Calculation methodologies for the share of renewables in energy consumption

Data extracted in August 2019

The aim of this article is to describe the key aspects of the most common methods used to calculate the share of renewables in energy consumption in the European Union (EU) . In addition, this article also provides additional methodological details on the primary energy content from renewable energy sources, which are essential to understand the calculation of the aggregates needed for the different types of shares of renewables.

Definition of the primary energy content of fuels

Table 1 shows the four most commonly used indicators to calculate the share of renewables in energy consumption. There are fundamental differences in the results and the underlying reasons for these differences might not be obvious to non-experts in the field of energy statistics.

Various indicators on the share of renewable energy in the total energy consumption for EU-28
Percentage (%)

	1990	2000	2005	2010	2015	2016	2017
Gross available energy	4.2	5.6	6.5	9.7	12.9	13.2	13.6
Gross Inland Energy Consumption	4.3	5.7	6.7	10.0	13.3	13.5	13.9
Total energy supply	4.4	5.8	6.8	10.2	13.7	13.9	14.4
Energy Available for Final Consumption	3.4	4.2	4.8	7.0	8.2	8.3	8.8
Final Energy Consumption	3.8	4.6	5.3	7.7	9.0	9.0	9.7
Directive 2009/28/EC (SHARES tool)	:	:	9.1	13.1	16.7	17.0	17.5

Source: Eurostat (online data code: nrg_bal_s and nrg_ind_ren)

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Table 1: Various indicators on the share of renewable energy in the total energy consumption for EU-28Percentage (%)Source: Eurostat (nrg_bal_s) (nrg_ind_ren)

For directly combustible fuels (fossil and renewable fuels/products[1]) the primary energy content is calculated as the heat value generated during combustion of this fuel.

For non-conventional energies (hydro, wind, solar photovoltaic, geothermal, nuclear and others) it is necessary to establish energy boundaries and make methodological choices in order to define their nature and quantity of primary energy.

The choice for Eurostat 's energy statistics and energy balances is to use the physical energy content method.

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[1]This concept applies to primary fuels (crude oil, natural gas, coal) as well as derived fuels (motor gasoline, gas/diesel oil, coke oven coke, wood pellets, etc.).

The general principle of this method is that the primary energy form is taken as the first flow in the production process that has a practical energy use. This leads to different situations depending on the energy product:

- For directly combustible energy products (for example lignite, natural gas, motor gasoline, biogas, firewood and combustible municipal waste) the primary energy is defined as the heat generated during combustion.

- For products that are not directly combustible, the application of this principle leads to:

  - the choice of heat as the primary energy form for nuclear, geothermal, solar thermal and ambient heat; and

  - the choice of electricity as the primary energy form for solar photovoltaic, wind, hydro, tide, wave, ocean.

In cases when the amount of heat produced in the nuclear reactor is not known, the primary energy equivalent is calculated from the electricity generation by assuming an efficiency of 33 %. In the case of electricity and heat generated by geothermal energy: if the actual amount of geothermal heat is not known, the primary energy equivalent is calculated assuming an efficiency of 10 % for electricity production and 50 % for derived heat production.If two energy balances are constructed with different methodological choices and respective assumptions on efficiency conversions and calorific values, it will lead to different results for the share of renewables.

Gross available energy

This aggregate is calculated with the following arithmetic definition:

Gross available energy = Primary production + Recovered & Recycled products + Imports – Export + Stock changes

For the total of all products, the Gross available energy is one of the most important aggregates of energy balance and represents the quantity of energy necessary to satisfy all energy demand of entities operating under the authorities of the geographical entity under consideration. Its interpretation for individual products is different. For secondary products, which are produced as transformation output and not as primary productions, the Gross available energy can be negative. This aggregate includes both international maritime bunkers (fuels delivered to ships of all flags that are engaged in international navigation at sea, on inland lakes and waterways, and in coastal waters) and international aviation (fuels delivered to aircrafts for international aflights, determined on the basis of departure and landing locations and not by the nationality of the airline).

Gross inland energy consumption

The gross inland energy consumption (also called gross inland consumption) of all products represents the quantity of energy necessary to satisfy inland consumption of the geographical entity under consideration. This aggregate excludes international aviation but includes international maritime bunkers.

For primary fossil fuels (coal, oil, natural gas), gross inland energy consumption represents the quantities of energy that were consumed in the country/region. It is calculated from the supply perspective and reflects the actual production, imports, exports and stock changes, minus international aviation. All forms of renewable energies are treated as primary fuels and thus all renewable energy is included in the gross inland energy consumption.

