MITSUBISHI ELECTRIC
Changes for the Better

for a greener tomorrow eco Changes

MELCO Smart Grid Technologies

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Content

1. Growth of RES usage and technical challenge
2. MELCO Smart Grid Technology
3. Implementation Example at Kyusyu Electric

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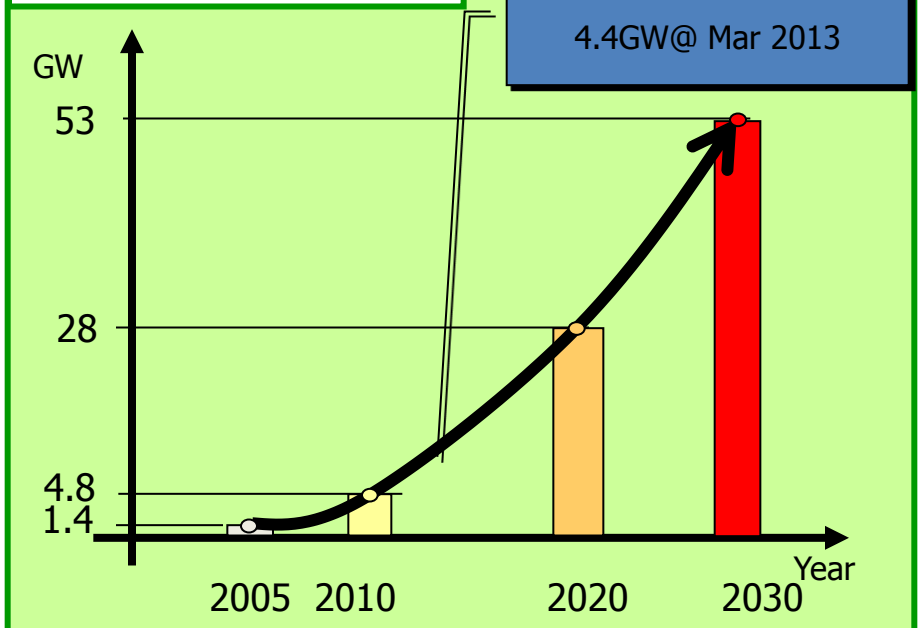
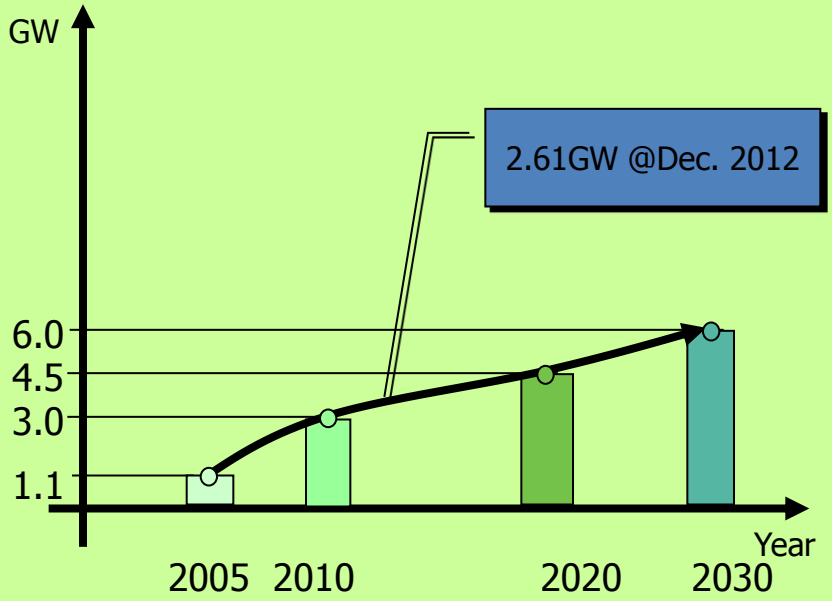
Growth of renewable energy usage

