The 3rd Basic Plan for Long-Term Electricity Supply and Demand
(2006 ~ 2020)

Dec. 2006

Ministry of Commerce, Industry & Energy

Korea Power Exchange

This document was written by KPX on December 2006 in the English languages. In case of any divergence of interpretation, the Korean text shall prevail.

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1. Background and Characteristics

A. Legal Background

☐ The 3rd Basic Plan for Long-term Electricity Supply and Demand (BPE) is prepared pursuant to Article 25 of the Electricity Business Act (EBA) and Article 15 of the Electricity Business Decree. EBA requires the Ministry of Commerce, Industry, and Energy (MOCIE) to prepare and announce the BPE on a biennial basis.

O BPE stipulates electricity policy directions on supply and demand, long-term outlook, construction plan, DSM, etc.

B. Characteristics

☐ The plan shall provide the basic directions for electricity policy to secure electricity supply following the electricity industry restructuring plan and the market information on its supply and demand.

O The government shall exert every effort to implement the BPE through various administrative formalities such as licensing the electricity business. Special measures shall also be taken when electricity shortages are expected.

☐ To implement business properly, generation companies (GenCos) shall apply for their generation business and construction license based on the supply and demand plan indicated in the letter of construction intents of power plants.

* Construction intents → reflection of the BPE → Approve the generation business and the construction plan.

* The reflection of the BPE on the construction plan is a prerequisite for the expeditious processing of approval procedures (19 items) related to the construction of power plants pursuant to the Power Resources Development Law (Clause 3, Article 2 and Clause 1, Article 6).

C. Procedure

☐ Six subcommittees consisting of experts from universities, institutes, electricity companies, and other organizations shall submit study reports individually.

* 6 subcommittees: Demand Forecast, Demand Side Management (DSM), Transmission System, Generating Capacity, Renewables (newly established), and General Policy.

☐ The BPE shall be made based on the constructional intentions of GenCos and the demand forecast provided by Korea Power Exchange (KPX).

☐ The government shall collect and review ideas and opinions of every aspect from various economic organizations through public hearing, and shall finalize the BPE by incorporating comments from the Electricity Policy Review Board on the plan.

☐ The government shall revise and/or supplement the BPE on an annual basis considering the changes in the letter of intent for construction submitted by GenCos and the changes of the electricity market including electricity supply and demand situation.

Figure 1.1 Procedure for BPE Establishment

Establish directions for BPE	○ MOCIE
⇩	
Submit materials covering each field (with the letter of intent for construction by GenCos)	○ GenCos/KPX
⇩	
Review and prepare the working drafts	○ 6 subcommittees (Demand Forecast/Demand Side Management/Transmission System/ Generating Capacity/Renewables/General Policy)
⇩	
Collect opinions related to the BPE (tentative plan)	○ Public hearing
⇩	
Examine the BPE (draft)	○ Electricity Policy Review Board
⇩	
Finalize and announce the BPE	○ MOCIE

2. Direction of BPE

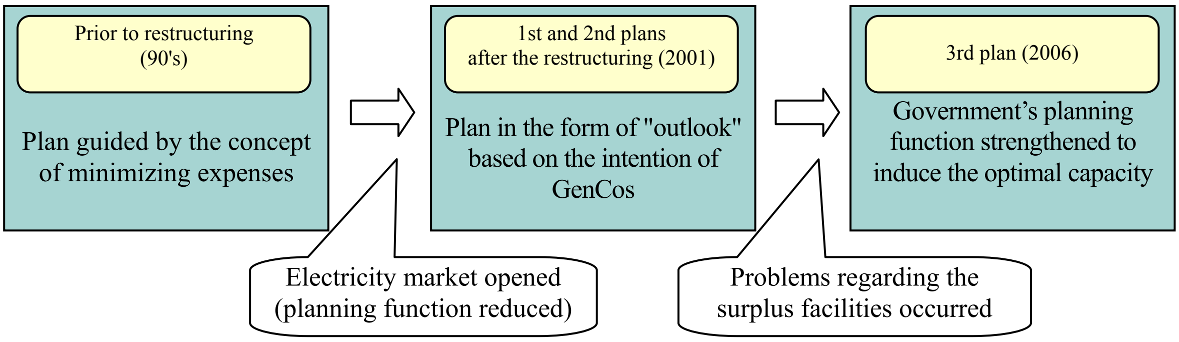
A. Planning Period: From 2006 to 2020

- The planning period has been set for 14~15 years, assuming the lead time and the actual construction time of coal and nuclear power plants which take approximately 8~10 years.

B. Strengthening the Planning Functions

- Taking into account the circumstances of the current electricity market, i.e., guaranteeing the effective distribution of resources is difficult, the 3rd BPE has strengthened "planning" function for the optimization of the capacity and generation mix.

Figure 1.2 The Changes in Planning Characteristics



- The GenCos' construction intents was selectively reflected based on the optimal generating capacity considering the minimization of social costs and generation mix.

C. Strengthening Supply Security by establishing regional electricity supply and demand plans

- The relatively weak supply securities in metropolitan area and Jeju Island have been strengthened considerably by establishing regional electricity supply and demand plans (Metropolitan, non- Metropolitan area, and Jeju Island).

- The optimal capacity has been calculated, and thus the expansion of generating facilities has been promoted accordingly.
  * While Metropolitan (Seoul and its vicinity) area accounts for 41% of the peak demand, it has only 22% of the generating capacity.

- A long-term electricity supply plan has been established considering the characteristics of the power system in Jeju Island.

D. Reflecting the Environmental Costs to the Generation Mix

- CO_2 costs (KRW13,000/CO_2 ton*) are considered when composing the appropriate generation mix in order to effectively cope with international environmental regulations such as the Kyoto Protocol.

  * Costs are calculated considering the overseas emission trading price, CDM, and marginal CO_2 reduction costs.

- While such environmental consideration is slightly disadvantageous to the coal power plants due to their high CO_2 emission, it is relatively advantageous to nuclear and LNG power plants.

  * CO_2 emission by generation resources (kg-C/kWh): 0 for nuclear, 0.21 for coal, and 0.10 for LNG

E. Minimizing Uncertainties of the Supply and Demand Outlook by Introducing the Concept of Effective Reserve Margin

- A statistical concept of effective reserve margin has been introduced, considering the contributions of utilities(non-regular generators such as renewables, CES) to the peak, and the performance rate of LNG generators' construction.

- Supply outlook has been set according to the actual reserve margin concept, promoting the reliability of the plan as well as solving the controversy of over-generation.

F. Strengthening Professionalism and Transparency in the Process of Establishing Plans

- Operation of the working subcommittee composed of experts in each field

  - Meetings consisting of the 6 subcommittees - Demand Forecast, Demand Side Management, Transmission System, Generating Capacity, Renewables (newly established) and General Policy - were held for 21 times so far (as of Dec. 2006).

  - The plan has been established via examination by experts (total of 75 persons) in each field who also participate in the working subcommittee.

- Transparency and objectivity of the plan have been promoted through discussions with the 「Presidential Commission on Sustainable Development (PCSD)」 since the initial stage of establishing the plan (meetings have been held for 9 times since March 2006).

3. History

- ○ Basic directions for BPE were set: the establishment of working subcommittees. (October 2005~)
  - Characteristics of BPE were redefined in a direction wherein the government's political functions have been strengthened, considering the circumstances of the current electricity industry.
  - Composition of working subcommittees: experts from academy, industry, and research areas including the government (75 persons in 6 fields)
    * Working subcommittee meetings were held: Demand Forecast (3 times), Demand Side Management (4 times), Transmission System (3 times), Generating Capacity (5 times), Renewables (4 times), and General Policy (twice)
- ○ Surveys on 「Generating Capacity Expansion and Retirement Intention」 with GenCos were conducted. (twice: December 2005 and March 2006)
- ○ Political meetings with PCSD(March ~ July 2006) were held for 9 times to discuss the nature and roles of BPE and method of its establishment.
- ○ Electricity demand forecasts were set: demand side management plan considering the economic growth rate, changes in industrial structures, latest electricity demand, and other circumstantial changes. (January ~ May 2006)
- ○ The construction intents submitted by GenCos were classified, and the conditions of grid connections were examined. (April and May 2006)
- ○ Reference Generating Capacity plan was established based on the electricity demand, and GenCos' letters of intent for construction were assessed. (May ~ July 2006)
- ○ Transmission expansion plan and long-term electricity supply and demand plan were set based on the generation capacity plan. (July and August 2006)
- ○ Public hearing on the 3rd BPE draft was held on September 27, 2006.
- ○ The 3rd BPE draft was reviewed by PCSD. (September 28 ~ November 23, 2006)
- ○ Electricity Policy Review Board was convened to discuss the 3rd BPE draft. (November 24, 2006)

Ⅱ. Long-term Electricity Demand Forecast

1. Recent Status and Conditions of Electricity Supply and Demand
2. Demand Forecasting Methodologies
3. Electricity Demand Forecast
4. Measures Related to Demand Side Management

1. Recent Status and Conditions of Electricity Supply and Demand

a. Status of Electricity Supply and Demand

☐ Electricity consumption has steadily increased owing to the economic growth alongside of the improvement in the standard of living.

○ The ratio of generation among the primary energy consumption has increased continuously.

Table 2.1 Ratio of generation among the primary energy consumption

Year	1970	1980	1990	2000	2006
Ratio of generation among the fuels used (%)	12.7	20.6	28.0	31.6	36.0

○ While the energy demand from 1990 to 2004 has increased by an annual average rate of 6.2%, the annual average rate of electricity demand during that period has grown by 9.1% (annual average rate of economic growth: 5.5%).

- The industrial structure has converted into a low electricity consuming form, with the increase of IT and electronics businesses since 2001. Although the increase rate of electricity demand has somewhat slowed down compared to that of 90s, it remained at a level higher than the economic growth rate.

* Annual average electricity demand increase rate: 9.7% in ’91~’00 and 6.8% in ’01~’05

☐ The electricity quality of Korea has been maintained at the best level, so has the electricity rate.

○ The electricity quality has been the world's best in terms of the transmission/distribution loss factor and outage time.

* Transmission/Distribution loss factor: 4.5% for Korea, 5.1% for Japan, 6.5% for US, and 6.7% for France

* Average outage time (minute/customer/year): 19 for Korea, 19 for Japan, 97 for US, and 50 for France

○ Compared to 1990, the consumer price index for 2005 surged by 86%, and the electricity rate, by 46%.

* Electricity rates (US cent/kWh): 7.02 for Korea, 18.92 for Japan, 7.44 for US, and 10.00 for Britain

b. Conditions of Electricity Supply and Demand

□ Increased uncertainties in the future energy environment

○ Due to the rapid changes in the international situation and intensified competition in securing energy resources, oil prices have surged; thus causing insecurities in the supply of energy.

- Factors contributing to the uncertainties in the supply of energy persist owing to the limits in natural resources* and regional unbalances.

* The limits in natural resources: 41 years for oil, 65 years for natural gas, 155 years for coal, and 70 years for uranium (BP statistics)

○ The market situation for the domestic electricity industry has changed, including the increase of private GenCos' participation to the market, and caused delays in the implementation of projects and uncertainties in the supply of electricity.

- Uncertainties further increased as a result of the delays in the implementation and cancellations of project plans due to the opposition of the local citizens to the construction of electricity facilities with increased environmental awareness.

□ Necessity of sustainable energy policies

○ Strengthening the demand side management and expanding the supply of renewables are necessary due to the high dependency on overseas energy resources and the surge of fossil fuel prices.

○ Environmental-friendly policies, such as the greenhouse gas reduction, are needed in order to deal with the strengthened domestic and international environment regulations including the Kyoto Protocol.

□ Active investment of public enterprises to electricity facilities

○ There are limits to effectively realize the stabilized electricity supply based on the market function and to acquire optimal generation mix given the limited electricity market environments.

○ GenCos have expressed favorable construction intentions to expand their businesses, thanks to the stable electricity market (CBP market) with capacity payment.

□ Increasing social interest in the electricity policies

○ A public consensus on energy policies has become necessary, from the increasing social interest in the electricity policy covering the diversification of GenCos, expanded distributed generation systems including renewables, nuclear policy, and the construction of transmission lines.

2. Demand Forecasting Methodologies

a. Key Assumptions

☐ Economic Growth Forecast (data from the Korea Development Institute (KDI))

○ An annual average rate of 4.4% is forecasted for the period of 2006~2020 (slight increase compared to the 2nd BPE).

Table 2.2 Economic Growth Forecast (unit: %)

	'06	'06~'10	'11~'15	'16~'20	'06~'20
3rd BPE	5.0	4.7	4.4	4.1	4.4
			'11~'20 : 4.2		
2nd BPE	5.4	5.0	4.0	3.4 ('16~'17)	4.1 ('06~'17)
			'11~'17 : 3.7		

☐ Industrial Structure Forecast (data from the Korea Institute for Industrial Economics and Technology (KIET))

○ Compared to the 2nd BPE, the ratio of service and manufacturing is expected to increase and decrease, respectively.

Table 2.3 Industrial Structure Forecast (unit: %)

Classification		2006	2010	2015	2020
Agriculture and fisheries	3rd (2nd)	3.4 (4.0)	2.8 (3.3)	2.3 (2.6)	1.9 (2.1)
Manufacturing	3rd (2nd)	28.9 (33.1)	29.4 (32.1)	28.9 (30.3)	28.3 (28.6)
Service	3rd (2nd)	67.5 (62.6)	67.7 (64.4)	68.6 (66.9)	69.7 (69.2)

☐ Other assumptions include electricity rate outlooks, population growth, home appliance supply rate outlook, and public development plans such as subway and city water.

b. Forecasting Methodologies

☐ KPX has produced forecasts using the long- and short-term forecasting models based on the outlooks issued by related institutions (KDI, KIET, etc.).

○ The forecasting results are finalized based on the consultation from related experts and the review by the demand forecast subcommittee.

☐ Electricity demand forecast

○ Electricity demand(kWh) is forecasted based on 2 residential sectors, 4 commercial sectors, and 10 industrial sectors considering the economic growth, industrial structure, and trends in electricity demand in the future.

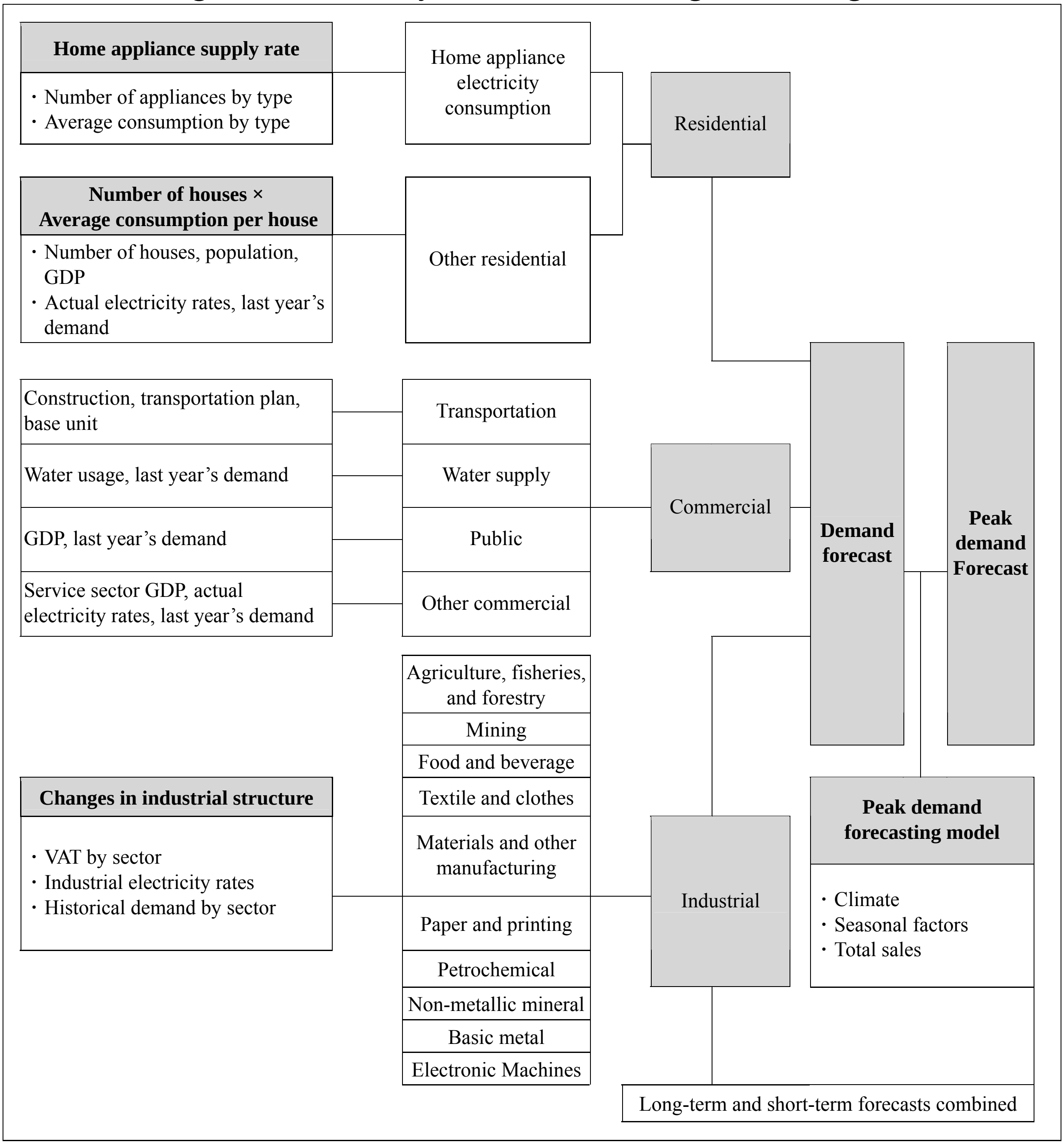
☐ Peak demand forecast

○ Peak demand(kW) is forecasted before considering the DSM, with seasonal, climate and electricity elasticity factors on the sales reflected.

☐ Reflecting the demand side management

○ Peak demand is calculated with DSM reflected, and high and low electricity demand forecast scenarios are created considering the uncertainty of future electricity demand growth.

Figure 2.1 Electricity Demand Forecasting Methodologies



3. Electricity Demand Forecast

a. National Electricity Demand

[Electricity demand]

- An average growth rate of 2.5% per annum is expected from 2006 to 2020 (3,531TWh in 2006 → 4,786TWh in 2020).
  - Increase rate by contract classification: 2.2% for residential, 3.0% for commercial and 2.2% for industrial
- The industry is expected to evolve gradually into a low electricity-consuming structure; an annual average growth rate of approximately 1% is expected after 2013.

