

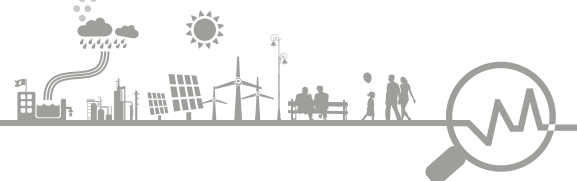


KEEI

Korea Energy Demand Outlook



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Published by the Korea Energy Economics Institute (KEEI), Energy Demand Outlook takes a closer look at the global energy market and supply and demand trends in domestic energy and examines the outlook for short-term energy demand.

This report outlines the recent changes in the supply and demand of energy and provides important data and policy implications in an effort to contribute to the establishment and adjustment of a series of energy policies by the government.

This report is written by the Energy Demand and Supply Division of the Center for Energy Information and Statistics in cooperation with the Energy Statistics Research Division of KEEI and other related research divisions.

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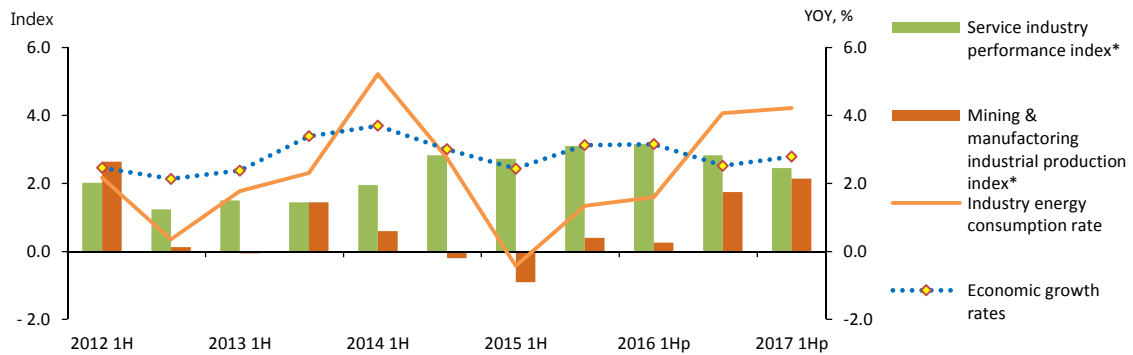
Summary

1. Energy Trends¹

□ TPES in 1H 2017 increased to 149.4 Mtoe, up 1.9% year-on-year.

- Despite the sluggish energy consumption growth in the transport and buildings sectors due to rising oil prices and temperature effect, TFC increased as energy consumption in the industrial sector went up along with the recovery of the manufacturing industry thanks to base effects and expanded facilities.
 - The mining and manufacturing production index growth remained at 2.1%, showing a slight increase of 1.8%p year-on-year, due to the base effect of plunging exports (which recorded a year-on-year decrease of -10.2%) and stagnant production activities.
 - The industrial energy consumption has shown a moderate increase in year-on-year 1H thanks to the base effect of the sluggish performance in 1H 2016 and expanded petrochemical production facilities, however, a stagnant recovery of the manufacturing industry except the semiconductor sector restrained energy consumption growth.
 - The growth of service industry performance index slowed down (-0.7%p) but still showed a modest growth compared to that of the manufacturing industry (2.5%).

Figure 1.1 Economic and TPES growth rates, Industrial and Service production index



* YOY difference (index)

- Excluding the feedstock energy use (non-energy oil and bituminous coal for steelmaking), TPES is estimated to have increased by 1.0% on a year-on-year basis.

¹ The growth rates of TPES and TFC by energy source and sector were calculated in toe, and thus, the figures could be different from the growth rates suggested in energy trend and outlook by source, as the calculations used different units.

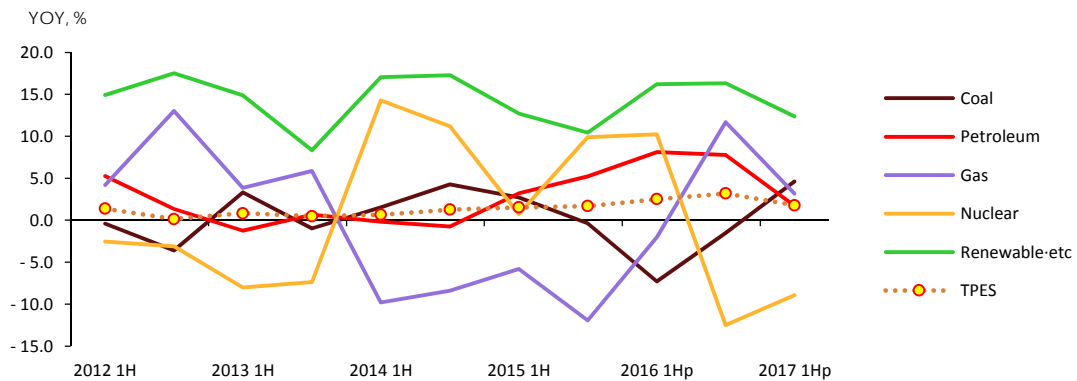
- Taking into account that naphtha consumption went up by nearly 6% thanks to expansion of mixed-xylene production facilities in the petrochemical industry and the base effect of coking coal consumption for steelmaking which posted a sharp year-on-year decrease (-10.2%), feedstock energy rebounded (2.5%) to 4.1%.
- The feedstock energy share in TPES marked 27.7%, up by 0.6%p, due to the relative increase of feedstock energy use.

☐ **By energy source, petroleum and gas consumption grew at a slower pace while coal consumption rebounded, and nuclear energy use maintained its sharp downward trend.**

- o Despite soaring naphtha consumption thanks to the expanded petrochemical facilities, the growth rate of petroleum consumption in 1H 2017 slowed down to the mid-1% range, driven by a stagnant consumption growth in the transport sector and a negative consumption growth in the power generation sector.
- o Coal consumption rapidly increased due to the diminishing effects of the lower maximum output at coal-fired power plants (2016.1) and newly introduced bituminous coal power plants,² and coal use for steelmaking also rebounded by more than 5% thanks to a recovery of the iron & steel industry at home and abroad.
- o Despite the commissioning of Shinkori Unit 3 (2016.12), nuclear generation maintained its steep downward trend since 2H 2016 and reduced by nearly 10%, due to extended preventive maintenance period of several nuclear power plants along with strengthened safety requirements after the outbreak of an earthquake in Gyeongju.
- o Gas consumption, particularly the power generation use, rose by 3% mid-way on a year-on-year basis, as decreased nuclear generation was partially replaced by gas generation, however, the growth slowed down compared to 2H 2016 (11.7%), driven by the increased coal-based generation.

² As of the end of June 2017, the installed capacity of bituminous coal power plants increased by 8.3 GW (31.5%) year-on-year.

