

Current Status and Prospect of Coal Industry in Korea


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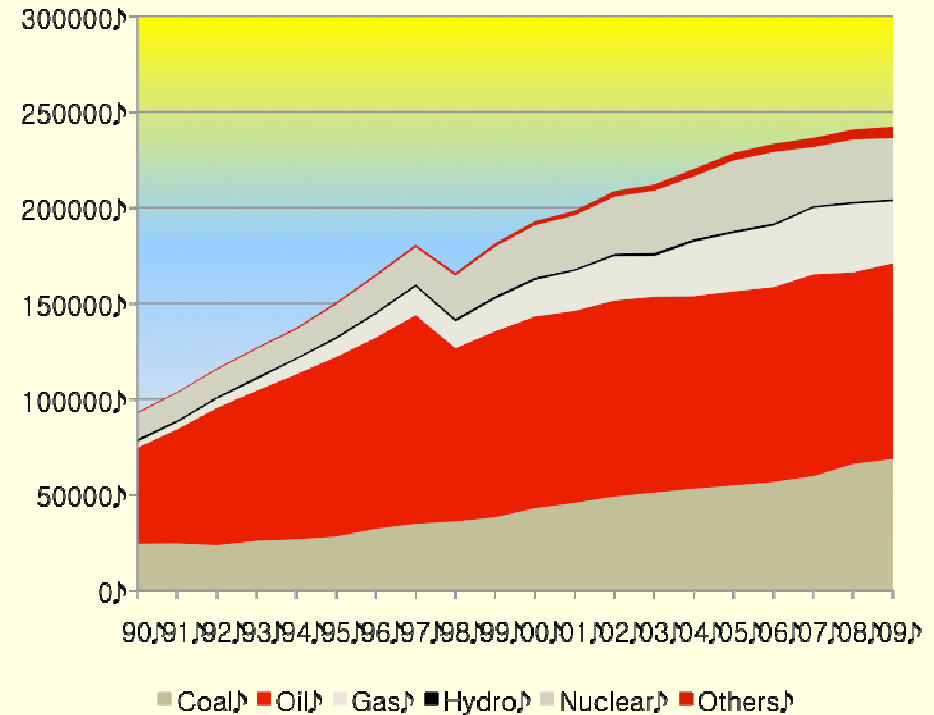
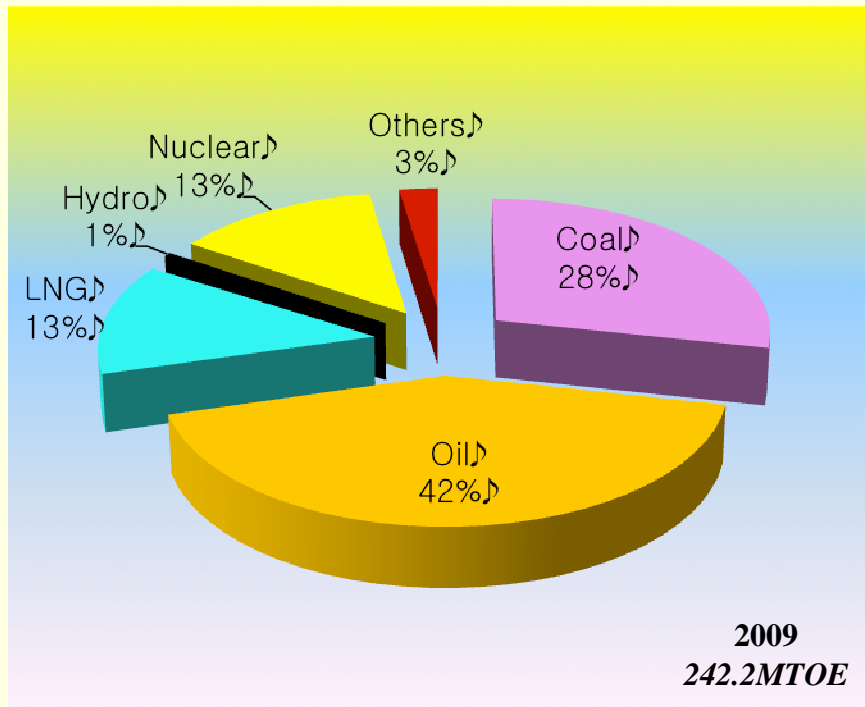
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I. Current Status of Korea's Energy Sector

