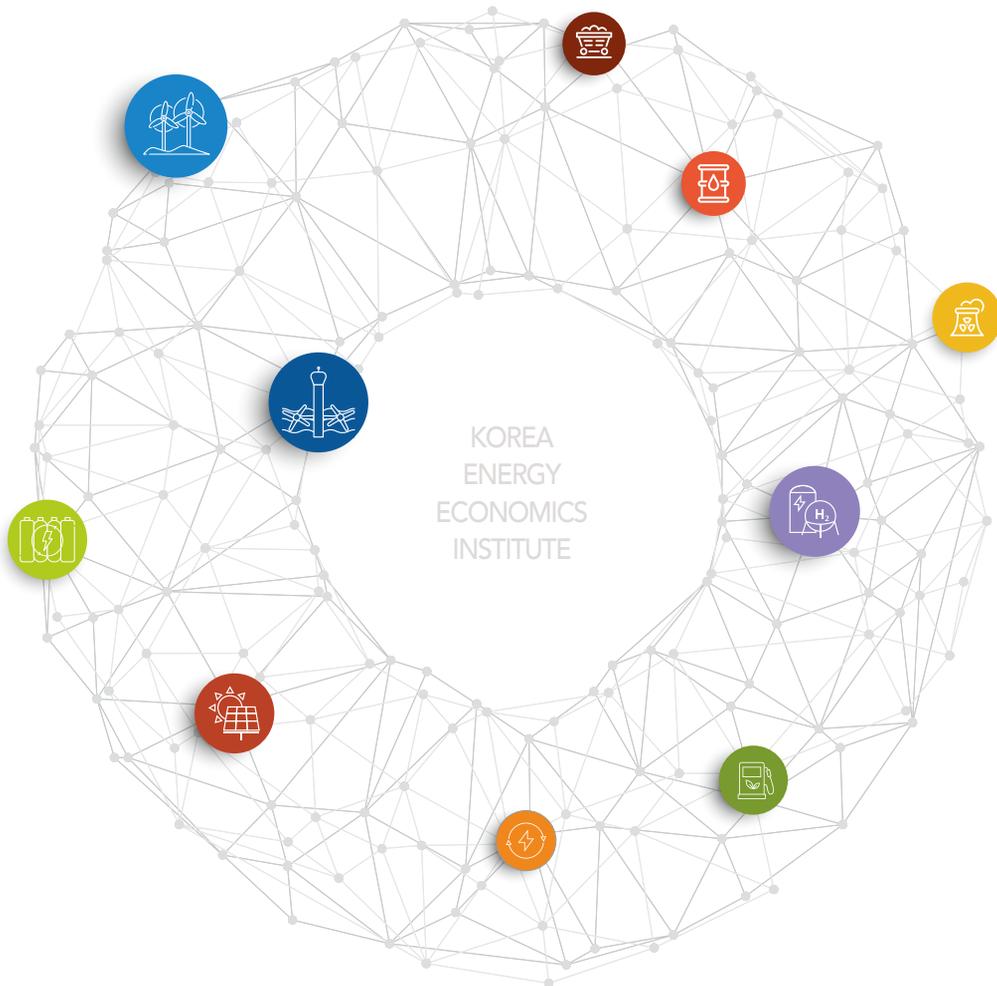


# 2023 KOREA ENERGY DEMAND OUTLOOK

2023 First Half



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 Outlook Research Team of the Center for Energy Information and Statistics in cooperation with the Energy Supply Statistics Research Team of KEEI and other related research divisions.

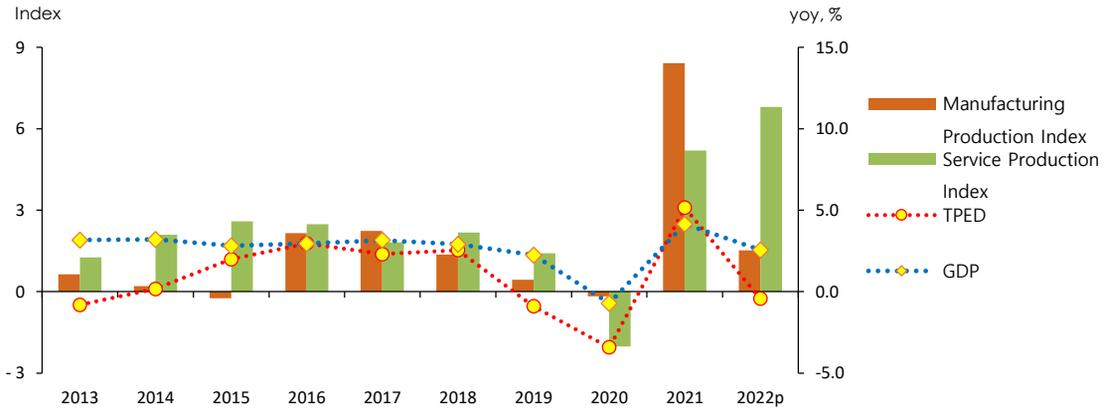
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# 1. Total Primary Energy Demand and Total Final Consumption

- **In 2022, Total Primary Energy Demand (TPED) dropped by 0.4% year-on-year to 302.0 Mtoe due to a slowdown in manufacturing production.**
  - In the first half of 2022, energy use increased, driven by enhanced production activities in the mining & manufacturing sector. In the second half, however, energy use decreased as a result of sluggish production in the mining & manufacturing sector with the slowdown in global growth.
  - By energy sources, the use of nuclear energy and renewable & other energy grew by 11.4% and 11.2% year-on-year, while the use of fossil fuels such as coal, petroleum and gas fell by 5.3%, 1.9% and 1.2% respectively, and accordingly, greenhouse gas emissions are estimated to have declined than the previous year.<sup>1</sup>

**Figure 1.1 The growth rates of GDP and TPED, production index**



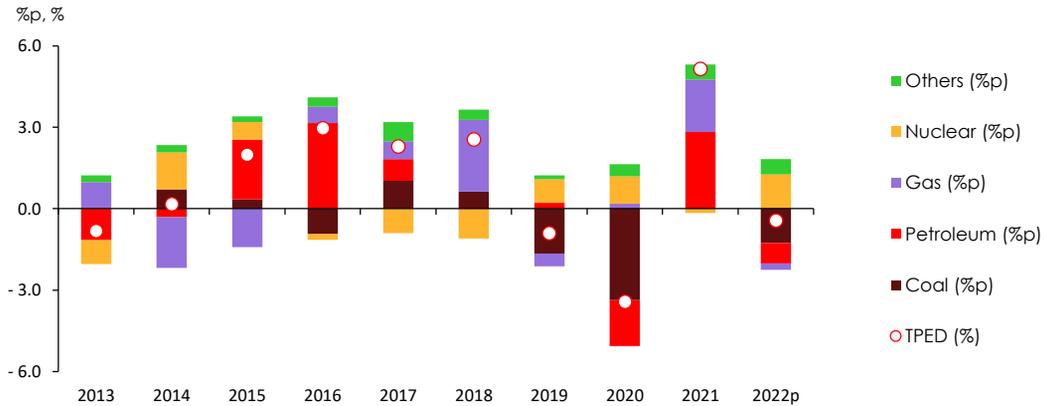
Note: Production indexes show year-on-year differences.

- Gross Domestic Product (GDP) grew by 2.6% owing to a decent growth in production activities in the service industry that accounts for a large share of the total added values, while TPED decreased. As a result, energy intensity (toe/million won) improved(declined) by 2.9%.
- **In 2022, nuclear and renewable & other energy use increased, while the use of coal, petroleum and gas declined than the previous year.**

<sup>1</sup> The statistics on greenhouse gas emissions are published biennially, and the data of 2021 is the latest available statistics as of April 2023.

