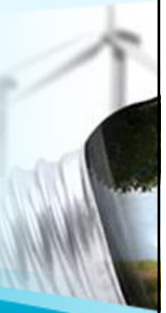
AMI Development in KOREA

2011. 8



KSGI

(재)한국스마트그리드사업단

Korea Smart Grid Institute

Contents

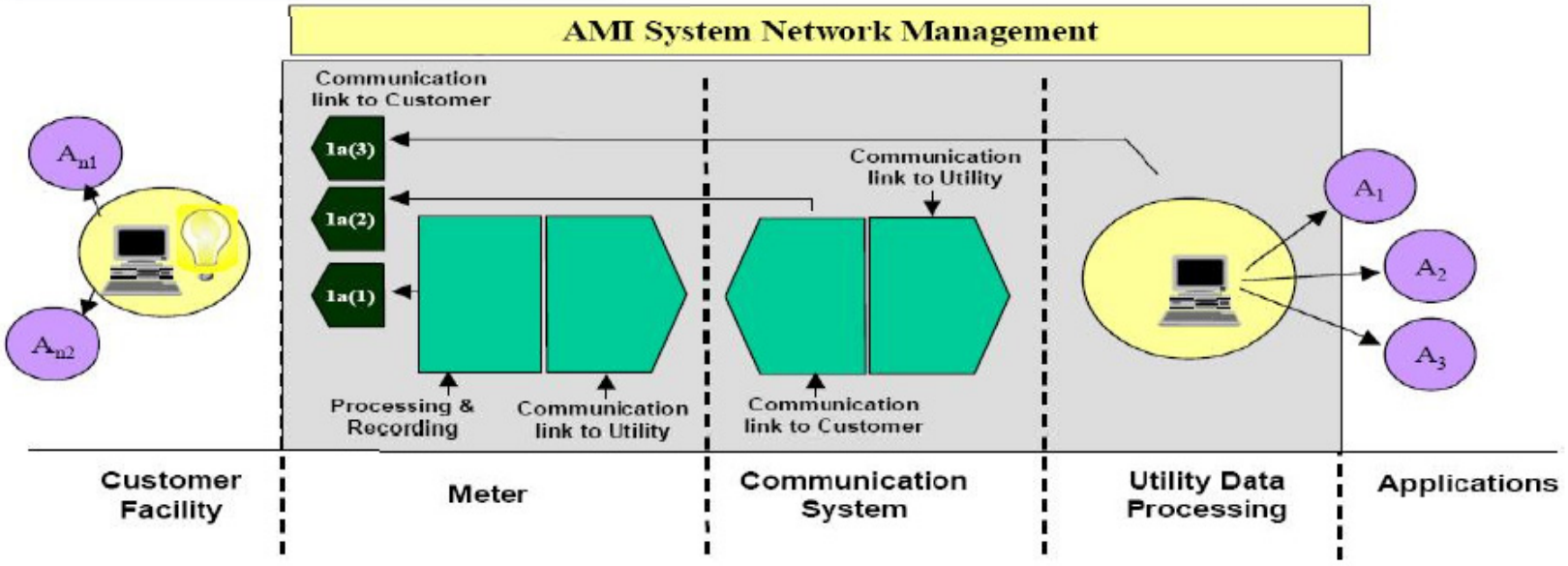
I. AMI(Advanced Metering Infrastructure) Outline

1-1. AMI concept

Technology Concept

- Electricity Service Data Infrastructure between the final consumer and electricity companies
  - Essential infrastructure system for Smart Grid
  - Core Method for Supplier and consumer based demand response
  - The most appropriate data system for the management of future smart grid

AMI System Diagram



1-2. AMI component

CUSTOMER FACILITY

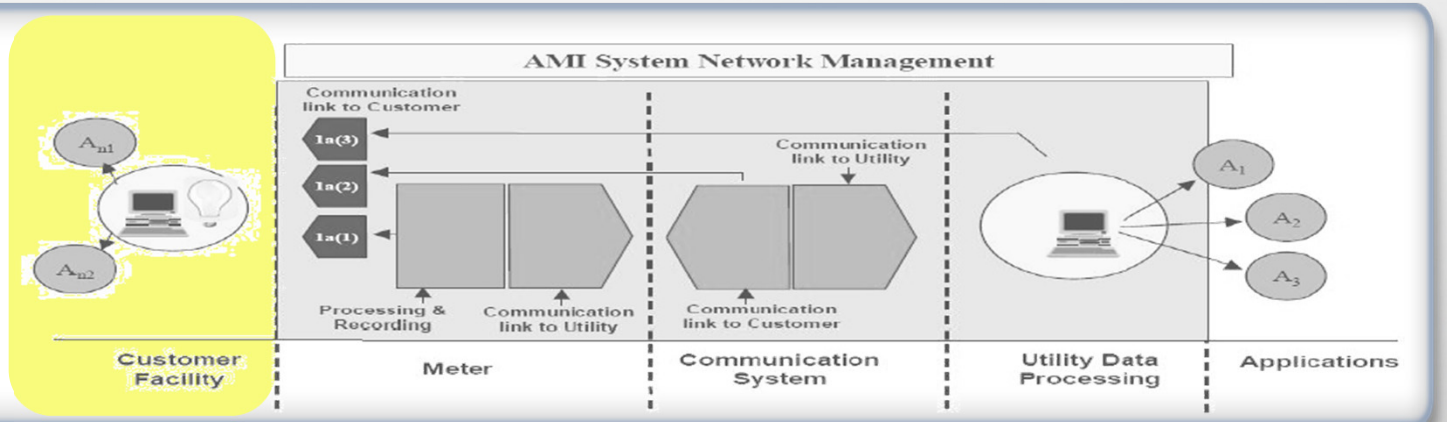
Basic Element

- Lamp that is responsible for existing electricity energy consumption
- Regular facilities like Refrigerator and air conditioner
- Home network system and energy management system for communication between the facilities at home

