

POWER 101



IEC on WESM Mindanao
30 October 2018 | Agusan del Norte

OUTLINE OF THE PRESENTATION

- **Power Systems 101**
- **Philippine Power System**
- **The DOE under the Restructured Power Industry**



POWER SYSTEMS 101

How does it work?



How the Power System Works

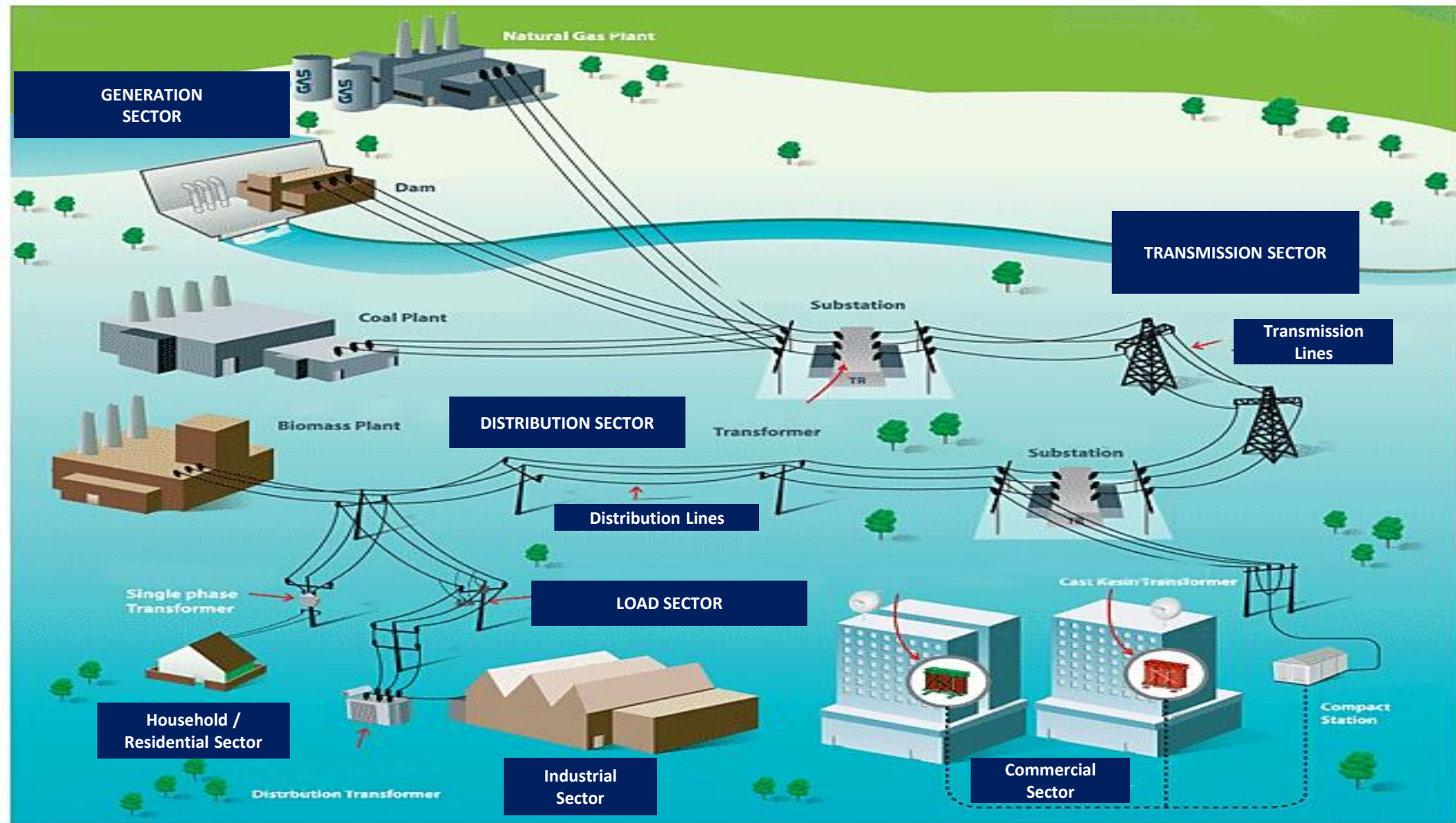


Image source: <http://www.thaimaxwell.com/images/TME-Introduction-to-the-electricity-grid.gif>





Generation Sector

- Conversion of other forms of energy into electrical energy.



Fossil-based Power Plants

- Coal
- Natural Gas
- Oil-based
- Liquefied Natural Gas (LNG)*
- Nuclear*



Renewable Energy Power Plants

- Biomass
- Geothermal
- Solar
- Hydro
- Ocean / Tidal*
- Wind

*No existing facilities yet within the Philippines





Generation Sector



Fossil-based Power Plants



GNPower Mariveles Coal-Fired Power Plant (Bataan)



Ilijan Combined-Cycle Power Plant (Batangas)



TMI Nasipit Oil-fired Power Barge (Agusan del Norte)





Generation Sector



Renewable Energy Power Plants



**VMC Bagasse-fired
Cogeneration Plant (Negros)**



**Tiwi Geothermal Power Plant
(Albay)**



**Kirahon Solar Farm
(Misamis Oriental)**



**AGUS VI Hydroelectric Power
Plant (Iligan)**



Pililla Wind Farm (Rizal)





