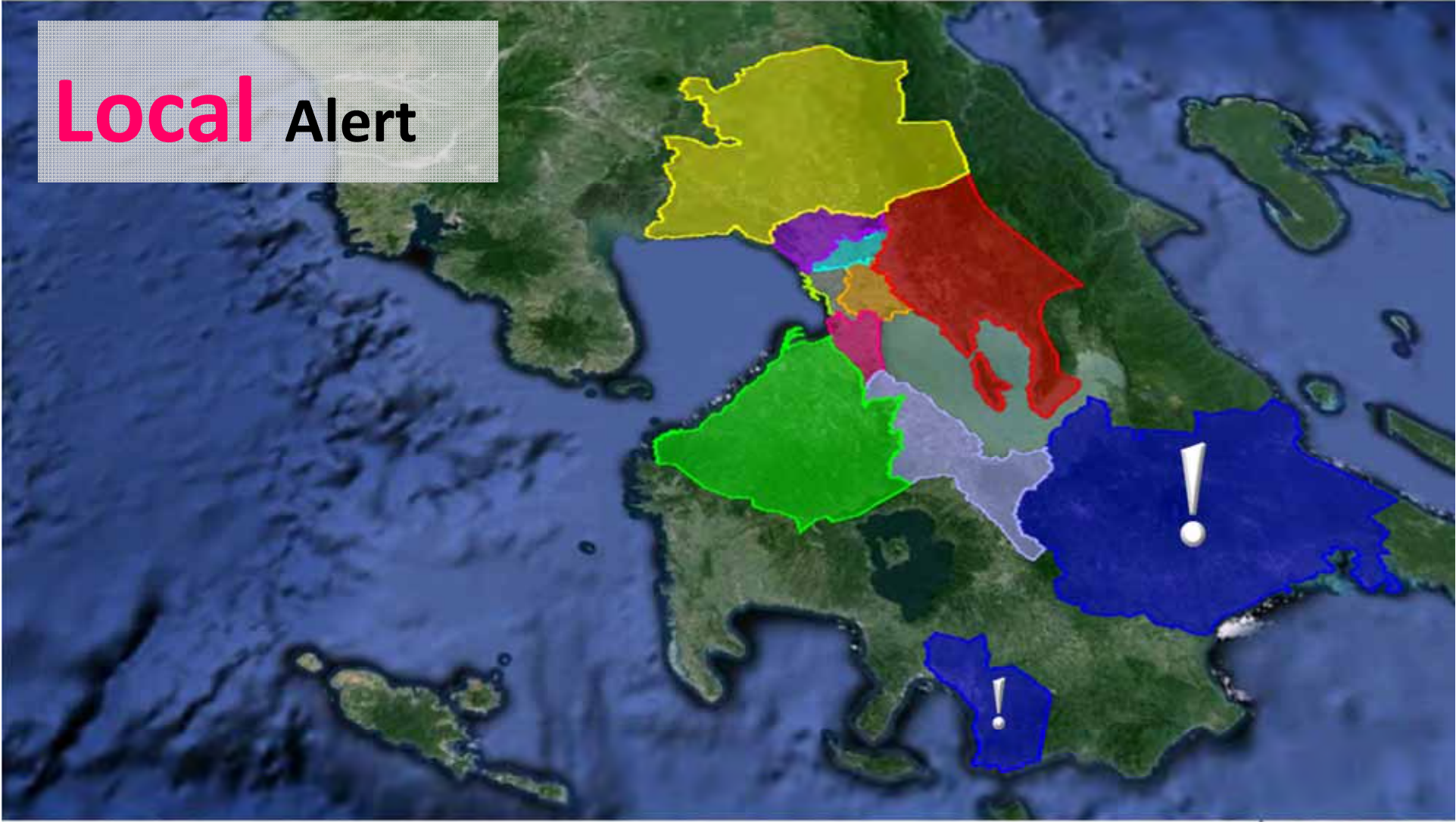
- Keep MERALCO in State of Readiness
- Delineate responsibilities of different essential services
- Expedite restoration of power electric services.
- Provide timely and accurate information on power situation

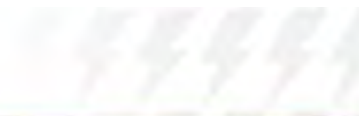
State of Alert is a condition calling for all concerned organizations to be ready within reasonable time in preparation for an impending calamity like typhoon, adverse weather condition that may affect a portion or major portion of the Meralco's franchise area.