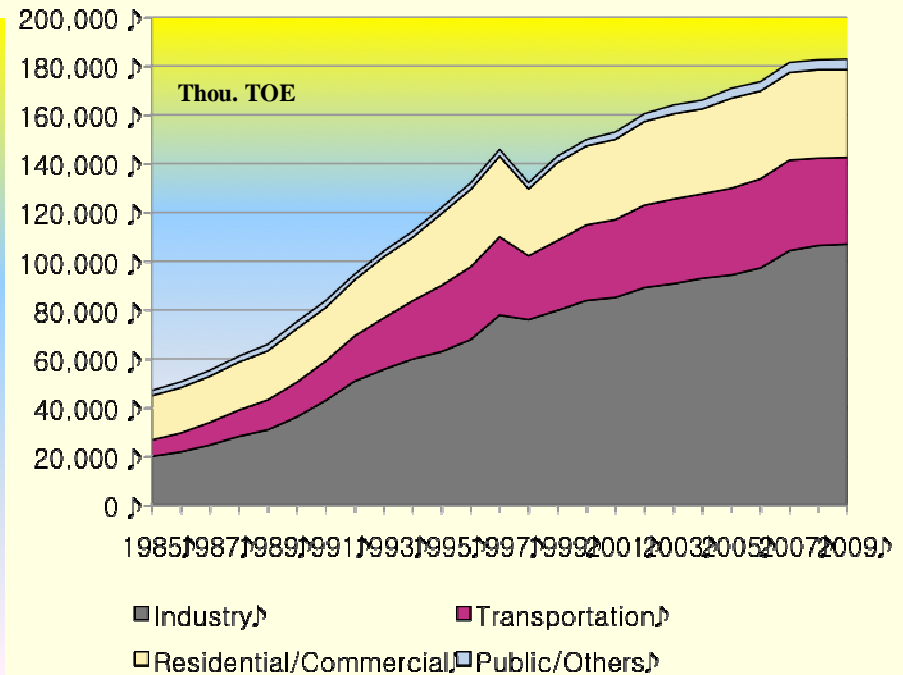
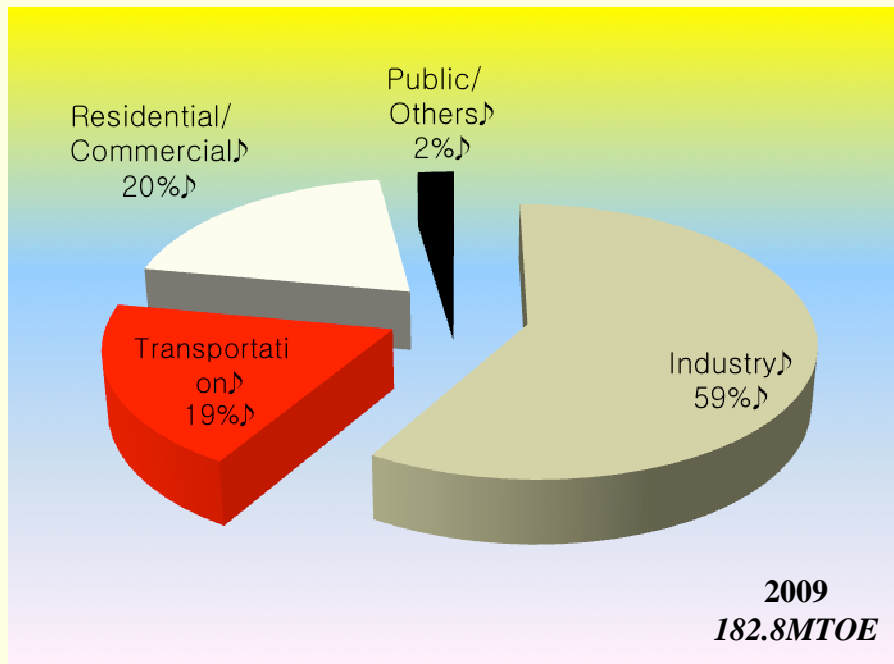
Primary Energy Consumption by Source



