

Jeju Smart Grid Field Trial

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General aspects

Jeju Field Trial

Lessons Learned

Economy Overview – South Korea



- Area: 99,720km² (115th in the world)
- Population: 48 million (26th in the world)
- GDP : US\$929.1 billion (14th in the world[2007])
- Trade : US\$950 billion (10th in the world)

• Key Industries and Global Ranking

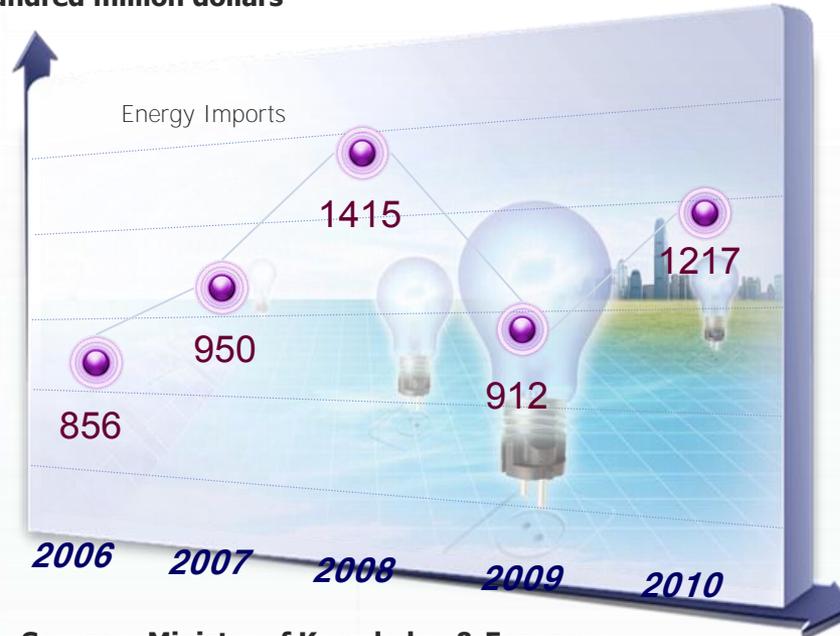


Energy dependency

- One of 10 largest energy consumption countries
- Foreign Energy Dependency (97%), (2008: U\$141.5 billion)

Energy Imports

Unit: one hundred million dollars



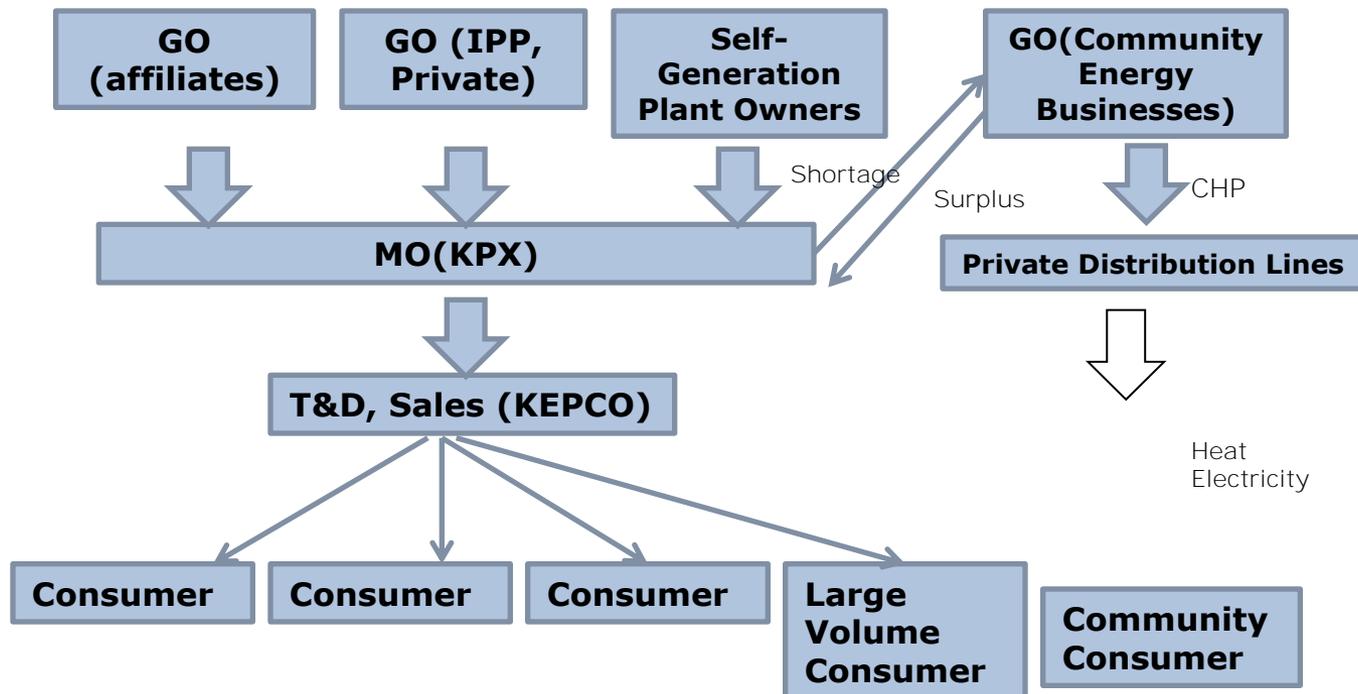
Source : Ministry of Knowledge & Economy

