

# Jeju Smart Grid Test-bed

2017. 11. 14

**Jung-Hyo, Bae**  
**Korea Electrotechnology Research Institute**



# Contents

- I Overview of Jeju Test-bed
- II Target and Detail
- III Major Accomplishments





# I Overview of Jeju Test-bed



# 1. Overview of Jeju Test-bed

## Target

Set-up of the world largest smart grid test-bed at an initial stage

➡ Commercializing technologies & Facilitating exportation

## Budget

total KRW 249.5 billion (Public KRW 76.6B, Private KRW172.9B)

## Status

Phase 1 (Dec. 2009 ~ May. 2011) construction of demonstration infra

Phase 2 (Jun. 2011 ~ May. 2013) Integrated operation



The background of the slide is a vibrant green field under a clear blue sky. In the foreground, a yellow electric car is parked, connected to a green charging station. A green cable runs from the car to the station. In the background, there are white wind turbines and a city skyline with several tall buildings. The overall scene is bright and clean, representing a sustainable future.

## II

# Target & Detail

**1. Target**

**2. Plan**

**3. Detail**



# 2-1. Target

## Technology Verification

- Integrate each product & provide the environment for testing
- Be SG powerhouse based on verified SG techs and products

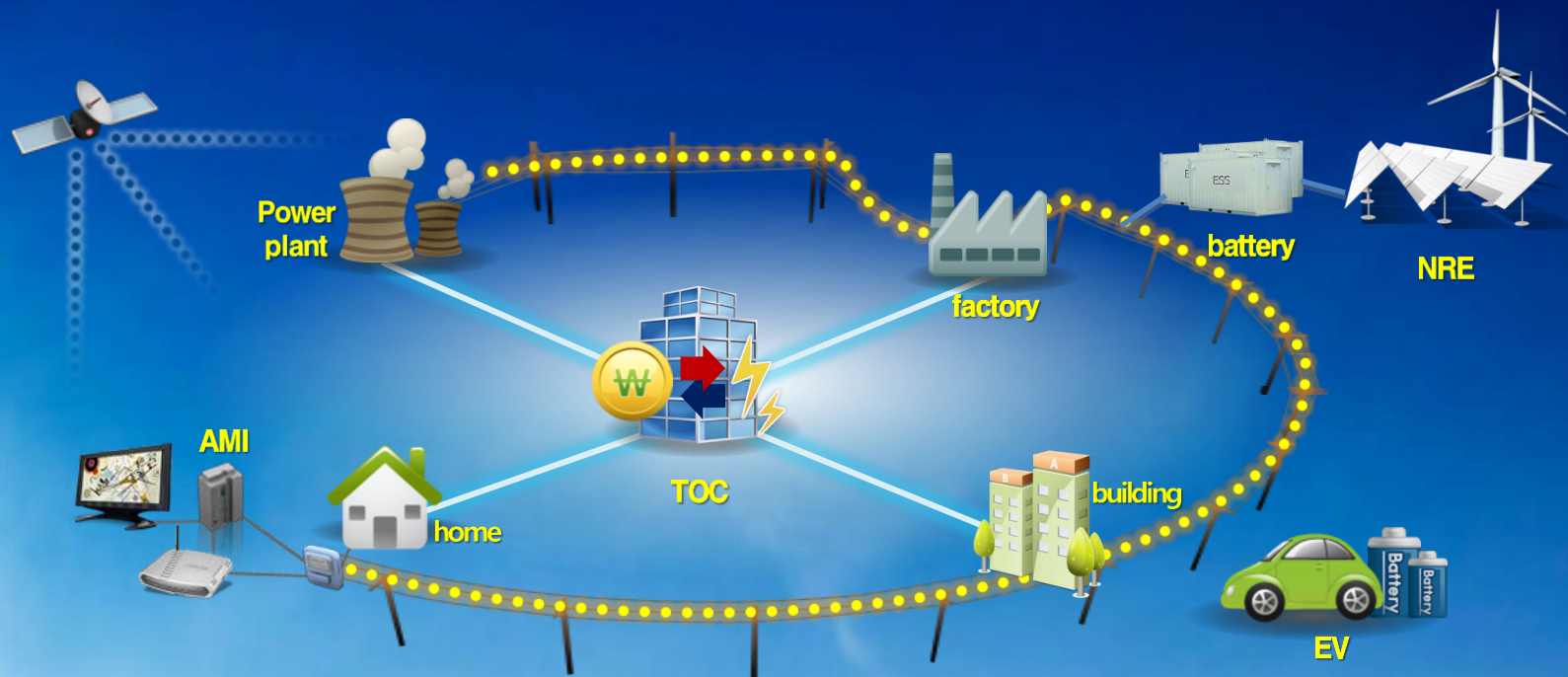


## BM Verification

- Verify various BM competitiveness with SG infra
- Identity & nurture new BM on SG