For derived fossil products, as well as for electricity and derived heat, the quantities of energy only reflect the trade (imports and exports) and stock changes of the commodities, because these energy goods cannot be produced directly from nature (i.e. their primary production is zero). These energy goods are always produced by transformation of primary fossil fuels. In the gross inland energy consumption these derived fuels are accounted as primary fuels, from which they were produced.

Total energy supply

This aggregate follows the recommendations in the International Recommendations for Energy Statistics for key aggregates of energy balances. This is an aggregate with the following arithmetic definition:

Total energy supply = Primary production + Recovered & Recycled products + Imports – Export + Stock changes – International maritime bunkers – International aviation.

Therefore, it excludes both international maritime bunkers and international aviation.For the total of all products, the total energy supply is one of the most important aggregates of energy balance and represents the quantity of energy necessary to satisfy inland consumption (inland fuel deliveries) of the geographical entity under consideration. Its interpretation for individual products is different. For secondary products, which are produced as transformation output and not as primary productions, the total energy supply can be negative.

Share of renewable energy based on gross available energy, gross inland energy consumption and total energy supply

The share of energy from renewable sources calculated on the level of gross available energy, gross inland energy consumption and total energy supply represents the ratio of renewable energy consumed in the country/region to the total amount of energy consumed by the country/region (expressed by each of the above indicators). In addition to energy delivered to end-users (industry, services, households etc.), it also includes quantities of energy delivered for energy transformation purposes (for example coal or biogas combustion to generate electricity) and its related transformation losses (e.g. heat losses through the chimney). The use of fossil fuels for non-energy purposes are also included (e.g. natural gas for chemical reactions or bitumen for road surface).

The calculation of the share of energy from renewable sources using data on the supply level (with each of the above indicators) is influenced by the choice of the energy balance methodology. It represents the use of renewable energies for all purposes with respect to the use of all other forms of energies.

Based on Eurostat data, these indicators can be consistently calculated starting from 1990 for all EU Member States and for all EU aggregates (EU-28 , EA-19 , EU-15 , and others).

Results of the calculations of the share of energy from renewable sources using data based on the gross available energy, gross inland energy consumption and total energy supply are shown in Tables 2, 3 and 4 respectively.

Share of renewable energy in total energy calculated on the level of gross available energy
Percentage (%)

	1990	2000	2005	2010	2015	2016	2017
EU-28	4.2	5.6	6.5	9.7	12.9	13.2	13.6
Euro area (EA-19)	4.6	5.4	6.3	9.7	12.5	12.9	13.2
Belgium	0.9	1.0	1.7	4.1	6.2	6.2	6.4
Bulgaria	1.2	4.2	5.5	8.3	11.0	11.1	10.3
Czechia	2.3	3.9	4.6	7.0	10.3	10.5	10.4
Denmark	5.7	9.0	14.2	19.2	28.0	28.6	31.9
Germany	1.5	2.6	5.0	8.2	12.0	12.1	13.2
Estonia	1.9	10.6	10.9	14.4	15.9	15.4	17.5
Ireland	1.6	1.6	2.4	4.4	7.5	7.3	8.9
Greece	4.5	4.5	4.9	6.9	10.8	10.5	11.1
Spain	6.8	5.2	5.5	10.8	13.0	13.6	12.4
France	6.7	6.1	5.7	8.2	9.4	10.4	10.3
Croatia	12.4	18.4	18.9	21.8	23.1	23.4	21.3
Italy	4.3	5.7	7.4	12.2	16.7	16.6	17.8
Cyprus	0.4	1.7	1.9	3.6	5.8	5.6	5.9
Latvia	12.4	30.8	30.4	29.4	33.2	34.5	40.2
Lithuania	2.0	9.2	9.9	15.3	20.3	20.2	20.7
Luxembourg	0.5	1.1	1.5	2.8	5.0	5.3	6.3
Hungary	2.6	3.3	5.9	10.4	12.0	11.7	11.1
Malta	0.0	0.0	0.0	0.2	0.9	1.0	1.4
Netherlands	0.9	1.5	2.3	3.3	4.3	4.4	4.7
Austria	19.9	22.5	20.4	26.2	29.3	29.7	28.9
Poland	1.5	4.2	4.8	7.2	9.4	8.7	8.5
Portugal	18.4	14.4	12.4	22.0	21.0	23.7	19.5
Romania	2.5	11.0	12.8	16.7	18.7	19.5	18.0
Slovenia	9.1	12.2	10.5	15.5	16.2	16.6	15.6
Slovakia	1.5	2.8	4.3	7.5	9.7	9.6	9.2
Finland	18.8	23.2	23.0	25.3	32.0	31.2	34.4
Sweden	24.0	30.0	27.7	32.3	40.9	37.7	39.6
United Kingdom	0.5	1.0	1.6	3.4	8.1	8.6	9.7
Iceland	66.9	70.6	69.3	85.5	84.2	81.6	81.3
Norway	53.4	51.1	46.8	35.5	45.5	50.6	47.1
Montenegro	:	:	29.2	35.2	30.0	33.7	26.7
North Macedonia	1.7	12.2	11.8	14.4	15.4	14.0	12.5
Albania	22.7	35.4	30.8	40.1	34.0	40.7	26.9
Serbia	9.2	12.1	11.1	13.2	13.0	13.0	12.0
Turkey	18.5	13.0	11.7	11.0	11.8	12.2	11.7
Bosnia and Herzegovina	:	:	:	:	16.8	15.6	11.7
Kosovo*	:	14.0	11.6	9.9	10.9	14.3	15.1
Ukraine	0.5	0.9	0.9	2.1	2.9	3.9	4.4
Georgia	:	:	:	:	24.3	24.9	24.2