Function

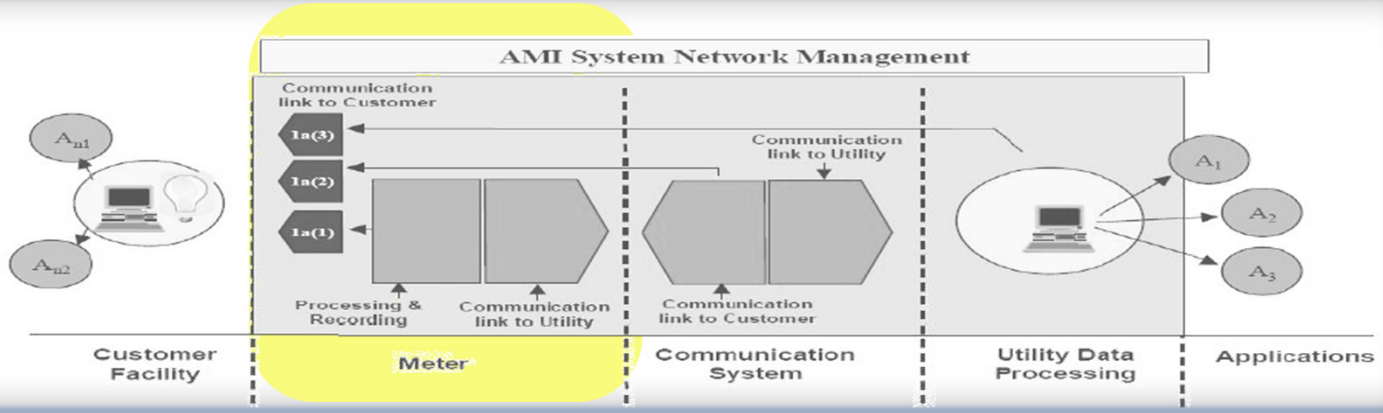
- Participation in energy reduction program through various data including consumer energy usage, billing etc.
- Provide future energy usage and analysis of real time energy usage through online energy management system
- Reading reduction amount through consumer demand response program and planning redction of CO2 emission according to the reduction of electricity

Diagram



1-2. AMI component

METER

Basic Element	• Section date collection and storage • Directly/ Real-time access, remotely access • Home network and energy management system for Home facilities and telecommunication • Solve within the meter for the support of Consumer service • Changing charge of CPP,RTP etc, remote load control
Typical Standard	• European Area: IEX 62056(DLMS) • North America Standard Meter Protocal: AMSI C12.XX
Diagram	

1-2. AMI component

COMMUNICATION SYSTEM

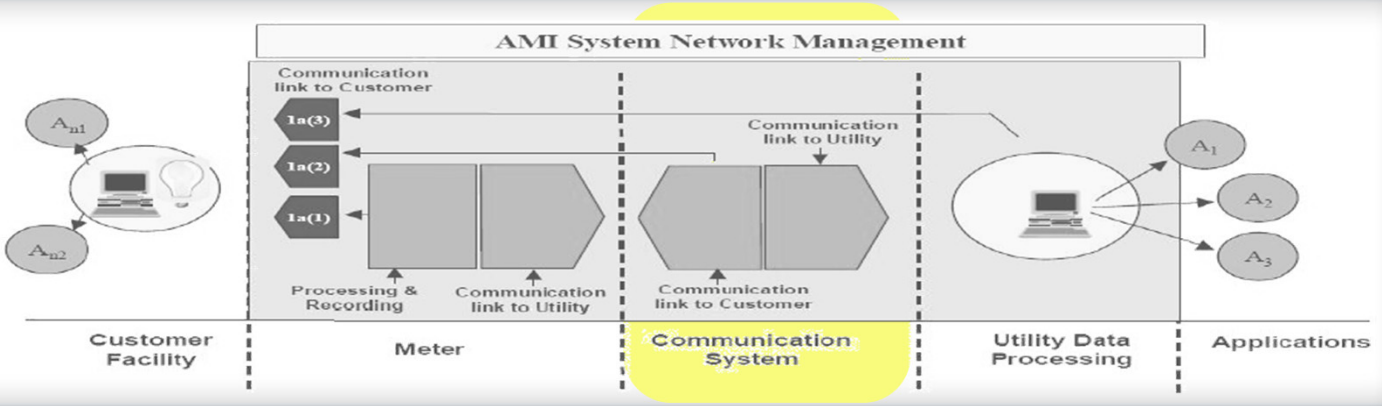
Basic Element

- HAN(Home Area Network), NAN(Neighborhood Area Network)
  - Power line using PLC technology
  - Zigbee technology for short distance commmunication
- NAN <-> Utility
  - Regular network WAN(Wide Area Network)
  - Long distance communication technology HFC, Wibro, WiMAX, GSM, CDMA

Standard Technology

- SE(Smart Energy) Profile, ANSI C12.xx, IEC 62056(DLMS) etc.