Figure 1.2 TPES growth rates by energy source



□ **TFC in 1H 2017 marked 116.3 Mtoe, 2.8% up on a year-on-year basis, led by the industrial sector.**

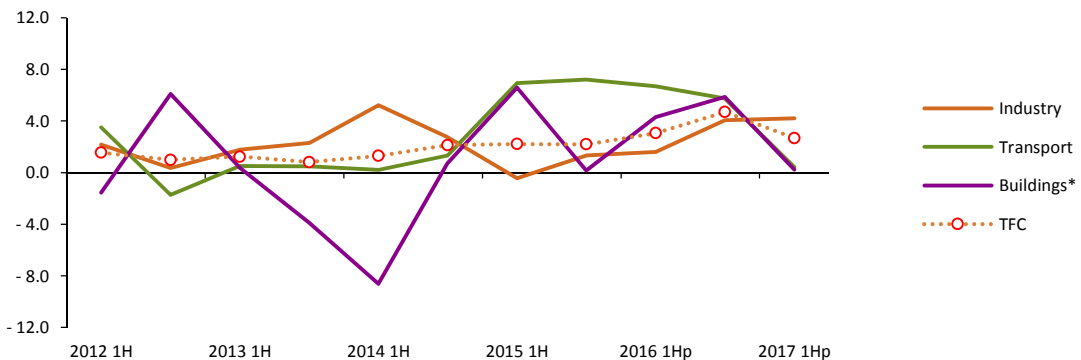
- The industrial energy consumption was up 4.2%, maintaining its recovery trend since 2H 2016, due to the rebound of bituminous coal consumption for steelmaking and increased consumption of naphtha and LPG.
 - Bituminous coal consumption for steelmaking rose by 2.5%, driven by the base effect of a sharp year-on-year decline (-10.2%) and the recovery of the global iron & steel industry in 2Q 2017.
 - Naphtha consumption maintained its rapid growth in 1H 2017 thanks to expansion of mixed-xylene production facilities in the petrochemical industry, however, the growth in 2Q 2017 slowed down compared to the previous quarter due to sluggish para-xylene exports to China and increased production facilities maintenance.
 - Industrial LPG consumption soared by more than 60% in 2H 2016, led by expanded propane dehydrogenation (PDH) production facilities, however, the growth slowed down to the mid-10% range in 1H 2017 as the facilities expansion effects faded away.
 - Electricity consumption in the industrial sector grew slower compared to 2H 2016, led by the decreased production of major petrochemical products such as synthetic resins and synthetic rubber, and it restrained energy consumption in the industrial sector in 1H 2017.
- The growth of the energy consumption in the transport sector which rapidly increased since 2015 along with rising oil prices slowed down and increased by mere 0.8%.
 - The growth declined dramatically due to the base effect of a steep increase in 1H 2016 (6.6%) along with falling oil prices, and rising oil prices (40.0%).
 - Global oil prices moderately recovered to USD 51.5/bbl on average in 1H 2017 after hitting bottom (USD 36.8/bbl) in 1H 2016.

Summary

- Despite falling energy and electricity prices and increased production in the service industry (2.6%), energy consumption in the buildings remained unchanged due to the base effect of the fast consumption growth³ during the same period last year, rising oil and city gas prices and decreased heating degree days (-1.7%).
 - City gas rates in the buildings sector showed a slight year-on-year increase, affected by rising natural gas prices, while heat energy rates decreased by 6.4%. Also, electricity rates for residential use went down due to the reform of the progressive electricity rate system (2016.12).
 - Although gas, electricity and heat energy consumption increased by 1.6%, 0.1% and 1.7% in the buildings sector, respectively, the overall energy consumption growth in buildings was restrained as petroleum consumption decreased by 2.9%.
- Meanwhile, despite the industrial electricity use maintained its modest recovery driven by increasing semiconductor exports, the use of electricity as final energy only rose by 1.2% along with the use in buildings remained stagnant due to the base effect of a sharp year-on-year increase.

Figure 1.3 TFC growth rates by end-use sectors

YOY, %



* The Buildings sector includes residential, commercial and other public buildings.

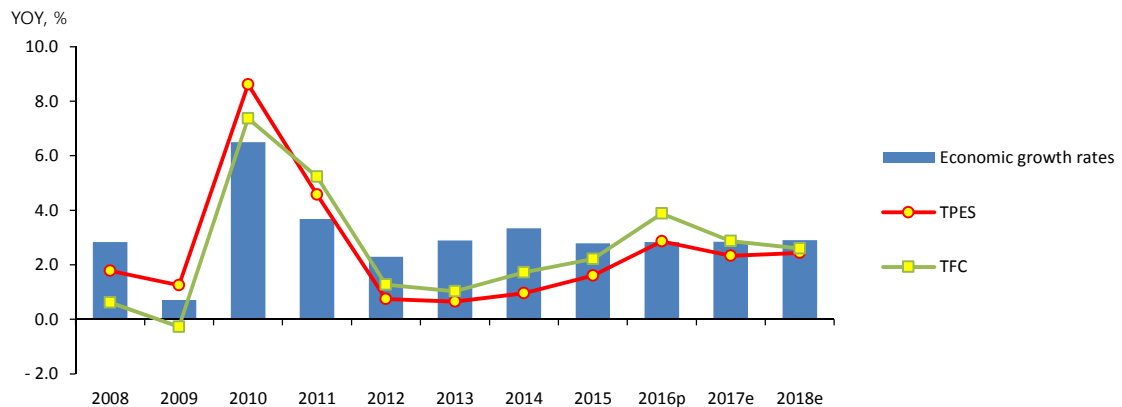
³ Due to the increased heating degree days (3.8%), energy use in the buildings sector rose by 4.3% in 1H 2016 and drove the growth of TFC.

2. Outlook of TPES and TFC

□ **In 2018, TPES will increase by 2.7% to 310.6 Mtoe and TFC is expected to be up by 2.8% to 240.1 Mtoe.**

- TPES growth is anticipated to show a slight increase while that of TFD is forecasted to decline.
 - The growth of TPES is projected to increase slightly, led by increasing electricity demand growth which is expected to cause a more rapid increase of power generation energy demand compared to 2017.
 - However, the growth of TFD will slow down, taking into account a slight decrease in economic growth (0.1%p) due to sluggish export growth amid the recovery of private consumption, and the diminishing effect of petrochemical facilities expansion compared to 2017.

Figure 2.1 Economic growth and growth trend of TPES and TFC



□ **In 2018, energy intensity and energy consumption per capita are forecasted to continue its recovery (downward) trend and upward trend, respectively.**

- Energy intensity (toe/KRW mil), an energy efficiency index, will decrease slightly due to the relative recovery of TPES compared to stagnant economic growth but maintain its recovery (downward) trend.
- Energy consumption per capita will continue to go up and reach 6.0 toe in 2018, driven by relatively fast energy demand growth compared to population growth.

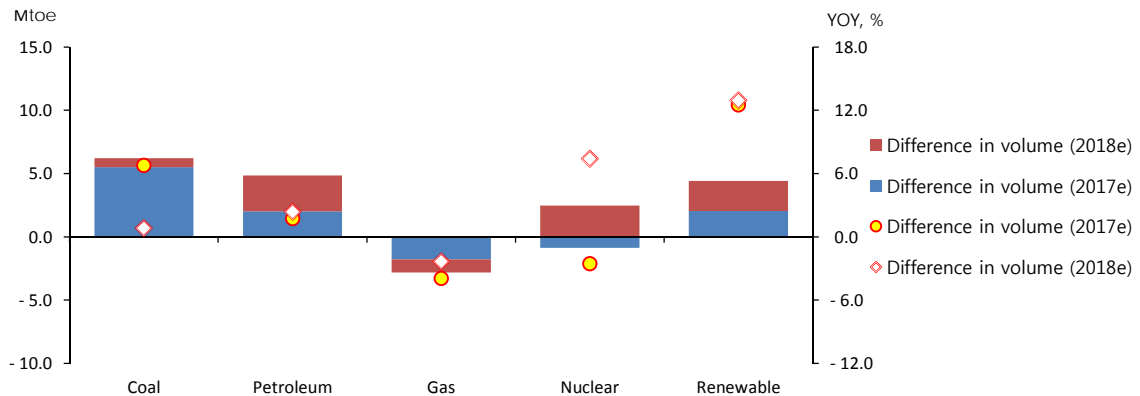
□ **Demand for petroleum, coal, nuclear energy and gas will further increase, slow down, rebound and continue to decline, respectively.**

- Despite rising oil prices, petroleum demand is anticipated to rise rapidly in 2018 driven by increasing demand in the transport sector.