Electricity Industry

Restructured from

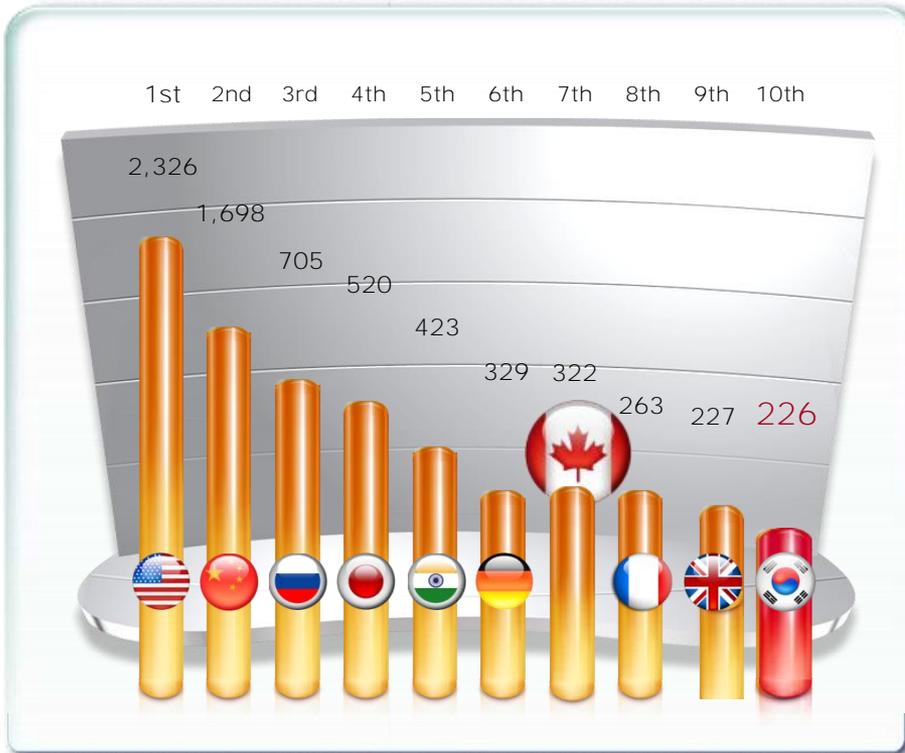
- **KEPCO** ²⁰⁰¹ : TO, DisCo, LSE
- **KPX (Korea Power Exchange)** : SO, RTO, MO
- **6 KEPCO affiliated Companies** : GenCo
- **Other 7 IPPs**

- TO: Transmission Owner
- DisCo: Distribution Company
- LSE: Load Service Entity
- SO: Service Operator
- RTO: Regional Transmission Org
- MO: Market Operator
- GO: Generation cOmpany
- IPP: Independent Power Producer



Electricity Consumption

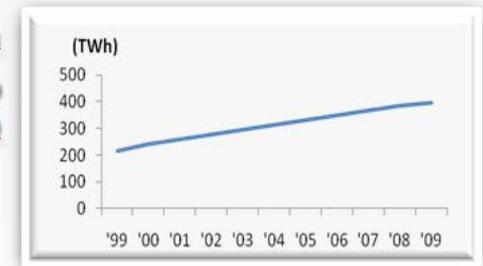
Global Energy Usage



Source: Consumption of Energy and Oil 2006: BP Statistical Review of Energy(BP,'07.6)



Annual Growth
8.4%
(average of last 10 years)



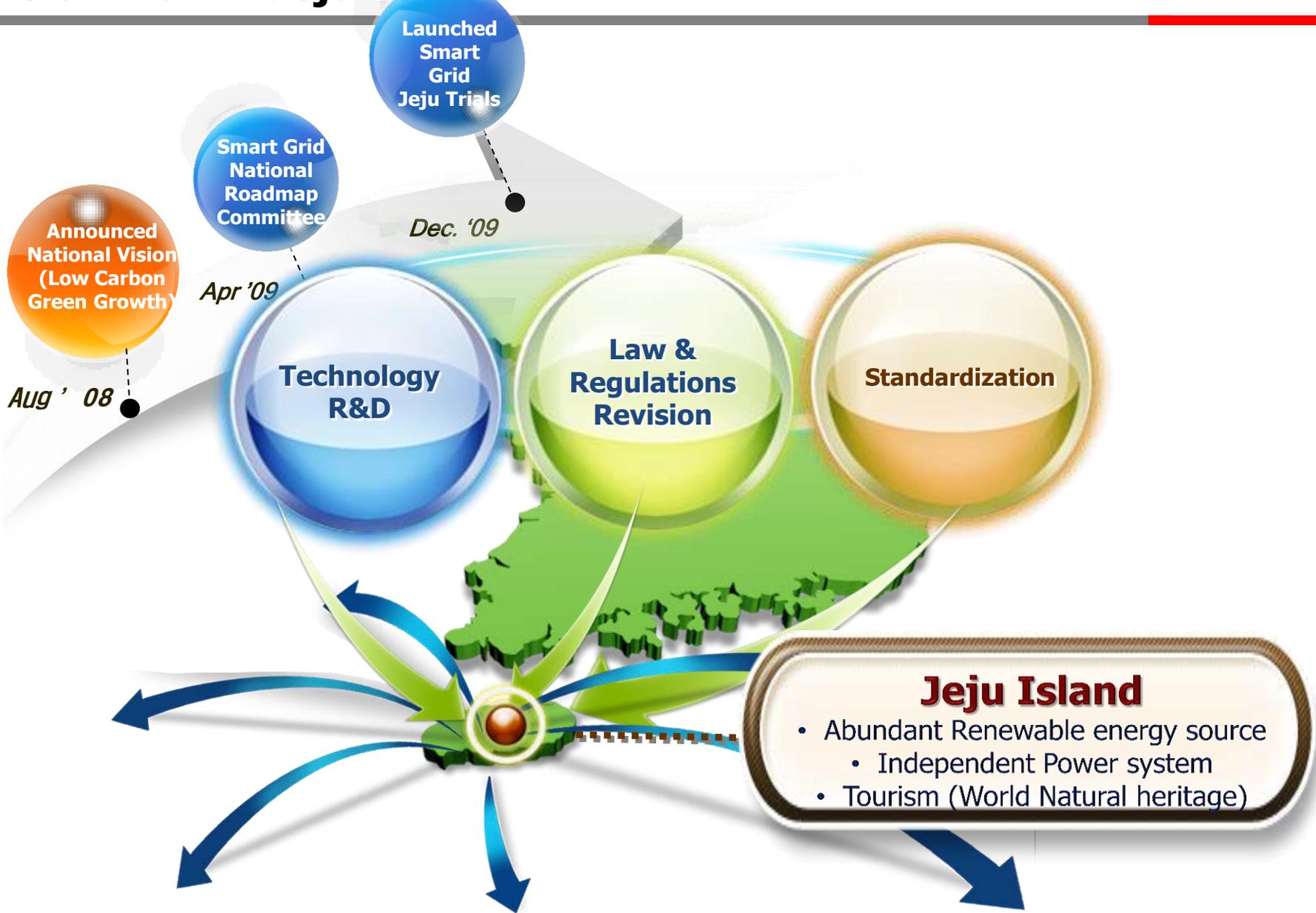
“Electricity usage is increasing because of low price and easy access.”