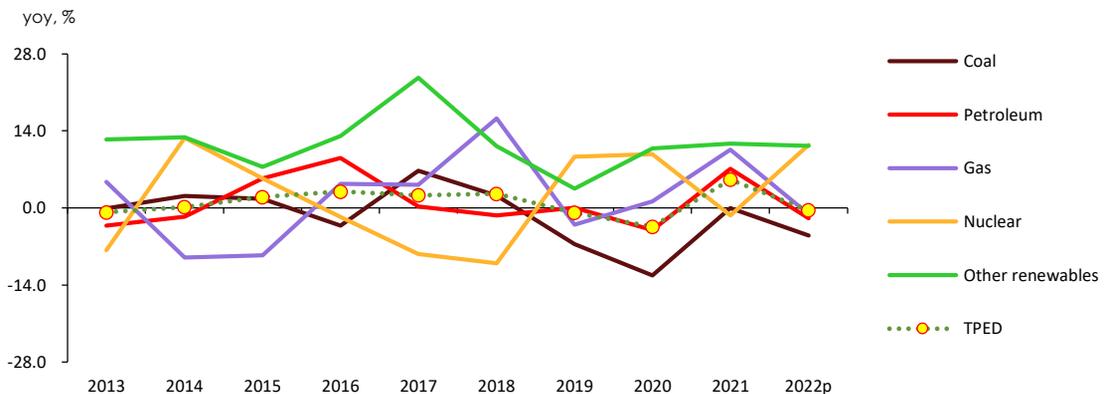
- Coal use fell by 5.0% year-on-year, as it declined in the power generation sector, affected by constraints on transmission lines, and its industrial use plunged, especially coking coal, due to a production loss in the iron & steel sector in the aftermath of a typhoon.
- Petroleum use dropped by 1.9% year-on-year, as its use as feedstocks declined in the petrochemical sector, which takes up a large share of the total industrial petroleum use, and as it also declined in the transport sector amid falling demand for diesel in the road transport sector.

**Figure 1.2 The growth rates of TPED & contributions by sources**



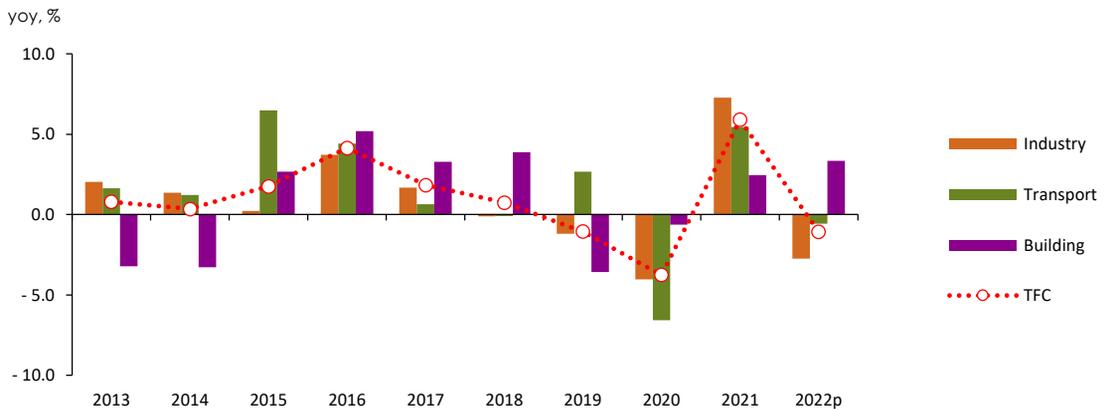
- Natural gas use slid by 1.1% year-on-year, with the power generation sector leading the downward trend, although its final use increased, especially in the building sector.
- The total nuclear generation posted a year-on-year growth of 11.4% as a result of the growth in capacity factor and installed capacity. Renewable & other energy use was up 11.2%, led by the power generation sector.

**Figure 1.3 The growth rates of energy use by major energy sources**



- Meanwhile, electricity use grew by 2.7% year-on-year, as it continued to grow rapidly in the building sector, although electricity use in the industry grew at slower pace mostly in the 2<sup>nd</sup> half of the year.
- **In 2022, Total Final Consumption (TFC) dropped by 1.1% year-on-year, as it declined in the industrial sector, which accounts for a large share of TFC, although the building sector consumed more energy.**
  - Industrial energy use went down by 2.7% year-on-year due to weak production activities in the midst of the global economic downturn and lower iron & steel production, which was hit by a typhoon.
  - In the transport sector, energy use fell by 0.6%, mostly in the road transport sector, affected by high petroleum product prices, even though mobility demand increased following the termination of social distancing restrictions since April.

**Figure 1.4 The growth rates of TFC by end-use sectors**



Note: The Building sector includes residential, commercial and public-etc usage.

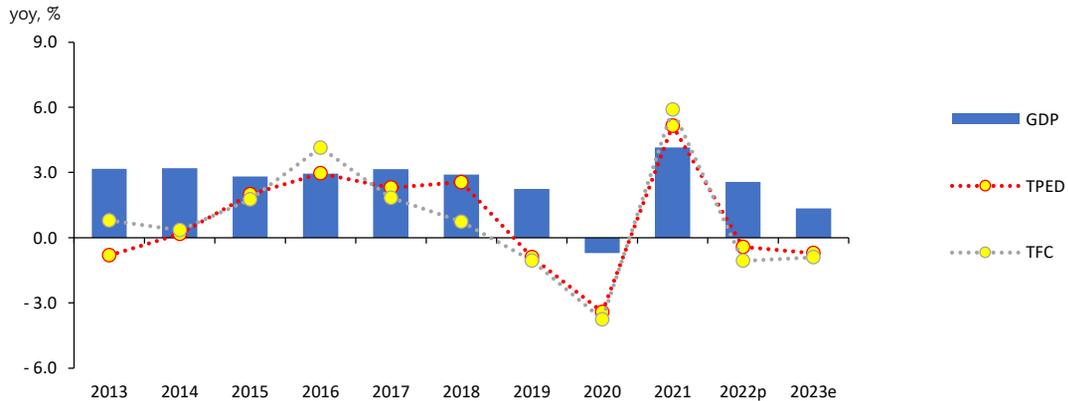
- Energy use in buildings went up by 3.3%, with the commercial sector leading the growth by much stronger service production, and it was also affected by the increased number of cooling & heating degree days.

## 2. TPED & TFC Outlook

□ In 2023, TPED is expected to drop by 0.7% year-on-year to 299.8Mtoe.

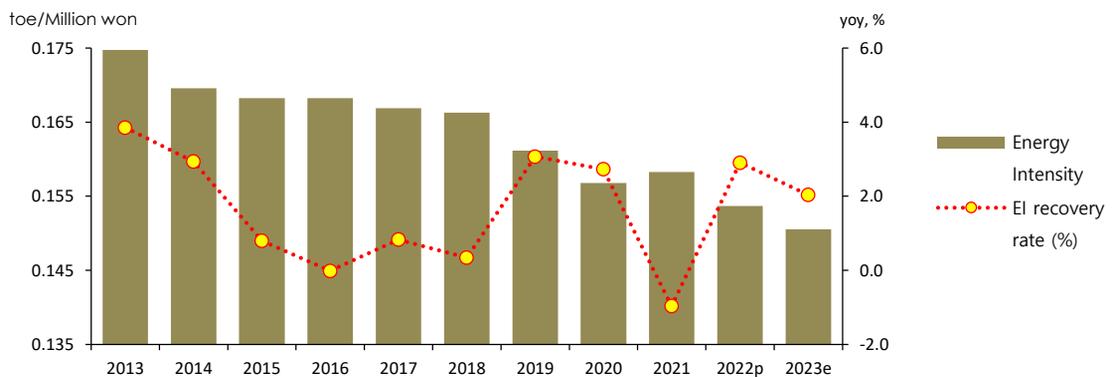
- TPED rapidly recovered from Covid-19 lows and peaked at 303.3 Mtoe in 2021. However, it is expected to decline for the second consecutive year partly due to a slowdown in economic growth.