Diagram



1-2. AMI component

UTILITY DATA PROCESSSING

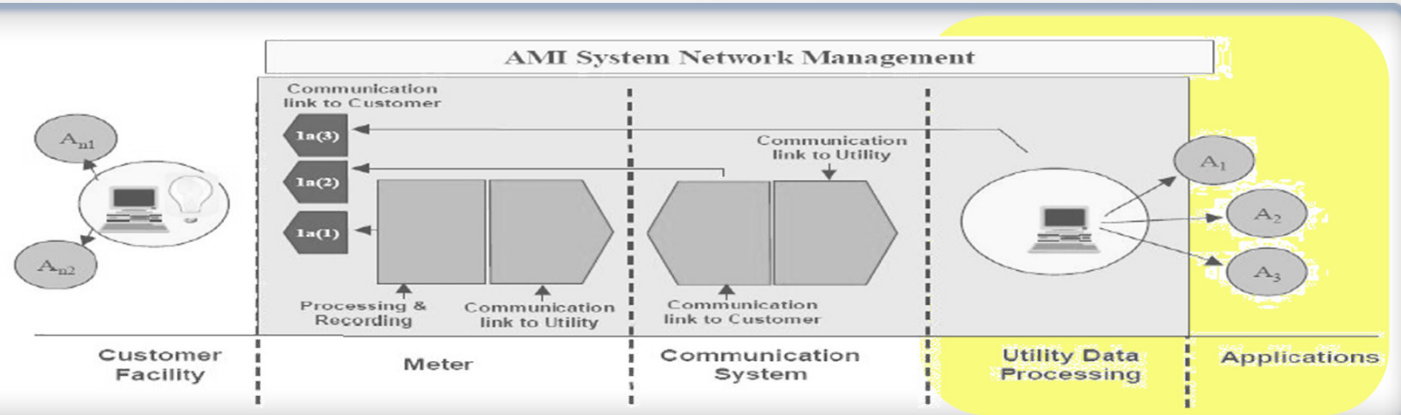
Basic Element

- Data Management/collection/ control facilities
  - collecting data through the network from the Smart Meter and storing and controlling the data
- Interface function
  - Exchange the controlled data through various application
- Provide Optional service function
  - Through the exchanged information provide Optional service function to the electricity function

Develop Requirement

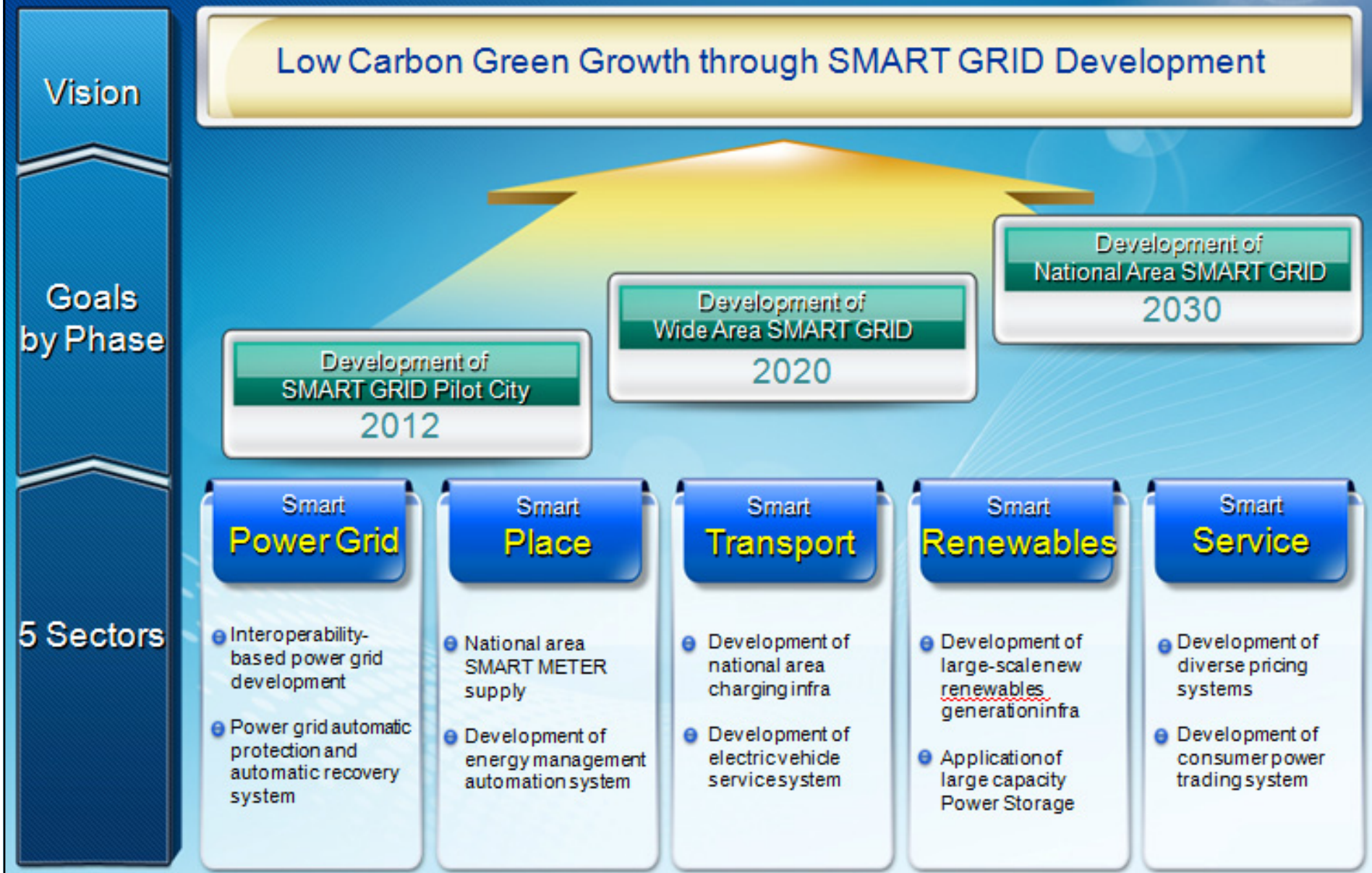
- Meter data automated collection function, policy and scheduling technique
- AMI Meter management, mass storage data controlling technology
- Data Monitoring, Security technology

