

# Meralco's Program for a Resilient Electric Distribution System

*Building and Operating a Resilient Renewable Electricity System*

*Asia - Pacific Energy Leaders' Summit:*

*Delivering Resilient Energy Infrastructure*

*InterContinental, Wellington, New Zealand*

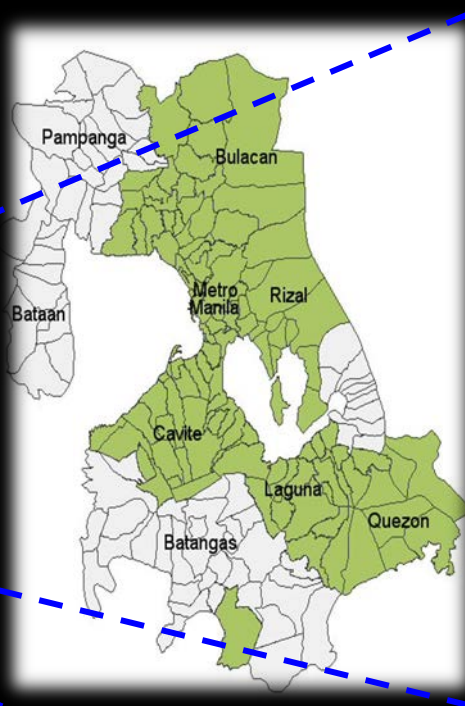
*March 16, 2016*

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Assistant Vice President

Manila Electric Company (MERALCO)

## PHILIPPINES



- Largest electric distribution utility in the Philippines
- 5.53 Million customers
- 9,337 square kms.
  - Metro Manila, Bulacan, Cavite, Rizal
  - Parts of Laguna, Quezon, Batangas, Pampanga

- 25% of Philippine populations
- 50% of the GDP
- 60% of the manufacturing output
- 75% and 55% of Luzon and Philippine energy sales, respectively
- Social, political and economic center of the Philippines

**Manila Electric Company**  
**MERALCO**  
*Founded in 1903*

# Exposure

## Power Substation

- 114 substations
- 4,250 MVA capacity

## Subtransmission Lines

- Loop system
- 900 km length
- 99.8% OH
- 13,000 wood, concrete, steel poles

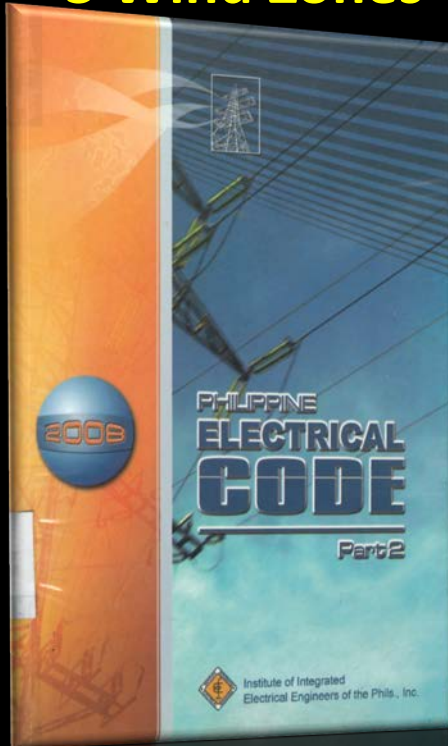
## Distribution Lines

- Radial with tie feeders
- 16,500 km length
- 98% OH
- 730,000 wood, concrete, steel poles