**Figure 2.1 The growth rates of GDP, TPED and TFC, trend and outlook**



- The total energy demand is likely to decline, led by fossil fuels including coal, petroleum and gas, while demand for zero emissions sources such as nuclear and renewable energy increases. As a result, national greenhouse gas emissions are expected to decline.
- The energy intensity (toe/million won) is forecast to improve (decline) rapidly for the 2<sup>nd</sup> consecutive year in 2023, as GDP grows by 1.4%, while TPED decreases.

**Figure 2.2 Energy Intensity and EI Recovery Trends**

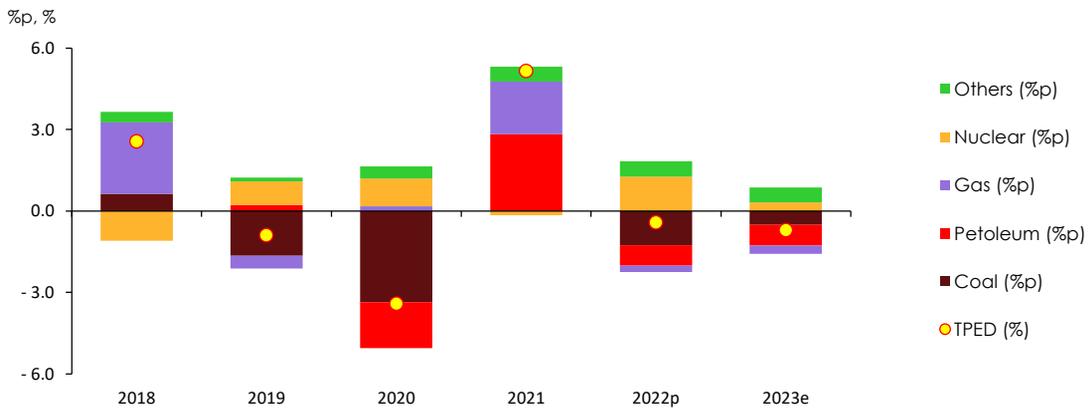


Note: Energy Intensity is calculated as the value of 'TPED/GDP', expressed in toe/million won, EI recovery rate multiplies EI increase rate by '-1'.

**While the demand for nuclear and renewable energy is expected to increase, fossil fuels such as coal, petroleum and gas are likely to lead the downward slide in energy demand.**

- Coal demand is projected to drop by 2.5% year-on-year, as it declines in the power generation sector due to power grid constraints, although its industrial demand is expected to grow compared to the previous year with the iron & steel production returning to normal operations.
- Petroleum demand is forecast to decrease by 1.8% year-on-year despite slightly increasing demand in the transport sector, as its industrial demand decreases, especially for use as petrochemical feedstocks.
- Natural gas demand is expected to drop by 0.8% year-on-year, although it slightly increases in the power generation sector, as city gas demand decreases, mostly in the building sector.

**Figure 2.3 The growth rate of TPED & contributions by sources**

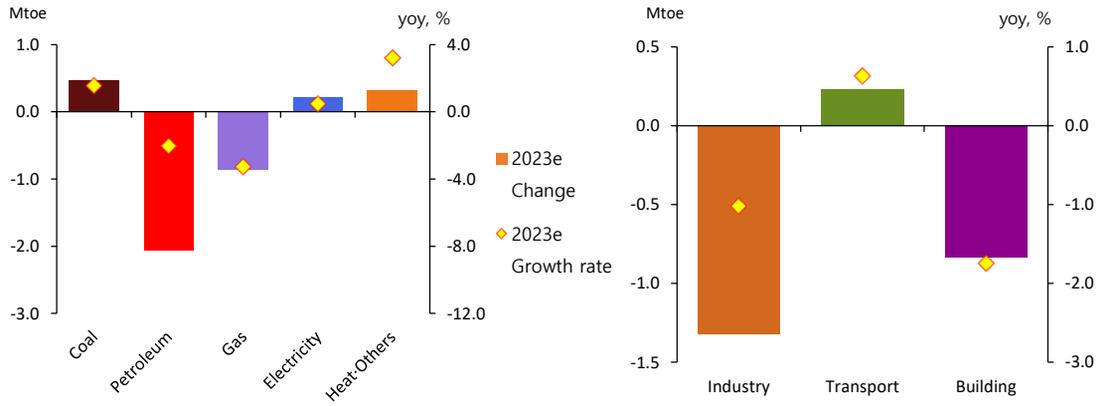


- Nuclear generation is expected to grow by 2.6% as a result of the commissioning of a new reactor and increased capacity factors. Renewable & other energy generation is also forecast to grow by 10.3% due to a steady increase in installations.
- Electricity demand is likely to grow by mere 0.5% year-on-year in the end-use sectors, as the demand remains flat in the industrial sector, while it declines in the residential sector, although it grows by more than 1% in the commercial sector.

**TFC is projected to drop by 0.9% year-on-year (in 2023), with the industrial and building sectors leading the downward slide, though transport energy use is expected to increase.**

- Industrial energy demand is expected to drop by 1.0% amid the overall slowdown in production activities, as especially demand for LPG and naphtha—petrochemical feedstocks that takes up a large share of the industrial energy demand—is expected to rapidly decline.

**Figure 2.4 The change and growth rate of TFC by energy sources and end-use sectors**



- Transport energy demand is expected to grow by 0.6% year-on-year, affected by stable fuel prices and growing mobility demand.
- Energy demand in buildings is projected to decline by 1.7% year-on-year, as consumer sentiment slides due to higher energy rates, and the number of cooling & heating degree days decreases.

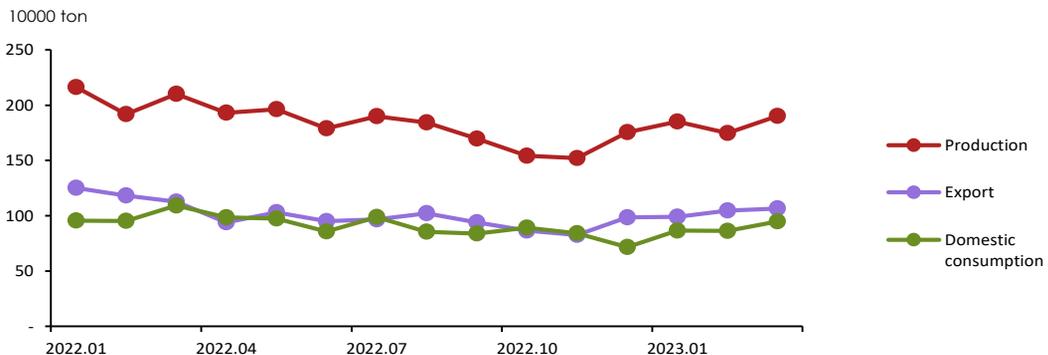
### 3. Key Features and Implications

- **In 2023, energy use is predicted to decline, largely driven by a drop in energy use as petrochemical feedstocks as well as lower energy demand in the building sector.**
  - In 2023, the industrial sector is expected to make the largest contribution to the decline in energy use, and by the types of industries, it will be affected most by lower feedstock energy use in the petrochemical sector, which accounts for a large share of the total industrial energy use.
  - In the building sector, energy use is expected to plunge due to weak consumer sentiment that was hit by the heating cost crisis at the beginning of the year and price & temperature effect, which will be the main factor of a decline in the total energy demand.
  - In the power generation sector, the total generation will decrease to the pre-2010 level, as coal-fired power generation steadily declines due to transmission constraints, while the power generation from nuclear and renewable energy increases.
  - This section explains key features of the outlook, listed above.

#### Demand for petroleum products used as petrochemical feedstocks

- **Since the 2<sup>nd</sup> half of 2022, petrochemical production declined, as its exports and domestic demand decreased amid the global economic slowdown.**
  - During the covid-19 pandemic (2021-1<sup>st</sup> half of 2022), domestic production of petrochemical products was solid in line with growing demand. Since the 2<sup>nd</sup> half of 2022, however, production declined amid the global economic downturn and weak demand from China.

