

Discussion Papers

Slovenia's energy balance and its continuing dependence on fossil fuels

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Summary¹

This analysis' aim is to examine Slovenia's energy balance and to show changes in the quantity and structure of energy by key items. The analysis shows the dependence of certain items on fossil fuel consumption and gives a broad assessment of their replacement by more climate-friendly sources, on the strict assumption that energy quantities will remain at 2023 levels and fossil fuels will be phased out in their entirety. The main source of data and of the methodology is the Statistical Office of the Republic of Slovenia (SORS). It should be noted that comparisons with the EU are provided only in footnote form and for information purposes; this is because the paper's focus is on Slovenia, there are differences in methodologies, and the data is not sufficiently up to date for comparison purposes. The unit of measurement used is the tonne of oil equivalent (toe).

An energy balance proceeds first and foremost from domestic production – that is, production within the borders of a country and based on available primary sources. In Slovenia, the central role in domestic production is played by nuclear energy. This is followed by imports, predominantly of petroleum products. Imports have a positive impact as they increase the quantity of energy available within the country (the reverse is true for exports). Domestic production and, in Slovenia's case, net imports together make up the country's energy supply, i.e. energy consumed within the country. Some of this energy is transformed into electricity and heat in electricity and thermal power plants for final domestic consumption and, in the case of electricity, for export as well. A further portion of energy supply is intended for final domestic consumption, which is the final element of the energy balance. This includes energy from domestic consumption, net imports and transformation into forms suitable for final consumption within society.

The energy balance shows that considerable progress is being made in reducing the country's energy footprint, as final consumption has been falling since 2008. The biggest contributors to this fall are manufacturing and households: the first mainly because of a fall in natural gas and electricity consumption, the second chiefly on account of the phasing-out of wood and heating oil. With a reduction in final consumption comes a reduction in the quantities of energy produced domestically, net imports of energy and energy transformation. Owing to increases in efficiency, the quantities of electricity and heat obtained in the transformation process remain relatively stable.

While the gradual fall in fossil fuel consumption is noticeable at all stages of the energy process, the quantities of energy that would be needed to be replaced by more climate-friendly sources (assuming the hypothetical complete phasing-out of fossil fuels) remain considerable. The basic findings, classified by descending order of items in the balance, are as follows:

- Domestic energy production totalled 3,373 million toe in 2023, a fall of 9.3% compared with 2007. This fall can be attributed to the phasing-out of solid fuel production, although solid fuels still accounted for 20.8% of domestic energy production in 2023. If they were to be completely phased out, but with a desire to maintain

¹ I would like to thank Teja Rutar from SORS for her help with methodology. This analysis uses data available on 28 January 2025.

domestic consumption at 2023 levels using more climate-friendly sources, domestic production would have to rise by just over a quarter, and by approximately 60% in the absence of additional nuclear energy sources.

- At 2.918 million toe, net energy imports were 22.5% lower. This was mainly on account of a fall in imports of petroleum products, although fossil fuels still accounted for 96.9% of net imports in 2023. Hypothetically, if we wished to replace fossil fuels with more climate-friendly sources domestically produced, the capacities would have to be at least doubled or increased by approximately 250% in the absence of additional nuclear energy sources. If they are replaced by imports, a similar energy revolution would have to take place in the net exporting countries.
- Fuel consumption in the transformation process totalled 2.924 million toe, but this was a fall of 14.4% because of the phasing-out of solid fuels. Fossil fuels accounted for 28.8% of energy transformation in 2023. If we wished to replace fossil fuels with more climate-friendly sources while retaining the same volume of transformation into electricity and heat, we would have to increase the consumption of those sources in the process by more than 40%, and by more than 130% in the absence of an increase in nuclear energy quantities.
- At 4.573 million toe, final energy consumption fell by 14.6% between 2007 and 2023. However, the share of fossil fuels within that total, considering current levels of consumption in the electricity and heat transformation process, can be roughly estimated at 66%. Hypothetically, if we wished to replace that share with more climate-friendly sources, we would have to triple their availability in final consumption. This would require radical changes across the whole energy process. These changes are most difficult to imagine in the transport sector, where fossil fuels accounted for 93.6% of total consumption in 2023.

Even rough calculations regarding the replacement of fossil fuels with more climate-friendly sources show how complex and extensive the decarbonisation process is. It requires substantial long-term investments in structural and technological changes, with the likelihood of negative impacts on stability of supply, competitiveness and prosperity for the duration of society's transformation process. That process is indeed taking place unevenly across the globe, which is why the costs of the energy transition can differ strongly from country to country and economy to economy. With their considerable dependence on energy imports, the projected high intensity of change and the strict time limits set for those changes, Slovenia and the EU would appear to be particularly vulnerable.

Description of the energy balance

The energy balance is an accounting framework for data on all energy products that enter, exit or are used within the borders of a particular country.

The energy balance covers all statistically significant energy products within a country, and their production, trade, transformation and consumption by different sectors. It measures all forms of energy and all energy flows using a common unit of measurement. The first step when drawing up an energy balance is to produce balances for each individual energy product using the units of measurement customary for them. The second step is to convert the balances of those individual energy products, which have different units of measurement, into a total balance expressed in the form of a single energy unit. In this analysis, the single energy unit selected is the tonne of oil equivalent (toe).²

The main items within an energy balance are domestic consumption, imports, exports, energy supply, transformation, own use, losses and final consumption. They are technically and substantively placed in this order in an energy balance. An energy balance also contains information on international maritime bunkers, stock changes, reclassifications, and statistical differences that are quantitatively small and therefore less important (Table 1).³

Domestic energy production is the starting point for the energy balance. This is production that takes place within the borders of the country and using locally available sources. This is followed by imports and exports, with imports predominant to a considerable extent (Slovenia is entirely dependent on foreign suppliers of petroleum products and natural gas). Energy supply is an aggregate item and shows the quantity of energy consumed within the borders of the country. It includes domestic production, net imports, stock changes and international maritime bunkers. This is followed by the transformation process, which includes the consumption of fuels to produce electricity and heat. It is an intermediate link between exports, supply and final energy consumption. Domestic and imported sources are included in the transformation item. Energy generated in the transformation process is available for final domestic consumption and export. The energy balance concludes with the final consumption of energy obtained from domestic production, net exports, and transformation into electricity and heat. This is energy consumption by end-users, i.e. in companies, transport, households and public institutions.