□ Trend in Consumption Shares (1981 → 1990 → 2009, %)

- Oil ↓: 58.1 → 53.8 → 42.2
- Coal ↓: 33.3 → 26.2 → 28.3
- LNG ↑: 0 → 3.2 → 13.3
- Nuclear ↑: 1.6 → 14.2 → 13.1

Final Energy Consumption by Sector



□ Trend in Consumption Shares (1981→1990→2009, %)

- Industry ↑: 44.9→48.1→58.5
- Res. & Com. ↓: 40.7→29.3→19.7
- Transport ↑: 9.6→18.9→19.4
- Public & Others ↓: 4.8→3.7→2.4

Korea in the World Energy Market

● Overseas Energy Dependency



● Energy Import

1980 US\$ 6.7 billion
2009 US\$ 91.2billion('08: 141.5 billion)

● Korea is one of big Energy Consumer(2008)

Oil : 9th, 103.3 Mil.TOE Nuclear : 5th, 34.2 Mil.TOE
N.Gas : 19nd, 35.7 Mil.TOE TPES : 9nd, 240.1 Mil.TOE
Coal : 8th, 66.1 Mil.TOE

Energy Capacity Expansion

	Unit	1980	1990	2008
Generation capacity	GW	10.4	24.1	70.4
Generation	TWh	40.1	118.5	422.4
Refinery capacity	thousand bbl/d	640	840	2,855
Oil imports	MMbbl	196.7	409.6	1,089.5
LNG Imports	thousand M/T	-	2,291	27,259
City gas consumer	Thousand	99	1,220	13,361
Coal production	million ton	18.7	19.8	2.8
Coal imports	thousand M/T	7.7	24.0	96.4



II. Current Status of Coal Supply and Demand

Coal Supply in Korea

● Korea's Coal Supply (unit: mln. Ton, \$/ton)

			2000	2004	2005	2006	2007	2008	2009
Classification									
Import	Bituminous	Production	64.6	72.1	69.3	70.9	79.4	90.5	92.9 (91.2%)
		cost	34.9	54.0	69.3	66.3	71.5	123.3	96.7
	Anthracite	Production	3.9	4.3	4.6	5.1	5.5	5.9	6.6 (6.3%)
		cost	38.3	38.1	93.9	79.5	82.2	166.4	103.9
Domestic	Anthracite	Production	3.3	3.2	2.8	2.8	2.9	2.8	2.5 (2.5%)
Total			71.8	79.5	76.7	78.8	87.7	99.2	101.9

➔ In 2000, 71.8 mln. ton -> 101.9 bln Ton in 2009

- Supply for bituminous coal increased rapidly due to strong demand for power generation sector and steel industry
- The main usage of domestic coal is to manufacture honeycomb briquette for residential heating fuel

Bituminous Coal Imports in Korea (1)

- In early days, Australia/Canada/USA, in recent days Australia/Indonesia/China/USSR
(unit: ThousandTon)