Plant Operations

PEAKING

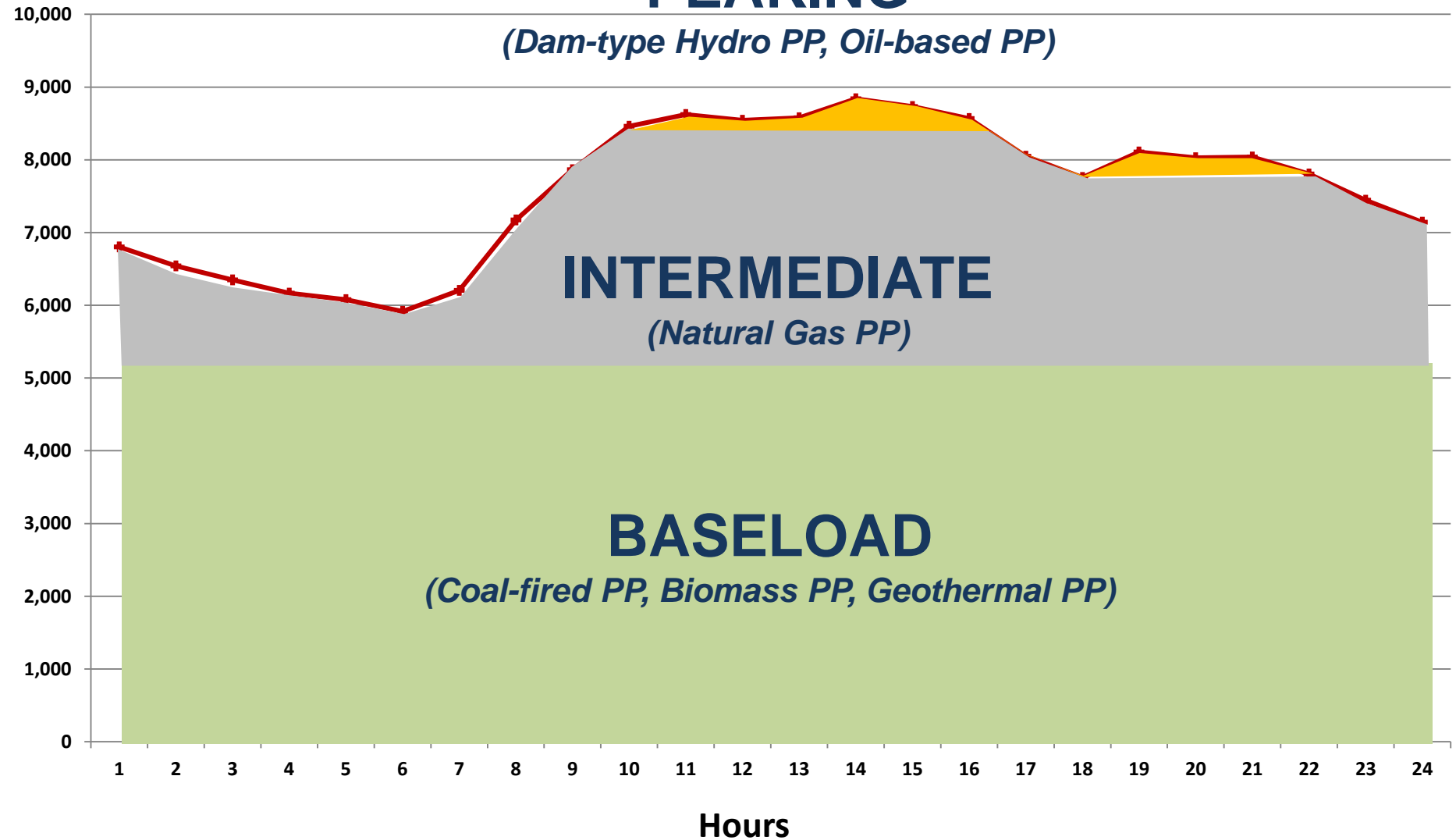
(Dam-type Hydro PP, Oil-based PP)

INTERMEDIATE

(Natural Gas PP)

BASELOAD

(Coal-fired PP, Biomass PP, Geothermal PP)





Transmission Sector

- Transport of electricity from one region to another through the high voltage overhead transmission lines.

Transmission Voltages

- **Luzon:** 500 kV, 230 kV, 138 kV, 115 kV, 69 kV
- **Visayas:** 230 kV, 138 kV, 69 kV
- **Mindanao:** 138 kV, 69 kV

**Note: 1 kiloVolt = 1,000 Volts*



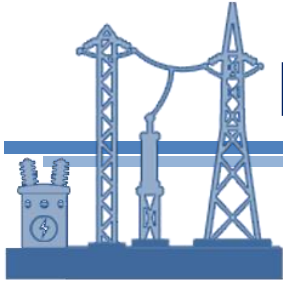


Transmission Sector



- Owned by the National Transmission Corporation
- Managed and operated by the National Grid Corporation of the Philippines (NGCP) under a Concession Agreement