We can see from the energy balance for 2023, for example, that energy supply totalled 6.143 million toe in that year. On the one hand, domestic production contributed 3.373 million toe and imports 6.242 million toe; on the other, exports reduced energy supply by 3.324 million toe and stock increases by 0.148 million toe.⁴ We can also see that final energy consumption reached 4.573 million toe, which is the energy supply (6.143 million toe) increased by statistical differences (-0.006 million toe) and reduced

² Tonne of oil equivalent (toe) is a unit that expresses the quantity of heat released when burning one tonne of oil. It is an accounting unit used mainly to show energy consumption in energy balances. 1,000 toe = 41.868 TJ.

³ A more detailed description can be found in the SORS methodological note: Annual energy statistics.

⁴ In an energy balance, stock increases have a negative impact because they reduce current energy supply. Stock changes are calculated as the difference between stocks at the start of the year and stocks at the end of the year.

by energy losses in the transformation process ("Transformation – total" item, -1.363 million toe) and own use and losses (-0.213 million toe, Table 1).⁵

Table 1: Detailed presentation of Slovenia's energy balance for 2023

in 1,000 toe	Solid fuels	Crude oil	Petroleum products	Natural gas	Nuclear	Hydropower	Geothermal, solar, etc.	Renewables and waste	Electricity	Heat	Total
A. Domestic production	700.970	0.163	0.000	3.635	1459.915	431.708	169.552	607.012			3372.955
B. Imports	197.594	0.000	4486.592	655.666				118.510	783.667		6242.029
C. Exports	-1.637	-0.130	-2386.083	0.000				-22.665	-913.142		-3323.656
D. International maritime bunkers			0.000					0.000			0.000
E. Stock changes	-172.631	-0.033	24.317					0.399			-147.948
F. Energy supply (A+B+C+D+E)	724.296	0.000	2124.826	659.302	1459.915	431.708	169.552	703.256	-129.474	0.000	6143.380
G. Reclassification											
H. Statistical differences	8.276	0.000	0.000	-13.937	0.000	0.000	0.000	0.000	0.000	0.000	-5.661
I. Transformation – Total	-691.661	0.000	-4.249	-145.595	-1459.915	-431.708	-86.039	-104.576	1365.126	195.681	-1362.936
Electricity power plants – Total	0.000	0.000	-0.494	-1.036	-1459.915	-431.708	-85.188	-1.574	1025.064	0.000	-954.851
... power plants – producers, by core activity	0.000		-0.494	-1.036	-1459.915	-413.453	-2.626	-1.565	924.244		-954.845
... power plants – self-producers	0.000		0.000	0.000		-3.143	-82.561	-0.009	85.707		-0.006
... power plants – small hydroelectric						-15.112			15.112		0.000
Thermal power plants – Total	-690.900	0.000	-1.508	-95.693	0.000	0.000	0.000	-85.672	340.062	137.923	-395.789
... thermal power plants – producers, by core activity	-688.768		-1.452	-80.340				-72.968	319.395	136.034	-388.099
... thermal power plants – self-producers	-2.133		-0.057	-15.353				-12.704	20.667	1.889	-7.690
Heating plants	-0.761		-2.246	-48.866			-0.851	-17.330		57.758	-12.296
Gas plants											0.000
Refineries											0.000
Coal processing											0.000
Liquefaction											0.000
J. Own use and losses									-164.626	-48.639	-213.265
K. Final consumption (F+G-H+I+J)	24.359	0.000	2120.577	527.643	0.000	0.000	83.513	598.680	1071.025	147.042	4572.840
... energy sector	0.000		0.653	0.407			0.000	0.000	7.226	1.274	9.560
... manufacturing and construction	19.357		104.827	381.086			0.233	126.350	404.134	37.372	1073.358
... transport	0.000		1729.758	4.901			-	94.812	24.184	-	1853.655
... households	0.002		121.690	84.075			63.347	352.741	350.706	67.461	1040.023
... agriculture and forestry	0.000		69.292	0.000			2.592	0.000	2.095	0.000	73.980
... services	0.000		54.718	52.785			17.341	24.777	247.035	40.518	437.174
... other users	0.000		34.264	0.000			0.000	0.000	35.644	0.416	70.324
... non-energy use	5.001		5.376	4.390							14.766

Source: SORS.

2 Domestic energy production

Nuclear energy is the main item within the domestic energy production structure, although total production is falling because of the gradual phasing-out of solid fuels.

Slovenia's domestic energy production sources are nuclear energy, solid fuels, renewable energy sources and waste, hydropower, and geothermal and solar power.⁶ Domestic production is falling because of a fall in solid fuel production.⁷ In 2007 it totalled

⁵ According to information provided by SORS, statistical differences arise because of differences in the way data is collected and differences in the administrative resources available. Owing to differences in methodological approach, data is not always captured fully, which can show up as statistical differences in energy balances. When final consumption is calculated, they are deducted from energy supply.

The own use and losses item includes own use in electricity power plants (lighting, operation of pumps, fuel preparation, etc.), grid distribution and transmission losses, and the consumption of electricity for pumping at a pumping hydroelectric power plant.