General aspects

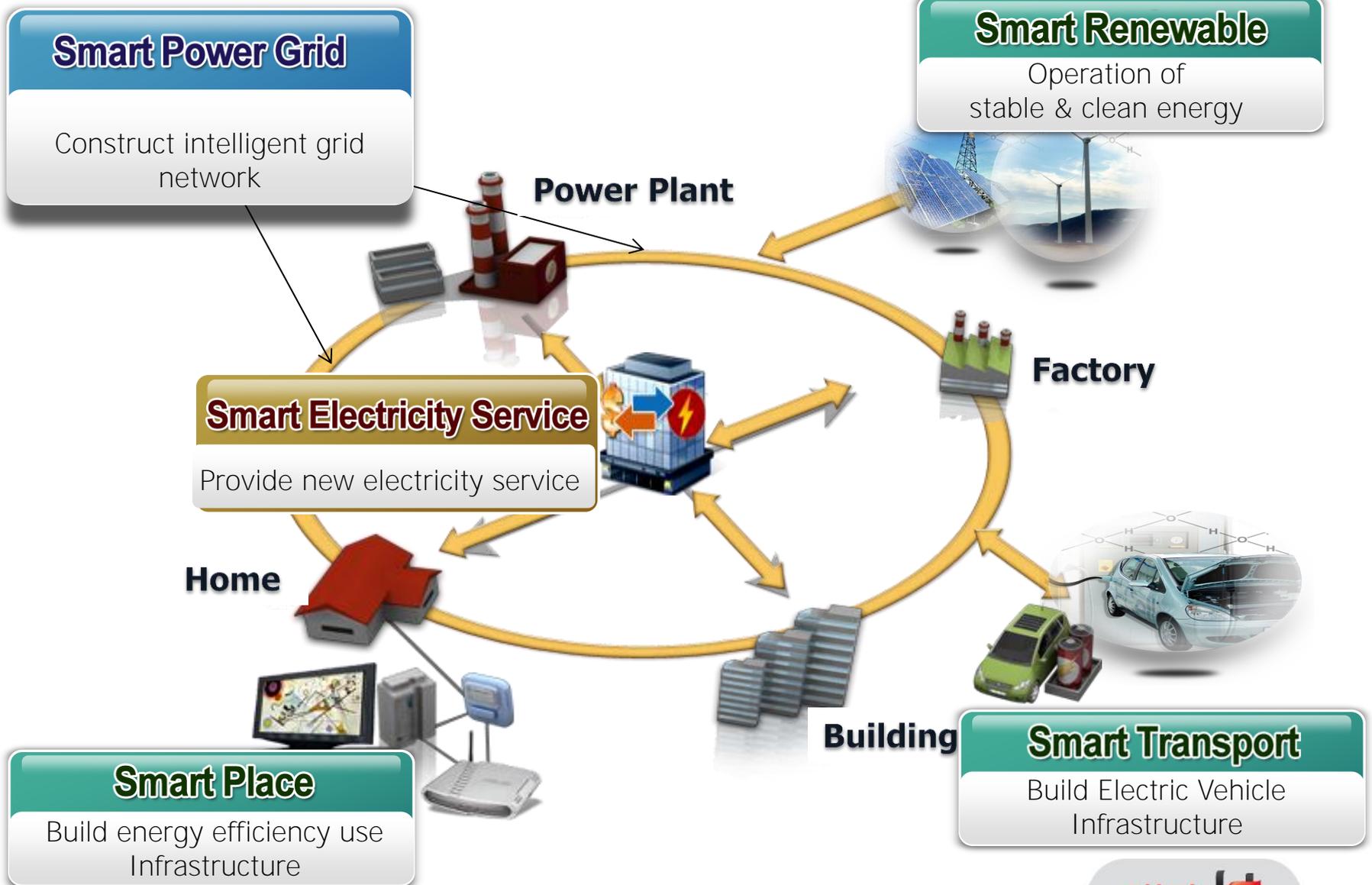
Jeju Field Trial

Lessons Learned

Field Trial in Jeju Island



Five Domains



Consortia

	Leader	Participants	Investment(us\$)
Smart Place	 SK telecom	Samsung electronics, Korea Cable TV, Jeju broadcast etc (29 companies)	Govt : 5 million Private: 25 million
	 olleh kt	Samsung SDS, Samsung Trade, Rootech etc (14 companies)	Govt : 4.7 million Private: 30 million
	 LG Electronics	LG U+, GS pure cell, GS construction etc (15 companies)	Govt : 4.7 million Private: 17.5 million
	 KEPCO	Samsung electronics, Taihan Electric, Nuri Telecom etc (38 companies)	Govt : - Private 10 million
Smart Transportation	 KEPCO	Samsung SDI, Lotte data communication, P&E Solution etc (22 companies)	Govt : 4.5 million Private:14 million
	 SK energy	SK Network, Iljin Electrics, Ientech etc (13 companies)	Govt : 4.5 million Private: 13 million
	 GS Caltex	LG CNS, ABB Korea, NexCon Take etc (7 companies)	Govt : 4 million Private 8 million
Smart Renewables	 KEPCO	KOSPO, Hyosung, LSIS etc (16 companies)	Govt : 4.7 million Private: 15.3 million
	 HYUNDAI HEAVY INDUSTRIES CO.,LTD.	Maxcom, Icellkorea etc (6 companies)	Govt : 4.7 million Private 7 million
	 POSCO ICT	LG Chem, Woojin Industrial System, Daekyung Engineering etc (6 companies)	Govt : - Private: 9 million
Smart Power Grid	 KEPCO	LS IS, KDN (KEPCO affiliate), wtc (18 companies)	
Smart Electricity Service	 KEPCO  KPX	Wooam Corp., Bitek,IC etc (5 Companies)	