PV



	Cap. (GW)	Compared to 2005 (times)
2005	1.4	1
2010	4.8	3.4
2020	28	20
2030	53	40

Wind



	Cap. (GW)	Compared to 2005 (times)
2005	1.1	1
2010	3	3
2020	4.5	4.5
2030	6	6

Target of PV and Wind power generation according to government policy

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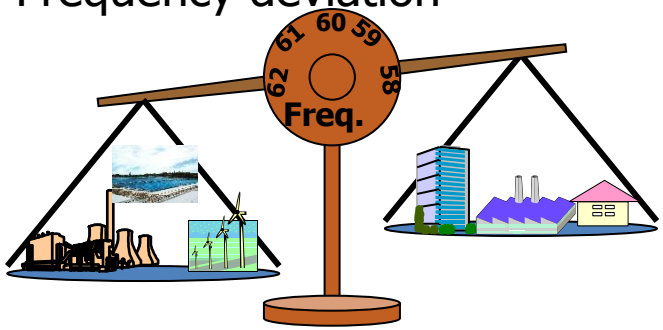
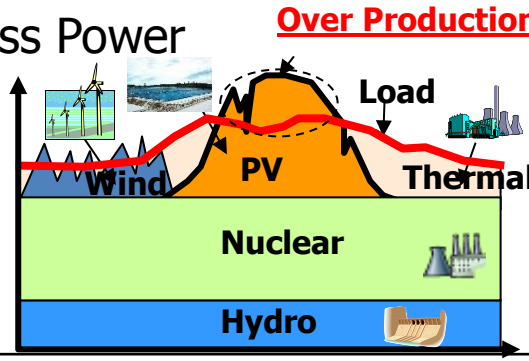
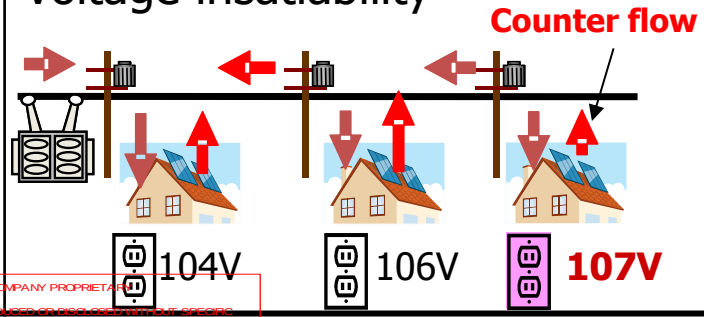
Technical challenges and solutions

	Problem	factor	solution
1	Frequency deviation 	output fluctuation from renewable	•Control for PV and Wind •Hydro Optimization (Variable Speed) •Installation of Battery
2	Excess Power 	Over production from all the PV panels at low load period	•Installation of Battery •Control for PV and Wind •Demand Response
3	Voltage insatiability 	Counter flow from individual PV panel in the distribution network	•Installation of Voltage Regulator •Installation of Battery •Control for PV

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MELCO Smart grid project

■Functionality –Smart Grid Demonstration Facility-

Bulk

Demand

Distribution

Infra

Wakayama PV system

PV System

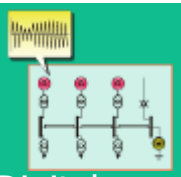
Charge Station・EV

Building/houses

Generators

Operation Center

- **Balance Management**
- **Distribution Management**
- **Advance Metering Infra**
- **Energy Management**



Digital Simulator

Storage

IT Network

Power lines

Substation

Smart Meters

Concentrator

SVR

SVC

Intelligent Switch

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Balance Management System

＜Concept＞

・Determine optimal generation plan for power plant based on forecasted load/PV output and various unit constraints

【Conventional method】

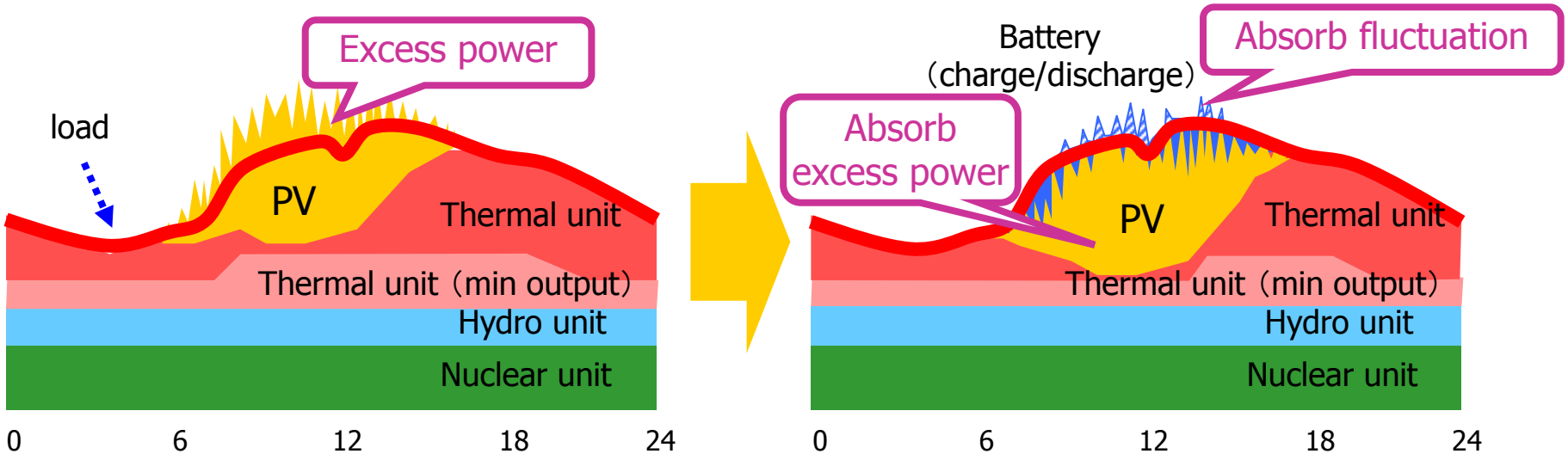
・Thermal unit has minimum output constraint, so that they can absorb only a part of excess power from PV