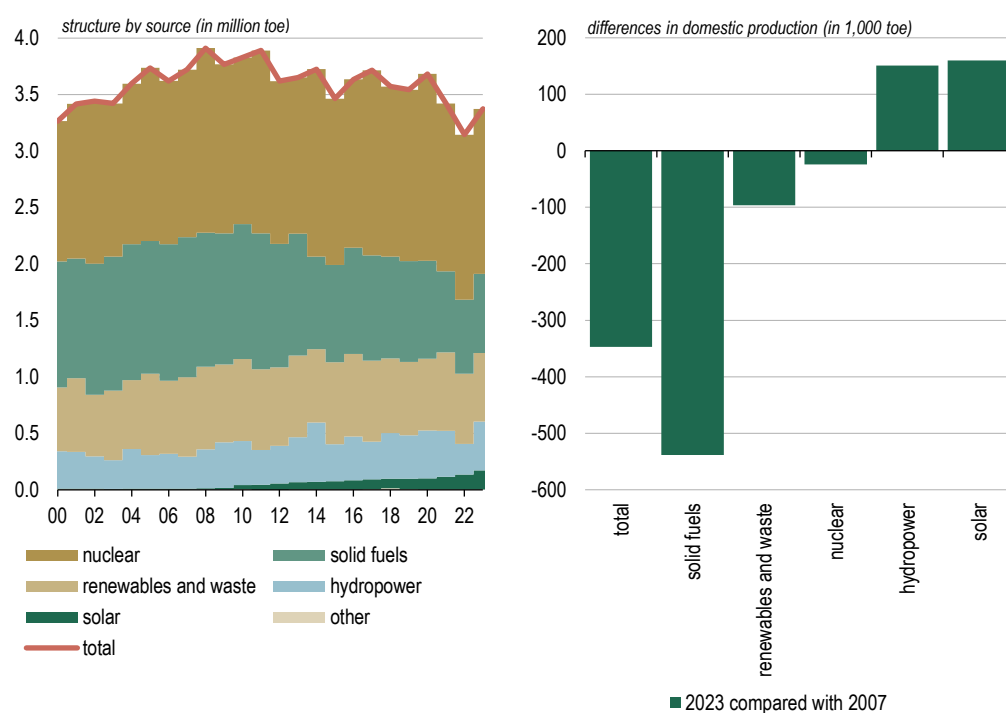
⁶ When compiling the Slovenian energy balance, SORS proceeds in line with the internationally accepted methodology by which nuclear power is counted as a domestic source and uranium ore is not included in the energy statistics.

⁷ In the period observed (2000–2023), domestic energy production reached a peak of 3,911 million toe in 2008. Since 2008 was an exceptional year for energy, particularly in terms of energy imports and consumption in transport, inter-year comparisons in this analysis are based on 2007, which was the last "normal" year before the crisis year of 2009.

3.720 million toe, but had fallen by 0.347 million toe (or 9.3%) to 3.373 million toe by 2023 (Figure 1).⁸ Since Slovenia does not have its own sources of oil and gas, nuclear energy accounts for the largest single share (43.3% in 2023). A direct comparison between individual years can be imprecise because production fluctuates on account of factors such as the volume of water in rivers and repairs at Krško nuclear power plant.

There has been a clear move away from solid fuels. Although it still occupied second place within the structure of domestic production in 2023 with 20.8%, this was 12.5 percentage points lower than in 2007, chiefly because of a fall in lignite extraction. In the period observed, lignite production reached its peak in 2003 at 4.222 million tonnes. By 2023, this figure had fallen by 39.1% to 2.571 million tonnes. At the same time, brown coal mining came to an end in 2013. Renewables and waste⁹ are next on the list with an 18% share, followed by hydropower with a 12.8% share. The share of the former, measured in toe, has been falling since 2016, while the latter has seen a slight upward trend in the last 20 years. Solar power¹⁰ reached a 5% share in 2023, which was an increase of 4.8 percentage points compared with 2008. In recent years, this share has risen sharply (Figure 1, left).

Figure 1: Domestic energy production



Sources: SORS, author's calculations

In the domestic balance of solid, liquid and gaseous fuels, the following solid fuels were used in 2023, in descending order of quantity: lignite, brown coal, black coal and anthracite, coke and petroleum coke. In terms of share, domestic lignite was far ahead of the other solid fuels, although the quantity of brown coal imported is also worthy of note. According to the E-PE/L classification (Energy and non-energy consumption of energy, fuels and selected petroleum products, V1), solid fuels also include wood and wood waste, which are included under the renewables and waste item in the energy balance.

⁸ Between 2007 and 2022 (according to Eurostat), domestic energy production fell by 18.5% in the EU and by 18.7% in Slovenia. The reason for this pronounced fall lay in the poor hydrological conditions (severe drought) seen in 2022.

According to SORS, Eurostat does use Slovenian data to compile energy balances and indicators, but there are methodological differences in the compilation process, including the use of different calorific values for conversion into energy units.

⁹ The renewables item of the energy balance includes biomass, biofuels, biogas, wind, renewable industrial waste and renewable municipal waste. Solar, geothermal and hydropower are shown separately.

¹⁰ The item also includes geothermal power, but its share is small.

If we wished to entirely remove solid fuels from the national energy mix but retain domestic energy production at 2023 levels, we would have to replace 0.701 million toe of energy with energy from other sources. If solid fuels are replaced by a combination of more climate-friendly sources (nuclear, renewables and waste, hydro and solar), a total of 2.668 million toe, those sources would have to be increased in quantity by more than a quarter, one for one; and if the quantity of nuclear power were to remain at the same level (1.460 million toe in 2023), they would have to be increased by around 60%. Hypothetically, the replacement of solid fuels with solar power alone (0.170 million toe in 2023) would require an increase in this source type of more than 400%. The stability of domestic supply would be compromised by seasonal and weather factors, and by a lack of sufficient energy storage capacities.

3 Net energy imports

Although imports of fossil fuels are gradually falling, they remain indispensable to the normal functioning of the economy and society.

As is generally the case in the EU, Slovenia is not blessed with large quantities of classic energy sources. This means that, given the current energy and technology structure, large quantities of fossil fuels must be imported if the economy and society as a whole are to function normally.¹¹ Owing to its co-ownership with Croatia of Krško nuclear power plant (NEK), Slovenia is a net exporter of electricity according to the energy balance. However, it is entirely dependent on imports for all other key sources in international energy trade (Figure 2, left).