Trial Sites

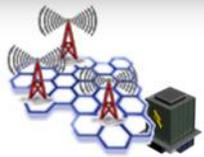


 **Smart Place**

 **Smart Transport**

 **Smart Renewable**

Smart Power Grid



Smart Renewables



Smart Green Homes



Smart Power Market



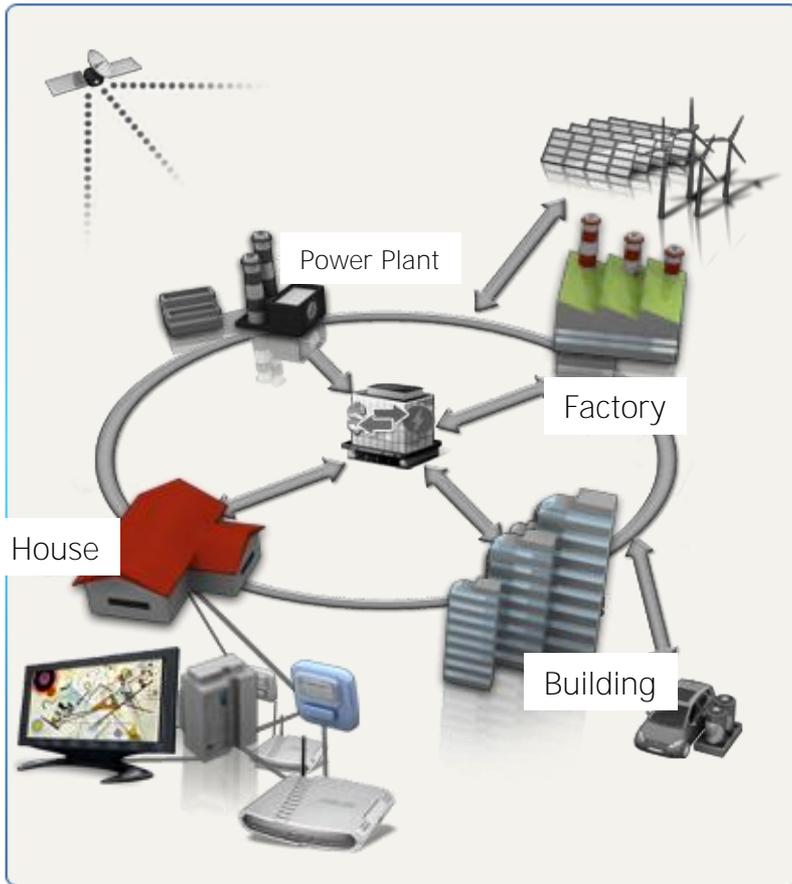
Smart Transport



Domain 1 - Smart Place

Objectives

- To increase energy efficiency and reduce energy use via AMI
- To control energy use via two-way communication energy management System



Key Technology Deliverables

- Develop AMI and set standard (2012)
- Develop system to connect DR with the grid (2020)

Business Model

- Emergence of smart appliances and energy management service providers
- Emergence of prosumers (sell and consume)

Goals by Critical Index

Energy save(%)



Demonstration

'12 '20 '30

Smart meter installation(%)

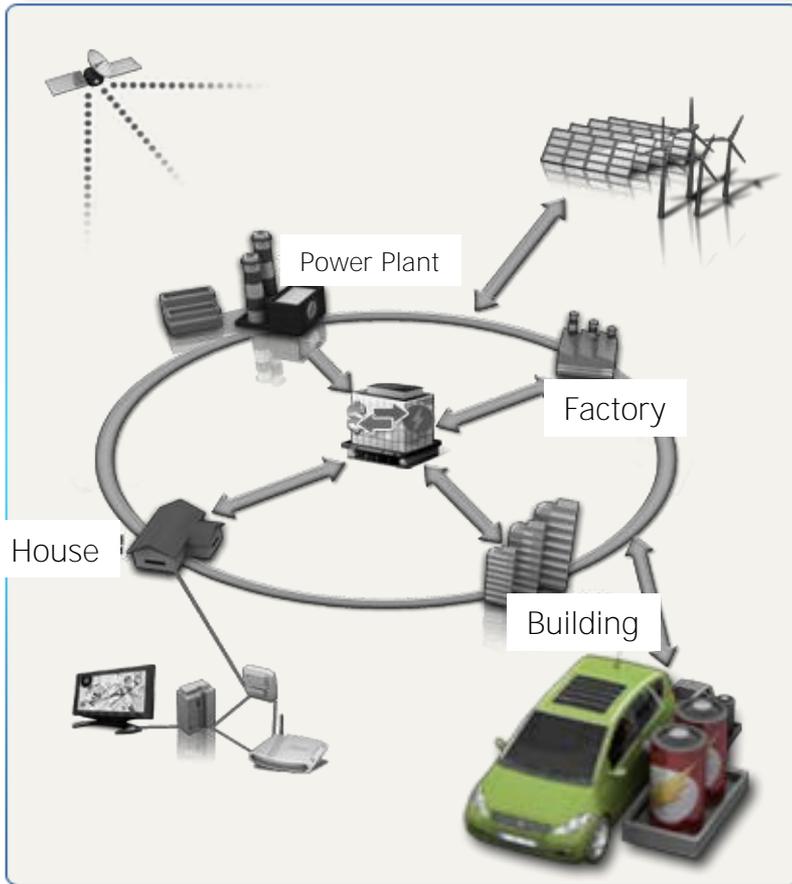


'12 '20

Domain 2 - Smart Transportation

Objectives

- To establish charging infrastructure
- To allow consumers to charge during low-demand/low-rate hours and re-sell During peak hours