・Some PV output will be curtailed

【New method】

・Storage system (battery) is introduced to absorb excess power and fluctuation from PV systems

・Maximize usage of PV



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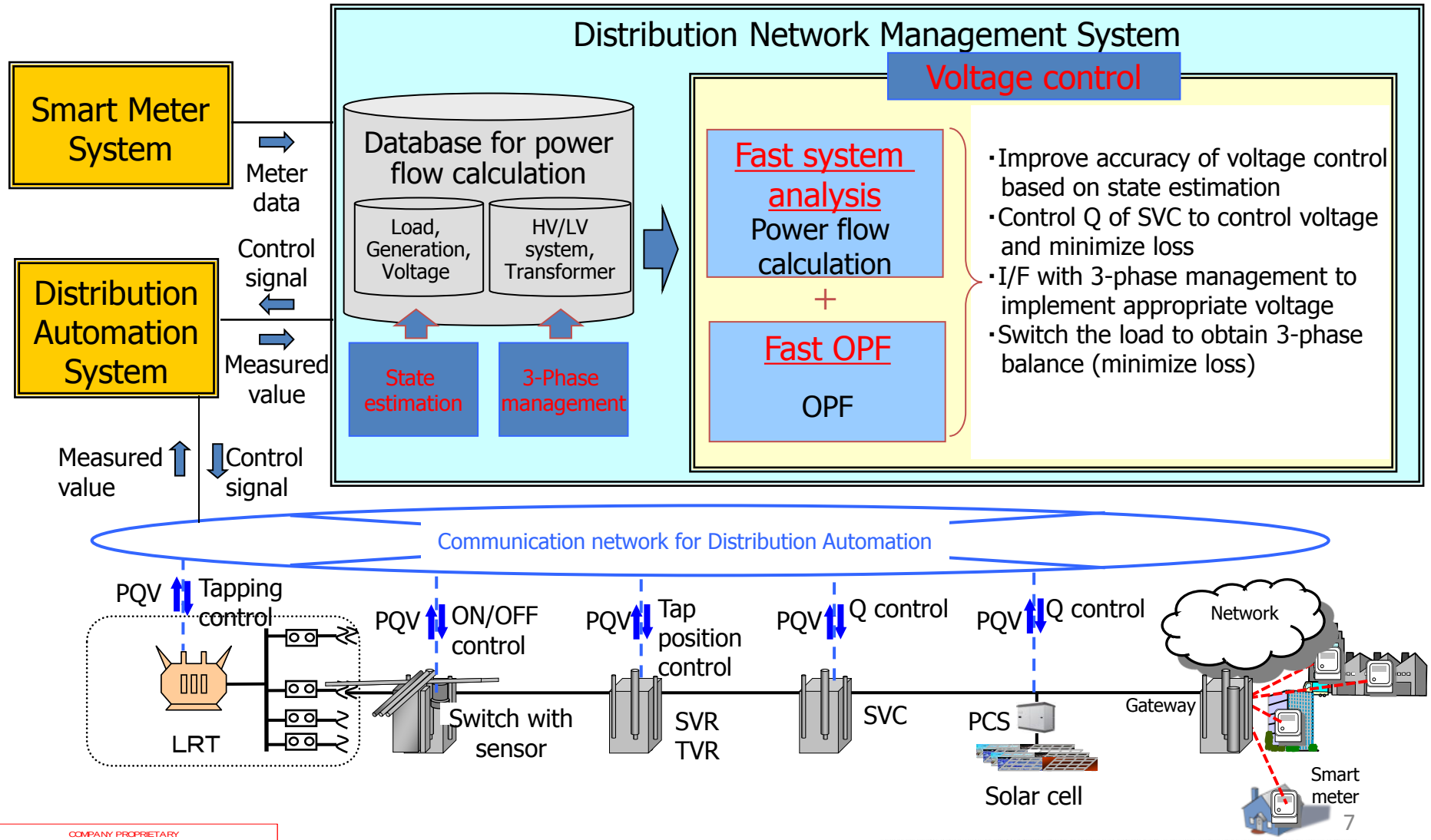
Distribution Management System