As net imports of energy are falling slightly faster than domestic production, their ratio to domestic production is also gradually falling. In the 2000–2008 period, they frequently outstripped domestic production but after 2008 only in 2022, when domestic production was marked by poor hydrological conditions and savings in coal use. In 2023 net imports accounted for 86.5% of domestic production, which was eight percentage points below the average for 2000–2023.¹²

Net energy imports reached a peak of 4.190 million toe in 2008. However, that year is not the most suitable one for long-term comparisons because of the extremely high one-off import of petroleum products (Figure 2, left). At 2.918 million toe, energy imports in 2023 were down 22.5% (or 0.846 million toe) in comparison with the more “normal” year of 2007. Within that figure, imports of petroleum products fell by 15.8%, natural gas imports by 28.1% and solid fuel imports by 40.6%. In absolute terms, the biggest contribution to the fall came from a reduction in imports of petroleum products of 0.394 million toe, natural gas (0.256 million toe) and solid fuels (0.134 million toe) (Figure 2, right).

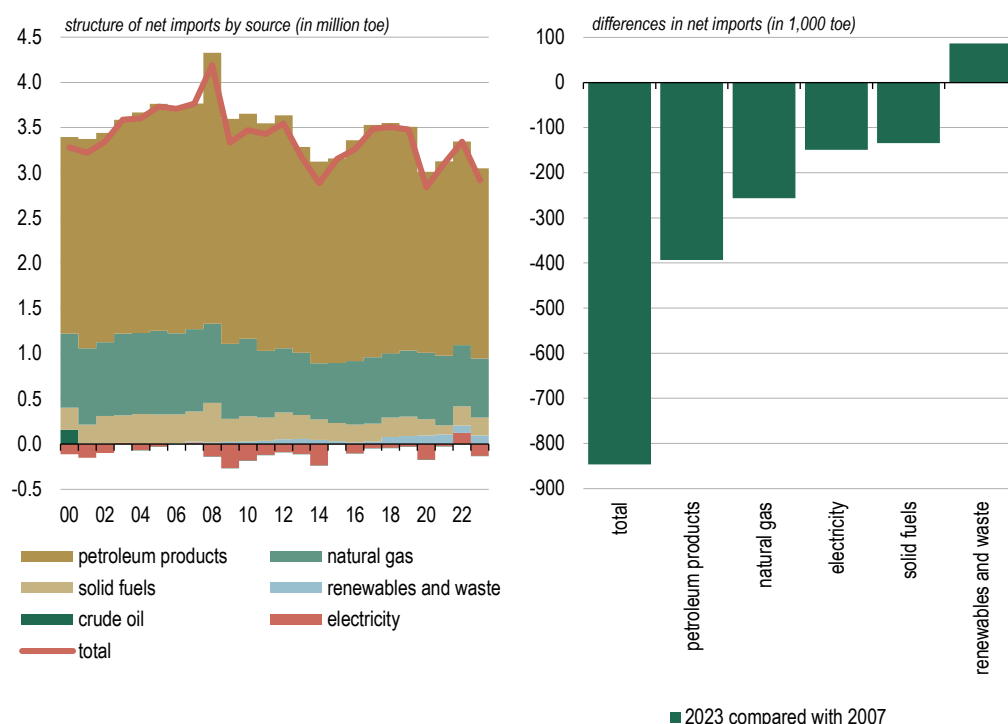
¹¹ Fossil fuels include solid fuels, crude oil and petroleum products, and natural gas.

¹² The energy dependence indicator, which measures dependence on energy imports and is defined by SORS as the ratio between net imports and energy supply at national level, shows a similar picture. In 2023 it was 47.5%, which was 1.4 percentage points below the average for 2000–2023. In 2022, according to Eurostat, the EU’s energy dependence was 62.5% and Slovenia’s 54%. On average over the 2000–2022 period, Slovenia’s energy dependence was 6.8 percentage points lower than the EU average.

If only net import sources are considered in energy trade, we find that fossil fuels accounted for 96.9% in 2023 (2.952 million toe). This is just over 10% (or 0.284 million toe) more than the total energy produced domestically from more climate-friendly sources. Hypothetically, if we wished to replace the quantity of net imports of fossil fuels seen in 2023 on a one-for-one basis with domestic production from more climate-friendly sources (nuclear, renewables and waste, hydro and solar), we would have to increase those sources by more than 110%, i.e. capacities would have to be at least doubled. Without an increase in the quantities of nuclear energy produced, other more climate-friendly sources, domestically produced, would have to be increased by around 250%.

Hypothetically, if we wished to replace fossil fuels with net imports of more climate-friendly energy, a similar energy revolution would have to take place in the net exporting countries. This would require substantial long-term investments in structural and technological changes across the whole of society, with the likelihood of negative impacts on competitiveness and prosperity at least for the duration of the transition process. The transition is indeed taking place unevenly, in an uncoordinated fashion and with large differences in levels of commitment across the globe, which is why the costs of the energy transition can differ strongly from country to country and economy to economy.¹³

Figure 2: Net energy imports



Sources: SORS, author's calculations

¹³ The most recent example is the announcement that the US are again withdrawing from the Paris Climate Agreement. Source: "Izstop ZDA iz pariškega sporazuma smrtna rana podnebnim prizadevanjem" (US withdrawal from the Paris agreement a fatal blow to climate efforts).