Diagram



II. Smart Grid National Roadmap

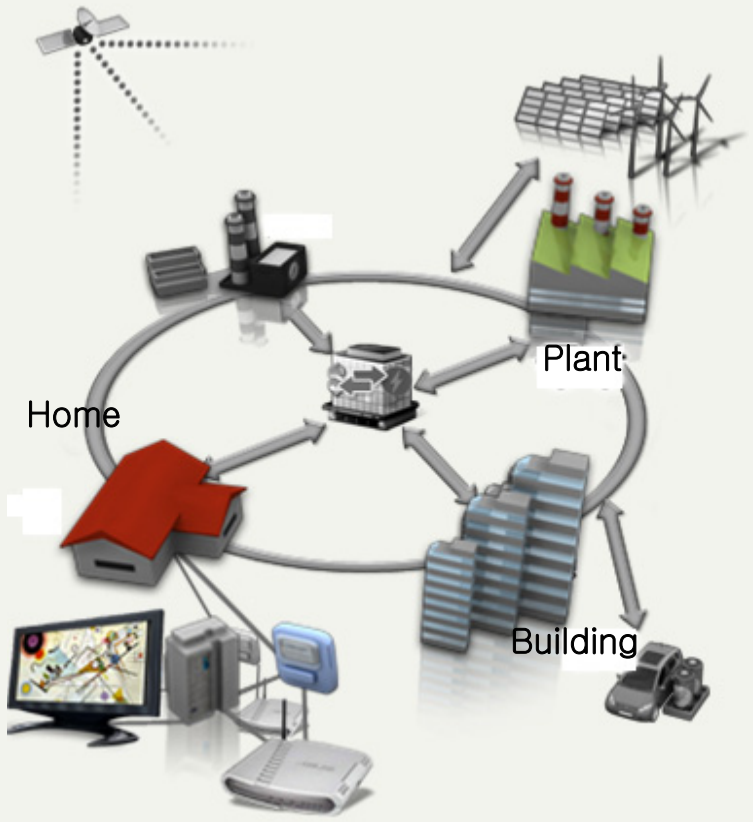
2-1. Vision and Goals



2-2. Smart Place

Objective

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



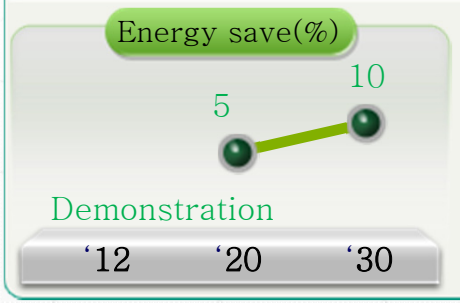
Key Technology Developments

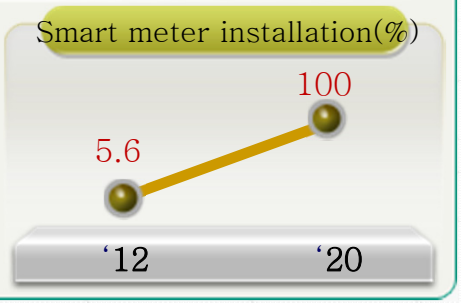
- Develop (AMI) and set standard (2012)
- Develop system to connect DR with the grid (2020)

Business Model

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

Goals by Critical Index





2-3. Technology Level Analysis

AMI	• Korea : AMR technology development completed and AMI commercializing technology development in progress • North America : State's large scale AMI demonstration and supply • North America : Early phase of In Home Display commercialization
EMS	• Korea : Early phase of HEMS, BEMS, FEMS technology development • North America : Early phase of commercialization
Two-way Network	• Completion of HAN technology development but insufficient standardization in Korea • Completion of diverse LAN technologies development but insufficient standardization • Completion of diverse WAN technologies development but insufficient standardization

2-4. Action Plan

Item	Phase 1	Phase 2	Phase 3
Technology Development	AMI system development and standardization Smart Meter development and standardization HEMS/BEMS/FEMS technology Smart In-Home device HAN/BAN/FANstandardization	Integrated energy portal system technology Consumer power trading technology Micro Grid-linked technology DR-linked system technology	Convergence service system technology
Business	ESCO business (BEMS-associated business) Smart device and solution sale	Energy management business DR business Excess power trading business	Power prosumer Convergence service business