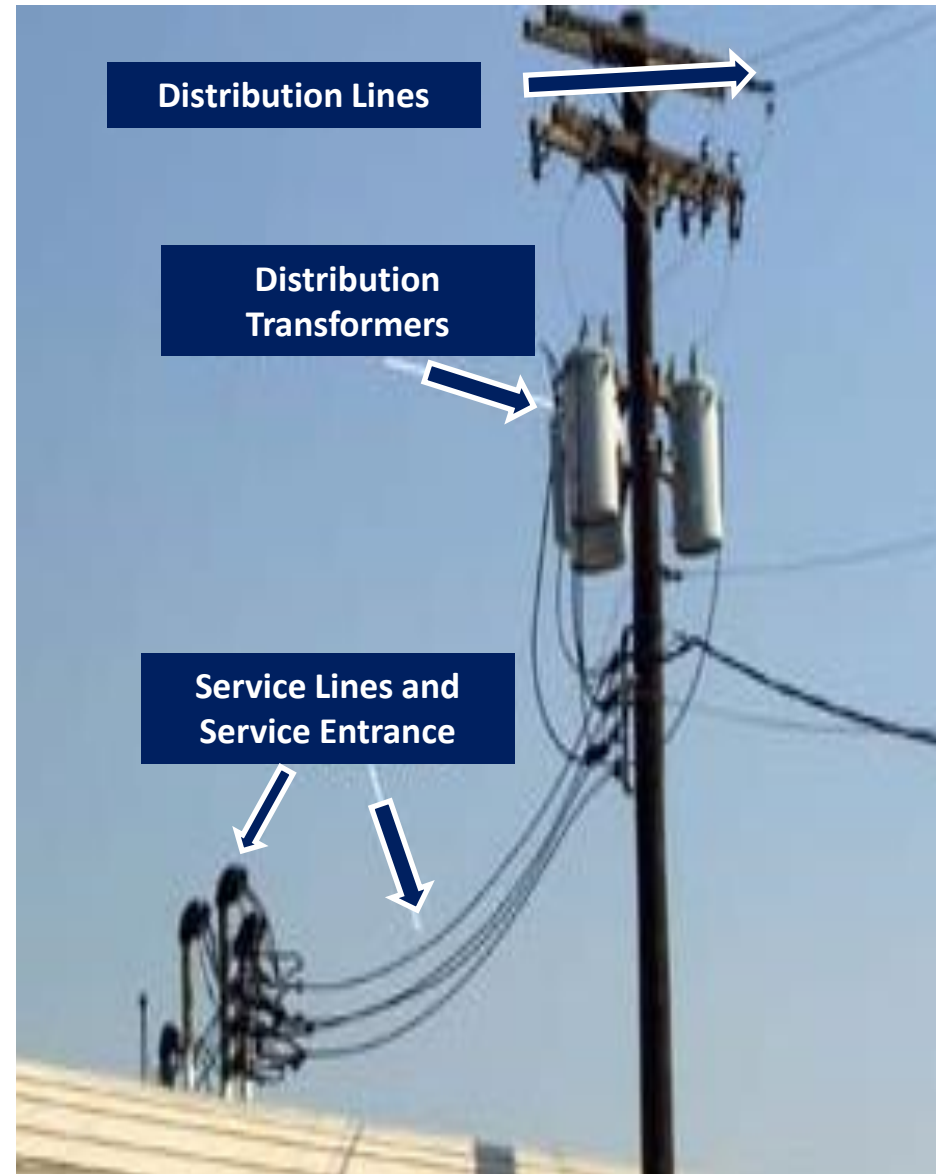
Distribution Sector

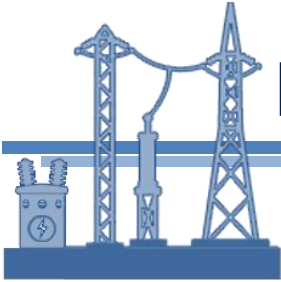
- Transport of electricity from the lower voltage distribution lines to homes, businesses, and other load centers.

Distribution Voltages

- Primary : 69 kV, 34.5 kV, 13.8 kV, 4.16 kV
- Secondary: 220/230 V or 110/115 V

**Note: 1 kiloVolt = 1,000 Volts*





Distribution Sector

Electric Cooperatives (ECs)



**Private Investor-
Owned Utilities
(PIOUs)**

**Local Government
Unit-Owned
Utilities (LGUOUs)**



**Qualified Third
Parties (QTPs)**

**Multipurpose
Cooperative
(MPC)**





Supply Sector

Suppliers refer to any Person licensed by the ERC to sell, broker, market, or aggregate electricity to End-users





Load Sector

Load is the power required of or consumed by a circuit.



Residential



Commercial



Industrial

Customer Types of Load

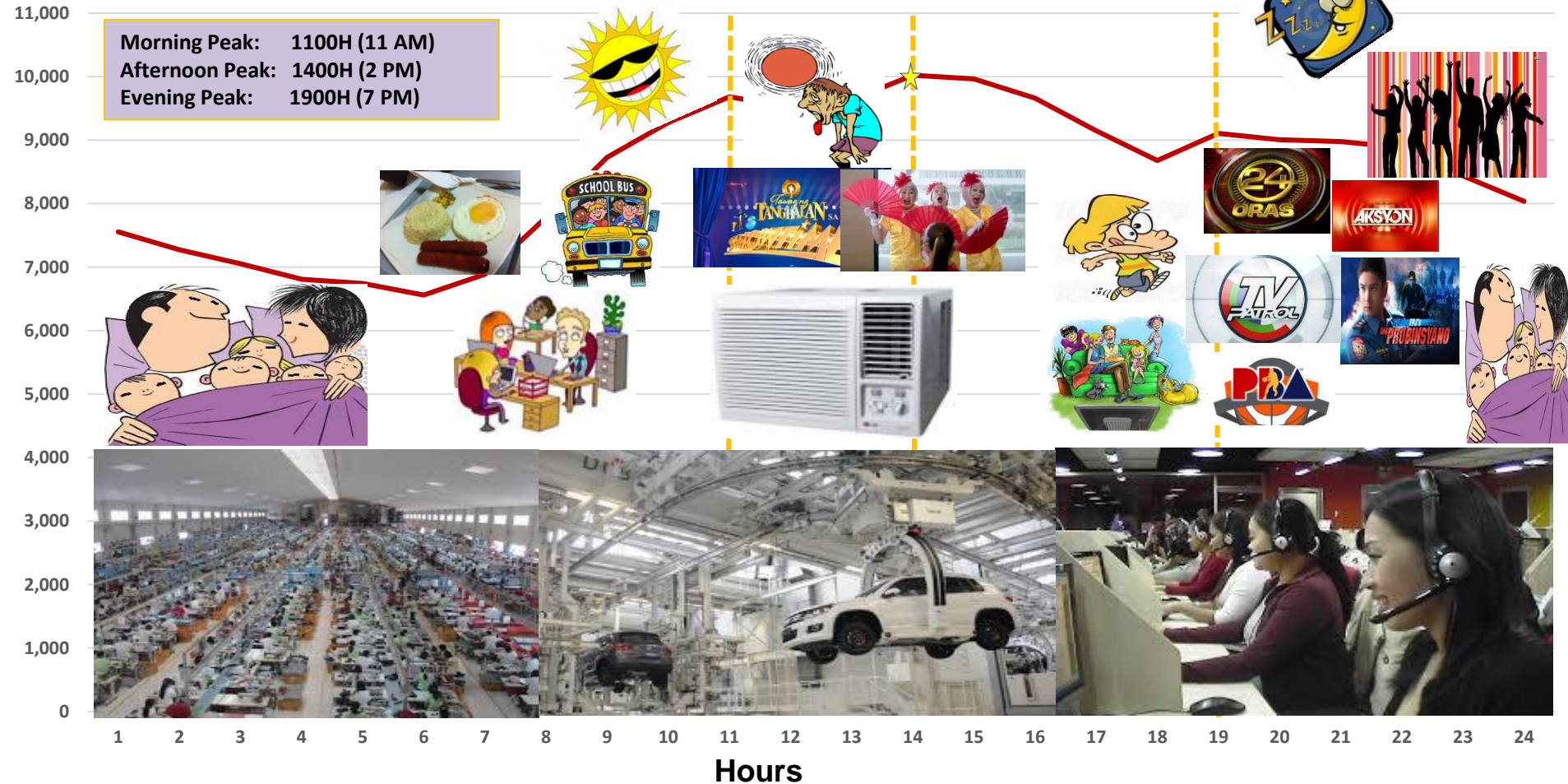


Typical 24-hour Load Profile

LOAD PROFILE

- a graph of the variation in the electrical load versus time
- varies according to customer type (typical examples include residential, commercial and industrial), temperature and holiday seasons