Summary

- In 2018, petroleum demand for industrial uses will continue to show its rapid upward trend as it did in 2017, led by increasing naphtha demand due to expanded petrochemical production facilities, however, the growth will slow down on a year-on-year basis as most facilities expansion plans are set for 2H 2018.
- Although the average annual global oil price in 2018 is forecasted to be up by about 2% year-on-year, the demand for the transport sector is expected to grow rapidly as the Chinese government's ban on group tours to Korea has been partially lifted.

Figure 2.2 Demand growth by energy source in TPES



- The growth of coal demand will greatly slow down, led by the diminishing effect of the introduction of new bituminous power plants.
 - As of the end of 2017, thanks to newly introduced facilities including BukPyeong Units 1 & 2, Taean Unit 10, Samcheok Green Unit 2 and Shinboryeong Units 1 & 2 and capacity expansion of Dangjin Units 9 & 10, the total installed capacity of coal-fired power plants increased by about 21% (6.5 GW) year-on-year to 37.9 GW and it will remain the same in 2018.
 - Thus, coal demand for power generation in 2017 is expected show a sharp increase by more than 10% compared to the previous year, however, the growth rate will plunge to around 1% in 2018.
 - The sluggish coal demand for power generation is attributable to the extension of temporary shutdown period of old coal-fired power plants from one month in 2017 to four months in 2018⁴, and improved overall coal-fired power generation efficiency along with the introduction of high-efficient new power plants.

⁴ To fight fine dust, the government shut down old coal-fired power plants which had been operated for 30 years or longer for one month (June 2017) and decided to temporarily cease the power plant operation from March to June from 2018.

- Meanwhile, demand for coal for steelmaking, which takes up most of industrial coal demand, is projected to go up for two consecutive years, however, the growth will not be brisk due to a modest recovery of the iron & steel industry at home and abroad.
- Nuclear power demand will rapidly decline in 2017 but rebound in 2018, driven by base effects and new power plants to be commissioned.
 - Despite the introduction of Shinkori Unit 3 (2016.12), nuclear power generation is expected to show a sharp decrease of around 6% due to permanent shutdown (2017.6) of Kori Unit 1 (587.0 MW) and increased preventive maintenance along with strengthened safety inspection requirements.
 - In particular, in 4Q 2017, nuclear power generation will rebound due to the base effect of a sharp year-on-year decrease⁵, indicating that, from an annual perspective, the rapid downward trend (-9.7%) which continued until 1H 2017 will be mostly offset.
 - Nuclear power generation is expected to rebound in 2018, driven by the base effect of the preventive maintenance dramatically increased in the previous year and introduction of new power plant (2018.9) Shinkori Unit 4 (1,400 MW).
- Despite increasing city gas demand driven by its improved price competitiveness, gas demand is predicted to decrease for two consecutive years due to decreasing demand for power generation.
 - City gas demand will maintain the 2%-range growth which continued since 2017, taking into account the moderate increase of global oil prices and that city gas rates are to drop significantly from November 2017 as Korea Gas Corporation completes collection of accounts receivable.
 - However, due to a recovery of nuclear power generation since 4Q 2017, gas demand for power generation is expected to maintain negative growth that continued since 2017, taking into account that two sources may replace each other.
- Meanwhile, electricity demand as final energy will increase to the mid-2% range as the demand growth in the industrial sector is expected to show a slight decrease but that for buildings is projected to rise.
 - Electricity demand in the industrial sector is forecasted to go up by nearly 3% in 2018, thanks to the petrochemical industry which maintains the strong demand since 2017, however, sluggish consumption in the iron & steel industry and automobile manufacturing industry will restrain the growth.

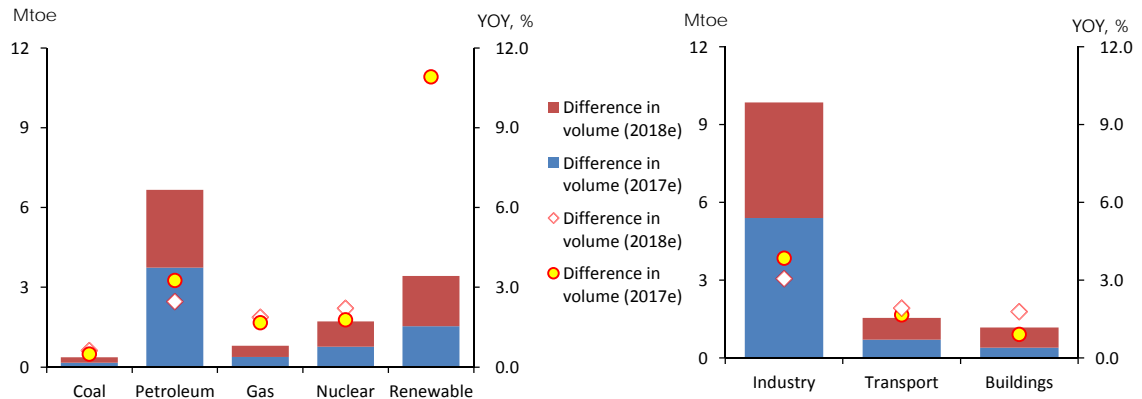
⁵ In 4Q 2016, nuclear power generation plunged by 22.1%p year-on-year, as Wolsung Units 1-4 were shut down due to in-depth safety inspections after the outbreak of an earthquake in Gyeongju in September 2016.

- Electricity demand in the buildings sector is expected to remain unchanged in 2017 due to the base effect of a steep year-on-year increase and sharply decreased cooling degree days. However, the growth will recover in 2018 as the service industry maintains a moderate growth and the lowered residential progressive electricity rates take effect⁶.
- **Energy demand in the industrial sector is anticipated to grow slower while that in the transport and buildings will grow further.**
 - Thanks to export recovery and expansion of petrochemical facilities, energy demand in the industrial sector will increase by 3% year-on-year and drive TFC demand in 2018, but the growth will slow down compared to 2017 due to sluggish feedstock energy demand.
 - Naphtha demand will rapidly increase in 2018, driven by increasing exports of major petrochemical products to China and expansion of NCC and mixed-xylene production facilities, however, the growth will slow down compared to 2017 as most facilities are to be expanded in 2H 2018.
 - The demand for bituminous coal for steelmaking will grow at a slower pace due to stagnant in-demand industries and steel import regulations of major countries.
 - Energy demand in the transport sector is expected to grow faster thanks to a partial recovery of the travel and cargo transport demand and much slower rise in oil prices compared to the previous year.
 - In 2017, the annual average global oil price (based on Dubai Crude prices) is expected to jump by more than 20% year-on-year and restrain energy demand growth, however, the price will increase by less than 2% and have a limited influence on energy demand in 2018.
 - In particular, jet oil demand is projected to rise rapidly taking into account that the number of Chinese tourists that plunged due to China's THAAD retaliation in 2017 is anticipated to recover as the Chinese government lifts a ban on group tour to Korea.
 - Energy demand in the buildings sector is expected to slow down greatly in 2017, due to a sharply increased consumption in the previous year along with the temperature effect, but will recover to a certain extent due to falling energy rates in 2018.
 - Although the residential progressive electricity rates were reduced in December 2016, the energy demand growth in the buildings sector is expected to go down to the early-1% range due to base effects and sharply decreased cooling degree days (-21.5%).