* This designation is without prejudice to positions on status, and is in line with UNSCR 1244/1999 and the ICJ Opinion on the Kosovo Declaration of Independence.

Source: Eurostat (online data code: nrg_bal_s)

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Table 2: Share of renewable energy in total energy calculated on the level of gross available energy(%)Source: Eurostat (nrg_bal_s)

Share of renewable energy in total energy calculated on the level of gross inland energy consumption
Percentage (%)

	1990	2000	2005	2010	2015	2016	2017
EU-28	4.3	5.7	6.7	10.0	13.3	13.5	13.9
Euro area	4.7	5.5	6.5	10.1	12.9	13.3	13.7
Belgium	1.0	1.1	2.0	4.7	6.9	7.0	7.2
Bulgaria	1.2	4.2	5.6	8.4	11.1	11.1	10.3
Czechia	2.3	3.9	4.6	7.0	10.3	10.5	10.4
Denmark	6.0	9.6	14.8	19.8	29.3	29.7	32.8
Germany	1.5	2.6	5.0	8.2	12.1	12.2	13.3
Estonia	1.9	10.8	11.2	15.0	16.7	16.1	18.4
Ireland	1.6	1.6	2.4	4.4	7.6	7.4	9.0
Greece	5.0	5.1	5.3	7.6	11.6	11.3	12.0
Spain	7.0	5.5	5.8	11.5	13.8	14.4	13.0
France	6.7	6.1	5.7	8.3	9.5	10.5	10.4
Croatia	12.5	18.4	18.9	21.8	23.1	23.4	21.4
Italy	4.4	5.8	7.4	12.4	16.9	16.9	18.1
Cyprus	0.4	1.9	2.1	3.8	6.4	6.2	6.5
Latvia	13.1	30.8	32.2	31.0	35.1	37.0	42.5
Lithuania	2.0	9.4	10.0	15.6	20.5	20.7	21.2
Luxembourg	0.5	1.1	1.5	2.8	5.0	5.3	6.3
Hungary	2.6	3.3	5.9	10.4	12.0	11.7	11.1
Malta	0.0	0.0	0.1	0.5	2.7	3.4	4.9
Netherlands	1.1	1.7	2.7	3.8	4.9	5.0	5.5
Austria	19.9	22.5	20.4	26.2	29.3	29.7	28.9
Poland	1.5	4.3	4.8	7.2	9.4	8.8	8.5
Portugal	19.0	14.8	12.7	22.4	21.6	24.5	20.1
Romania	2.5	11.0	12.8	16.7	18.8	19.5	18.1
Slovenia	9.1	12.2	10.6	15.5	16.3	16.9	15.9
Slovakia	1.5	2.8	4.3	7.5	9.7	9.6	9.2
Finland	19.2	23.7	23.3	25.5	32.3	31.5	34.7
Sweden	24.3	30.9	28.7	33.5	42.5	39.2	41.5
United Kingdom	0.5	1.0	1.7	3.5	8.2	8.7	9.8
Iceland	67.8	72.0	70.7	86.4	84.9	82.4	82.2
Norway	:	:	48.0	35.9	45.8	50.8	47.4
Montenegro	:	:	29.2	35.2	30.0	33.7	26.7
North Macedonia	1.7	12.2	11.8	14.4	15.4	14.0	12.5
Albania	22.7	35.4	30.8	40.1	34.3	41.3	27.3
Serbia	9.2	12.1	11.1	13.2	13.0	13.0	12.0
Turkey	18.6	13.1	11.9	11.0	11.8	12.3	11.8
Bosnia and Herzegovina	:	:	:	:	16.8	15.6	11.7
Kosovo*	:	:	11.6	9.9	10.9	14.3	15.1
Ukraine	:	:	:	2.1	2.9	3.9	4.4
Georgia	:	:	:	:	24.3	24.9	24.2