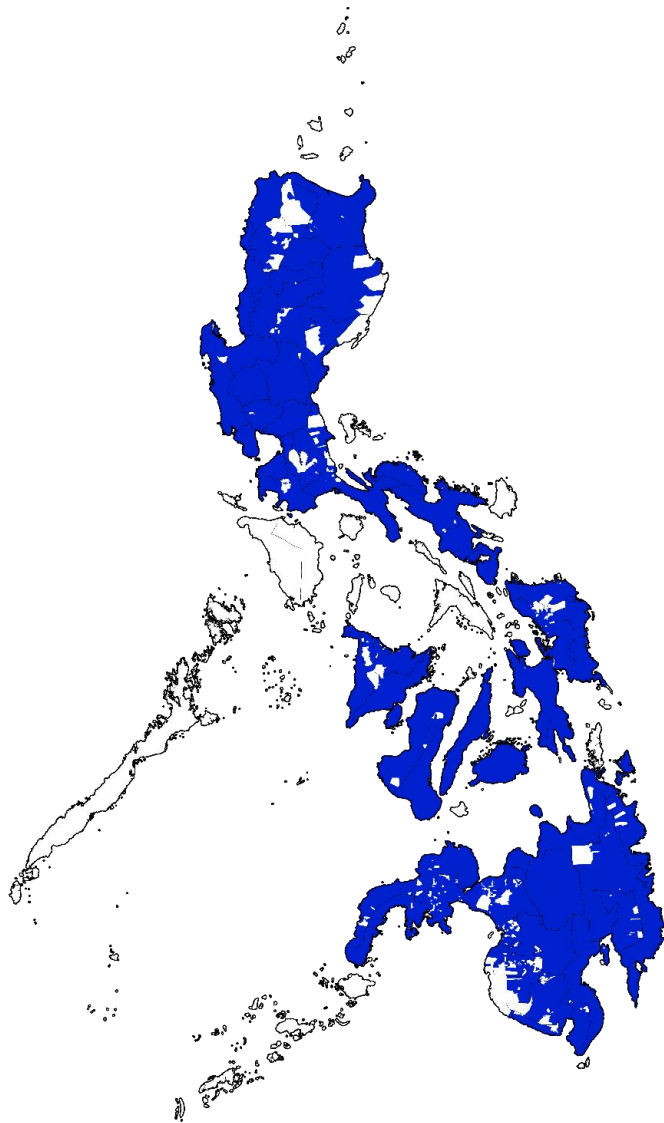
MW



Philippine Power System



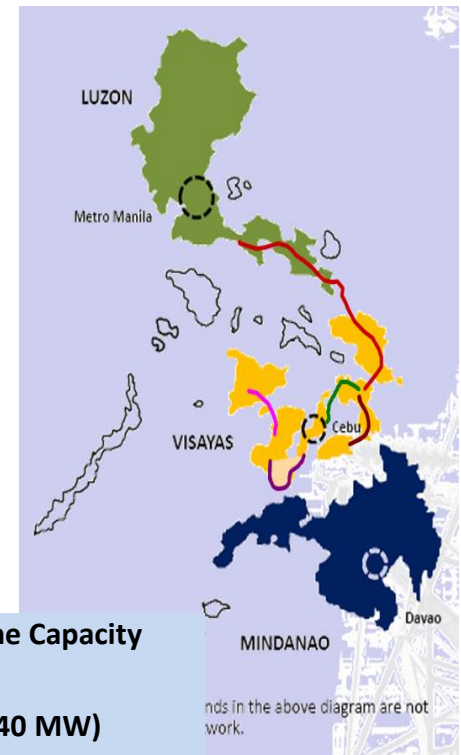
Philippine Power System



Power System

Grid

- **Luzon, Visayas** and **Mindanao** grids
- Connected to main transmission backbone