⁶ In most studies, price elasticity of electricity demand is proved to be higher over a long term rather than a short term.

- However, energy demand is projected to increase by nearly 2% taking into account that the reduced residential progressive electricity rates will take effect⁷ and city gas prices will also go down significantly in 2018.

Figure 2.3 TFC volume and growth by source and sector



⁷ Residential progressive electricity rates were reduced in December 2016, but the effects will only be felt in the medium term rather than a short term as consumers may take some time to recognize price changes. For the same reason, most studies show that price elasticity of electricity demand is higher over a long term rather than a short term.

3. Key Features and Implications

- **2017 TPES and TFD outlook have been raised slightly from the previous forecast, reflecting the actual records and changes in outlook assumptions.**
 - TPES and TFD growth are predicted to increase by 0.1%p respectively in 2017, taking into account that economic growth outlook has been adjusted upward by 0.2%p from the previous outlook (2017 Summer) and actual energy consumption has been updated.
 - 2017 petroleum demand outlook has been adjusted downward as petroleum consumption in the transport sector slowed down more rapidly than expected while that of electricity has been upgraded thanks to a strong recovery of energy consumption in the industrial sector.

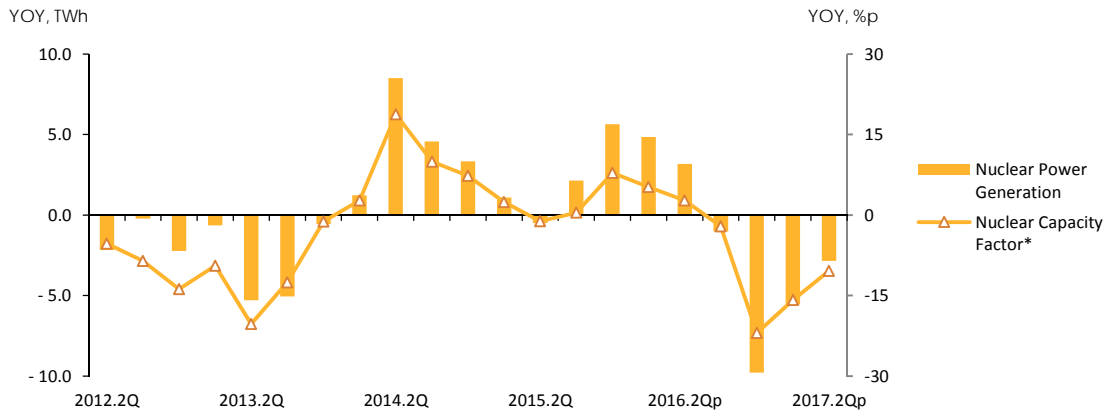
Table 3.1 Main assumption difference from last outlook

	2017 Main Assumption		Difference
	2017 Summer	2017 Fall	
Economic growth rates, %	2.8	3.0	0.2 ▲
Oil price, USD/bbl	50.8	51.2	0.4 ▲
Heating degree days	2 596.2	2 596.2	-
Cooling degree days	184.8	187	2.2 ▲

- **Outlook for gas input for power generation greatly varies from the actual records until 2Q 2017, as nuclear power generation is forecasted to recover.**
 - As nuclear power generation plunged by nearly 10% in 1H 2017, gas input for power generation increased by about 6%.
 - Nuclear power generation decreased sharply as strengthened safety inspection requirements extended the preventive maintenance period while gas input for power generation partially replaced the decreased nuclear power generation and increased dramatically until 1H 2017.
 - However, from an annual perspective, the steep downward trend of nuclear power generation will become rather moderate due to a recovery in 4Q 2017 and gas input for power generation is anticipated to decline compared to the previous year.
 - Capacity factor of nuclear power plants in 4Q 2016 showed a sharp year-on-year decrease (-21.9%p) as four power plants (Wolsung Units 1-4) were shut down due to safety inspections after the outbreak of an earthquake in Gyeongju in September 2016. However, due to the base effect of such decrease, the capacity factor will recover dramatically in 4Q 2017 and the steep downward trend of annual nuclear power generation is projected to recover significantly.

- Thus, gas input for power generation in 4Q 2017 is forecasted to plunge and from an annual perspective, it will switch to negative growth on a year-on-year basis.

Figure 3.1 Nuclear Power Generation amount and Nuclear Capacity Factor Variation

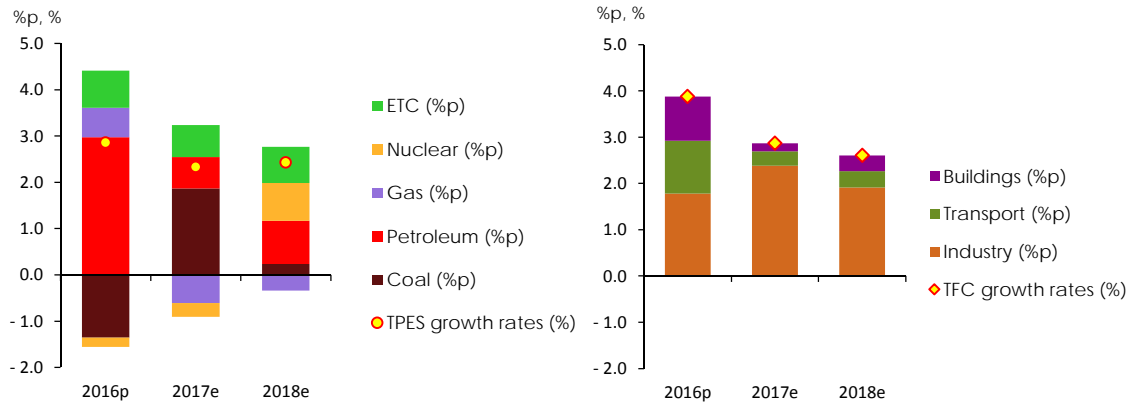


□ **TPES and TFD are forecasted to increase, led by nuclear power and petroleum demand, and industrial uses, respectively.**

- By energy source, coal will drive TPES in 2017 while nuclear power and petroleum will lead TPES growth in 2018.
 - The level of contribution that coal makes to the 2018 TPES growth is projected to decline due to the diminishing effect of the introduction of new bituminous coal power plants while that of nuclear power is expected to recover thanks to the diminishing effect of preventive maintenance along with strengthened safety inspection requirements and the introduction of Shinkori Unit 4.
 - Meanwhile, the contribution of petroleum to TPES growth is forecasted to increase taking into account that naphtha demand in the petrochemical sector is rapidly increasing and the demand for transport fuel is growing faster than the previous year.
- By sector, TFD is forecasted to grow in 2017 and 2018, led by the industrial sector, however, the growth of TFD will go down slightly as the level of contribution of the industrial sector is expected to decrease on a year-on-year basis.
 - Energy demand in the industrial sector has driven TFD in 2017 and will do so in 2018 thanks to the expansion of petrochemical facilities, however, most facilities are to be installed in 2H 2018, thus, the level of contribution of the industrial sector to TFD growth will decrease compared to the previous year.

- Energy demand for the transport sector is projected to show a year-on-year increase as oil prices are expected to rise slower and the Chinese government reduced THAAD retaliation.
- The level of contribution of the buildings sector is anticipated to drop dramatically in 2017 due to the base effect of a surge in the previous year, but increase in 2018 thanks to falling electricity and gas rates.

