

R&D in Consumer Portals for Active Management and Monitoring of the Distribution System in Korea*

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*Disclaimer: Opinions expressed in this presentation is solely of the presenter and do not necessarily represent the opinions of others.

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Objective

- Description of Research and Development in Consumer Portals in Korea
 - Key ingredients for active management and monitoring of the distribution system in the market environment



Outline

- Introduction to R&D in Consumer Portals
- Current Status around the World
- Challenges
- Development Strategy in Korea
- This Year's Development Goals



Consumer Portals

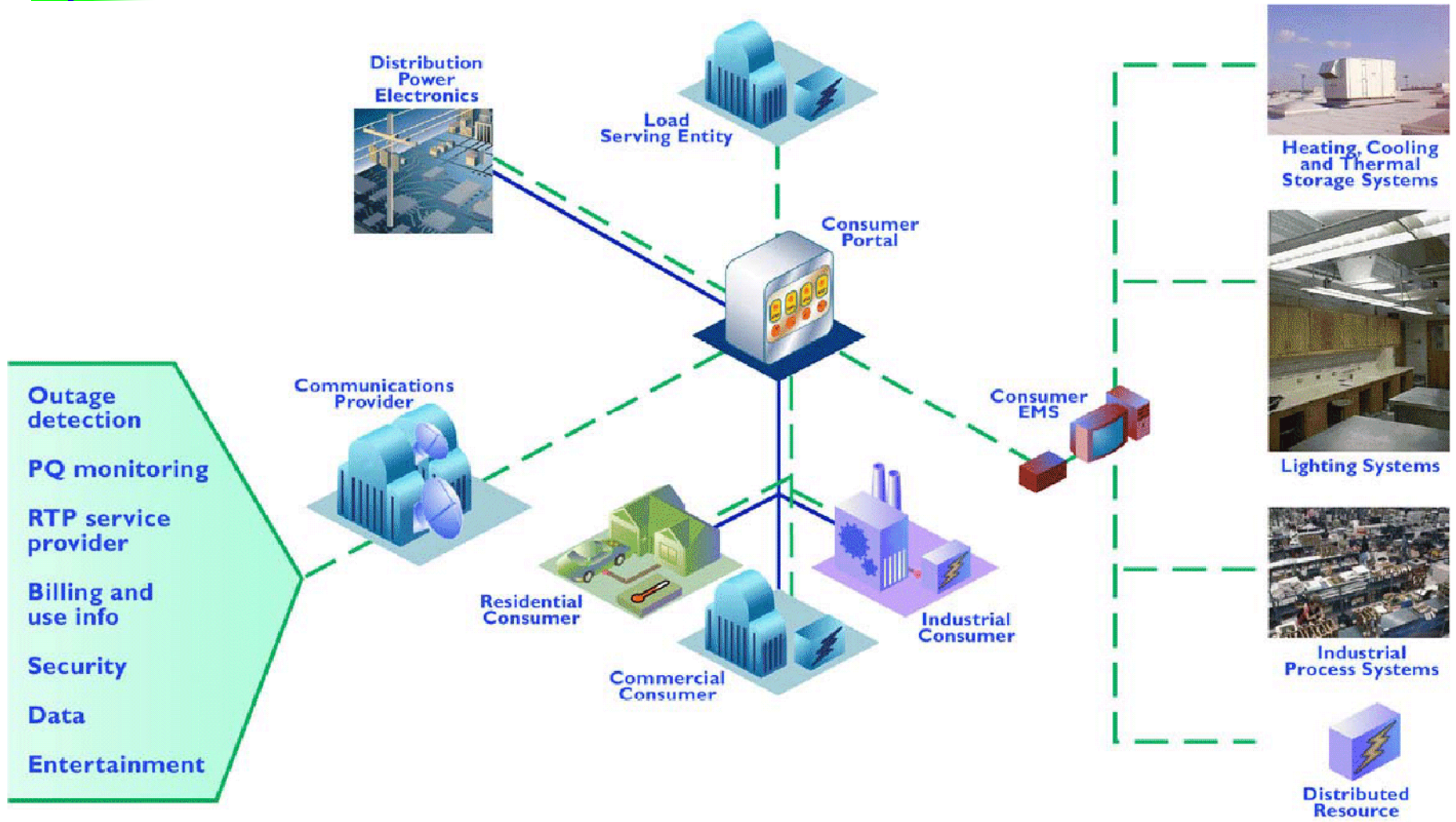
- Core Enabler for Providing Value-added Services
 - Actively responding to rapid changes in industry through two-way communication between consumers and suppliers
 - Sound combination of S/W and H/W technologies for linking in-building network and wide-access network
 - Tried ideas since 1970's but not yet practically realized, i.e. provision of easy communication interface between electronic devices



Current Status around the World

- EPRI leading the Effort through CEIDS Project
 - the Consortium for Electric Infrastructure to Support a Digital Society (CEIDS) – \$10 billion per year
 - 4 areas of R&D
 - Intelli-Grid: open architecture integrating electric power systems and communication systems
 - Advanced distributed automation (ADA) and Distributed energy resource (DER) integration
 - Real-time simulation and modeling technology
 - Consumer Portal: On-demand, consumer-oriented value-added electric power energy services and demand management strategies

Consumer Portal in CEIDS Project



Consumer Portal Based Value-added Services

- Often mentioned:
 - Innovative pricing
 - Outage detection, notification, etc.
 - Energy information services (EIS): consumer meter data & energy use analysis
 - E-business services: electronic bill payment, billing, billing processing, customer service management functions
 - Demand response (DR): direct load control, remote device monitoring & control
 - Power quality and reactive power management
 - Smart devices