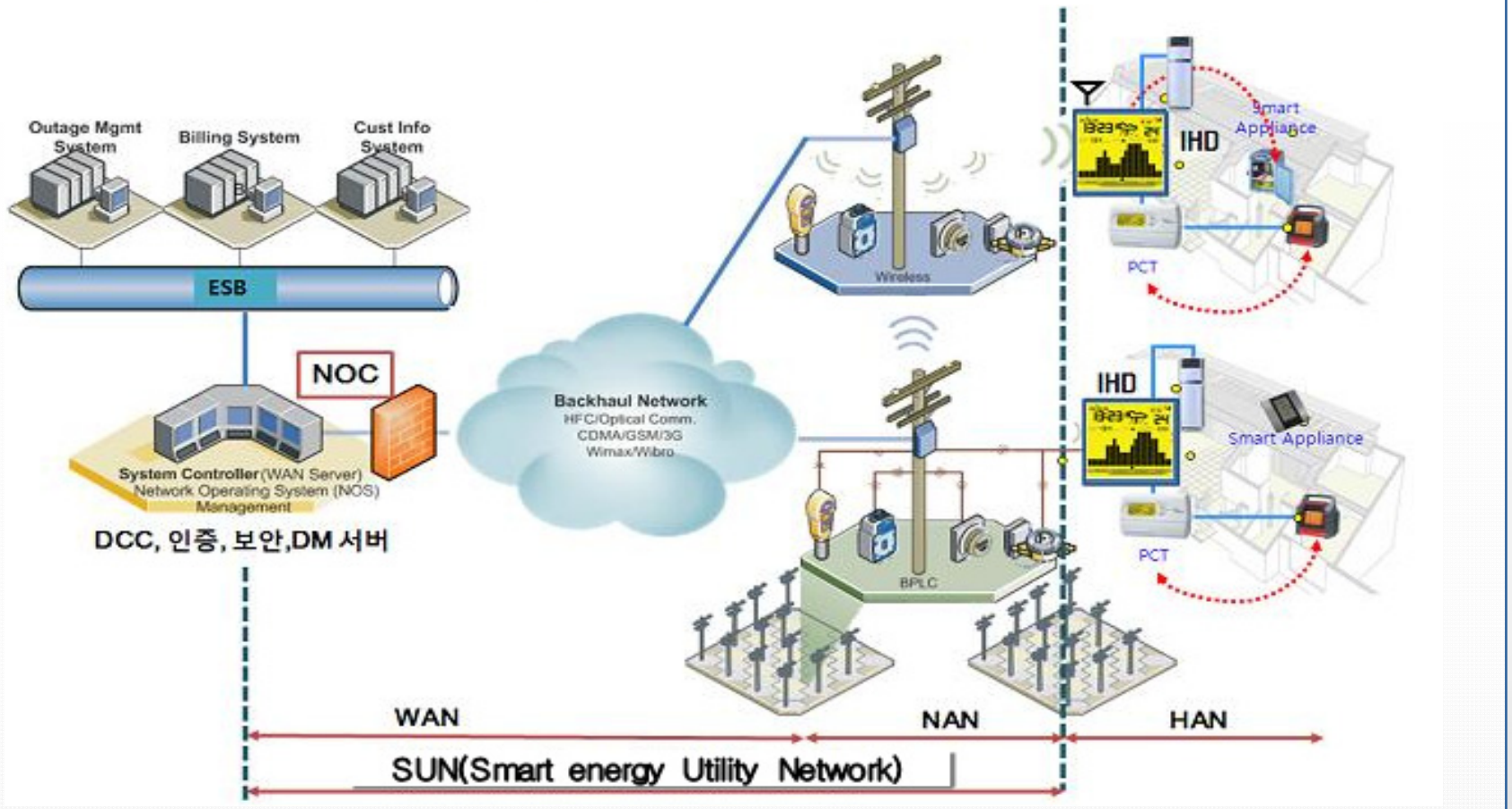

III. Status of AMI system development research project

3-1. AMI system development research project Outline

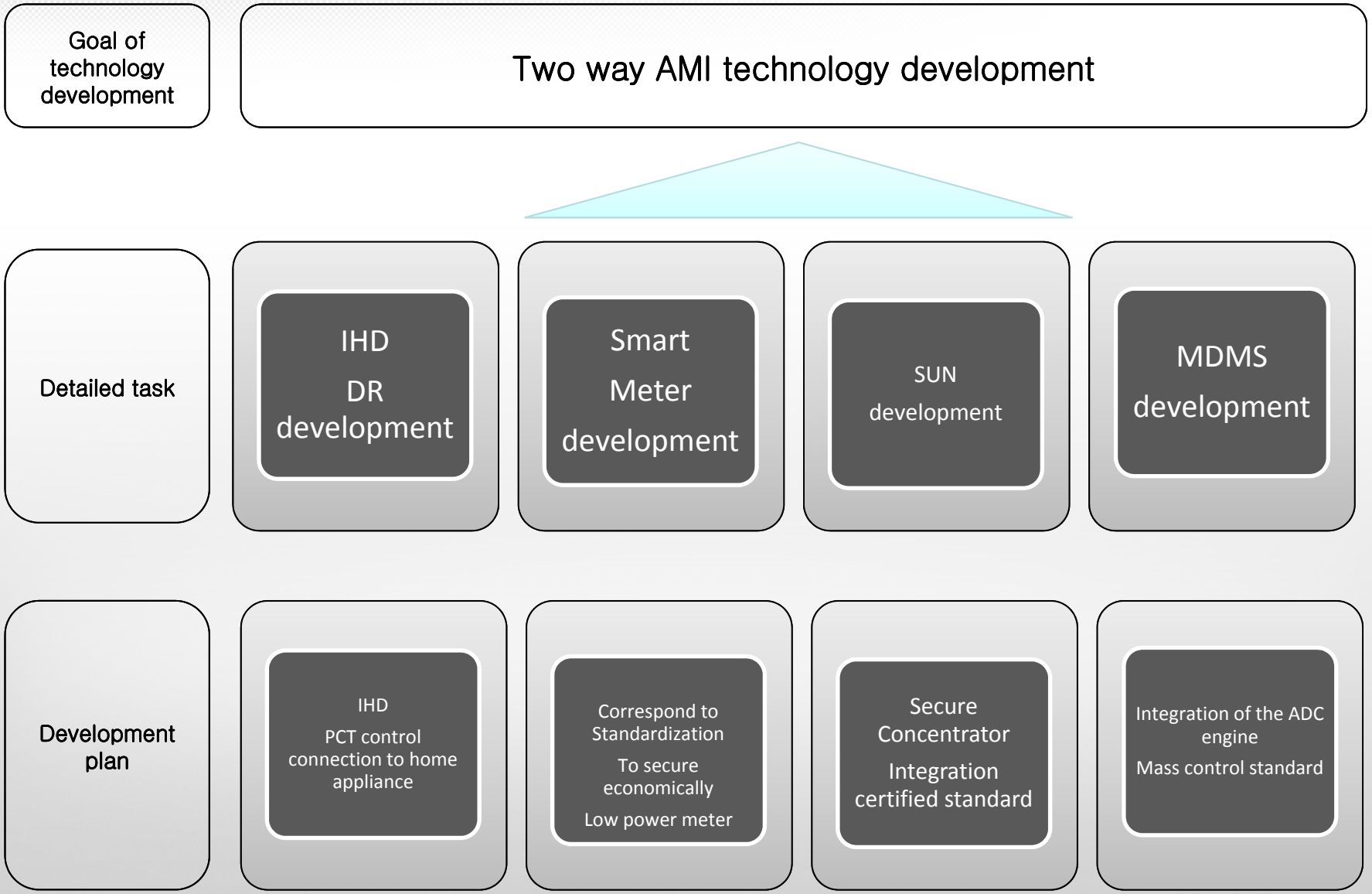
Status and necessicity	● To secure base technology for Smart Grid ● Achievement of the goal of reducing CO2 emission through basis of energy management and load reduction ● Reinforce the international competitiveness of domestic businesses and establish basis of advancing overseas • To secure Interoperability through Applying Open standard • To secure the international competitiveness of AMI based technology
Task outline	● Task area: Meidum and long term, Data Technology/IT infrastructure ● research period : '09.6~'11.5(24 month) ● Total research budget: 18.1 Billion won (Government fund 8.55 Billion won, Private fund 9.55 Billion won)
Plan to Achieve Essential Technology	● Commercialized development through the appliance of Brand new technology and open type standard ● Cooperation between international research centers for the appliance of AMT new technology AMI ● Optimization of development function through the usage Research project and standardization results • Smart Meter, MDMS related process etc.

3-2. AMI System Diagram

AMI System Diagram



3-3. AMI system development research project Vision



3-4. AMI Detailed Task

HOME DR

Goal of Development

- Develop a home demand response product through the understanding various information on energy including Energy Usage, billing system etc. and enabling to voluntarily get involved with the energy reduction program

Function

- Recognizing real-time management, analysis of energy usage and the future amount of energy usage through the usage of online energy management system

Current Status

- Consumer electricity energy management technology using In-Home Display, HVAC control techonolgy using PCT(Programmable Communicating Thermostat), Developed a Smart energy profile applied home appliances controller

3-4. AMI Detailed Task

SMART METER

Goal of Development