* This designation is without prejudice to positions on status, and is in line with UNSCR 1244/1999 and the ICJ Opinion on the Kosovo Declaration of Independence.

Source: Eurostat (online data code: nrg_bal_s)

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Table 3: Share of renewable energy in total energy calculated on the level of gross inland energy consumption(%)Source: Eurostat (nrg_bal_s)

Share of renewable energy in total energy calculated on the level of total energy supply
Percentage (%)

	1990	2000	2005	2010	2015	2016	2017
EU-28	4.4	5.8	6.8	10.2	13.7	13.9	14.4
Euro area	4.8	5.7	6.7	10.3	13.3	13.7	14.1
Belgium	1.0	1.1	2.0	4.8	7.1	7.1	7.4
Bulgaria	1.2	4.2	5.6	8.4	11.2	11.2	10.5
Czechia	2.3	3.9	4.6	7.0	10.4	10.6	10.5
Denmark	6.2	10.0	15.4	20.6	30.8	31.4	34.7
Germany	1.5	2.7	5.1	8.4	12.4	12.5	13.7
Estonia	2.0	10.9	11.3	15.1	16.8	16.2	18.6
Ireland	1.7	1.7	2.5	4.6	8.1	7.9	9.7
Greece	5.2	5.2	5.5	7.8	12.1	11.7	12.5
Spain	7.1	5.6	5.9	11.8	14.3	14.9	13.5
France	6.8	6.3	5.9	8.4	9.7	10.7	10.7
Croatia	12.7	18.6	19.1	22.1	23.4	23.7	21.7
Italy	4.4	5.9	7.6	12.6	17.2	17.2	18.5
Cyprus	0.4	2.1	2.4	4.3	7.2	7.0	7.4
Latvia	13.3	31.0	32.6	31.8	36.0	38.0	43.9
Lithuania	2.0	9.4	10.1	15.7	20.8	21.0	21.5
Luxembourg	0.5	1.2	1.6	3.1	5.6	6.1	7.3
Hungary	2.6	3.3	6.0	10.5	12.1	11.8	11.2
Malta	0.0	0.0	0.1	0.6	3.1	4.1	5.8
Netherlands	1.1	1.8	2.8	4.0	5.2	5.3	5.7
Austria	20.1	22.9	20.8	26.7	29.9	30.4	29.5
Poland	1.5	4.3	4.9	7.2	9.5	8.8	8.6
Portugal	19.5	15.2	13.0	23.2	22.6	25.8	21.3
Romania	2.5	11.0	12.8	16.8	18.9	19.7	18.2
Slovenia	9.1	12.3	10.6	15.6	16.4	16.9	16.0
Slovakia	1.5	2.8	4.3	7.5	9.7	9.7	9.3
Finland	19.4	24.0	23.6	25.8	32.9	32.1	35.4
Sweden	24.5	31.4	29.1	34.0	43.2	39.9	42.2
United Kingdom	0.5	1.0	1.8	3.7	8.7	9.3	10.5
Iceland	70.0	75.1	73.6	88.4	88.3	87.2	87.9
Norway	55.7	53.5	48.7	36.4	46.7	51.8	48.3
Montenegro	:	:	29.6	35.3	30.5	34.3	27.3
North Macedonia	1.7	12.3	11.8	14.4	15.5	14.1	12.6
Albania	22.7	36.2	31.7	40.4	34.3	41.5	27.4
Serbia	9.3	12.2	11.1	13.2	13.1	13.1	12.1
Turkey	18.6	13.2	12.0	11.2	12.2	12.6	12.1
Bosnia and Herzegovina	:	:	:	:	16.9	15.6	11.7
Kosovo*	:	14.0	11.6	10.0	10.9	14.3	15.1
Ukraine	0.5	0.9	0.9	2.1	2.9	3.9	4.4
Georgia	:	:	:	:	24.7	25.3	24.7

* This designation is without prejudice to positions on status, and is in line with UNSCR 1244/1999 and the ICJ Opinion on the Kosovo Declaration of Independence.