Value-added Services

- Innovative Pricing
 - 43% of consumers in US are interested in saving on their electricity payments and choosing suppliers
 - Reducing costs and enhancing reliability
 - Oregon PUC offering to commercial customers with contracted power higher than 200kW
 - California PUC testing small commercial and residential customers
 - Public Service Commission in New York evaluating load shifting
 - Georgia Power offering real-time pricing (RTP)
 - Enel providing Networked Energy Services (NES) system, time-of-use (TOU) rates and RTP



Value-added Services

- Outage Detection and Notification
 - Important services due to increased outage costs to both utility companies and digital-oriented customers
 - No extra infrastructure needed with consumer portals
 - Ameren energy and Central Electric Membership Corporation (EMC) offering outage management system based on metering data



Value-added Services

- Energy information services
 - Monitoring energy use of devices and equipment at the customer sites
 - Enhancing existing building automation and energy management application
 - Consolidating energy-related customer information and system control
 - Entergy corporation: DataLink system for managing commercial and industrial customers
 - Atos Origin: MyEnergyInfo Web portal



Value-added Services

- E-business Services: electronic bill payment, billing, billing processing, customer service management through internet
 - E-payment increased to 60% of billing by 2005
 - We-energies, Austin Energy, Orlando Utilities Commission, Palo Alto Utilities, Sacramento Municipal Utility in US
 - Halton Hills Hydro, Hydro Quebec, Newfoundland Power in Canada
 - The BEST undertaking on behalf of BrihanMumbai Corporation Electric Supply and Transport



Value-added Services

- Power Quality
 - More important with increase in digital load
 - Over 50% of large customers in US interested in higher power quality services: 10% of customers subscribing to the service in 2003 and 60% of customers expected by 2020.
 - Salt River Project in US
 - Vector in New Zealand

Value-added Services

- Demand Response Program
 - Various incentive-based methods for controlling load with respect to price signals in the market
 - Providing unwanted load interruption prevention, reliability enhancement, and additional infrastructure construction delay
 - Direct load control (DLC) by utilities most common
 - State of the art metering technology and communication application needed for implementing efficient pricing policies and incentive-based methods

ISO	Reliability-based Contractual	Reliability-based Voluntary	Market-based Bid-based	Market-based Price-taker
CAISO	Participating Load: Demand Relief	Discriminatory Load Curtailment		Demand Bidding
ISO_NE	Demand Relief			Price Response
NYISO	ICAP Special Case Resources	Emergency Demand Respond	Day-ahead Demand Response	
PJM		Emergency Option		Economic Option



International CEIDS Consortium

- Forms the Energy Consumer Service Portal Consortium
 - 14 utility companies and a few related enterprises in US
 - EDF and Polish utility company in Europe
 - Hitachi in Japan
- Goals to provide various services through consumer portal
 - Power Measurement, Itron, Enel

Problems with Value-added Service Provision

- Dispute among Manufacturers - No standard for communication protocol between devices
 - Large costs for establishing and maintaining devices under single protocol
- Lack of Well-established Techniques for Collection and Management of Large Quantity of Data using the Existing IT Infrastructure
- Poor Market Research for Identifying Consumer Needs and Demand, Business Strategy, and Market Trend
 - Barrier to entry due to the lack of relevant regulatory support



Challenges

- Establishing Communication Standards between Consumer Portals and Devices and between Devices
 - High business risks and low incentive for manufacturers
- Transforming Supplier-oriented Technology Industry into Consumer-oriented Service Industry
- Modifying the Existing IT Infrastructure for Integrating Energy-related Service Provision and the Existing Electric Power Infrastructure for Integrating Communication Service Provision



Technical Challenges

- Integration of Communication Interfaces Developed Independently for In-building Network, Home-automation Devices, Smart Building Cooling and Heating Systems
 - Telephone Lines, Cable, DSL, Satellite and Terrestrial Broadcasting, etc.
- Management of Following Various Data:
 1. Energy data
 2. Market data
 3. Monitoring data
 4. Customer data
 5. Quality data
 6. Security data
 7. Device data
 8. Administration data
 9. Other service data



Development Strategy in Korea

- One of 9 5-year Power IT Projects Funded by Ministry of Commerce, Industry, and Energy
 - Total solution for large customer
 - Consumer portal
 - Unified resource management system
 - Business model for value-added service provision
 - Demonstration projects
 - Marketing strategy
 - Cost reduction strategy
 - DR-AMR support services
 - Digital load



