

Smart Grid Deployment Project of KEPCO

Nov.14. 2017

Gun-Bae, Park
Senior Manager





Contents

I. KEPCO in brief



II. Smart Grid Road Map of KEPCO

III. Smart Grid Deployment Project



I . KEPCO in brief

KEPCO Profile



Government

(As of 2016) (1USD=1,100KRW)

Total Assets	\$159 billion
Revenues	\$54 billion
Customers	22,030,000
Employees	20,196

(51%)



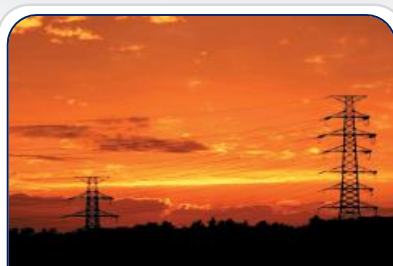
Generation Capacity & Peak

Year	'14	'15	'16
Capacity (MW)	93,216	97,649	105,866
Peak (MW)	80,154	78,790	85,183



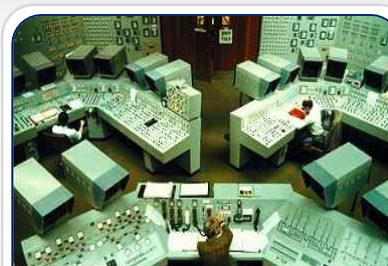
Generation

84%



Transmission

100%



Distribution

100%



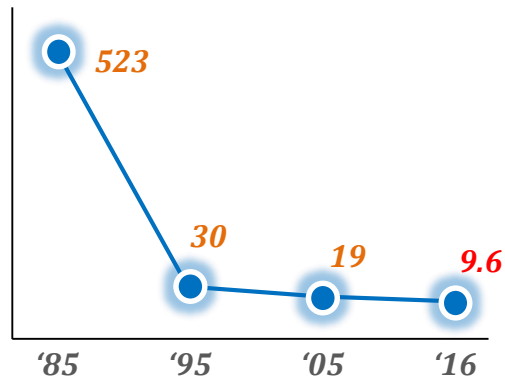
Retail

100%

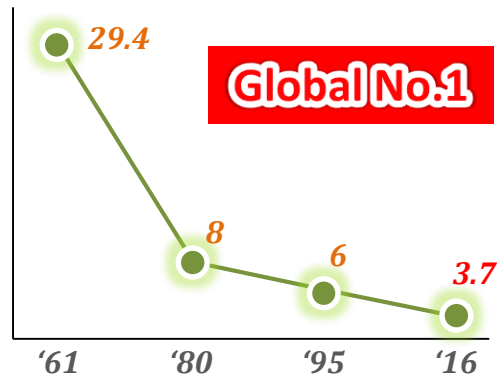
Management Performance



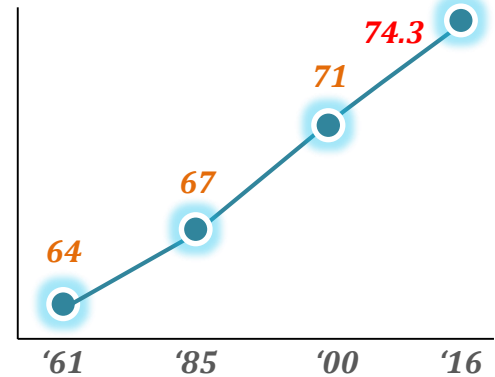
SAIDI
[min]



T & D Loss Rate
[%]



Load Factor
[%]



- SAIDI: System Average Interruption Duration Index

No.1 Electric Utility Company (Forbes)

The List

[Spreadsheet](#)
[Reprints](#)
[Logo Use](#)


