



India
SMART GRID
Week 2015

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Bengaluru, India

An Example of IOT Application: KEPCO Smart Grid Business

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Organisers:

ISGF
India Smart Grid Forum

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OUTLINE

Part I

KEPCO & “Power IT” Achievement

Part II

Example of IOT application to KEPCO SG BUSINESS

1

Smart Transportation

2

Building Energy Management

3

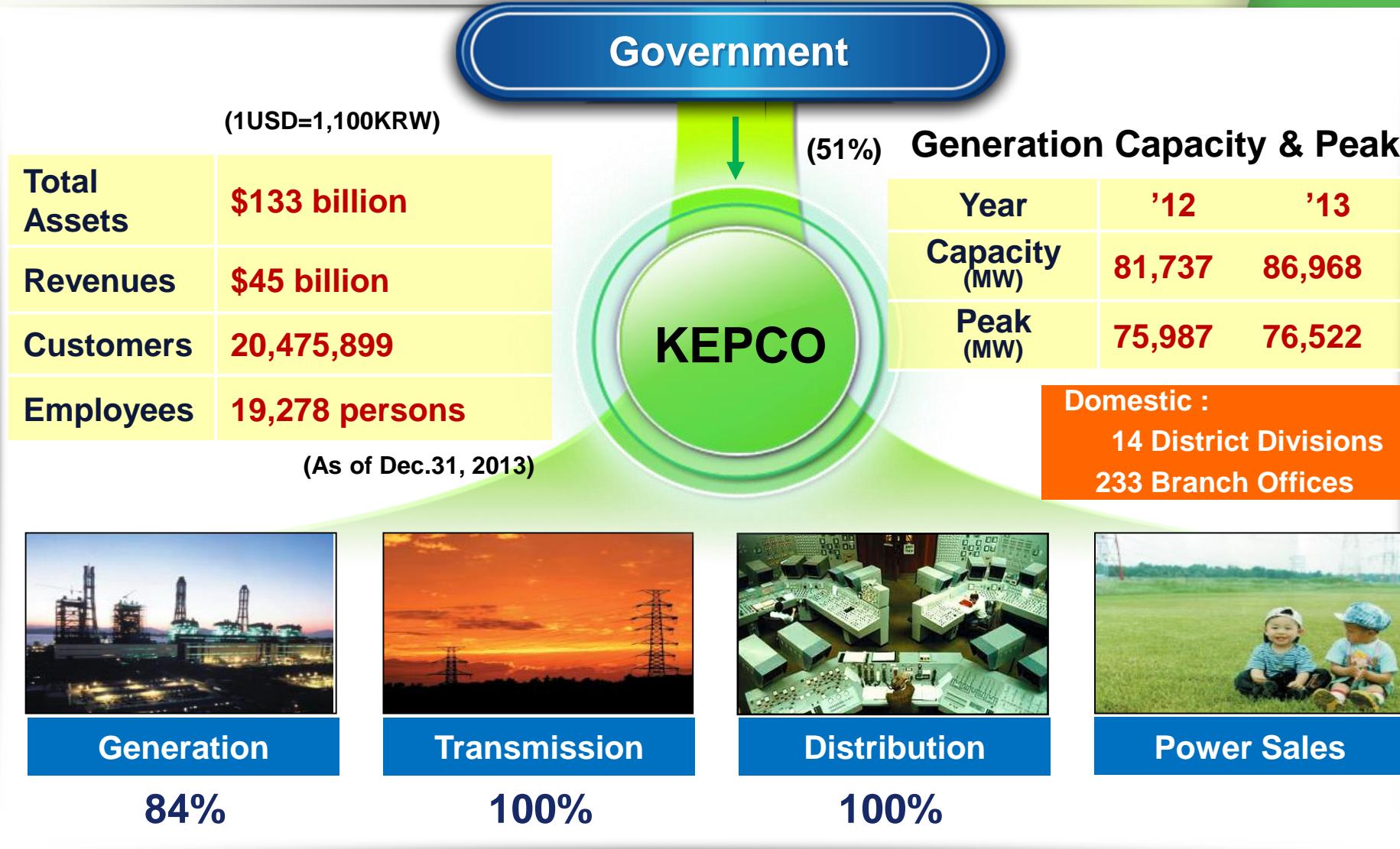
Micro-Grid

Summary

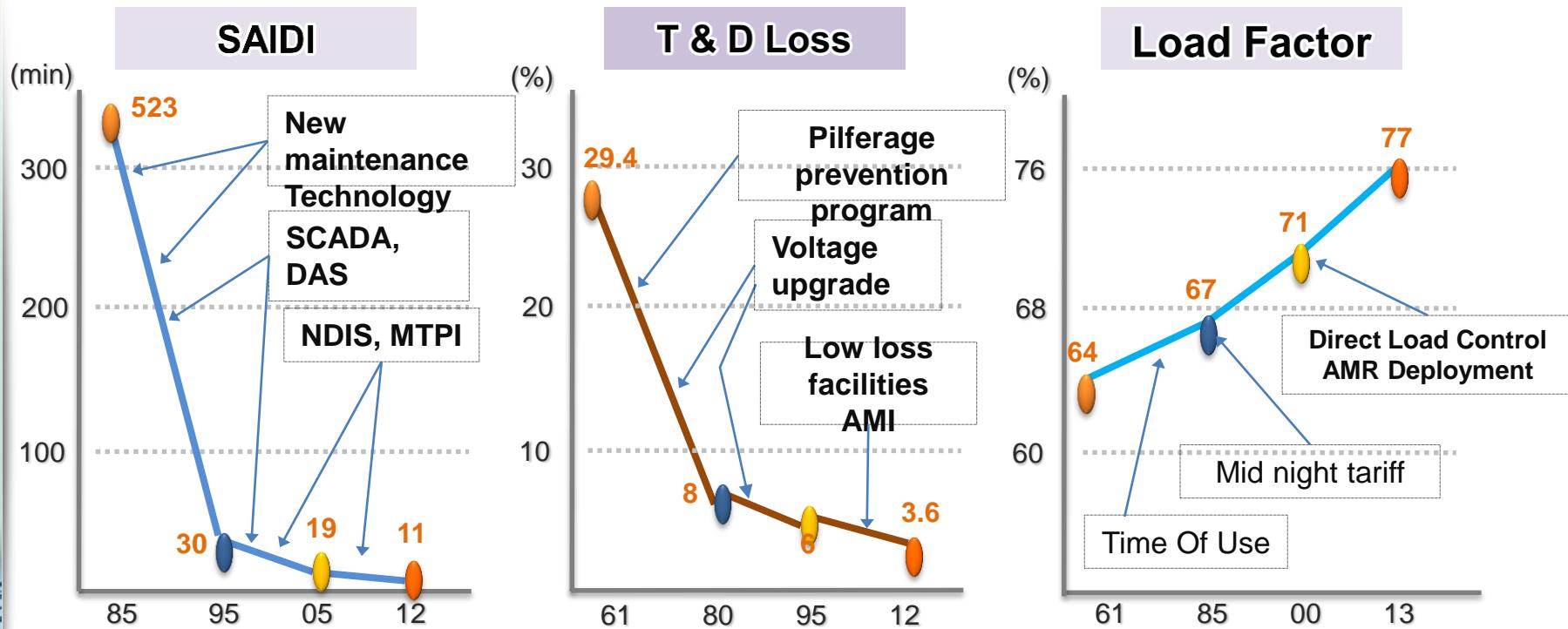
Part I

KEPCO & “Power IT” Achievement

