New Energy Business of KEPCO

2018. 3

1. Business Background

Our purpose of Smart Grid is to:
- Enhance energy efficiency
- Reduce 30% of CO₂ emission by 2030 (Paris Agreement)
- Create new biz model by Power industry with ICT
- Save budget for building additional power plant
- Encourage customers on use of electricity with "smart” technologies
- Minimize power consumption with smart management

- Optimize Power Consumption
- Reduce CO₂ Emission
- ICT + Energy Convergence
2. National Smart Grid Road Map

2009 Selection of Jeju Island as SG Test Bed

2011 Completion of Infrastructure for SG Test Bed

2012 Announcement of the 1st SG Master Plan

2013 Selection of Hub Cities for SG Expansion to Mainland

2015 Implementation of SG Expansion Projects

2030 Nationwide Smart Grid

2. National Smart Grid Road Map

3. Goal and Strategy

1. Vision
   Establishing response system for the Climate Change and Posterity of New Energy Business

2. Goal
   Creating a job
   Increasing participating companies
   Improving energy efficiency
   Creating a new industry ecosystem
   Activating new industry investment
   Achieving SG business
   Accelerating overseas cooperation

3. Promotion Strategy
   Energy Valley
     Research/Production
     Accumulation of technology
     Establishment of facility, training of manpower
     Product production
   Smart City
     Energy utilization efficiency
     Expansion of energy independence rate
     Co-growth with small and medium-sized company
     Establishing a global energy belt

4. Promotion Project
4. EV Charging Expansion

**EV Expansion Plan (Nation Wide)**

<table>
<thead>
<tr>
<th>Year</th>
<th>2018.2</th>
<th>2020</th>
<th>2022</th>
</tr>
</thead>
<tbody>
<tr>
<td>EV</td>
<td>27,425</td>
<td>250,000</td>
<td>350,000</td>
</tr>
</tbody>
</table>

**Installed EV Charging Infra (2018.2)**

<table>
<thead>
<tr>
<th>Classification</th>
<th>EV</th>
<th>Charging Infra</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Quick</td>
</tr>
<tr>
<td>National-Wide</td>
<td>27,425</td>
<td>2,858</td>
</tr>
<tr>
<td>KEPCO</td>
<td>664</td>
<td>1,486</td>
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</tbody>
</table>

- Apartment
- Public Station

5. AMI (Advanced Metering Infrastructure)

**Key Performances**

- **Controlling** Power Demand through Sending Demand Response Signals by Bi-directional Communication Network
- **Supporting** Utility's Main Businesses in Power Distribution, Sales, etc.

**Configuration**

**Installation Plan** (Budget $1,562 million)

<table>
<thead>
<tr>
<th>Item</th>
<th>'17</th>
<th>'18</th>
<th>'19</th>
<th>'20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Installation (10 thousand unit)</td>
<td>780</td>
<td>400</td>
<td>520</td>
<td>550</td>
</tr>
<tr>
<td>Cumulative Installation (10 thousand unit)</td>
<td>780</td>
<td>1,180</td>
<td>1,700</td>
<td>2,250</td>
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</tbody>
</table>

Plan implemented by 2020
6. F/R ESS Expansion

1. ESS for Frequency Regulation

Utilizing 100% of Generator Output by Replacing Frequency Reserve in Thermal Generators with ESS → Reduce Generation Costs

2. Target: To Build 500MW ESS (2014~2016)

<table>
<thead>
<tr>
<th>Item</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity</td>
<td>52MW</td>
<td>184MW</td>
<td>140MW</td>
<td>376MW</td>
</tr>
<tr>
<td>substations</td>
<td>2</td>
<td>7</td>
<td>4</td>
<td>13 Sites</td>
</tr>
</tbody>
</table>

※ The largest capacity of F/R ESS in the world
- Reduced $346 million of generation cost
- Project with 33 SMEs provided track record for SMEs to win overseas contracts

7-1. K-EMS: Definition

**K-EMS: KEPCO Energy Management System**

- Saves cost and enhances energy efficiency through real-time monitor, control and analysis on various energy consuming facilities including gas, thermal and other energy sources as well as electricity

**Technology & Application**

- Data Measurement, Analysis, and Control
- Wired or Wireless (Ethernet, RS485, NFC)
- Control Panel, Control Valve, Light Control
- Factory (FEEMS), Building (BEMS), Home (HEMS)
- Renewable, ESS, Smart Devices, Chiller / Boiler, Pumps, Gas / Water
7-2. K-EMS : EXPansion

Construction of 130 domestic & overseas locations including public institutions & factories

8. Smart Town

Purpose: Improving energy efficiency by installing SG facilities in each building and operating all K-BEMS system implemented.

Duration: DEC 2014 ~ MAR 2015 (1st Stage), DEC 2015 ~ OCT 2016 (2nd Stage)

Goal: Reduce Power Consumption by 15%, Peak Load by 10%, CO2 by 15%
9. Smart City: Naju Innovative City Project

- **Goal**: To Enhance the quality of life and sustainability of the city
  - Establishing the Smart City with advanced Smart Solutions to reduce CO₂ and enhance energy efficiency
  - Energy Self-supporting 20%, Utilization Efficiency Enhancement 15%, CO₂ reduction 30%

- **Duration**: 2016 ~ 2020

- **Infra**
  - K-EMS (Building, Factory etc.)
  - Photo Voltaic
  - EV Charger
  - AMI
  - Total Integrated Operation System for Smart City

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10. New Energy Biz Model

[Diagram showing the New Energy Biz Model]

- **Behind The Meter**
  - EMS
  - EV
  - DER

- **Self Production & Consumption**
  - E-Prosumer

- **Surplus Power Sales**
  - V2G
  - DR

- **Aggregator**

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11/14
11. Expected Benefit

KEPCO SMART City

SG Infra + ICT + GRID

- Reducing CO2 Emission
- Enhancing Energy Efficiency
- Securing Future New Growth Engine
- Creating New Market

THANK YOU