Filter list by: All industries ▼ All countries ▼ All states ▼

Search by company name



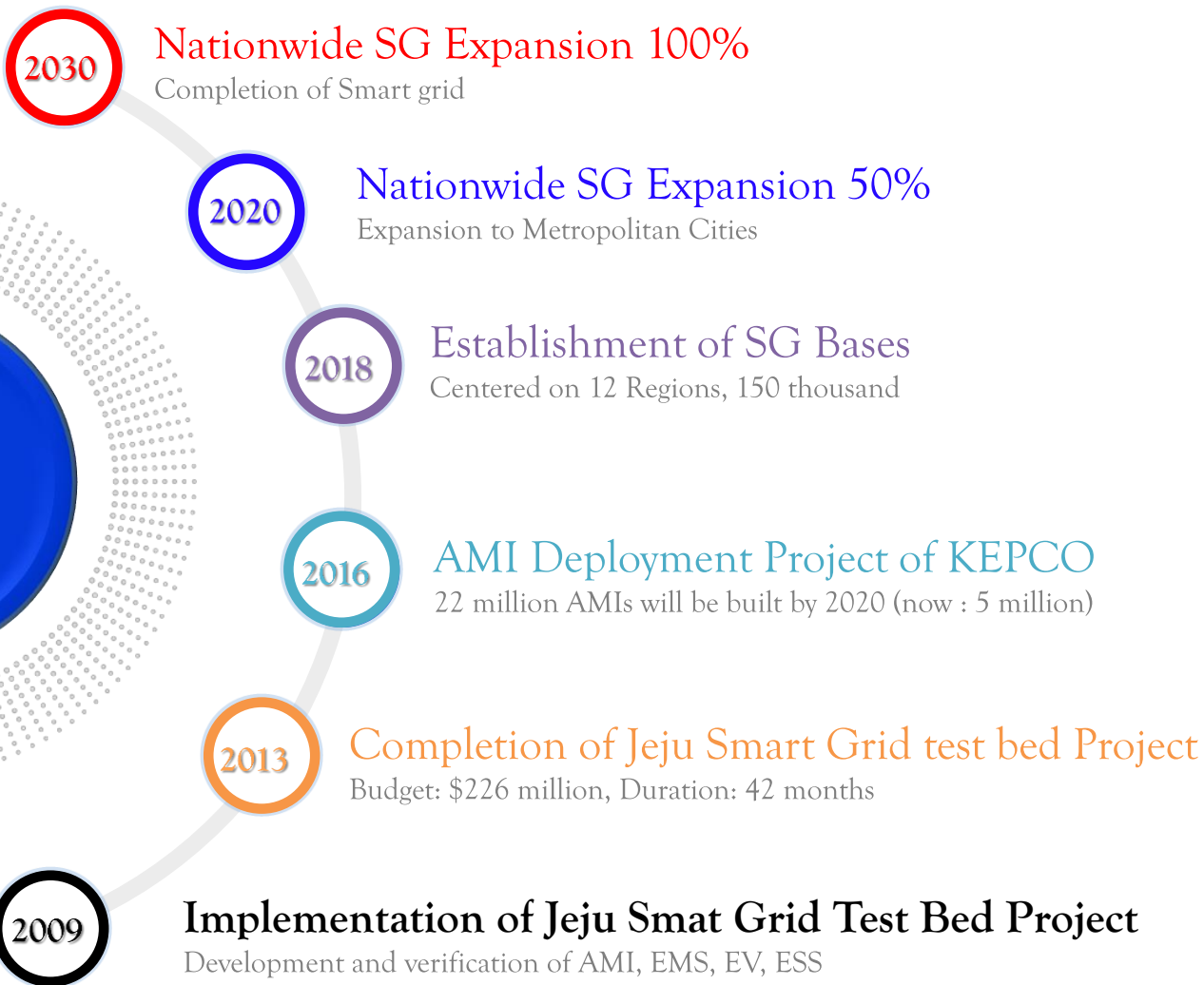
Rank	Company	Country	Sales	Profits	Assets	Market Value
#97	Korea Electric Power	South Korea	\$52.1 B	\$11.7 B	\$149.5 B	\$33.1 B

II. Smart Grid Road Map

National Smart Grid Road Map



Project History



III. SG Deployment Project

(AMI, K-BEMS, Smart City, MG, FR-ESS)

