Republic Of Indonesia

COORDINATING MINISTRY FOR ECONOMIC AFFARS

SMART GRID DEVELOPMENT POLICY IN INDONESIA




Hanoi, 2 April 2013

What is a Smart Grid?

The smart grid will be characterized by

- A two-way flow of electricity and information to create an automated, widely distributed energy delivery network.
- It incorporates into the grid the benefits of distributed computing and communications
  - to deliver real-time information and
  - enable the near-instantaneous balance of supply and demand at the device level.

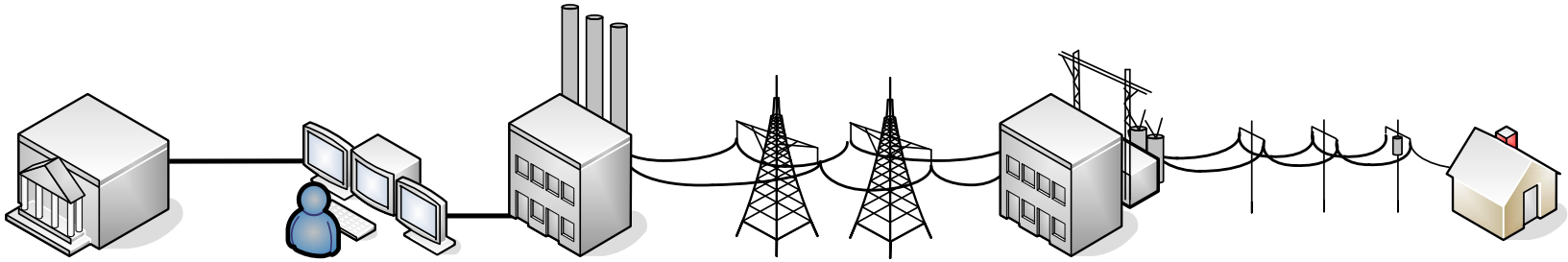
What is a Smart Grid?

Distinguishing characteristics of the Smart Grid cited in US-EISA (US Energy Independence and Security Act, 2007) include:

- Increased use of **digital information and controls** technology to improve reliability, security, and efficiency of the electric grid;
- **Dynamic optimization** of grid operations and resources, with full cyber security;
- Deployment and integration of **distributed resources** and generation, including renewable resources;
- Development and incorporation of **demand response, demand-side resources, and energy-efficiency resources**;
- Deployment of **‘‘smart’’ technologies for metering**, communications concerning grid operations and status, and distribution automation;
- Integration of ‘‘**smart’’ appliances** and consumer devices;
- Deployment and integration of **advanced electricity storage** and peak-shaving technologies, including plug-in electric and hybrid electric vehicles, and thermal-storage air conditioning;
- Provision to **consumers of timely information** and control options;

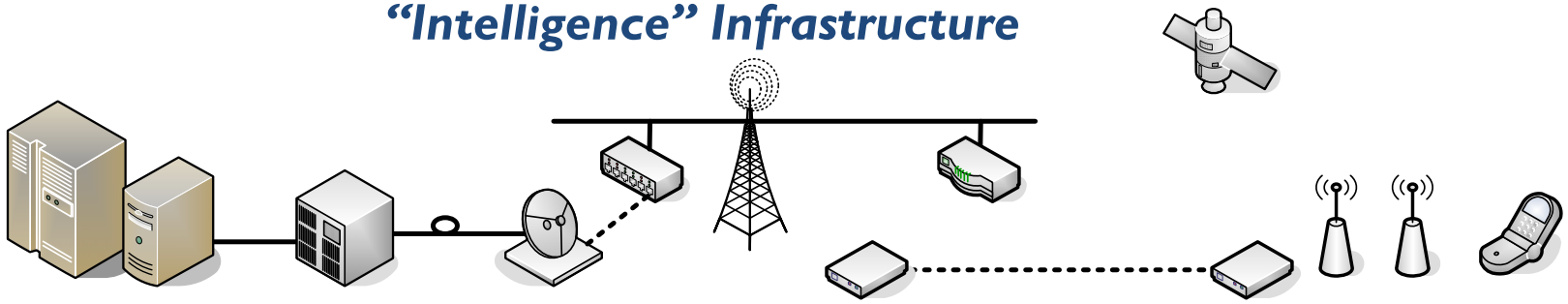
Source: US-NIST Framework and Roadmap for Smart Grid interoperability Standards, Release 2.0

What does the concept of Smart-Grid look like?



