

A speculation on the debate about the future electricity demand in Korea

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1. Introduction

Since 1991, Korean government established the Long term Power Development Plan(LPDP) to secure a stable electricity supply. With the introduction of market mechanism into electricity supply sector, that plan has been changed into the Basic Plan of the Electricity supply and demand(BPE), which plays a role as a non-binding guideline or a reference rather than the implementation plan. The BPE still has its importance as a tool providing market participants with appropriate information of future electricity market.

According to the second BPE, released at the end of 2004, electricity demand is projected to grow at 2.5% per annum and reach 416.5TWh in 2017 from 293.6TWh in 2003. Based on the projected demand, power expansion plan provided by utilities has established. In the process of formulating the BPE, there were hot debates on the excess capacity margins for certain period of planning time. Some people, especially from environmental groups maintained that many Koreans were wasteful with electricity so that stronger policy for curbing the electricity consumption should be introduced rather than commissioning of additional power plants. They referred to relatively high number of the electricity intensity of Korea as the grounds of their argument. However, electricity intensity in a region or a country is influenced by various factors and higher intensity does not necessarily mean more wasteful consumption of electricity.

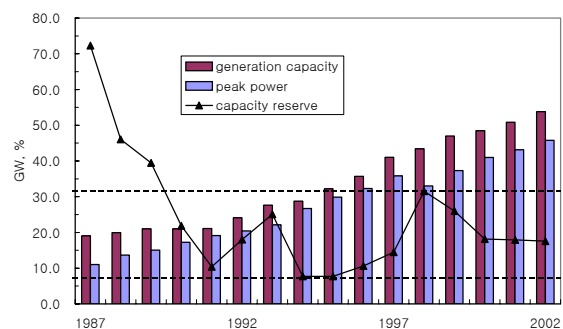
We have compared various aspects of electricity demand in Korea with other countries to speculate the argument that electricity consumption in Korea is too high. We have also discussed electricity projection in the BPE.

2. Electricity demand forecast

Electricity demand in Korea has mainly increased by population growth, economic growth and resultant improvement of living standard. Per capita electricity consumption of Korea was 6,601kWh in 2003, which only corresponded to 50% of USA's and 80% of Japan's. Most of past forecasts, which have done from 1980 to 2001, had a tendency to underestimate the future demand[1]. Those underestimations seem to be related to the past forecast performance. For instance, 1980s in which the substantial excess capacities existed, forecast was done at much lower level compared with the actual record. While those underestimation was significantly reduced in 1990s when the shortage of reserve capacity became a crucial issue.

In general, it takes longer than 5 years from the plan to operation of a power plant. Therefore, underestimation of demand may result in the shortage of supply capacity by 5-10 years later. Figure 1 shows that historical trends of the supply capacity, peak power and capacity reserve. Figure 1 shows that capacity reserve fluctuated by time.

Figure 1 trends of the supply capacity, peak power and capacity reserve



3. Comparison of electricity intensity with other countries

The electricity intensity is widely used for comparison between different regions or countries. However we should pay attention to interpret that intensity value, because it is influenced by various factors. Per capita electricity consumption in a country is related to various factors such as industrial structure of that country, life style, economic status, climate and so on. For instance, climate pattern may influence the electricity consumption. Table 1 shows that per capita electricity consumptions in northern European countries are much higher than other European countries. Per capita electricity consumption in Korea is about the same with west European countries like UK and Germany. On the other hand, per capita electricity consumption in household sector of Korea is much lower than that of most of developed countries.

Electricity consumption per unit production of value added(GDP) of Korea was compared with other countries in table 2. Korea consumes more electricity for creating same amount of GDP than the average OECD member states. However, it does not mean that Korean industry wastes more electricity than the others. Table 3 shows that Korean industry achieved equal or even higher physical energy efficiency comparing with Japan. Therefore, to improve the energy intensity, Korea should pay more attention to developing higher

value add products than improving physical energy efficiency.