Source: Eurostat (online data code: nrg_bal_s)

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Table 4: Share of renewable energy in total energy calculated on the level of total energy supply(%)Source: Eurostat (nrg_bal_s)

Energy available for final consumption

Energy available for final consumption is a calculated aggregate of Eurostat's energy balances[2]. The energy available for final consumption has some differences compared with gross available energy, as follows:

- The first and most important difference is that losses occurred in energy transformation processes are now excluded.

- The second most important difference is the transformation of all nuclear energy, as well as a part of fossil fuels and renewables, into electricity and derived heat. They are now included in their totality. Furthermore, there is no distinction between "renewable electricity" and "nuclear electricity"; there is "average" electricity, with all energy sources combined (fossil, nuclear and renewable).

- Other elements of consumption, such as consumption of the energy branch of industry, distribution losses and other elements of energy balance methodology have less significant implications for this calculation, due to their much lower magnitudes.

Share of renewable energy based on energy available for final consumption

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[2]Available for final consumption = Gross inland energy consumption – Transformation input + Transformation output – Energy sector – Distribution losses

The calculation of the share of energy from renewable sources using data on the level of the energy available for final consumption represents the ratio of renewable energy put at the disposal of end-users to the total amount of energy available to end-users (for energy and non-energy purposes). This is measured at the level of energy actually at the disposal of end-users (after transformation from primary energy form to the end-use form) and all electricity is counted as not renewable. In other words, renewables in this accounting do not include electricity and derived heat produced from renewable energy sources. Consequently, the calculated result using energy available for final consumption **underestimates** the share of energy from renewable sources.

Based on Eurostat data, this indicator can be consistently calculated starting from 1990 for all EU Member States and for the EU aggregate.

Results of the calculations for the share of energy from renewable sources using data based on the energy available for final consumption are shown in Table 5.

Share of renewable energy in total energy calculated on the level of energy available for final consumption
Percentage (%)

	1990	2000	2005	2010	2015	2016	2017
EU-28	3.4	4.2	4.8	7.0	8.2	8.3	8.8
Euro area	3.8	3.9	4.7	6.8	7.7	7.8	8.5
Belgium	1.0	1.0	1.5	3.7	4.0	4.7	4.8
Bulgaria	1.0	5.6	7.0	10.7	12.7	13.4	13.4
Czechia	3.0	4.5	5.9	8.3	10.9	11.2	10.5
Denmark	4.6	5.0	6.8	9.3	12.5	12.7	12.8
Germany	1.2	2.1	3.8	5.5	6.4	6.4	6.9
Estonia	3.0	15.8	14.2	18.4	17.1	12.6	15.8
Ireland	1.4	1.1	1.7	2.6	3.0	3.2	4.0
Greece	6.6	5.7	5.2	6.1	8.8	7.7	9.9
Spain	6.5	4.0	3.7	5.5	6.9	7.0	7.1
France	6.7	5.7	5.6	8.0	8.7	9.4	9.4
Croatia	12.3	15.2	15.9	16.3	17.7	16.7	15.8
Italy	0.8	1.4	3.3	6.9	7.1	6.9	9.3
Cyprus	0.4	2.9	3.4	5.8	7.5	7.4	7.8
Latvia	9.6	25.3	25.0	23.3	24.9	23.6	24.9
Lithuania	2.6	14.2	12.9	13.6	11.8	11.4	10.4
Luxembourg	0.0	0.5	1.0	2.4	3.9	4.2	4.7
Hungary	3.4	4.5	5.7	10.5	11.7	11.3	10.4
Malta	0.0	0.0	0.1	1.2	2.4	2.7	5.0
Netherlands	0.8	0.9	1.0	1.6	2.5	2.3	2.5
Austria	10.7	10.2	10.2	13.2	14.9	14.4	14.3
Poland	1.7	6.2	6.2	7.5	8.4	7.9	7.8
Portugal	16.7	12.5	12.1	13.3	13.4	13.5	13.1
Romania	1.3	11.4	12.3	16.3	15.6	16.0	15.5
Slovenia	7.1	9.3	8.4	12.6	12.9	12.6	12.7
Slovakia	1.1	0.8	2.8	4.7	6.3	5.6	5.4
Finland	16.3	18.9	16.8	18.8	22.2	21.4	24.7
Sweden	14.7	15.2	14.1	16.0	22.9	22.3	24.5
United Kingdom	0.3	0.4	0.4	2.0	3.7	4.1	4.2
Iceland	6.4	5.1	5.3	3.9	4.6	0.7	2.6
Norway	5.2	5.7	5.6	6.3	5.9	7.1	7.2
Montenegro	:	:	18.6	21.3	24.2	22.9	21.3
North Macedonia	0.0	13.9	12.1	11.1	12.5	10.0	11.9
Albania	16.6	16.5	11.6	10.6	12.1	13.0	12.1
Serbia	9.7	11.1	8.5	10.8	12.2	11.4	11.3
Turkey	18.9	12.5	10.1	8.0	6.0	5.5	4.9
Bosnia and Herzegovina	:	:	:	:	14.4	13.7	11.3
Kosovo*	:	27.6	22.0	19.8	19.1	24.8	23.7
Ukraine	:	:	:	1.2	2.5	3.3	3.6
Georgia	:	:	:	:	10.1	9.3	8.7