Business Model for Value-added Services

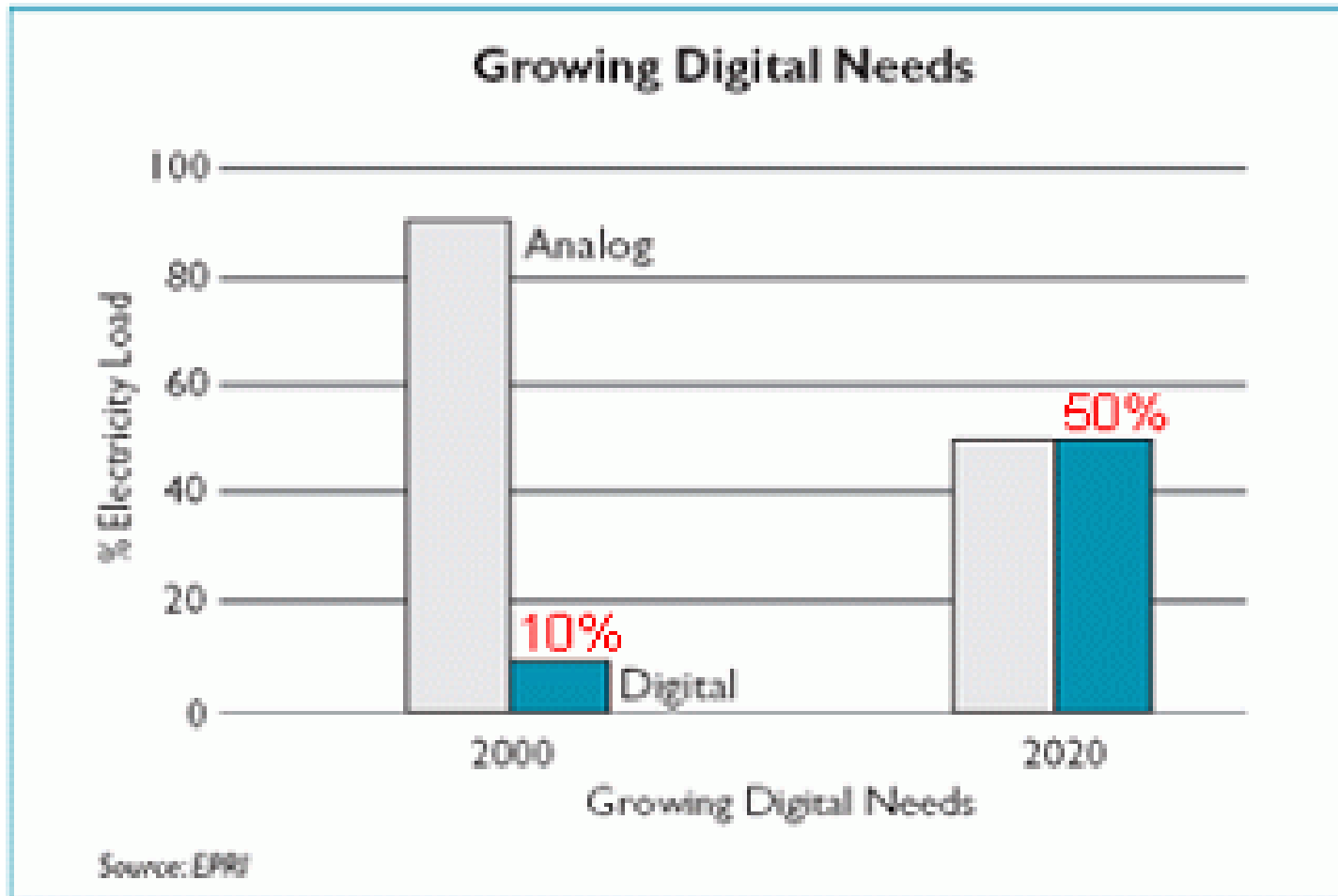
- Development of Strategies for Proliferation of Value-added Services and Support Systems related to Energy
 - Business and market analysis: B2B, B2C, B2E
- Needs and Functional Requirements Development
- Robust Technology and Business Development Strategy
- Proposal for Improving Market Environment
- Technical Roadmap for Customer-oriented Coordinated Resource Management Technology Development



Advanced Consumer Energy Service Model

- PLC-based Value-added Energy and Communication Service Promotion Strategy
- Customer-oriented DR- and AMR-based Service Model
- Low-voltage DC Service Promotion Strategy for Digital Load
- Service Model for Employing Smart Cabinet Panel (SCP)
- Core Value-added Service Strategy and Model Development

Importance of Large Customers' Digital Load



Reason for Focusing Large Customer

Range	No of Customers	Electricity Sales (GWh/yr)	Average Cost (\$1,000/yr)
100kW ~ 499kW	64,460	18,910 (6.4%)	24.7
500kW and above	31,271	158,626 (54.0%)	312.1
Total	95,731	177,527 (60.5%)	118.6