- Applying new communication technology and support two way communication Develop a smart meter that increases energy efficiency through demand response by providing electricity usage information to the consumer

Function

- A digital smart meter that provide feedback with the proper information which leads to less usage of electricity and eventually increases energy efficiency

Current Status

- Smart Meter, HAN and NAN communication interface, digital Smart Meter Cost Effective accumulated technology, Developed Smart Meter security service

3-4. AMI Detailed Task

MDMS

Goal of Development

- Development of electricity data management system and supplementary services which manages consumer based mass storage electricity recourses and distributes it efficiently and increases energy usage efficiency for electricity companies and consumers

Function

- MDMS collects , manage and controls data collected by the Smart Meter

Current Status

- MDMS,
  Simulation engine for Advance charge system adoptation
  Electricity efficiency contents development

3-4. AMI Detailed Task

SUN

Goal of Development

- Development of electricity communication technology to use is as a smart grid network including AMI composed elements which is the connection between the consumers (electricity company system and smart meter)

Function

- The collected data from the smart meter will be sent to the electricity company and will efficiently be connected to HAN composed of various terminals (to support the demand response), to the power utility or energy service provider

Current Status

- Development of concentrators for the NAN conncetion
  Development of NOC technology Technology development for export

IV. Domestic Smart Meter Status

4-1. Domestic Smart Meter Status

Digital smart meter

- 7.5 million household out of 18 million household were supplied which 4.4%
  - (high tension) 0.1 million supply completed for the appliance of the timely and season based fee following the Electricity business law and basic supply terms
  - (low tension) 5.6 million household out of 18 million household were supplied which 3.1%