Table 1 per capita electricity consumption

country	UK	Germany	Japan	France	Korea	Australia	USA
Kwh/\$	0.26	0.20	0.18	0.25	0.45	0.43	0.41
country	Taiwan	Canada	Finland	Sweden	Norway	OECD Avg.	
KWh/\$	0.57	0.71	0.66	0.46	0.61	0.32	

Table 2 electricity consumption per GDP

country	UK	Korea	Germany	France	Japan	Taiwan	USA	Sweden	Norway
Per capita electricity consumption	6,192	6,495	6,742	7,366	8,220	8,841	13,228	15,665	24,526
Per capita electricity consumption in household sector	1,941	899	1,599	2,180	2,093	1,690	4,418	4,653	7,813

Table 3 energy intensity comparison

Industry	Product	Energy intensity		
		Korea	Japan=100	Japan
			0	
Steel*	Billet	420	82	515
Metal	Crude	3,057	101	3,028
	Sections	484	96	504
Petrochemical	ethylene	4,425	92	4,800
	PVC	1,268	82	1,550

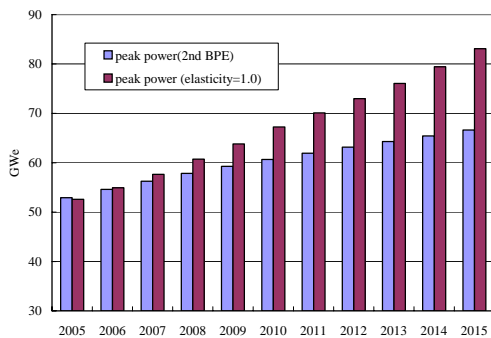
4. Electricity demand projection in the plan

According to the 2nd BPE, elasticity of electricity demand to GDP (electricity growth/GDP growth) will gradually decrease and reach 0.43 during 2011-2015. However, that level of elasticity seems to be somewhat optimistic compared with that of USA and Japan (see Table 4).

Table 4 elasticity of electricity demand

	GDP Growth rate (A)	Electricity demand growth rate (B)	Elasticity of electricity demand (B/A)	USA	Japan
1971-1980	7.5	15.6	2.09	1.03	1.13
1981-1990	8.7	11.2	1.29	0.78	0.95
1991-1995	7.5	11.6	1.55	0.77*	-
1996-2000	5.0	8.1	1.64		
2001-2005	5.1	5.4	1.05		
2006-2010	5.0	2.7	0.54		
2011-2015	4.0	1.7	0.43		

Figure 2 comparison of electricity peak



In case that future elasticity of electricity demand should maintain current level, the electricity peak in 2015 will increase to 83.1GW instead of 66.7GW by the existing projection(see Figure 2). As a result the supply capacity will not sufficient enough to meet increased demand. The deficiency will be about 5,2 GWe in 2015 with 0% reserve margin and 17.7GWe with 5% reserve margin.

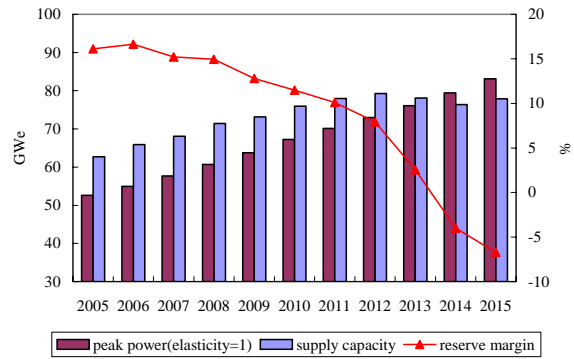


Figure 3 peak power, supply capacity and reserve margin (elasticity=1.0)

5. Conclusion

Underestimated future demand may bring about serious shortage of electricity or soaring price of electricity owing to introducing the short term options such as high cost diesel engine or gas turbine. Therefore, the electricity demand in the current national plan requires circumspection.

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