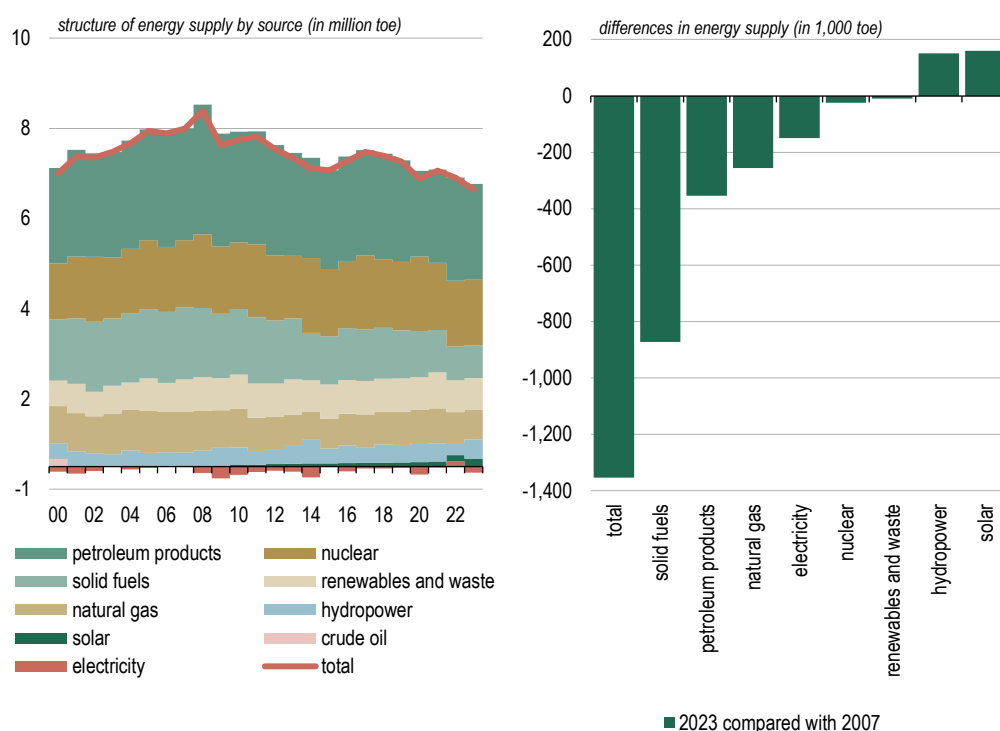
In the last two decades, the increase in more climate-friendly sources for energy supply has been relatively small in absolute terms.

Since the global economic and financial crisis reached its peak in 2009, energy supply has dropped in tandem with the fall in domestic production and imports. In 2023 it stood at 6.143 million toe, which was a fall of 18.1% (or 1.354 million toe) in comparison with 2007.¹⁴

Fossil fuels are the largest single source, but even they have declined markedly within supply. They accounted for 4.990 million toe in 2007 and 3.508 million toe in 2023 – a fall of 29.7% (1.481 million toe). Solid fuels have seen the biggest fall, of 54.6% (0.872 million toe). In terms of quantity, these sources are followed by petroleum products (a fall of 14.3%, or 0.354 million toe) and natural gas (a fall of 27.9%, or 0.255 million toe).

Alongside the fall in fossil fuel supply, the increase in more climate-friendly energy sources has been relatively small in absolute terms (hydropower 0.151 million toe, solar power 0.160 million toe, Figure 3).

Figure 3: Energy supply



Sources: SORS, author's calculations

¹⁴ Between 2007 and 2022 (according to Eurostat), energy supply fell by 15.3% in the EU and by 16.8% in Slovenia.

The quantity of domestically produced electricity and heat has not increased since 2008, although the transformation process is now more efficient.

Transformation involves the consumption of fuels to produce electricity and heat. This process used 2.924 million toe in 2023, which was a fall of 14.4% on the figure for 2007. In 2023 the most important source for transformation was nuclear power (49.9%), followed by solid fuels (23.7%) and hydropower (14.8%). The shares taken by other sources are small: natural gas 5%, renewables and waste 3.6%, and solar a mere 2.9% (Figure 4).

It is evident from the changes in the structure of sources in transformation that environmentally friendly production is becoming more important to domestic electricity and heat production as the phasing-out of solid fuels is clear. In 2007 they matched nuclear power in terms of quantity (1.470 million toe), but by 2023 consumption of solid fuels had fallen by 53% (by 0.779 million toe to 0.692 million toe). In the same period, consumption of hydropower increased by 0.151 million toe, solar power by 0.086 million toe, and renewables and waste by 0.071 million toe (Figure 4, right).

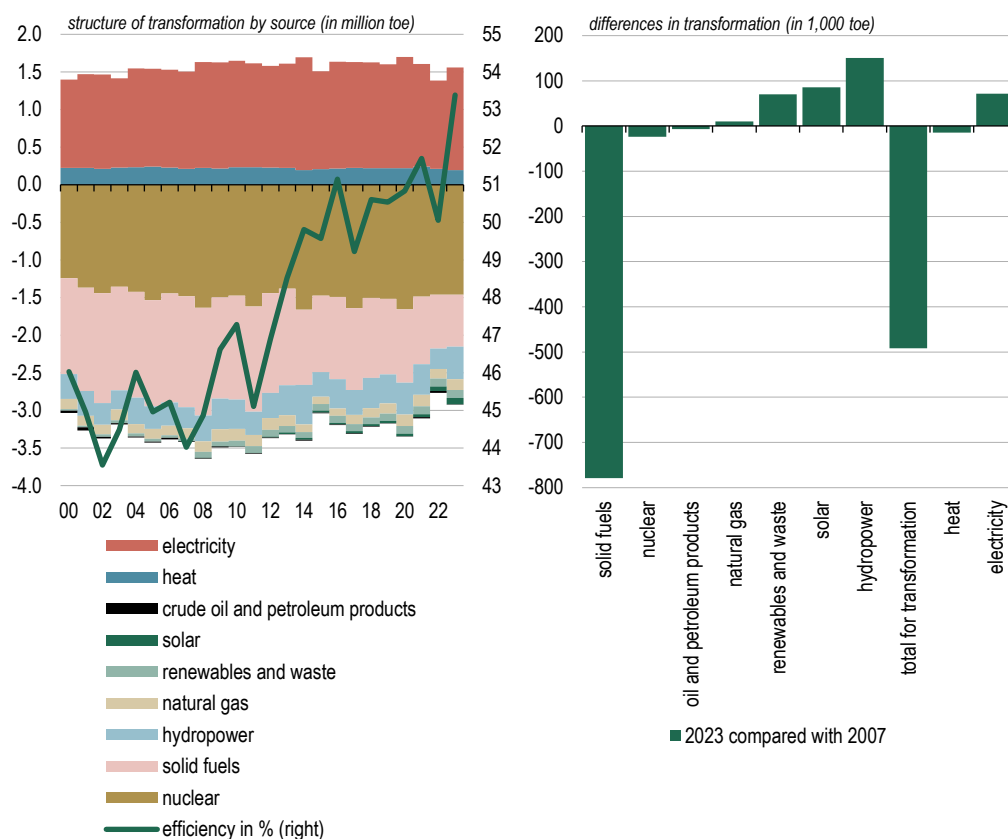
The quantity of electricity and heat generated through transformation has not been increasing since 2008 and fluctuates at around 1.6 million toe per year (Figure 4, left). However, the quantity of energy required to generate this electricity and heat is lower than previously, which means that the transformation process has become more efficient. Where energy efficiency in the transformation process was constantly below 50% before 2016 (ratio between electricity and heat generated and the energy involved in the transformation process), it has mostly been above 50% since 2016.¹⁵ In 2023 electricity and heat accounted for 53.3% of all energy used in the transformation process, which was the highest figure recorded in the 2000–2023 period (Figure 4, left).