Table 2.4 Electricity demand by contract classification (unit: GWh)

Classification		2006	2010	2015	2020
Before DSM		353,581	420,656	465,801	492,653
After DSM	Residential	68,794	80,573 (4.0%)	86,190 (1.4%)	89,241 (0.7%)
	Commercial	107,702	130,190 (4.9%)	146,837 (2.4%)	157,808 (1.5%)
	Industrial	176,590	205,859 (3.9%)	223,416 (1.7%)	231,506 (0.7%)
	Total	353,086	416,623 (4.6%)	456,443 (1.8%)	478,555 (1.0%)

* Figures in parenthesis denote the annual average growth rate.

[Peak demand]

- An annual average growth rate of 1.8% is expected during the period of 2006~2020 (2006: 5,899MW → 2020: 7,181MW).
  - Peak demand is expected to reach 5,899MW in 2006 and 7,181MW by 2020.
  - The amount of DSM shall be expanded continuously to 1,161MW, which takes 14% of the peak load demand (based on 2020).

Table 2.5 Peak demand Forecast (unit: MW)

Classification	2006	2010	2015	2020
Before DSM	-	6,878	7,729	8,342
Amount of DSM	-	417	782	1,161
After DSM	5,899 (actual)	6,461 (3.4%)	6,947 (1.5%)	7,181 (0.7%)

* The amount of DSM is based on the annual demand side management targets (aggregate total) versus the 2005 performance (excluding direct load).

b. Electricity Demand by Province

[Metropolitan area]

○ Electricity demand is expected to increase by an annual average rate of 2.9%, a level similar to the national electricity demand increase rate during the period of 2006~2020.

- 2006: 1,359TWh → 2020: 1,969TWh

○ Peak demand is expected to increase by an annual average rate of 2.4% during the period of 2006~2020.

- 2006: 2,379MW → 2020: 3,190MW

Table 2.6 Electricity demand in metropolitan area

Classification	2006	2010	2015	2020
Electricity sales (GWh)	135,888	164,096 (4.8%)	186,255 (2.6%)	196,926 (1.1%)
Peak demand (MW)	2,379 (actual)	2,773 (3.9%)	3,027 (1.8%)	3,190 (1.1%)

* Figures in parenthesis denote the annual average growth rates.

[Jeju Island]

○ Electricity demand is expected to increase by an annual average rate of 2.4% during the period of 2006~2020.

- 2006: 29.8TWh → 2020: 39.6TWh

○ Peak demand is expected to increase by an annual average rate of 4.1% until 2020, a level that is slightly high compared to the increase trend.

- 2006: 52MW → 2020: 88MW

Table 2.7 Electricity demand in Jeju

Classification	2006	2010	2015	2020
Electricity sales (GWh)	2,975	3,648 (5.2%)	3,960 (1.7%)	3,962 (0%)
Peak demand (MW)	52 (actual)	65 (5.7%)	78 (3.7%)	88 (2.4%)

* Peak demand is an asynchronous peak demand.

* Figures in parenthesis denote the annual average growth rates.

4. Measures Related to Long-term DSM

a. Status of Demand Side Management

- DSM programs have been implemented since 1990 to ease the burdens related to financing, siting and environmental impact caused by new power plant constructions.
- Recently, DSM projects have become the priority tasks and the related budgets have been increased considerably to save energy and improve energy efficiency.

Table 2.8 Demand Side Management Records

Classification	2002	2003	2004	2005
Amount of DSM (MW)	346	387	428	516
Investment (KRW100 million)	640	645	692	1,084

* The amount of DSM represents the cumulative quantities since 1991 (excluding direct load control); investment pertains to the yearly cost for DSM.

b. Basic Policy for Demand Side Management

☐ Steady increment of DSM

- Since a high rate of increase in peak demand is expected until 2010, load management programs with high contribution to the stable supply and demand shall be maintained on a short-term basis.
- In the long run, DSM shall focus on the efficiency improvement program.

☐ Continuous Development of new DSM programs

- The effects of each detailed support program shall be reanalyzed, and the system shall be improved according to the technology and market share.
- New programs shall be developed and applied in connection with the technical levels vis-à-vis new technologies and new products.

☐ Building an effective DSM system

- An effective implementation system shall be constructed and operated, including planning, managing, executing and evaluating of DSM projects.
- Resources subject to DSM shall be discovered, regional targets shall be calculated, and performance shall be quantified.

c. DSM Target

○ The DSM target shall be set to maintain the high level in the previous 2nd BPE.

○ The percentage of energy improvement projects has been increased significantly to save the energy consumption.

* Efficiency improvement share: 12.9% ('06) → 25.3% ('20)

Table 2.9 Peak Demand Saving Targets

(unit: MW)

Classification	2005 (actual)	2010	2015	2017	2020
Load control (including gas cooling)	(4,420)	2,818	4,949	5,932	7,404
Efficiency improvement	(735)	1,004	2,334	2,825	3,521
New development	(1)	350	540	600	690
Total	- (5,156)	4,172 (9,328)	7,823 (12,979)	9,357 (14,513)	11,615 (16,771)

* Yearly DSM targets are shown based on the accumulated net increment compared to 2005

* Figures in parenthesis denote the accumulated amount of DSM.

d. Investment in DSM

☐ The total investment in DSM from 2006 to 2020 will amount to KRW2.824 billion.

Table 2.10 Estimated Investments in DSM

(unit: 100 million, %)

Classification		2006	2010	2015	2017	2020	Cumulative Total
3rd BPE	Load control	745	1,014	1,255	1,339	1,452	17,375
	Efficiency improvement	348	761	784	810	759	10,865
	Total	1,093	1,775	2,039	2,149	2,211	28,240

* Only subsidies are calculated based on the current constant unit price.

Ⅲ. Generating Capacity Plan and Electricity Supply and Demand Outlook

1. Basic Direction and Planning Principle

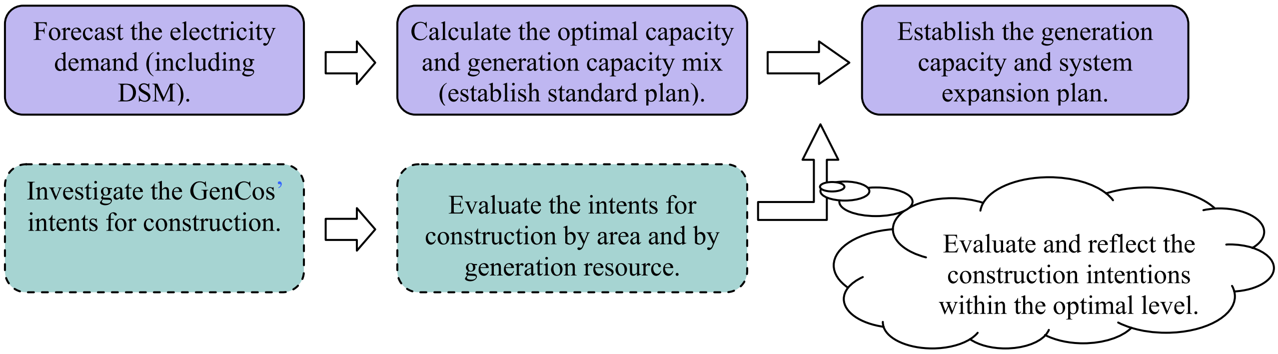
a. Basic Direction

○ Draw the optimal generating capacity and fuel mix with least social costs based on the demand forecasts through a computer model. (Establish reference generation expansion plan).

- According to the calculated necessary generation capacity, The GenCos' intents for construction are evaluated considering the generation capacity required by region and generation resource; and the results are reflected selectively.

  * All construction intents to distributed generation systems (renewables and Regional Cogeneration System (RCS))are reflected without evaluation in a policy level.

Figure 3.1 Conceptual Drawing of the Method of Establishing the Capacity Plan



b. Reference generating capacity planning principle

○ Optimal solutions (appropriate level of facilities and generation fuel mix) shall be derived through a computer model based on supply reliability, environmental impact (CO_2 emissions), and economic value according to the forecasted electricity demand.

○ Application standard for prerequisite input

- Regional (metropolitan, non-metropolitan, Jeju Island) supply reliability criteria: LOLP* 0.5days/years

- CO2 emission limits: 0.11 kg-C/kWh; CO2 emission costs reflected: KRW13,000/ CO_2 ton

  * LOLP (Loss of Load Probability): The probabilistic electricity supply reliability index when the electricity supply does not satisfy demand considering the number of days of generator's failure/repair

○ The input prerequisites (fuel prices, discount rate, and CO2 restraints) are changed, and 6 scenarios are prepared to analyze sensitivity; 1 best standard plan is then selected.

c. Results of the Planning Principle

○ Reference capacity reserve margin (based on the effective capacity)

- Nationwide basis: Approximately 15~20% (may vary according to the transmission congestion)
- Metropolitan areas: 14% or more, Jeju Island: 28% or more

Table 3.1 Reference generating capacities composition ratio (based on 2020)

Nuclear	Coal	LNG	Petroleum	Hydro/Others
30~33% level	28~31% level	22~26% level	2~3% level	12~15% level

* Others include renewables/RCS facilities.

○ Scale of capacities required per reference generating capacity

- Projects under construction or preparation shall be considered fixed projects; additionally required (2020 basis) generating capacities are calculated.

Table 3.2 Scale of capacities required per reference generating capacity

Classification	New Capacity Added by Generation Resources (MW)				Total (MW)	Remarks
	Nuclear	Coal	LNG	Internal Combustion		
Metropolitan areas	-	1,800 (2 units)	4,400 (8 units)	-	6,200	
Non-metropolitan areas	2,800 (2 units)	1,000 (1 unit)	1,400 (2 units)	-	5,200	
Total (new project added)	2,800 (2 units)	2,800 (3 units)	5,800 (10 units)		11,400	Reserve margin: 20% level

* Jeju Island shall be analyzed separately.

2. Surveys on Gencos' Intents for Construction

a. Survey Outline

○ Purpose: The goal of the survey is to reflect the Gencos' intents to participate in the market.

○ Surveys were conducted twice.

▪ 1st survey: 23 Dec. 2005 ~ 31 Jan. 2006

▪ 2nd survey: 23 Mar. 2006 ~ 5 Apr. 2006

○ Objects: Capacity Plans under construction, new construction and power plant retirement plans

b. Overall data on Power Plant Construction Intents

○ Construction intents covering a total of 5,657MW were submitted during the period of 2006~2020.

- Under construction (including renewables): 2,140MW
- New Intentions: 3,517MW
- Public GenCos prefer bituminous coal and LNG combined plants, with private GenCos preferring LNG combined.

Table 3.3 Construction intents by company

(unit: MW)

Classification	KHNP	5 Major Public Enterprises	Private* GenCos	KEPCO, KOWACO, etc.	Total
Under construction (permits ~ commencement of work)	686	978	347	128	2,140
Under planning	560	1,872	1,085	0	3,517
Total	1,246	2,850	1,432	128	5,657

* Private: POSCO Power, K-Power, GS EPS, Meiya, Daelim, SK E&S, RCS

Table 3.4 Generation capacity intents by fuel type

(unit: MW, stations)

Classification	Nuclear	Coal	LNG	Petroleum	Hydro	Renewables / Others	Total
Capacity (no. of units)	1,240 (10)	1,772 (23)	1,854 (30)	126 (23)	250 (23)	416 (159)	5,657 (278)
Percentage	21.9%	31.3%	32.8%	2.2%	4.4%	7.4%	100%

* 1. Among the renewable generations, small Hydros are included in the Hydro.

2. RCS capacities (total of 198.4MW) are included in renewables/others.

c. Overall data on Power Plant Retirement Intents

○ GenCos plan to retire 570.6MW (43 plants) from 2006 to 2020.

Table 3.5 Generation Capacity Retirement Intents

(unit: MW, stations)

Classification	Nuclear	Bituminous Coal	LNG	Anthracite	Petroleum	Hydro	Total
'06-'20	-	100 (2)	153.8 (6)	52.5 (3)	264.3 (31)	0.07 (1)	570.6 (43)

d. Summary

○ GenCos have submitted their intents to construct a total of 5,086MW during the period of 2006~2020.

Table 3.6 Submitted GenCos' Intents for Construction by Year

Year	Peak Demand (MW)	Generating Capacity (MW)			Installed Reserve Margin (%)
		Retirement	Expansion	Generating Capacity	
2005		Existing capacity 6,226			
2006	5,899 (actual)	13.5	343	6,452 (6,555)	9.4
2007	5,968	0.3	248	6,671 (6,804)	11.8
2008	6,138	-	376	7,060 (7,179)	15.0
2009	6,299	66.1	408	7,310 (7,521)	16.1
2010	6,461	-	320	7,526 (7,841)	16.5
2011	6,594	75.5	701	8,056 (8,466)	22.2
2012	6,712	88.8	373	8,582 (8,750)	27.9
2013	6,809	122.5	800	8,918 (9,428)	31.0
2014	6,883	100	564	9,415 (9,892)	36.8
2015	6,947	100	647	10,182 (10,439)	46.6
2016	7,005	-	397	10,576 (10,836)	51.0
2017	7,054	-	-	10,836 (10,836)	53.7
		566.6	5,177		
2018	7,103	4	140	10,972 (10,972)	54.5
2019	7,141	-	240	11,112 (11,212)	55.6
2020	7,181	-	100	11,312 (11,312)	57.5
Total		570.6	5,657		

* Figures in parenthesis denote the year-end standard capacities.

3. Criteria for Evaluating the Intents for Construction

- The GenCos' intents for construction are evaluated to establish a generation capacity plan at an optimal capacity shown in the "Reference generating expansion plan," and the results are reflected selectively.
  - However, that all intents for the construction of renewables and RCS are reflected in consideration of promotion policy for the distributed generation systems.
- Basic evaluation directions
  - Social costs including generation costs and transmission costs are evaluated in relation to the construction of facilities.
  - Construction workability, timely retirement of aged plants, and cases of delay in planning are evaluated; additional points are granted to private utilities to promote the participations of private enterprises.

Table 3.7 Criteria for Evaluating the Intents for Construction

Classification	Evaluation Index	Details	Evaluation Standard	Weighted Value
Metric index	Transmission costs	Grid connection costs (KRW)	Total costs	80%
		System reinforcement costs (KRW)		
	Generation costs	Power plant facilities (KRW)		
		Operation costs (KRW)		
Non-metric index	Public Acceptance	Desire to induce	Whether inducement is desired by the local area	20%
	Project progress	Obtain sites for power plants	Degree of acquisition	
		Acquire grid connecting facilities	Degree of acquisition	
		Degree of prior preparation	Construction feasibility survey service	
			Level of environmental impact assessment	
	Policy effectiveness	High-cost aged facilities to be retired	Replace construction project in the same site	
		Project delays to be suppressed	Extent of project delays	
		Promote participation by private enterprises	Private projects	

* 1. The construction feasibility survey service refers to a report submitted by an external service company after examining the economic effects and technical aspects of the projects.
2. Each working subcommittee evaluates the projects.

4. Results of the Generating Capacity Plan

a. Projects Considered in the Plan

- A grade (capacities under construction), B grade (capacities for which construction is being prepared): Projects to be fixed
- C1 grade (projects under planning): Capacities to be selectively evaluated, regarding the capacities (considering the uncertainties of performance) required by area and by generation as shown in the “Reference Generating Capacity Expansion Plan.”
- C2 grade: Excluded from evaluation due to the problem of supplying fuels and connecting systems

Table 3.8 Project Classification and Projects to be reflected

<table>
<tr><th colspan="2">Grade</th><th>Nuclear</th><th>Coal</th><th>Gas Combined</th><th>Heavy Oil</th><th>Hydro</th><th>Renewables/RCS</th><th>Total Capacity (MW)</th><th>Remarks</th></tr>
<tr><td colspan="2" rowspan="2">A, B Grade</td><td>Singori #1 (‘10.12) 1000
#2 (‘11.12) 1000
Sinwolseong #1 (‘11.10) 1000
#2 (‘12.10) 1000
Singori #3 (‘13.09) 1400
#4 (‘14.09) 1400</td><td>Dangjin #6 (‘06.06) 500
#7 (‘07.06) 500
#8 (‘07.12) 500
Taean #7 (‘07.06) 500
#8 (‘08.03) 500
Boryeong #7 (‘08.06) 500
#8 (‘08.12) 500
Hadong #7 (‘08.12) 500
#8 (‘09.06) 500
Yeongheung #3 (‘08.06) 870
#4 (‘09.03) 870</td><td>Gwangyang #1 (‘06.03) 494.6
#2 (‘06.12) 494.6
Bugok #2 (‘08.03) 500</td><td>South Jeju #3 (‘06.9) 100
South Jeju #4 (‘07.3) 100

small islands 17.5</td><td>Yangyang pump 1-4 1000
Cheongsong pump 1,2 600
Yecheon pump 1,2 800
Cheongpyeong extension 60</td><td>Renewables/ RCS 2,205/ 1,984</td><td>Retirement -5706.2</td><td rowspan="2">Reflected final</td></tr>
<tr><td>6,800</td><td>6,240</td><td>1,489</td><td>218</td><td>2,460</td><td>4,189</td><td>21,396 (15,690)</td></tr>
<tr><td rowspan="6">C1 Grade</td><td rowspan="2">Metro politan areas</td><td></td><td>Yeongheung #5 (‘14.06) 870
#6 (‘14.12) 870</td><td>Incheon #2 (‘09.06) 500
#3 (‘12.12) 700
POSCO #2 (‘10.12) 1000
Seoul #1,2 (‘11.3, 9) 1000
Godeok (‘11.10) 700
Yangju #1 (‘11.12) 700
Yangju #2 (‘13.12) 700
Songdo #1 (‘12.01) 1000</td><td></td><td></td><td></td><td>8,040</td><td>Reflected</td></tr>
<tr><td></td><td>Yeongheung #7 (‘15.09) 870
#8 (‘16.03) 870
#9(‘19.12) 1000
#10 (‘20.06) 1000</td><td>POSCO #3 (‘ 15.1) 1000
Yangju #3 (‘ 16.12) 700
Songdo #2,3 (‘15.06) 2000</td><td></td><td></td><td></td><td></td><td>Candidate</td></tr>
<tr><td rowspan="2">Non-metro politan areas</td><td>Sinuljin #1 (‘15.12) 1400
#2 (‘16.12) 1400</td><td>Dangjin #9 (‘13.12) 1000
#10 (‘14.12) 1000</td><td>Gunsan (‘09.11) 700
Yeongwol #1,2 (‘10.11) 900
Yulchon #2 (‘12.06) 550
Bugok #3,4 (‘11.6) 1000</td><td></td><td></td><td></td><td>7,950</td><td>Reflected</td></tr>
<tr><td>New #1 (‘18.06) 1400
#2 (‘19.06) 1400</td><td>Boryeong #9 (‘13.03)1000
#10 (‘13.09)1000
Taean #9 (‘13.03) 1000
#10 (‘13.09)1000</td><td>Yeongnam #1,2 (‘13.03) 900
Bugok #5,6 (‘14.12) 1500
Yeongnam #3,4 (‘15.03) 900</td><td></td><td></td><td></td><td></td><td>Candidate</td></tr>
<tr><td rowspan="2">Jeju Island</td><td></td><td></td><td>JejuA (’11.06) 300</td><td>Jeju Int. combustion #2 (‘09.6) 40</td><td></td><td></td><td>340</td><td>Reflected</td></tr>
<tr><td></td><td></td><td>JejuB (’11.06) 300</td><td></td><td></td><td></td><td></td><td>Candidate</td></tr>
<tr><td colspan="2">C2 Grade</td><td></td><td></td><td></td><td>Gunjang (‘16.03, ‘16.09) 1000</td><td></td><td></td><td></td><td>Excluded</td></tr>
<tr><td rowspan="2">Total reflected</td><td>(C1)</td><td>2,800</td><td>3,740</td><td>9,750</td><td>40</td><td>0</td><td>0</td><td>16,330</td><td></td></tr>
<tr><td>Total</td><td>9,600</td><td>9,980</td><td>11,239</td><td>258</td><td>2,460</td><td>4,189</td><td>37,726 (32,020)</td><td></td></tr>
</table>

* Figures in parenthesis denote those when the retired capacity is included; GenCos for Jeju combined (300MW) have yet to be decided (plans to select in 2007).