1 2 3 4 5 6

Local Alert





General Alert



VI. Typhoon Preparedness and Restoration

Lifting of State of Alert

**General
Alert**

- Situation eases
- Declaration of state of emergency

**Local
Alert**

- Situation eases
- Declaration of state of emergency



VI. Typhoon Preparedness and Restoration



State of Emergency (SOE)



VI. Typhoon Preparedness and Restoration

Classification of SOE

Yellow SOE

- Declared when interrupted kW demand **or** count of customers still without power is **between 5% and 25%** of the previous year's kW demand or the previous month's total customer count.

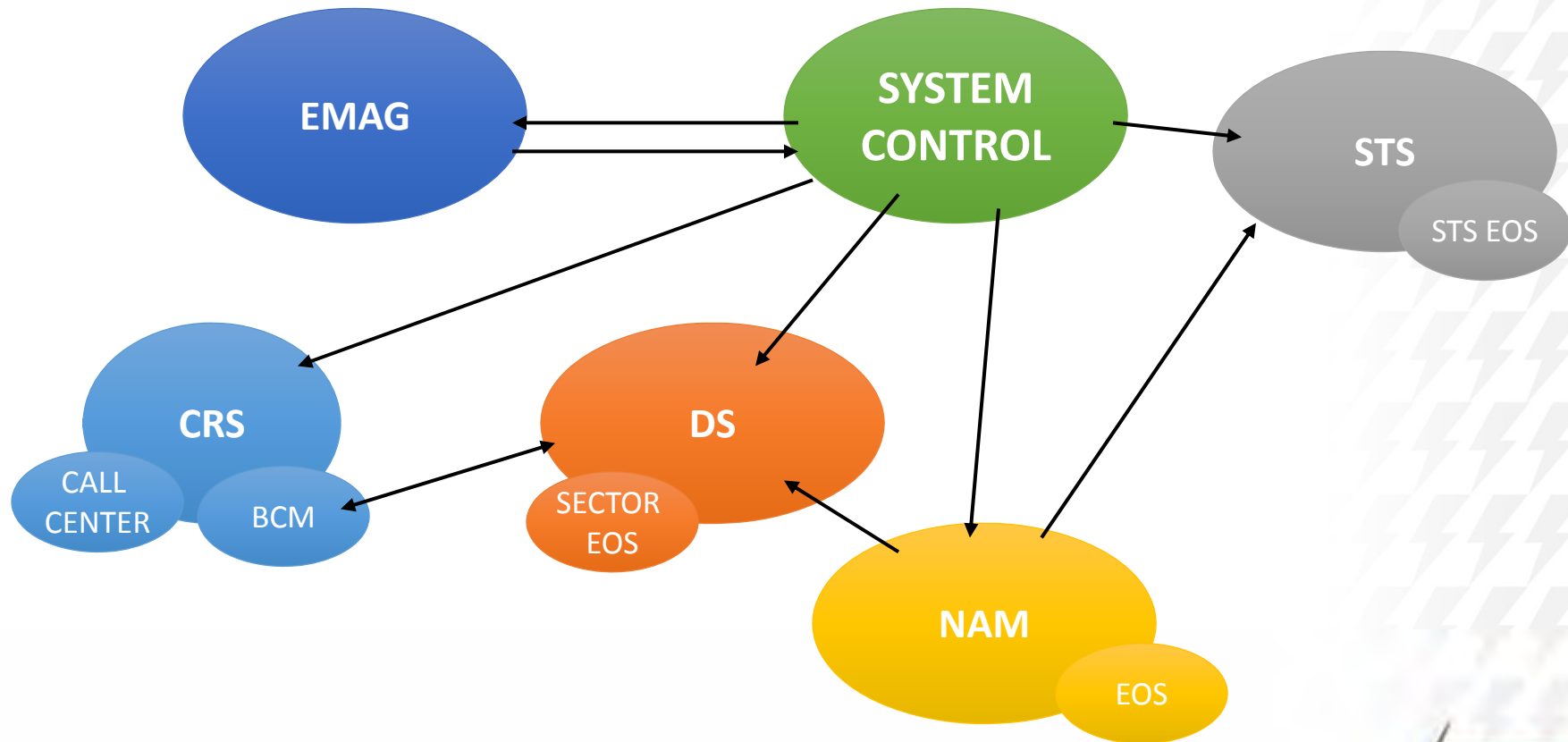
Red SOE

- Declared when interrupted kW demand or count of customers still without power is **greater than 25%** of the previous year's kW demand or the previous month's total customer count.