# Hazard (Wind)

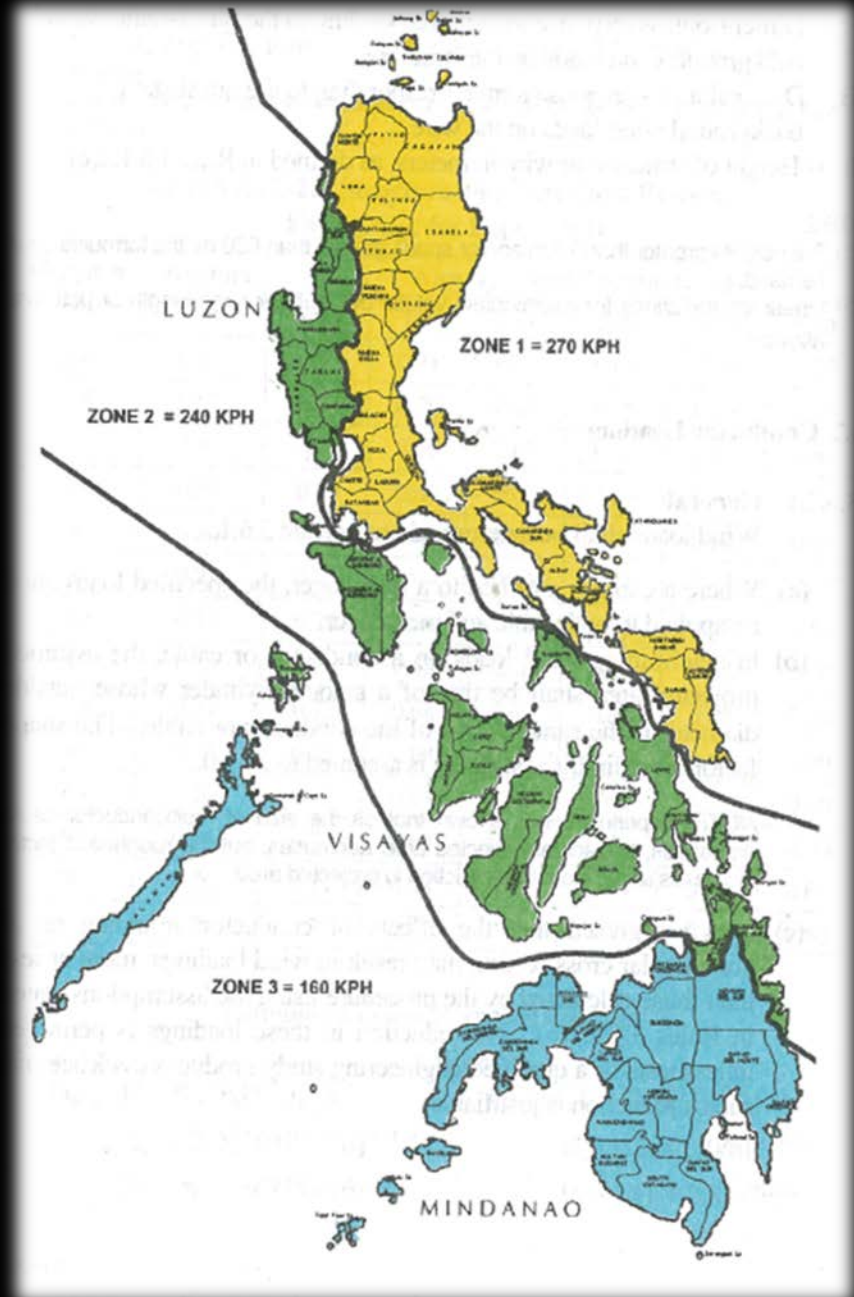
## 3 Wind Zones



**Zone 1 – 270 kph** Luzon (except Bataan, Mindoro, Palawan and Romblon) and Samar

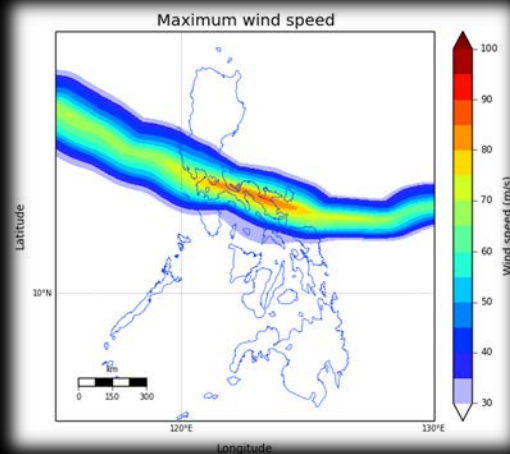
**Zone 2 – 240 kph** Visayas (except Samar), Surigao, Agusan del Norte, Romblon, Busuanga & Culion Islands, Dinagat and Siargao Islands