**Verify tech development & new BM based on the establishment of electricity market and SG in test-bed**

# 2-2. Plan



Schedule	Phase 1 (Infra Construction)		Phase 2 (Integrated Operation)	
	1 <sup>st</sup> year	2 <sup>nd</sup> year	3 <sup>rd</sup> year	4 <sup>th</sup> year
	Select site/ recruit participants	Install facility/ system	Conduct Real time pricing	Verify BM
Tech Verification	<ul style="list-style-type: none"> <li>Design system</li> <li>Test system</li> </ul>	<ul style="list-style-type: none"> <li>Verify communication test</li> <li>Set up TOC, NOC</li> </ul>	<ul style="list-style-type: none"> <li>Ensure interoperability</li> <li>Evaluate grid integration</li> </ul>	<ul style="list-style-type: none"> <li>Verify interoperability</li> <li>Supplement grid Integration</li> </ul>
BM verification	<ul style="list-style-type: none"> <li>Recruit participants</li> <li>Hold info. session</li> <li>Analyze candidate sites</li> </ul>	<ul style="list-style-type: none"> <li>Devise real time pricing</li> <li>Design power trading way</li> </ul>	<ul style="list-style-type: none"> <li>Conduct power exchange</li> <li>Hold info. session</li> </ul>	<ul style="list-style-type: none"> <li>Analyze BM impacts (economic impact)</li> </ul>

## 2-3. Detail



### Smart Place

- Two-way communication energy management system between consumers & suppliers
- AMI, EMS, Bi Direction communication



### Smart Transport

- Set-up of EV charging infra & development of EV parts
- Quick charger/charging stand, V2G, EV parts such as Inverter, connector



### Smart Renewable

- Set-up & verification of large-scale NRE storage & higher efficient system under real time pricing
- Micro-grid, energy storage tech, grid connection tech



### Smart Power Grid

- Demonstration of techs & response to irregular supply/demand such as EV & NRE
- Smart T&D Sys, smart power grid, smart appliances



### Smart Electricity

- Monitoring for test-bed, real time pricing, virtual power market, DR
- Dynamic pricing DR, power exchange tech



The background image shows a vibrant green field under a clear blue sky. In the foreground, a bright yellow electric car is parked, connected to a green and black charging station. A green charging cable is plugged into the car. In the background, there are modern skyscrapers and two white wind turbines. The scene is decorated with floating green leaves and a network of glowing white lines with circular nodes at the bottom, suggesting a smart or sustainable infrastructure.

## **III Major Accomplishment**

- 1. Infra Establishment**
- 2. Technology Verification**
- 3. New Business Model**
- 4. Commercialization**
- 5. Relevant System**



# 3-1. Infra Establishment



Smart Place	Smart Transport	Smart Renewable	Smart Power Grid	Smart Electricity
<ul style="list-style-type: none"> <li>Smart meter IHD Gateway DCU</li> <li>Smart appliance</li> <li>NRE, household battery</li> </ul>	<ul style="list-style-type: none"> <li>Quick charger, charging stand</li> <li>EV</li> <li>Electric bus/scooter</li> </ul>	<ul style="list-style-type: none"> <li>Wind, PV, small hydro power, Diesel engine generator</li> <li>BESS</li> <li>CPD</li> </ul>	<ul style="list-style-type: none"> <li>PGOMS</li> <li>Parts of smart distribution</li> <li>Ball sensor</li> </ul>	<ul style="list-style-type: none"> <li>TOC</li> <li>Smart Board</li> <li>Real time pricing market</li> </ul>



## 3-2. Technology Verification

### Advanced Metering Infra(AMI)

- Real-time information exchange between consumers and suppliers that optimizes electricity supply and demand through technology development and trial operation



### Energy Management System(EMS)

- Monitor the flow of electrical energy that is being used and verify optimal control technology



### Charging Infra Technology

- Development of quick and standard charging service and delivery various services for the electric vehicle infrastructure communication



### Grid Integration Technology

- Connecting Micro-grid, electric car battery to the power grid and electricity to transmit both ways



### Energy Storage Technology

- Conjunction with distributed generation, develop a management technology and discharge and charging technology for high-capacity battery charge that have different capacity and usage



### Smart Appliances

- Electronic sensors, smart devices (IED), including the SG and the next generation of power transmission equipment demonstration. Distribution Technology Development



### Demand Response

- Depending on the changes of the electricity rates in real-time consumption, test a system that consumers are able to induce and adjust the electricity consumption freely



# 3-3. New Business Model

## Demand Response

- Electricity retail
- Demand response
- Consumer-generated power trading service
- Operation of Virtual power plant based on EV

## EV Charging

- EV quick charger, Charging stand
- Moving/Emergercing charging service for EV

## Others

- Consulting on energy consumption
- EV rental service
- Stable NRE production & better power quality



## 3-4. Commercialization

### Smart Appliances : LG Electronics

- Development and display of smart appliances applicable to real time pricing



### EV Rental Service: POSCO ICT, SK Innovation, KT

- Pilot project of EV rental car service to enter into Jeju rental car market



### Building Energy Management System : SKTelecom, KT

- Apply BEMS to 3 buildings including T-Tower(SKT) and GS Caltex Research center



### Electric Scooter Sharing Service: GSCaltex

- Pilot project of E-Scooter rental service for students in Jeju national university



### Factory Energy Management System :POSCOICT

- Apply FEMS technology to industrial complex (oxygen making factory in Gwang Yang)



# 3-5. Relevant System



## Real-time Pricing

Apply real-time pricing to households, operating energy-saving incentive system and comparing it with the existing cumulative tax basis



## Interoperability

Design SG system to ensure stable communication between different devices such as smart appliances and smart meters



## Demand Response

Incentives for consumers who reduce electricity based on real-time information on power supply and demand



## Cyber Security

Establish security guideline, inspecting system security and conducting simulation of cyber terror



## Electricity Retail

Purchase electricity from power suppliers and then resell electricity together with optional services



# Thank you