* Since there are uncertainties in procuring fuels, the Gunjang orimulsion (1,000MW, 2016) project was excluded from the evaluation; the project will be reviewed again in the next plan.

b. Generating Capacities Expansion

☐ Amount of added generating capacity (2006~2020)

○ Out of the capacity (total of 5,657MW) indicated in the intents for construction submitted by GenCos, only 3,773MW (88 units) are finally reflected to the generation capacity plan.

- Capacities under progress: 2,140MW, New plant: 1,633MW
- Compared to the 2nd BPE, nuclear capacity is almost the same; coal and LNG have increased with 368MW and 359MW respectively.

Table 3.9 Generating Capacity additions by fuels

(unit: MW, number of units)

Classification		Nuclear	Coal	LNG	Oil	Hydro	Renewables/ Others	Total
2nd BPE	'06-'17	960(8)	630(12)	765(14)	121(14)	240(8)	464(19)	3,181(75)
3rd BPE	'06-'17	960(8)	998(15)	1,124(18)	26(21)	246(8)	419(18)	3,773(88)
	'06-'20	960(8)	998(15)	1,124(18)	26(21)	246(8)	419(18)	3,773(88)

* Small Hydro is included in renewables/RCS, with renewable facilities are excluded from the number of units.

☐ Generator retirement (2006~2020)

○ Compared with the 2nd BPE, 1 nuclear unit (Wolseong#1) and 2 coal stations (Honam#1,2) are excluded from among those subjected to retire (life extended). On the other hand, 2 LNG stations (Incheon #3, 4) are added to the retirement list.

Table 3.10 Generating Capacity retirements by fuels

(unit: MW, stations)

Classification		Nuclear	Coal	LNG	Oil	Hydro	Renewables/ RCS	Total
2nd BPE	'06-'17	68(1)	203(7)	89(4)	259(14)	-	-	619(26)
3rd BPE	'06-'20	-	153(5)	154(6)	264(31)	0.07(1)	-	571(43)

* Wolseong #1 was assumed to be operating continuously according to the intention of GenCos; however, further approvals/licenses are required.

Table 3.11 Generator construction and retirement (2006~2020)

(unit: MW, %)

Classification	Nuclear	Coal	LNG	Oil	Hydro	RCS/ Renewables	Total
Capacity (as of the end of 2005)	1,772 (28.5)	1,796 (28.8)	1,645 (26.4)	471 (7.5)	383 (6.1)	159 (2.6)	6,226 (100)
Construction plan (‘06-‘20)	+960	+998	+1,124	+26	+246	+419	+3,773
Retirement plan (‘06-’20)	-	-153	-154	-264	0.07	-	-571
Capacity (as of the end of 2020)	2,732 (29.0)	2,641 (28.0)	2,615 (27.7)	233 (2.5)	629 (6.7)	578 (6.2)	9,428 (100)

* Based on the apparent capacity (including the uncertainties of contribution to peak and construction performance)

5. Long Term Electricity Balance Outlook

a. Overall

○ The electricity supply and demand outlook is forecasted stochastically based on the "Effective Capacity" considering the supply uncertainties of the generating facilities.

* Effective Capacity: Capacity calculated considering the supply contribution during the peak demand of the distributed generation system and performance rate of LNG facilities

· Peak Contribution Rate(%): Wind power (10%), Solar (30%), Small Hydro (60%), LNG (50%), RCS (dispatchable: 60%; non-dispatchable: 30%)

· Construction performance rate of LNG facilities: 70 %

b. Electricity Supply and Demand Outlook

□ Nationwide basis

○ Since the installed reserve margin is expected to be 11~13% until 2010, active measures should be taken to respond effectively in terms of short-term supply and demand.

○ The reserve margin is expected to remain at 16~25% after 2011, thereby enabling the effective stabilization of supply and demand.

Table 3.12 Electricity Supply and Demand Outlook by Year

Year	Peak Demand (MW)	Total Capacity (MW)		Installed Reserve Margin (%)
		Summer	Year-end	
2006	5,899 (actual)	6,370	6,459	(actual) 8.0 (9.4)
2007	5,968	6,569	6,665	10.1 (11.8)
2008	6,138	6,906	7,009	12.5 (15.0)
2009	6,299	7,135	7,286	13.3 (16.1)
2010	6,461	7,287	7,600	12.8 (16.5)
2011	6,594	7,653	8,059	16.1 (21.3)
2012	6,712	8,020	8,147	19.5 (27.0)
2013	6,809	8,055	8,295	18.3 (26.3)
2014	6,883	8,282	8,609	20.3 (29.2)
2015	6,947	8,509	8,679	22.5 (31.3)
2016	7,005	8,679	8,819	23.9 (32.6)
2017	7,054	8,819	8,819	25.0 (33.7)
2018	7,103	8,815	8,815	24.1 (32.7)
2019	7,141	8,815	8,815	23.5 (32.0)
2020	7,181	8,815	8,815	22.8 (31.3)

* The figures above are based on effective capacity; figures in parenthesis under the installed reserve margin are based on the apparent capacity.

□ Metropolitan area

- ○ Since the installed reserve margin is expected to be 11~14% until 2010, active measures should be taken to respond effectively in terms of short-term supply and demand especially during the preventive maintenance period in summer.
- ○ The installed reserve margin is expected to remain at 15~19% after 2011, thereby enabling the effective stabilization of supply and demand by maintaining the adequate installed reserve margin in the metropolitan areas.

Table 3.13 Electricity Supply and Demand Outlook in Metropolitan Area

Year	Peak Demand (MW)	Generating Capacity (MW)		Transmission Credit (MW)	Total Capacity (MW)		Installed Reserve Margin (%)
		Summer	Year-end		Summer	Year-end	
2006	2,379 (actual)	1,442	1,445	1,270	2,712	2,715	14.0 (15.0)
2007	2,491	1,445	1,475	1,315	2,760	2,790	10.8 (11.8)
2008	2,599	1,563	1,565	1,375	2,938	2,940	13.0 (14.8)
2009	2,695	1,637	1,688	1,400	3,037	3,088	12.7 (14.5)
2010	2,773	1,688	1,791	1,400	3,088	3,191	11.4 (14.4)
2011	2,836	1,847	1,967	1,490	3,337	3,457	17.7 (20.7)
2012	2,896	1,929	1,949	1,490	3,419	3,439	18.0 (24.4)
2013	2,949	1,879	1,879	1,500	3,379	3,379	14.6 (20.9)
2014	2,990	1,966	2,053	1,565	3,531	3,618	18.1 (26.6)
2015	3,027	2,053	2,053	1,565	3,618	3,618	19.5 (27.9)
2016	3,055	2,053	2,053	1,580	3,633	3,633	18.9 (27.3)
2017	3,088	2,053	2,053	1,595	3,648	3,648	18.1 (26.4)
2018	3,122	2,053	2,053	1,610	3,663	3,663	17.3 (25.5)
2019	3,156	2,053	2,053	1,625	3,678	3,678	16.5 (24.6)
2020	3,190	2,053	2,053	1,645	3,698	3,698	15.9 (23.9)

* The figures above are based on effective capacity; figures in parenthesis under the installed reserve margin are based on the apparent capacity.

☐ Jeju Island

○ The security of Jeju's supply and demand, which has been somewhat poor to date, improved to at least 28% of installed reserve margin, and thus significantly enhancing supply reliability.

○ Since the installed reserve margin is expected to be 23% by 2010, however, active measures should be taken to respond effectively in terms of short-term supply and demand including demand side management measures.

Table 3.14 Electricity Supply and Demand Outlook in Jeju

Year	Peak Demand (10,000 ㎾)	Generating Capacity (MW)		Transmission Credit (10,000 ㎾)	Total Capacity (MW)		Installed Reserve Margin (%)
		Summer	Year-end		Summer	Year-end	
2006	52 (actual)	53	50	15	68	65	32.4 (35.3)
2007	57	60	61	15	75	76	33.0 (38.4)
2008	60	61	62	15	76	77	27.6 (45.7)
2009	63	65	65	15	80	80	28.2 (58.1)
2010	65	65	65	15	80	80	22.5 (51.1)
2011	68	60	60	35	95	95	38.9 (66.4)
2012	71	60	60	35	95	95	33.8 (60.3)
2013	73	90	90	35	125	125	70.2 (95.8)
2014	76	90	90	35	125	125	65.0 (89.8)
2015	78	90	90	35	125	125	60.6 (84.7)
2016	80	90	90	35	125	125	56.1 (79.6)
2017	82	90	90	35	125	125	52.3 (75.2)
2018	84	86	86	35	121	121	43.9 (66.2)
2019	86	86	86	35	121	121	40.4 (62.2)
2020	88	86	86	35	121	121	37.2 (58.5)

* The figures above are based on effective capacity; figures in parenthesis under the installed reserve margin are based on the apparent capacity.

c. Generation Outlook by Fuel Mix

☐ Generating Capacity Mix Outlook

○ The share of nuclear is expected to increase slightly, while that of coal and LNG is predicted to remain at a level similar to the current level.

* Compared to the 2nd BPE, the percentage of the nuclear, petroleum, hydro/other has decreased slightly, while that of the coal and LNG facilities is anticipated to increase slightly.

○ The percentage of oil-fired is expected to decrease continuously, whereas that of hydro/other energy is anticipated to increase slightly.

Table 3.15 Generating Capacity Mix Outlook

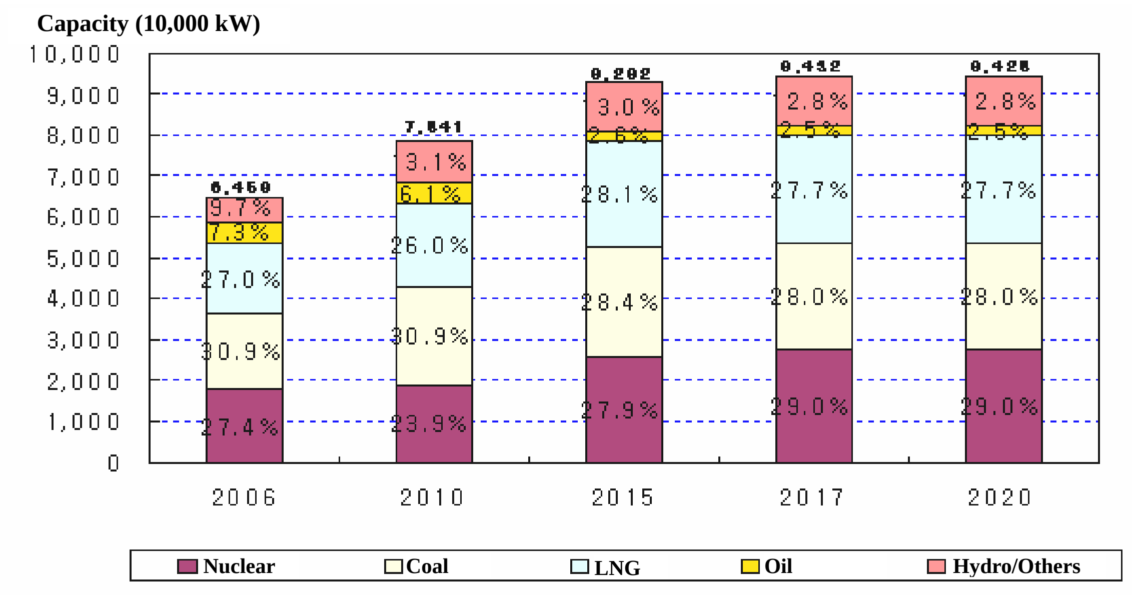
(unit: MW, %)

Classification		Nuclear	Coal	LNG	Oil	Hydro/Others	Total
2006	Current status	1,772 (27.4)	1,847 (30.9)	1,744 (27.0)	468 (7.3)	628 (9.7)	6,459 (100)
2010	2nd	1,872 (23.8)	2,427 (30.9)	2,055 (26.1)	491 (6.2)	1,018 (13.0)	7,863 (100)
	3rd	1,872 (23.9)	2,420 (30.9)	2,039 (26.0)	482 (6.1)	1028 (13.1)	7,841 (100)
2017	2nd	2,664 (30.3)	2,224 (25.3)	2,313 (26.3)	333 (3.8)	1,270 (14.4)	8,804 (100)
	3rd	2,732 (29.0)	2,642 (28.0)	2,615 (27.7)	236 (2.5)	1,207 (12.8)	9,432 (100)
2020	3rd	2,732 (29.0)	2,642 (28.0)	2,615 (27.7)	232 (2.5)	1,207 (12.8)	9,428 (100)

* 1. Based on the year-end rated capacity (apparent capacity)

2. Others include renewables, RCS, and pumped storage generation.

Figure 3.2 Generating Capacity Mix Outlook by Fuel Type



☐ **Generation outlook by fuel type**

○ The percentage of nuclear and coal generation has somewhat increased, whereas that of LNG decreased slightly. On the other hand, the percentage of petroleum generation has decreased significantly.

* Compared to the 2nd BPE, the percentage of nuclear, oil, and hydro/other generation has decreased, with that of bituminous coal and LNG increasing slightly.

Table 3.16 Generation outlook

(unit: GWh, %)

Classification		Nuclear	Coal	LNG	Oil	Hydro/Others	Total
2005 (actual)		146,779 (40.3)	134,964 (37.0)	60,820 (16.7)	16,422 (4.5)	5,654 (1.6)	364,639 (100)
2010	2nd BPE	144,742 (35.2)	191,997 (46.4)	54,615 (13.3)	11,630 (2.8)	8,782 (2.1)	411,766 (100)
	3rd BPE	146,752 (32.3)	187,187 (41.2)	93,286 (20.5)	20,130 (4.4)	6,938 (1.5)	454,293 (100)
2017	2nd BPE	213,559 (46.7)	173,408 (38.0)	48,519 (10.6)	12,002 (2.6)	9,432 (2.1)	456,920 (100)
	3rd BPE	225,968 (44.7)	201,655 (39.9)	65,917 (13.1)	3,494 (0.7)	7,942 (1.6)	504,976 (100)
2020	3rd BPE	225,063 (43.4)	204,520 (39.4)	77,627 (15.0)	3,317 (0.6)	7,808 (1.5)	518,335 (100)

* Calculated based on unconstrained fuels as well as the current economic dispatch market

d. Carbon Emission Outlook by Year

Table 3.17 Carbon Emission

Year	2005	2006	2008	2010	2013	2015	2018	2020
CO_2 emissions (ton-C)	41,802	44,923	51,970	57,018	54,420	55,754	54,584	55,792
Unit base emissions (kg-C/kWh)	0.1146	0.1158	0.1218	0.1255	0.1128	0.1127	0.1070	0.1076

e. Investment Cost Outlook

○ If capacity construction is carried out as planned, a total of KRW32 trillion will be required as investment in generation capacity expansion from 2006 to 2020.

Table 3.18 Investment Cost Outlook

(unit: 100 million)

Year	2006~2010	2011~2015	2016~2020	Total
Nuclear	71,620	96,020	3,286	170,926
Coal	58,668	32,909	0	91,577
Petroleum	2,139	0	0	2,139
LNG	39,080	9,869	0	48,949
Pumped	6,850	0	0	6,850
Total	178,357	138,798	3,286	320,441

* Basis of price: Fixed price as of January 2006, excluding investment in renewables/RCS

Ⅳ. Transmission Expansion Plan

1. Long-term Transmission System Expansion Policy
2. Transmission Expansion Outline
3. Implementation of Transmission Connection and Reinforcement
4. Direction and Planning of the Implementation of Transmission Expansion

1. Long-term Transmission System Expansion Policy

a. Direction

☐ Role of network systems classified by voltage level

- ○ 765kV: delivers electricity from the large scale generation complex to load congested areas
- ○ 345kV: builds inter-regional network or a bulk power source in city areas
- ○ 154kV: builds the intercity network within the 345kV-supplied areas or works as the supply source of electricity distribution
- ○ 66kV: construction of any new line shall be minimized with flexibility

☐ Security of adequate network reliability

- ○ Prepare for siting for transmission lines and substations in advance and expand the transmission facilities at a suitable time
- ○ Strengthen the linkage between the generating facilities construction plans and transmission facilities construction plans as well as the stability of power systems in the metropolitan areas and Jeju Island

☐ Harmony of supply reliability and economical efficiency

- ○ Minimize the Transmission and Distribution (T&D) loss and congestion costs to promote the efficiency of investment in transmission facilities
- ○ Minimize the impediment in power supply in case of failure of the transmission system
- ○ Improve the techniques for examining the economic value of the transmission system and introduce supply reliability evaluation techniques

☐ Improving the stability of the transmission system

- ○ Enhance the stability of a large scale transmission system
  : Introduce new technologies such as the flexible AC transmission system(FACTS)
- ○ Minimize fault current
  : upgrade of rated short circuit breaking circuit, installation of serial reactors, bus split, and transmission lines off
- ○ Balance the reactive power supply and demand
  : Install power condensers, shunt reactors and static var compensators, deploy distributed generations, and off the transmission lines on light load, etc

b. Criteria for Transmission System Expansion

☐ Criteria for power plant interconnection to the power system

- Determine through a comprehensive review of the generation capacity, distance, surrounding environments and other circumstances.
- The capacity, circuit number, and applied voltage of the interconnecting line are determined by reviewing the expected maximum transmission capacity and final capacity of a power plant.
- In principle, power plants shall be connected with 2 or more lines; note, however, that only 1 line may be used as may be preferred by generation companies and if there will be no significant influence on the system.
- Connection lines shall consist of at least 2 routes if the standard for transmission system planning cannot be satisfied due to unstable transmission system transient stability on the equipment failure.