Control voltage based on sensor status (number of sensors, frequency of data-updating)



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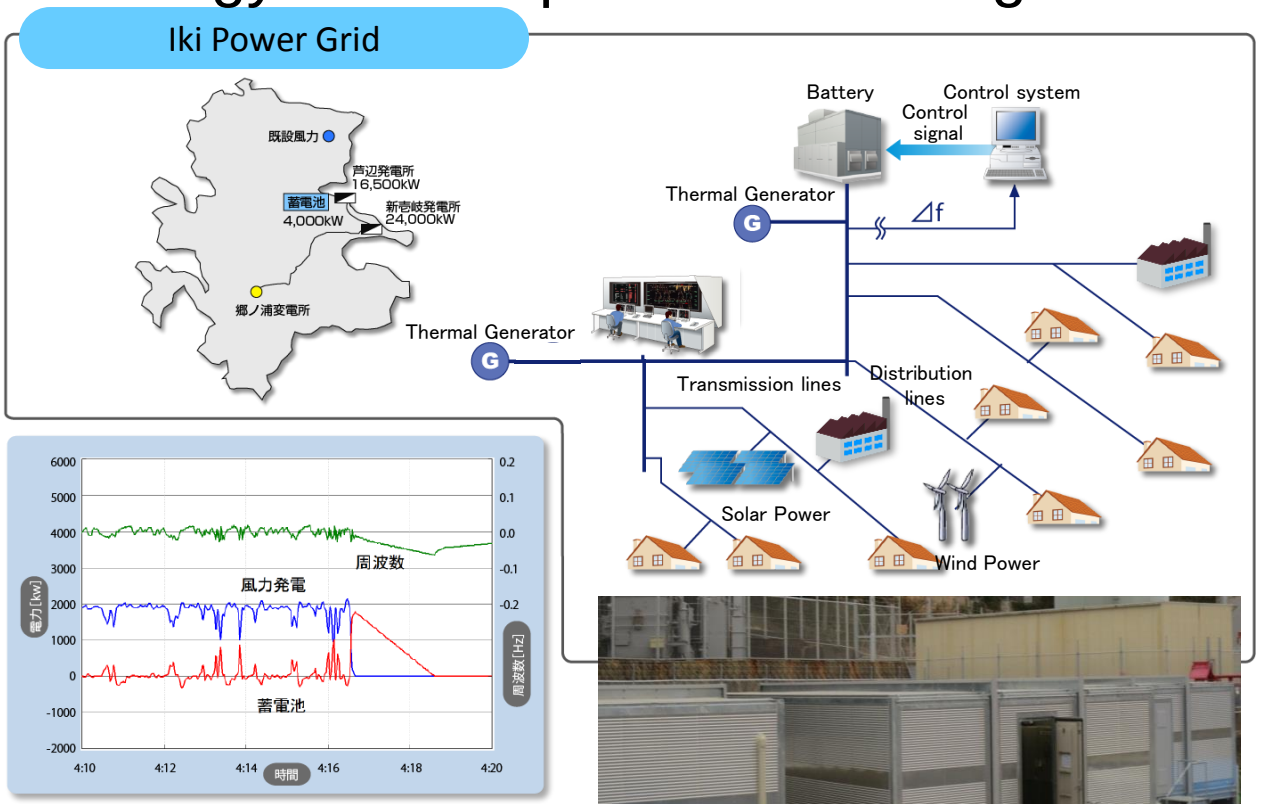
Implementation example

■ Concept of Smart battery at remote island

•Batteries are installed in Iki island (Nagasaki prefecture where the renewable energy sources penetration is high.

- Objective is to prevent and adjust frequency deviation and power flow fluctuations
- Battery size is 4MW/1.6MWh



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