Key Technology Deliverables

- Develop EV parts and materials (2012)
- Develop Vehicle to Grid system and ICT service (2020)

Business Models

- Emergence of EV/battery rental service
- Emergence of EV operating management service business

Goals by Critical Index

EV Distribution(1,000 units)



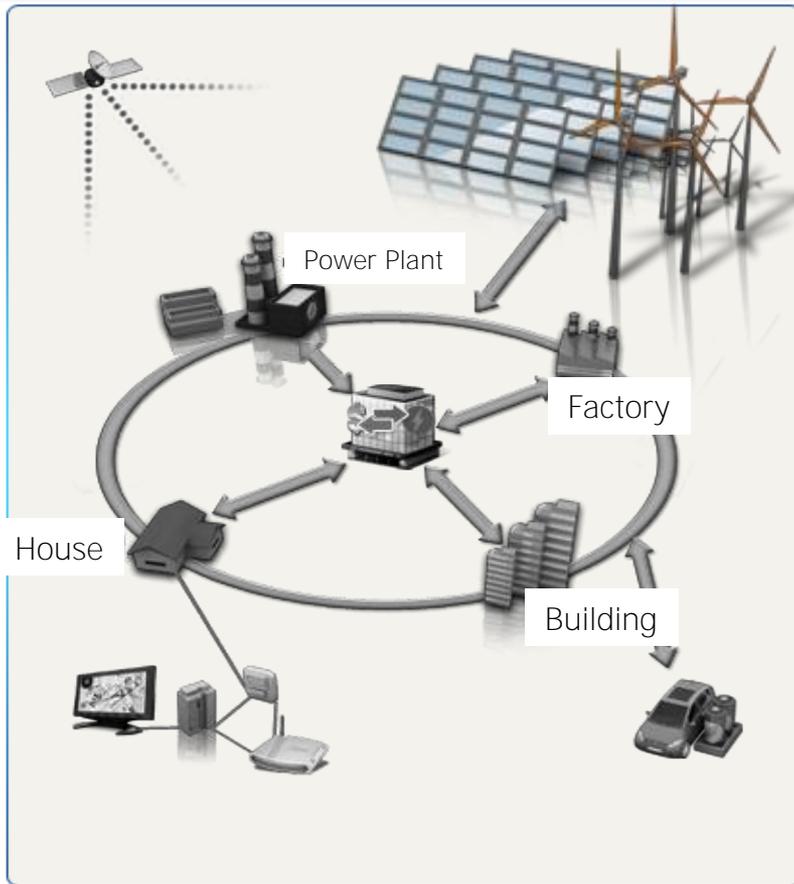
EV Charging infra (1,000 units)



Domain 3 - Smart Renewables

Objectives

- To create large-scale renewable generation power plants
- To build green homes and buildings that are energy independent using renewable



Key Technology Deliverables

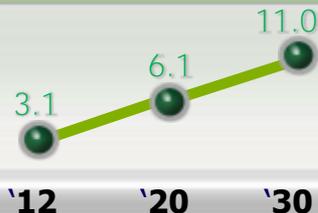
- Develop technology for stable connection of renewable generation to the grid (2012)
- Develop ESS for bulk renewable generation ('20)

Business Models

- Production and sales of renewable energy
- Exportation of ESS that is connected to the grid

Goals by Critical Index

Renewable Energy(%)



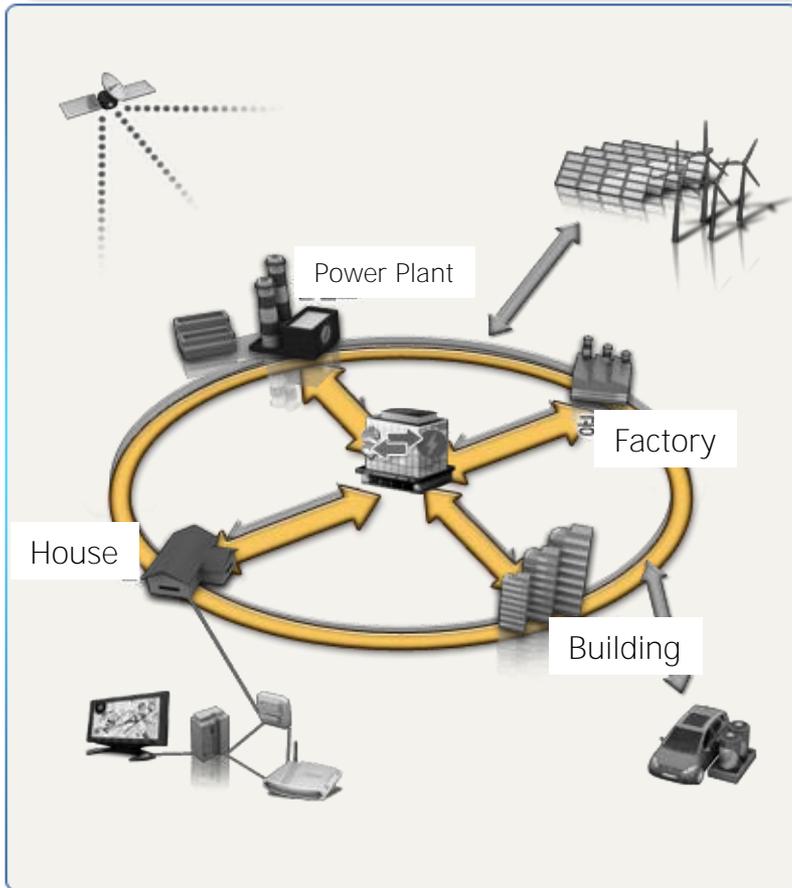
Zero net energy building(%)



Domain 4 - Smart Power Grid

Objectives

- ⊖ To establish bidirectional power grid that allows new integrated/complex businesses
- ⊖ To increase energy efficiency and quality through self-automated recovery system



Key Technology Deliverables

- ⊖ Pilot smart grid technology :distribution/ transmission ('12)
- ⊖ Implement self/automated recovery system for broad area

Business Models

- ⊖ Testing/ certifying system of smart power grid technology
- ⊖ Exporting key smart power grid