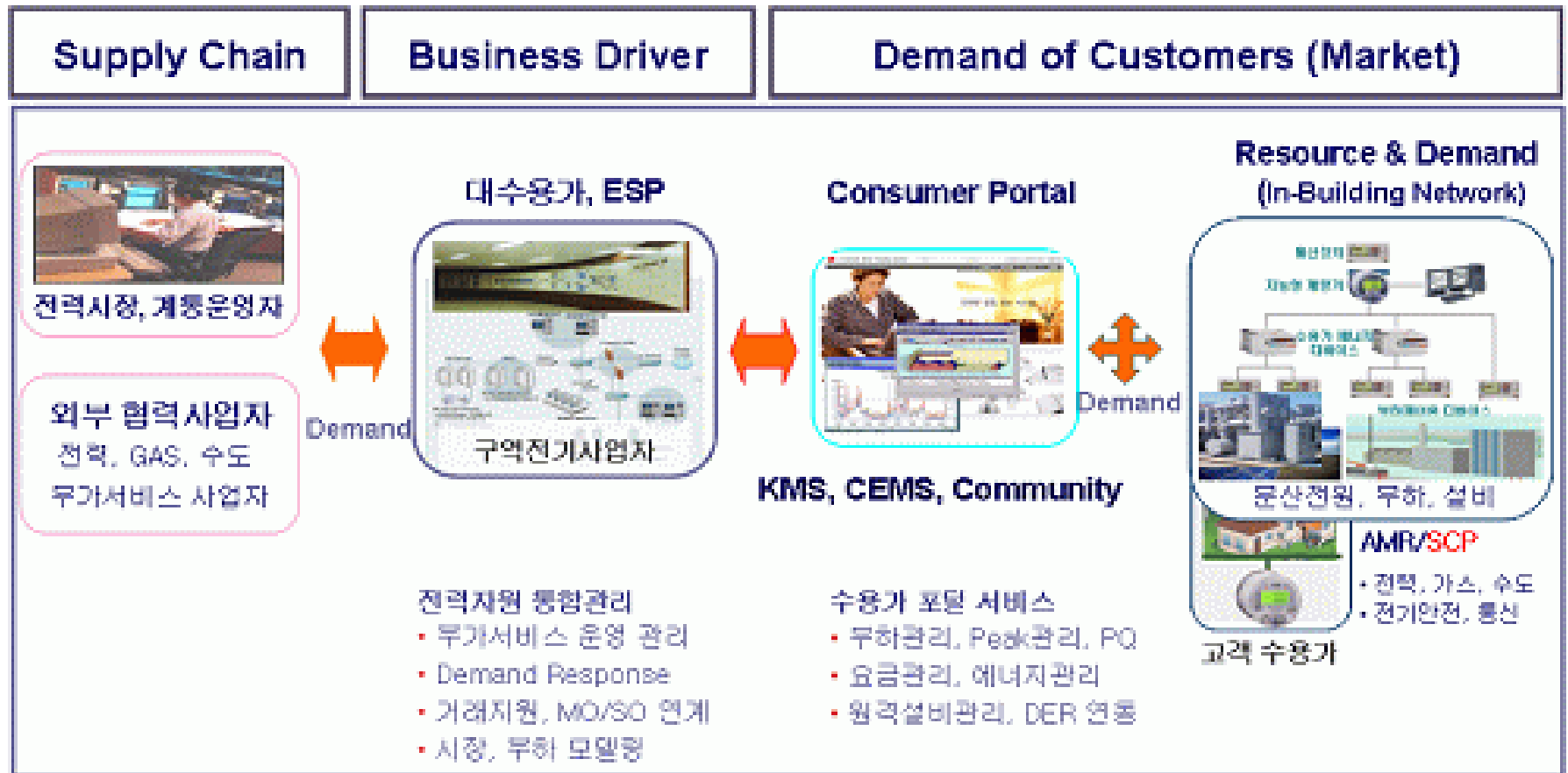
(): % with respect to total electricity sales



Large Customers

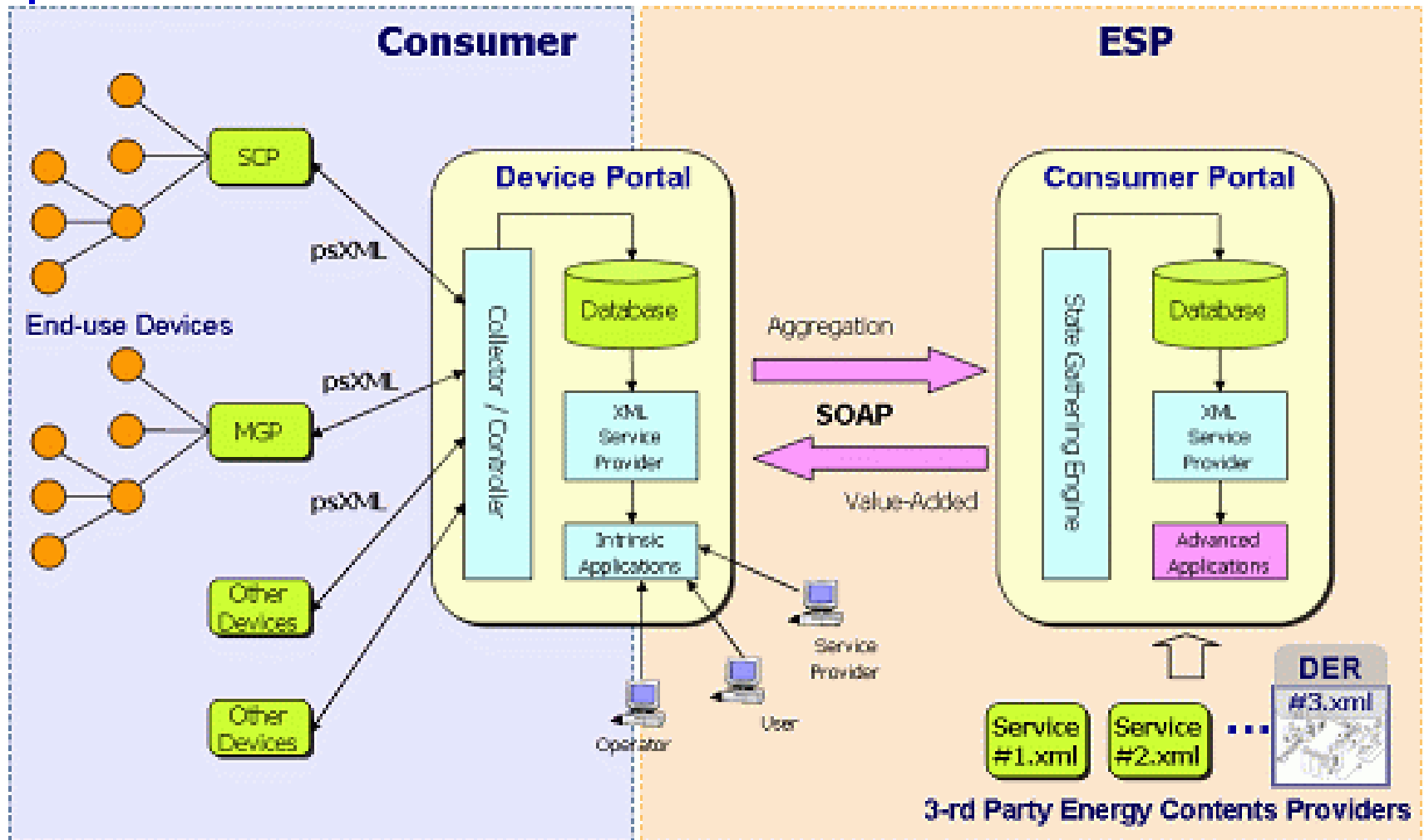
- Belief: Large Customer Reform leads to Electric Power Industry Reform
 - Large customers with 100kW and above make up only 0.6% of total number of customers but 60.5% of total consumption in Korea averaging the electricity cost of \$118,000/yr
 - Last 1-mile from the end-user in the electric power industry value chain
 - Both consumer and supplier in character
 - Core to the demand power due to their impact on electric power industry in terms of profit of utility companies
 - Market driver representing on-demand consumers
 - Prosumer for operating distributed generation and active load
 - Leading the next generation flexible Micro-grid formation according EPRI (Grid 2030)