* This designation is without prejudice to positions on status, and is in line with UNSCR 1244/1999 and the ICJ Opinion on the Kosovo Declaration of Independence.

Source: Eurostat (online data code: nrg_bal_s)

eurostat

Table 5: Share of renewable energy in total energy calculated on the level of energy available for final consumption(%)Source: Eurostat (nrg_bal_s)

Final energy consumption

Final energy consumption is a calculated aggregate of Eurostat's energy balances. In Eurostat's energy balance, the link between the final energy consumption and the energy available for final consumption is the statistical difference[3]. A schematic diagram of this relationship is shown in Figure 1.

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[3]Statistical difference = Energy available for final consumption – Final non-energy consumption – Final energy consumption
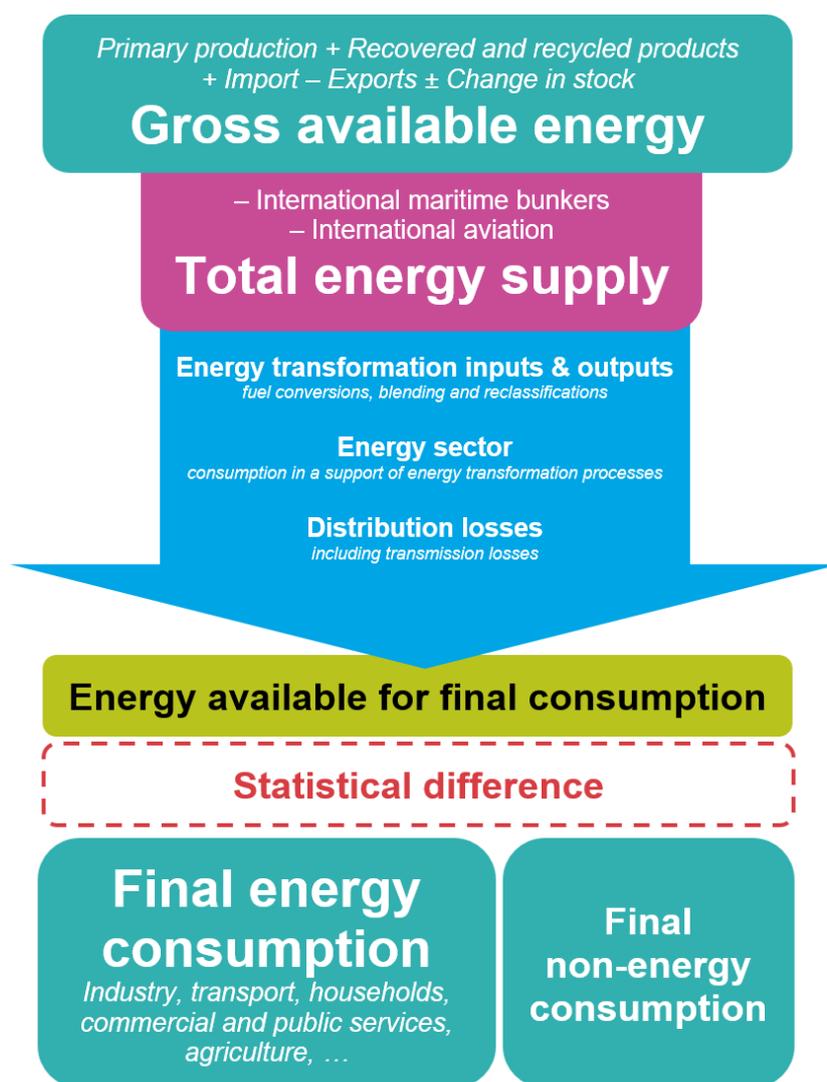
Figure 1: Simplified scheme of Eurostat's energy balance

Final energy consumption is a concept stemming from a bottom-up approach – aggregation of consumption in various sectors of consumption (industry, transport, households, services and others). As such, it often uses different data sources and calculation concepts other than the top-down approach used to calculate gross inland energy consumption, which reflects rather more the supply side.