☐ Criteria for the new construction of a transmission system

- 765kV: shall be installed in case of the transmission requirement is more than 345kV, and final substation capacity shall be 4 banks.
- 345kV: shall be installed in case of a huge demand increase is expected due to the construction of a large-scale industrial complex or a new city, and generation restriction or transmission congestion are occurred.
- 154kV: shall be installed in case of a over-load occurs at existing substations and demand increases due to the development of an industrial complex or a new city.

☐ Standard for reinforcing transmission and transformation facilities

- Reinforce transmission lines in case the existing lines are unable to maintain appropriate levels due to an increase in generation facilities or in electricity demand.
- Branch the transmission lines from the existing lines based on the 2π branch principle except in special cases.
- Install 2 banks of transformers at the initial stage. Extend transformers in case 1 bank fails and the other bank exceeds the supply capacity.

□ Criteria for contingency

- ○ 765kV overhead line: n-1 contingency
- ○ Overhead lines of less than 345kV: n-1 or n-2 contingency
- ○ Underground lines: n-1 contingency
- ○ Main transformer: 1 bank failure
  - * Refer to the range of allowable supply reliability in case of failure in the transmission facilities.

□ Others

- ○ In principle, the regional network supplied by a 345kV-substation is configured by a 154kV self-loop system.
- ○ Prepare for future uncertainties such as rapid addition in case of load increase by constructing substation site for 4Bank while determining the final size of transformers of 345kV and 154kV substations according to the 3Bank size.
  - In addition, consider building a hub substation with the size of 154㎸ 8Bank in load-concentrated industrial complexes and in large cities.
- ○ 154kV radial lines shall be converted gradually into loop networks to guarantee power supply reliability.

Table 4.1 Reliability Limit in Contingencies

Contingency Conditions	Overload Factor	Extent of Failure	Available Steps After a Fault
• One line of the 345kV system connected to power plant • 1 Bank of the 345kV main transformer	Prohibit overload (at nominal capacity).	• Prohibit load drop. • Prohibit generator drop out.	• Prohibit adjustment of generation power.
• One line of the 154kV system connected to power plant	Allow temporary overload.	• Prohibit load drop. • Prohibit generator drop out.	• Allow adjustment of generation power.
• One line of the main system below 345kV • One line of the load supply system below 345kV	Allow temporary overload.	• Prohibit load drop. • Prohibit generator drop out.	• Allow adjustment of generation power. • Allow load cutoff.
• 1 Bank of 154kV main transformer	-do-	• Allow temporary load drop (note 1). • Prohibit permanent load drop (note 2).	• Allow load cutoff.
• Two lines of the load supply system below 345kV • Two lines of the 154kV main system	-do-	• Allow temporary load drop (note 1). • Prohibit permanent load drop (note 2). • Allow generator drop out.	• Allow load cutoff.
• Two lines of the 345kV main system • One line of the 765kV main system	-do-	• Prohibit load drop. • Prohibit generator drop out.	• Allow adjustment of generation power.
• One line of the 765kV system connected to power plant • Two lines of the system connected to power plant below 345kV	-do-	• Prohibit load drop. • Allow generator drop out.	• Allow adjustment of generation power.

* 1. A temporary load drop is defined as a condition wherein power supply can be restored in a short period following an interruption using means such as load reallocation without repairing the facilities that failed.

2. A permanent load drop is defined as a condition wherein power supply cannot be restored following an interruption using means such as load reallocation without repairing the facilities that failed.

2. Transmission Expansion Outline

☐ Transmission lines

- Total length of transmission lines: 1.32 times longer in 2020 compared to 2005
- Share of underground line: 8.3% (2005) → 10.5% (2020)

Table 4.2 Transmission Expansion Outlook

(unit: C-㎞)

Voltage		2005 (actual)		2010		2015		2020	
765㎸	Overhead	662	662 (2%)	1,005	1,005 (3%)	1,005	1,005 (3%)	1,005	1,005 (3%)
345㎸	Overhead	7,770	7,990 (29%)	9,208	9,460 (28%)	9,333	9,678 (28%)	9,509	9,875 (27%)
	Underground	220	7,990 (29%)	252	9,460 (28%)	345	9,678 (28%)	343	9,875 (27%)
154㎸	Overhead	17,110	19,190 (69%)	19,764	22,739 (69%)	20,798	24,301 (69%)	22,340	25,843 (70%)
	Underground	2,080	19,190 (69%)	2,975	22,739 (69%)	3,503	24,301 (69%)	3,503	25,843 (70%)
Total	Overhead	25,542	27,842	29,977	33,204	31,136	34,984	32,854	36,700
	Underground	2,300	27,842	3,227	33,204	3,848	34,984	3,846	36,700

☐ Number of substations

- Total number of substations: 1.45 times more in 2020 compared to 2005 (from 619 to 902 substations)

Table 4.3 Substation Expansion Outlook

(unit: stations)

Voltage	2005(actual)	2010	2015	2020
765㎸	5	7	8	8
345㎸	77	90	99	101
154㎸	537	652	743	793
Total	619	749	850	902

☐ Capacity of substations

- Share of extra high voltage substation: 50.8% (2005) → 51.4% (2020)
- Substation capacity below 154kV compared to the peak load: 1.87 times in 2005 → 2.05 times in 2020

Table 4.4 Substation Capacity Outlook

(unit: MVA)

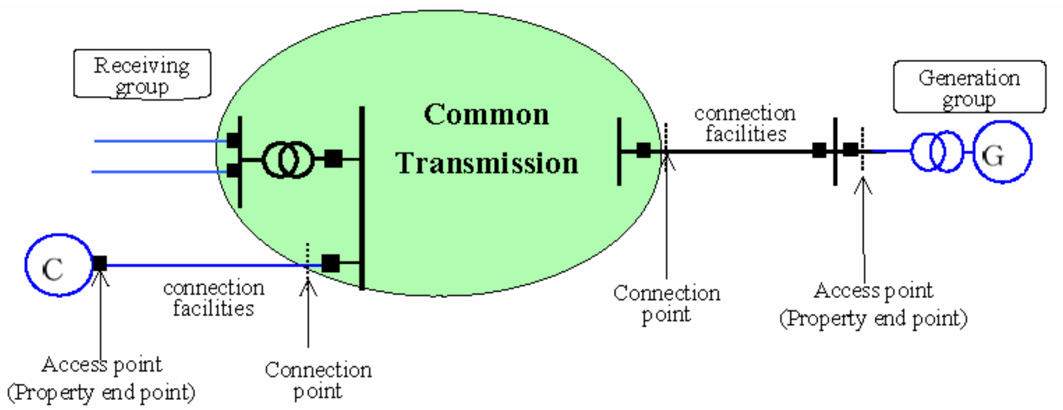
Classification		2005 (actual)	2010	2015	2020
Capacity (MVA)	765㎸	21,110	25,110	33,510	33,510
	345㎸	84,381	104,585	117,087	122,589
	154㎸	102,168	125,733	140,798	147,358
	Total	207,659	255,428	291,395	303,457

3. Implementation of transmission connection and reinforcement

a. Concept

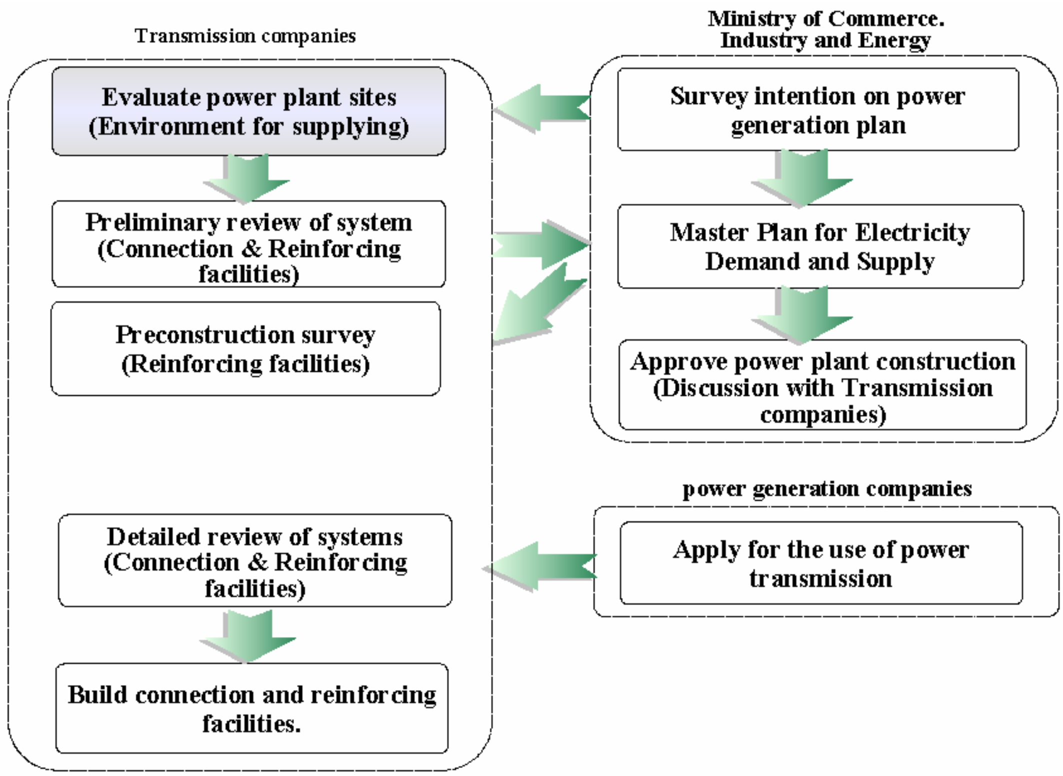
- Connection facilities: Transmission facilities used to connect the customers of the electricity market including power plants with the transmission system
- Transmission grid: All new and extended transmission facilities other than the connection facilities

Figure 4.1 Transmission connection and reinforcement Concept



b. Procedure

Figure 4.2 Transmission access Procedure



c. Transmission Connection and Reinforcement

□ Evaluation of influences on systems in relation to the construction intention of generation companies

- ○ Objects of evaluation: Generators included in the intent for construction related to the 3rd BPE
- ○ Elements of evaluation: Access programs (expenses) and system reinforcement programs (expenses)
- ○ Details of evaluation
  - Presenting optimal power plant access programs and system reinforcement programs in relation to the system
  - Expenses required for system connection and reinforcement, workability (time of connection, etc.)

□ Preliminary system examination and preconstruction surveys

- ○ Conduct preliminary surveys when establishing a BPE (conduct detailed examination when applying for the use of transmission networks).
- ○ Transmission companies shall conduct preconstruction surveys on connection facilities and reinforcement facilities: Review of transit areas (12 months), environmental impact assessment (17 months), and discussion with the government authorities and survey (25 months).
- ○ Generation companies shall provide transmission companies with the materials required for preconstruction surveys.

□ Applying for generation business license and transmission network connection

- ○ Generation companies shall submit their own system review results when applying for business licenses (the government shall approve the business considering the opinions indicated in the system review results).
- ○ Generation companies shall apply to the transmission companies in accordance with the ‘Transmission Facilities Access Regulation’.

□ Construction of transmission networks and connection facilities

- ○ Connection facilities and transmission networks shall be constructed by transmission companies; note, however, that connection facilities may be built after discussing construction entity with the GenCo if necessary.
- ○ Construction costs related to connection facilities shall be settled based on the “beneficiary-pays” principle.

□ Transmission network service agreement and payment of service charges

- ○ Determine the asset value of the existing connection facilities and conclude a power plant’s transmission network access agreement.
- ○ Revise the ‘Transmission Facilities Access Regulation’ to impose transmission connection costs.

4. Direction and Planning of the Implementation of Transmission Expansion

a. Flexible Implementation of the Plan

- BPE specifies only the primary criteria in the transmission & substation expansion plan. Therefore, KEPCO establishes a detailed transmission & substation expansion plan based on the BPE and obtains approval from the government as a transmission operator. KEPCO is set to implement the confirmed plan.

- The confirmed transmission & substation plan can be modified or added by the transmission operator only under the following cases:

  - In case of changes in power plant construction plans or in demand

  - In case of unavoidable circumstances such as control of the fault current or system voltage level, etc.

  - In case inevitable modification is required for the ongoing project

- KEPCO is entitled to invoke a special law called Power Resources Development Law after establishing a self review committee to facilitate the acquired land for transmission facilities unless KEPCO and the land owner enter into an agreement for the land.

- KEPCO promotes the details of the plan according to Power Resources Development Law procedures in consideration of the cost required, so that KEPCO can acquire the right of existing land for transmission line.

b. Adequate Power Supply in Jeju Island

- Construct the additional undersea HVDC cables for long-term stable power supply in Jeju Island

  - The installation of additional undersea HVDC cables (based on capacity of 400㎿ and operation of 200㎿) is scheduled to be completed in 2011.

- Select the optimal system connection position based on the system conditions on the land and the results of marine surveys, and reinforce the 154kV facilities to an appropriate level.

c. Improving Service Reliability for Large Customers and in Load Concentrated Areas

○ Expansion of the service limit for bilateral customers (22.9kV)

- The service limit for bilateral customers (22.9㎸) has been raised from 20MW to 40MW (Electricity Supply Agreement amended on July 1, 2006).
- A stabilized supply program is established following the expansion of the supply range for 22.9㎸.

○ Capacity increment of 154㎸ transformers

- The supply capacity shall be increased to prepare for load surge and to solve the difficulties at the construction site.
- Transformer capacity shall be incremented.

○ Construction of 154㎸ hub substation

- 154㎸ hub substations shall be constructed in order to promote service reliability in large industrial complexes, new cities, and other load concentrated areas.
- Supply capacity shall be increased. (final size of transformers: 4Bank → 8Bank)

d. Timely Expansion of Transmission & Substation Facilities

○ Within 3 months from the establishment of this plan, KEPCO shall establish detailed implementation plans according to the standard in this plan and get approval from the government.

○ Formulate effective system connection measures for Renewables Expansion plans.

○ Actively pursue the transmission service agreement based on the Transmission Facilities Access Regulation.

○ To secure electricity supply in the Community Energy System (CES) areas, select suppliers in newly developed areas at the early stages to prevent double investment in electricity supply facilities.

- Since the increase of Community Energy System supplier and Regional Cogeneration System (RCS) supplier entering the market is expected, there is a need to manage small-scale supply resources as a government policy.

○ The construction of transmission lines in relation to the economic cooperation between the South-North Koreas shall be pursued after obtaining government approval considering the domestic electricity supply and demand and transmission system conditions.

Ⅴ. Electricity Policy

1. Directions
2. Strengthening the Ability to Respond Effectively to the Future Energy Environment
3. Realizing Effective Supply and Demand Stability by Inducing the Adequate Generation Mix
4. Establishment of Sustainable Electricity Supply and Demand Systems
5. Promoting the Efficiency of the Electricity Industry Through the Revitalization of Market Functions
6. Future Policy Studies

1. Directions

◆ **Strengthen the ability to respond to the rapidly changing energy environment.**
◆ **Promote effective supply and demand stability by inducing the adequate generation MIX.**
◆ **Establish sustainable electricity supply and demand systems.**
◆ **Enhance the efficiency of the electricity industry by revitalizing the market functions.**

2. Strengthening the Ability to Respond Effectively to the Future Energy Environment

☐ Strengthening the ability to prospect and analyze the energy environment

○ Strengthen the ability to collect and analyze information on the trends and strategies of various overseas energy policies and outlook on energy prices.

○ Research and analyze the electricity policies of advanced countries including generation mix, supply and demand stabilization policies, and type of electricity markets.

○ Improve the forecasting procedures, models, and techniques to promote the accuracy of demand forecast.

- Conduct researches on the causes of supply and demand errors and demand forecast improvement techniques.

☐ Inter-year adjustment plans

○ The establishment of inter-year plans is necessary for the increasing uncertainties in the energy environment including the sudden changes in electricity demand, sudden fluctuation of energy prices, and changes in the construction intention.

- During the intermediate years after the BPE is established, the plans shall be readjusted by re-forecasting electricity demand, checking the progress of facilities construction, and reflecting the changes in the investors' construction intentions.

☐ Strengthening the competency of professional institutions

- ○ Strengthen the competency of the general support institution (KPX) by developing various analysis techniques and by fostering and reinforcing specialists.

- ○ Consider the introduction and use of analysis models for the advanced generation mix and demand forecast.

☐ Securing the transparency and compatibility of BPE

- ○ Promote participation of civilian experts from various fields in the working subcommittees (6 sectors) for the establishment of a BPE.

- ○ Ensure consistency in the national energy plans by establishing a BPE considering the long-term supply and demand conditions of resources including gas.

  - Analyze fuel outlooks based on the electricity supply and demand forecast and provide related data to the related institutions including Korea Gas Corporation (KOGAS).

  - Hold political meetings with energy-related institutions and activate information exchanges.

    * To promote the stability of LNG supply and demand, generation fuels shall be analyzed and provided based on future scenarios.

- ○ Change the characteristics of plans flexibly according to the market functions as well as increase stabilized supply and expand the information provision functions by harmonizing the market functions with the planning functions.

3. Realizing Effective Supply and Demand Stability by Inducing the Adequate Generation Mix

□ Establishing the 2030 vision for electricity supply and demand

○ Formulate the vision for electricity supply and demand, including an adequate generation mix based on the electricity demand forecast up to 2030 and estimated future energy prices.

* The establishment of the vision will begin during the 2nd half of this year (to be completed in 2007).

- Present an adequate generation mix based on various scenarios such as the energy price rather than based on the construction intentions of investors.
- Determine the appropriate percentage of non-competitive generations such as Combined Heat and Power (CHP) and pumped storage generation.