Figure 3.2 TPES and TFD growth and contribution by energy source and sector



Note: TPES growth (%) = Total contribution by energy source (%p); TFD growth (%)=Total contribution by sector (%p)

☐ **Due to expansion of petrochemical facilities, energy consumption in the petrochemical sector will drive TFC in 2017 and 2018.**

- PX, NCC (naphtha cracking center) and PDH facilities have been expanded from 2016 to 2017 due to increased para-xylene (PX) exports to China, falling oil prices, diversification of raw materials of petrochemical products, etc.
 - As of June 2017, the total capacity of petrochemical facilities increased to approximately 393.2 Mtoe (4.9% up from 2015) and that of basic petrochemicals and PX facilities rose to 286.9 Mtoe (9.9%) and 42.7 Mtoe (4.2%), respectively.
 - Energy consumption in the petrochemical industry went up by 4.9% in 1H 2017 as expanded petrochemical facilities increased production of petrochemical product which resulted in more use of naphtha, LPG and electricity.
 - Energy consumption in the petrochemical industry increased by 1.6 Mtoe in 1H 2017 which accounts for 56.7% of the TPES increase (2.7 Mtoe).
 - The share of the petrochemical industry in TPES declined to 21.0% in 1H 2015 when production of petrochemical products was stagnant but since then about 22% range has been maintained.

- The petrochemical industry will drive TPES in the industrial sector in 2018, but the level of its contribution is expected to go down.
 - Naphtha demand is anticipated to grow slower than 2017 as the effects of facilities expansion in 2017 will be mostly diminished in 2H 2018 and most facilities are planned to be installed in 2H 2018.
 - As LPG is used for PDH facilities, LPG consumption increased dramatically in 2016 and 1H 2017 but is expected to be stagnant due to the diminishing effects of introduction of new PDH facilities.
 - Although the petrochemical industry is expected to drive TPES in the industrial sector, along with an increase in naphtha and electricity consumption to accommodate increased production of petrochemical products, the level of its contribution to energy consumption in the industrial sector will decrease due to sluggish growth of naphtha consumption and stagnant LPG consumption.

- **City gas demand which has plunged since 2014 is expected to recover in 2017 and 2018 due to the improved price competitiveness against petroleum.**
 - City gas demand for the industrial sector had declined rapidly at an average annual rate of 8.9% from 2013 to 2016 as Korea Gas Corporation (KOGAS)'s collection of accounts receivable further increased city gas prices and global oil prices dropped.
 - City gas rates are determined by global oil prices and foreign exchange rates according to the raw material cost pass-through scheme. The accounts receivable were accrued as the government postponed the raw material cost pass-through scheme (2008.3-2013.2) for price stabilization during the period (2008-2012) in which global oil prices were over USD 100/bbl.
 - KOGAS started collecting the accounts receivable from September 2010 and city gas rates further went up accordingly. According to KOGAS, such accounts receivable take up 5-8% and 11-21% of city gas bills in 2014 and from 2015 to 2017, respectively.
 - However, KOGAS completed accounts receivable collection, and from November 2017, city gas rates decreased by 9.3% on average in Seoul. In this sense, city gas demand for industrial uses is projected to recover gradually in 2017 and 2018.
 - In 2017, the growth will mark mid-4% range on a year-on-year basis, taking into account the mixed effects of the base effects of decreased city gas consumption in the industrial sector until 2016, improved economic recovery, rising global oil prices, etc.
 - Although the reduction in city gas rates will become more visible in 2018, the growth of city gas demand for industrial uses will remain at the early-3% range as other effects will fade away.

- Among city gas demands for different uses, the share of the industrial sector has become bigger, and taking into account that city gas used in the industrial sector may easily replace energy and thus show high volatility, uncertainty regarding city gas demand outlook will expand.

☐ **Energy (especially electricity) demand management framework utilizing market mechanisms should be established for more effective energy transition.**

- Demand for coal and nuclear power will show a steady growth in the transformation sector as electricity consumption is expected to rise by 2.6% in 2018.
 - The combined energy consumption of coal and nuclear power in the transformation sector is forecasted to rise to 89.5 Mtoe in 2018, up 3.5% year-on-year, and its share will account for 62.9%, up 0.8%p from 2017.
 - Despite the implementation of energy transition policy, reducing coal and nuclear demand will have limits if electricity consumption continues to increase steadily.
- Inappropriate electricity rates will cause negative effects in electricity demand management and irrational structure of energy consumption.
 - Despite rising power generation fuel prices, the reduced residential progressive electricity rates brought down electricity unit rates by 1.3% on a year-on-year basis as of September 2017, while fossil fuel prices such as petroleum and gas increased.
 - Low electricity rates and consequent distorted relative prices have brought electrification, serving as an obstacle to electricity demand management.
- Tax reform plan for power generation fuels and rational electricity pricing should be promptly promoted to better accommodate price signals in electricity rates.
 - By realizing external costs for power generation fuels, changes of the competition structure of individual power generation sources should be promoted, and also other costs yet to be reflected or realized must be included in electricity rates.
 - In particular, cost prices should be reflected when determining tariffs (e.g. electricity rates by voltage, the electricity cost pass-through scheme) to strengthen price signals and promote rational electricity consumption.

4. The Main Indicator and Energy Outlook Result

Main Economic and Energy Indicators

	2013	2014	2015			2016			2017		
			1H	2H		1H	2H		1H	2H	
Economy and Population											
GDP (2010 trillion won)	1 380.8	1 427.0	711.7	755.1	1 466.8	734.1	774.1	1 508.3	754.6	798.9	1 553.5
Industrial Production(2010=100)	108.2	108.4	107.4	108.8	108.1	107.7	110.7	109.2	109.9	111.5	110.7
Crude Oil Price (Dubai, USD/bbl)	105.3	96.7	56.3	45.2	50.8	36.8	45.7	41.2	51.5	50.8	51.2
Working Days	276.0	274.5	133.5	138.0	271.5	135.5	138.5	274.0	133.5	139.5	273.0
Population (million)	50.4	50.7	51.0	51.0	51.0	51.2	51.2	51.2	51.4	51.4	51.4
Average Temperature (°C)	12.5	13.4	10.4	16.8	13.6	10.2	16.9	13.6	10.2	16.2	13.2
Cooling Degree days	194.8	125.4	13.5	138.3	151.8	10.2	227.9	238.1	18.2	168.8	187.0
Heating Degree days	2 893.2	2 501.6	1 593.0	866.1	2 459.1	1 654.1	935.6	2 589.7	1 626.1	970.1	2 596.2
Energy Indicators											
Total Primary Energy Demand (Mtoe)	280.2	282.9	143.1	144.3	287.4	146.7	148.9	295.6	149.4	153.1	302.5
Energy Intensity (toe/million won)	0.203	0.199	0.202	0.191	0.196	0.200	0.192	0.196	0.199	0.192	0.195
TPED/capita (toe/capita)	5.556	5.574	2.805	2.829	5.633	2.862	2.906	5.768	2.904	2.977	5.881
Electricity Generation (TWh)	517.7	522.0	260.6	267.5	528.1	266.1	274.4	540.4	269.8	283.7	553.6
Electricity Generation/capita (MWh/capita)	10.3	10.3	5.1	5.2	10.4	5.2	5.4	10.5	5.2	5.5	10.8
Electricity Demand/capita (MWh/capita)	9.4	9.4	4.8	4.7	9.5	4.8	4.9	9.7	4.9	5.0	9.9