Goals by Critical Index

Transmission/ Distribution Loss(%)



'12 '20 '30

Power failure (min)

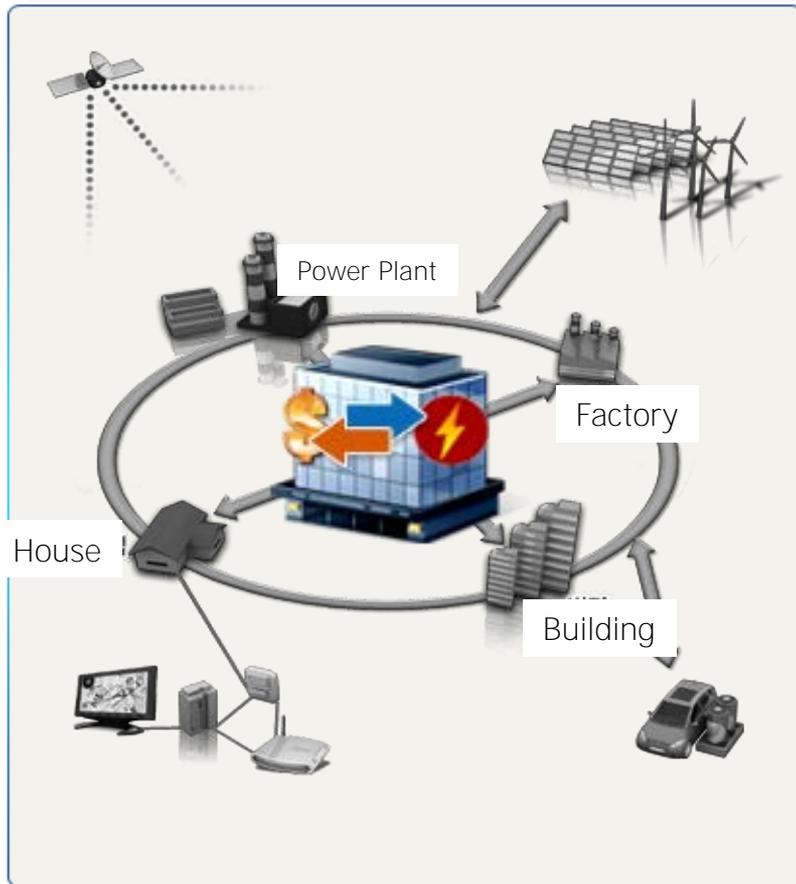


'12 '20 '30

Domain 5 - Smart Electricity Service

Objectives

- ⊖ To encourage TOU pricing with consumer participation
- ⊖ To promote on-line system for power exchange and derivatives



Key Technology Deliverables

- ⊖ Develop real time pricing and demand response system ('12)
- ⊖ Develop on-line power exchange system (2020)

Business Models

- ⊖ Customer based power providers
- ⊖ Diverse power derivatives are expected to emerge