In 2023 the share of fossil fuels involved in transformation was 28.8% (0.842 million toe). Hypothetically, if we wished to replace fossil fuels in their entirety (one for one) with more climate-friendly sources (nuclear, renewables and waste, hydro and solar) while maintaining transformation volumes at 2023 levels, we would have to increase our use of those sources by more than 40%. Without an increase in the quantities of nuclear energy produced, other more climate-friendly sources would have to be increased by around 130%. In both cases, the technological process of transformation into electricity and heat would have to be radically altered as a change of this type would require the abolition of thermal power plants.¹⁶

¹⁵ Šoštanj 6 thermal power plant (TEŠ6) obtained an operating permit in 2016. Owing to technological advances, the investment raised the net efficiency of the plant from 32% to 43%. Source: Brošura-60-let-TEŠ (Brochure celebrating 60 years of TEŠ). The thermal efficiency of Krško nuclear power plant is 36%. Source: Production and maintenance | Operation | Krško nuclear power plant.

¹⁶ The updated Integrated National Energy and Climate Plan (NECP 2024), adopted on 18 December 2024, envisages an exit from coal by 2033, with gas capacities being retained. Source: Updated Integrated National Energy and Climate Plan with ambitious but realistically achievable targets | GOV.SI.

Figure 4: Transformation of energy sources into electricity and heat



Sources: SORS, author's calculations

Note: In the figure on the left, the quantities of energy products that enter the transformation process are shown below the x-axis with negative values. The quantities of electricity and heat generated by the process are shown above the x-axis and have positive values. Efficiency is the ratio between the quantities of energy products below the x-axis and above the x-axis.

6

Final energy consumption

Final energy consumption is becoming more climate-friendly, but fossil fuels are still way out in front.

Final consumption has gradually fallen since 2008, causing reductions in energy quantities in the other main energy balance items. In 2023 it stood at 4.573 million toe, which was a fall of 14.6% (or 0.784 million toe) compared with 2007 (Figure 5, right).^{17,18}

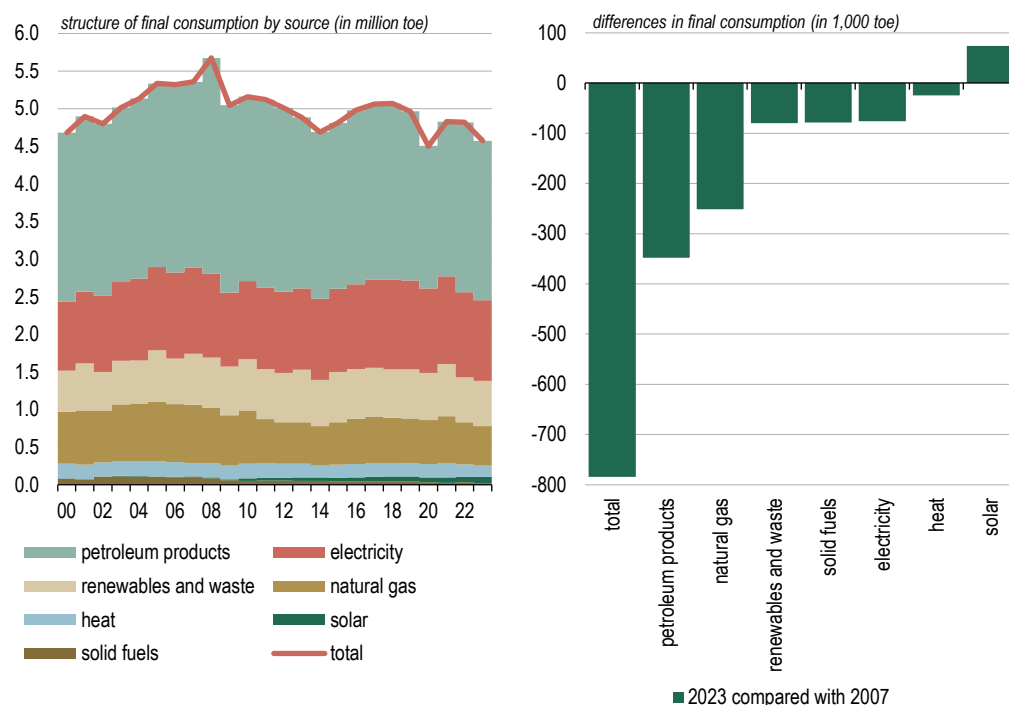
Most (86%) of this reduction was the result of a direct fall in the final consumption of fossil fuels. The consumption of petroleum products fell by 0.348 million toe (-14.1%), natural gas by 0.252 million toe (-32.3%) and solid fuels by 0.078 million toe (-76.3%). In total, final consumption of fossil fuels fell by 0.678 million toe, or more than

¹⁷ In NECP 2024, the Slovenian government set a target for final energy consumption of no more than 4.320 million toe by 2030. That is a 5.5% reduction on the 2023 figure. In the 2007–2023 period, there was an average annual fall in final energy consumption of 0.9%. Source: Updated Integrated National Energy and Climate Plan with ambitious but realistically achievable targets | GOV.SI.

¹⁸ Between 2007 and 2022 (according to Eurostat), final energy consumption fell by 8.6% in the EU and by 8.3% in Slovenia.

a quarter. Of the more climate-friendly sources, only solar power consumption has increased, but only by 0.074 million toe (Figure 5, right).