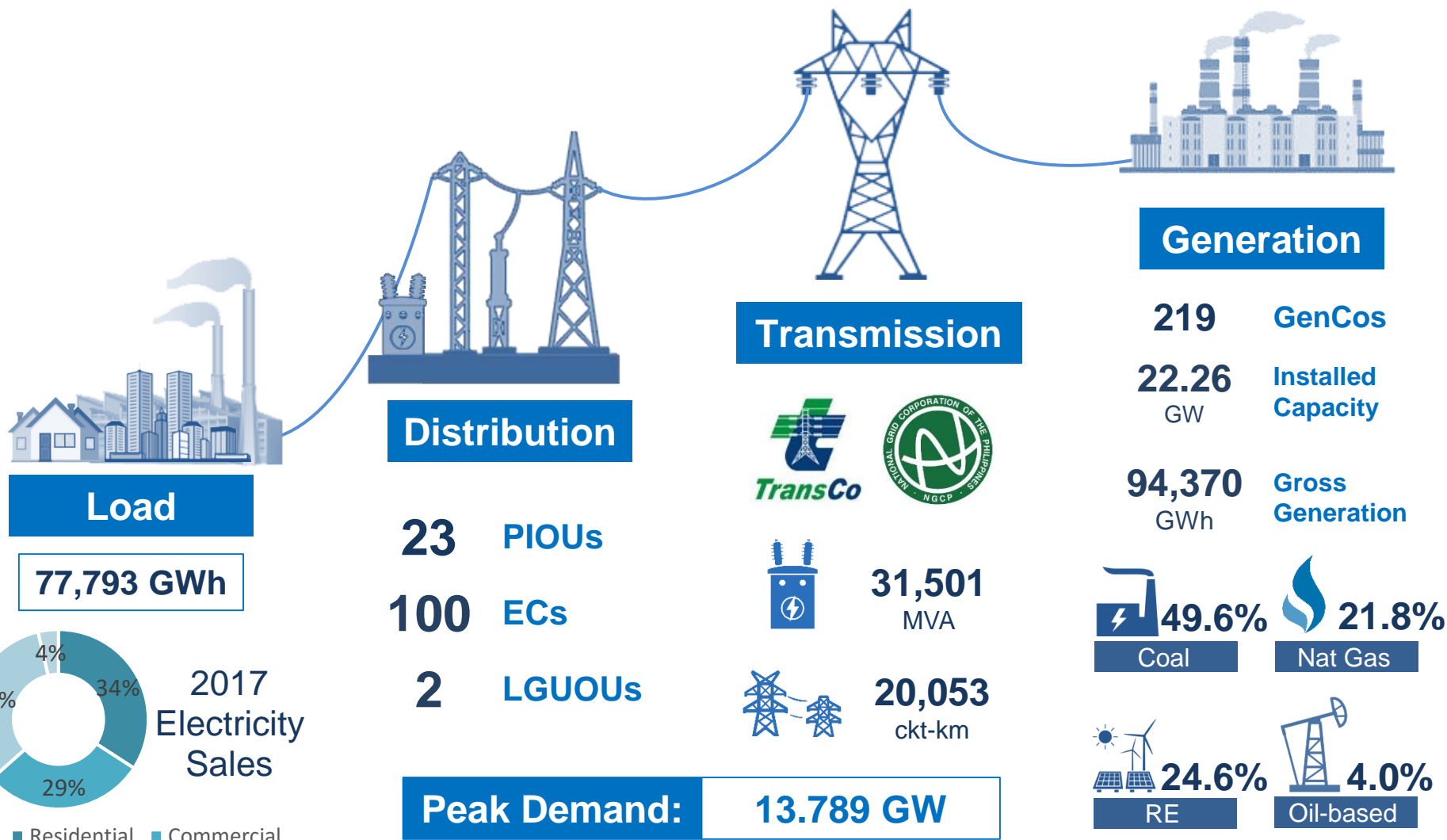


Interconnection Line Capacity (2014-2015 TDP)

- Leyte-Luzon (440 MW)
- Leyte-Cebu (370 MW)
- Cebu-Negros (180 MW)
- Negros – Panay (85 MW)
- Leyte-Bohol (90 MW)

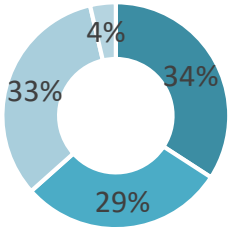


Grid Power System



Load

77,793 GWh



2017 Electricity Sales

- Residential
- Commercial
- Industrial
- Others

Distribution

- 23 PIOUTs
- 100 ECs
- 2 LGUOUTs

- PIOUTs** - Private-Investor Owned Utilities
- ECs** - Electric Cooperatives
- LGUOUTs** - LGU-Owned Utilities

Transmission



- 31,501 MVA
- 20,053 ckt-km

Peak Demand: 13.789 GW

Generation

- 219 GenCos
- 22.26 GW Installed Capacity
- 94,370 GWh Gross Generation
- 49.6% Coal
- 21.8% Nat Gas
- 24.6% RE
- 4.0% Oil-based