**Zone 3 – 160 kph** Mindanao (except Agusan del Norte & Surigao) and Palawan (except Culion and Busuanga islands)



# Risk Assessment

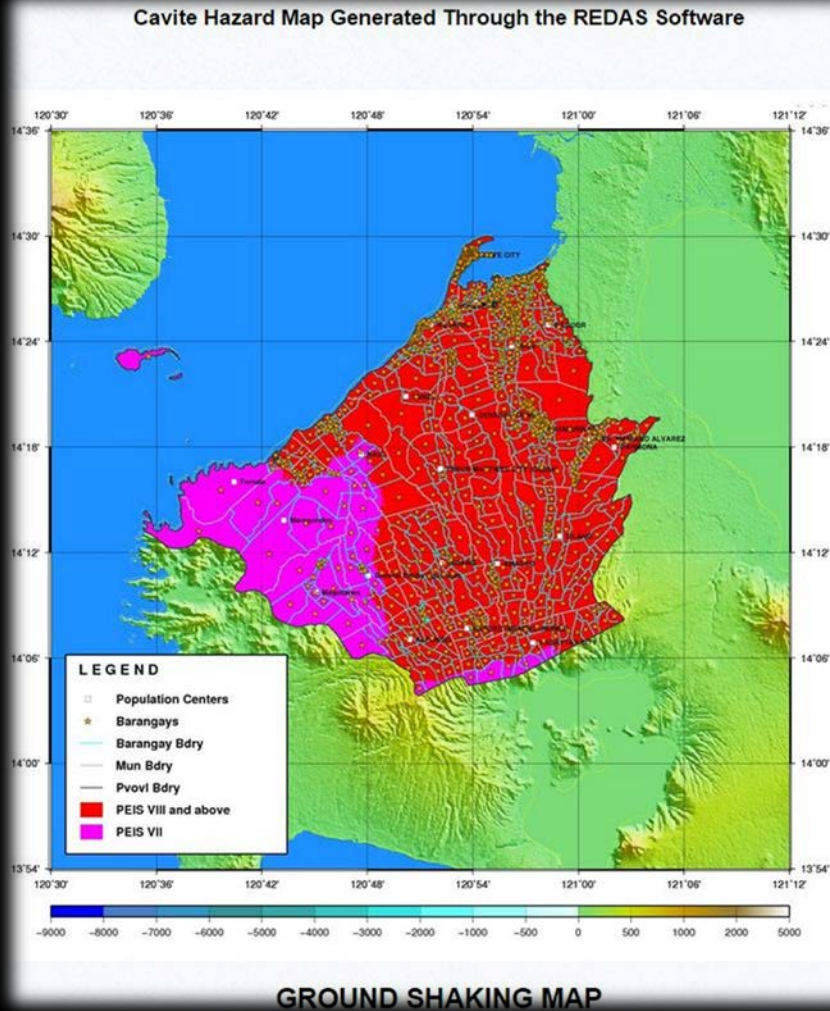
- GMMA-RAP Bridging Project
  - Risk assessment to energy infrastructure
  - Typhoon and earthquake
  - Impact to the national economy



# Hazard (Earthquake)

## Rapid Earthquake Assessment System (REDAS)

- Developed by PHIVOLCS
- Quick and near real-time simulated earthquake hazard map information as a decision support tool for disaster managers during potentially damaging earthquakes