1. KEPCO in Brief



2. Key performance of KEPCO

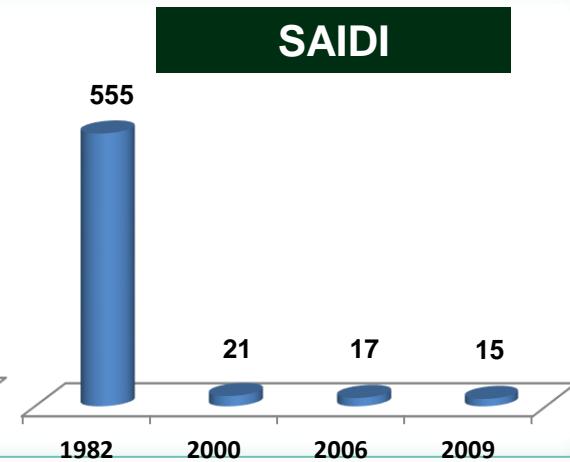
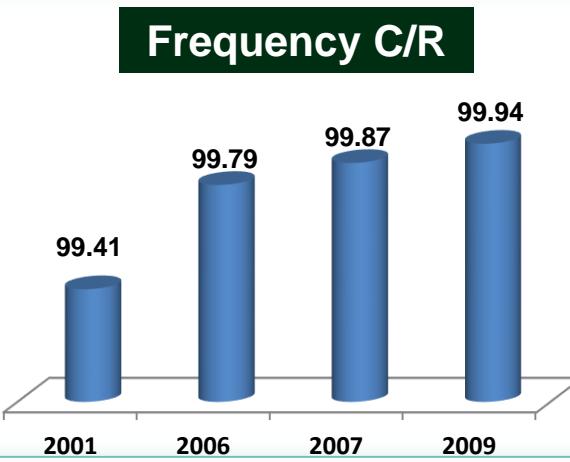
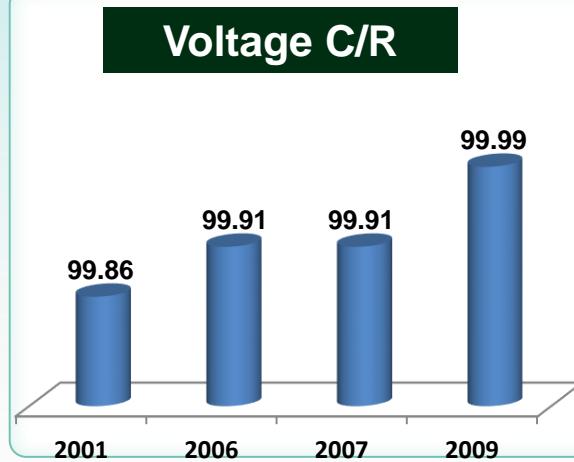


👉 **SAIDI : System Average Interruption Duration Index**

NDIS : New Distribution Information System

MTPI : Maintenance Technology without Power Interruption

2-a. Power Quality Improvement



Inconvenience:
Large investment for maintaining
High power quality

3. Limits of Power Systems Interconnection

Operating by Separated System

SCADA

- Monitoring transmission line
- Substation equipment monitoring, protection, control