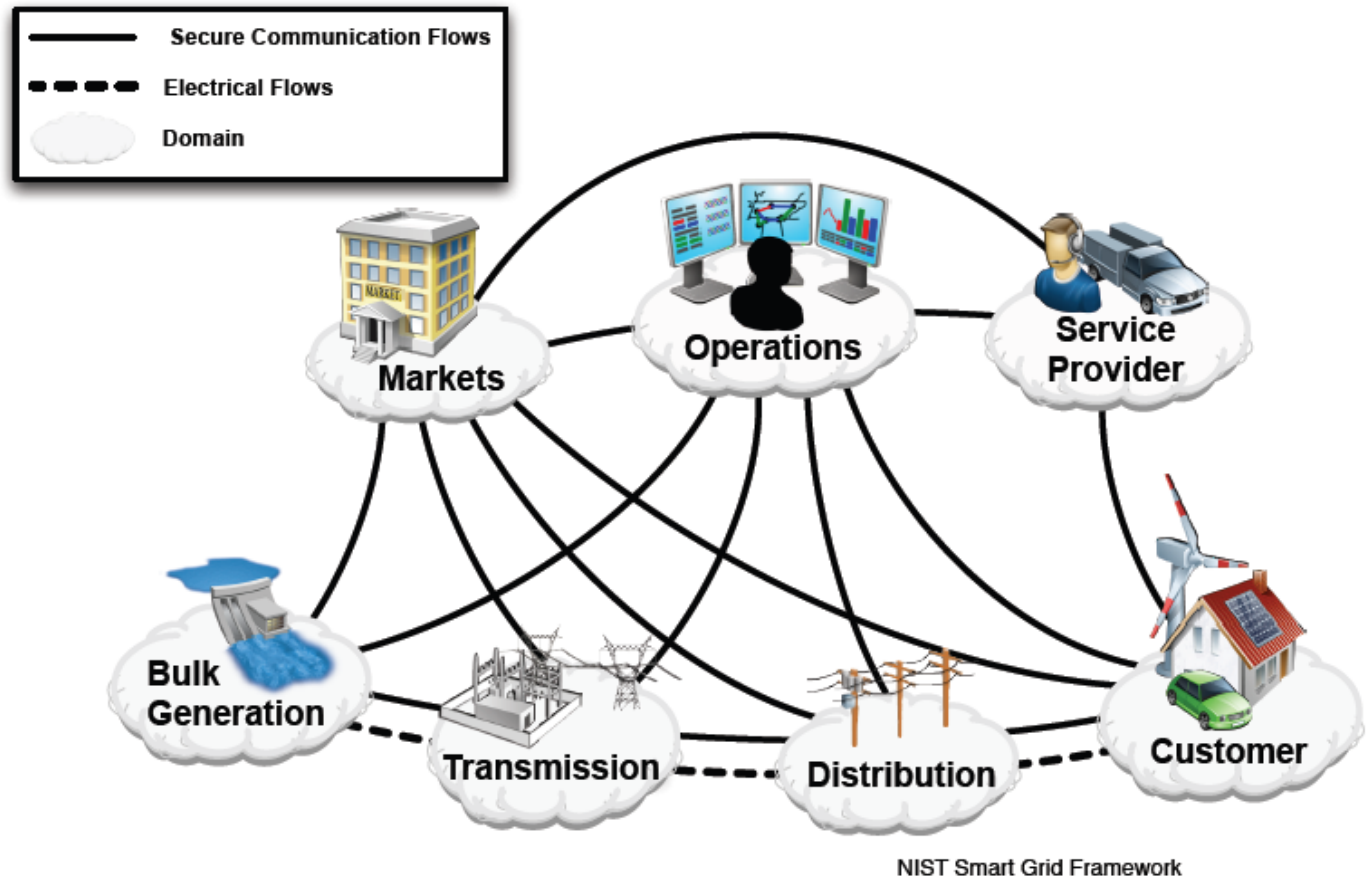
Electrical Infrastructure

"Intelligence" Infrastructure



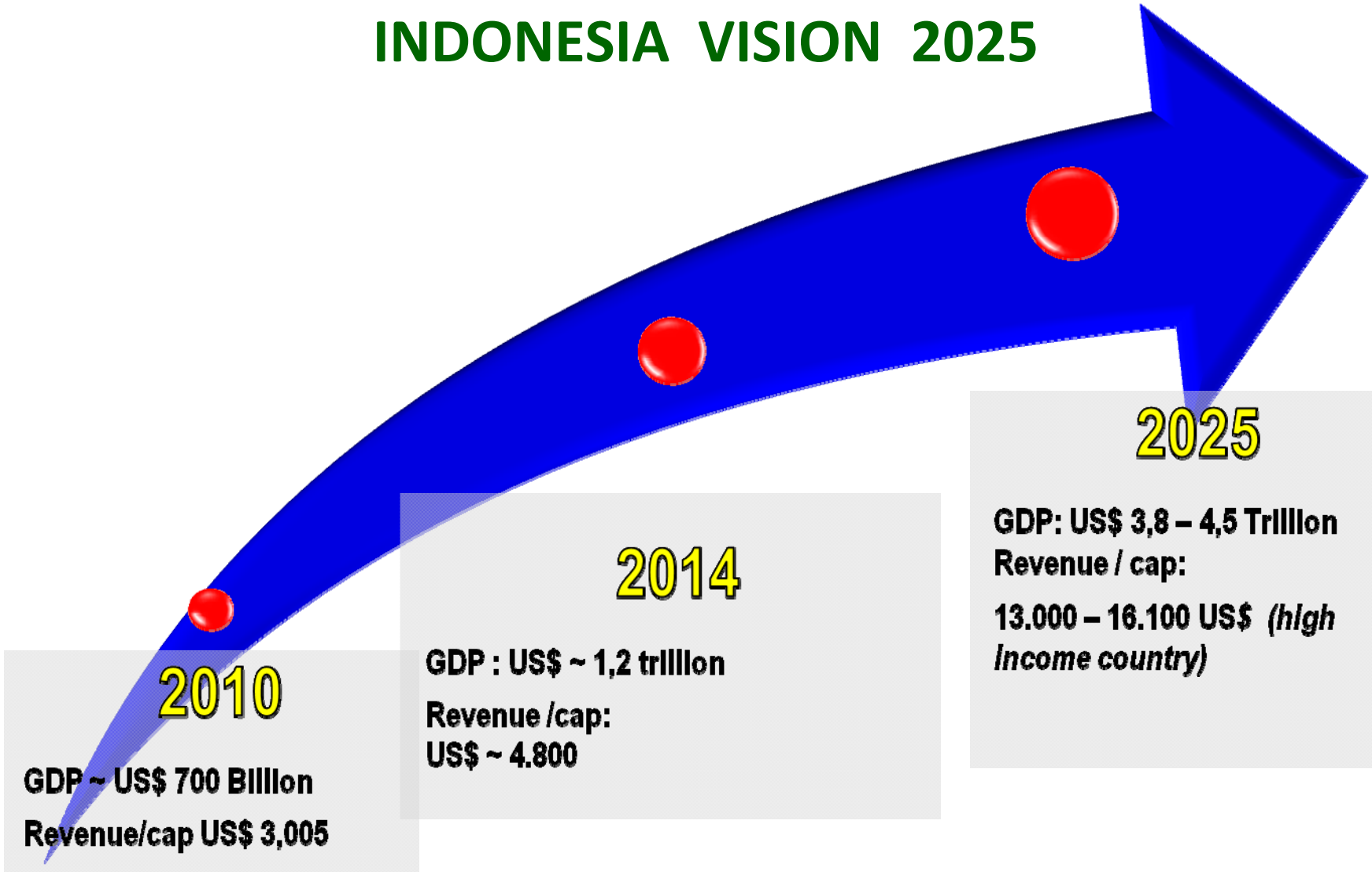
Source: Rochester Institute of Technology

Interactions of Smartgrid Actors



Source: US-NIST Framework and Roadmap for Smart Grid interoperability Standards, Release 2.0

INDONESIA VISION 2025



2010

GDP ~ US$ 700 Billlon

Revenue/cap US$ 3,005

17th largest of the world

2014

GDP : US$ ~ 1,2 trillion

Revenue /cap:
US$ ~ 4.800

2025

GDP: US$ 3,8 – 4,5 Trillion

Revenue / cap:

13.000 – 16.100 US$ *(high Income country)*

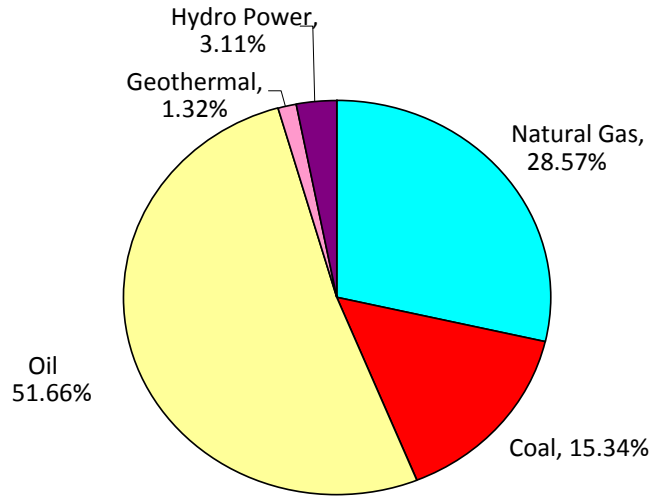
NATIONAL ENERGY POLICY

(PRESIDENTIAL DECREE NO. 5 YEAR 2006)

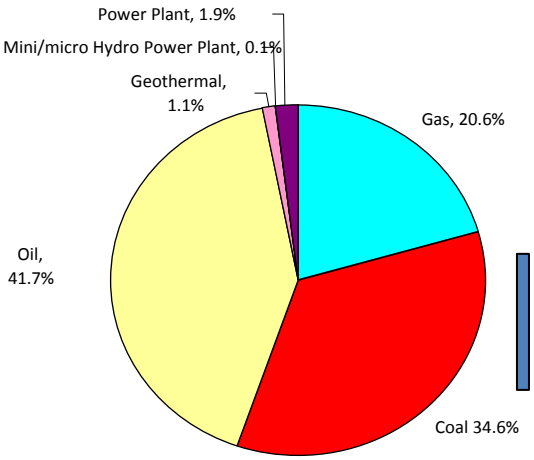
Target in 2025

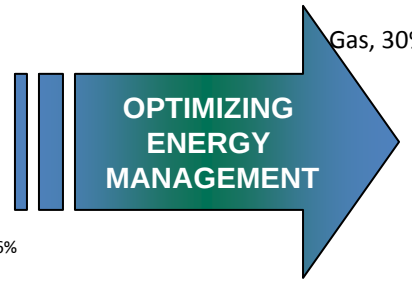
1. Less than 1 for energy elasticity
2. Optimized primary energy mix

CURRENT ENERGI MIX (1 million BOE) National (Primary) Energy Mix

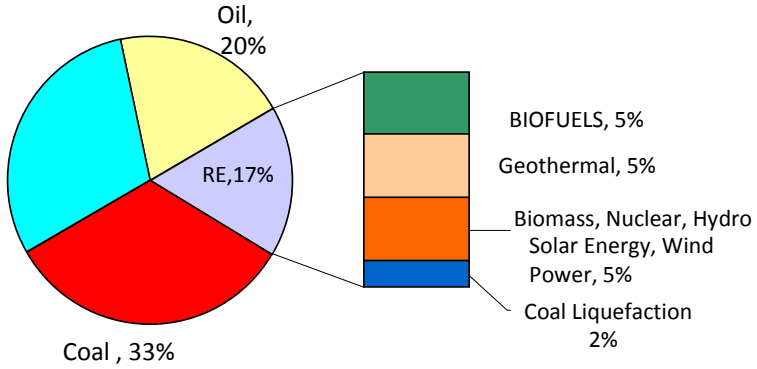


National (Primary) Energy Mix of 2025 (BaU Scenario) (5 million BOE)





National Energy Mix 2025 (3 million BOE) (Presidential Decree No. 5/2006)



DEPUTIES DUTIES AND FUNCTIONS OF ENERGY AND MINERAL RESOURCES
COORDINATING MINISTRY FOR ECONOMIC AFFAIRS

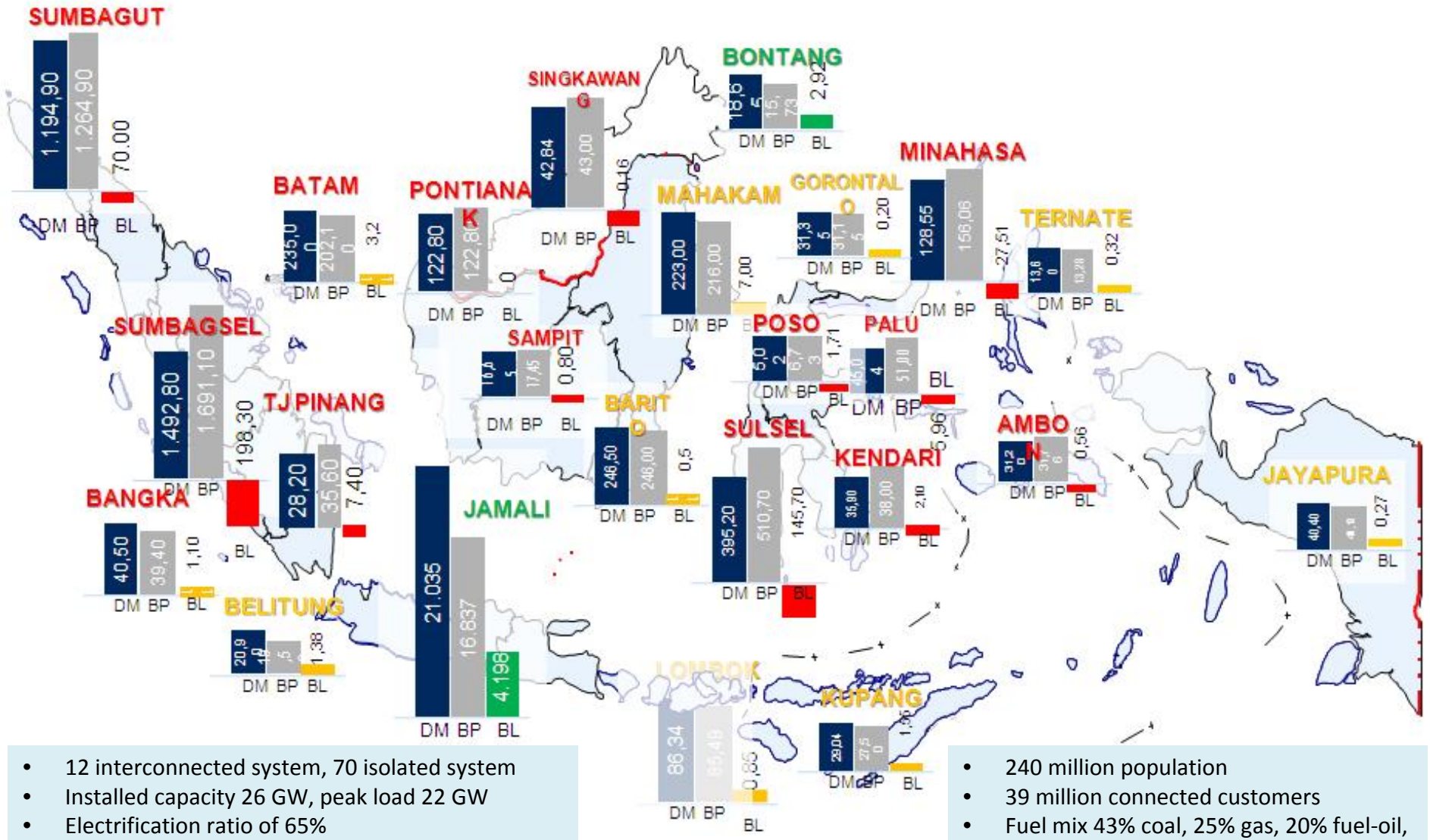
- **MAIN TASK**
  - Prepare coordination and preparation of Policy Planning and synchronize the implementation of policies, monitoring, analysis, and evaluation of policy implementation in energy, and mineral resources.