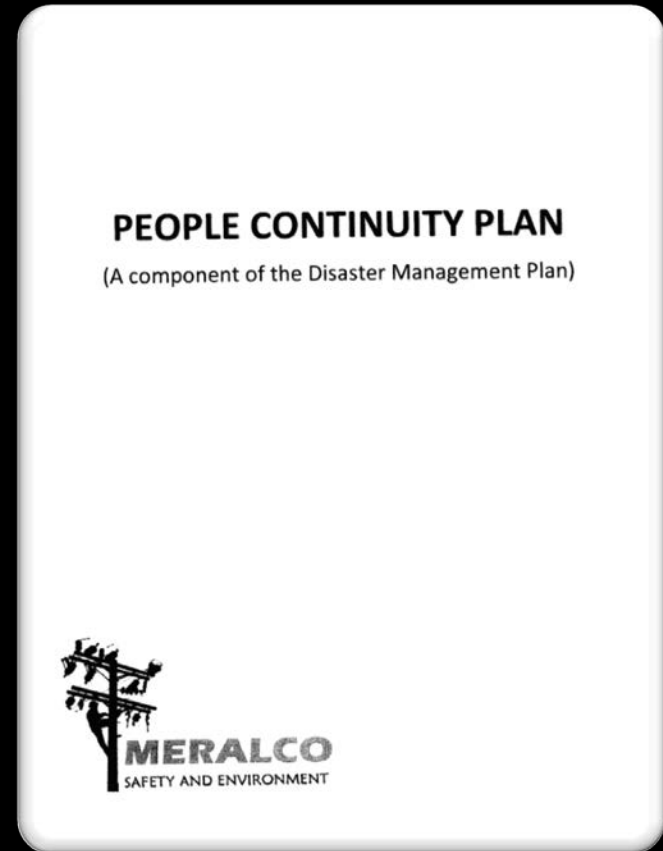


# MERALCO Typhoon Readiness

- People/Process/Partnership
- Infrastructure/Technology

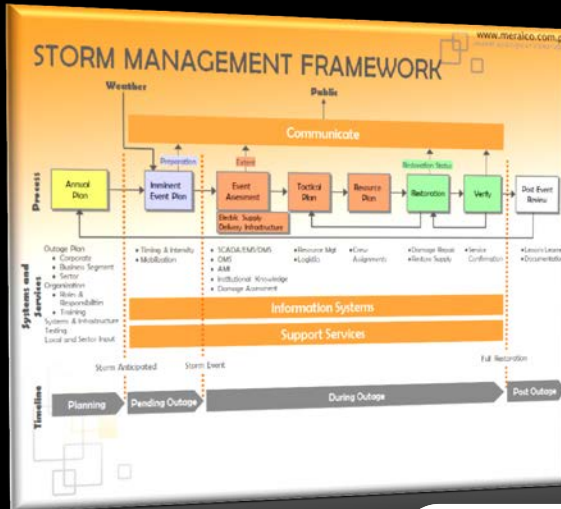
# People Continuity Plan

- Conservation of human lives
- System for organizing, training and instructing employees
- Emergency action
- All employees are kept safe, informed and taken cared of
- Not only during normal working conditions, even when at home

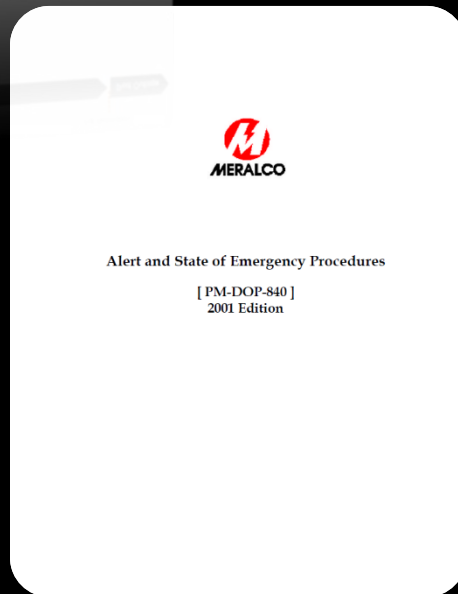




# Alert and State of Emergency



Mitigation  
Preparedness  
Review



- State of alert
- State of emergency
- Responsibilities of personnel during emergency periods
- Manpower requirements
- Safeguarding lives and properties
- Respond to customer calls
- Evaluation of extent of damage
- Restoration works

# Partnership

- Customer
- National government
- Local government
- Weather bureau
- Disaster management organizations
- Police/Fire departments

# Information Systems

The screenshot displays the Autodesk Operations Portal for STORMS. The interface is divided into two main sections. On the left is a map of the Philippines, showing various provinces and cities. Several provinces are highlighted in red, including Amnihan, Bulacan, Batangas, and Manila. On the right is a control panel with the following elements:

- Help** and **Logout** buttons.
- Typhoon Name** section: **Current Typhoon:** DAILY OPERATION (dropdown menu).
- Circuit/Segment Event Logger** section: **ECN / Circuit** (input field) and **Breaker No.:** (input field) with a **Locate** button.
- Buttons for **Alternate Circuit**, **Create Switching Log**, **Batch De-Energization**, and **Batch Energization**.
- Reports** section: Buttons for **Customer Count Report**, **Switching Operation Reports**, **Areas Affected Report**, **List of Affected Distribution Transformers**, and **Prioritization Report**.