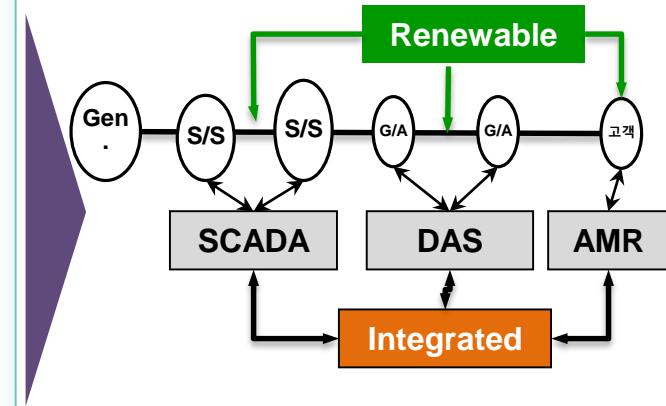
DAS

- Monitoring distribution, remote control
- Voltage management,
- protective coordination

AMR

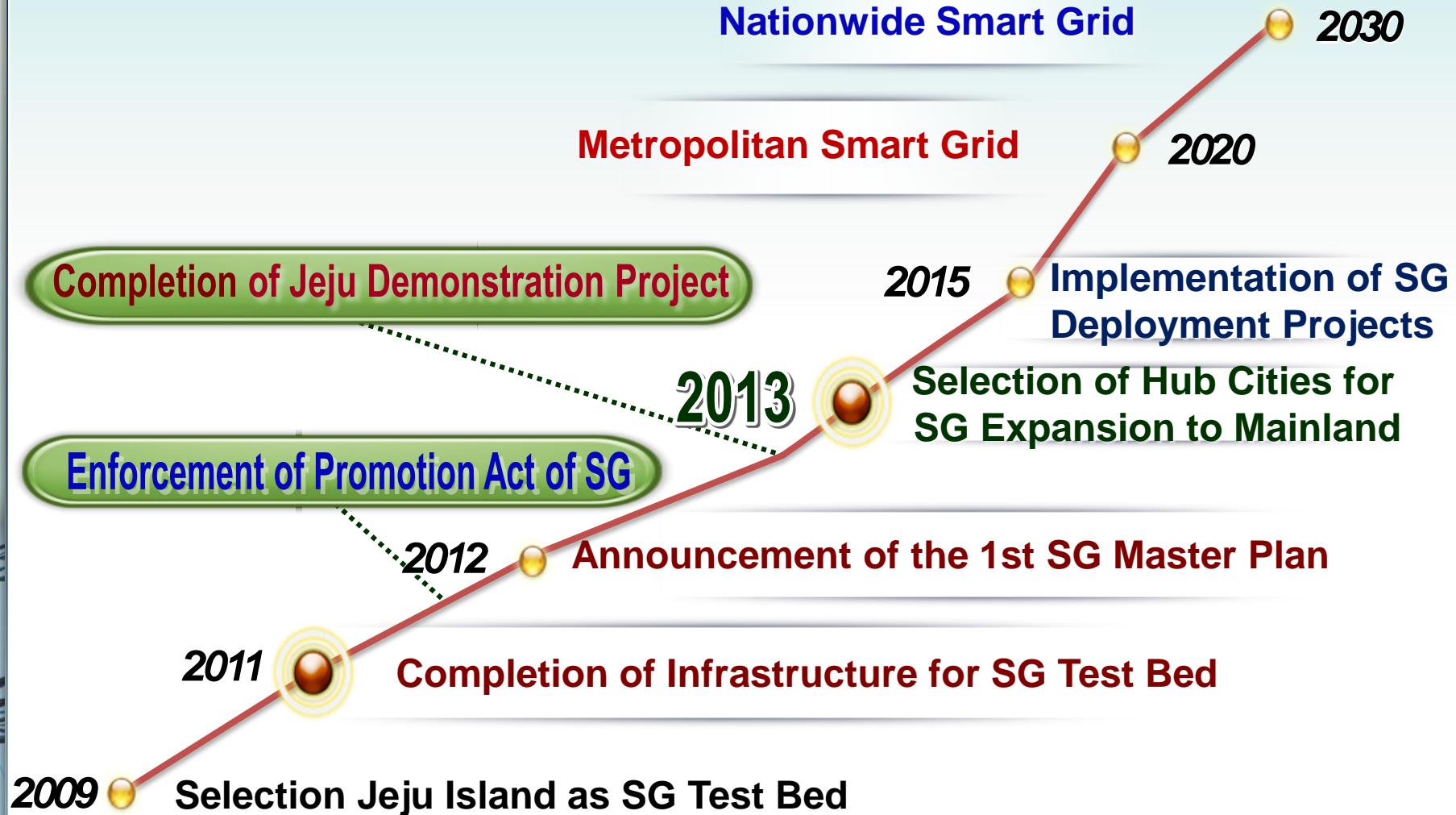
- Automation Meter Reading
- Measurements of customer voltage

- Increasing renewable sources
- Power equipment deterioration
- Difficulty to expansion
- Necessity of integrated system



Implementation of ICT → “Power IT”

4. Smart Grid Road Map till 2030 as “Power IT”



4-a. Main areas of Smart Grid Business



Smart Grid
5 business
areas



Smart Place

2-way information exchange to
efficiently use energy

Smart power grid
Automatic recovery system by
upgrading transmission and
distribution facilities