- **FUNCTION**
  - Preparation of planning and coordination of energy policies and mineral resources.
  - Sync implementation of energy policies and mineral resources.
  - Monitoring, analysis, evaluation and reporting of problems or policy implementation activities in the field of energy, and mineral resources.

MAIN TASK COORDINATING MINISTRY FOR ECONOMIC AFFAIRS

. VISION	:	Realization agency coordination and synchronization of effective economic development.
. MISION	:	Improve coordination of planning and policy making, as well as synchronize the implementation of policies in the field of economy.
. GOAL	:	Realize the synchronization of policies for the economy and improve the effectiveness of coordination in achieving sustainable economic growth.

Indonesia Electricity Sytem

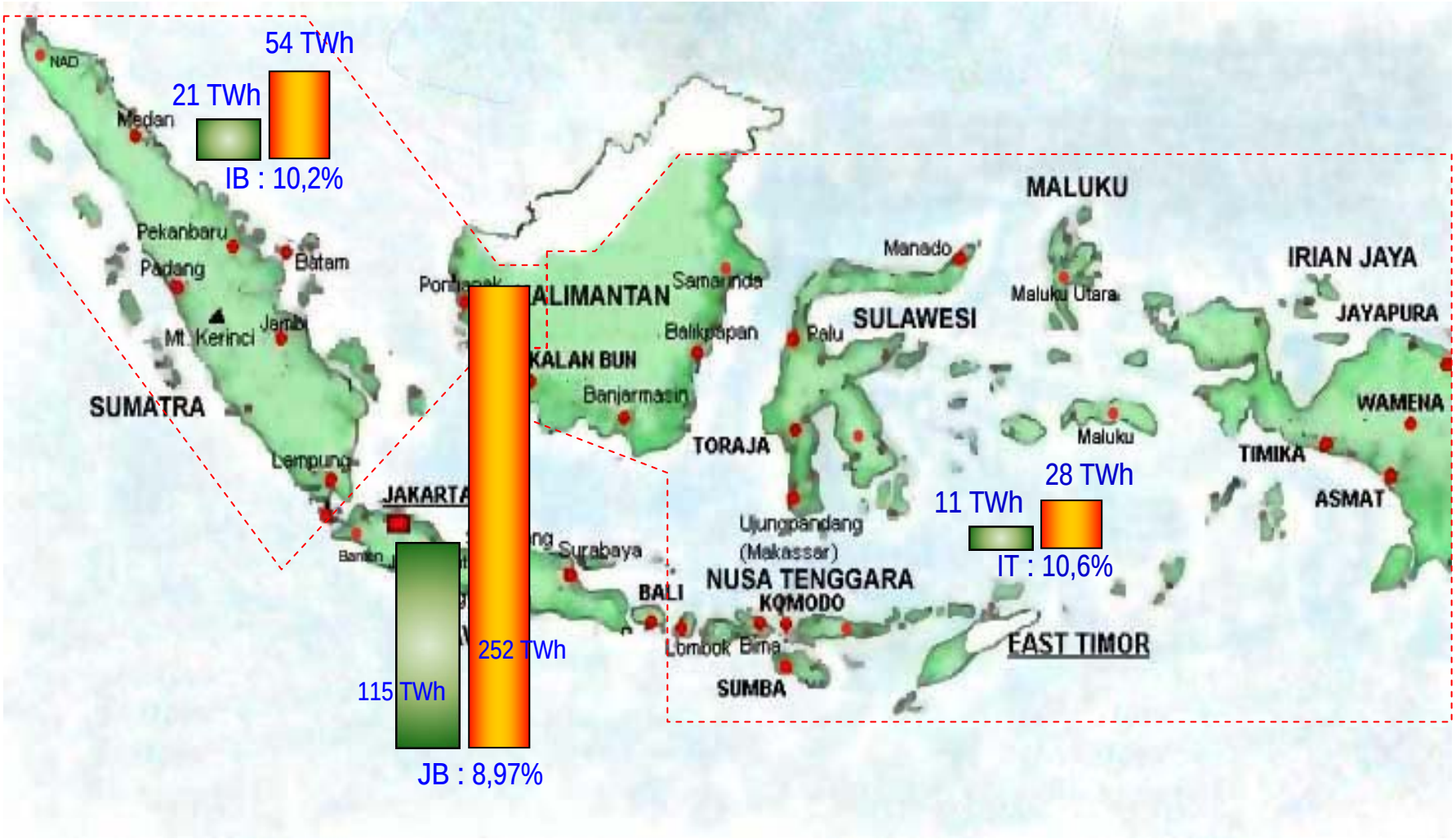


- 12 interconnected system, 70 isolated system
- Installed capacity 26 GW, peak load 22 GW
- Electrification ratio of 65%
- Demand growth rate of 9.17%

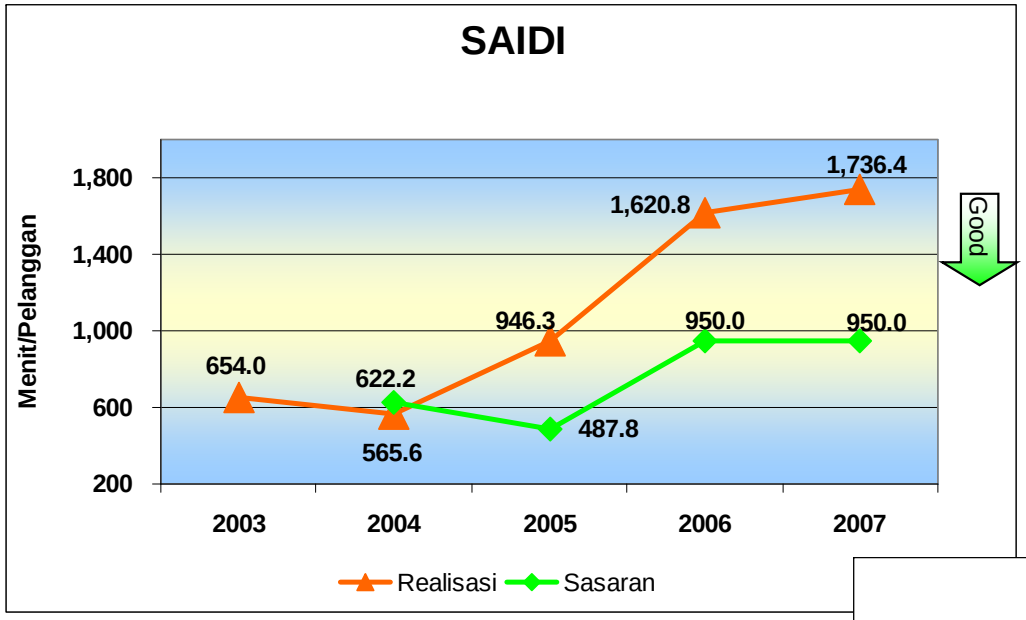
- 240 million population
- 39 million connected customers
- Fuel mix 43% coal, 25% gas, 20% fuel-oil, 6% hydro, 6% geothermal