Year	total	Australia	Austria	Canada	Indonesia	Japan	N.Zealand	PR.China	Taiwan	USA	USSR	S.Africa	Others
1986	16,436	7,985	87	3,160	84	1	11	0	60	2,112	0	0	2,936
1987	18,386	7,687	0	3,991	78	1	10	0	103	3,007	0	0	3,509
1988	21,832	8,350	0	4,772	125	2	0	0	142	3,197	0	0	5,244
1989	23,500	7,854	0	5,373	64	0	0	0	0	3,617	0	0	6,591
1990	22,846	8,413	0	4,478	33	0	0	0	0	3,343	0	0	6,579
1991	27,849	11,029	107	6,716	13	161	0	3,229	24	3,544	437	0	2,589
1992	29,768	14,608	167	4,889	128	43	8	3,998	31	3,175	192	0	2,528
1993	34,959	15,623	273	5,791	757	0	15	4,824	0	3,146	678	3,820	30
1994	38,507	16,859	0	5,488	1,424	0	15	6,424	0	3,111	674	4,512	0
1995	42,359	17,917	0	6,429	1,900	0	7	7,819	0	3,239	883	4,160	5
1996	44,932	19,321	0	6,007	2,503	44	7	7,910	0	3,647	813	4,681	0
1997	48,401	21,880	238	5,922	3,555	0	0	8,126	0	3,032	814	4,830	4
1998	51,417	25,555	0	6,358	4,981	0	0	7,337	0	2,666	649	3,806	65
1999	52,315	21,670	0	5,421	5,341	68	0	12,741	0	2,074	839	4,124	38
2000	61,807	22,238	0	5,744	5,045	3	0	21,386	0	2,173	2,565	2,503	149
2001	63,629	24,161	0	5,451	5,835	0	0	24,767	0	1,205	1,887	264	60
2002	66,235	26,074	0	4,543	6,936	0	0	25,410	0	335	2,894	0	44
2003	67,060	25,333	0	3,767	8,121	0	0	26,530	0	171	3,034	0	104
2004	74,714	29,131	0	4,486	13,457	0	0	21,300	0	1,030	5,043	0	265
2005	72,192	29,779	0	4,118	15,382	0	0	18,112	0	1,160	3,491	0	150
2006	74,594	27,717	0	4,447	20,696	0	0	16,212	0	658	4,799	0	64
2007	82,840	27,435	0	6,047	25,335	0	0	17,176	0	300	6,181	301	65
2008	93,629	36,572	0	6,521	26,546	0	0	14,837	0	1,041	7,440	609	62
2009	96,514	40,773	0	7,676	33,548	0	0	7,334	0	1,575	4,596	604	408

Bituminous Coal Imports in Korea (2)

- In late 80s, coal price was \$45~50, In early 2000s, \$34, but in 2008, jumped to \$121.

(unit: \$)

Year	Mean	Australia	Austria	Canada	Indonesia	Japan	N.Zealand	PR.China	Taiwan	USA	USSR	S.Africa	Others
1986	48.53	46.12	41.94	52.22	48.79	107.27	81.31		41.66	58.72			43.97
1987	45.02	43.31		50.50	45.33	148.62	79.76		36.74	52.18			36.48
1988	46.60	44.95		50.92	47.98	100.25			36.13	57.65			39.13
1989	51.58	50.39		53.79	54.66					61.05			45.96
1990	53.26	53.12		57.33	52.20					60.62			46.92
1991	54.38	53.08	56.81	57.98	53.67	70.12		46.40	54.09	64.42	50.78		46.29
1992	52.16	51.23	56.39	57.05	40.38	56.50	79.39	45.10	39.46	61.41	46.39		48.43
1993	47.79	48.27	51.40	53.48	41.85		73.33	41.77		55.97	42.34	39.92	39.03
1994	44.62	45.89		49.57	38.92		73.00	37.67		54.12	43.92	38.97	
1995	47.02	47.88		50.76	38.73		86.71	40.68		58.35	48.42	44.00	118.60
1996	50.30	51.35		54.60	42.83	50.93	86.00	45.96		58.68	50.85	45.05	
1997	47.55	48.40	42.16	53.32	39.09			42.89		59.55	48.82	43.18	98.93
1998	42.18	42.79		48.83	30.40			38.20		58.22	45.42	38.44	37.29
1999	36.23	38.42		42.49	27.79	32.58		32.44		50.21	36.41	32.06	42.12
2000	33.72	36.48		40.92	26.17	55.02		30.07		44.90	30.64	32.46	33.73
2001	34.58	37.32		40.86	27.56			31.91		38.12	35.12	37.17	45.28
2002	34.63	38.67		44.93	26.03			31.48		21.88	31.78		35.15
2003	34.50	37.54		45.20	29.66			31.41		19.78	36.77		31.20
2004	53.35	52.23		60.33	40.74			57.81		85.39	61.97		51.29
2005	68.12	73.79		104.80	46.40			66.43		104.87	67.41		99.55
2006	64.94	74.56		109.34	45.07			62.52		80.31	60.39		41.67
2007	70.37	76.57		99.03	54.01			72.44		102.03	74.13	70.91	116.75
2008	121.42	133.28		190.48	79.02			124.18		291.87	127.7	75.37	197.19
2009	95.47	106.56		127.09	68.80			109.40		158.80	93.28	104.72	102.75