Energy Demand

	2013	2014	2015			2016e			2017e		
			1H	2H		1H	2H		1H	2H	
Total Primary Energy Supply											
Coal (Mton)	129.6	133.3	66.7	68.1	134.8	61.9	67.1	129.0	65.1	72.1	137.2
Oil (Mbbbl)	825.2	821.5	417.5	438.7	856.2	451.4	472.7	924.2	458.4	481.9	940.3
Gas (Bm ³)	40.3	36.6	18.2	15.2	33.4	17.9	17.0	34.9	18.5	16.1	34.6
Hydro (TWh)	8.4	7.8	2.8	3.0	5.8	3.0	3.6	6.6	3.2	3.8	7.0
Nuclear (TWh)	138.8	156.4	78.5	86.3	164.8	86.5	75.5	162.0	78.1	74.6	152.7
Other Renewables (Mtoe)	9.0	11.0	6.4	6.4	12.8	7.5	7.5	15.0	8.6	8.5	17.1
Total (Mtoe)	280.2	282.9	143.1	144.3	287.4	146.7	148.9	295.6	149.4	153.1	302.5
Coal	81.9	84.6	42.3	43.2	85.5	39.2	42.4	81.6	41.2	45.6	86.9
Oil	105.8	104.9	53.5	56.1	109.6	57.8	60.3	118.1	58.4	61.5	119.8
Gas	52.4	47.7	23.7	19.8	43.5	23.2	22.1	45.4	24.1	21.0	45.1
Nuclear	1.8	1.6	0.6	0.6	1.2	0.6	0.8	1.4	0.7	0.8	1.5
Hydro	29.3	33.0	16.6	18.2	34.8	18.3	15.9	34.2	16.5	15.7	32.2
Other Renewables	9.0	11.0	6.4	6.4	12.8	7.5	7.5	15.0	8.6	8.5	17.1
Total Final Consumption											
Coal (Mton)	49.5	53.1	25.5	26.8	52.4	23.2	25.7	49.0	23.3	25.6	48.9
Oil (Mbbbl)	799.1	808.5	410.2	431.3	841.6	438.7	463.7	902.4	452.7	478.0	930.6
Gas (Bm ³)	23.9	22.1	12.2	8.6	20.8	12.3	9.0	21.3	12.7	9.1	21.7
Electricity (TWh)	474.8	477.6	244.5	239.2	483.7	248.5	248.5	497.0	251.4	256.9	508.3
Heat (Mtoe)	1.7	1.6	1.0	0.6	1.6	1.0	0.7	1.7	1.1	0.7	1.8
Other Renewables (Mtoe)	7.9	9.5	5.6	5.5	11.1	6.4	6.3	12.7	7.2	7.0	14.2
Total (Mtoe)	210.2	213.8	109.8	108.7	218.5	113.2	113.8	227.0	116.3	117.4	233.7
Coal	32.7	35.4	17.1	17.8	34.9	15.5	17.1	32.6	15.6	17.1	32.6
Oil	101.8	103.0	52.4	55.0	107.3	55.9	58.9	114.8	57.5	60.9	118.4
Gas	25.3	23.3	12.9	9.2	22.0	13.0	9.5	22.5	13.4	9.6	23.0
Electricity	40.8	41.1	21.0	20.6	41.6	21.4	21.4	42.7	21.6	22.1	43.7
Heat	1.7	1.6	1.0	0.6	1.6	1.0	0.7	1.7	1.1	0.7	1.8
Other Renewables	7.9	9.5	5.6	5.5	11.1	6.4	6.3	12.7	7.2	7.0	14.2
Industry	130.8	136.0	67.4	69.2	136.6	68.5	72.0	140.5	71.4	74.6	146.0
Transport	37.3	37.6	19.6	20.7	40.3	20.9	21.9	42.8	21.0	22.4	43.5
Buildings	42.0	40.1	22.8	18.8	41.6	23.8	19.9	43.7	23.9	20.3	44.2

Energy Demand

(yoy, %)

	2013	2014	2015			2016e			2017e		
			1H	2H		1H	2H		1H	2H	
Total Primary Energy Supply											
Coal (Mton)	1.1	2.9	2.7	-0.4	1.1	-7.3	-1.5	-4.4	5.2	7.5	6.4
Oil (Mbbbl)	-0.3	-0.5	3.2	5.2	4.2	8.1	7.8	7.9	1.5	1.9	1.7
Gas (Bm ³)	4.8	-9.2	-5.8	-11.9	-8.7	-2.0	11.7	4.2	3.5	-5.1	-0.7
Hydro (TWh)	9.7	-6.8	-22.3	-29.0	-25.9	7.3	21.1	14.5	6.7	5.3	5.9
Nuclear (TWh)	-7.7	12.7	0.7	9.9	5.3	10.2	-12.5	-1.7	-9.7	-1.2	-5.7
Other Renewables (Mtoe)	11.8	21.9	17.6	16.8	17.2	17.1	15.8	16.4	14.3	14.5	14.4
Total (Mtoe)	0.6	1.0	1.5	1.7	1.6	2.5	3.2	2.9	1.9	2.8	2.4
Coal	1.2	3.3	2.4	-0.3	1.0	-7.4	-1.8	-4.5	5.2	7.6	6.5
Oil	-0.3	-0.8	3.3	5.4	4.4	8.2	7.4	7.8	0.9	2.0	1.5
Gas	5.1	-9.0	-5.9	-12.0	-8.8	-2.0	11.7	4.2	3.5	-5.1	-0.7
Nuclear	9.7	-6.8	-22.3	-29.0	-25.9	7.3	21.1	14.5	6.7	5.3	5.9
Hydro	-7.7	12.7	0.7	9.9	5.3	10.2	-12.5	-1.7	-9.7	-1.2	-5.7
Other Renewables	11.8	21.9	17.6	16.8	17.2	17.1	15.8	16.4	14.3	14.5	14.4
Total Final Consumption											
Coal (Mton)	2.3	7.1	-2.7	0.1	-1.3	-9.0	-4.0	-6.4	0.2	-0.4	-0.1
Oil (Mbbbl)	0.3	1.2	3.6	4.6	4.1	7.0	7.5	7.2	3.2	3.1	3.1
Gas (Bm ³)	0.5	-7.5	-2.7	-10.1	-5.9	1.1	3.8	2.3	2.8	1.5	2.3
Electricity (TWh)	1.8	0.6	1.8	0.7	1.3	1.7	3.9	2.8	1.2	3.4	2.3
Heat (Mtoe)	-3.2	-7.6	6.1	-9.7	-0.5	8.1	12.3	9.7	1.7	3.7	2.4
Other Renewables (Mtoe)	10.7	20.1	17.7	16.7	17.2	14.6	13.7	14.2	12.3	11.8	12.1
Total (Mtoe)	1.0	1.7	2.2	2.2	2.2	3.1	4.7	3.9	2.8	3.2	3.0
Coal	2.2	8.4	-2.9	0.1	-1.4	-9.1	-4.3	-6.7	0.5	-0.1	0.2
Oil	0.1	1.1	3.8	4.6	4.2	6.7	7.1	6.9	2.9	3.4	3.2
Gas	-0.3	-7.8	-2.3	-9.8	-5.6	1.1	3.7	2.2	2.8	1.5	2.3
Electricity	1.8	0.6	1.8	0.7	1.3	1.7	3.9	2.8	1.2	3.4	2.3
Heat	-3.2	-7.6	6.1	-9.7	-0.5	8.1	12.3	9.7	1.7	3.7	2.4
Other Renewables	10.7	20.1	17.7	16.7	17.2	14.6	13.7	14.2	12.3	11.8	12.1
Industry	2.0	4.0	-0.4	1.3	0.5	1.6	4.1	2.8	4.2	3.7	3.9
Transport	0.5	0.8	6.9	7.2	7.1	6.7	5.8	6.2	0.8	2.3	1.6
Buildings	-1.6	-4.5	6.6	0.2	3.6	4.3	5.9	5.0	0.4	2.3	1.2