Share of renewable energy based on final energy consumption

The calculation of the share of energy from renewable sources using data on the level of the final energy consumption represents the ratio of renewable energy consumed by end-users to the total energy consumption of end-users. This is measured as the energy actually consumed by end-users (after transformation from primary energy form to the end-use form) and electricity is counted as a separate fuel besides the others such as coal or renewables. In other words, renewables in this accounting do not include electricity and derived heat produced from renewable energy sources. Consequently, the calculated result using final energy consumption **underestimates** the share of energy from renewable sources.

An important difference with energy available for final consumption is that the consumption of energy products for non-energy purposes is excluded.

Based on Eurostat data, this indicator can be consistently calculated starting from 1990 for all EU Member States and for the EU aggregate.

Results of the calculations for the share of energy from renewable sources using data based on the final en-

ergy consumption are shown in Table 6.

Share of renewable energy in total energy calculated on the level of final energy consumption
Percentage (%)

	1990	2000	2005	2010	2015	2016	2017
EU-28	3.8	4.6	5.3	7.7	9.0	9.0	9.7
Euro area	4.2	4.4	5.2	7.5	8.5	8.6	9.4
Belgium	1.1	1.2	1.9	4.4	5.0	5.8	5.9
Bulgaria	1.1	6.4	7.7	11.3	13.6	14.2	14.2
Czechia	3.3	5.0	6.6	9.5	12.2	12.2	11.9
Denmark	4.7	5.1	6.8	9.4	12.6	12.9	13.3
Germany	1.4	2.3	4.3	6.1	7.0	7.0	7.8
Estonia	3.5	17.6	15.8	19.2	17.7	14.8	15.3
Ireland	1.5	1.2	1.6	2.6	3.2	3.4	4.1
Greece	6.9	5.9	5.3	6.3	9.2	8.1	10.3
Spain	7.2	4.5	4.0	5.9	7.2	7.4	7.6
France	7.7	6.1	6.2	8.8	9.8	10.4	10.5
Croatia	13.6	16.9	17.4	17.6	19.2	18.0	17.0
Italy	0.9	1.5	3.5	7.4	7.5	7.2	10.0
Cyprus	0.5	3.1	3.3	6.0	7.6	7.5	8.0
Latvia	9.7	25.5	25.6	23.6	25.6	24.1	25.3
Lithuania	2.9	16.2	15.1	15.5	14.6	13.8	13.0
Luxembourg	0.0	0.5	1.0	2.4	3.9	4.2	4.8
Hungary	3.7	5.0	6.4	11.7	12.9	12.4	11.6
Malta	0.0	0.0	0.1	1.2	2.5	2.8	5.1
Netherlands	0.9	1.1	1.3	2.0	3.1	3.0	3.3
Austria	11.7	11.0	10.8	14.1	16.0	15.5	15.2
Poland	1.9	6.6	6.7	8.1	9.0	8.6	8.4
Portugal	20.6	14.1	13.9	14.7	14.6	14.4	14.1
Romania	1.4	12.5	13.5	18.3	16.4	16.8	16.5
Slovenia	7.1	9.8	9.0	13.1	13.3	13.0	13.1
Slovakia	1.2	0.9	3.2	5.2	7.1	6.2	6.0
Finland	16.8	19.2	17.6	19.5	23.4	22.6	25.8
Sweden	15.4	15.7	14.7	17.4	23.7	24.2	25.4
United Kingdom	0.3	0.4	0.4	2.2	3.9	4.3	4.5
Iceland	4.9	4.7	5.0	4.0	3.8	3.7	3.9
Norway	5.7	6.8	6.6	8.3	7.2	8.1	9.2
Montenegro	:	:	19.1	22.5	25.6	24.2	22.7
North Macedonia	0.0	14.0	12.4	11.4	12.7	10.8	12.5
Albania	19.0	17.4	12.6	11.2	12.6	13.7	12.3
Serbia	10.1	11.6	8.6	11.8	13.1	12.6	12.5
Turkey	20.1	13.5	10.8	8.8	6.5	6.0	5.2
Bosnia and Herzegovina	:	:	:	:	15.1	14.0	11.5
Kosovo*	:	27.8	22.1	19.9	19.7	25.6	24.5
Ukraine	:	:	:	1.4	2.7	3.5	3.9
Georgia	:	:	:	:	11.0	10.0	9.4

* This designation is without prejudice to positions on status, and is in line with UNSCR 1244/1999 and the ICJ Opinion on the Kosovo Declaration of Independence.