Last 1-mile in the Value Chain



- KMS : Knowledge Management System, CEMS : Consumer Energy Management System, SCP : Smart Cabinet Panel

Consumer Portal for Large Customers





Asset Optimization Strategy

- Consumer Portal: Technology for Providing Two-way Communication Enabling Supply and Demand Pricing for Electricity and Real-time Pricing
 - 10-15% of load control through real-time pricing might have reduced price hike effectively according to DoE's report
- Combining IT Technology and Device Control (Water Service, Cable, Gas & Electricity) to Increase the Efficiency
 - Reduction of equipment failures and blackouts
 - Improvement of power quality
 - Reduction of peak loads
- Customer-oriented Grid Operation
 - Flexible response and feedback by 17 million customers connected to the grid

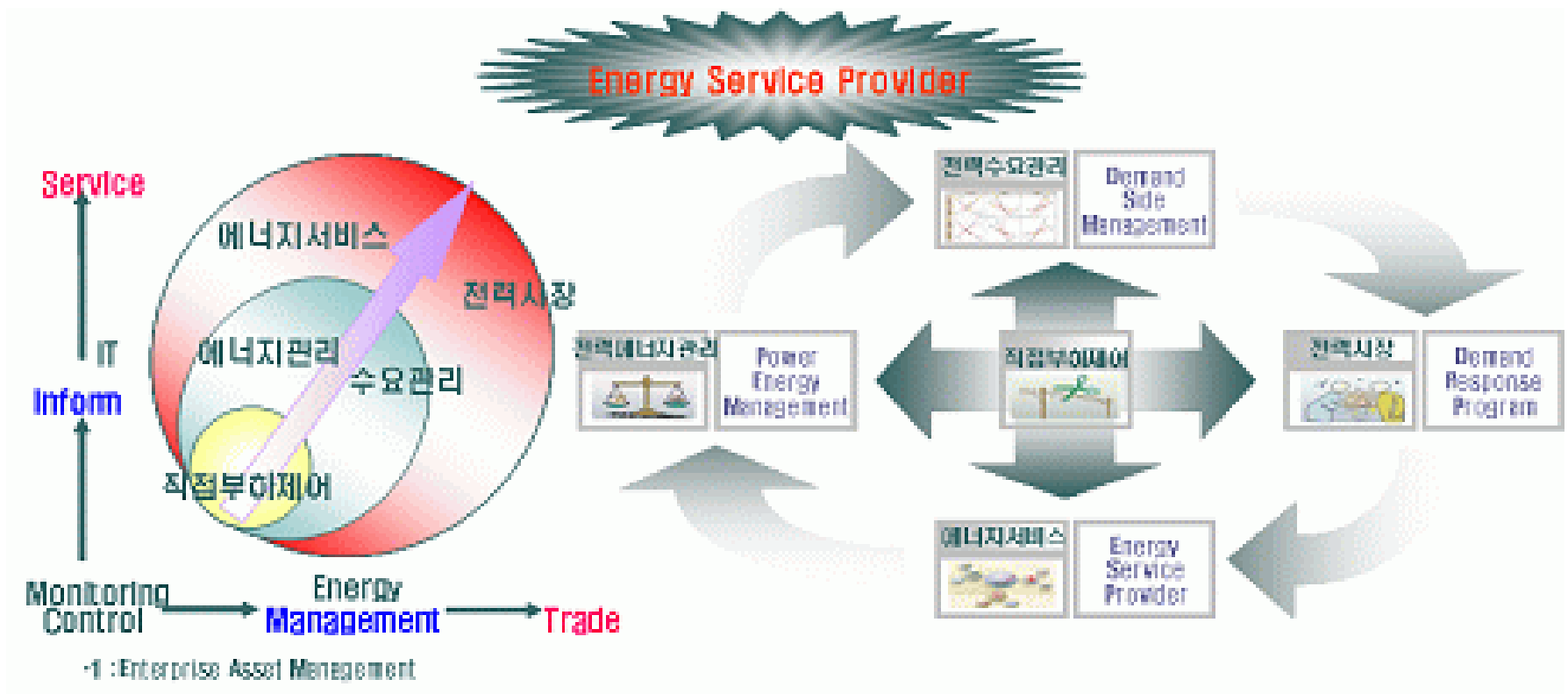


Consumer Portal as Common Good

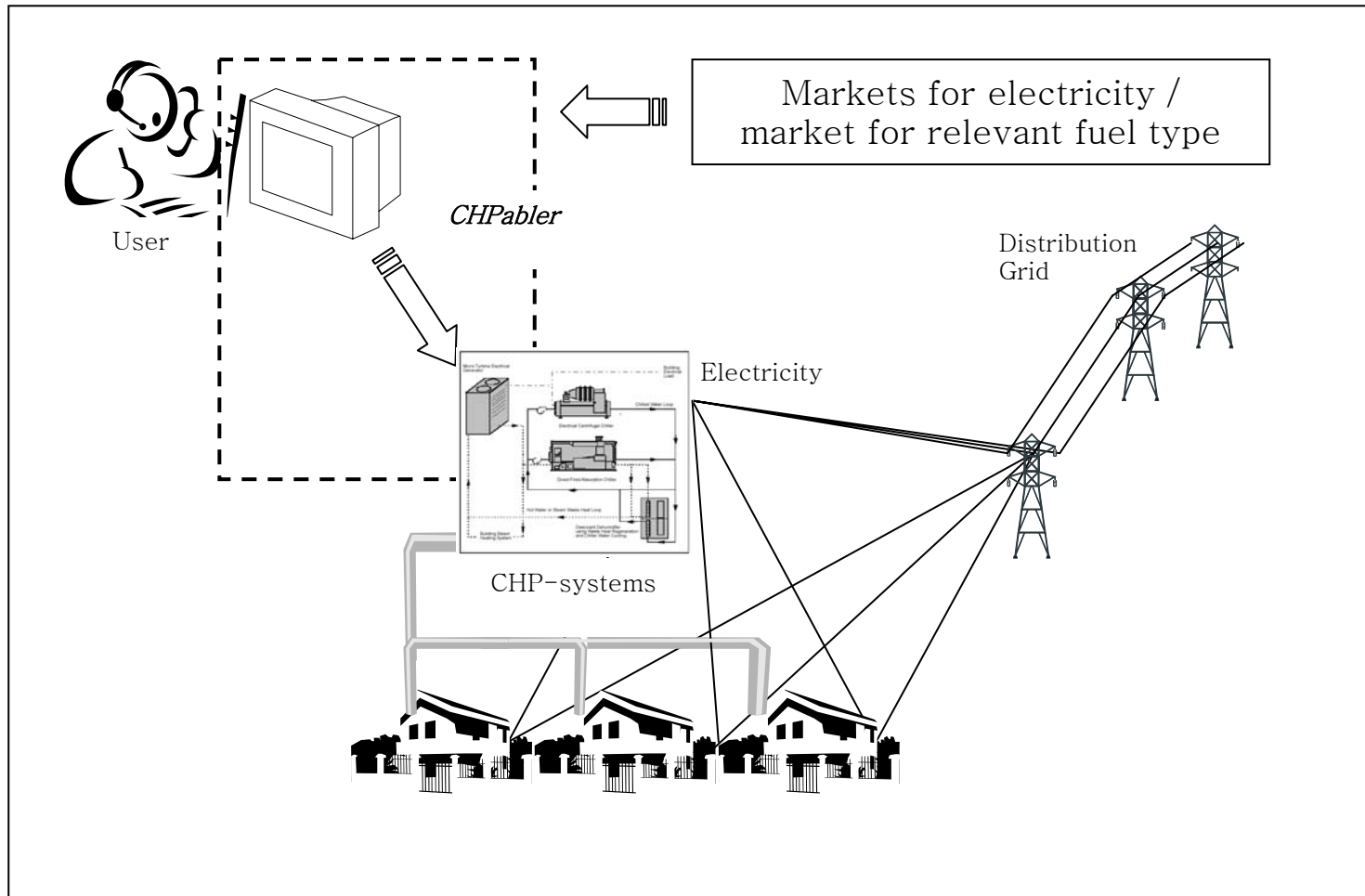
- Consumer Portal Fundamentals to Value-added Service Provision
 - Every commercial and industrial customers equipped with consumer portal eventually replacing and/or becoming an integral part of the existing power meters
 - National interest to develop an open architecture for consumer portals (possibly allowing a single provider) completely separate from value-added service development, distribution and consumption