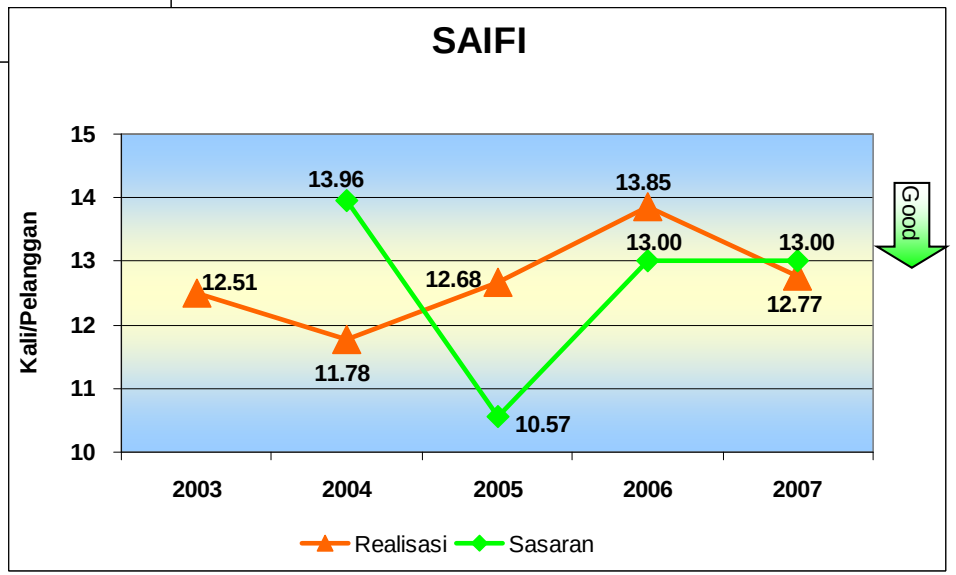
Projection on Consumption: 2010-2019

Average Growth: 9,2 % per annum



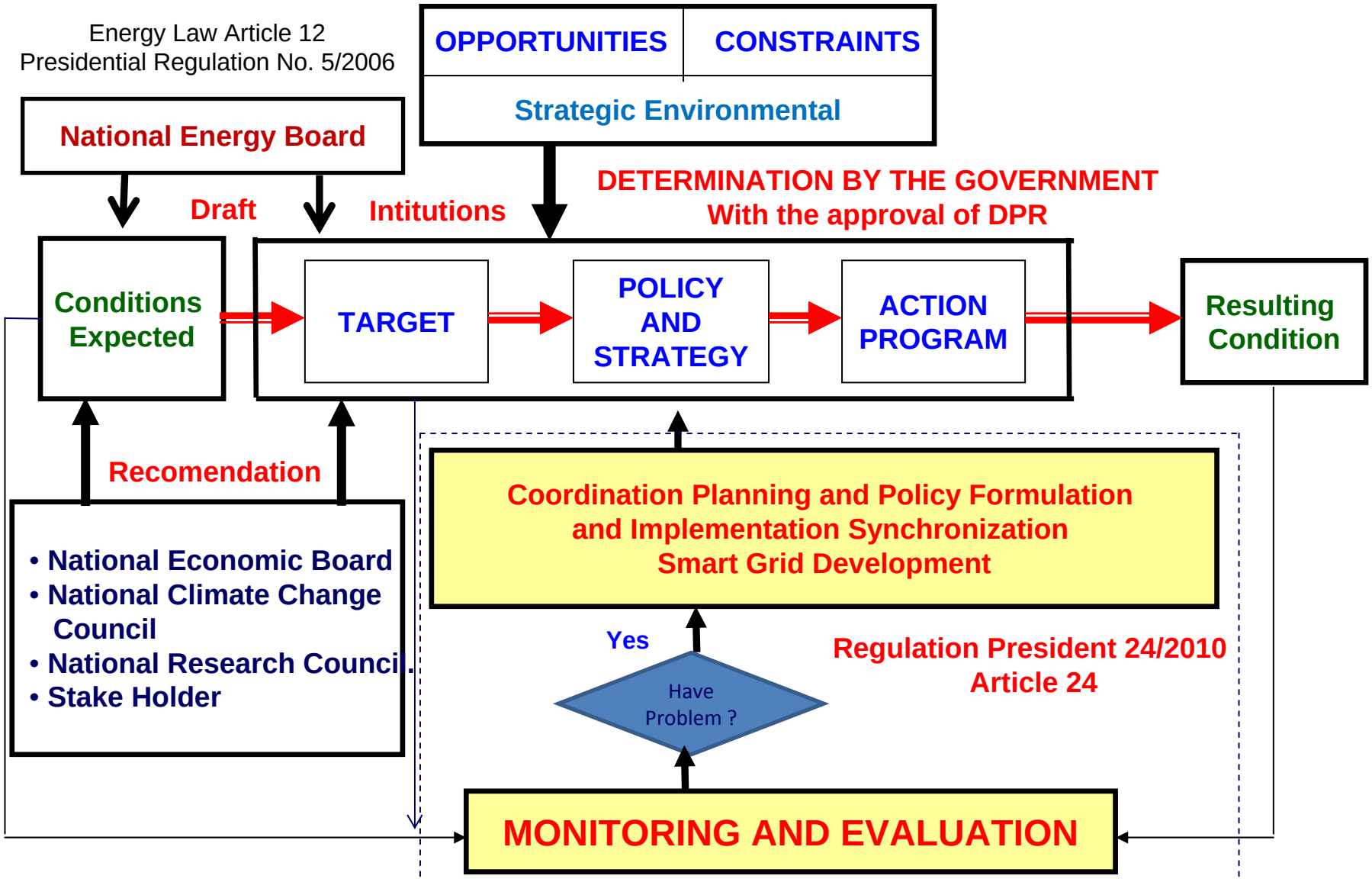
Power System Reliability
Trends on SAIDI & SAIFI



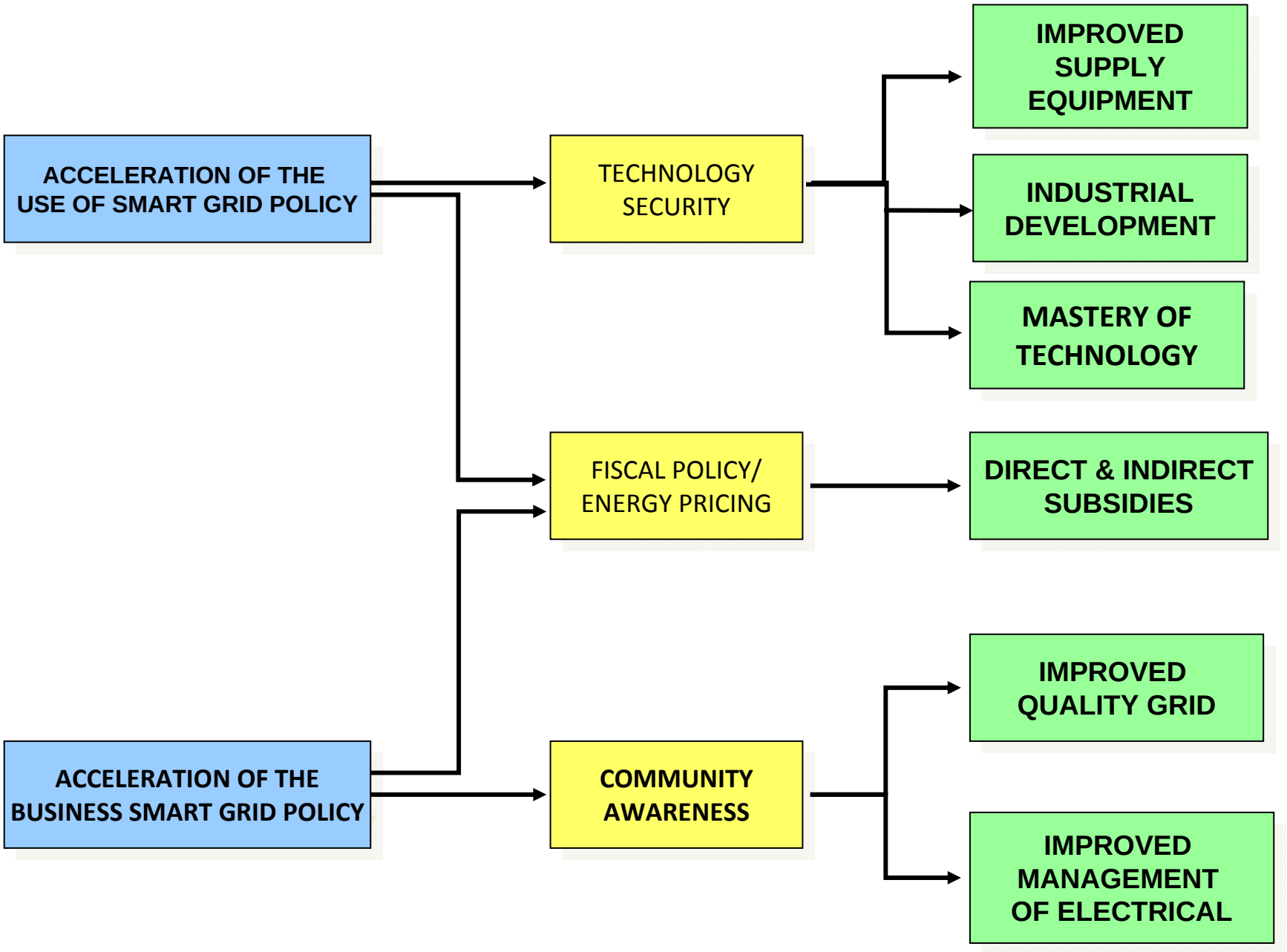


SAIDI: System Average Interruptions Duration Index
SAIFI: System Average Interruptions Frequency Index