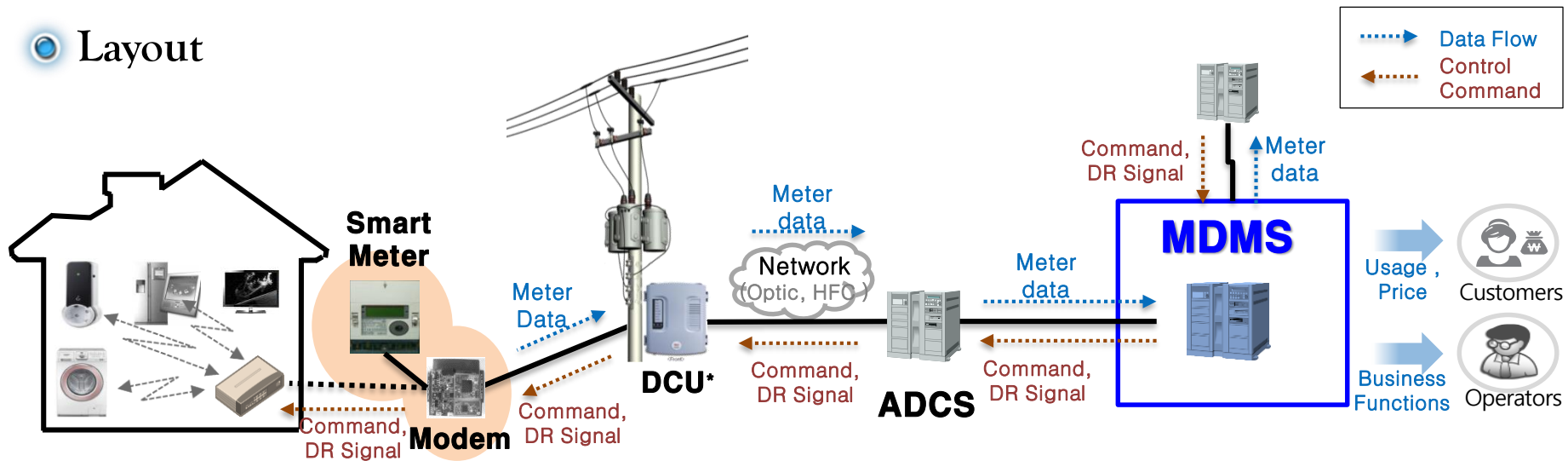
1-1 AMI - Overview



Objectives of AMI

- **Reducing** customer's power consumption voluntarily by providing usage and price information
- **Managing** the power demand through sending 'Demand Response Signal' by bi-directional communication network
- **Supporting** utility's business operation in marketing and distribution area