Energy Demand by Sector

(Mtoe)

	2013	2014	2015			2016e			2017e		
			1H	2H		1H	2H		1H	2H	
Industry	130.8	136.0	67.4	69.2	136.6	68.5	72.0	140.5	71.4	74.6	146.0
Coal	31.8	34.7	16.8	17.4	34.2	15.3	16.7	32.0	15.4	16.8	32.2
Oil	60.1	61.2	30.3	31.9	62.2	32.3	34.6	66.9	33.9	36.0	69.9
Gas	10.3	9.3	4.2	3.8	8.0	4.1	3.8	7.8	4.3	3.9	8.2
Electricity	22.1	22.8	11.5	11.4	22.8	11.5	11.7	23.2	11.8	12.1	23.9
Heat	-	-	-	-	-	-	-	-	-	-	-
Other Renewables	6.5	8.1	4.7	4.7	9.4	5.3	5.3	10.6	6.0	5.9	11.9
Transport	37.3	37.6	19.6	20.7	40.3	20.9	21.9	42.8	21.0	22.4	43.5
Coal	-	-	-	-	-	-	-	-	-	-	-
Oil	35.5	35.8	18.6	19.7	38.4	19.9	20.9	40.8	20.0	21.4	41.4
Gas	1.3	1.3	0.6	0.7	1.3	0.6	0.6	1.3	0.6	0.6	1.3
Electricity	0.2	0.2	0.1	0.1	0.2	0.1	0.1	0.2	0.1	0.1	0.2
Heat	-	-	-	-	-	-	-	-	-	-	-
Other Renewables	0.4	0.4	0.2	0.2	0.4	0.3	0.3	0.5	0.3	0.3	0.5
Buildings*	42.0	40.1	22.8	18.8	41.6	23.8	19.9	43.7	23.9	20.3	44.2
Coal	0.9	0.7	0.2	0.4	0.7	0.2	0.4	0.6	0.2	0.3	0.5
Oil	6.2	6.0	3.4	3.3	6.8	3.7	3.4	7.1	3.6	3.5	7.0
Gas	13.7	12.7	8.1	4.7	12.7	8.3	5.1	13.4	8.4	5.1	13.6
Electricity	18.6	18.1	9.5	9.1	18.6	9.7	9.6	19.3	9.7	9.8	19.6
Heat	1.7	1.6	1.0	0.6	1.6	1.0	0.7	1.7	1.1	0.7	1.8
Other Renewables	1.0	1.0	0.7	0.6	1.3	0.8	0.8	1.6	0.9	0.9	1.8
Transform	137.8	135.1	68.1	65.9	134.0	68.9	66.6	135.5	69.1	68.1	137.3
Coal	49.2	49.2	25.2	25.3	50.6	23.7	25.3	49.0	25.7	28.6	54.2
Oil	4.0	2.0	1.1	1.1	2.2	2.0	1.4	3.3	0.9	0.6	1.4
Gas	52.4	47.7	23.7	19.8	43.5	23.2	22.1	45.3	24.1	20.9	45.0
Nuclear	29.3	33.0	16.6	18.2	34.8	18.3	15.9	34.2	16.5	15.7	32.2
Hydro	1.8	1.6	0.6	0.6	1.2	0.6	0.8	1.4	0.7	0.8	1.5
Renewables	1.1	1.5	0.8	0.9	1.7	1.1	1.2	2.3	1.4	1.5	2.9

* include residential, commercial, public-etc usage

Coal

(Mton)

	2013	2014	2015			2016e			2017e		
			1H	2H		1H	2H		1H	2H	
Total Coal Demand	129.6	133.3	66.7	68.1	134.8	61.9	67.1	129.0	65.1	72.1	137.2
Transform	80.0	80.3	41.2	41.3	82.5	38.6	41.3	80.0	41.8	46.5	88.3
Power Generation	80.0	80.3	41.2	41.3	82.5	38.6	41.3	80.0	41.8	46.5	88.3
Heat	-	-	-	-	-	-	-	-	-	-	-
Gas Manufacture	-	-	-	-	-	-	-	-	-	-	-
Total Final Consumption	49.5	53.1	25.5	26.8	52.4	23.2	25.7	49.0	23.3	25.6	48.9
Industry	47.6	51.4	25.0	25.9	50.9	22.8	25.0	47.7	22.9	25.0	47.9
Transport	-	-	-	-	-	-	-	-	-	-	-
Buildings	1.9	1.6	0.6	0.9	1.5	0.5	0.8	1.3	0.4	0.7	1.0
Consumption by products											
Anthracite	10.7	10.2	5.1	5.6	10.7	4.7	6.2	10.9	4.3	5.0	9.3
Bituminous	118.8	123.1	61.7	62.5	124.2	57.2	60.9	118.0	60.8	67.1	127.9
Iron making	32.1	37.6	18.0	18.7	36.8	16.2	17.3	33.5	16.6	17.4	34.1
Cement	4.6	4.9	2.3	2.3	4.7	2.1	2.5	4.6	2.2	2.5	4.6
Power Generation	79.7	78.2	40.1	40.3	80.4	37.6	40.1	77.7	40.9	46.1	86.9

Oil

(Mbbl)

	2013	2014	2015p			2016e			2017e		
			1H	2H		1H	2H		1H	2H	
Total Oil Demand	825.2	821.5	417.5	438.7	856.2	451.4	472.7	924.2	458.4	481.9	940.3
Transform	26.1	13.0	7.3	7.3	14.6	12.7	9.1	21.8	5.7	3.9	9.7
Power Generation	23.0	11.0	6.3	6.6	12.8	11.2	8.1	19.3	4.5	3.0	7.5
Heat	1.3	1.0	0.6	0.2	0.8	0.8	0.4	1.3	0.8	0.4	1.2
Gas Manufacture	1.9	0.9	0.5	0.6	1.0	0.7	0.6	1.2	0.5	0.5	1.0
Total Final Consumption	799.1	808.5	410.2	431.3	841.6	438.7	463.7	902.4	452.7	478.0	930.6
Industry	482.0	491.8	243.8	257.2	501.0	261.6	281.0	542.6	275.6	291.6	567.2
Transport	267.4	268.8	139.4	147.6	287.1	147.9	155.7	303.6	148.7	159.0	307.7
Buildings	49.7	47.9	27.0	26.5	53.5	29.2	27.1	56.3	28.4	27.4	55.8
Consumption by products											
Gasoline	73.4	73.5	37.1	39.5	76.6	38.2	40.8	78.9	38.5	41.5	80.0
Diesel (including Transformation)	143.0	144.8	76.0	80.4	156.4	81.3	85.2	166.6	82.2	87.6	169.8
Kerosene (including Transformation)	18.8	15.4	8.2	8.0	16.2	10.0	9.0	19.1	9.3	8.6	17.9
B-C (including Transformation)	46.4	33.3	19.3	19.0	38.3	25.4	22.1	47.5	18.5	17.9	36.4
Jet Oil	30.3	32.0	17.1	17.3	34.4	18.2	18.8	37.0	18.5	20.4	38.9
LPG (including Transformation)	93.1	89.6	41.5	48.4	89.9	50.0	58.9	109.0	52.6	54.9	107.5
Naphtha	384.2	396.3	203.1	207.7	410.8	210.7	219.4	430.1	222.9	231.3	454.2
Other Non-Energy	36.0	36.6	15.4	18.3	33.7	17.6	18.5	36.1	16.0	19.7	35.7