ROLE OF THE COORDINATING MINISTRY FOR ECONOMIC DEVELOPMENT POLICY IN SMART GRID



PROBLEMS MAP OF SMART GRID



SMART GRID - INDONESIAN VIEW

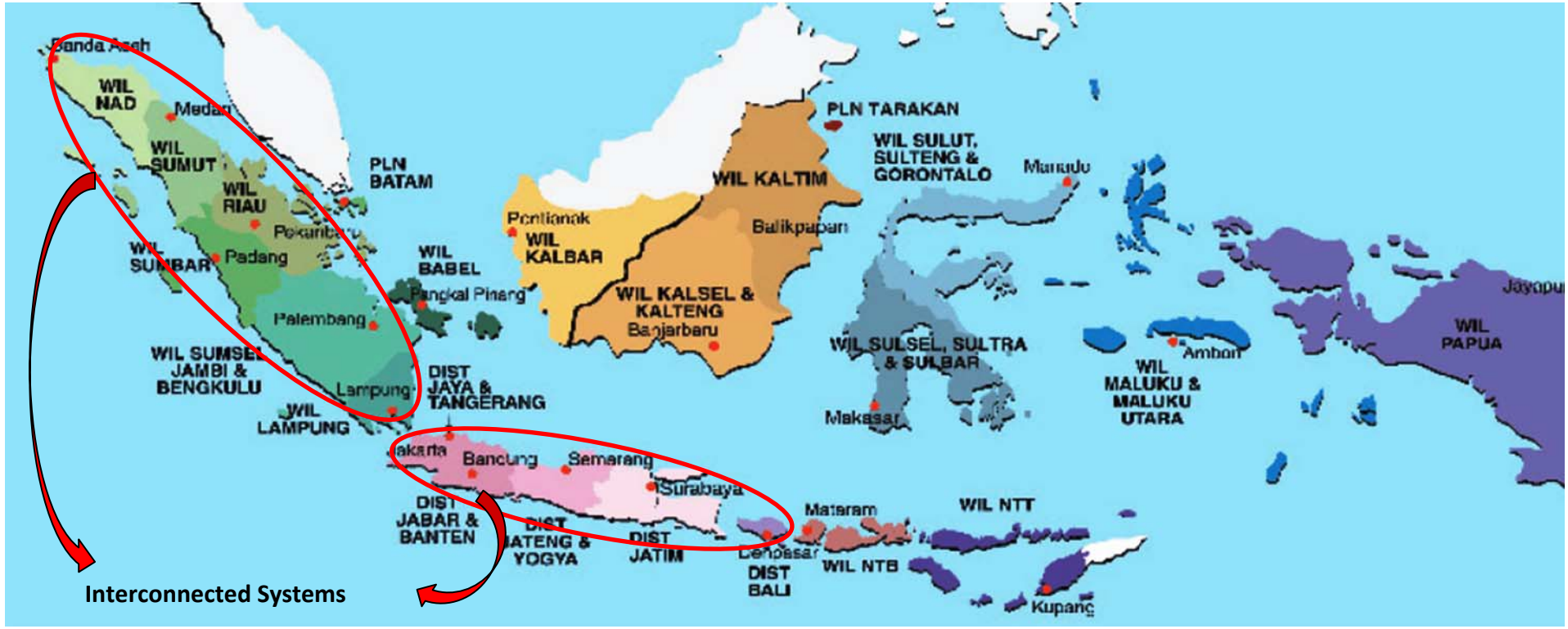
TODAY's GRID Vs. TOMORROW's

Today's Grid	Smart Grid
Consumers are uniformed and non-participative with power system	Informed, involved and active consumers; demand response and distributed energy resources
Dominated by central generation: many obstacles exist for distributed energy resources interconnection	Many distributed energy resources with plug-and-play convenience:focus on renewables
Limited wholesale markets, not well integrated: limited oppurtunities for consumers	Mature, well-integrated wholesale markets, growth of new electricity markets consumers
Focus on outages: slow response to power quality issues	Power quality is a priority with a variety of quality/price options: rapid resolution of issues
Little integrationof operational data with asset management: business process silos	Greatly expanded data acquisition of grid parameters: focus on prevention, minimizing impact to consumer.
Responds to prevent further damage: focus is on protecting assets following fault	Resillient to attack and natural disasters with rapid restoration capabilities.

Benefits of a Smart Grid

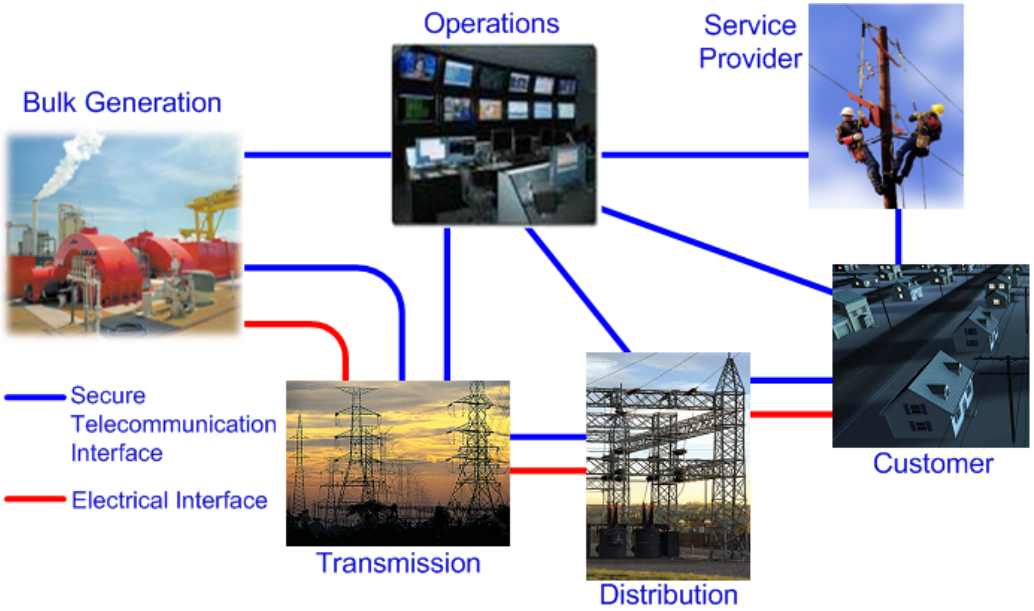
- **Higher Customer Satisfaction:** The combination of lower costs, improved reliability and better customer control will raise satisfaction among all types of customers (residential, commercial, industrial, institutional).
- **Improved Reliability:** Smart grid will reduce and shorten outages and improve the quality of power.
- **Shorter Outages:** The incorporation of advanced sensors and measurement (PMU), communication networks and smart systems will allow an unprecedented degree of system visibility and situational awareness of the electric power system. Smart grid will result in shorter outages through its “islanding” and “self-healing” features.
- **Customer Energy/Cost Savings:** As pricing becomes more transparent and is aligned with the underlying economics of generation and distribution, customers’ decisions to save money will benefit society as well.
- **Highest Security:** Security will be incorporated into the design of the smart grid and will require the implementation of practices and procedures by individual stakeholders. In this way, the physical and cyber security risks can be managed to the highest standards possible
- **Timely renewable:** Smart grid is the enabler of more renewable energy. Its development will allow for the timely incorporation of these sustainable sources of power in a user-friendly, cost-effective manner.

Indonesian Geographic of Electricity Service Areas



Smart Grid – Indonesian View

- **Smart interconnection grids**
  - Improved reliability
  - Energy savings
  - Robustness of operation and control (Self-Heals)
  - Etc.
- **Smart microgrids with distributed energy resources (DER) where applicable**
  - Distribution systems containing high DER penetration may require considerable operational control capabilities.



Smart Interconnection Systems

- Faster Protection & Control / Self-Heals
- More robust
- More renewable
- More efficient
- Higher Power Quality
- More MicroGrids
- Improved Capacity Factor
- More Reconfigurable
- Demand Response/Control
  - Smart meters for large loads at commercial and industrial facilities

Smart Microgrids and Renewable Energy Penetration – Remote, Isolated Areas

Paradigm Shift in Energy System

Increasing penetration of renewable energy, diversification in electricity generations, reduction in carbon emission, etc.

Future Chalenges

- Enhanced compatibility of electricity network with increased penetration of renewable energy
- Communications between the network and various types of generations
- Providing services for various consumers' electricity needs, mainly in remote and isolated areas

A key solution

Smart MicroGrid could efficiently control integration of renewable energy to the main grid.

CHALLENGES / ENABLERS

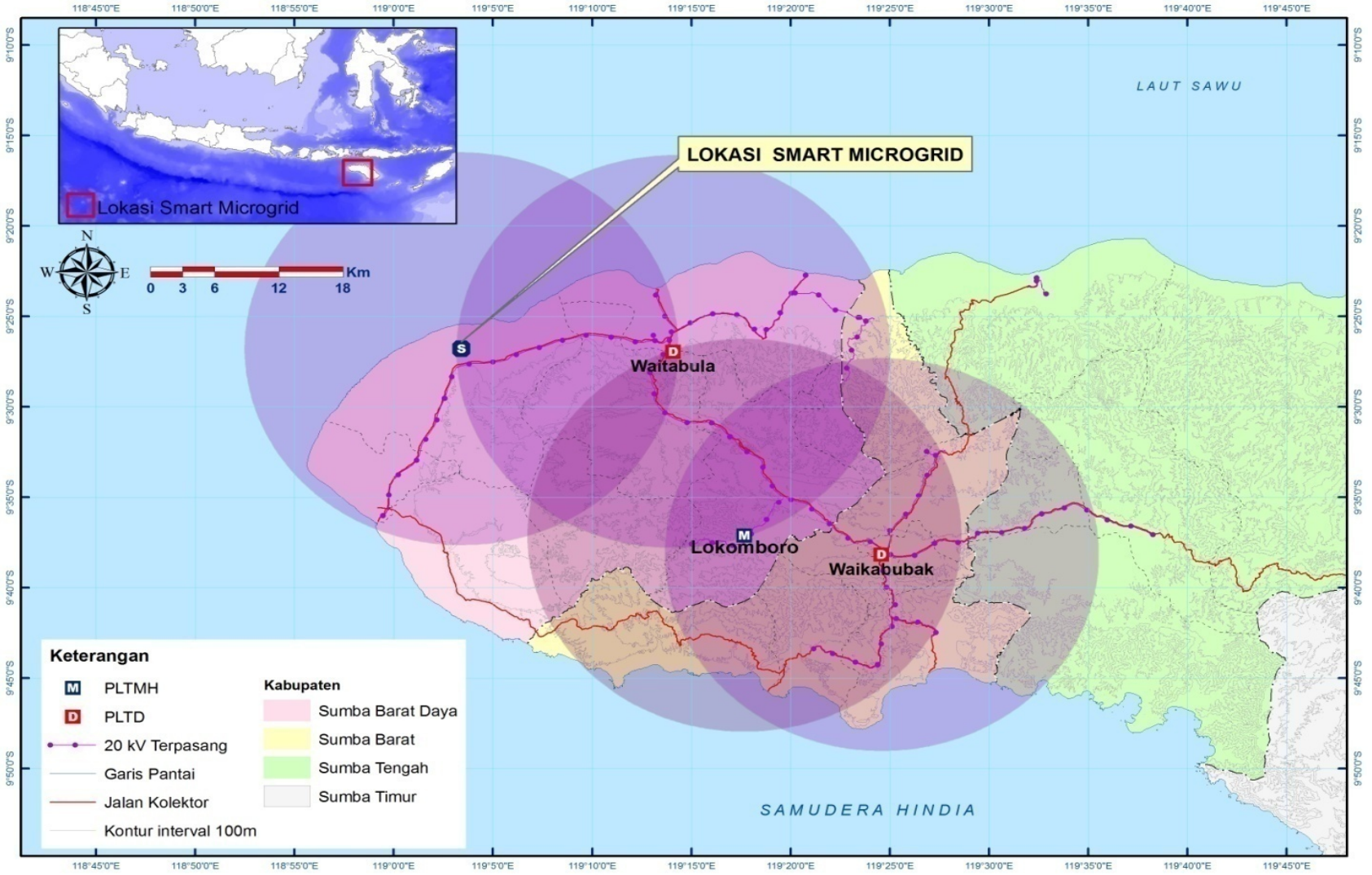
CHALLENGES	ENABLERS
Communication Infrastructures * Big Cities: Available but Expensive * Small Towns: Not all available	Development of communication infrastructure
Information Technology * Limited SCADA capabilities * Smart meters only for large consumers	SCADA Improvement Proliferation of smart meter
Non-competitive Electricity Market	Opening up electricity market
Regulated Government Pricing	Policies & Regulations: * Dynamic Pricing
Unsteady supply from Renewable Energies (Micro Hydro, Solar, etc.)	Incentives for Renewable Energy
Participation from consumers difficult	Incentives for Consumer Participations
Very few Smart Building applications	Energy efficiency awareness
Investments are expensive	Incentives for Investments