Goals by Critical Index

TOU billing

Demonstration | Nationwide

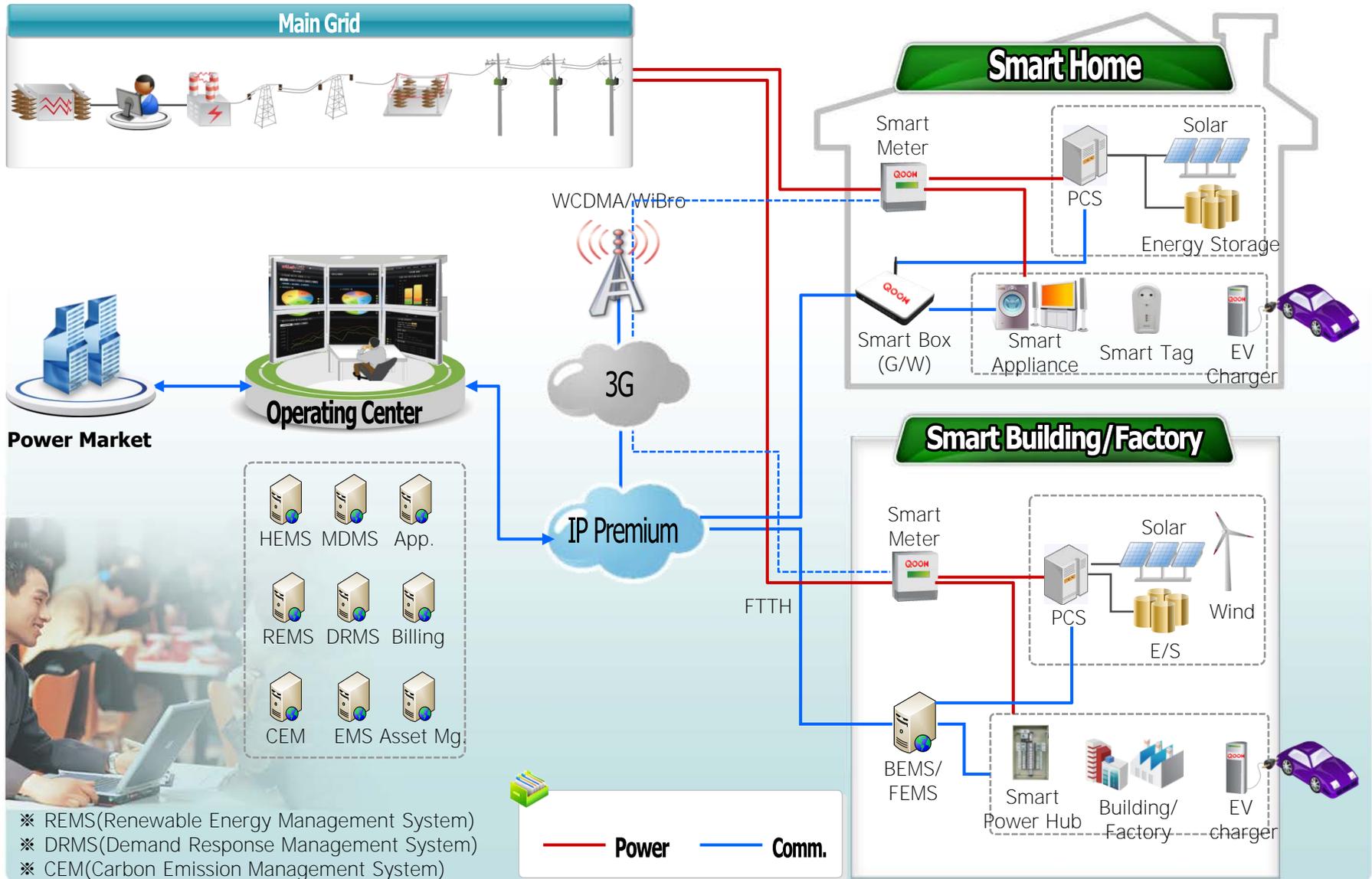
'12 | '20

Consumer participation (%)



'12 | '20 | '30

Architecture – KT Consortium



- ※ REMS(Renewable Energy Management System)
- ※ DRMS(Demand Response Management System)
- ※ CEM(Carbon Emission Management System)

New Business Models



- Electricity Retail
- Demand Response
- Consumer-generated power trading service
- Operation of Virtual Power Plant based on EV



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



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

Technology Verification



AMI, EMS, Smart Appliance

- Real-time information exchange between consumers and suppliers that optimizes electricity supply and demand through technology development and trial operation
- AMI, EMS, Smart Appliances



EV Charging Infrastructure

- Development of quick and standard charging service and delivery of various services for the electric vehicle infrastructure communication
- EV Charging, V2G



Energy Storage System

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



Grid Integration Technology

- Connecting Micro-grid, electric car battery to the power grid and allow electricity to transmit both ways
- Transmission, Distribution Technology Development



Demand Response

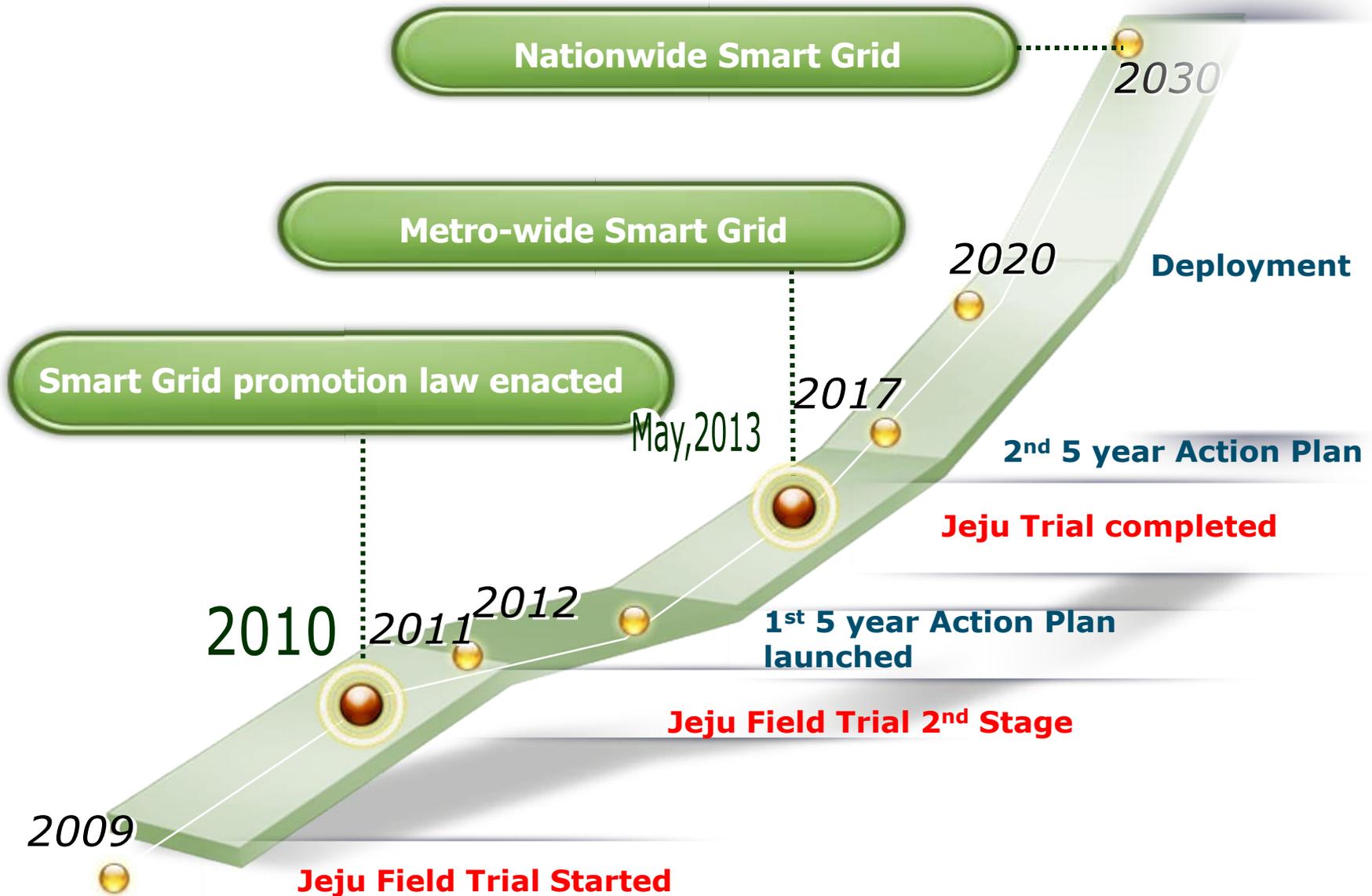
- Depending on the changes of the electricity rates in real-time consumption, test a system that consumers are able to induce and adjust the electricity consumption freely
- DR price market