Sources of Data: DOE; NGCP

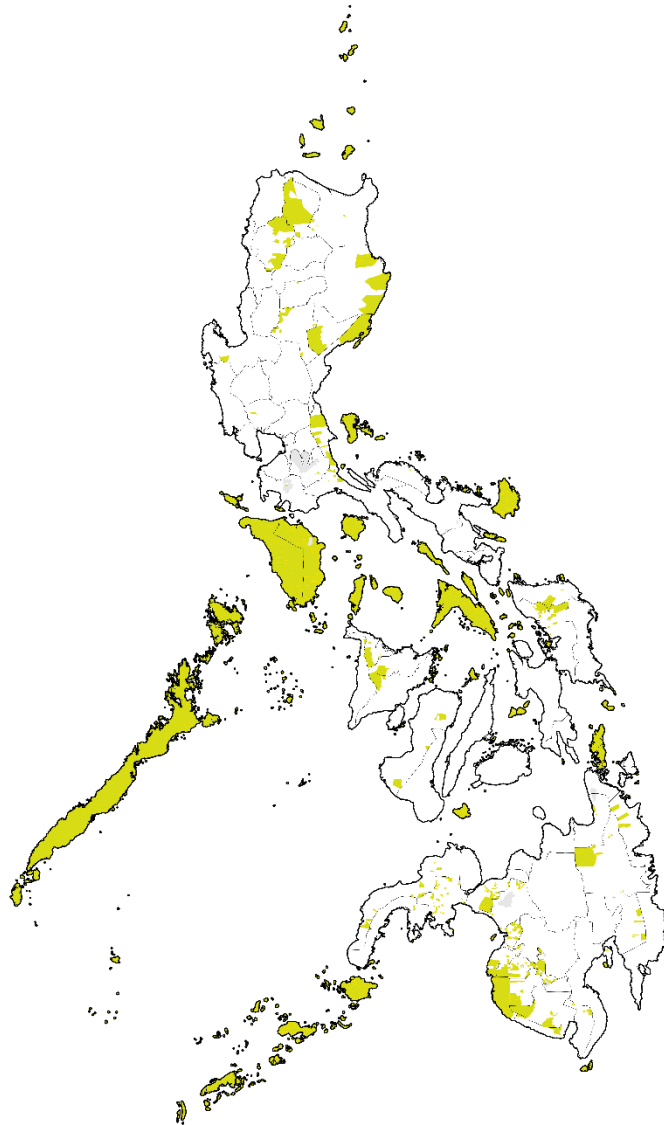
* DU data as of December 2017

** Based on 2014-2015 TDP

***Gross Generation data as of December 2017



Philippine Power System



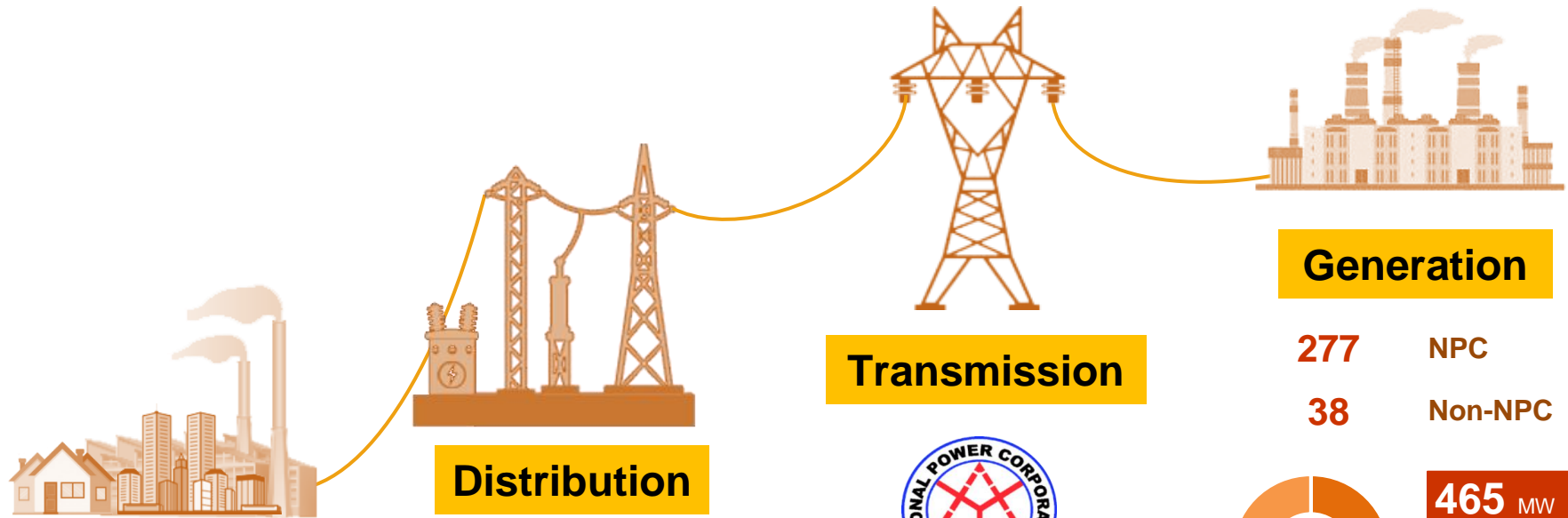
Power System

Off-Grid

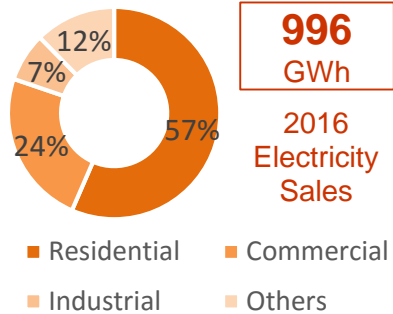
- Missionary areas
- Also known as Small Islands and Isolated Grid (SIIG)
- Power supplied by NPC SPUG and Private Sector (New Private Provider and Qualified Third Party)



Off-Grid (SPUG) Power System



Load



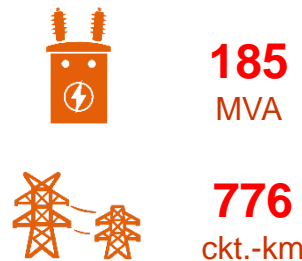
76.6%*
Energized

Distribution

- 21** ECs
- 1** MPC
- 3** LGUOUS
- 2** QTPs

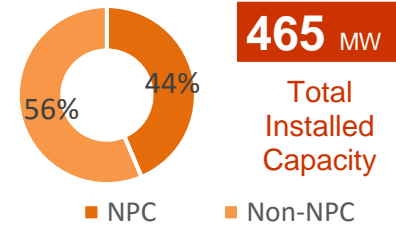
ECs - Electric Cooperatives
 MPCs - Multi-Purpose Cooperatives
 LGUOUS - LGU-Owned Utilities
 QTP - Qualified Third Parties

Transmission

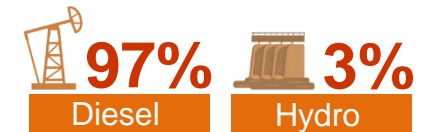


Generation

- 277** NPC
- 38** Non-NPC



1,315 GWh Gross Generation



Source of Data: DOE; NPC; NEA

*As of January 2018; excluding ARMM ECs

**Gross Generation data as of December 2017

***Transmission data as of April 2018



The DOE under the Restructured Power Industry



The DOE and the Restructured Power Industry

RA 7638
“Department
of Energy Act
of 1992”

09 December 1992

Prepare, integrate, coordinate, supervise and control all plans, programs, projects and activities of the government relative to energy exploration, development, utilization, distribution and conservation

RA 9136
“Electric Power
Industry Reform
Act”

08 June 2001

Supervise the restructuring of the electricity industry.

RA 9513
“Renewable
Energy Act”

28 July 2008

Develop and implement plans, programs and policies to accelerate the development and utilization of renewable energy.



The DOE and the Restructured Power Industry

DOE Vision

A globally-competitive DOE powering up Filipino communities through clean, efficient, robust and sustainable energy systems that will create wealth, propel industries and transform the lives of men and women and the generations to come.

DOE Mission

In partnership with our stakeholders, shall improve the quality of life of the Filipino by formulating and implementing policies and programs to ensure sustainable, stable, secure, sufficient, accessible and reasonably-priced energy. In pursuit of this mission, we commit to render efficient service with utmost integrity and professionalism.