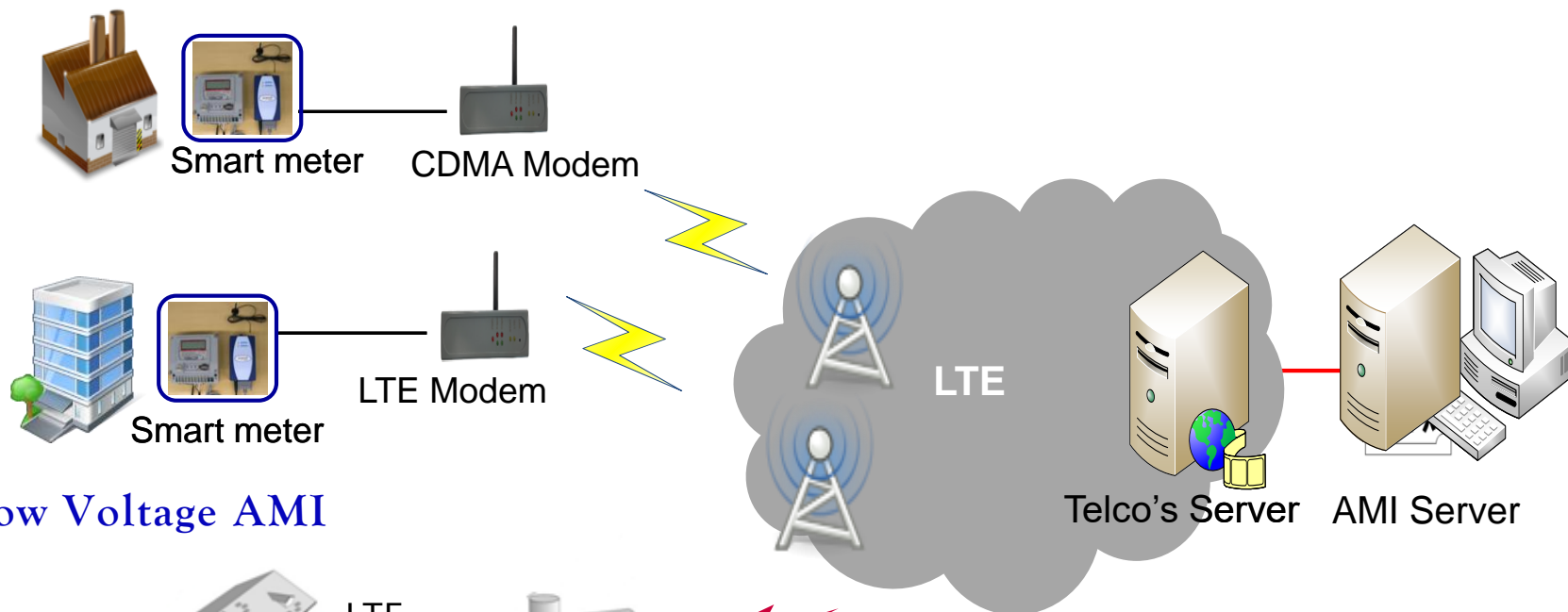
Layout



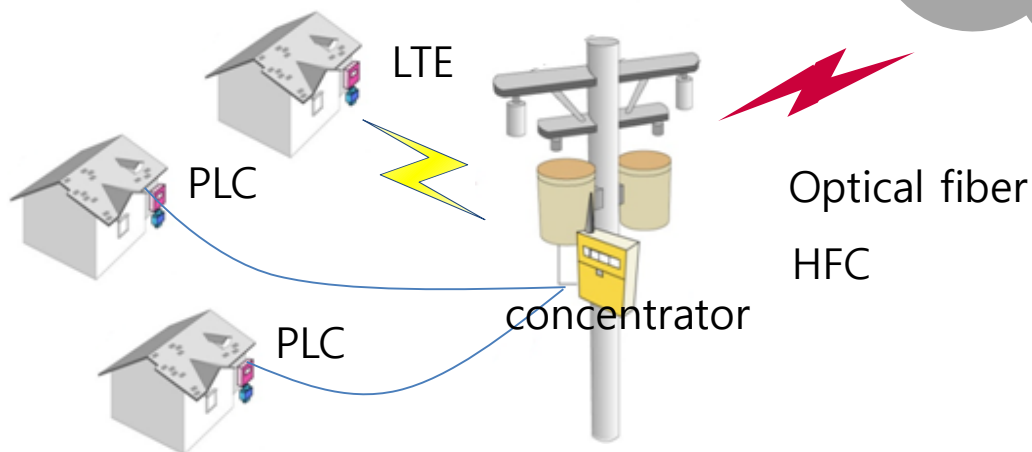
AMI - Configuration



High Voltage AMI



Low Voltage AMI





AMI – Roll Out & Meter

Roll Out

Low voltage	~ 2016	2017	2018	2019	2020
Installation (10 thousand unit)	480	300	400	520	550
Cumulative Installation (10 thousand unit)	480 (Completed)	780 (In progress)	1,180	1,700	2,250

✓ High voltage : Completed the installation of AMI in 2006 (200,000)

Smart Meter

AE-type

For residential,
small business customer



G-type

For business district,
small scale industrial area



Remote Reading : Bi-directional Electric-Power, PF, Peak, Power Quality (Voltage, Harmonics)
Power Outage Management, Remote Power On/Off, Tampering Detection etc.



AMI – Services for Marketing Area(1)

Marketing Area

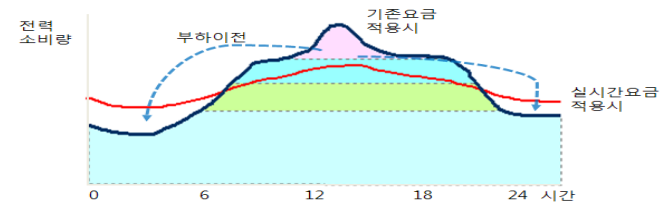
Auto Meter Reading



- Collecting the Real-time Power Consumption Information using LP Data (15min./30min./1hours)
- Economic Cost-related Tariff like RTP Applicability

Demand Response(DR)

- Application of Tariff(TOU, CPP, RTP) for DR
- Decreased Investment of Power Facilities through Peak Reduction
- Inducing Customer's Voluntary Energy Consumption Saving with Providing Real-time Power Consumption and Charging Data





AMI – Services for Marketing Area(2)

Marketing Area

Remote On/Off

- Remote Electricity On/Off using Relay S/W of Smart Meter
- Securing Electricity Safety through Remote Suspension in Case of Fire

Distributed Generator Management

- Calculation of Real-time Renewable Energy Generation Quantity
- Optimization of DL Operation Considering Distributed Generator

Anti-Theft Function

- Detect theft by comparing Tr. load data with clients' consumptions
- Automatic warning for meter tampering (via Beeping and SMS)



AMI – Services for Distribution Area(1)

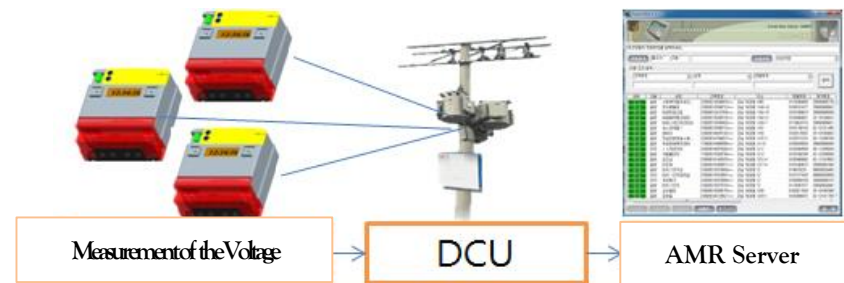
Distribution Area

Outage Management

- Reduction of Fault Recovery time using Real-time Data Acquired by AMI
- Minimization of the Outage Damage by real time information to Customer

Power Quality Management

- Real-time Measurement of the Voltage by Smart Meter
- Solving Phase Unbalance through Measuring each Phase



< Real-time Voltage Measurement >

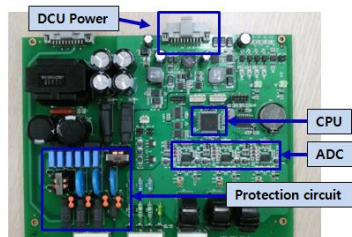


AMI – Services for Distribution Area(2)

Distribution Area

Transformer Load Management

- Transformer Monitoring such as Temperature (Adding Sensor), Overload Rate
- Customer Load Management by Monitoring Transformer Load Data