VI. Typhoon Preparedness and Restoration

General Declaration



VI. Typhoon Preparedness and Restoration

Power Situation Report

Power Situation Report	OSM	DSAM	SSAM
Weather Update	✓		
System Demand	✓		
Count of Circuits without Power by Area	✓		
List of Affected Major Facilities	✓		✓
Estimate of Damaged Facilities		✓	✓
Manpower & Vehicle Report		✓	✓
Customers without Power by Area	✓		
Restoration Updates	✓		✓

**OSM collates all data to form the power situation report*



VI. Typhoon Preparedness and Restoration

PREPARATORY ACTIVITIES

- Weather disturbance monitoring and communication of Severe Weather Bulletin to all concerned groups as typhoon enters the PAR
- Declaration of State of Alert (General or Local)
- Public Advisory / Typhoon Watch (through media & social networks)
- Activation of Emergency Operations Support Group
- Sector Preparation
 - Last-minute Tree Trimming
 - Line Inspection and Clearing
 - Coordination with Building Work Sites and Billboard Owners
 - Removal of Line Conductor Covers
 - Preparation of Truck Stock / Stock Inventory
 - Advance deployment of crews on selected substations
 - Dispatch of Operations Engineers to NGCP Control Center (LRCC)
 - Deployment of Distributed Control Center
 - On Call duty of engineers and operating crews

DURING TYPHOON

RESTORATION ACTIVITIES

Track of Tropical Depression "AURING"



Philippine Atmospheric, Geophysical and Astronomical Services Administration



VI. Typhoon Preparedness and Restoration



- Monitoring of tripping events
- Outage Management (Trouble analysis / Isolation of faulted facilities)
- Public Advisory and Customer Complaint Management



VI. Typhoon Preparedness and Restoration



VII. Business Continuity Initiatives



VIII. MERALCO Participation in Task Force Kapatid

ONE MERALCO FOUNDATION (OMF) has assisted 17 electric cooperatives since 2012

<u>2012</u>	Typhoon Pablo (Dec 3)	185kph (Cat 5)	Davao Oriental Electric Cooperative (DORECO) 14 days
<u>2013</u>	Typhoon Santi (Oct 14)	140 kph (Cat 3)	Cabanatuan Electric Cooperative (CELCOR) 6 days
	Typhoon Yolanda (Nov 8)	230kph (Cat 5)	Aklan Electric Cooperative (AKELCO) 15 days Capiz Electric Cooperative (CAPELCO) 15 days Iloilo Electric Cooperative (ILECO 3) 15 days Leyte Electric Cooperative (LEYECO 2&5) 66 days
<u>2014</u>	Typhoon Glenda (July 14)	165kph (Cat 5)	Albay Electric Cooperative (ALECO) 21 days
<u>2015</u>	Typhoon Nona (Dec 13)	175kph (Cat 4)	Oriental Mindoro Electric Cooperative (ORMECO) 12 days Sorsogon Electric Cooperative (SORECO) 5 days
	Typhoon Ferdie (Sept 13)	220kph (Cat 5)	Batanes Electric Cooperative (BATANELCO) 12 days
	Typhoon Lawin (Oct 19)	215kph (Cat 5)	Cagayan Electric Cooperative (CAGELCO I) 13 days Isabela Electric Cooperative (ISELCO II) 2 days
<u>2016</u>	Typhoon Nina (Dec 26)	195kph (Cat 5)	Quezon Electric Coop (QUEZELCO I) 7 days First Catanduanes Electric Coop (FICELCO) 14 days Oriental Mindoro Electric Coop (ORMECO) 3 days Camarines Sur Electric Coop (CASURECO 2 & 4) 9 & 14 days Albay Power Energy Corp (APEC) 14 days



MERALCO

End of Presentation

*ONE MERALCO
remains committed
to continuously
support the
Energy Industry*