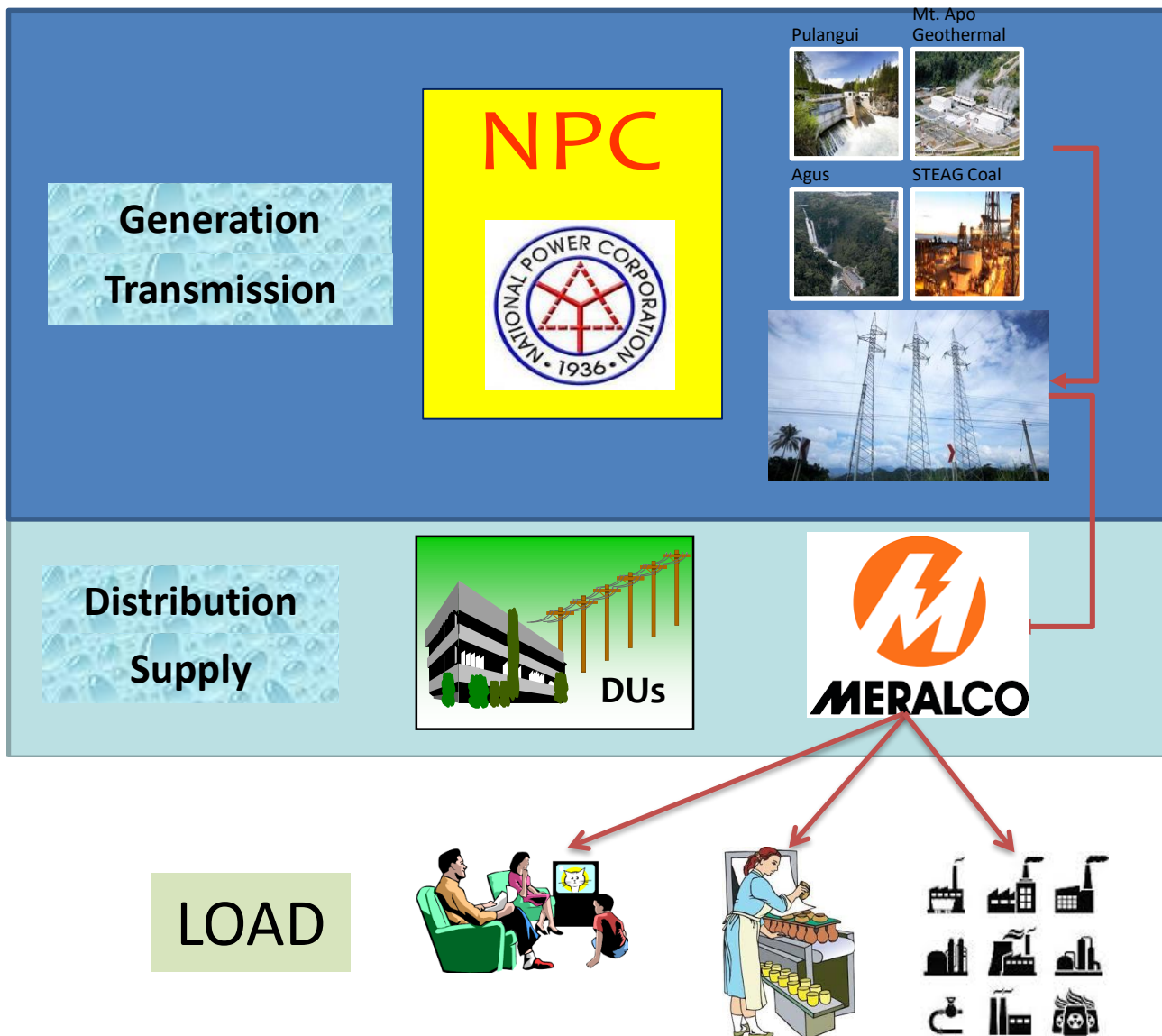


The DOE and the EPIRA

- Ensure the reliability, quality and security of supply of electric power.
- Encourage private sector investments in the electricity sector and promote development of indigenous and renewable energy sources.
- Facilitate and encourage reforms in the structure and operations of distribution utilities for greater efficiency and lower costs.
- Jointly with the electric power industry participants, establish the wholesale electricity spot market and formulate the detailed rules governing the operations thereof.
- Develop policies and procedures and, as appropriate, promote a system of energy development incentives to enable and encourage electric power industry participants to provide adequate capacity to meet demand including, among others, reserve requirements.