The Role of Energy Service Provider

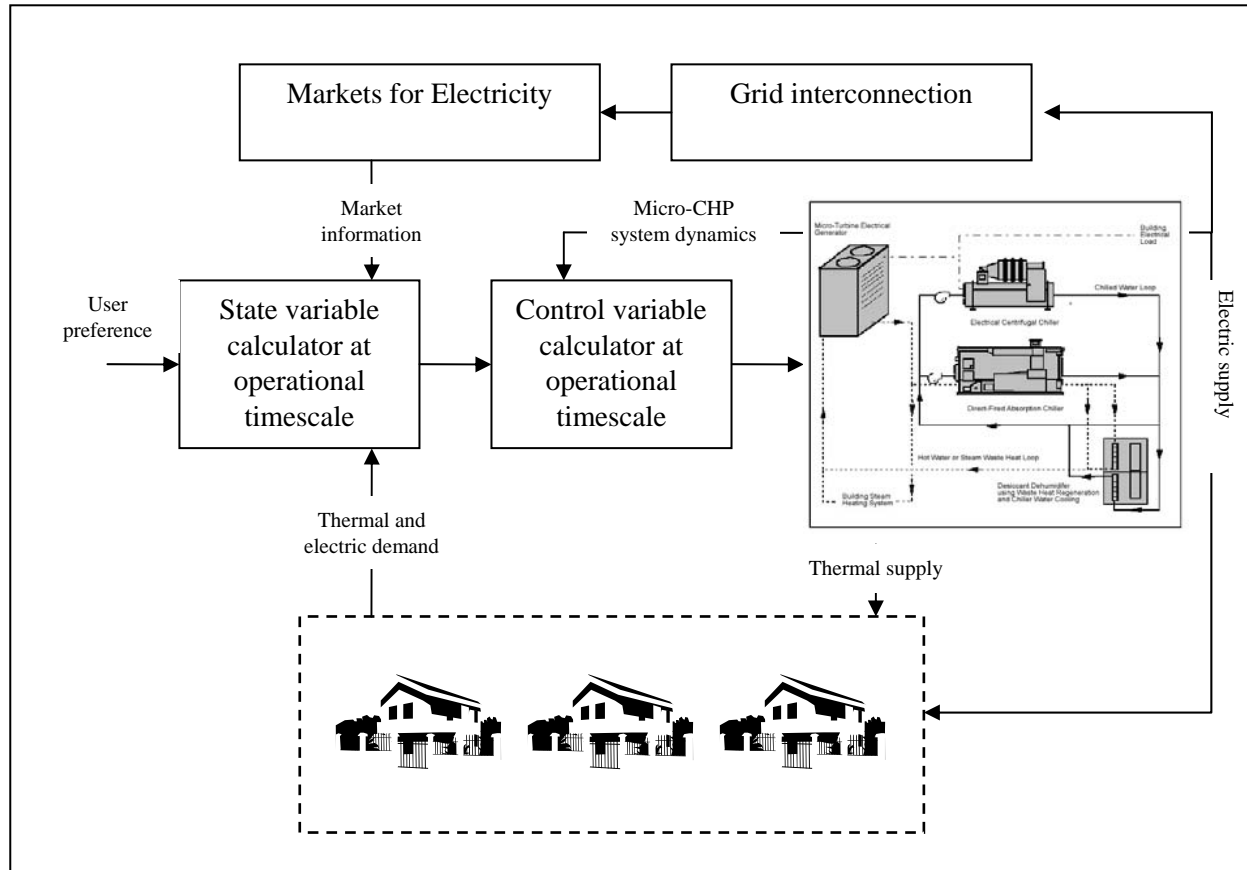
- Utilizing Consumer Portals



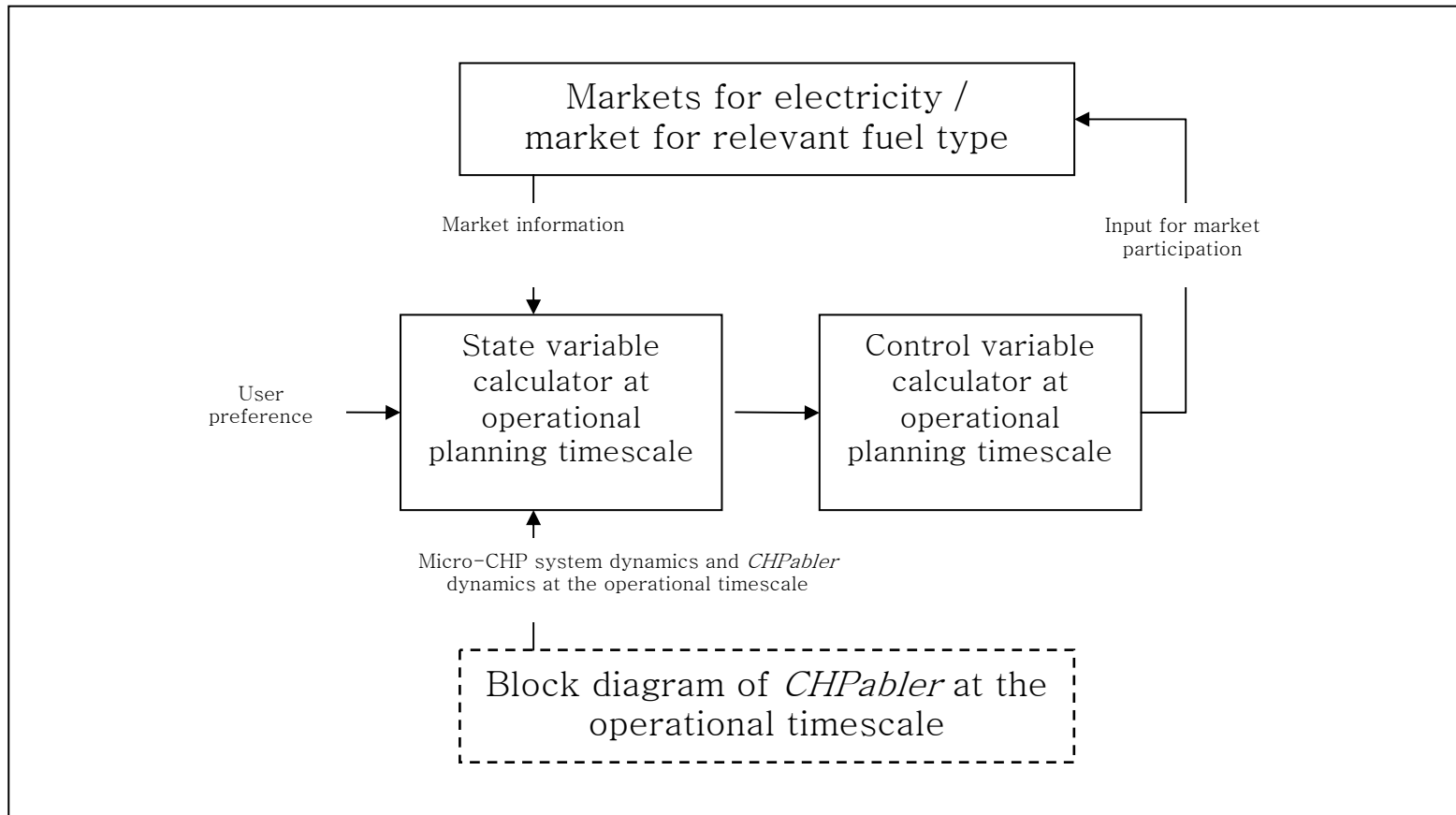
Example of Asset Management by ESP with CHP through Consumer Portal