PILOT PROJECTS
AGENCY FOR ASSESMENT AND APLICATION TECHNOLOGY (BPPT-PLN)

Smart Microgrid on Sumba

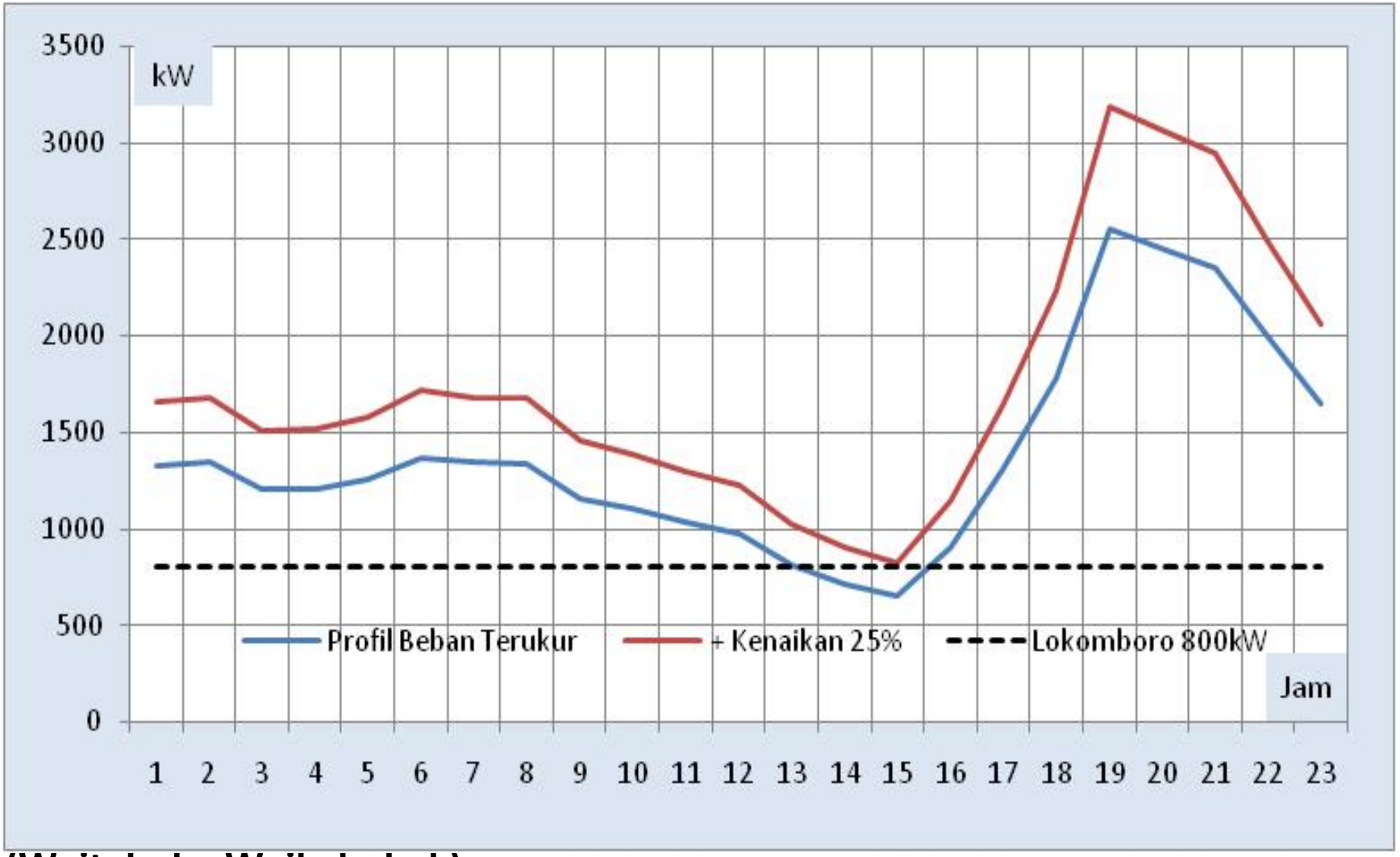
Source : BPPT, 2013

Main Powerplant Sites



Source : BPPT, 2013

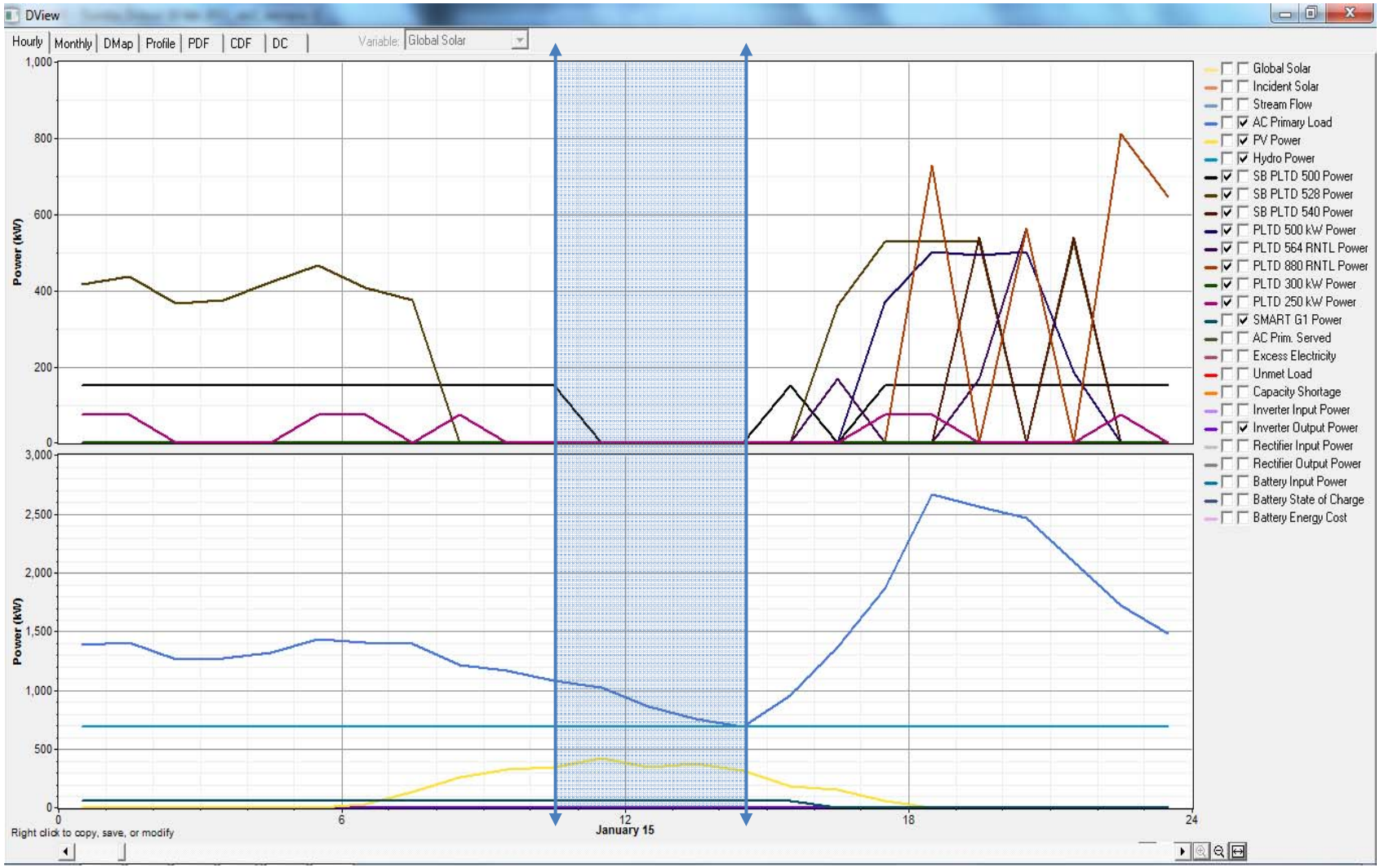
Sumba Barat Load Profile



(Waitabula+Waikabubak)