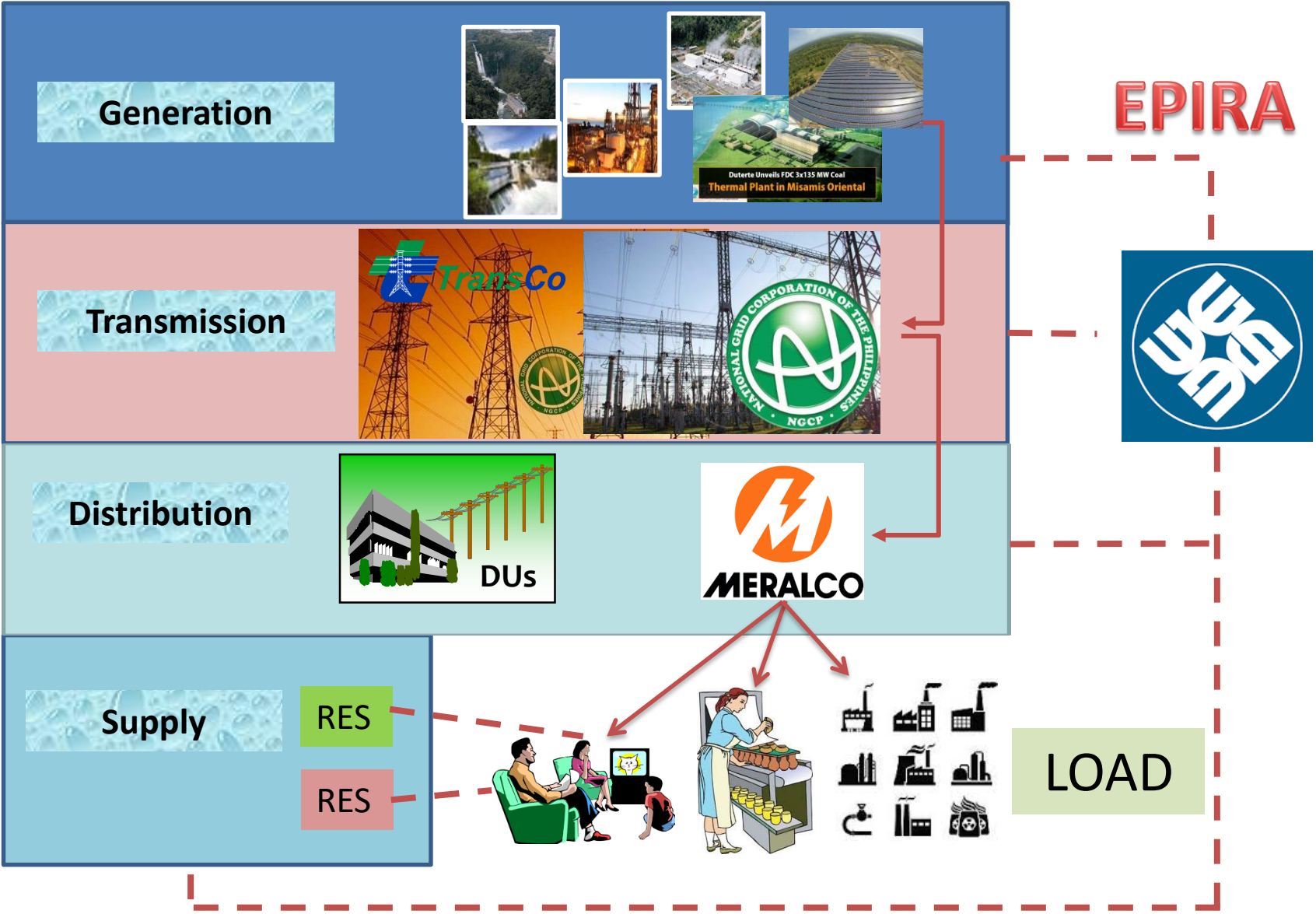
Overview of Power Sector Restructuring



Pre-EPIRA



Overview of Power Sector Restructuring



The Restructured Power Sector

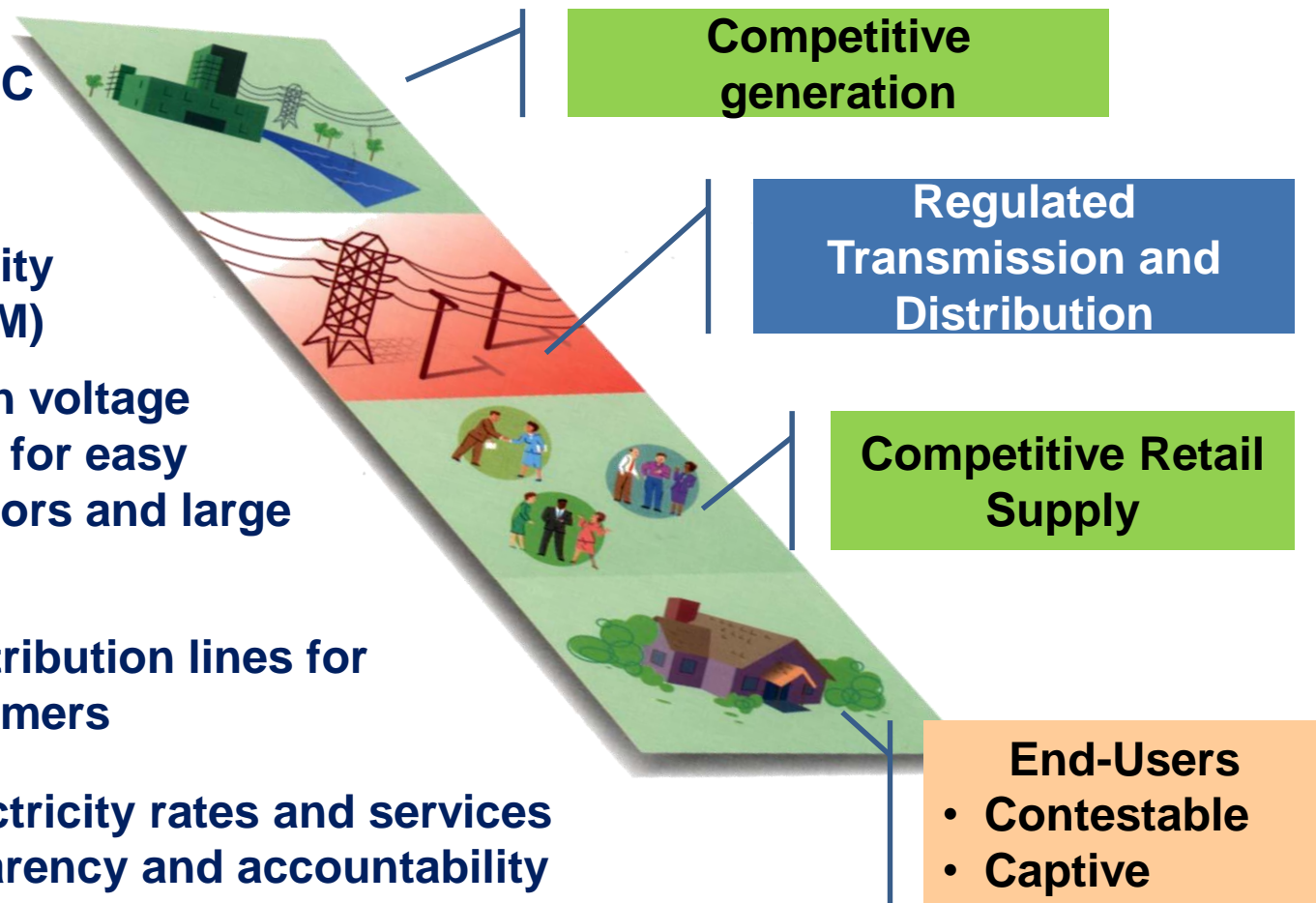
- Privatization of NPC Generating Assets

- Establishment of Wholesale Electricity Spot Market (WESM)

- Opening up of high voltage transmission lines for easy access of distributors and large consumers

- Opening up of distribution lines for contestable consumers

- Unbundling of electricity rates and services for greater transparency and accountability



Overview of Power Sector Restructuring

Commercial operation of RCOA in 26 June 2013 for 1MW and above

Establishment of WESM in Luzon and Visayas (June 2006, Dec. 2010)

Creation of PSALM to manage privatization and NPC assets and liabilities

Unbundling of NPC rates (26 Mar. 2002), and DUs rates (June 2003)

EPIRA created the ERC, an independent quasi-judicial body

Passage of EPIRA in June 2001



EPIRA



Competition in retail supply

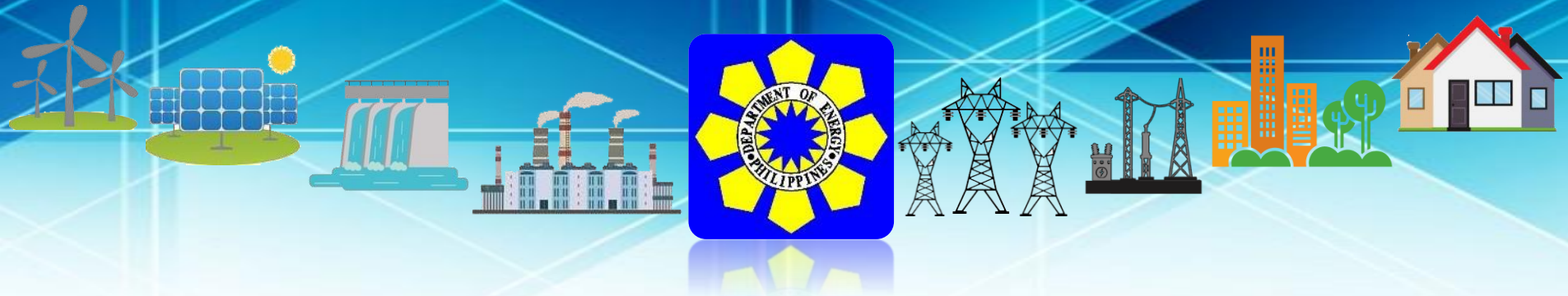
Competition in generation

Privatization/
widening the asset base

Transparency in functions and rates

Independent regulation





Thank You!



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