Support to Distribution Business

- Distribution Planning through Real-time Distribution Line Load Analysis
- Set up Investment Plan by Real Time Load Analysis Data from AMI
- Supporting to locate optimizing Transformer Installation by AMI

AMI – Smart Phone App

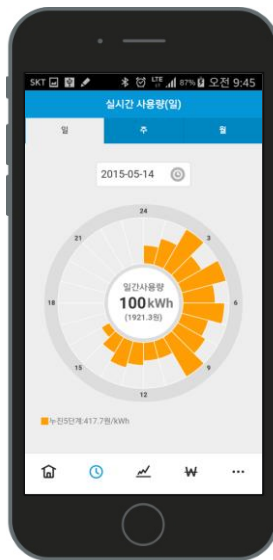


AMI Customer Service (Smart phone App)

- ✓ Real-time usage/price, predicted usage/bill
- ✓ Usage pattern analysis, neighborhood usage comparison → inducing voluntary power saving



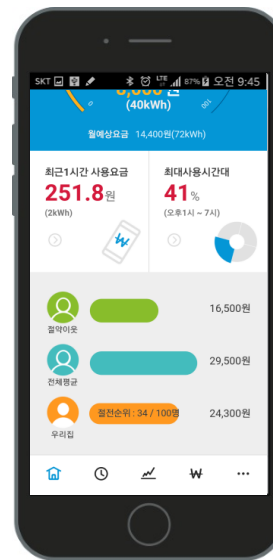
Realtime
usage / price,
predicted Bill



Historical Info.



Usage pattern
Analysis



Neighborhood
usage comparison

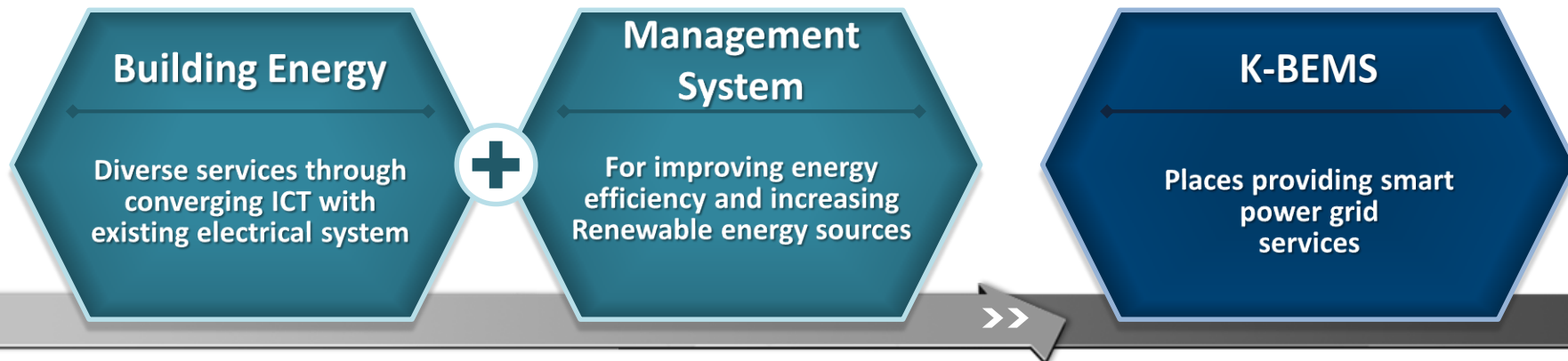


Web Service

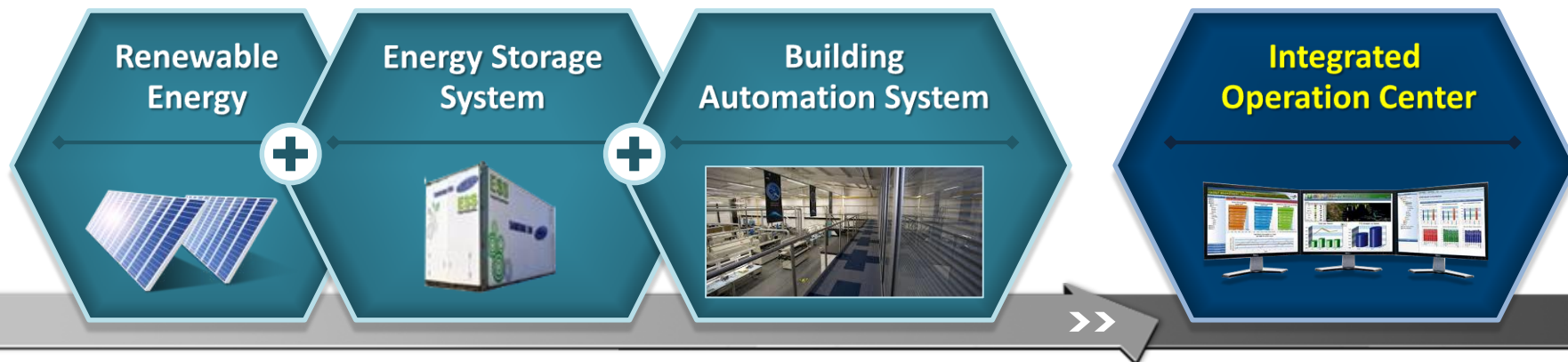
K-BEMS



Definition



Functional Definition



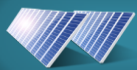
K-BEMS



K-BEMS Project Construction

- Based on the successful Guri office test-bed, project was expanded to 120 offices
- 83 SMEs participated in the K-BEMS project.