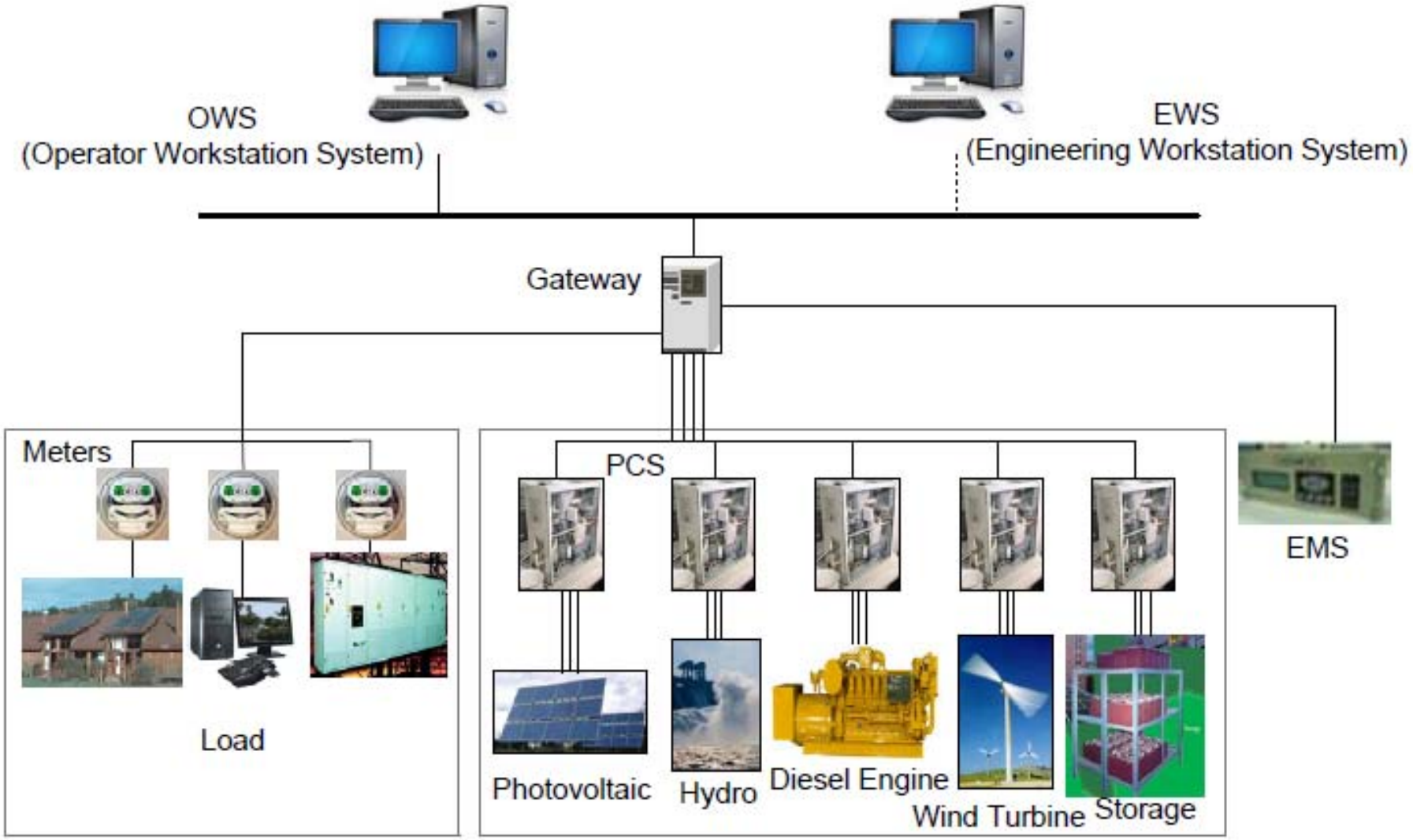
Source : BPPT, 2013

Simulasi Smart Grid



Source : BPPT, 2013

Pilot Plant – Sumba Smart Microgrid with a Large PV System



Example Scenario :
Energy Control for Smart Solar in Smart Micro-grid

Photovoltaic

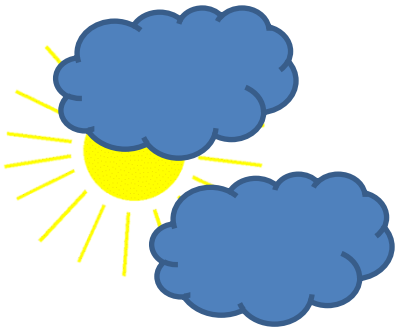
Batteries

Master Controller

Diesel Generator

Micro Hydro

Control System:



Max

Min

Master

Start..!!