○ Present an appropriate generation mix based on the long-term national energy mix in connection with the "National Energy Plan", which is scheduled to be established in 2007.

□ Construction directions for generation facilities

○ Build effective and stabilized supply and demand systems by continuously improving the economic value evaluation techniques among competitive generations (natural gas, bituminous coal, and nuclear).

○ Decide the policy directions for nuclear power by examining public opinions through the national energy committee considering the economic and social receptiveness comprehensively.

- Implementing the timely construction of small and medium–sized radioactive waste disposal plants (100,000 drums for the 1st stage; total of 800,000 drums targeted) (project period for the 1st stage: January 2006 ~ December 2009)

□ Improving the generation efficiency

○ Examine the ways of promoting the generation facilities' efficiency in relation to supply and demand plans by analyzing the current facilities' efficiency and outlook.

- Provide active support for R&D activities related to the improvement of generating facilities' efficiency and outputs.

4. Establishment of Sustainable Electricity Supply and Demand Systems

☐ Seeking rational and effective DMS policies

○ Examine the appropriate level of investment in load control and efficiency improvement projects.

- Estimate the potential availability to calculate realistic target values and examine the appropriate level of investment in each project by analyzing the expense effects according to the detailed projects.

○ Review the project implementation systems for efficient project operation.

○ Conduct basic research activities to introduce Demand Response (DR) programs.

☐ Expanding the supply of renewables and environment-friendly technology development support

○ Encourage investment by the private sector in renewables using the renewables feed in tariff system and renewables portfolio agreement (RPA) concluded with generation companies.

* Level of renewables feed in tariff support: A total of KRW550 billion (between 2007 and 2010) is scheduled to be provided.

* Voluntary renewables portfolio agreement: Investment agreements covering a total of KRW1.1 trillion to be concluded with 9 institutions including KEPCO between 2006 and 2008.

○ Select the solar, wind power, hydrogen, and fuel cell sectors as the key fields for concentrated R&D activities.

* Approximately KRW550 billion shall be provided for the period of 4 years (2007~2010) for the development of renewables technologies.

○ Support environment-friendly technology development such as the Integrated Gasification Combined Cycle (IGCC) and implement projects with applicable effects.

* Taean IGCC 300MW(to be completed in September 2015 by Korea Western Power Co., Ltd.)

☐ Air pollutants reduction in the electricity sector

- ○ Based on the air pollutant control regulation, measures shall be taken to reduce the pollutants produced at power plants.

- ○ Establish an environment-friendly generation mix system in the electricity supply and demand plans by calculating and reflecting the appropriate CO_2 environmental costs and the total regulated amount.

- ○ Introduce greenhouse gas emission trading systems and research operation programs.

☐ Expansion of distributed CHP generation

- ○ Encourage and expand the RCS supply areas of collective energy to promote the efficiency of RCS facilities.

- ○ Provide full support to small CHP facilities and establish reasonable targets by carefully analyzing the future economic value and prevailing circumstances.

  - Support for development and facilities investment to overcome the low economic feasibility.

    * Development of small gas turbine engines for high-efficiency 5MW power generation: Total of KRW51.7 billion for 3 years (government subsidies: KRW20.3 billion)

5. Promoting the Efficiency of the Electricity Industry Through the Revitalization of Market Functions

☐ Development of system for supply and demand balance in the competitive electricity market

- ○ Develop standards for power supply reliability as well as the capacity mechanism to maintain appropriate supply reliability in competitive markets.

- ○ Examine the voluntary adjustment programs through market signals when overage or shortage of facilities is expected.

  - Encourage the Gencos to set appropriate capacity mix based on the market signals through the market system including adjusting the capacity payment levels.

☐ Inducing the establishment of regional electricity supply and demand systems

- ㅇ Introduce incentive systems by area to encourage facilities investment in the electricity demand hub, e.g., the metropolitan areas.
  - Reflect the transmission loss in addition to variable costs when calculating the energy price on a short-term basis.
- ㅇ Examine the scale of the facilities in demand congested areas and grant incentives based on the supply and demand plan to regional power plants which contribute significantly to the system.

☐ Examination of the gradual improvement of the electricity rate system

- ㅇ On a long-term basis, review the reorganization of the tariff system such that electricity demand side management can be realized through the rate system.
- ㅇ Study the application of the same tariff system to consumers who receive electricity of the same voltage by minimizing the rate difference by sector on a long-term basis.
- ㅇ To rationalize demand for the midnight electricity supplied at a rate below the cost, gradually implement the actualization of charges covering the light load rate.

6. Future Policy Studies

☐ **Study the improvement of the "criteria for evaluating the intent for construction"**

- ○ More careful and rational supplementation is required in the future by identifying the areas for improvement in the construction intention evaluation standard applied to the 3rd BPE.
- ○ Items applicable to the metering index and non-metering index including the economic value evaluation standard shall be reviewed.

☐ **Study programs and procedures for the implementation of electricity supply and demand plans**

- ○ Recently, there have been many cases wherein the scheduled projects are delayed or shelved.
- ○ The reliability of plans shall be promoted by evaluating the actual performance from the time when the letters of intent for construction are received from investors to the time when the BPE is reflected and power plants are completed.
- ○ The legal basis for the retirement and/or life extension of power plants and permits/licenses shall be improved.

☐ **Study the VOLL and adequate reliability criteria in the competitive electricity market**

- ○ The VOLL shall be reviewed to determine the criteria for minimum generation capacity and reliability criteria for stable electricity supply in competitive electricity market.

☐ **Introduce models for analyzing advanced electricity supply and demand and study their application techniques**

- ○ To respond effectively to external variables including changes in the market structure and fuel prices, analysis techniques and develop supplementation methods shall be developed, and new computer models shall be introduced.
- ○ Appropriate generation mix techniques and procedures, the status of generation mix and standard for reliability used by advanced countries shall be introduced.

☐ **Develop the transmission tariff structure and regulations in relation to the environmental changes in the electricity industry**

- ○ A reasonable transmission tariff structure as well as related procedures in preparation for the changes in the electricity market environment shall be developed (expansion of distributed generation and implementation of an independent business system in the distribution sector).

☐ **Develop transmission network asset management techniques**

- Promoting the efficiency of transmission grid investments and ensuring fair billing for transmission in the competitive electricity market necessitate the development of reasonable transmission network asset management techniques.

☐ **Research the fault current considering the long-term transmission system**

- Since generation capacity has increased particularly in certain areas, fault currents have continuously increased; hence to devise appropriate countermeasures against fault current considering the system reliability and economic effects is needed.

☐ **Research the marginal capacity and operation of wind power generation considering the system circumstances in Jeju**

- Considering the characteristics of power generation, i.e., frequent output changes in wind power generators, there is a need to review the standard for the marginal capacity of the available wind power generators to ensure the stable operation of the system in Jeju Island and to maintain power quality.

☐ **Expand high-efficiency equipment and analysis of the effects of the new DSM program**

- In order to save energy by effectively utilizing resources and to reduce greenhouse gas, measuring the performance of the high-efficiency equipment expansion and studying the ways of securing reliability are required.
- Continuously discovering new programs, measuring the performance of DSM programs, and analyzing their economic effects are required.

☐ **Develop models for analyzing the effects of DSM costs and research their application programs**

- The effects of costs conforming to the domestic demand side management situation shall be analyzed and the ways of applying the electricity supply and demand plan shall be studied.
- The influences of the current midnight electricity on the supply and demand plan shall be studied and its countermeasures in the future shall be devised.

☐ **Utilize the received resources of direct load control (DLC) and plan to secure resources in case of emergency**

- To acquire and utilize the supplied resources effectively in case of emergency, the roles of the DLC proponents and implementing institutions must be established first. There is a need to select loads considering the characteristics of the system and to analyze the load which can be controlled by the user.

[Appendix]

1. Electricity Demand Outlook
2. Demand Side Management
3. Generating Capacity Expansion and Retirement
4. Electricity Supply and Demand in the Island Areas
5. Renewables Development
6. Major Transmission Facilities Expansion Plan

1. Electricity Demand Outlook

a. Reference Demand

〔national forecasts)

Year		Electricity Sales (GWh)	Peak Load Before DSM (MW)	DSM (MW)	Peak Load After DSM (MW)
2005 (actual)		332,413	54,631(59,787)	(5,156)	54,631
2006		353,086	58,994(65,663)	(6,669)	58,994
2007		372,788	61,886(67,042)	2,208(7,364)	59,678 【61,059】
2008		389,581	64,235(69,391)	2,853(8,009)	61,382 【62,805】
2009		404,159	66,481(71,637)	3,494(8,650)	62,987
2010		416,623	68,777(73,933)	4,172(9,328)	64,605
2011		427,211	70,832(75,988)	4,888(10,044)	65,944
2012		436,146	72,759(77,915)	5,639(10,795)	67,120
2013		444,054	74,446(79,602)	6,354(11,510)	68,092
2014		450,748	75,914(81,070)	7,082(12,238)	68,832
2015		456,443	77,297(82,453)	7,823(12,979)	69,474
2016		461,376	78,631(83,787)	8,582(13,738)	70,049
2017		466,046	79,892(85,048)	9,357(14,513)	70,535
2018		470,428	81,124(86,280)	10,099(15,255)	71,025
2019		474,561	82,261(87,417)	10,853(16,009)	71,408
2020		478,555	83,424(88,580)	11,615(16,771)	71,809
Period average (%)	'06-'10	4.6	4.7	-	3.4
	'11-'20	1.4	1.9	-	1.1
	'06-'20	2.5	2.9	-	1.8

※ 1. Electricity sales reflect the reduction by DSM; the DSM effect refers to the net incremental value compared to the year 2005. The values in parenthesis refer to the cumulative total amounts.

2. Figures in 【 】 under the peak load after DSM denote the peak load projections in case DLC(Direct Load Control) is not executed.

3. Peak load for 2006 is an actual value.

〔**forecasts by area**〕

Year		Metropolitan Area		Jeju Island	
		Electricity Sales (GWh)	Peak Load (MW)	Electricity Sales (GWh)	Peak Load (MW)
2003 (actual)		111,007	18,830	2,364	431
2004 (actual)		118,605	20,200	2,562	463
2005 (actual)		127,426	22,240	2,768	479
2006		135,888	23,789 (actual)	2,975	515 (actual)
2007		144,242	24,905	3,177	567
2008		151,192	25,987	3,362	597
2009		157,792	26,950	3,521	625
2010		164,096	27,732	3,648	654
2011		169,691	28,364	3,742	681
2012		174,630	28,962	3,823	707
2013		179,105	29,485	3,886	732
2014		182,958	29,897	3,932	755
2015		186,255	30,273	3,960	776
2016		189,004	30,547	3,971	798
2017		191,431	30,883	3,970	818
2018		193,538	31,224	3,969	838
2019		195,347	31,558	3,966	859
2020		196,926	31,904	3,962	879
Period average (%)	’06-’10	5.2	4.5	5.7	6.4
	’11-’20	1.8	1.4	0.8	3.0
	’06~’20	2.9	2.4	2.4	4.1

※ Peak load in Jeju Island is an asynchronous peak load.

b. Maximum and Minimum Demand (draft)

〔**national electricity sales**〕

	Variable Range (%)	High Demand (GWh)	Reference Demand (GWh)	Low Demand (GWh)	Variable Range (%)
2006	6.00	374,259	353,086	333,215	-5.63
2007	6.10	395,514	372,788	351,801	-5.63
2008	6.04	413,094	389,581	367,320	-5.71
2009	6.16	429,047	404,159	381,120	-5.70
2010	6.12	442,136	416,623	392,698	-5.74
2011	6.19	453,635	427,211	402,649	-5.75
2012	6.19	463,162	436,146	410,796	-5.81
2013	6.09	471,100	444,054	417,964	-5.88
2014	6.13	478,367	450,748	424,319	-5.86
2015	6.25	484,964	456,443	429,779	-5.84
2016	6.16	489,791	461,376	434,117	-5.91
2017	6.21	494,965	466,046	438,663	-5.88
2018	6.22	499,666	470,428	442,736	-5.89
2019	6.26	504,252	474,561	446,545	-5.90
2020	6.30	508,689	478,555	450,128	-5.94

〔**national peak load**〕

	Variable Range (%)	High Demand (MW)	Reference Demand (MW)	Low Demand (MW)	Variable Range (%)
2007	6.34	63,463	59,678	56,305	-5.65
2008	6.34	65,274	61,382	57,990	-5.53
2009	6.16	66,870	62,987	59,569	-5.43
2010	5.93	68,438	64,605	60,948	-5.66
2011	6.02	69,916	65,944	62,144	-5.76
2012	6.25	71,315	67,120	63,084	-6.01
2013	6.48	72,507	68,092	63,994	-6.02
2014	6.54	73,337	68,832	64,767	-5.91
2015	6.70	74,126	69,474	65,411	-5.85
2016	6.85	74,846	70,049	65,952	-5.85
2017	6.94	75,427	70,535	66,283	-6.03
2018	6.65	75,751	71,025	66,596	-6.24
2019	6.63	76,140	71,408	66,925	-6.28
2020	6.41	76,415	71,809	67,200	-6.42

c. Electricity Sales by Use

(unit: GWh)

Year		Residential	Commercial	Industrial	Total
2004 (actual)		61,179	92,579	158,337	312,095
2005 (actual)		64,701	100,899	166,813	332,413
2006		68,794	107,702	176,590	353,086
2007		73,031	114,118	185,639	372,788
2008		76,149	120,054	193,378	389,581
2009		78,659	125,448	200,052	404,159
2010		80,573	130,190	205,859	416,623
2011		82,109	134,304	210,799	427,211
2012		83,345	137,931	214,869	436,146
2013		84,390	141,235	218,429	444,054
2014		85,339	144,168	221,241	450,748
2015		86,190	146,837	223,416	456,443
2016		86,905	149,194	225,278	461,376
2017		87,541	151,531	226,974	466,046
2018		88,138	153,729	228,562	470,428
2019		88,676	155,779	230,106	474,561
2020		89,241	157,808	231,506	478,555
Avg. increase rate (%)	'06-'10	4.5	5.2	4.3	4.6
	'11-'20	1.0	1.9	1.2	1.4
	'06-'20	2.2	3.0	2.2	2.5

2. Demand Side Management

a. Demand Side Management Targets by Year (cumulative total)

(unit: MW)

Year	Load Control						Efficiency Improvement					New	Gas	Total
	Summer Vacation	Voluntary Conservation	DLC	Accumulated Air Conditioning	Remote Air Conditioner Control	Subtotal	Lighting	Inverter	Motor	Vending Machines	Subtotal			
'05 Actual	1,867	954	-	340	44	4,491	653	69	8	5	735	1	1,215	5,156
2006	1,746	1.947	1,286	385	59	4,423	723	114	15	6	858	41	1,347	6,669
2007	1,755	1.986	1,381	502	80	4,704	820	185	37	8	1,050	131	1,479	7,364 (2,208)
2008	1,764	1,022	1,423	573	107	4,889	906	275	57	10	1,248	241	1,631	8,009 (2,853)
2009	1,772	1,056	1,462	649	141	5,080	994	393	81	12	1,480	301	1,789	8,650 (3,494)
2010	1,781	1,089	1,502	730	183	5,285	1,082	533	110	14	1,739	351	1,953	9,328 (4,172)
2011	1,790	1,122	1,539	816	230	5,497	1,169	688	144	16	2,017	401	2,129	10,044 (4,888)
2012	1,799	1,153	1,575	907	282	5,716	1,255	852	185	19	2,311	451	2,317	10,795 (5,639)
2013	1,808	1,182	1,608	1,003	340	5,941	1,338	981	231	22	2,572	481	2,516	11,510 (6,354)
2014	1,817	1,213	1,640	1,104	404	6,178	1,419	1,095	284	25	2,823	511	2,726	12,238 (7,082)
2015	1,826	1,244	1,667	1,211	474	6,422	1,496	1,203	342	28	3,069	541	2,947	12,979 (7,823)
2016	1,835	1,274	1,695	1,322	548	6,674	1,569	1,311	404	31	3,315	571	3,178	13,738 (8,582)
2017	1,844	1,304	1,720	1,439	626	6,933	1,638	1,419	469	34	3,560	601	3,419	14,513 (9,357)
2018	1,854	1,314	1,720	1,560	708	7,156	1,702	1,527	533	37	3,799	631	3,669	15,255 (10,099)
2019	1,863	1,324	1,720	1,687	794	7,388	1,761	1,635	596	40	4,032	661	3,928	16,009 (10,853)
2020	1,872	1,334	1,720	1,818	884	7,628	1,815	1,743	655	43	4,256	691	4,196	16,771 (11,615)

* 1. The values for year 2005 are actual values; ditto for the values for the summer vacation and voluntary conservation for year 2005. The values for other programs are based on the total amount of supply.

2. Annual targets after 2006
   - Summer vacation, voluntary conservation, DLC: Targets for the year
   - Other programs: 2005 Actual + Net increment total for the year

* Figures in parenthesis denote the net increments compared to 2005.

b. Investment Cost of DSM

(unit: KRW100 million)

Year	Load Control						Efficiency Improvement					Total
	Summer Vacation	Voluntary Conservation	DLC	Accumulated Air Conditioning	Remote Air Conditioner Control	Subtotal	Lighting	Inverter	Motor	Vending Machines	Subtotal	
2006	278	152	54	213	48	745	96	220	26	6	348	1,093
2007	268	160	54	550	65	1,097	133	245	112	7	497	1,594
2008	270	166	54	334	84	908	118	311	102	7	538	1,446
2009	271	171	54	357	105	958	121	408	122	8	659	1,617
2010	272	177	54	381	130	1,014	121	484	148	8	761	1,775
2011	274	182	54	404	146	1,060	119	535	173	8	835	1,895
2012	275	187	54	428	161	1,105	118	567	209	9	903	2,008
2013	276	192	54	451	180	1,153	114	446	234	9	803	1,956
2014	278	197	54	475	198	1,202	111	394	270	10	785	1,987
2015	279	202	54	503	217	1,255	106	373	295	10	784	2,039
2016	281	207	54	522	229	1,293	100	373	316	10	799	2,092
2017	282	211	54	550	242	1,339	95	373	331	11	810	2,149
2018	284	213	55	569	254	1,375	88	373	326	11	798	2,173
2019	285	215	55	597	267	1,419	81	373	321	11	786	2,205
2020	286	216	55	616	279	1,452	74	373	300	12	759	2,211
Total	4,159	2,848	813	6,950	2,605	17,375	1,595	5,848	3,285	137	10,865	28,240

※ Investment costs denote the subsidies for the year by program.