**Figure 3.1 Production, export and domestic consumption of three major petrochemical products**

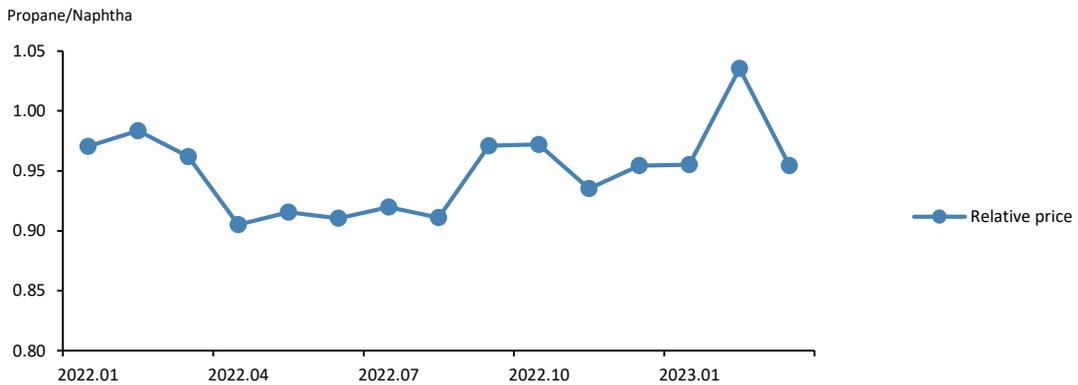


Note: The three major petrochemical products are synthetic resin, synthetic fiber raw materials and synthetic rubber.  
 Source: Korea Petrochemical Industry Association, Statistics on production & sales (2023.6.19)

- **In the petrochemical sector, demand for petroleum products used as feedstocks such as naphtha and LPG dropped fast due to weak production.**

- The use of naphtha and LPG, which are petrochemical feedstocks, decreased by 7.6% year-on-year in the first quarter of 2023.

**Figure 3.2 Relative price of propane in terms of naphtha (major petrochemical feedstocks)**



Note: It is the price of propane when naphtha price is assumed to be 1 (based on weight).

Source: Korea International Trade Association, data on volume and value of import (2023.6.19)

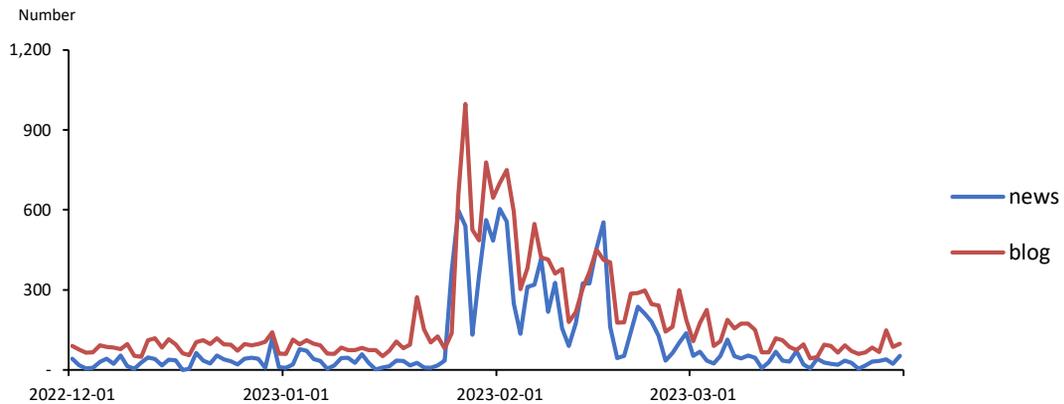
- While demand for petroleum products used as petrochemical feedstocks declined amid a drop in petrochemical production, LPG demand dropped faster compared to naphtha due to a surge in LPG Contract Price (CP), which is the global price benchmark.

### Heating cost crisis and buildings' energy demand

- **The heating cost crisis, which occurred early this year, raised consumers' sensitivity to energy costs in the building sector, contributing to the decline in energy demand.**

- Domestic energy prices increased amid the global energy price hikes last winter, and the number of heating degree days drastically increased in December. Consequently, a steep rise in heating costs emerged as a social issue.

**Figure 3.3 The number of times “heating cost” appeared on the internet news sites and blogs, 2022.12.1-2023.3.31**



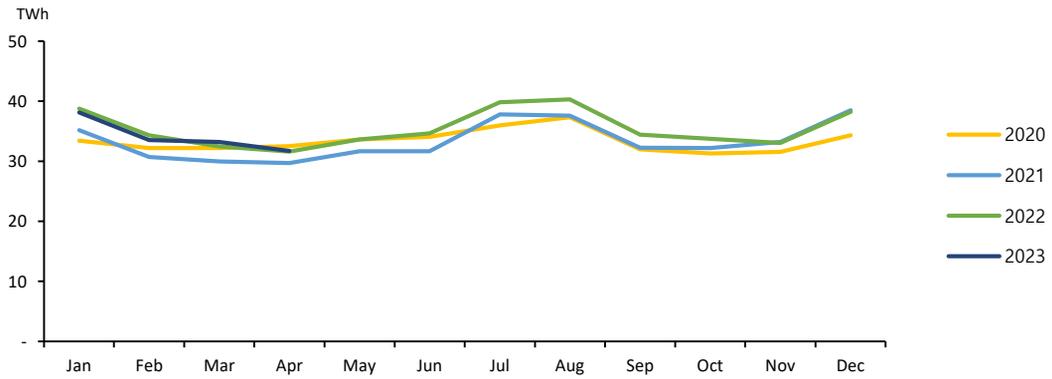
Source: The graph was drawn by the author of this report using the data derived from keywords trend analysis of big data platform, owned by National Research Council for Economics, Humanities and Social Sciences (<https://www.nrcdata.re.kr/nrc/usr/main.do>).

- As heating cost crisis emerges as a social issue, general households and small business owners’ sentiment for energy use fell sharply, and most of the energy rates including electricity, city gas and heat energy increased from the previous year, which will lead to a decline in buildings’ energy demand.
- In addition to higher energy rates, the number of cooling & heating degree days, which is the most important factor of the growth and decline in buildings’ energy use, drastically decreased, and these factors are expected to accelerate the decline in buildings’ energy demand.
- In this outlook, energy use in buildings is projected to drop by 1.7% in 2023, contributing (-0.4%p) to the downward trend in TFC (-0.9%).

### Transmission constraints and power generation mix

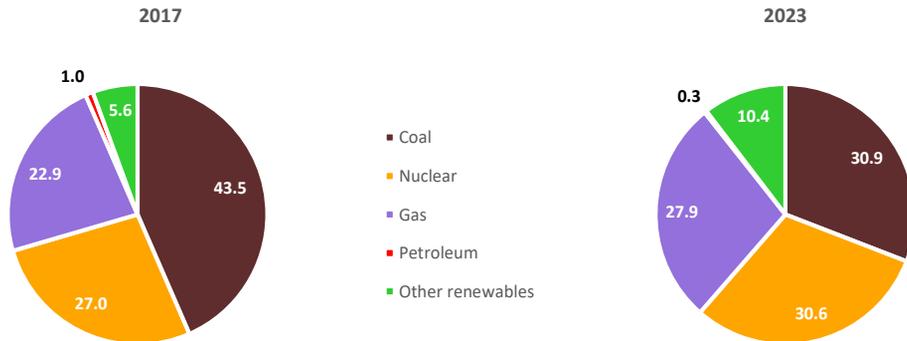
- Coal-fired power generation is predicted to drop fast due to transmission constraints amid growing renewable and nuclear power generation.**
  - Recently, new generation facilities have been rapidly increasing, while the construction of transmission infrastructure is being delayed partly due to a lack of consensus in local communities, exacerbating constraints on transmission lines connecting the east coast & Honam areas and the metropolitan area.