Diesel

Hydro

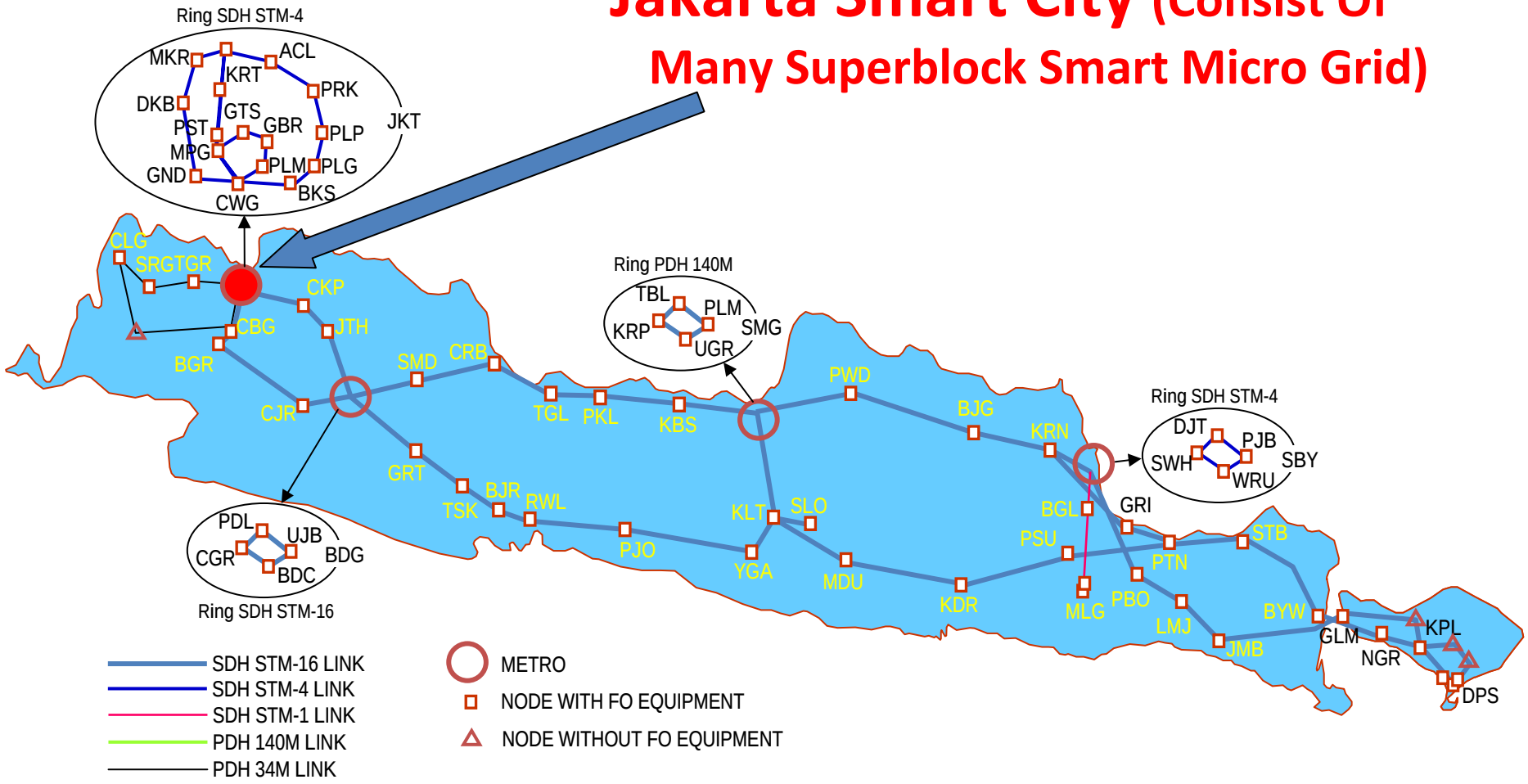
Photovoltaic

Battery

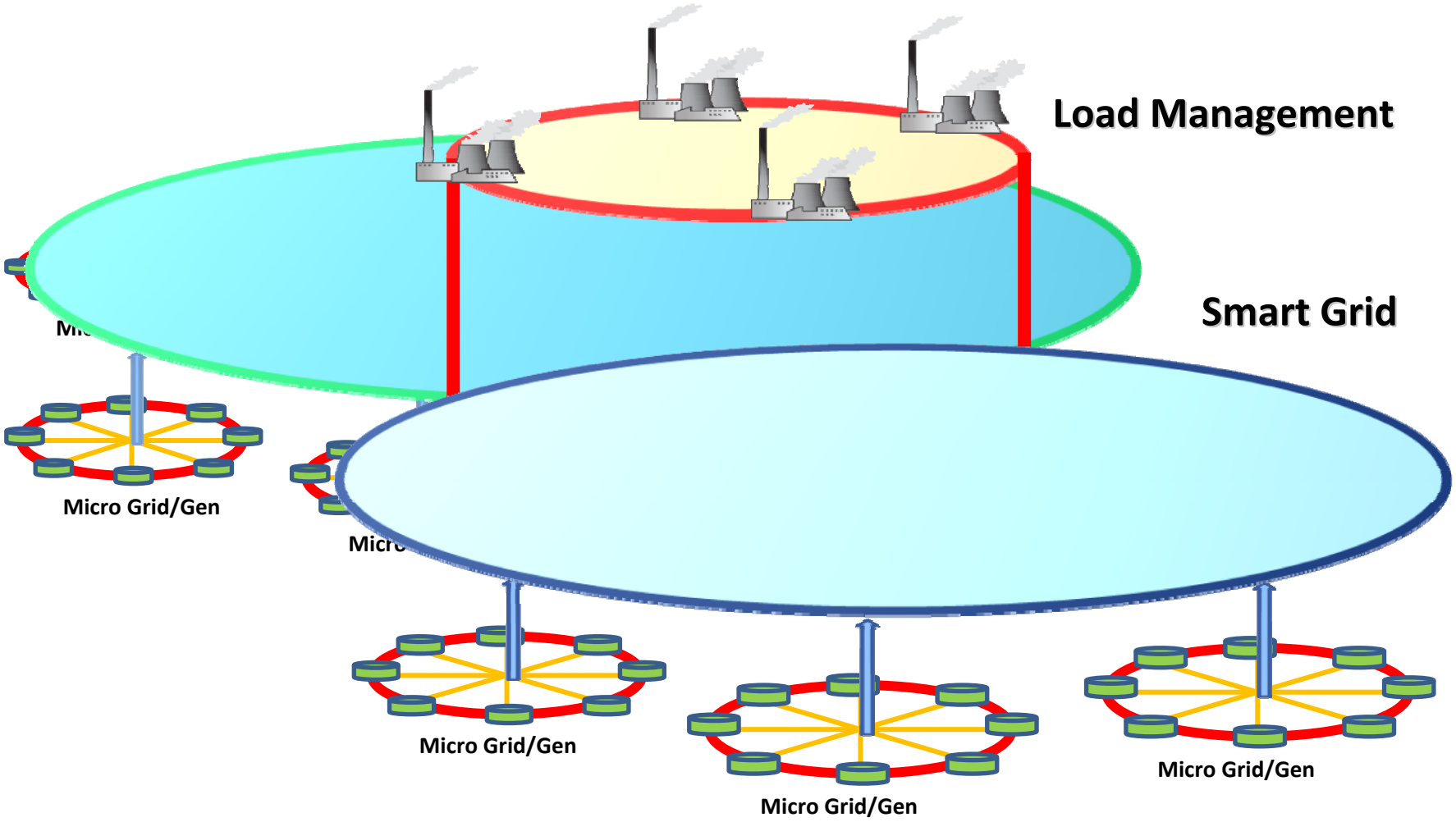
Load

Other Potential Project

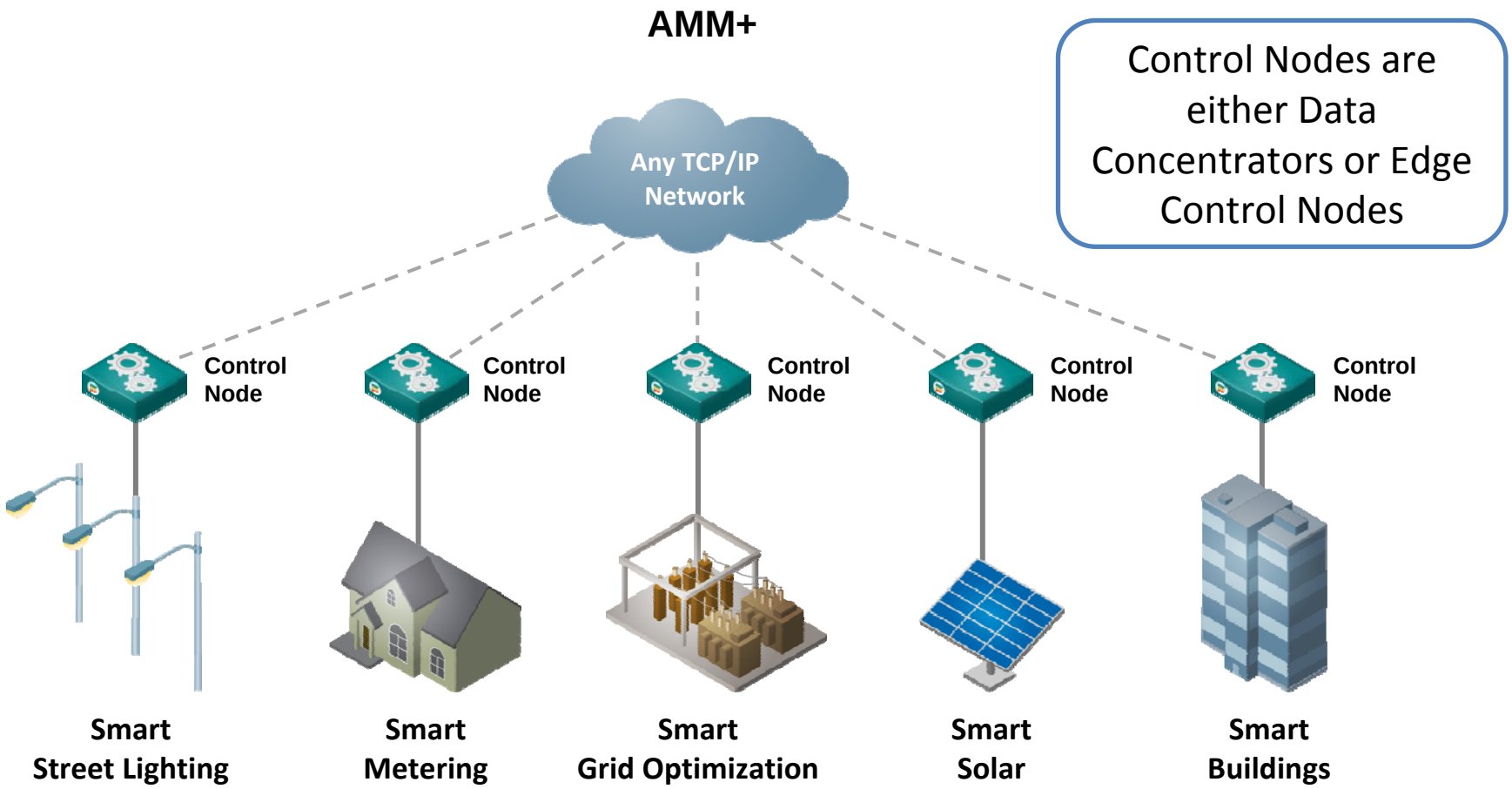
Jakarta Smart City (Consist Of Many Superblock Smart Micro Grid)



JAWA & BALI BACKBONE NETWORK TOPOLOGY

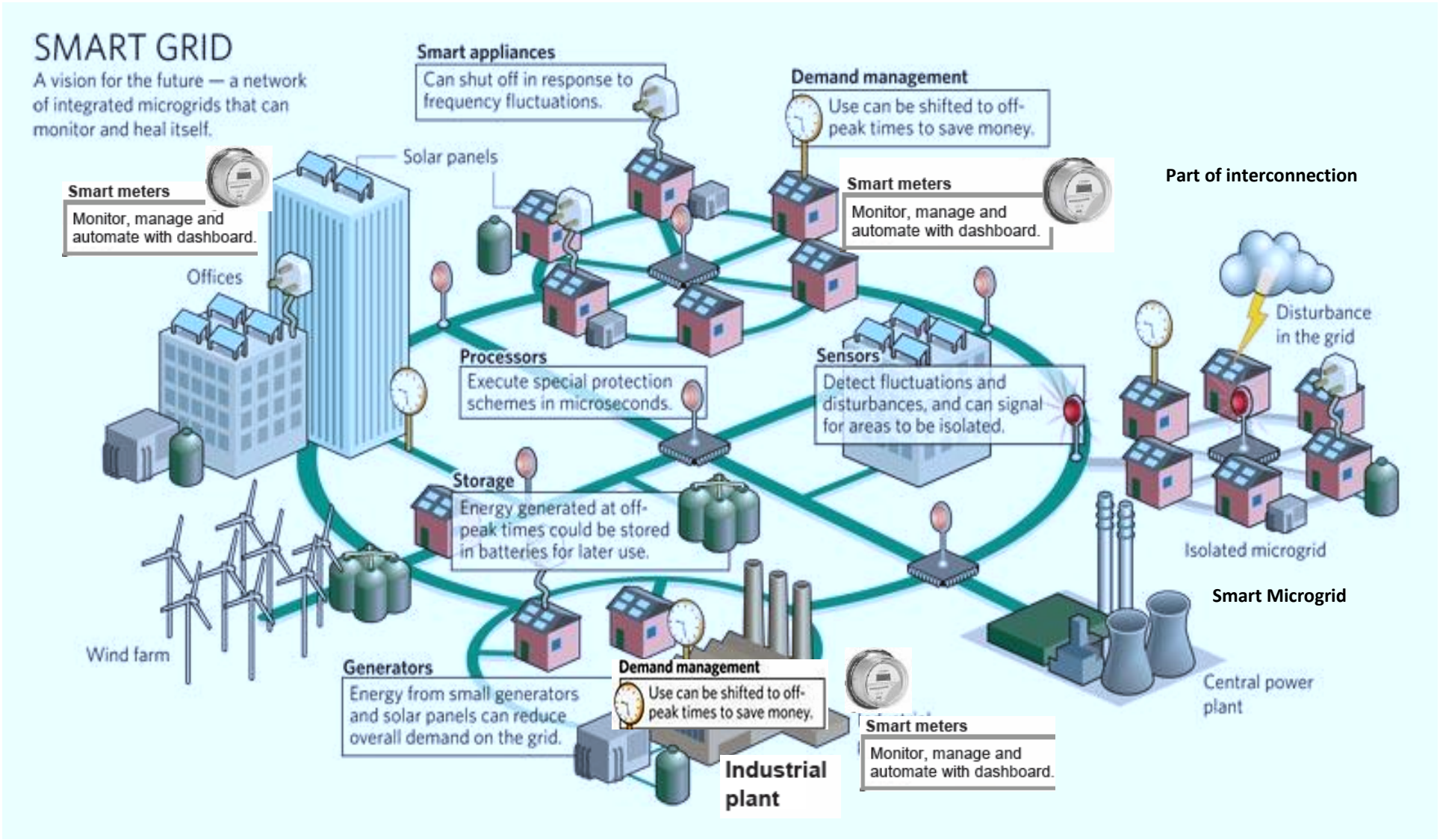

Load Management
Smart Grid
Micro Grid/Gen
Micro Grid/Gen
Micro Grid/Gen
Micro Grid/Gen
Micro Grid/Gen

Energy Control Networking Platform



Smart Grid Vision – Summary

Indonesian vision for the future - a network of integrated systems that can monitor and heal itself



Thank you for your attention…