Smart Transportation

Establish charging
infrastructure for EV



Smart Renewable
Incorporate renewable energy
(PV, wind power) into power grid

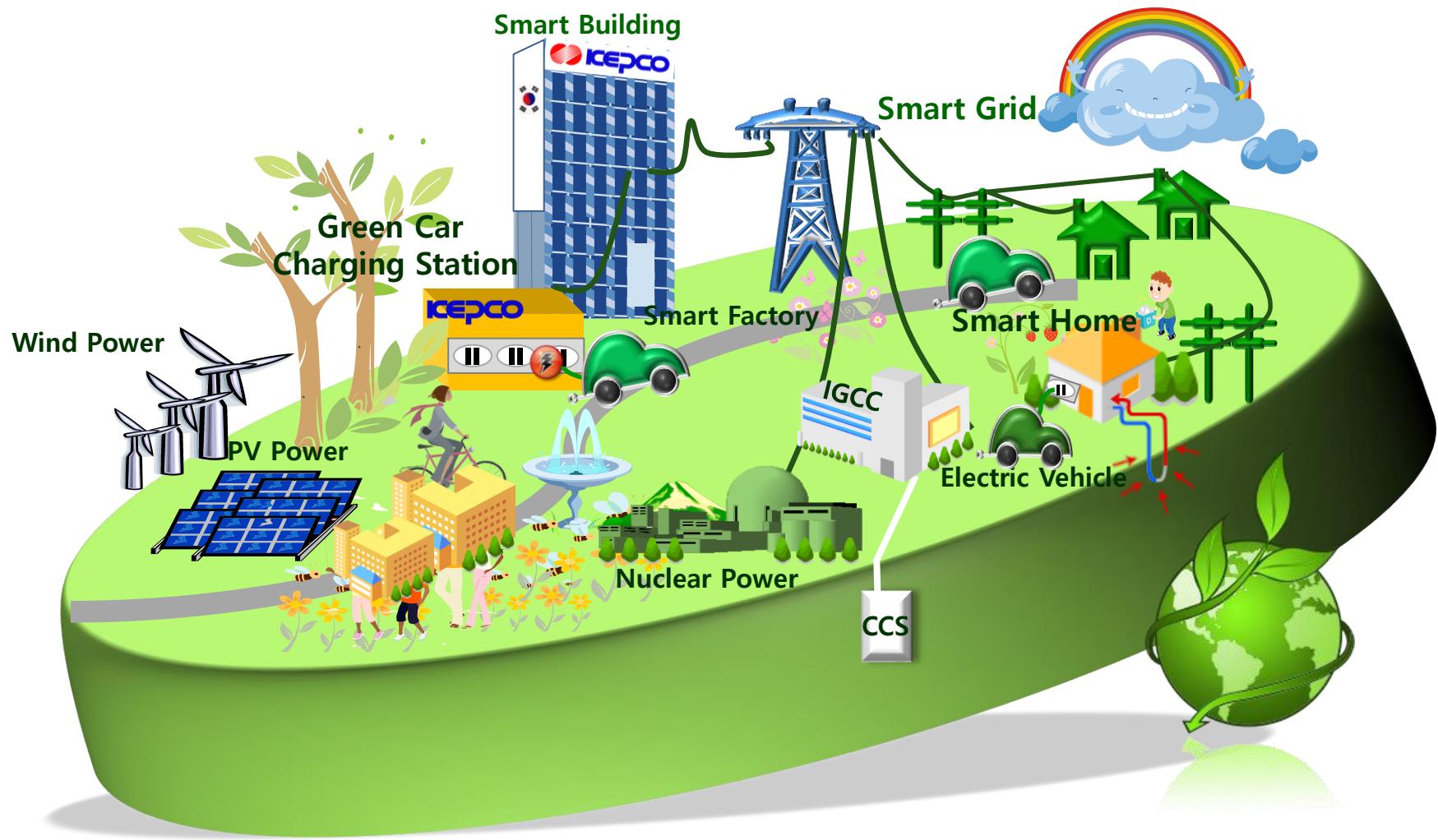


Smart Electricity service

Provide real-time energy
information to consumers and
comprehensive data
management

□ Jeju Smart Grid test-bed : for 3,000 households, business model development

4-b. Smart Green City in 2030



Part II

Example of IOT application:

Project 1. Smart Transportation

1. Project 1: Smart Transportation

Project

Smart Transportation Test bed in Jeju ('09.12~'13. 5 / 42month)

Partners in Consortium

(20partners)

| Manager | Charging devices | Operation system | Security | Service |
|---|---|--|--|---|
|  |        |      |   |    |

Objectives

- ◆ Development of Technical Solution
- ◆ Business Models for Domestic & Overseas Market

Commercialized EV Charging Service

EV Charging
Solution using
Test bed

Business solution
through Various
Field Tests

Upgrading
and
Optimization

2. Technical Achievements & Biz Model

Technical Solution

- 1st commercial EV chargers (7types)
 - Normal, DC, Home, etc
- User Identification & Billing System
- AVC (Automatic VAR Com)
- ESS (Energy Storage Sys.)
- Power Trade (B2G, V2G)
- Operation System
- Comm. & Security System
- Various Services

Field Test

- Field test for Charging fare
 - Fair = Power price + Service fee
- Power trade test (B2G, V2G) & Load Control Test
- Charging station for service
- Data Consistency with TOC
- Information Security
- Power Quality Guideline for Chargers