III. Prospect of Demand and Supply in Coal Industry

Korea's Coal Demand Forecast and Problem

Korea's Coal Demand Forecast

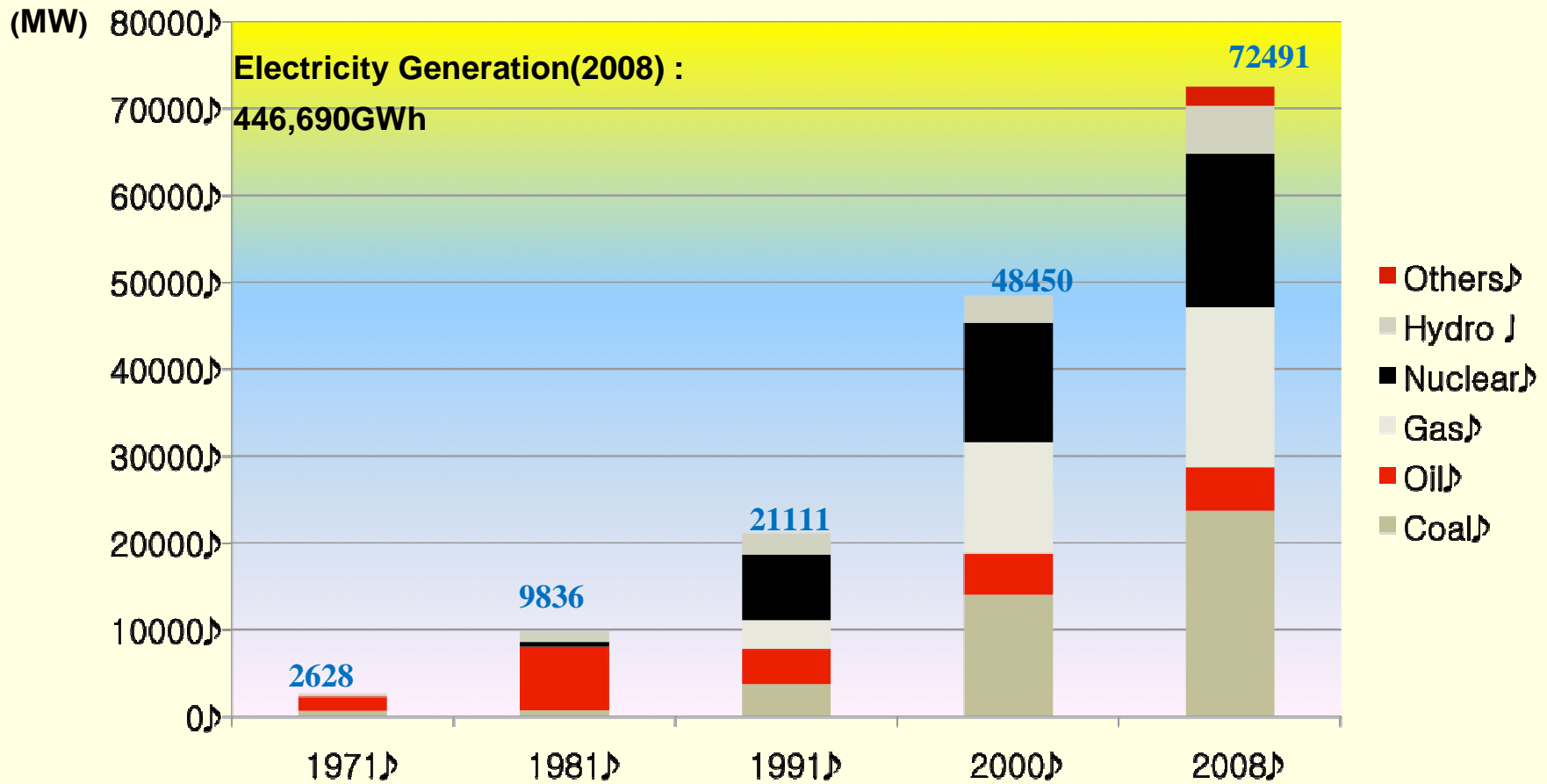
(unit: mln. ton)