3. Generating Capacity Expansion and Retirement

a. Generating Capacity Expansion by Year

1) Nationwide

Year	Month	Plant Name (company)	Capacity (MW)		Total Capacity (MW)		Peak Load (MW)	Installed Reserve Margin (%)		Remarks
			Effective	Apparent	**Effective**	Apparent		**Effective**	Apparent	
2005		Existing Capacity			**61,453 (61,453)**	61,735 (62,258)	**54,631**	**12.5**	13.0	
2006					**63,701 (64,585)**	64,519 (65,555)	**58,994**	**8.0**	9.4	
	2	Yangyang pump storage#1 (KOMIPO)	**250**	250						
	2	Gwangyang C/C #1 (K-Power)	**494.6**	494.6						
	4	Banwol CHP capacity add.(STX)	**4.3**	14.3						
	4	Yangyang pump storage #2 (KOMIPO)	**250**	250						
	5	Chujado Int. combustion (KEPCO)	**2**	2						
	5	Gwangyang C/C #2 (K-Power)	**494.6**	494.6						
	6	Gaeyado Int. combustion (KEPCO)	**1**	1						
	6	Gaeyado Int. combustion (KEPCO)	**-0.3**	-0.3						
	6	Dangjin thermal #6 (KEWESPO)	**500**	500						
	6	Daecheongdo Int. combustion (KEPCO)	**0.5**	0.5						
	6	Socheongdo Int. combustion (KEPCO)	**0.3**	0.3						
	6	Yangyang wind power (KOMIPO)	**0.3**	3						
	6	Yangyang pump storage#3 (KOMIPO)	**250**	250						
	6	Socheongdo Int. combustion add. (KEPCO)	**0.5**	0.5						
	7	Eocheongdo Int. combustion (KEPCO)	**0.6**	0.6						
	7	Sapsido Int. combustion (KEPCO)	**-0.2**	-0.2						
	7	Eocheongdo Int. combustion (KEPCO)	**-0.2**	-0.2						
	8	Sapsido Int. combustion (KEPCO)	**0.6**	0.6						
	8	Ret-Chusan Hydro (KEPCO)	**-0.4**	-0.7						
	8	Donghae Solar #1 (KEWESPO)	**0.3**	1						
	8	Ecoenergy LFG	**25**	50						
	8	Yangyang pumpstorage #4 (KOMIPO)	**250**	250						
	8	JejuNansan wind power (Unison)	**1.5**	14.7						
	9	Jeonju Incinerating facility	**4**	8						
	9	South Jeju thermal #3 (KOSPO)	**100**	100						
	9	Cheongsong pump storage#1 (WP)	**300**	300						
	9	Gangwon wind power (GAWIP)	**7**	70						
	10	Ulneungdo Int. combustion (KEPCO)	**-3**	-3						
	10	Ret-South Jeju thermal #1,2 (KOSPO)	**-20**	-20						
	10	Ulneungdo Int. combustion (KEPCO)	**4**	4						
	10	Ret-Jeju thermal GT #1,2 (KEPCO)	**-110**	-110						
	10	Bundang C/C fuel cell (KOSEP)	**0.3**	0.3						
	10	Gwangyang Solar (Unison)	**0.3**	1						
	10	Chujado Int. combustion (KEPCO)	**-0.3**	-0.3						
	11	DaeguJukgok CHP (Daegu City Gas)	**2.7**	9						
	11	Gwangdong Small Hydro (K-Water)	**0.1**	0.2						
	12	Hongcheon Small Hydro (Hongcheon Small Hydro)	**1.8**	2.9						
	12	Taebaek wind power, etc.	**0.6**	5.6						
	12	Chungju Dam Small Hydro (K-Water)	**1.8**	3						
	12	Cheongsong pump storage #2 (WP)	**300**	300						
	12	Solar Energy, etc.	**12**	40						
	12	Damyang Small Hydro, etc.	**5.6**	9.4						

Year	Month	Plant Name (company)	Capacity (MW)		Total Capacity (MW)		Peak Load (MW)	Installed Reserve Margin (%)		Remarks
			Effective	Apparent	**Effective**	Apparent		**Effective**	Apparent	
2007					**65,692 (66,653)**	66,712 (68,036)	**59,678**	**10.1**	11.8	
	2	Sancheong Small Hydro 2 (KEWESPO)	**0.3**	0.5						
	2	Dalbang Small Hydro (K-Water)	**0.1**	0.2						
	3	South Jeju thermal #4 (KOSPO)	**100**	100						
	4	JejuPyoseon wind power (Unison)	**0.3**	3						
	6	Juam Dam Small Hydro (K-Water)	**0.6**	1						
	6	Taean thermal #7 (WP)	**500**	500						
	6	Jodo Int. combustion (KEPCO)	**1**	1						
	6	Jodo Int. combustion (KEPCO)	**-1.2**	-1.2						
	6	Yeonggwang Solar Park #1 (KHNP)	**0.3**	1						
	6	Daecheong Small Hydro (K-Water)	**0.5**	0.8						
	6	Dangjin thermal #7 (KEWESPO)	**500**	500						
	6	Milyang wind power #1 (Gyeongnam renewables)	**5**	50						
	7	Seungbongdo Int. combustion (KEPCO)	**1.5**	1.5						
	7	Seungbongdo Int. combustion (KEPCO)	**-0.5**	-0.5						
	7	Heuksando Int. combustion (KEPCO)	**-1.5**	-1.5						
	7	Heuksando Int. combustion (KEPCO)	**1.5**	1.5						
	10	Hangyeong wind power 2nd stage (KOSPO)	**1.5**	15						
	10	Unmun2 Small Hydro (K-Water)	**0.4**	0.7						
	11	Yeocheon CHP add. (Gumho petrochemical)	**79.2**	132						
	11	Hwaseong Dongtan CHP (KDHC)	**307.1**	511.8						
	11	Seongsan wind power (KOSPO)	**2**	20						
	12	Daeyeong Solar, etc.	**1.6**	5.4						
	12	Dangjin thermal #8 (KEWESPO)	**500**	500						
	12	Asan Baebang CHP (KNHC)	**61.7**	102.8						
	12	Sacheon Solar (Unison)	**0.5**	1.5						
	12	Buncheon Small Hydro, etc.	**2.2**	3.7						
	12	Boryeong Small Hydro (KOMIPO)	**1.1**	1.8						
	12	Gori wind power (KHNP)	**0.1**	0.9						
	12	Gangwon Chahang wind power (Unison)	**2.3**	22.5						
	12	Donghae Solar #2 (KEWESPO)	**0.3**	1						
	12	Seongnam2 Small Hydro (K-Water)	**0.2**	0.4						
	12	JeollaBukdo wind power, etc.	**0.4**	3.6						
	12	G&G Bio	**0.4**	0.8						
2008					**69,056 (70,093)**	70,595 (71,792)	**61,382**	**12.5**	15.0	
	1	SeoulGangil CHP (Daehan City Gas)	**3.2**	10.5						
	2	JejuSangdo wind power (Jeju wind power)	**3.2**	31.5						
	3	Cheonan Chungsu CHP (JB City Gas)	**12.6**	21.1						
	3	Taean thermal #8 (WP)	**500**	500						
	3	Bugok C/C #2 (GS EPS)	**500**	500						
	6	Yeongheung #3 (KOSEP)	**870**	870						
	6	Jangjado Int. combustion (KEPCO)	**1**	1						
	6	Jangjado Int. combustion (KEPCO)	**-0.3**	-0.3						
	6	JejuCheongsu wind power (Unison)	**0.3**	3						
	6	Jangodo Int. combustion (KEPCO)	**-0.1**	-0.1						
	6	Yeonggwang Solar Park #2 (KHNP)	**0.6**	2						
	6	Yanggu wind power (KOMIPO)	**2**	20						
	6	Boryeong thermal #7 (KOMIPO)	**500**	500						
	6	Gaegiri wind power (Hyoseong)	**4**	40						

Year	Month	Plant Name (company)	Capacity (MW)		Total Capacity (MW)		Peak Load (MW)	Installed Reserve Margin (%)		Remarks
			Effective	Apparent	Effective	Apparent		Effective	Apparent	
	6	Milyang wind power #2 (Gyeongnam renewables)	6	60						
	7	Jangodo Int. combustion (KEPCO)	0.3	0.3						
	9	Sammu wind power	3	30						
	9	Deokchi Small Hydro	0.5	0.8						
	9	Taebaek wind power (KOSPO)	2	20						
	10	Dongdaemun Environment Bio	0.5	1						
	10	GangwonPyeongchang wind power (KOSPO)	2	20						
	10	Sumjingang Dam Small Hydro (K-Water)	0.8	1.4						
	10	GyeongjuYangnam wind power (Unison)	2.1	21						
	12	Jeongseon wind power (KEWESPO)	2.5	25						
	12	DangjinHaeyang Small Hydro (KEWESPO)	1.8	3						
	12	Jukam Solar, etc.	0.4	1.2						
	12	Osan CHP capacity add. (Daesung Industries)	2.6	8.7						
	12	Yangju Goeup CHP (Daelim)	14.8	24.7						
	12	Boryeong thermal #8 (KOMIPO)	500	500						
	12	Donghae wind power (KEWESPO)	2.5	25						
	12	Jeju Sangmyeong wind power (Unison)	1.6	16						
	12	Hadong thermal #7 (KOSPO)	500	500						
2009					71,351 (72,861)	73,102 (75,210)	62,987	13.3	16.1	
	1	Ret-Jeju thermal #1 (KOMIPO)	-10	-10						
	3	Yeongheung thermal #4 (KOSEP)	870	870						
	4	Geumho solar energy	0	0.1						
	6	Gaeyado Int. combustion (KEPCO)	-0.5	-0.5						
	6	Jeju Int. combustion #2 (KOMIPO)	40	40						
	6	Hadong thermal #8 (KOSPO)	500	500						
	6	Gaeyado Int. combustion (KEPCO)	1.5	1.5						
	6	Incheon C/C #2 (KOMIPO)	500	500						
	6	Ret-Incheon 3,4 (KOMIPO)	-650	-650						
	6	Hongdo Int. combustion (KEPCO)	0.3	0.3						
	7	Jeju Deokcheon wind power (KOMIPO)	4	40						
	7	Jeju Daehol wind power (Unison)	1.8	18						
	7	Jawoldo Int. combustion (KEPCO)	0.3	0.3						
	9	Songdo CHP (Incheon Total Energy)	123	205						
	9	Jecheol thermal #1,2 (Hyundai Steel)	200	200						
	9	Lake Sihwa Tidal Power (K-Water)	38.1	254						
	10	Gumi CHP (STX energy)	52.3	87.2						
	10	Hwabuk Dam Small Hydro (K-Water)	0.2	0.4						
	11	Gunsan C/C (WP)	700	700						
	11	Pangyo CHP (KDHC)	87.6	146						
	11	Paju CHP (KDHC)	309	515						
2010					72,866 (75,995)	75,260 (78,408)	64,605	12.8	16.5	
	4	Gangwon Sohwang Byeongsan wind power (Unison)	5	50						
	6	Ret-Sapsido Int. combustion (KEPCO)	-0.2	-0.2						
	7	Sapsido Int. combustion (KEPCO)	0.3	0.3						
	7	Jodo Int. combustion (KEPCO)	0.5	0.5						
	11	Yeongwol C/C #1,2 (KOSPO)	900	900						
	12	POSCO C/C #2 (POSCO)	1,000	1,000						
	12	Gwangmyeong Station CHP (Samchully)	28.9	48.1						

Year	Month	Plant Name (company)	Capacity (MW) Effective	Capacity (MW) Apparent	Total Capacity (MW) Effective	Total Capacity (MW) Apparent	Peak Load (MW)	Installed Reserve Margin (%) Effective	Installed Reserve Margin (%) Apparent	Remarks
	12	Jecheol thermal #3,4 (Hyundai Steel)	**200**	200						
	12	Singori #1 (KHNP)	**1,000**	1,000						
2011					**76,529 (80,589)**	79,961 (84,061)	**65,944**	**16.1**	21.3	
	1	Ret-JejuGT #3 (KOMIPO)	**-55**	-55						
	1	Ret-Pyeongtaek thermal #1,2 (WP)	**-700**	-700						
	3	Seoul C/C #1(KOMIPO)	**500**	500						
	6	Bugok C/C #3,4 (GS EPS)	**(1,000)**	1,000						
	6	Cheongpyeong Hydro add.(KHNP)	**60**	60						
	6	Daejeon Seo Nambu CHP (Jugong)	**28.4**	47.3						
	6	Godeok C/C (SK E&S)	**700**	700						
	9	Seoul C/C #2 (KOMIPO)	**500**	500						
	9	Yecheon pump #1 (KOSEP)	**400**	400						
	10	Sinwolseong #1 (KHNP)	**1,000**	1,000						
	11	Jeonggwan CHP (Hyundai Construction)	**60.2**	100.3						
	12	Yangju C/C #1 (Daelim)	**700**	700						
	12	Yecheon pump storage#2 (KOSEP)	**400**	400						
	12	Singori #2 (KHNP)	**1,000**	1,000						
2012					**80,201 (81,473)**	85,223 (86,903)	**67,120**	**19.5**	27.0	
	1	Songdo C/C #1 (Daelim)	**(1,000)**	1,000						
	1	Ret-Seoul #4,5 (KOMIPO)	**-388**	-388						
	6	Yulchon C/C #2 (Meiya)	**(550)**	550						
	10	Sinwolseong #2 (KHNP)	**1,000**	1,000						
	12	Garorim Tidal Power (WP)	**72**	480						
	12	Incheon C/C #3 (KOMIPO)	**700**	700						
	12	Ret-Incheon thermal #1,2 (KOMIPO)	**-500**	-500						
2013					**80,548 (82,948)**	85,978 (89,078)	**68,092**	**18.3**	26.3	
	1	Ret-Yeongnam thermal #1,2 (KOSPO)	**-400**	-400						
	1	Ret-Yeongdong #1 (KOSEP)	**-125**	-125						
	1	Ret-Pyeongtaek thermal #3,4 (WP)	**-700**	-700						
	3									Yeongnam #1,2 (900) Boryeong #9 (1000) Taean #9 (1000)
	6	Jeju LNG C/C #1	**300**	300						
	9	Singori #3 (KHNP)	**1,400**	1,400						Boryeong #10(1000) Taean #10 (1000)
	12	Dangjin thermal #9 (KEWESPO)	**1,000**	1,000						
	12	Yangju C/C #2 (Daelim)	**(700)**	700						
2014					**82,818 (86,088)**	88,948 (92,218)	**68,832**	**20.3**	29.2	
	1	Ret-Ulsan thermal #1,2,3 (KEWESPO)	**-600**	-600						
	1	Ret-Seocheon thermal #1,2 (KOMIPO)	**-400**	-400						
	5	Renewables experience	**0**	0.1						
	6	Yeongheung thermal #5 (KOSEP)	**870**	870						
	9	Singori #4 (KHNP)	**1,400**	1,400						
	12	Dangjin thermal #10 (KEWESPO)	**1,000**	1,000						Bugok #5,6 (1500)
	12	Yeongheung thermal #6 (KOSEP)	**870**	870						

Year	Month	Plant Name (company)	Capacity (MW)		Total Capacity (MW)		Peak Load (MW)	Installed Reserve Margin (%)		Remarks
			Effective	Apparent	**Effective**	Apparent		**Effective**	Apparent	
2015					**85,088 (86,788)**	91,218 (92,918)	**69,474**	**22.5**	31.3	
	1	Ret-Boryeong thermal #1,2 (KOMIPO)	**-1,000**	-1,000						POSCO #3 (1,000)
	3									Yeongnam #3,4 (900)
	6									Songdo #2,3 (2000)
	9	Taean CCT (WP)	**300**	300						Yeongheung #7 (870)
	12	Sinuljin #1 (KHNP)	**1,400**	1,400						
2016					**86,788 (88,188)**	92,918 (94,318)	**70,049**	**23.9**	32.6	
	3									Yeongheung #8 (870)
	12	Sinuljin #2 (KHNP)	**1,400**	1,400						Yangju #3 (700)
2017					**88,188 (88,188)**	94,318 (94,318)	**70,535**	**25.0**	33.7	
2018					**88,148 (88,148)**	94,278 (94,278)	**71,025**	**24.1**	32.7	
	1	Ret-South Jeju Int. combustion #1-4 (KOSPO)	**-40**	-40						
	6									New Nuclear #1 (1400)
2019					**88,148 (88,148)**	94,278 (94,278)	**71,408**	**23.5**	32.0	New Nuclear #2 (1400)
	12									Yeongheung #9 (1000)
2020					**88,148 (88,148)**	94,278 (94,278)	**71,809**	**22.8**	31.3	
	6									Yeongheung #10 (1000)

※ 1. Total capacity and installed reserve margin are based on summer (July); the total capacities shown in parenthesis are based on year-end.

2. Effective capacity refers to the capacity derived by excluding the capacity with uncertain level of contribution to the peak time (renewables and RCS) and capacity (LNG) reflecting the uncertainties of executing construction. Figures shown in parenthesis under the effective capacity of the LNG combined cycle represent the facilities reflecting the uncertainties of executing construction (excluded in the calculation of the effective capacity).

3. The Remarks column shows the candidate projects submitted in the letter of intent for construction; some of them will be converted for execution as necessary based on the result of analyzing short-term supply in the future.

4. To connect the system of the 2nd stage of POSCO C/C (1000MW), the output of the company's own existing power plant should be reduced (from 1800 to 1500MW).

5. For Yeosu thermal #2, fuel changing work is scheduled to be completed by December 2008 without changing the capacity (from heavy oil to coal fluidized bed).