Customer and Facilities Outage Management System

Damage to Facilities Management System

# Strategies on Infrastructure



## ***Storm hardening & resiliency***

- Selective undergrounding, covered conductors, spacer cable systems
- Vegetation management
- Design and construction standards to withstand stronger typhoons (composite poles)
- Pole inspection and replacement program
- Joint-pole use (foreign attachments)
- Relocation of substations/control room
- Reinforced substation concrete fence

# Strategies on Infrastructure



## *Storm hardening & resiliency*

- Flood pumps
- Elevated meters
- Further enhance communication, planning & restoration
- Vehicles with GPS, tablets & smartphones
- Aerial drones
- Smart Grid/ DA, Micro Grid

*But, always ready for the “mano-mano”*

# Milenyo and Glenda



## TY Glenda (Rammason)

Date: July 15, 2014  
 Max. winds: Sustained, **150 kph\***  
 Gustiness, **185 kph\***  
 Unrealized Sales: 187 GWh  
 Cust. affected: 87%  
 Circuits affected: 89%  
 Est. cost of damage: PHP 400M

## TY Milenyo (Xangsane)

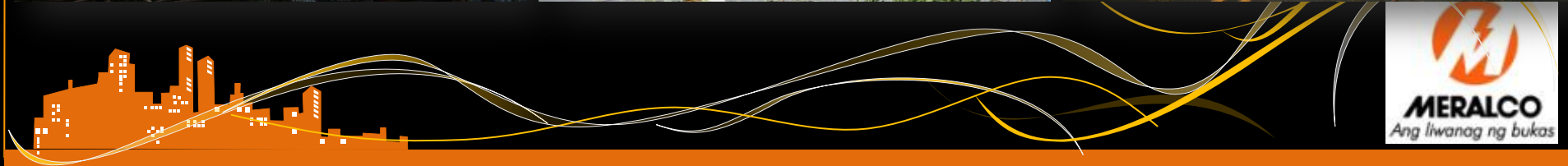
Date: September 28, 2006  
 Max. winds: Sustained, **130 kph**  
 Gustiness, **160 kph**  
 Unrealized Sales: 183.3 GWh  
 Cust. affected: 100%  
 Circuits affected: 100%  
 Est. cost of damage: PHP 500M

Sources: PAGASA Website & Operations - Networks Process Final Report on Milenyo

# Milenyo - BILLBOARDS



# Glenda - TREES





# Ondoy (Ketsana)

September 26, 2009 (Saturday)

- One of the strongest to ever hit Metropolitan Manila
- Considered among the worst typhoons to hit Southeast Asia

Strong winds battered the Metro for 9 hours!

- 96 kph maximum winds
- Gusts to 100 kph
- 411 mm of rainfall

Effect:

- 13 substations, 215 circuits,
- 1.54 million customers
- Damages estimated at P300 million



# Ondoy – Flooded Substations



# Take aways

- Location of energy infrastructure
- Energy supports delivery of essential services
- Urgent need to adapt
- Systematic assessment of the electric distribution system
- Medium to long term strategy in place
- Improvement in electricity utilization via smart grid
- Partnership and cooperation with the community and government agencies

# Take aways

- Partnership and cooperation with the community and government agencies
- Distributed generation from alternative sources (microgrids)
- Strategic infusion of capital expenditures (e.g., selective undergrounding)
- Adaptation and Mitigation (storm hardening and resiliency)
- Reliability of electric supply
- Assessment of energy supply (risk and hazard analysis)
- Technical standards



Thank you...  
***MERALCO, determined to serve***