	2009	2011	2013	2016
For generation of electricity	65.2	66.4	66.3	73.5
Steel Industry	24.1	26.4	26.4	26.4
Cement	5.2	5.5	5.5	5.8
Others	2.4	2.6	2.7	2.8
Total	96.9	100.9	100.9	108.5

- ➔ **In 2011, 1 bln. ton -> 1.08 bln Ton in 2016**
- **The Capacity of bituminous coal-fired power plants will be increased to 25.8GW in 2016 (22.6GW in 2008)**
 - **Demand of bituminous coal for power generation is expected to increase to 73.5 mln. Ton in 2016 (63.2mln ton in 2008)**

Electricity Sector Development in Korea

Increasing Trend of Power Generation Capacity



Prospect of Power Generation in Korea

- Since 2010, nuclear will increase significantly and coal will remain as a role of base-load power generation until 2020.

Power Generation (GWh)													
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Nuclear	145,070	153,053	167,344	179,043	190,263	199,726	211,448	220,879	222,015	233,148	249,848	260,028	265,180
Bituminous coal	184,478	184,601	184,642	184,198	188,207	203,317	218,582	213,805	215,845	212,406	203,661	197,382	195,646
Anthracite coal	5,610	5,600	5,650	5,013	3,156	3,165	3,117	3,146	3,124	3,162	3,176	3,161	3,176
Oil	10,465	6,799	863	848	903	934	935	942	935	931	914	870	887
LNG	91,192	98,579	99,773	93,854	86,393	66,577	45,026	42,241	43,417	39,830	34,592	34,439	34,132
Renewable	8,305	9,684	9,796	13,539	14,669	17,161	18,985	22,063	22,063	22,063	22,063	22,063	22,063
Hydro	3,638	3,781	3,781	3,781	3,781	3,781	3,781	3,781	3,781	3,781	3,781	3,781	3,781
Pump-storage	1,685	1,712	1,528	1,410	1,971	3,167	5,466	5,856	5,961	6,014	6,265	6,600	7,112
DH-oil	1,318	1,288	1,319	1,326	1,540	1,544	1,486	1,424	1,474	1,403	1,426	1,382	1,355
DH- Bituminous coal	3,173	3,821	3,951	3,946	3,943	3,938	3,968	4,462	4,474	4,466	4,413	4,394	4,393
DH(LNG)	8,957	9,669	11,545	13,006	14,437	14,557	14,359	14,138	14,271	14,647	15,755	15,754	15,573
Total	463,891	478,587	490,192	499,965	509,263	517,867	527,154	532,737	537,360	541,851	545,894	549,855	553,297

Prospect of Power Generation in Korea

Power Generation (Share, %)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Nuclear	31.3	32	34.1	35.8	37.4	38.6	40.1	41.5	41.3	43	45.8	47.3	47.9
Bituminous coal	39.8	38.6	37.7	36.8	37	39.3	41.5	40.1	40.2	39.2	37.3	35.9	35.4
Anthracite coal	1.2	1.2	1.2	1	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Oil	2.3	1.4	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
LNG	19.7	20.6	20.4	18.8	17	12.9	8.5	7.9	8.1	7.4	6.3	6.3	6.2
Renewable	1.8	2	2	2.7	2.9	3.3	3.6	4.1	4.1	4.1	4.1	4	4
Hydro/Pump-storage	1.1	1.1	1.1	1	1.1	1.3	1.8	1.8	1.8	1.8	1.8	1.9	2
DH	2.9	3.1	3.4	3.7	3.9	3.9	3.8	3.8	3.8	3.8	4	3.9	3.9
Total	100	100	100	100	100	100	100	100	100	100	100	100	100