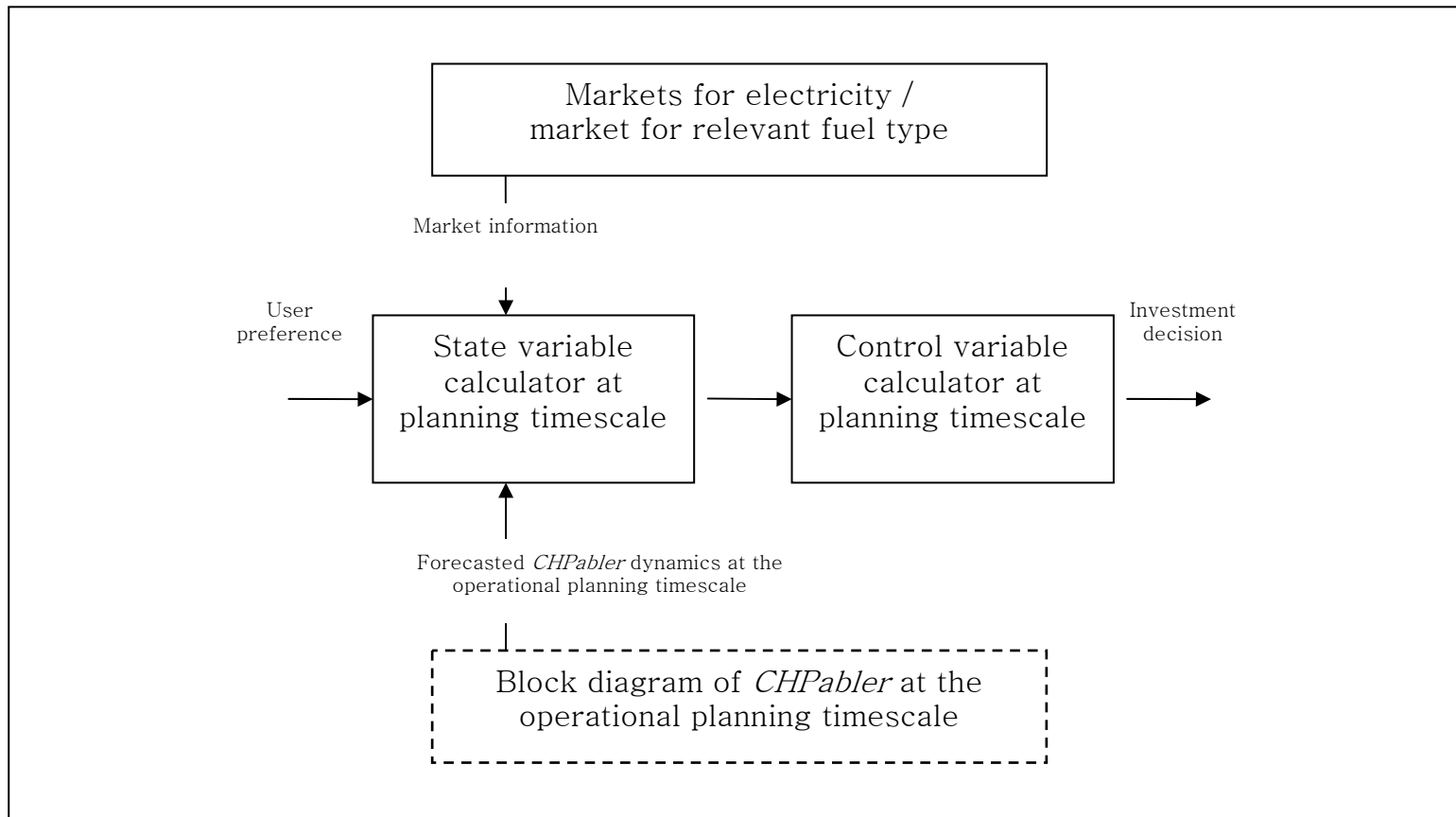
Managing CHP at Operational Timescale



Managing CHP at Operational Planning Timescale



Managing CHP at Planning Timescale





SWOT Analysis

Strength	Weakness
<ul style="list-style-type: none">○ Competitive high quality IT technology○ Proven experience of technology development at the subsystem level○ Strong will for development	<ul style="list-style-type: none">○ Dependence on traditional technology○ Lack of system integration technology○ Lack of ability to forecast for application upon development
Threats	Opportunity
<ul style="list-style-type: none">○ Developed countries leading to Power IT R&D○ Various related standards being established in US○ Existence of both technical and institutional uncertainties	<ul style="list-style-type: none">○ Reorganization of technological dominance○ Increase of market share in power IT services○ Achieving leadership in establishing power IT technology standards



Dealing with Threats to R&D

- Technology development in stages to take the uncertainties account: technical, institutional, business model-related, and utility company and industry-related
- Continuous concurrent market research and analysis
- Understanding the “cultural” differences between electric power industry and IT industry
- Government’s role in supporting core players for innovative approaches to R&D through well-defined incentives



This Year's Development Goals

- Business and Market Analysis with respect to Value-added Services
 - Define large customers' requirements
 - Market trend analysis and demand forecast
 - Business model development and cost-and-benefit analysis
- Collaboration with CEIDS
 - Combine goals and milestones
- Proposals for Improving Market Environment
 - Define the necessary regulatory support
 - Complete technical roadmap for integrated resource management system development of large customers
 - Define core technology in development