Figure 5: Final energy consumption



Sources: SORS, author's calculations

Despite the fall, fossil fuels still account for the bulk of final consumption. Their direct share was 58% in 2023, which was only five percentage points lower than in 2007. Hypothetically, if we wished to replace this share in terms of quantity on a one-for-one basis while still maintaining final consumption at 2023 levels, we would have to increase the toe of other sources by approximately 140%. If we also take current fossil fuel consumption in the process of transformation into electricity and heat into consideration, the dependence of final consumption on fossil fuels is even more considerable (approximately 66%), which further highlights just how extensive and complex the process of decarbonising domestic production and net imports is. Under this scenario, there would have to be an increase of around 200% in the quantity of energy produced from more climate-friendly sources.¹⁹

¹⁹ The share taken by fossil fuels in the transformation process was 28% in 2023. A total of 2.924 million toe of energy was consumed; with energy losses of 1.363 million toe, this gives a total of 1.560 million toe of electricity and heat generated. Taking own use and losses of 0.213 million toe and net exports of 0.129 toe into account, 1.218 million toe of electricity and heat went towards final consumption. If we include the share of fossil fuels in transformation in this value, we can estimate that 0.351 million toe of electricity and heat in final consumption came from fossil fuels in 2023.

This indirectly means that the share of fossil fuels in total final energy consumption was 66%, or 3.024 million toe. Hypothetically, if we wished to replace this quantity of energy in final consumption with more climate-friendly sources (which accounted for 1.549 million toe of final consumption in 2023), we would, at a rough estimate, have to increase their availability by around 200%. Simply by replacing fossil fuels with electricity and heat produced from more climate-friendly sources would require the availability of those sources to be increased by around 350%.

In the case of final consumption, it would be impractical to calculate a scenario that did not include an increase in the quantities of nuclear energy produced. Nuclear energy takes a 50% share in the transformation process, although half the electricity produced at NEK goes to Croatia. In the energy structure of imports, the complexity of the required assumptions would be even greater, as would the number of unknowns.

NECP 2024 sets as the target value a share of renewables in final energy consumption of 33% by 2030, or 1.426 million toe relative to the target total final energy consumption. Direct final consumption of renewables (renewables and waste, geothermal and solar) amounted to 0.682 million toe in 2023. The share of renewables in transformation was 21.3% in 2023. If we carry this share over into final consumption, we can give a rough estimate that 0.259 million toe of electricity and heat in final consumption came from renewable sources. Renewables were responsible for 0.942 million toe in final consumption in 2023. If we wish to reach the 2030 target value, their availability must increase by more than 50% over the next five years.

The biggest contributors to the total fall in final energy consumption are manufacturing and households, while the services sector and transport continue to be responsible for consumption increases.²⁰

Final energy consumption was lower in 2023 than in 2007 in the majority of sectors. Manufacturing and construction contributed most (68.2%) to the total fall, with reductions in consumption of 0.535 million toe (33.2%). This can be linked to technological improvements in production and to the negative effects of high electricity and natural gas prices. This is most clearly seen in the fall in production in energy-intensive manufacturing sectors, with the final discontinuation of domestic aluminium production in 2023 being the most significant factor. The share of this sector in total final consumption therefore fell by 6.5 percentage points to 23.5% (Figure 6).

By absolute magnitude of fall, this is followed by households (0.262 million toe, which is a fall of 20.1% compared with 2007). At 22.7%, the share taken by households in total final consumption was down 1.6 percentage points. This is a major achievement if we consider that the population has grown, and one that can be attributed to warmer winters, the energy renovation of buildings, the use of heat cost allocators, more advanced heating equipment, and the savings made on account of the high electricity and natural gas prices seen in the last few years.

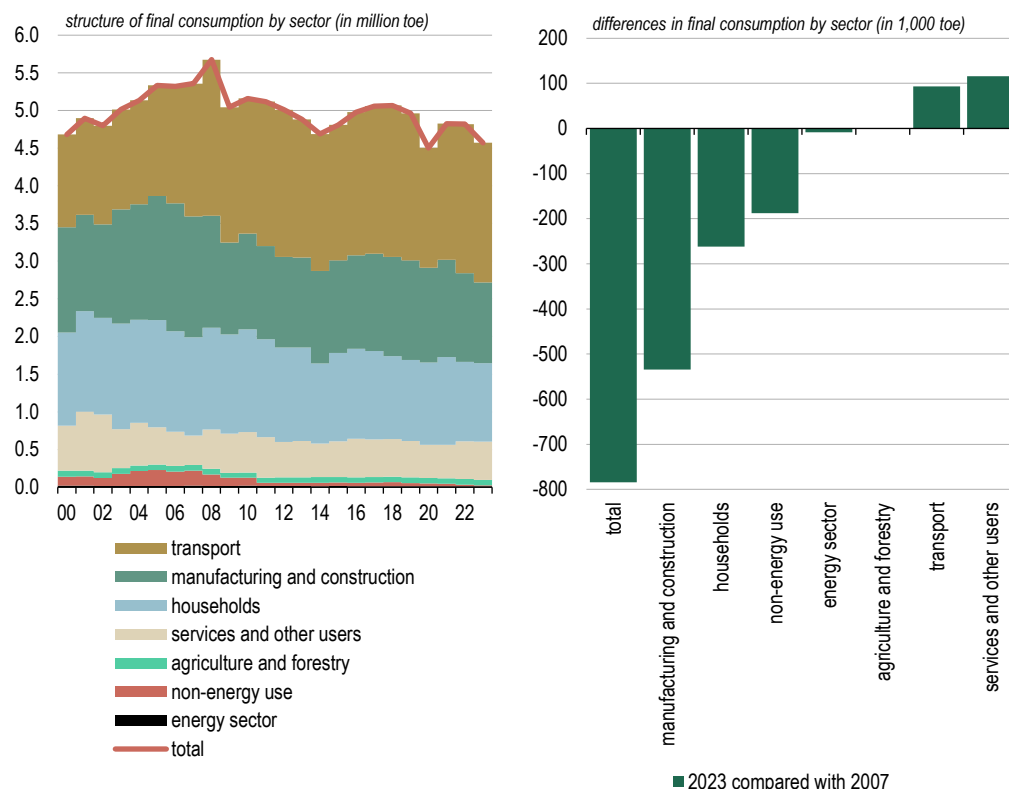
Non-energy use has fallen strongly (by 0.188 million toe, or 92.7%) to become a negligible factor in total final energy consumption.²¹ There have also been further falls in the energy sector and, to a lesser extent, in agriculture and forestry, although the share taken by these sectors in total final consumption is extremely small.