K-BEMS Specifications



4.54 MW



9.07 MWh



6.63 MW

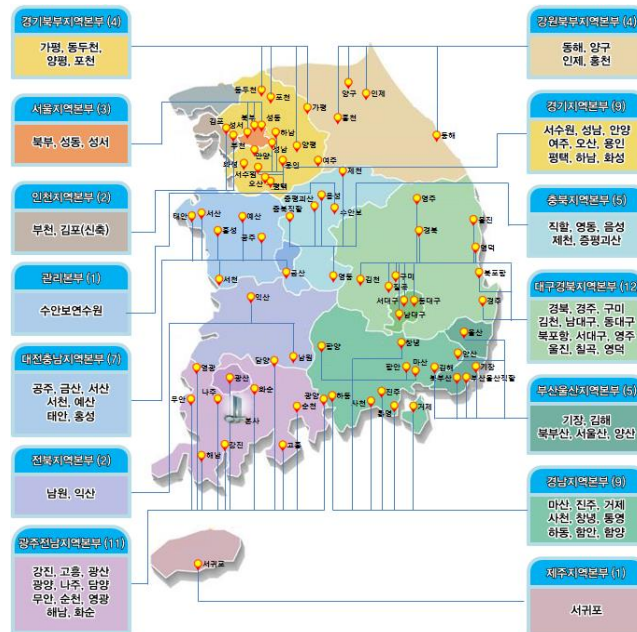
BAS

31 integration



\$ 20.3 million

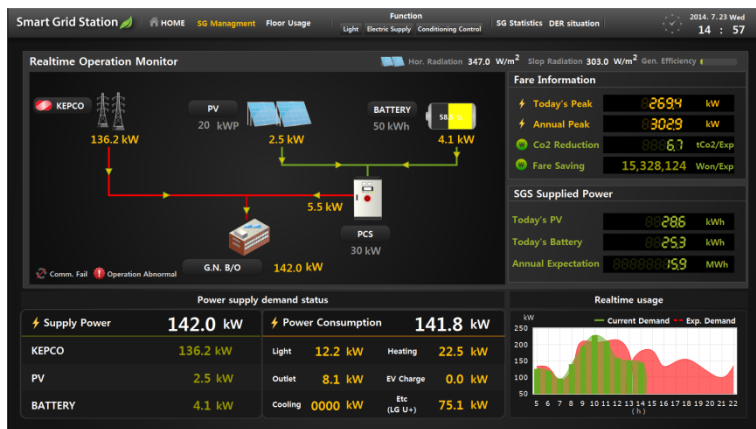
Location of K-BEMS



K-BEMS



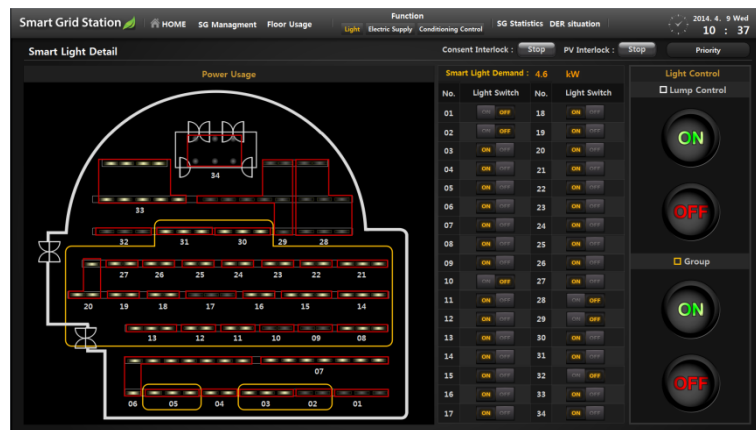
Operation System



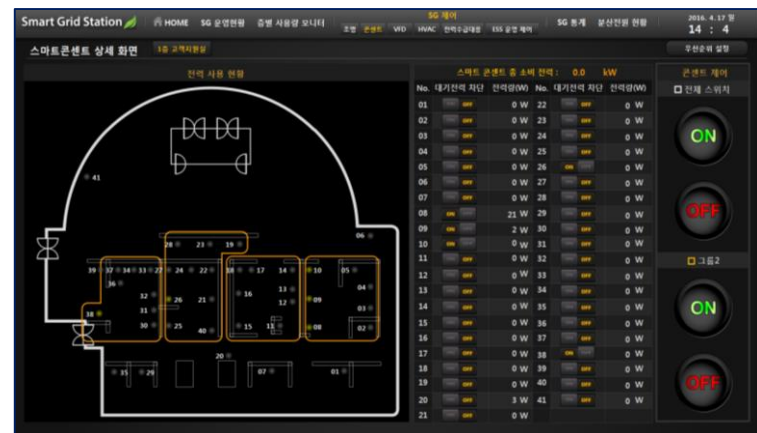
Realtime Operation Monitor



Analysis & Record



Smart Light Control



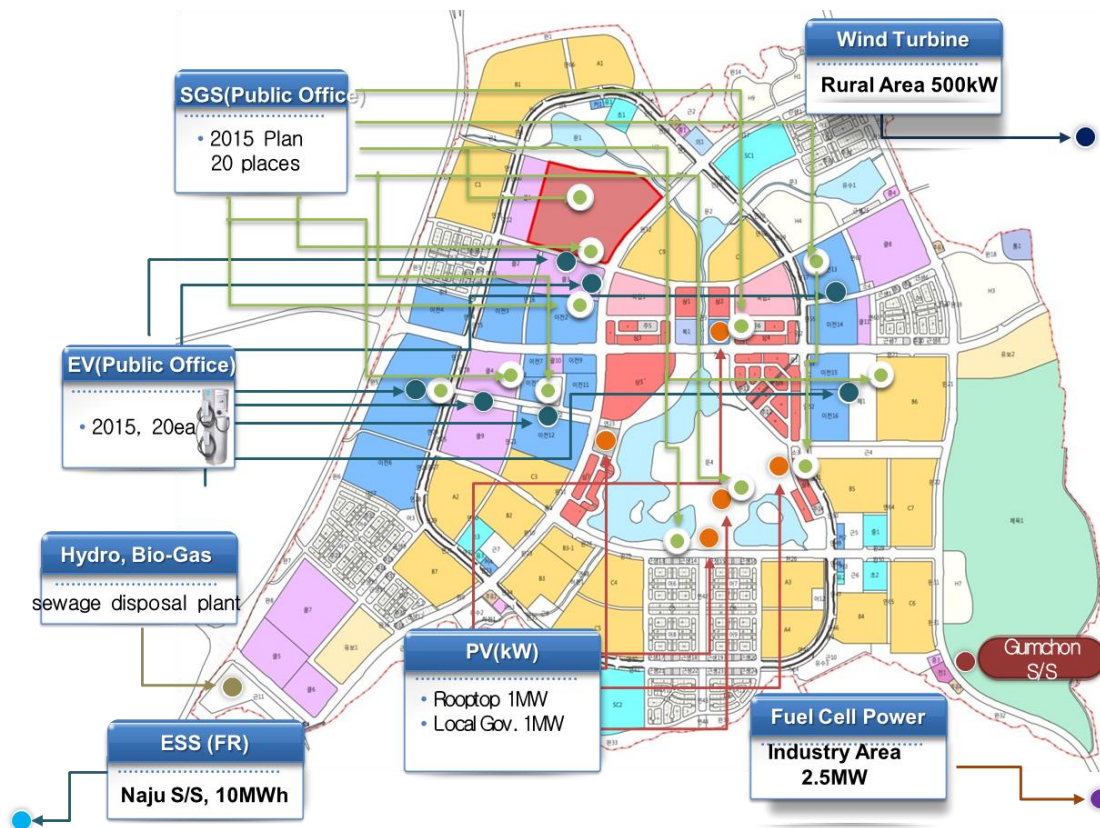
Smart Outlet Control

Smart City – Naju City



Smart City Project (Domestic)

- Duration : 2015 ~ 2020
- Contents : K-BEMS, Renewable, EV charger, ESS, TOC



Smart City - Dubai



Dubai Smart City

Layout of dewa green Garage K-BEMS



Micro Grid – Gapado Island Project



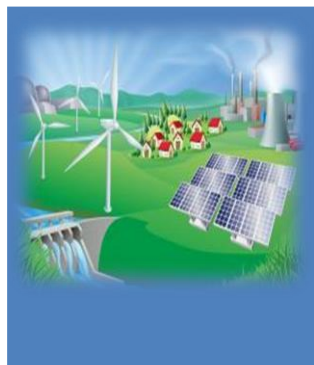
► Satellite Picture



Micro Grid



Project for isolated island



Gapa Island



Deokjeok Island



Ulleung Island

Area/
Population

0.85km² / 281

Customers

193

Configuration

WT+PV+ESS+AMI

Feature

Carbon Free
Island
(Korea's First)

Status

Operating

22.97km² / 1,919

1,000

WT+ PV+ ESS + EMS
+ Geotherm

Ecology Energy
Independent Island
(Stailization, Optimization)