General aspects

Jeju Field Trial

Lessons Learned

Roadmap by MKE



Smart Grid Promotion Law

Backgrounds

Needs for Systematic & consistent Smart Grid Business promotion

Limitation of current regulation and systems

Promoting Integration of power infrastructure with IT for co-growth

Legislation

- Set up Smart Grid Implementation Action Plan (5 year span)
- Smart Grid Service Provider Registration
- Subsidies for Smart Grid Private Investment
- Dedicate Areas for Smart Grid Implementation
- Certification & Standardization

Holdbacks Against Early Deployment

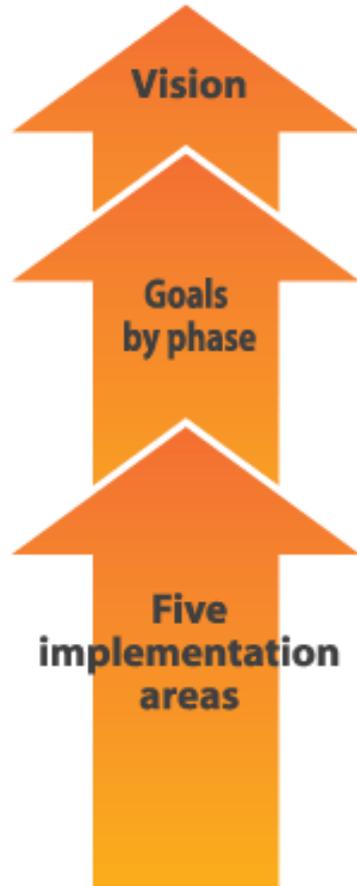
- Regulation (for Smart Grid Trials)
- Skeptical Eyes of Stakeholders
- **Low Consumers' Participation** (Weak Impact on Residential Consumer)
- Lack of Business Models
- Reluctance of Market Player with Vested Interest
- Lack of Private Investment Attraction
- Low and Uniform Pricing
- Low Incentives for Private Investment
- Too Many Technologies Options vs. No Technology

Solutions for Early Deployment

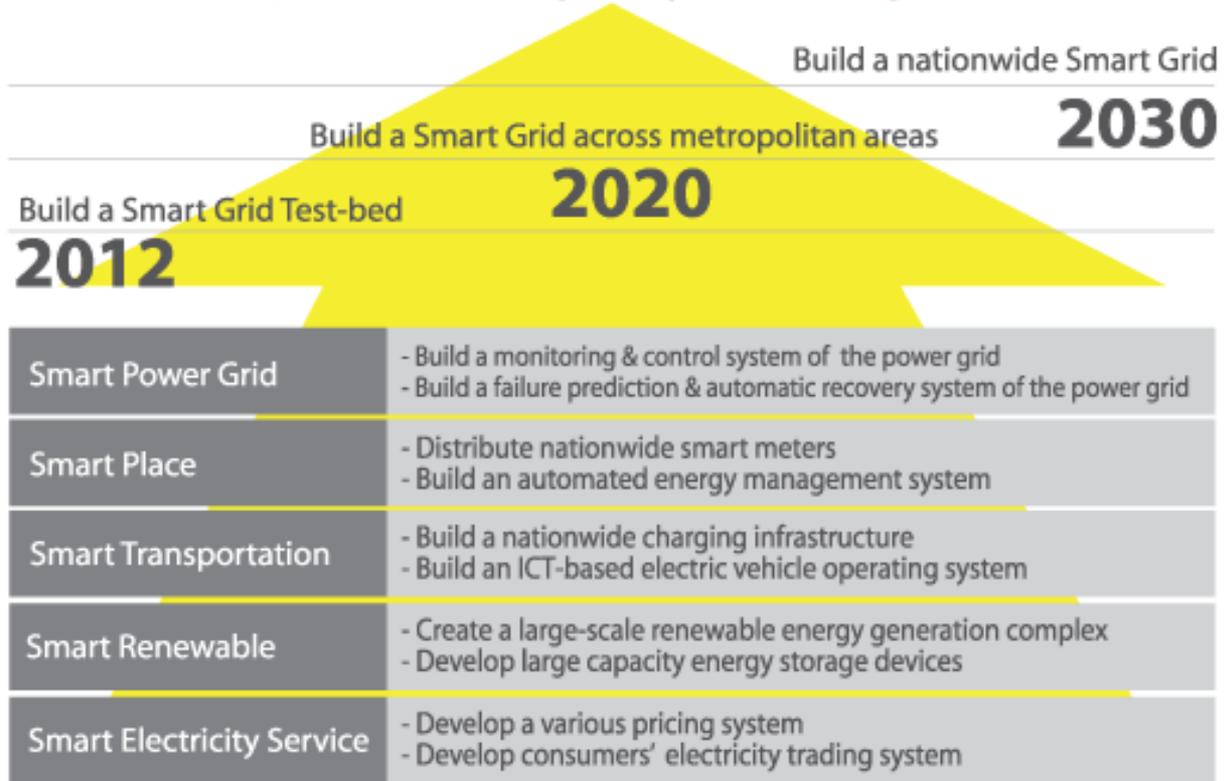
- Deregulation for Market Entry, Competition
- Dedicated Joint (Gov + Private) Organization for Smart Grid Planning
- **Government's consistent Will and Driving Force**
- Promotion to Provoke Participation
- R&D Competition and Incentives
- Discover DR Resources and setting up utilization plan
- Introduction of Various Pricing (TOU , CPP , Sliding Scale on Oil Price)
- Technology vs. Behavior (Habits)
- Budget for Operation for DR Market
- Make most of Other Industry Technologies
- Voluntary Competition among Local Autonomous Governments
- Network Security & Data Privacy Preparation

Smart Grid – National Roadmap

Vision and Goals of Korea's Smart Grid



Pave the way for low carbon, green growth through a Smart Grid



Effects from introducing smart grid system nationwide by 2030

Creation of	Reduction of GHG	Reduction in energy imports	Increase in smart grid related exports	Creation of smart grid-related demand	Reduction in construction costs of new power plants
50,000 new jobs	230 Million t	47 Trillion won	49 Trillion won	74 Trillion won	3.2 Trillion won

THANK YOU
FOR YOUR ATTENTION!