2) Metropolitan Area

Year	Month	Plant Name (company)	Capacity (MW)		Total Capacity (MW)		Peak Load (MW)	Installed Reserve Margin (%)		Remarks
			Effective	Apparent	Effective	Apparent		Effective	Apparent	
2005		Existing Capacity			**26,367 (26,367)**	26,587 (26,587)	22,240	**18.6**	19.5	
2006					**27,121 (27,146)**	27,352 (27,402)	23,789	**14.0**	15.0	
	1	ATC[1] increments	**750**	750						
	4	Banwol CHP capacity add. (STX)	**4.3**	14.3						
	8	Ecoenergy	**25**	50						
	10	Bundang C/C fuel cell (KOSEP)	**0.3**	0.3						
2007					**27,596 (27,904)**	27,852 (28,364)	24,905	**10.8**	11.8	
	1	ATC increments	**450**	450						
	11	HwaseongDongtan CHP (KDHC)	**307.1**	511.8						
	12	Seongnam2 Small Hydro (K-Water)	**0.2**	0.4						
2008					**29,377 (29,395)**	29,845 (29,879)	25,987	**13.0**	14.8	
	1	ATC increments	**600**	600						
	1	SeoulGangil CHP (Daehan City Gas)	**3.2**	10.5						
	6	Yeongheung thermal #3 (KOSEP)	**870**	870						
	10	Dongdaemun Environment Bio	**0.5**	1						
	12	Osan CHP capacity add. (Daesung Industries)	**2.6**	8.7						
	12	Yangju Goup CHP (Daelim)	**14.8**	24.7						
2009					**30,365 (30,884)**	30,849 (31,715)	26,950	**12.7**	14.5	
	1	ATC increments	**250**	250						
	3	Yeongheung thermal #4 (KOSEP)	**870**	870						
	6	Incheon C/C #2 (KOMIPO)	**500**	500						
	6	Ret-Incheon 3,4 (KOMIPO)	**-650**	-650						
	9	Songdo CHP (Incheon Total Energy)	**123**	205						
	11	Paju CHP (KDHC)	**309**	515						
	11	Pangyo CHP (KDHC)	**87.6**	146						
2010					**30,884 (31,913)**	31,715 (32,763)	27,732	**11.4**	14.4	
	12	POSCO C/C #2 (POSCO)	**1,000**	1,000						
	12	Gwangmyeong Station CHP (Samchully)	**28.9**	48.1						
2011					**33,373 (34,573)**	34,223 (35,423)	28,364	**17.7**	20.7	
	1	ATC increments	**900**	900						
	1	Ret-Pyeongtaek thermal #1,2 (WP)	**-700**	-700						
	3	Seoul C/C #1 (KOMIPO)	**500**	500						
	6	Godeok C/C(SK E&S)	**700**	700						
	6	Cheongpyeong Hydro capacity add. (KHNP)	**60**	60						
	9	Seoul C/C #2 (KOMIPO)	**500**	500						
	12	Yangju C/C #1 (Daelim)	**700**	700						

[1] ATC: Available Transmission Capacity

Year	Month	Plant Name (company)	Capacity (MW)		Total Capacity (MW)		Peak Load (MW)	Installed Reserve Margin (%)		Remarks
			Effective	Apparent	Effective	Apparent		Effective	Apparent	
2012					34,185 (34,385)	36,035 (36,235)	28,962	18.0	24.4	
	1	Ret-Seoul thermal#4,5(KOMIPO)	-388	-388						
	1	Songdo C/C #1 (Daelim)	(1000)	1,000						
	12	Ret-Incheon thermal #1,2 (KOMIPO)	-500	-500						
	12	Incheon C/C #3 (KOMIPO)	700	700						
2013					33,785 (33,785)	35,635 (36,335)	29,485	14.6	20.9	
	1	Ret-Pyeongtaek thermal #3,4 (WP)	-700	-700						
	1	ATC increments	100	100						
	12	Yangju C/C #2 (Daelim)	(700)	700						
2014					35,305 (36,175)	37,855 (38,725)	29,897	18.1	26.6	
	1	ATC increments	650	650						
	6	Yeongheung thermal #5 (KOSEP)	870	870						
	12	Yeongheung thermal #6 (KOSEP)	870	870						
2015					36,175 (36,175)	38,725 (38,725)	30,273	19.5	27.9	
	1									POSCO #3 (1,000)
	6									Songdo #2,3 (2000)
	9									Yeongheung #7 (870)
2016					36,325 (36,325)	38,875 (38,875)	30,547	18.9	27.3	
	1	ATC increments	150	150						
	3									Yeongheung #8 (870)
	12									Yangju #3 (700)
2017					36,475 (36,475)	39,025 (39,025)	30,883	18.1	26.4	
	1	ATC increments	150	150						
2018					36,625 (36,625)	39,175 (39,175)	31,224	17.3	25.5	
	1	ATC increments	150	150						
2019					36,775 (36,775)	39,325 (39,325)	31,558	16.5	24.6	
	1	ATC increments	150	150						
	12									Yeongheung #9 (1000)
2020					36,975 (36,975)	39,525 (39,525)	31,904	15.9	23.9	
	1	ATC increments	200	200						
	6									Yeongheung #10 (1000)

※ 1. Total capacity and installed reserve margin are based on summer (July); total capacities indicated in parenthesis are based on year-end.

2. Effective capacity refers to the capacity derived by excluding the capacity with an uncertain level of contribution to the peak time (renewables and RCS) and capacity (LNG) reflecting the uncertainties of executing construction. Figures shown in parenthesis under the effective capacity of LNG combined cycle represent the facilities reflecting the uncertainties of executing construction (excluded in the calculation of the effective capacity).

3. The Remarks column shows the candidate projects submitted in construction intents; some of them will be converted for execution as necessary based on the result of analyzing short-term supply in the future.

3) Jeju Island

Year	Month	Plant Name (company)	Facilities Capacity (MW)		Total Capacity (MW)		Peak load (MW)	Installed Reserve Margin (%)		Remarks
			Effective	Apparent	Effective	Apparent		Effective	Apparent	
2005		Existing Capacity			**682 (682)**	697 (697)	479	**42.4**	45.5	
2006					**682 (654)**	697 (682)	515	**32.4**	35.3	
	8	JejuNansan wind power	**1.5**	14.7						
	9	South Jeju thermal #3(KOSPO)	**100**	100						
	9	Ret-JejuGT #1,2 (KEPCO)	**-110**	-110						
	10	Ret-South Jeju thermal #1,2 (KOSPO)	**-20**	-20						
2007					**754 (757)**	785 (820)	567	**33.0**	38.4	
	3	South Jeju thermal #4 (KOSPO)	**100**	100						
	4	Jeju Pyoseon wind power (Unison)	**0.3**	3						
	10	Hangyeong wind power 2nd stage (KOSPO)	**1.5**	15						
	11	Seongsan wind power (KOSPO)	**2**	20						
2008					**762 (765)**	870 (900)	597	**27.6**	45.7	
	2	Jeju Sangdo wind power (Jeju wind power)	**3.2**	31.5						
	6	Jeju Sangmyeong wind power (Unison)	**1.6**	16						
	6	Jeju Cheongsu wind power (Unison)	**0.3**	3						
	9	Sammu wind power	**3**	30						
2009					**801 (801)**	988 (988)	625	**28.2**	58.1	
	1	Ret-Jeju thermal #1 (KOMIPO)	**-10**	-10						
	6	Jeju Int. combustion #2 (KOMIPO)	**40**	40						
	7	Jeju Deokcheon wind power (KOMIPO)	**4**	40						
	7	Jeju Daehol wind power (Unison)	**1.8**	18						
2010					**801 (801)**	988 (988)	654	**22.5**	51.1	
2011					**946 (946)**	1133 (1133)	681	**38.9**	66.4	JejuB LNG (300)
	1	HVDC line add.	**200**	200						
	1	Ret-JejuGT#3 (KOMIPO)	**-55**	-55						
2012					**946 (946)**	1133 (1133)	707	**33.8**	60.3	
2013					**1246 (1246)**	1433 (1433)	732	**70.2**	95.8	
	6	Jeju LNG CC#1	**300**	300						
2014					**1246 (1246)**	1433 (1433)	755	**65.0**	89.8	

Year	Month	Plant Name (company)	Facilities Capacity (MW)		Total Capacity (MW)		Peak load (MW)	Installed Reserve Margin (%)		Remarks
			Effective	Apparent	**Effective**	Apparent		**Effective**	**Apparent**	
2015					**1246 (1246)**	1433 (1433)	776	**60.6**	84.7	
2016					**1246 (1246)**	1433 (1433)	798	**56.1**	79.6	
2017					**1246 (1246)**	1433 (1433)	818	**52.3**	75.2	
2018					**1206 (1206)**	1393 (1393)	838	**43.9**	66.2	
	1	Ret-South Jeju Int. combustion #1-4(KOSPO)	**-40**	-40						
2019					**1206 (1206)**	1393 (1393)	859	**40.4**	62.2	
2020					**1206 (1206)**	1393 (1393)	879	**37.2**	58.5	

* 1. Total capacity and installed reserve margin are based on summer (July); total capacities indicated in parenthesis are based on year-end.
2. Effective capacity refers to the capacity derived by excluding the capacity with an uncertain level of contribution to the peak time (renewables and RCS) and capacity (LNG) reflecting the uncertainties of executing construction.
3. The Remarks column shows the other intents for construction.
4. Data may vary depending on the resolutions adopted by the Jeju Island Council.

b. Generating Capacity Retirement Plan

(unit: MW)

Year	Nuclear	Steam Power				Internal Combustion		Hydro	Capacity Retirement
		Bituminous Coal	Anthracite	Heavy Oil	LNG	Heavy Oil	Light Oil		
2006				South Jeju thermal#1, 2 (20)			JejuGT #1,2 (110) Gaeyado (0.25) Sapsido (0.15) Eocheongdo (0.15) Chujado (0.3) Ulneungdo Int. combustion (3)	Chusan Small Hydro(0.7)	134.6 (9 stations)
2007							Jodo (1.2) Seungbongdo (0.45) Heuksando Int. combustion (1.5)		3.2 (3 stations)
2008							Jangjado (0.25) Jangodo (0.08)		0.3 (2 stations)
2009				Jeju thermal#1 (10)	Incheon3,4 (650)		Gaeyado Int. combustion (0.5)		660.5 (4 stations)
2010							Sapsido Int. combustion (0.15)		0.15 (1 station)
Subtotal ('06~'10)	-			30 (3 stations)	650 (2 stations)		118.0 (14 stations)	0.7 (1 station)	798.7 (19 stations)
2011				Pyeongtaek #1,2(700)			JejuGT#3 (55)		755 (3 stations)
2012					Seoul #4,5 (387.5) Incheon #1,2 (500)				887.5 (4 stations)
2013			Yeongdong #1 (125)	Yeongnam# 1,2(400) Pyeongtaek thermal #3,4 (700)					1225 (5 stations)
2014			Seocheon# 1,2 (400)	Ulsan#1~3 (600)					1,000 (5 stations)
2015		Boryeong #1,2 (1,000)							1,000 (2 stations)
Subtotal ('11~'15)	-	1,000.0 (2 stations)	525.0 (3 stations)	2,400 (9 stations)	887.5 (4 stations)		55 (1 station)		4,868 (19 stations)
2018						South Jeju Int. Combusti on #1-4 (40)			40 (4 stations)
Total ('06~'20)	-	1,000.0 (2 stations)	525.0 (3 stations)	2,430 (12 stations)	1537.5 (6 stations)	40 (4 stations)	173 (15 stations)	0.7 (1 station)	5,706.2 (43 stations)

※ 1. Jeju GT #1,2 represent transmission facilities; they shall be excluded from those covered by the required generating capacity (at the request of KEPCO; until a reserve self-starting generator is designated in Jeju Island, however, the facilities shall maintain the generating capacity).

2. Wolseong #1 has been excluded from among those subject to closure since KHNP expressed its intention to operate the facilities continuously. Whether or not to allow continuous operation shall be decided in the future in accordance with related nuclear power laws.

c. Generating Capacity Outlook by Fuel Type

(unit: MW, %)

Year	Nuclear	Bituminous Coal	LNG	Heavy Oil	Light Oil	Anthracite	Hydro/Pumped	Renewables	RCS/Others	Total
2005	17,716	16,840	16,447	4,389	322	1,125	3,829	210	1,382	62,258
	28.5%	27.0%	26.4%	7.0%	0.5%	1.8%	6.1%	0.3%	2.2%	100.0%
2006	17,716	17,340	17,437	4,469	217	1,125	5,429	418	1,405	65,555
	27.0%	26.5%	26.6%	6.8%	0.3%	1.7%	8.3%	0.6%	2.1%	100.0%
2007	17,716	18,840	17,437	4,569	218	1,125	5,429	552	2,151	68,036
	26.0%	27.7%	25.6%	6.7%	0.3%	1.7%	8.0%	0.8%	3.2%	100.0%
2008	17,716	21,710	17,937	4,569	219	1,125	5,429	872	2,216	71,793
	24.7%	30.2%	25.0%	6.4%	0.3%	1.6%	7.6%	1.2%	3.1%	100.0%
2009	17,716	23,080	18,487	4,559	261	1,125	5,429	1,185	3,370	75,210
	23.6%	30.7%	24.6%	6.1%	0.3%	1.5%	7.2%	1.6%	4.5%	100.0%
2010	18,716	23,080	20,387	4,559	261	1,125	5,429	1,235	3,618	78,409
	23.9%	29.4%	26.0%	5.8%	0.3%	1.4%	6.9%	1.6%	4.6%	100.0%
2011	20,716	23,080	23,787	3,859	206	1,125	6,289	1,235	3,765	84,061
	24.6%	27.5%	28.3%	4.6%	0.2%	1.3%	7.5%	1.5%	4.5%	100.0%
2012	21,716	23,080	25,149	3,859	206	1,125	6,289	1,715	3,765	86,903
	25.0%	26.6%	28.9%	4.4%	0.2%	1.3%	7.2%	2.0%	4.4%	100.0%
2013	23,116	24,080	26,149	2,759	206	1,000	6,289	1,715	3,765	89,078
	25.9%	27.0%	29.4%	3.1%	0.2%	1.1%	7.1%	1.9%	4.2%	100.0%
2014	24,516	26,820	26,149	2,159	206	600	6,289	1,715	3,765	92,218
	26.6%	29.1%	28.4%	2.3%	0.2%	0.7%	6.8%	1.9%	4.0%	100.0%
2015	25,916	25,820	26,149	2,159	206	600	6,289	2,015	3,765	92,918
	27.9%	27.8%	28.1%	2.3%	0.2%	0.6%	6.8%	2.2%	4.0%	100.0%
2016	27,316	25,820	26,149	2,159	206	600	6,289	2,015	3,765	94,318
	29.0%	27.4%	27.7%	2.3%	0.2%	0.6%	6.7%	2.1%	4.0%	100.0%
2017	27,316	25,820	26,149	2,159	206	600	6,289	2,015	3,765	94,318
	29.0%	27.4%	27.7%	2.3%	0.2%	0.6%	6.7%	2.1%	4.0%	100.0%
2018	27,316	25,820	26,149	2,159	166	600	6,289	2,015	3,765	94,278
	29.0%	27.4%	27.7%	2.3%	0.2%	0.6%	6.7%	2.1%	4.0%	100.0%
2019	27,316	25,820	26,149	2,159	166	600	6,289	2,015	3,765	94,278
	29.0%	27.4%	27.7%	2.3%	0.2%	0.6%	6.7%	2.1%	4.0%	100.0%
2020	27,316	25,820	26,149	2,159	166	600	6,289	2,015	3,765	94,278
	29.0%	27.4%	27.7%	2.3%	0.2%	0.6%	6.7%	2.1%	4.0%	100.0%

* Based on the facilities' rated capacity (apparent capacity)

* Due to the characteristics of renewables facilities with short construction period, the renewables facilities are expected to be expanded further after 2009.

d. Electricity Generation Outlook by Fuel

(unit: GWh, %)

Year	Nuclear	Bituminous Coal	Anthracite	LNG	Petroleum	Hydro/Pumped storage	Renewables/ Others	Total
2005 (actual)	146,779	129,174	5,790	60,820	16,422	5,015	639	364,639
	(40.3)	(35.4)	(1.6)	(16.7)	(4.5)	(1.4)	(0.2)	100.0%
2006	146,754	134,266	5,790	75,434	19,780	5,152	654	387,830
	(37.8)	(34.6)	(1.5)	(19.5)	(5.1)	(1.3)	(0.2)	100.0%
2007	146,756	140,880	5,790	86,527	22,497	5,139	1,005	408,594
	(35.9)	(34.5)	(1.4)	(21.2)	(5.5)	(1.3)	(0.2)	100.0%
2008	146,754	157,832	5,790	88,030	21,715	5,149	1,295	426,565
	(34.4)	(37.0)	(1.4)	(20.6)	(5.1)	(1.2)	(0.3)	100.0%
2009	146,754	177,193	5,790	84,900	20,375	5,140	1,463	441,615
	(33.2)	(40.1)	(1.3)	(19.2)	(4.6)	(1.2)	(0.3)	100.0%
2010	146,752	181,397	5,790	93,286	20,130	5,137	1,801	454,293
	(32.3)	(39.9)	(1.3)	(20.5)	(4.4)	(1.1)	(0.4)	100.0%
2011	156,804	180,840	5,790	99,829	14,631	5,145	1,866	464,905
	(33.7)	(38.9)	(1.2)	(21.5)	(3.1)	(1.1)	(0.4)	100.0%
2012	173,762	180,766	5,790	97,197	9,642	5,193	1,866	474,216
	(36.6)	(38.1)	(1.2)	(20.5)	(2.0)	(1.1)	(0.4)	100.0%
2013	183,312	180,566	5,273	100,052	5,530	5,187	2,388	482,308
	(38.0)	(37.4)	(1.1)	(20.7)	(1.1)	(1.1)	(0.5)	100.0%
2014	194,857	195,408	3,232	84,323	3,581	5,204	2,497	489,102
	(39.8)	(40.0)	(0.7)	(17.2)	(0.7)	(1.1)	(0.5)	100.0%
2015	203,099	202,302	3,232	74,919	3,535	5,257	2,497	494,841
	(41.0)	(40.9)	(0.7)	(15.1)	(0.7)	(1.1)	(0.5)	100.0%
2016	214,618	200,007	3,232	70,551	3,521	5,328	2,497	499,754
	(42.9)	(40.0)	(0.6)	(14.1)	(0.7)	(1.1)	(0.5)	100.0%
2017	225,968	198,423	3,232	65,917	3,494	5,445	2,497	504,976
	(44.7)	(39.3)	(0.6)	(13.1)	(0.7)	(1.1)	(0.5)	100.0%
2018	225,080	199,619	3,232	70,495	3,324	5,367	2,497	509,614
	(44.2)	(39.2)	(0.6)	(13.8)	(0.7)	(1.1)	(0.5)	100.0%
2019	225,055	200,530	3,232	74,096	3,299	5,338	2,497	514,047
	(43.8)	(39.0)	(0.6)	(14.4)	(0.6)	(1.0)	(0.5)	100.0%
2020	225,063	201,288	3,232	77,627	3,317	5,311	2,497	518,335
	(43.4)	(38.8)	(0.6)	(15.0)	(0.6)	(1.0)	(0.5)	100.0%

* 1. Based on reference demand
2. Figures calculated assuming economic dispatch and fuel unconstrained condition based on the fuel costs for 2005

4. Electricity Supply and Demand in the Island Areas

a. Planning Criteria

○ Scope

- Establishing the generating capacity plan for 13 islands with more than 300 households
- Islands covered by the plan shall be expanded gradually to islands with 50 or more households (63 islands with households numbering 50 or more)

○ Load forecast

- Period: From 2006 to 2010 (5 years)
- Demand forecast:
  - ･EXCEL program-based forecasts (linear, exponential, polynomial forecasts)
  - ･Forecasts using the trends of increasing reference load performance
  - ･Obtaining data by averaging the results of the EXCEL program and reference load forecast
- Application for new demand (estimate) to reflect 50% of the capacity to the peak load

○ Standard for the adequate reserve margin

- Maintain at least 5% of the capacity reserve margin excluding the capacity reserve for maintenance.