Project Started

72.9km² / 10,673

7,932

WT + PV+ Hydro +
Geotherm + ESS + EMS

Green Energy Independence
Island
(Economic feasibility
+ Supply reliability)

Planning



ESS for Frequency Regulation

▶ ESS for Frequency Regulation

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

▶ Target : To Build 500MW ESS (2014 ~ 2017)

Classification	Operation		Construction	Planning	Total
	'14	'15	'16(~'17.6)	'17	
Capacity(MW)	52	184	140	124	500
Substations	2	7	4	4	17



< Seoansung S/S >



< Shinyongin S/S >



< Shingerong S/S >



< Shinhwassun S/S >

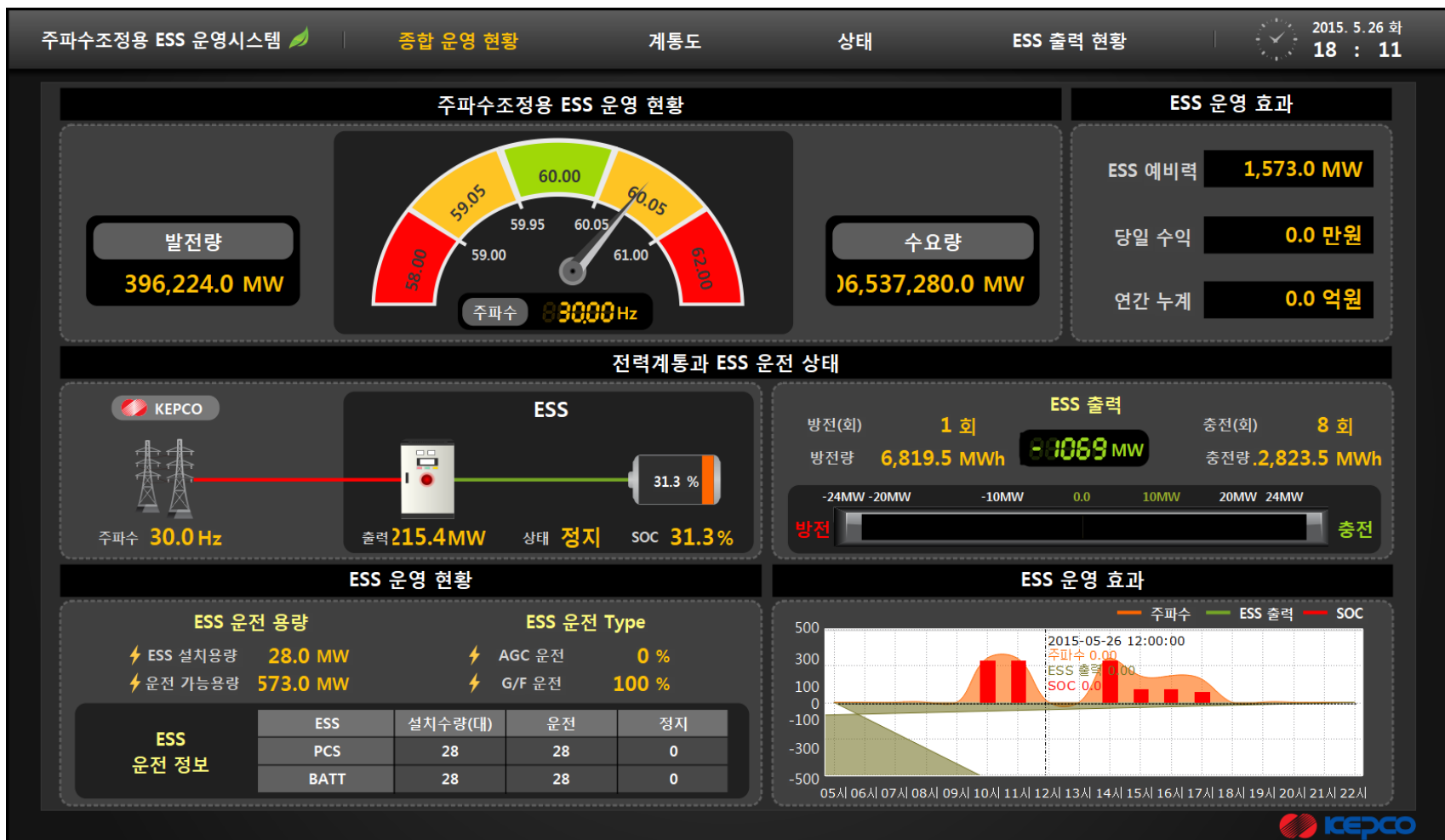
※ The largest capacity of F/R ESS in the world

- Reduced \$346 million of generation cost
- Project with 33 SME's provided track record for SME's to win overseas contracts

ESS for Frequency Regulation



FR ESS Operation System



Thank you for your attention

E-mail : gbpark@kepco.co.kr