Business Model

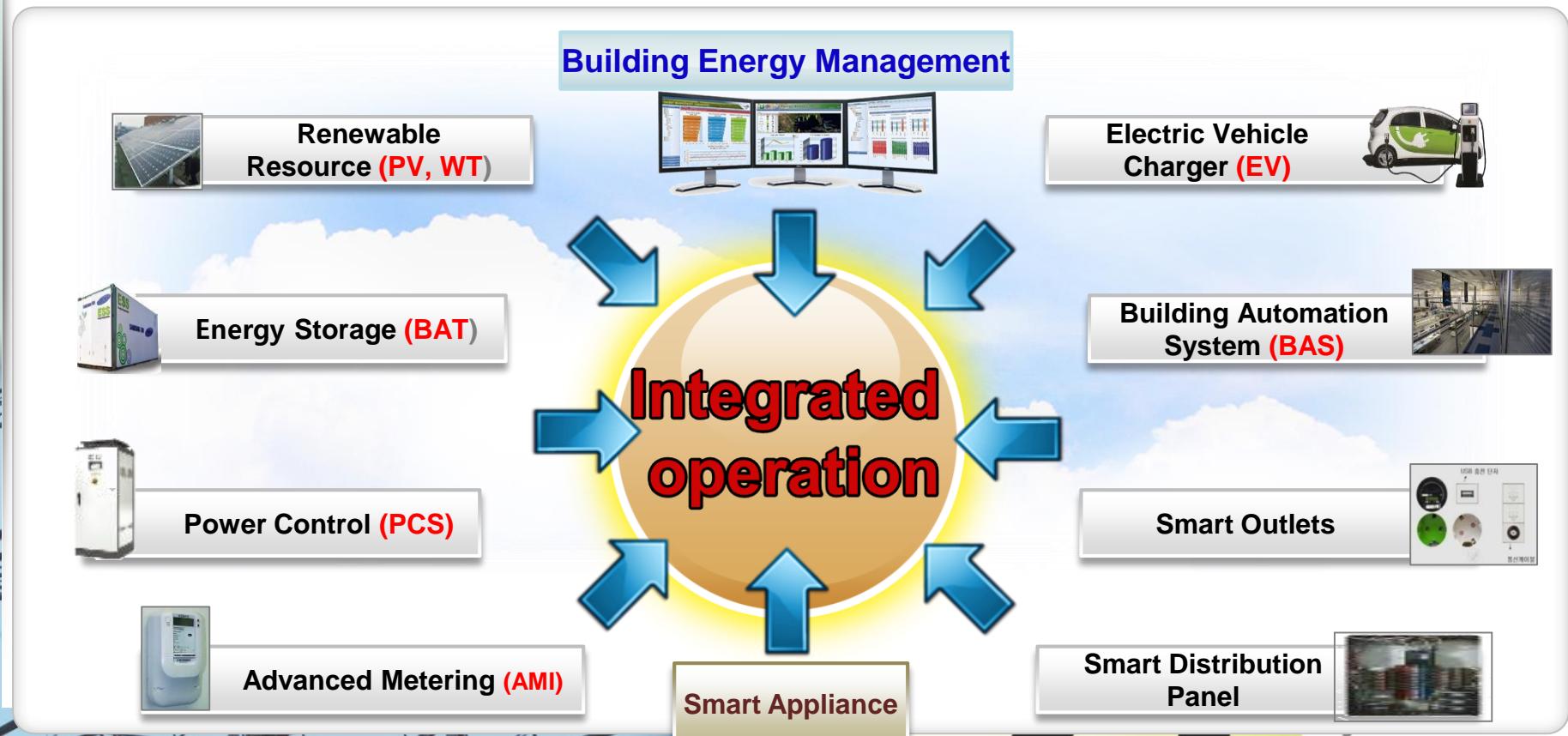
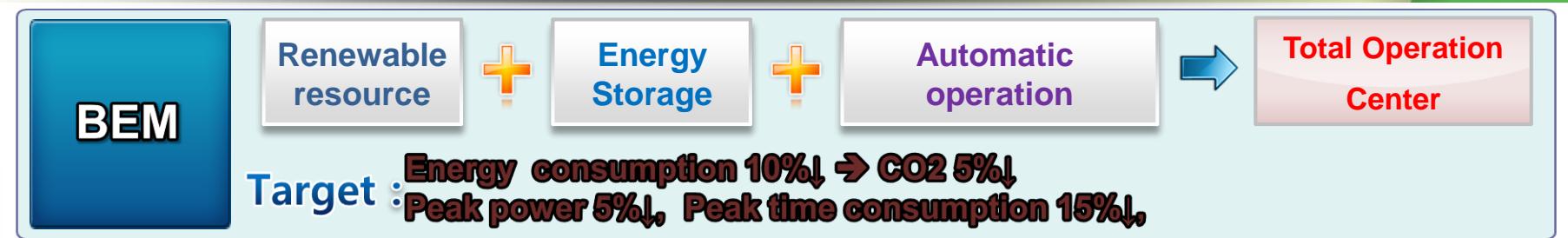
- EV sharing service
- Highway charging service
- Charging system market
- Export of ESS & ITC Modem

Part II

Example of IOT application:

**Project 2.
Building Energy Management**

1. Scheme of Building Energy Management



2. Outline of BEM Project

Guri- Namyangju Pilot site

Verification

Function of Installed
Devices

Confirmation

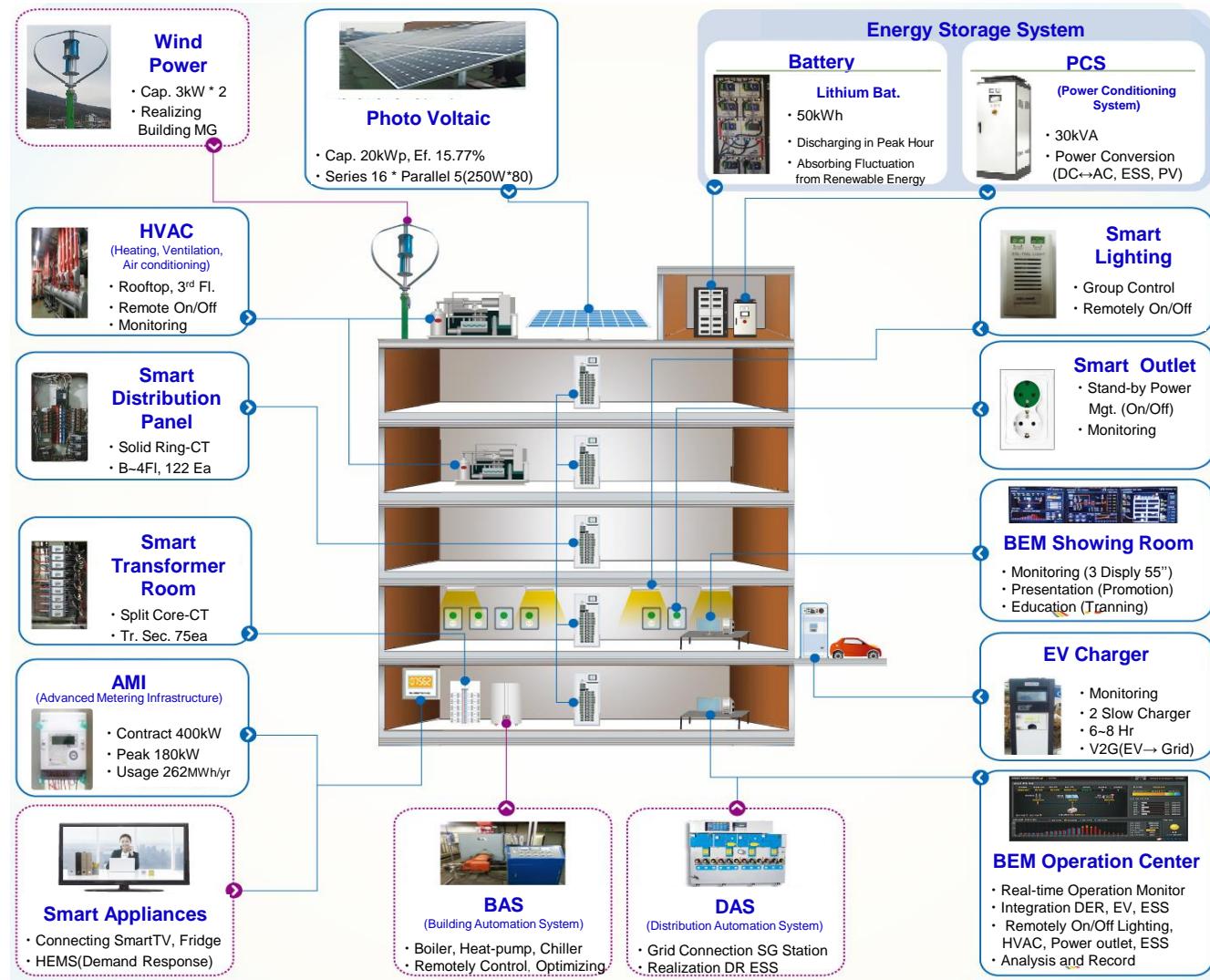
Integrated system for
Optimized Energy Management

Installation Oct.25 2013 ~ Dec.23 2013 (60days)

Goal

Development of a commercially available Building Energy Management Tool using the techniques from Jeju Test Bed

2-a. Installed Location



3. Future plan of BEM

Expansion
of
Installation

Installation at KEPSCO Office >300kW

- '14 : 29 Offices with Contracted demand power > 300kW
- '15 : 83 Offices with Contracted demand Power >of 300kW or more

Next
Generation
BEM

Improvement and R&D for Next generation BEM

- Interconnection with nearby Buildings for '**BEM Cloud-Center**'
- Combination with WP, Smart Appliances, V2G, etc

National
wide
application

Nationwide application of BEM Tools

- '15 : Consultation to private firms and Government offices
Support for application
- '15 : **ECO-friendly Smart city** and Conducting intelligent DR

Part II

Example of IOT application:

Project 3. Micro-Grid

1. Different Power supply for Island

| | Diesel Power | Hybrid Power | Micro Grid |
|--------------------|------------------|--------------------------------------|--------------------------------------|
| Main Generator | Diesel Generator | Diesel Gen. + WT Diesel Gen. + PV | Renewable Energy (WTs, PVs, Etc.) |
| Frequency Control | Diesel Generator | Diesel Gen. or Load control | Grid Forming Inverter + EMS |
| Voltage Control | Diesel Generator | Diesel Gen. or Synchronous Con. | Grid Forming Inverter |
| V/f Quality | Low | Low | High |
| Energy Storage | × | Small battery | Large Battery |
| EMS | × | △ | ○ |
| Initial Investment | Low | Medium | High |
| Operating Expense | High | Medium | Low |

2. Micro Grid Total Solution for Island

Main Tasks

Stabilization of Engineering process

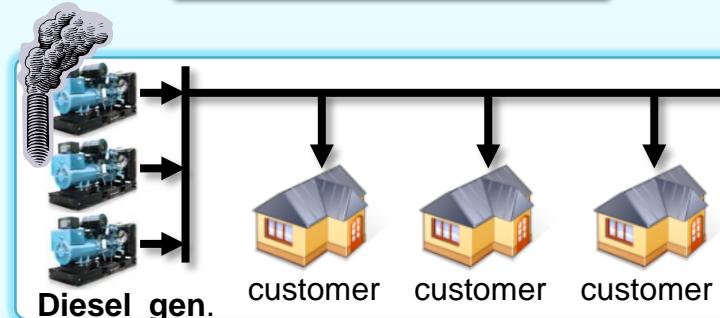
- optimal combination of DG and evaluation of economic feasibility
- system analysis and optimal location of DG