**Figure 3.4 Monthly baseload generation trend since 2020 (including renewable energy)**



- Amid growing renewable and nuclear power generation, such transmission constraints are causing a drop in coal-fired power generation that is given a lower priority than renewable and nuclear energy when generating electrical power.

**Figure 3.5 Comparison of power generation mix, 2017 vs 2023**



Note: 2023’s power generation mix by energy sources was compared with that of 2017 when coal accounted for the largest share of the total power generation during the past decade.

- This outlook predicted power generation by energy sources, considering the fact that transmission infrastructure is the same as the previous year in 2023, and assuming this year’s baseload generation (including nuclear energy) is at a level similar to 2022.



# The Main Indicator and Energy Outlook Result

## Main Economic and Energy Indicators

	2019	2020	2021p		2022e			2023e			
			1H	2H		1H	2H		1H	2H	
<b>Economy and Population</b>											
GDP (trillion won)	1 852.7	1 839.5	932.0	983.8	1 915.8	959.5	1 005.3	1 964.8	967.6	1 023.8	1 991.4
Industrial Production(2020=100)	100.3	100.0	105.7	110.7	108.2	111.7	107.8	109.7	113.8	107.1	110.4
Crude Oil Price (Dubai, USD/bbl)	63.5	42.2	63.5	75.0	69.3	101.8	90.9	96.4	78.5	77.2	77.9
Working Days	272.5	275.5	135.5	138.0	273.5	133.5	139.0	272.5	136.5	137.0	273.5
Population (million)	51.8	51.8	51.7	51.7	51.7	51.6	51.6	51.6	51.6	51.6	51.6
Average Temperature (°C)	13.5	13.0	10.4	16.3	13.3	10.2	15.7	13.0	10.7	16.1	13.4
Cooling Degree days	120.4	85.2	-	101.3	101.3	18.5	123.4	141.9	-	104.2	104.2
Heating Degree days	2 370.9	2 448.0	1 492.3	912.4	2 404.7	1 577.8	989.3	2 567.1	1 458.0	914.9	2 372.9
<b>Energy Indicators</b>											
Total Primary Energy Demand (Mtoe)	298.6	288.4	149.7	153.5	303.3	152.2	149.8	302.0	148.5	151.3	299.8
Energy Intensity (toe/million won)	0.162	0.157	0.161	0.156	0.159	0.159	0.149	0.154	0.154	0.148	0.151
TPED/capita (toe/capita)	5.769	5.564	2.894	2.967	5.861	2.947	2.902	5.849	2.880	2.936	5.815
Electricity Generation (TWh)	559.6	548.9	276.9	295.5	572.4	289.6	300.9	590.5	287.6	303.1	590.7
Electricity Generation/capita (MWh/capita)	10.8	10.6	5.4	5.7	11.1	5.6	5.8	11.4	5.6	5.9	11.5
Electricity Demand/capita (MWh/capita)	9.8	9.6	4.9	5.1	10.1	5.2	5.2	10.4	5.2	5.3	10.4

## Energy Demand

	2019	2020	2021p		2022e			2023e			
			1H	2H	1H	2H	1H	2H			
<b>Total Primary Energy Demand</b>											
Coal (Mton)	136.7	119.9	56.4	63.6	119.9	55.5	58.4	113.9	53.1	57.9	111.1
Oil (Mbbbl)	808.2	775.7	404.5	426.2	830.7	407.8	407.2	815.0	392.7	407.6	800.3
Gas (Bm <sup>3</sup> )	41.0	41.5	24.1	21.7	45.9	24.2	21.2	45.3	23.7	21.3	45.0
Nuclear (TWh)	145.9	160.2	77.2	80.8	158.0	86.7	89.4	176.1	88.3	92.2	180.6
Other Renewables (Mtoe)	12.1	13.4	7.6	7.4	15.0	8.3	8.4	16.7	9.3	9.1	18.4
<b>Total (Mtoe)</b>	<b>298.6</b>	<b>288.4</b>	<b>149.7</b>	<b>153.5</b>	<b>303.3</b>	<b>152.2</b>	<b>149.8</b>	<b>302.0</b>	<b>148.5</b>	<b>151.3</b>	<b>299.8</b>
Coal	82.8	72.8	34.3	38.5	72.8	33.7	35.3	69.0	32.3	35.2	67.4
Oil	118.5	113.4	59.2	62.3	121.5	59.4	59.8	119.2	57.2	59.7	116.9
Gas	54.0	54.6	32.2	28.0	60.2	32.3	27.2	59.5	30.9	27.7	58.6
Nuclear	31.1	34.1	16.4	17.2	33.7	18.5	19.0	37.5	18.8	19.6	38.5
Other Renewables	12.1	13.4	7.6	7.4	15.0	8.3	8.4	16.7	9.3	9.1	18.4
<b>Total Final Consumption</b>											
Coal (Mton)	51.9	49.2	24.9	26.1	51.0	23.8	22.9	46.8	23.1	24.2	47.3
Oil (Mbbbl)	796.1	752.3	394.0	415.1	809.1	398.8	396.8	795.6	384.0	398.2	782.2
Gas (Bm <sup>3</sup> )	22.4	22.0	13.2	9.6	22.7	13.9	9.7	23.6	13.1	9.4	22.6
Electricity (TWh)	507.5	497.3	255.8	265.2	521.0	265.9	269.4	535.3	266.7	271.1	537.8
Heat (Mtoe)	2.5	2.6	1.6	1.1	2.7	1.7	1.2	2.9	1.6	1.2	2.8
Other Renewables (Mtoe)	6.5	6.7	3.6	3.5	7.1	3.6	3.6	7.2	3.8	3.8	7.6
<b>Total (Mtoe)</b>	<b>211.7</b>	<b>203.8</b>	<b>107.9</b>	<b>107.9</b>	<b>215.8</b>	<b>109.2</b>	<b>104.3</b>	<b>213.5</b>	<b>106.4</b>	<b>105.2</b>	<b>211.6</b>
Coal	32.9	31.2	15.8	16.5	32.3	15.2	14.7	29.9	14.8	15.6	30.4
Oil	101.2	95.9	50.3	53.0	103.3	50.6	50.6	101.2	48.7	50.5	99.1
Gas	25.0	24.7	14.6	11.0	25.6	15.2	11.1	26.3	14.6	10.9	25.4
Electricity	43.6	42.8	22.0	22.8	44.8	22.9	23.2	46.0	22.9	23.3	46.3
Heat	2.5	2.6	1.6	1.1	2.7	1.7	1.2	2.9	1.6	1.2	2.8
Other Renewables	6.5	6.7	3.6	3.5	7.1	3.6	3.6	7.2	3.8	3.8	7.6
Industry	129.2	124.0	65.0	68.1	133.0	66.0	63.4	129.4	63.4	64.6	128.1
Transport	37.2	34.7	18.0	18.7	36.6	17.3	19.1	36.4	17.7	18.9	36.7
Buildings	45.3	45.0	25.0	21.1	46.1	25.9	21.8	47.7	25.3	21.6	46.8

## Energy Demand

(yoy, %)