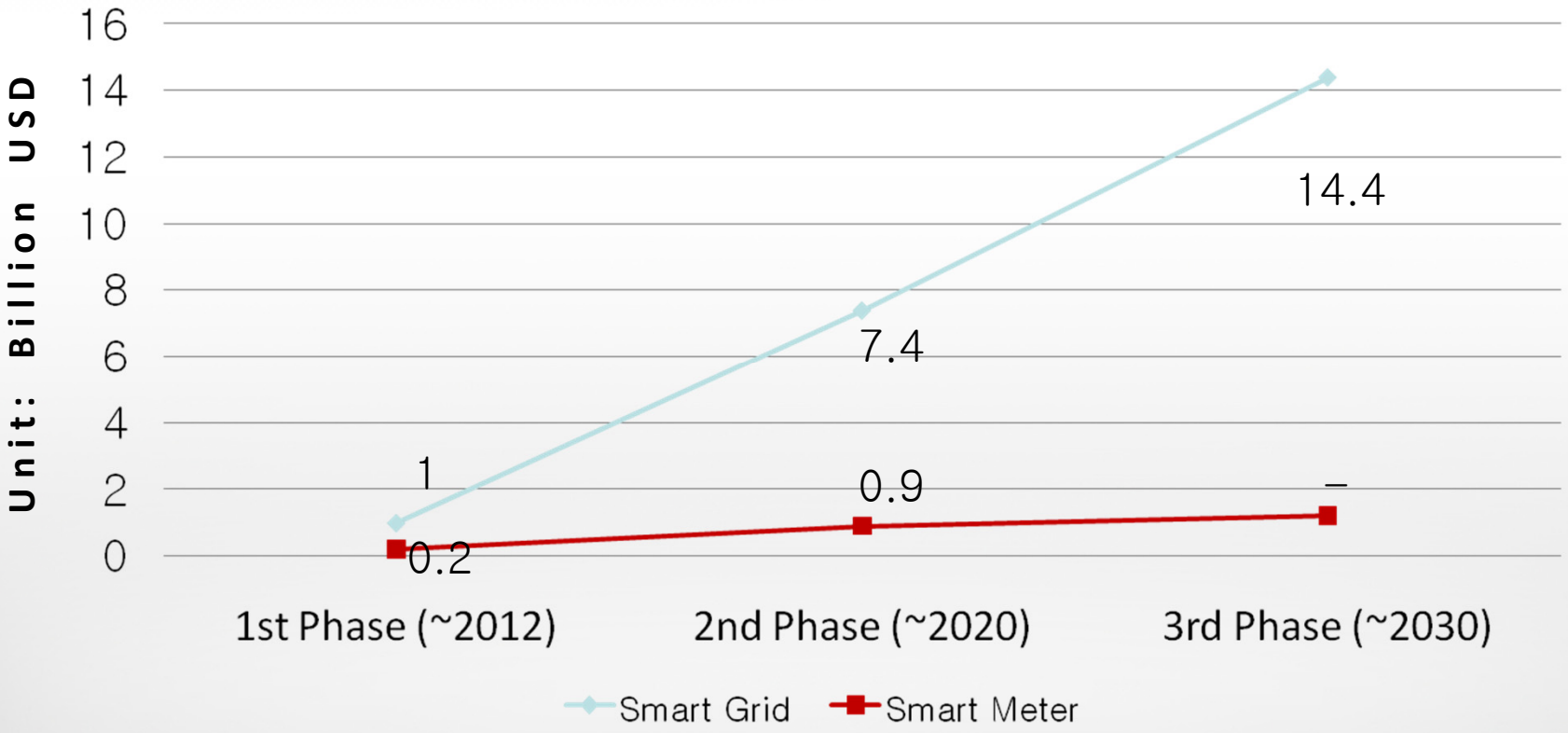
Metering system

- '09 disseminated 8000 smart meters to new constructed apartments as a demonstration project