- generation control, emergency control, load control, etc.
- operation manual, emergency operation manual

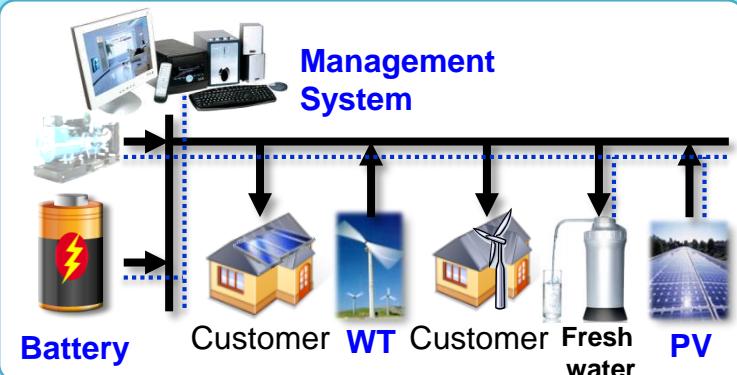
Service for Biz Model

- verify technology based on DG capacity combination
- Build infrastructure for commercialization through site optimization

Concept Shift



[Traditional power supply]



[Micro Grid Application]

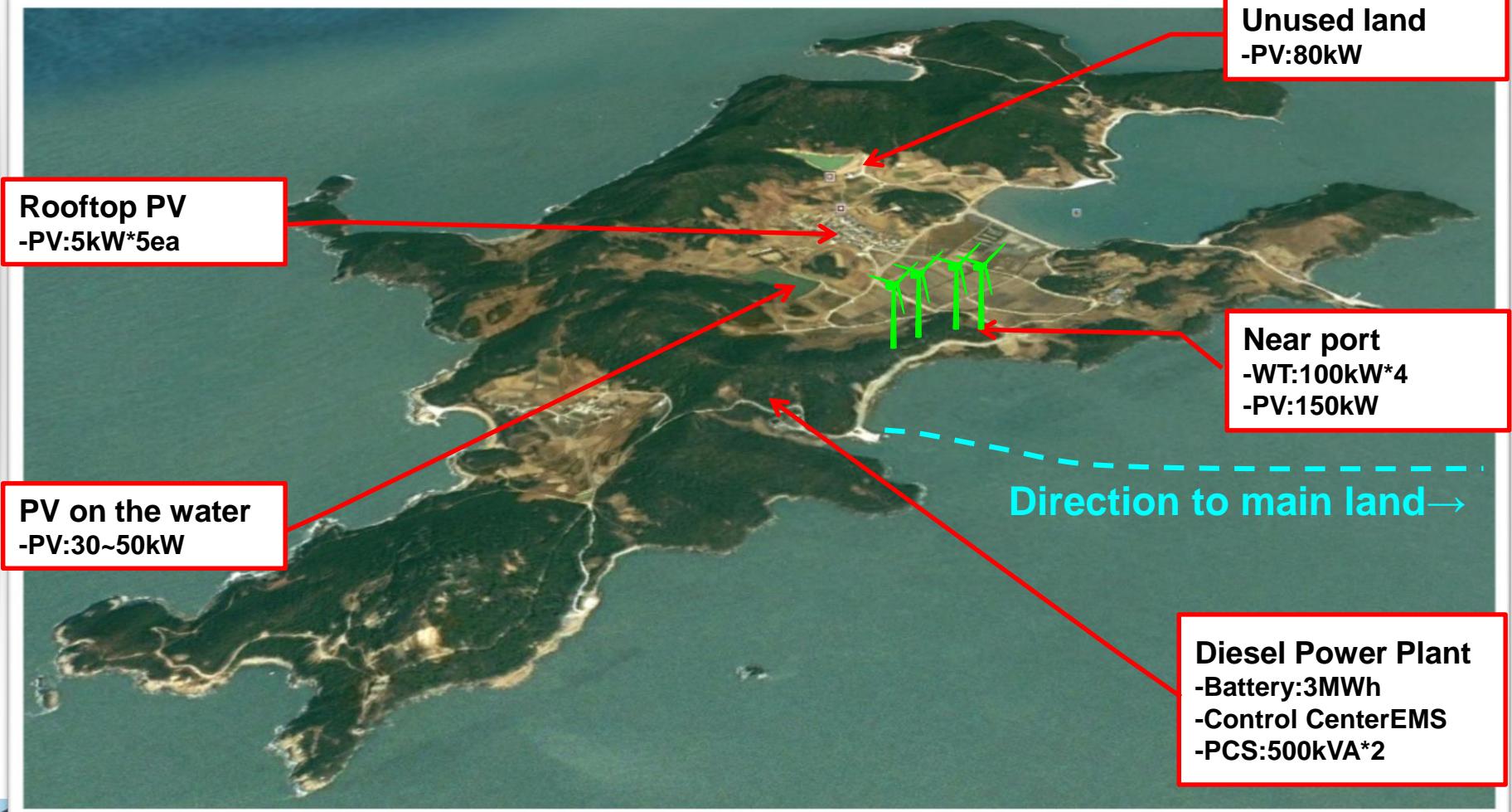
3. Gasado Pilot project (Oct.12~Sept.15)