	2019	2020	2021p		2022e			2023e			
			1H	2H	1H	2H		1H	2H		
<b>Total Primary Energy Demand</b>											
Coal (Mton)	-6.6	-12.3	-2.2	2.1	-0.0	-1.5	-8.1	-5.0	-4.3	-0.8	-2.5
Oil (Mbbbl)	0.0	-4.0	2.4	12.0	7.1	0.8	-4.4	-1.9	-3.7	0.1	-1.8
Gas (Bm <sup>3</sup> )	-3.0	1.2	15.4	5.7	10.6	0.2	-2.6	-1.1	-2.0	0.6	-0.8
Nuclear (TWh)	9.3	9.8	-5.9	3.5	-1.4	12.3	10.6	11.4	1.9	3.2	2.6
Other Renewables (Mtoe)	3.5	10.8	15.6	8.0	11.7	9.3	13.3	11.2	11.6	9.0	10.3
<b>Total (Mtoe)</b>	<b>-0.9</b>	<b>-3.4</b>	<b>3.5</b>	<b>6.9</b>	<b>5.2</b>	<b>1.6</b>	<b>-2.4</b>	<b>-0.4</b>	<b>-2.4</b>	<b>1.0</b>	<b>-0.7</b>
Coal	-5.7	-12.1	-2.0	1.9	0.0	-1.9	-8.3	-5.3	-4.2	-0.4	-2.2
Oil	0.5	-4.3	2.8	11.7	7.2	0.4	-4.0	-1.9	-3.7	-0.2	-1.9
Gas	-2.6	1.0	14.7	5.6	10.3	0.3	-2.9	-1.2	-4.2	1.6	-1.5
Nuclear	9.3	9.8	-5.9	3.5	-1.4	12.3	10.6	11.4	1.9	3.2	2.6
Other Renewables	3.5	10.8	15.6	8.0	11.7	9.3	13.3	11.2	11.6	9.0	10.3
<b>Total Final Consumption</b>											
Coal (Mton)	-4.9	-5.2	4.5	2.8	3.6	-4.3	-12.1	-8.3	-3.0	5.7	1.2
Oil (Mbbbl)	1.0	-5.5	2.8	12.5	7.6	1.2	-4.4	-1.7	-3.7	0.3	-1.7
Gas (Bm <sup>3</sup> )	-2.9	-2.0	5.5	0.4	3.3	5.5	1.5	3.9	-5.4	-2.7	-4.3
Electricity (TWh)	-1.1	-2.0	3.8	5.7	4.8	3.9	1.6	2.7	0.3	0.6	0.5
Heat (Mtoe)	-2.5	4.9	6.7	0.8	4.2	6.4	6.3	6.4	-4.8	2.8	-1.7
Other Renewables (Mtoe)	-7.6	2.5	8.2	6.0	7.1	-1.1	3.4	1.1	6.2	4.1	5.1
<b>Total (Mtoe)</b>	<b>-1.1</b>	<b>-3.8</b>	<b>4.0</b>	<b>7.9</b>	<b>5.9</b>	<b>1.2</b>	<b>-3.3</b>	<b>-1.1</b>	<b>-2.6</b>	<b>0.9</b>	<b>-0.9</b>
Coal	-4.1	-5.3	4.7	2.5	3.5	-3.7	-10.8	-7.3	-2.8	6.0	1.6
Oil	0.8	-5.3	3.2	12.5	7.8	0.6	-4.6	-2.0	-3.9	-0.2	-2.0
Gas	-2.1	-1.1	4.7	1.7	3.4	4.3	0.6	2.7	-4.3	-1.9	-3.3
Electricity	-1.1	-2.0	3.8	5.7	4.8	3.9	1.6	2.7	0.3	0.6	0.5
Heat	-2.5	4.9	6.7	0.8	4.2	6.4	6.3	6.4	-4.8	2.8	-1.7
Other Renewables	-7.6	2.5	8.2	6.0	7.1	-1.1	3.4	1.1	6.2	4.1	5.1
Industry	-1.2	-4.0	3.9	10.7	7.3	1.7	-6.9	-2.7	-4.0	2.0	-1.0
Transport	2.7	-6.6	6.0	4.9	5.4	-3.6	2.4	-0.6	2.3	-0.9	0.6
Buildings	-3.6	-0.6	2.7	2.2	2.5	3.5	3.2	3.4	-2.4	-1.0	-1.7

## Energy Demand by Sector

(Mtoe)

	2019	2020	2021p			2022e			2023e		
			1H	2H		1H	2H		1H	2H	
<b>Industry</b>	<b>129.2</b>	<b>124.0</b>	<b>65.0</b>	<b>68.1</b>	<b>133.0</b>	<b>66.0</b>	<b>63.4</b>	<b>129.4</b>	<b>63.4</b>	<b>64.6</b>	<b>128.1</b>
Coal	32.6	30.9	15.7	16.3	32.0	15.1	14.5	29.7	14.7	15.4	30.2
Oil	60.1	57.7	30.5	32.8	63.4	31.6	30.0	61.5	29.4	30.0	59.4
Gas	9.6	9.5	5.1	5.0	10.1	5.2	4.8	10.0	5.1	5.0	10.1
Electricity	22.9	21.9	11.4	11.7	23.2	11.8	11.7	23.6	11.8	11.8	23.6
Heat	-	-	-	-	-	-	-	-	-	-	-
Other Renewables	4.0	4.0	2.2	2.2	4.4	2.3	2.3	4.6	2.4	2.4	4.8
<b>Transport</b>	<b>37.2</b>	<b>34.7</b>	<b>18.0</b>	<b>18.7</b>	<b>36.6</b>	<b>17.3</b>	<b>19.1</b>	<b>36.4</b>	<b>17.7</b>	<b>18.9</b>	<b>36.7</b>
Coal	-	-	-	-	-	-	-	-	-	-	-
Oil	35.0	32.7	16.9	17.6	34.6	16.3	18.0	34.3	16.7	17.9	34.5
Gas	1.2	1.1	0.5	0.5	1.1	0.5	0.5	1.0	0.5	0.5	1.0
Electricity	0.3	0.3	0.2	0.2	0.3	0.2	0.2	0.3	0.2	0.2	0.4
Heat	-	-	-	-	-	-	-	-	-	-	-
Other Renewables	0.7	0.7	0.4	0.4	0.7	0.4	0.4	0.7	0.4	0.4	0.8
<b>Buildings*</b>	<b>45.3</b>	<b>45.0</b>	<b>25.0</b>	<b>21.1</b>	<b>46.1</b>	<b>25.9</b>	<b>21.8</b>	<b>47.7</b>	<b>25.3</b>	<b>21.6</b>	<b>46.8</b>
Coal	0.3	0.2	0.1	0.1	0.2	0.1	0.1	0.2	0.1	0.1	0.2
Oil	6.1	5.5	2.8	2.6	5.4	2.8	2.6	5.3	2.6	2.6	5.2
Gas	14.2	14.2	9.0	5.5	14.5	9.5	5.7	15.2	9.0	5.4	14.4
Electricity	20.5	20.6	10.4	10.9	21.3	10.9	11.3	22.1	11.0	11.3	22.3
Heat	2.5	2.6	1.6	1.1	2.7	1.7	1.2	2.9	1.6	1.2	2.8
Other Renewables	1.8	1.9	1.1	0.9	2.0	0.9	1.0	1.9	1.0	1.0	2.0
<b>Transformation**</b>	<b>310.0</b>	<b>296.3</b>	<b>147.8</b>	<b>154.4</b>	<b>302.2</b>	<b>156.3</b>	<b>159.4</b>	<b>315.8</b>	<b>152.7</b>	<b>159.2</b>	<b>311.9</b>
Coal	49.9	41.6	18.5	22.0	40.6	18.4	20.6	39.1	17.5	19.6	37.1
Oil	173.7	164.1	79.6	85.2	164.8	85.3	89.3	174.6	82.0	89.1	171.2
Gas	49.7	49.7	29.3	26.1	55.3	29.4	25.7	55.1	28.9	25.5	54.3
Nuclear	31.1	34.1	16.4	17.2	33.7	18.5	19.0	37.5	18.8	19.6	38.5
Other Renewables	5.6	6.8	4.0	3.9	7.9	4.7	4.8	9.5	5.5	5.4	10.8

\* include residential, commercial, public-etc usage. \*\* Transformation is the sum of inputs from power generation, district heat, gas manufacture, and oil refinery processes.