IHD

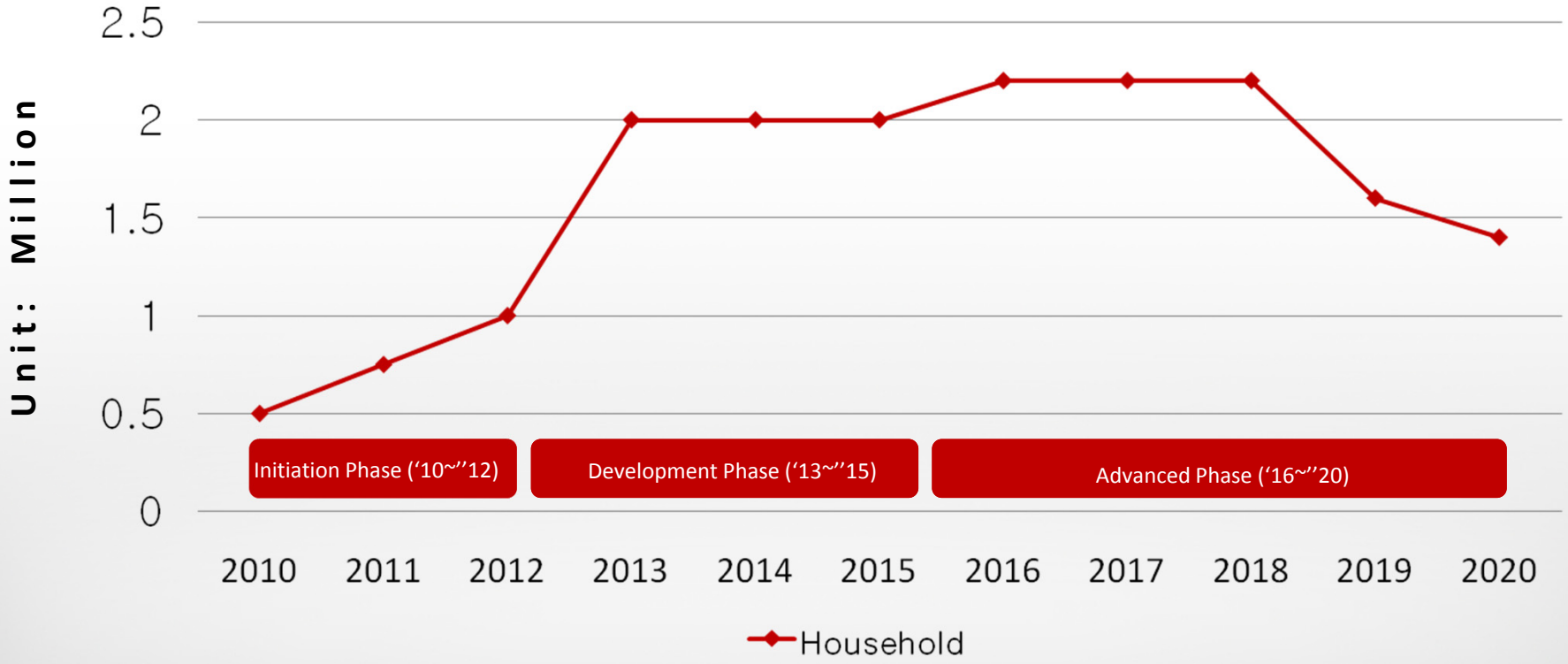
- On 2010 approximately 20 thousand household will be supplied, on 2011 more then 20 thousand household is planned to be supplied
  - (business content) Installment of display and gateway for real- time data exchange, management of server system to provide collection of energy information
  - (Future plan) Changing costumer patterns by reacting actively to energy information which will result in reducing energy and shifting or disperse electricity peak time

4-2. Domestic Smart Meter Investment Plan



Note: The total amount invested in Smart Grid will be approximately 22.8 billion USD by 2030
The total amount invested in Smart Meter will be approximately 1.1 billion USD by 2030

4-3. Annual Development Plan



Note: At 2011, additional 0.75 million Smart Meter's are scheduled to be supplied
At 2012, 1 million Smart Meter's are scheduled to be supplied
At 2013, 2 million Smart Meter's are scheduled to be supplied
On 2020, 17 million Smart Meter's are scheduled to be supplied


V. 5 leading Companies in AMI

5. Business Result

KEPCO KDN

KEPCO KDN

- Business Result
  - 1st 1500 Household Low-tension PLC Automatic Meter Reading Demonstration Project
  - 2nd 5000 Household Low-tension PLC Automatic Meter Reading Demonstration Project
  - 3rd 50 thousand Household Low-tension PLC Automatic Meter Reading Demonstration Project
  - 20 thousand Household and 500 thousand Household Low-tension PLC Automatic Meter Reading Demonstration Project

LS Industrial System

LS IS

- Business Result
  - MOU signed with Silver Spring Networks(SSN), an electric power company in the US
  - Government business of IHD dissemination for 20 thousand household, LS Industrial System supplied for 7 thousand household

5. Business Result

Omni System

Business Result

- Omni System have evolved to hold 70-80 percent of market share for Smart Grid metering systems within apartments in Korea.
- Omni Systems' meters are capable of measuring water, gas, electricity, heat, white ware consumption and light. system can collect and manage energy data from networks.
- Exceeded traditional competitors in this capacity because of Omni Systems' ability to integrate, manage and analyze a greater variety of elements in home networks.

Byucksan Power Co., LTD

Business Result

- Energle created an open standard architechture pattern to maximise scalability and operability of the system and to connect to building management systems
- Energle provides service functions in realtime, remote control, internet and iphone monitoring as well as peak power management and reduction of energy analysis.

5. Business Result

Omni System

Business Result

- In 2000, NURI Telecom commercially introduced a CDMA based electric AMR system for the first time in the world and implemented the system to over 140,000 industrial sites nationwide.

- Following the AMR system for electric meters, it introduced the gas AMR system and water AMR system using Mesh RF technology in 2004 and 2006, respectively, to lead the AMR market in Korea.

- The company has also been actively penetrating the global market. As a result, the systems were successfully implemented in Sweden, Norway, Paraguay, Thailand, Mexico and Spain.

- The company plans to expand its global marketing in Northern Europe, Asia, Africa and America.


VI. Future Plans

6. Future Plans

AMI system goal Model development

- Depending on the standard the difference of the communication protocol and communication method and the difference in cost
  - Development of a AMI system model that can integrate the Korean AMI and export AMI version development

Establish interoperability amoung systems

- Need to analysis the international standard for each area and establish a standard and protocal
  - Participation of various international standard organization including AMI/HAN working groupfor the establishment of international networking

Policy support

- Management support of the DR system which is the most efficient application
  - The current stabled charge need to be changed to fluctuating charges
  - The cost problems for installing all the AMI system will be considered for support at a national level


Thank you!
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Autobiography

I have been designated as Team Leader of International Cooperation at Korea Smart Grid Institute on last June and have worked in Smart Grid industry ever since then. I have been actively involved in the field of Korea's Broadcasting and Communication regulatory body for last 12 years and have wide spectrum of experiences regarding Information Technology as well as international cooperation.