Gas

	2013	2014	2015			2016e			2017e		
			1H	2H		1H	2H		1H	2H	
Total Gas Demand (Mton)	40.3	36.6	18.2	15.2	33.4	17.9	17.0	34.9	18.5	16.1	34.6
Transform	40.0	36.4	18.1	15.0	33.1	17.7	16.8	34.5	18.3	16.0	34.3
Power Generation	17.6	15.9	7.6	7.0	14.6	6.9	8.4	15.3	7.3	7.4	14.7
Heat	2.6	2.2	0.9	0.7	1.5	0.9	0.8	1.7	0.9	0.8	1.7
Gas Manufacture	19.8	18.3	9.7	7.3	17.0	9.8	7.7	17.5	10.1	7.8	17.8
Industry	0.4	0.3	0.2	0.2	0.3	0.2	0.2	0.3	0.2	0.2	0.3
City Gas (Bm³)	23.9	22.1	12.2	8.6	20.8	12.3	9.0	21.3	12.7	9.1	21.7
Industry*	9.5	8.7	3.8	3.5	7.3	3.7	3.5	7.2	4.0	3.5	7.5
Transport	1.2	1.3	0.6	0.6	1.2	0.6	0.6	1.2	0.6	0.6	1.2
Buildings	13.1	12.2	7.7	4.5	12.2	8.0	4.9	12.8	8.1	4.9	13.0

* exclude industrial LNG usage

Electricity

(TWh)

	2013	2014	2015			2016e			2017e		
			1H	2H		1H	2H		1H	2H	
Net Electricity Demand	517.7	522.0	260.6	267.5	528.1	266.1	274.4	540.4	269.8	283.7	553.6
Own use and Losses	42.9	44.4	16.2	28.3	44.4	17.6	25.8	43.4	18.4	26.9	45.3
Total Final Consumption	474.8	477.6	244.5	239.2	483.7	248.5	248.5	497.0	251.4	256.9	508.3
Industry	256.8	264.6	133.3	132.4	265.6	134.1	135.8	270.0	136.9	141.0	277.9
Transport	2.2	2.0	1.1	1.2	2.2	1.3	1.4	2.7	1.3	1.5	2.8
Buildings	215.8	211.0	110.1	105.7	215.8	113.1	111.3	224.4	113.2	114.5	227.6
Installed Electrical Capacity (GW)*	327.2	357.5	190.1	194.4	384.5	197.5	205.2	402.7	219.5	230.9	450.4
Coal	98.1	103.6	54.1	54.3	108.4	54.9	60.5	115.4	66.0	73.9	139.9
Oil	19.5	18.5	8.5	8.5	17.0	8.4	8.3	16.6	8.3	8.3	16.6
Gas	89.1	110.6	63.1	64.1	127.2	65.0	65.2	130.3	70.2	73.3	143.5
Nuclear	82.9	82.9	41.4	43.4	84.9	43.4	43.9	87.3	46.0	45.1	91.1
Hydro	25.8	25.8	12.9	12.9	25.9	13.0	13.0	25.9	13.0	13.0	25.9
Other Renewables	11.8	16.1	10.0	11.1	21.2	12.8	14.3	27.1	16.0	17.4	33.4
Electricity Generation of Power Plants*	517.7	522.0	260.6	267.5	528.1	266.1	274.4	540.4	269.8	283.7	553.6
Coal	200.4	203.4	102.6	102.1	204.7	101.7	112.1	213.8	113.0	130.8	243.8
Oil	15.8	25.0	15.7	16.0	31.7	8.4	5.8	14.3	6.3	3.3	9.5
Gas	128.3	114.7	51.7	49.1	100.8	55.4	65.5	120.8	55.8	56.0	111.8
Nuclear	138.8	156.4	78.5	86.3	164.8	86.5	75.5	162.0	78.1	74.6	152.7
Hydro	8.5	7.8	2.8	3.0	5.8	3.0	3.6	6.6	3.2	3.8	7.0
Other Renewables	11.3	14.7	9.4	10.9	20.3	11.1	11.9	23.0	13.4	15.3	28.7
Fuel Consumption of Power Plants (Mtoe)*	108.3	108.1	54.2	55.4	109.6	54.6	55.5	110.2	54.6	56.9	111.5
Coal	49.2	49.2	25.2	25.3	50.6	23.7	25.3	49.0	25.7	28.6	54.2
Oil	3.6	1.7	1.0	1.0	2.0	1.8	1.3	3.0	0.7	0.5	1.1
Gas	23.3	21.0	10.0	9.3	19.3	9.2	11.1	20.3	9.7	9.8	19.5
Nuclear	29.3	33.0	16.6	18.2	34.8	18.3	15.9	34.2	16.5	15.7	32.2
Hydro	1.8	1.6	0.6	0.6	1.2	0.6	0.8	1.4	0.7	0.8	1.5
Other Renewables	1.1	1.5	0.8	0.9	1.7	1.1	1.2	2.3	1.4	1.5	2.9

* District Heat is classified by fuel type since 2014

Heat and Other Renewables

(Mtoe)

	2013	2014	2015			2016e			2017e		
			1H	2H		1H	2H		1H	2H	
Net Heat Demand	1.8	1.6	1.0	0.6	1.6	0.9	0.6	1.6	0.9	0.7	1.6
Own use and Losses	0.1	-0.0	-0.0	0.0	0.0	-0.1	-0.0	-0.2	-0.1	-0.0	-0.2
Total Final Consumption	1.7	1.6	1.0	0.6	1.6	1.0	0.7	1.7	1.1	0.7	1.8
Industry	-	-	-	-	-	-	-	-	-	-	-
Transport	-	-	-	-	-	-	-	-	-	-	-
Buildings	1.7	1.6	1.0	0.6	1.6	1.0	0.7	1.7	1.1	0.7	1.8
Heat Production by fuel											
Coal	-	-	-	-	-	-	-	-	-	-	-
Oil	1.2	1.0	0.6	0.4	1.0	0.7	0.4	1.1	0.7	0.4	1.1
Gas	0.6	0.5	0.3	0.2	0.5	0.2	0.2	0.4	0.2	0.2	0.5
Nuclear	-	-	-	-	-	-	-	-	-	-	-
Hydro	-	-	-	-	-	-	-	-	-	-	-
Other Renewables	-	-	-	-	-	-	-	-	-	-	-
Fuel Consumption of District Heat											
Coal	-	-	-	-	-	-	-	-	-	-	-
Oil	0.2	0.2	0.1	0.0	0.1	0.1	0.1	0.2	0.1	0.1	0.2
Gas	3.3	2.8	1.1	0.9	2.0	1.2	1.0	2.2	1.2	1.0	2.3
Nuclear	-	-	-	-	-	-	-	-	-	-	-
Hydro	-	-	-	-	-	-	-	-	-	-	-
Other Renewables	-	-	-	-	-	-	-	-	-	-	-
Other Renewables	10.8	12.6	7.0	7.1	14.1	8.1	8.2	16.4	9.2	9.3	18.6
Hydro	1.8	1.6	0.6	0.6	1.2	0.6	0.8	1.4	0.7	0.8	1.5
Transform	1.1	1.5	0.8	0.9	1.7	1.1	1.2	2.3	1.4	1.5	2.9
Total Final Consumption	7.9	9.5	5.6	5.5	11.1	6.4	6.3	12.7	7.2	7.0	14.2
Industry	6.5	8.1	4.7	4.7	9.4	5.3	5.3	10.6	6.0	5.9	11.9
Transport	0.4	0.4	0.2	0.2	0.4	0.3	0.3	0.5	0.3	0.3	0.5
Buildings	1.0	1.0	0.7	0.6	1.3	0.8	0.8	1.6	0.9	0.9	1.8

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