## Coal

(Mton)

	2019	2020	2021p			2022e			2023e		
			1H	2H		1H	2H		1H	2H	
<b>Total Coal Demand</b>	<b>136.7</b>	<b>119.9</b>	<b>56.4</b>	<b>63.6</b>	<b>119.9</b>	<b>55.5</b>	<b>58.4</b>	<b>113.9</b>	<b>53.1</b>	<b>57.9</b>	<b>111.1</b>
Transformation	84.8	70.7	31.5	37.5	68.9	31.7	35.4	67.1	30.0	33.7	63.7
Power Generation	84.8	70.7	31.5	37.5	68.9	31.7	35.4	67.1	30.0	33.7	63.7
Heat	-	-	-	-	-	-	-	-	-	-	-
Gas Manufacture	-	-	-	-	-	-	-	-	-	-	-
OilRefinery	-	-	-	-	-	-	-	-	-	-	-
<b>Total Final Consumption</b>	<b>51.9</b>	<b>49.2</b>	<b>24.9</b>	<b>26.1</b>	<b>51.0</b>	<b>23.8</b>	<b>22.9</b>	<b>46.8</b>	<b>23.1</b>	<b>24.2</b>	<b>47.3</b>
Industry	51.3	48.7	24.8	25.8	50.5	23.7	22.7	46.3	23.0	24.0	46.9
Transport	-	-	-	-	-	-	-	-	-	-	-
Buildings	0.6	0.5	0.2	0.3	0.4	0.1	0.3	0.4	0.1	0.3	0.4
<b>Consumption by products</b>											
Anthracite	7.9	7.2	3.4	3.9	7.3	3.4	3.0	6.3	3.1	2.7	5.8
Bituminous	128.8	112.7	53.0	59.6	112.6	52.1	55.4	107.6	50.1	55.2	105.3
Iron making	34.6	32.8	16.9	17.2	34.1	15.8	15.6	31.4	15.6	17.0	32.6
Cement	4.0	3.4	1.7	1.9	3.6	1.7	1.9	3.7	1.7	1.8	3.5
Power Generation	83.6	69.8	31.0	37.0	68.0	31.4	34.8	66.2	29.5	33.3	62.7

## Oil

(Mbbbl)

	2019	2020	2021p			2022e			2023e		
			1H	2H		1H	2H		1H	2H	
<b>Total Oil Demand</b>	<b>808.2</b>	<b>775.7</b>	<b>404.5</b>	<b>426.2</b>	<b>830.7</b>	<b>407.8</b>	<b>407.2</b>	<b>815.0</b>	<b>392.7</b>	<b>407.6</b>	<b>800.3</b>
<b>Crude Oil &amp; Refinery Feedstocks</b>	<b>1 159.0</b>	<b>1 089.3</b>	<b>526.2</b>	<b>562.9</b>	<b>1 089.1</b>	<b>564.7</b>	<b>591.2</b>	<b>1 155.9</b>	<b>543.0</b>	<b>589.8</b>	<b>1 132.8</b>
Transformation	1 159.0	1 089.3	526.2	562.8	1 089.1	564.5	590.9	1 155.4	542.8	589.5	1 132.3
Oil Refinery	1 159.0	1 089.3	526.2	562.8	1 089.1	564.5	590.9	1 155.4	542.8	589.5	1 132.3
<b>Petroleum products</b>	<b>- 350.8</b>	<b>- 313.6</b>	<b>- 121.7</b>	<b>- 136.7</b>	<b>- 258.4</b>	<b>- 156.9</b>	<b>- 184.0</b>	<b>- 340.9</b>	<b>- 150.4</b>	<b>- 182.2</b>	<b>- 332.5</b>
Transformation	-1 188.6	-1 106.8	- 534.6	- 570.5	-1 105.1	- 578.1	- 604.2	-1 182.3	- 555.8	- 603.8	-1 159.6
Power Generation	5.7	3.8	1.8	2.4	4.2	2.9	2.1	5.0	2.1	2.1	4.2
Heat	1.7	1.6	1.0	0.8	1.8	1.1	0.6	1.7	1.2	0.9	2.1
Gas Manufacture	0.4	0.6	1.1	1.2	2.4	0.2	0.1	0.4	0.2	0.1	0.3
Oil Refinery*	-1 196.3	-1 112.9	- 538.4	- 575.0	-1 113.4	- 582.3	- 607.1	-1 189.4	- 559.2	- 607.0	-1 166.2
<b>Total Final Consumption</b>	<b>796.1</b>	<b>752.3</b>	<b>394.0</b>	<b>415.1</b>	<b>809.1</b>	<b>398.8</b>	<b>396.8</b>	<b>795.6</b>	<b>384.0</b>	<b>398.2</b>	<b>782.2</b>
Industry	483.9	462.2	243.9	262.0	505.8	253.7	240.2	493.9	237.4	242.9	480.3
Transport	263.2	245.4	126.9	132.2	259.0	122.1	135.5	257.7	125.1	134.2	259.3
Buildings	49.1	44.7	23.3	21.0	44.2	23.0	21.0	44.0	21.5	21.1	42.6
<b>Consumption by products</b>											
Gasoline	82.7	81.0	40.8	44.0	84.9	40.3	48.1	88.3	42.0	47.2	89.2
Diesel	163.8	155.0	77.3	79.0	156.3	73.0	77.5	150.5	74.5	77.7	152.2
Kerosene	16.7	16.8	8.6	7.8	16.5	8.1	7.3	15.4	7.1	7.8	14.9
B-C	8.4	6.8	3.2	3.2	6.4	3.7	3.1	6.8	3.4	3.1	6.5
Jet Oil	13.1	7.8	7.8	7.8	15.5	7.6	8.0	15.6	7.3	7.8	15.1
LPG	110.9	109.1	54.6	54.6	109.2	60.7	54.8	115.6	52.8	54.4	107.2
Petrochem feedstock	46.9	48.8	22.7	24.6	47.3	31.0	25.1	56.2	23.8	25.1	48.9
Naphtha	365.4	333.9	177.5	192.4	369.9	181.1	174.9	356.0	172.9	176.9	349.8
Refinery gas	6.3	8.5	4.5	4.5	9.0	3.5	3.5	7.0	3.4	3.4	6.7
Other Non-Energy	28.8	33.3	19.7	21.6	41.3	20.8	19.6	40.4	20.6	19.9	40.5

\* Oil refinery is a process of manufacturing petroleum products by refining crude oil, and a negative (-) value means the production of petroleum products.

## Gas

	2019	2020	2021p		2022e			2023e			
			1H	2H		1H	2H		1H	2H	
<b>Natural Gas Demand (Mton)</b>	<b>41.0</b>	<b>41.5</b>	<b>24.1</b>	<b>21.7</b>	<b>45.9</b>	<b>24.2</b>	<b>21.2</b>	<b>45.3</b>	<b>23.7</b>	<b>21.3</b>	<b>45.0</b>
Transformation	38.0	38.0	22.4	19.9	42.4	22.5	19.6	42.1	22.1	19.5	41.6
Power Generation	19.4	20.0	11.8	11.5	23.2	11.4	11.1	22.5	11.2	11.4	22.7
Heat	-	-	-	-	-	-	-	-	-	-	-
Gas Manufacture	18.6	18.0	10.6	8.5	19.1	11.1	8.5	19.6	10.9	8.1	18.9
OilRefinery	-	-	-	-	-	-	-	-	-	-	-
<b>Total Final Consumption</b>	<b>1.5</b>	<b>1.6</b>	<b>0.8</b>	<b>0.9</b>	<b>1.7</b>	<b>0.8</b>	<b>0.9</b>	<b>1.7</b>	<b>0.9</b>	<b>0.9</b>	<b>1.8</b>
Industry	1.5	1.6	0.8	0.9	1.7	0.8	0.9	1.7	0.9	0.9	1.8
<b>City Gas Demand (Bm<sup>3</sup>)</b>	<b>22.4</b>	<b>22.0</b>	<b>13.2</b>	<b>9.6</b>	<b>22.7</b>	<b>13.9</b>	<b>9.7</b>	<b>23.6</b>	<b>13.1</b>	<b>9.4</b>	<b>22.6</b>
Transformation	-22.8	-22.1	-13.0	-10.4	-23.3	-13.7	-10.6	-24.3	-13.4	-9.9	-23.3
Power Generation	0.4	0.4	0.2	0.1	0.3	0.2	0.1	0.3	0.2	0.1	0.3
Heat	0.3	0.2	0.2	0.1	0.3	0.2	0.2	0.4	0.2	0.2	0.4
Gas Manufacture	-23.7	-22.9	-13.6	-10.8	-24.4	-14.4	-11.1	-25.5	-14.2	-10.5	-24.7
OilRefinery	-	-	-	-	-	-	-	-	-	-	-
<b>Total Final Consumption</b>	<b>22.4</b>	<b>22.0</b>	<b>13.2</b>	<b>9.6</b>	<b>22.7</b>	<b>13.9</b>	<b>9.7</b>	<b>23.6</b>	<b>13.1</b>	<b>9.4</b>	<b>22.6</b>
Industry	7.5	7.1	3.9	3.7	7.6	4.1	3.6	7.6	3.9	3.7	7.5
Transport	1.2	1.1	0.5	0.5	1.0	0.5	0.5	1.0	0.5	0.5	1.0
Buildings	13.8	13.8	8.7	5.3	14.1	9.3	5.6	15.0	8.8	5.3	14.1