Fuel consumption(thousand ton, thousand kl)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Bituminous coal	69,414	69,443	69,472	69,234	70,528	76,137	81,829	80,135	80,847	79,637	76,563	74,248	73,675
Anthracite coal	2,399	2,395	2,414	2,130	1,291	1,294	1,278	1,287	1,280	1,293	1,298	1,292	1,297
Oil	2,758	1,876	324	312	299	309	312	316	313	315	310	299	305
LNG	12,427	13,305	13,345	12,539	11,486	8,776	5,749	5,356	5,504	5,036	4,364	4,310	4,221
DH-oil	347	355	491	484	509	510	496	477	492	473	483	474	464
DH-bituminous coal	1,205	1,451	1,503	1,499	1,495	1,492	1,503	1,690	1,693	1,692	1,677	1,670	1,672
DH-LNG	1,224	1,311	1,554	1,750	1,932	1,931	1,846	1,805	1,821	1,864	2,000	1,983	1,938

Power Generation Capacity Expansion Plan

(unit: 10 thousand kW)

	Nuclear	Coal	LNG	Oil	Others	Total
Facilities (2008)	1,772 (20units)	2,371 (49units)	1,797 (46units)	534 (27units)	664	7,136
Planned (‘09~’22)	1,520 (12units)	624 (7units)	663 (11units)	7 (1unit)	527	3,341
Abolition (‘09~’22)		53 (3units)	154 (6units)	182 (13units)		388
Source: 4 th National Electricity Demand/Supply Plan, 2008						
Capacity (2022)	3,292 (32units)	2,942 (53units)	2,306 (51units)	359 (15units)	1,190	10,089

➔ 12 units of Nuclear power generation facilities will be constructed till 2022

➔ 7 units of coal fired power generation facilities will be constructed till 2022

Policy for Securing Bituminous Coal

- ➔ **Securing coal for forecasted demand in the future is considered as one of big Challenge for Korean energy sector**
- ➔ **Korea has heavily depended on Australia, Indonesia and China for importing coal (more than 84.5 %). And unstable factors were observed in Indonesian/Chinese coal market.**
- ➔ **Korea have to develop new stable coal import source.**

Policy for Securing Bituminous Coal

➔ **Promote importation through overseas development**

- **Incentives for consumer participation and purchases**

- **Policy target : 30% of imports in 2010 (24% in 2002)**

● **Korea's Self-Independence for Coal**

(unit: Million ton, Million \$)

Classification	2003	2004	2005	2006	2007	2008	2009
Import	64.6 (2,254)	65.3 (2,266)	72.0 (3,891)	74.6 (4,847)	82.8 (5,830)	93.6 (11,369)	96.5 (9,215)
Self-Develop	15.6 (545)	17.5 (607)	17.5 (943)	28.4 (1,843)	31.2 (2,196)	35.4 (4,304)	42.1 (4,024)
Share	24.2%	26.8%	24.2%	38.0%	37.7%	37.9%	43.7%



IV. Conclusion

Conclusion

- **Important role in energy security improvement through reducing oil dependency**
 - **Replacement in cement industry around 1980 and in power generation sector during 1980s**
- **But, it is difficult to expect increasing role of coal industry in the future**
 - **Low possibility of developing new usage of coal and replacing further oil**
 - **Stricter regulation on emission**
- **To maintain its role**
 - **Encourage coal development participation in overseas**
 - **Increase public acceptability**

Conclusion

- **Mutual cooperation in coal development can be a best practice of energy cooperation between two countries.**
- **Abundant resources of country + Korea's experience, capital, and technologies**
- **Korea has world-class end-users : POSCO, KEPCO, LS-Nikko. Korea will be a big market for Mongolian resources**
- **Support to Technologies and Know-How for Infra-construction**
 - ➡ • **Building, Equipment, and Operating Know-How etc.**

Cooperation can provide a win-win opportunity for both countries.

Thank you very much