Classification	Reserve capacity considering maintenance	Reserve capacity considering outage
3~6 generators	Max. capacity generator (1 unit)	N/A
More than 7 generators	Max. capacity generator (1 unit) + Min. capacity generator (1 unit)	Adjust the maintenance schedule during peak demand and use a spare generator.

○ Standard for generating facilities retirement

- Facilities life shall be assumed to be 15~25 years depending on the engine rpm.

Classification	Slow-speed engine	Medium-speed engine	High-speed engine
Design life (years)	25	20	15
rpm	300 or less	300~1000	1000 or more

b. Generation Facilities Plan

○ Peak demand outlook

(unit: kW)

Island	2006	2007	2008	2009	2010	Annual Mean Increase Rate (%)
Uleungdo	7,614	7,936	8,288	8,670	9,083	7.28
Paikryungdo	4,136	4,425	4,737	5,071	5,406	6.68
Jodo	1,282	1,364	1,432	1,505	1,584	5.60
Huksando	2,249	2,322	2,391	2,458	2,521	3.92
Chujado	2,273	2,420	2,566	2,711	2,855	6.34
Guemundo	2,070	2,183	2,308	2,449	2,606	9.26
Duckjukdo	1,354	1,405	1,453	1,499	1,543	3.84
Wido	1,090	1,137	1,181	1,222	1,261	3.38
Daecheongdo	996	1,218	1,242	1,266	1,292	15.85
Yeonpyeongdo	1,724	1,955	2,068	2,426	2,581	24.99
Jangjado	920	1,063	1,210	1,367	1,535	14.15
Jawoldo	565	670	727	785	847	12.94
Seungbongdo	1,045	1,218	1,406	1,611	1,834	18.86
Total	**29,324**	**31,323**	**33,017**	**35,049**	**36,958**	**10.24**

○ Generator construction and retirement (2006 ~ 2010)

- New construction (total; 29 units, 24,500kW), existing facilities retirement (in total; 33 units, 13,150kW)
- New generator construction cost: About KRW70.4 billion

(unit: kW)

Island	2006	2007	2008	2009	2010	Total
Ulneungdo	4,000 (3,700)	2,000 (1,000)	2,000 (1,000)			8,000 (5,700)
Jodo		1,000 (1,200)				1,000 (1,200)
Huksando		1,500 (1,500)				1,500 (1,500)
Chujado	2,000 (300)	(900)	1,000			3,000 (1,200)
Geomundo				2,000 (1,000)		2,000 (1,000)
Duckjukdo					1,000 (900)	1,000 (900)
Daecheongdo	500				500	1,000
Yeonpyeongdo	1,000			1,000		2,000
Jangjado	500		1,000 (750)			1,500 (750)
Jawoldo	500		500 (450)			1,000 (450)
Seungbongdo	1,000		500	500 (450)	500	2,500 (450)
Total	9,500 (4,000)	4,500 (4,600)	5,000 (2,200)	3,500 (1,450)	2,000 (900)	24,500 (13,150)

※ Values in parenthesis denote the retirement capacity.

○ Electricity Supply and Demand Outlook

- The average increase rate for 2006~2010 is expected to be 10.24%.

(unit: kW, %)

Classification		2006	2007	2008	2009	2010
Ulneungdo	Capacity	11,200	13,200	13,200	13,200	13,200
	Capacity reserve margin	7.70	28.53	17.04	11.88	6.79
Paikryungdo	Capacity	9,000	9,000	9,000	9,000	9,000
	Capacity reserve margin	81.33	69.49	58.33	47.90	38.73
Jodo	Capacity	2,200	2,000	2,000	2,000	2,000
	Capacity reserve margin	32.61	31.96	25.70	19.60	13.64
Huksando	Capacity	3,500	3,500	3,500	3,500	3,500
	Capacity reserve margin	22.28	18.43	15.01	11.88	9.08
Chujado	Capacity	4,400	4,400	4,500	4,500	4,500
	Capacity reserve margin	36.38	28.10	36.40	29.10	22.59
Geomundo	Capacity	3,500	3,500	3,500	4,500	4,500
	Capacity reserve margin	20.77	14.52	8.32	42.92	34.31
Duckjukdo	Capacity	2,900	2,900	2,900	2,900	3,000
	Capacity reserve margin	55.10	49.47	44.53	40.09	29.62
Wido	Capacity	3,850	3,850	3,850	3,850	3,850
	Capacity reserve margin	161.47	150.66	141.32	133.22	126.01
Daecheongdo	Capacity	1,850	1,850	1,850	1,850	2,350
	Capacity reserve margin	35.54	10.84	8.70	6.64	43.19
Yeonpyeongdo	Capacity	3,350	3,350	3,350	4,350	4,350
	Capacity reserve margin	36.31	20.20	13.64	19.54	12.36
Jangjado	Capacity	1,750	1,750	2,500	2,500	3,000
	Capacity reserve margin	35.87	17.59	23.97	9.73	30.29
Jawoldo	Capacity	1,450	1,450	1,500	1,500	1,500
	Capacity reserve margin	68.14	41.79	37.55	27.39	18.06
Seungbongdo	Capacity	1,950	1,950	2,450	2,450	2,500
	Capacity reserve margin	38.76	19.05	28.02	24.15	9.05

※ For the construction of new power plants, KEPCO as the actual operator of the facilities may change the scheduled completion time considering the characteristics of the islands after checking the progress of work related to the application for the construction of new facilities.

5. Renewables Development

a. Domestic Renewables Policy

2nd National Energy Plan (2002. 12)	◈ **Establish plans every 5 years under a planned period of 10 or more years.** · Percentage of the total primary energy renewables: 5% (2011) · Basis: Article 4 of the Energy Use Rationalization Act
⇩⇧	
2nd renewables technology development and supply plan (2003. 12)	◈ **To achieve the national energy plan objectives, establish and execute a 10-year energy plan for renewables.** · Plan based on the 11 sources of renewables and by year. · Basis: Article 4 of the Renewables Act
⇩	
2006 detailed implementation plan	◈ **Establish and execute annual detailed implementation plans.** · Basis: Article 5 of the Renewables Act

○ Four major national energy policy directions (2nd National Energy Plan)

- Establishing of sustainable energy systems
- Fostering a competitive energy industry with activated market functions
- Developing energy technology power
- Leading Asian energy industry with highly organized trading system

○ The 2nd renewables development plan

- Systemizing and focusing on the development of renewables technology
- Creating an environment to build the infrastructure for the renewables industry
- Strengthening market foundation for the expansion of renewable energy

b. Outlook on Renewables Facilities Construction

(unit: MW)

Year	Hydro	Wind Power	LFG	Tidal	CCT/Others	Solar	Subtotal	Total
2005	1582.8	93.5(96.1)	30.56		30.3	1.27 (1.46)	1738.4 (1741.2)	1738.4 (1741.2)
2006	Damyang1.274 Namwon 1.8 Hadongho0.825 ChusanClose-0.7 Baekgok 0.43 Yulhyon 0.56 Gwangdong 0.23 Samcheonpo 2.965 Gomun 1.5 Chungju Dam 3 Hongcheon 2.94	Unison 3 Jeju Nansan14.7 Taebaek 2.55 Gangwon 70 Sinan 3	Ecoenerg y50		Jeonju incinerator 8 Bundang C/C fuel cell 0.25	Solar city Korea 0.4 Gongju 0.2 Girinecho 0.003 Bucheon Environment 0.003 Hwang Uihong 0.003 YMCA Solar 0.2 Mupung 0.01 Byeonsan community 0.003 Acetech 0.099 Hanseung 0.003 Gwangyang 0.099 POSMEC 0.003 Goheung Solar 0.8 Solar Energy 3 Solar Plus 1.5CK Solar 0.2 Green Solar 0.2 Doljin solar 0.2 Solaec Energy 0.2 Jungang 0.099 Myeongwon 0.195 Oboksanjeon 0.06 Gunhyong Enterprise 0.099 Palyung 0.195 Propower 0.003 Hanseong 0.009 HS 1 Yongseong 0.05 Sokcho 0.01 Yanggok 0.045 Donghae #1 (KEWESPO) 1 Okgok Solar 0.099 Haegwang 0.195 Boseong Powertech 0.2 Byeollyang 0.199 Gomso 0.2 Miraean 0.195 Maegok 0.195 NH 0.195 Pungdeok 0.195 Dukryang 0.195 Daejeon 0.195 Baekro 0.195 Pyeongcheon 0.195 Cheongju 0.195 Owol 0.195 KC 1.13 Geumho 0.003 Daegu 0.1 Mirae 0.05 Cheongsong 0.195 Bunmaeri 0.195 Hwangsan 0.096 Gwangyang (Unison) 1 Dongjin Solar 0.2 Uiwang Sewage Plant 0.05 Cheongil 0.005 Korea SolTech 0.2C Solar 0.2 Green Solar 0.2 CoreSinan 3 MameTech 3 Greenlight 3 Solar player 3 Space Light 3 High Quality 2 Yeongheung-do 1 Donghwa energy 1 Suncheon3 1 Gwanri 0.195 Mirae energy Joseong 0.1 Propower 0.099 Jeonju Energy 2.5 JPV 0.1 Sehan Hospital 0.01 Choejeongnyo 0.01 Samsin 0.03 Eejong thermal 0.005 SL 1 Vision 1 Lsystech Goldfarm 0.199 Digital 0.195 Dodeok 0.195	208.3	1946.8
2007	Dalbang 0.17 Sancheong2 0.45 Cheongsong pump 2.2 Juam 1 Daecheong0.8 Buncheon 1.5 Unmun #2 0.7 Boryeong 1.8 Seongnam2 0.36	Jeolla Bukdo 3.4 JejuPyoseon 3 Milyang#1 50 Hangyeong#2 14 Hanjin Gen 0.2 Seongsan 20 GangwonChahang 22.5 Gori 0.85			G&G Bio 0.82	Daeyeong 0.195 Daeyang Tech 0.1 Yongdang 0.195 Yeonggwang Solar Park #1 1 Seongsan 0.2 Sinan 1 Solar electricity 1.5 Naju 0.195 Solarpark 0.4 Donggeom 0.003 Symphony 1 Donghae #2 (KEWESPO) 1 Boseong Jungang 0.1 Boseongjeil 0.1 Wonbongri 0.195 Samik 0.195 Sacheon 1.5	133.6	2080.4
2008	Deokch i0.8 SumjinRiver Dam 1.4 Dangjin Haeyang 3	JejuSangdo 31.5 Yanggu 20 JejuCheongsu 3 Taebaek 20 Daegi-ri40 Milyang#2 60 Sammu 30 GyeongjuYangnam 21 GangwonPyeongcha ng 20 Jeongseon 25 Donghae 25 JejuSangmyeong 16			Dongdaemun Environment Bio 1	Jukam1 GbsGwangju 0.195 Yeonggwang Solar Park #2 2	320.9	2401.3
2009	Hwabuk Dam 0.4	JejuDaehol 18 JejuDeokcheon 40		SihwaLak e 254	Jecheol thermal 200	Geumho Energy 0.05	512.5	2913.7
2010		GangwonSohwang Byeongsan 50			Jecheol thermal 200		250	3163.7
2011	Cheongpyeong extension 60						60	3223.7
2012				Garorim 480			480	3703.7
2014						Renewables experience 0.1	0.1	3703.8
2015					Cheongsong pump CCT 300		300	4003.8
New total	89.4	627.7	50	734	710.1	54.2	2265	
Cumulative total	1672	721.2	80.6	734	740.4	55.5	4003.8	

* Figures in parenthesis include PPA power plants.

* Due to the characteristics of renewables facilities with short construction period, the renewables facilities are expected to be expanded further after 2009.

6. Major Transmission Facilities Expansion Plan

a. Transformation Facilities

Classification	Substation Name	Region	Expected Year of Completion	Necessity
765 kV	Bukgyeongnam	Gyeongnam Changnyeong	2009	○ Transmission of power from future Kori nuclear units ○ Power supply to the southern area in Goryeong, Taegu
	Sinuljin	Gyeongbuk Uljin	2013	○ Transmission of power from future Uljin units
345 kV	Gonjiam	Kyonggi Gwangju	2006	○ Power supply to the Youngin, Gwangju areas
	Buktaegu	Kyongbuk Taegu	2006	○ Power supply to the Taegu City area
	Sinonyang	Chungnam Asan	2006	○ Power supply to the Asan area
	Sinsiheung#2	Kyonggi Jeongwang	2007	○ Transmission of power from Youngheung units
	Sinyangyang	Gangwon Injae	2008	○ Power supply to the northern Youngdong area
	Sinpochun	Kyonggi Dongduchun	2008	○ Power supply to the northern part of the capital area
	Taegu	Taegu Dalseong	2008	○ Power supply to the Taegu area
	Sinpaju	Kyonggi Paju	2009	○ Power supply to the northern Kyonggi area
	Seoansseong	Kyonggi Anseong	2009	○ Power supply to the Anseong, Songtan areas
	Sinchungju	Chungbuk Chungju	2010	○ Power supply to the Eumseong, Jeungpyeong, and Pongdong areas
	Sinnoksan	Busan Gangseogu	2010	○ Power supply to the southern part of Busan City
	Sintangjeong	Chungnam Asan	2011	○ Power supply to the Chungnam Tangjeong industrial complexes
	Pangyo	Kyonggi Seongnam	2012	○ Power supply to the Seongnam, Yongin areas
	Changwon	Gyeongnam changwon	2012	○ Power supply to the Masan, Changwon areas
	Singimpo	Kyonggi Gimpo	2012	○ Power supply to the Gimpo area
	Dongbusan	Busan Namgu	2013	○ Power supply to the eastern part of Busan City
	Sinonsu	Seoul Gurogu	2013	○ Power supply to the Gangseo, Guro areas
	Dongulsan	Ulsan Bukgu	2013	○ Power supply to the Ulsan area
	Seopyeongtaek	Kyonggi Pyeongtaek	2015	○ Power supply to the Kyonggi southern industrial complex area
	Seoseoul#2	Kyonggi Gunpo	2015	○ Power supply to the southwestern part of the Kyonggi area
	Dongseoul#2	Kyonggi Hanam	2015	○ Power supply to the southeastern part of the Seoul area
	Sinnamwon	Junbuk Namwon	2016	○ Power supply to the eastern part of the Junbuk area

b. Transmission Facilities

Classification	Section	Length (c-km)	Year of Completion	Necessity
765㎸	Sinansung - Singapyeong	75	2008	○ Interconnection between the capital area and rear network (southern area - eastern area)
	Singori - Bukgeungnam	200	2009	○ Future Kori units (the 2nd site) interconnection
345㎸	Chungsong branch	40	2006	○ Chungsong PS plant interconnection
	Boryeong T/P-Chungyang	60	2007	○ Boryeong # 7,8 coal plant interconnection
	Sinpochun-Singapyeong	128	2008	○ Reinforce the northeastern capital area network.
	Sindukeun-Sinpochun	90	2008	○ Reinforce the northwestern capital area network.
	Gwangyang - Singangjin	212	2008	○ Reinforce the Junnam Province network.
	Sinansseong branch	40	2008	○ Reinforce the southeastern capital area network.
	Sinsuwon-Sinyongin	22	2009	○ Reinforce the Suwon area network.
	Bukkyeongnam 1st branch	60	2009	○ Singori # 1, 2 nuclear plant interconnection
	Seonsan branch	100	2010	○ Reinforce the Gumi area network.
	Sinkimhae-Sinnoksan	40	2010	○ Reinforce the Busan Noksan Industrial Complex area network.
	Yeochun P/P-Sinyeongju	40	2010	○ Yeochun PS plant interconnection
	Sinchungju branch	104	2010	○ Reinforce the Chungbuk Province network.
	Sindangjin-Sinonyang	92	2010	○ Reinforce the midwestern Chungnam area network.
	Sinwolseong branch	40	2010	○ Sinwolseong #1,2 nuclear plant interconnection
	Bukkyeongnam 2nd branch	120	2010	○ Singori # 3, 4 nuclear plant interconnection
	Sinonyang-Sintangjung	20	2011	○ Power supply to the Asan Tangjung Industrial Complex
	Sinulsan-Sinonsan	16	2012	○ Reinforce the Ulsan area network.
	Kwangyang CC-Yeosu thermal	26	2013	○ Reinforce the Yusu National Industrial Complex network.
	Sinbupyeong-Sinonsu	22	2014	○ Reinforce the Incheon area network.

※ The construction plan may be changed based on the results of KEPCO's system assessment.

Abbreviations

CHP : Combined Heat and Power
CES : Community Energy System
DAELIM : Daelim Industrial Co., Ltd.
DSM : Demand Side Management
EBA : Electricity Business Act
BPE : The Basic Plan of Long Term Electricity Supply & Demand
ESI : The Electricity Supply Industry
GAWIP : Gangwon Wind Power Co., Ltd.
HVDC : High Voltage Direct Current
KDHC : Korea District Heating Corp.
KDI : Korea Development Institute
KEPCO : Korea Electric Power Corporation
KEWESPO: Korea East-West Power Co., Ltd.
KHNP : Korea Hydro & Nuclear Power Co., Ltd.
KIECO : Korea Independent Energy Corps.
KIET : Korea Institute for Industrial Economics and Technology
KNHC : Korea National Housing Corporation
KOMIPO : Korea Midland Power Co., Ltd.
KOSEP : Korea South-East Power Co., Ltd.
KOSPO : Korea Southern Power Co., Ltd.
K-Water : Korea Water Resources Corporation
KPX : Korea Power Exchange
LFG : Landfill Gas
MOCIE : Ministry of Commerce, Industry and Energy
WP : Korea Western Power Co., Ltd.
PCSD : The Presidential Commission on Sustainable Development
PS : Pumped Storage
RCS : Regional Cogeneration System
VOLL : Value of Lost Load