Goal: 99% from renewable resources

| | Contents | Remark |
|---------------------------|---|--------------------------------------|
| Power | 99% renewable resources | Independent |
| Battery | 1 day supplying capacity without Sun nor Wind | Economical |
| Emergency | Diesel generator | WT/PV absence > 1day or System fault |
| EMS | Automatic control | Efficient system |
| Plug & Play | Individual PV connected with Grid | Economical |
| WT/PV Installation | House roof, and Idle site | Economical |

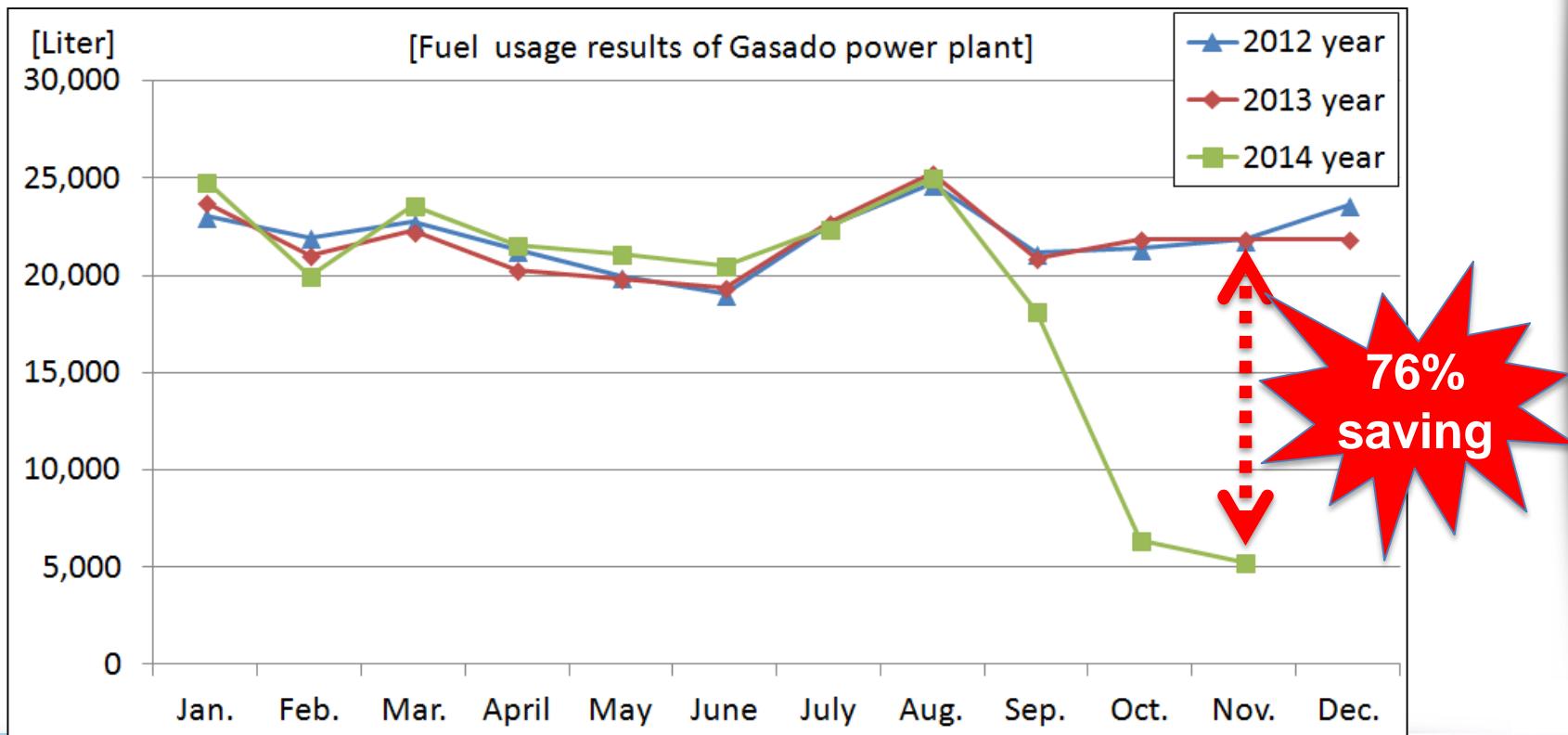
4. Bird view of Gasado Pilot project

- Completed installation of devices for renewable energies considering power flow, loss in network, topography.



5. Operation Results

- Commercial service since the 2nd Oct 2014
- Fuel saving results(compare to 2013 year)
 - Oct. : 71%(2013 year : 21,828L, 2014 year : 6,379L)
 - ✓ Nov. : 76%(2013 year : 21,829L, 2014 year : 5,272L)



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Summary

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Summary

KEPCO's Experiences from “Power IT”

■ Smart Transportation

- Smart Transportation Test bed in Jeju ('09.12~'13. 5 / 42month)
- Technical Solution (EV Charging system, etc), Field Test, Biz Model

■ BEM(Building Energy Management)

- Target: Energy consumption(10%↓) → CO2 5% ↓
Peak power 5% ↓, Peak time consumption 15% ↓
- Pilot project, Expansion Installation & R&D for Next generation BEM

■ Micro Grid

- Total solution for island to solve difficulty connecting to grid
- Pilot project in Gasa island (Oct.12~Sept.15), Fuel saving(76%)



**Reinvent your future and
unfold the expertise with KEPCO....**

Thank you