\* Gas manufacture is the process of evaporating natural gas and controlling the amount of heat to supply city gas, and a negative (-) value means the production of city gas.

## Electricity

	2019	2020	2021p			2022e			2023e		
			1H	2H		1H	2H		1H	2H	
<b>Net Electricity Demand</b>	<b>559.6</b>	<b>548.9</b>	<b>277.1</b>	<b>295.9</b>	<b>573.1</b>	<b>289.7</b>	<b>301.0</b>	<b>590.7</b>	<b>287.6</b>	<b>303.1</b>	<b>590.7</b>
Own use and Losses	52.0	51.6	21.1	30.3	51.4	23.7	31.5	55.2	20.8	32.1	52.9
<b>Total Final Consumption</b>	<b>507.5</b>	<b>497.3</b>	<b>255.8</b>	<b>265.2</b>	<b>521.0</b>	<b>265.9</b>	<b>269.4</b>	<b>535.3</b>	<b>266.7</b>	<b>271.1</b>	<b>537.8</b>
Industry	266.6	254.7	133.1	136.5	269.6	137.8	136.3	274.1	136.8	137.7	274.5
Transport	3.2	3.3	1.8	1.9	3.7	1.9	2.1	4.0	2.0	2.3	4.2
Buildings	237.8	239.2	120.9	126.8	247.8	126.2	131.0	257.2	128.0	131.1	259.1
<b>Installed Electrical Capacity (GW)*</b>	<b>119.9</b>	<b>124.0</b>	<b>125.0</b>	<b>129.1</b>	<b>129.1</b>	<b>129.4</b>	<b>132.1</b>	<b>132.1</b>	<b>134.9</b>	<b>137.6</b>	<b>137.6</b>
Coal	37.0	36.9	35.8	37.7	37.7	36.6	37.7	37.7	38.2	39.6	39.6
Oil	3.9	2.2	2.2	2.2	2.2	1.0	0.9	0.9	0.9	0.9	0.9
Gas	39.4	41.2	41.2	41.2	41.2	41.2	41.2	41.2	41.2	41.2	41.2
Nuclear	23.3	23.3	23.3	23.3	23.3	23.3	23.7	23.7	24.0	24.0	24.0
Other Renewables	16.4	20.5	22.7	24.8	24.8	27.3	28.6	28.6	30.5	31.8	31.8
<b>Electricity Generation of Power Plants*</b>	<b>559.6</b>	<b>548.9</b>	<b>277.1</b>	<b>295.9</b>	<b>573.1</b>	<b>289.7</b>	<b>301.0</b>	<b>590.7</b>	<b>287.6</b>	<b>303.1</b>	<b>590.7</b>
Coal	227.4	196.3	89.5	108.4	198.0	90.7	102.6	193.2	85.8	96.5	182.3
Oil	3.3	2.3	1.0	1.3	2.4	1.2	0.8	2.0	0.9	0.8	1.6
Gas	144.4	145.9	85.7	82.6	168.3	83.0	80.6	163.6	81.9	82.8	164.7
Nuclear	145.9	160.2	77.2	80.8	158.0	86.7	89.4	176.1	88.3	92.2	180.6
Other Renewables	38.6	44.2	23.7	22.7	46.4	28.2	27.7	55.9	30.7	30.8	61.5
<b>Fuel Consumption of Power Plants (Mtoe)*</b>	<b>113.5</b>	<b>110.4</b>	<b>55.3</b>	<b>59.2</b>	<b>114.5</b>	<b>57.7</b>	<b>60.0</b>	<b>117.6</b>	<b>57.5</b>	<b>60.6</b>	<b>118.1</b>
Coal	49.9	41.6	18.5	22.0	40.6	18.4	20.6	39.1	17.5	19.6	37.1
Oil	0.8	0.6	0.3	0.3	0.6	0.4	0.3	0.6	0.3	0.3	0.5
Gas	25.3	26.1	15.4	15.0	30.4	14.9	14.5	29.4	14.7	14.9	29.6
Nuclear	31.1	34.1	16.4	17.2	33.7	18.5	19.0	37.5	18.8	19.6	38.5
Other Renewables	6.3	8.0	4.7	4.6	9.3	5.5	5.5	11.0	6.3	6.1	12.4

\* District Heat is classified by fuel type since 2014

## Heat and Other Renewables

(Mtoe)

	2019	2020	2021p			2022e			2023e		
			1H	2H		1H	2H		1H	2H	
<b>Net Heat Demand</b>	<b>2.7</b>	<b>2.8</b>	<b>1.6</b>	<b>1.2</b>	<b>2.8</b>	<b>1.9</b>	<b>1.3</b>	<b>3.2</b>	<b>1.8</b>	<b>1.4</b>	<b>3.2</b>
Own use and Losses	0.3	0.3	0.1	0.1	0.1	0.2	0.2	0.4	0.2	0.2	0.4
<b>Total Final Consumption</b>	<b>2.5</b>	<b>2.6</b>	<b>1.6</b>	<b>1.1</b>	<b>2.7</b>	<b>1.7</b>	<b>1.2</b>	<b>2.9</b>	<b>1.6</b>	<b>1.2</b>	<b>2.8</b>
Industry	-	-	-	-	-	-	-	-	-	-	-
Transport	-	-	-	-	-	-	-	-	-	-	-
Buildings	2.5	2.6	1.6	1.1	2.7	1.7	1.2	2.9	1.6	1.2	2.8
<b>Other Renewables</b>	<b>12.1</b>	<b>13.4</b>	<b>7.6</b>	<b>7.4</b>	<b>15.0</b>	<b>8.3</b>	<b>8.4</b>	<b>16.7</b>	<b>9.3</b>	<b>9.1</b>	<b>18.4</b>
Transformation	5.6	6.8	4.0	3.9	7.9	4.7	4.8	9.5	5.5	5.4	10.8
<b>Total Final Consumption</b>	<b>6.5</b>	<b>6.7</b>	<b>3.6</b>	<b>3.5</b>	<b>7.1</b>	<b>3.6</b>	<b>3.6</b>	<b>7.2</b>	<b>3.8</b>	<b>3.8</b>	<b>7.6</b>
Industry	4.0	4.0	2.2	2.2	4.4	2.3	2.3	4.6	2.4	2.4	4.8
Transport	0.7	0.7	0.4	0.4	0.7	0.4	0.4	0.7	0.4	0.4	0.8
Buildings	1.8	1.9	1.1	0.9	2.0	0.9	1.0	1.9	1.0	1.0	2.0

Note: Heat is mostly produced through combined heat and power (CHP) generation, and CHP is included in the power generation