Final consumption in the services sector, other users and transport was higher in 2023 than in 2007. The services sector stands out here: an increase of 0.116 million toe or 29.5%, which increased its share by 3.8 percentage points to 11.1%. This can be attributed to the gradual reorientation of the economy towards services, whose share of value added in GDP (excluding transport and storage) increased by 2.8 percentage points to 51.7% in the period observed. The increase in final consumption in transport was 0.093 million toe, or 5.3%. Its share increased by 7.7 percentage points to 40.5% because of growth in the transport logistics sector and international trade in transport services, the number of road vehicles and international tourism (Figure 6).

²⁰ See also Review of macroeconomic developments, September 2024, pp. 35–39 ([Publications | Banka Slovenije](#)) and Luka Žakelj: Razmere v slovenskih energetske intenzivnih predelovalnih panogah (Situation in energy-intensive manufacturing sectors in Slovenia) ([Original publications | Banka Slovenije](#)).

²¹ Non-energy use means the use of energy sources as raw materials in certain sectors, i.e. they are not used as fuels nor converted into other energy sources. Final consumption in the energy sector includes the consumption of fuels and energy in fuel extraction and production but does not include own consumption of fuels and energy in electricity and thermal power plants.

Figure 6: Final energy consumption by sector



Sources: SORS, author's calculations

Note: Non-energy use means the use of energy sources as raw materials in certain sectors, i.e. they are not used as fuels nor converted into other energy sources. Final consumption in the energy sector includes the consumption of fuels and energy in fuel extraction and production but does not include own consumption of fuels and energy in electricity and thermal power plants.

The overview of consumption of energy sources by sector chiefly shows a fall in natural gas and electricity consumption in manufacturing, and of renewables and petroleum products in households.

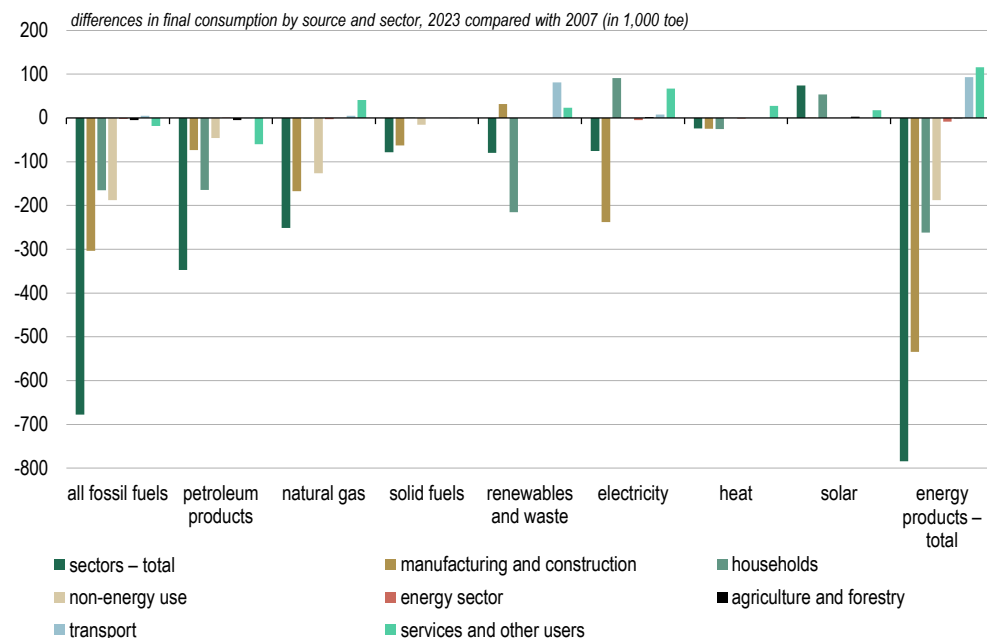
Except for transport, fossil fuel consumption was lower in all sectors in 2023 than it was in 2007. The manufacturing and construction sectors were the biggest contributors to the fall: 0.303 million toe (or 44.8%), with natural gas accounting for 0.167 million toe of this total. These were followed by non-energy use, with a fall of 0.188 million toe (a contribution of 27.7%). In the case of non-energy use as well, the biggest reduction among the fossil fuels was in natural gas (0.126 million toe). Households reduced their fossil fuel consumption by 0.165 million toe, accounting for 24.4% of the total fall. Lower consumption of petroleum products accounts for almost the entire fall and can be attributed to the phasing-out of heating oil to heat residential buildings. The contribution of other sectors to the phasing-out of fossil fuels was negligible. At the same time, the increase in consumption of fossil fuels in transport was also negligible, at a mere 0.3%, although that consumption still accounted for 93.6% of total consumption in the sector in 2023 (Figure 7).²²

Seen in aggregate terms, changes in the consumption of other sources were minor, but with two prominent examples among the sectors. The fall in the consumption of renewables and waste is the result of the reduction in the household sector (in particular wood for heating residential buildings), which was considerable (0.215 million toe or

²² Direct share of fossil fuels in total energy consumption in 2023: agriculture and forestry 93.7%, transport 93.6%, manufacturing and construction 47.1%, services and other users 27.9%, households 19.8% and the energy sector 11.1%.

37.9%), while the fall in electricity consumption was the result of a pronounced decline in manufacturing activities (0.238 million toe or 37.1%). The quantitative increase in solar energy consumption was insignificant when placed against the aggregate volume of consumption and mostly originates from the household sector (Figure 7).

Figure 7: **Final energy consumption by sector**



Sources: SORS, author's calculations

Note: Non-energy use means the use of energy sources as raw materials in certain sectors, i.e. they are not used as fuels nor converted into other energy sources. Final consumption in the energy sector includes the consumption of fuels and energy in fuel extraction and production but does not include own consumption of fuels and energy in electricity and thermal power plants.

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