Source: Eurostat (online data code: nrg_bal_s)

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Table 6: Share of renewable energy in total energy calculated on the level of final energy consumption(%)Source: Eurostat (nrg_bal_s)

Share of renewable energy based on Directive 2009/28/EC (SHARES tool)

Directive 2009/28/EC on the promotion of the use of energy from renewable sources established specific calculation criteria for the share of energy from renewable sources. The most important aspects are the following:

- Specific definition of gross final energy consumption that excludes sectors involved in energy transformation (including transformation losses) but includes losses due to transmission and distribution. As such, this is a new aggregate which does not exist in Eurostat's energy balances.

- Electricity produced from hydro and wind is normalised for annual variations. Such normalisation is often not performed in other calculations and is also not performed in energy balances.

- Only sustainable biofuels and bioliquids are taken into account as renewable energies eligible for the accounting of the share. The split between sustainable and non-sustainable biofuels and bioliquids does not exist in the traditional system of energy statistics and is also not covered in Eurostat's energy balances. Sustainable biofuels and bioliquids are those compliant with Articles 17 and 18 of Directive 2009/28/EC. The detailed split of categories under Annex IX of the Directive (which indicates the origin of sustainable biofuels) is compulsory from 2017 onwards. In case Annex IX quantities are known for periods before 2017, they can also be reported on a voluntary basis.

- Certain renewables are eligible for preferential accounting (multiplier for electricity in electric road vehicles and biofuels from wastes, residues, non-food cellulosic material and ligno-cellulosic material).

- Energy consumption of aviation is capped if the aviation sector is significant in the energy consumption of the country.

- Bioliquids and biofuels from food sources are also capped.

- Statistical transfers of renewable energies between countries and joint projects with countries outside the EU provide for administrative transfer of quantities of renewable energies between countries. This element is not reflected in Eurostat's energy balances.

Consequently, it is evident that for monitoring the targets under Directive 2009/28/EC, data from energy balances can only be used as an approximation and indication of development. While it is possible to calculate with very high accuracy these shares for all EU Member States based on energy balances, additional data are needed for a fully accurate calculation based on the accounting rules of Directive 2009/28/EC. This is one of the main reasons why Eurostat developed the SHARES tool , which allows for a harmonised calculation for all EU Member States.

Based on Eurostat data, this indicator can be consistently calculated only from 2004 for all EU Member States and for the EU aggregate. Results of the calculations for the share of energy from renewable sources based on the accounting rules of Directive 2009/28/EC are shown in Table 5.

Share of renewable energy based on Directive 2009/28/EC (SHARES tool)
Percentage (%)

	2004	2005	2010	2015	2016	2017
EU-28	8.5	9.1	13.1	16.7	17.0	17.5
Belgium	1.9	2.3	5.6	7.9	8.6	9.1
Bulgaria	9.4	9.4	14.1	18.2	18.8	18.7
Czechia	6.9	7.1	10.5	15.0	14.9	14.8
Denmark	14.9	16.0	22.1	31.4	32.6	35.8
Germany	6.2	7.1	11.7	14.9	14.9	15.5
Estonia	18.4	17.4	24.6	28.4	28.6	29.2
Ireland	2.4	2.8	5.8	9.1	9.3	10.7
Greece	6.9	7.0	9.8	15.4	15.1	16.3
Spain	8.3	8.4	13.8	16.2	17.4	17.5
France	9.5	9.6	12.7	15.2	15.9	16.3
Croatia	23.4	23.7	25.1	29.0	28.3	27.3
Italy	6.3	7.5	13.0	17.5	17.4	18.3
Cyprus	3.1	3.1	6.0	9.4	9.3	9.9
Latvia	32.8	32.3	30.4	37.5	37.1	39.0
Lithuania	17.2	16.8	19.6	25.8	25.6	25.8
Luxembourg	0.9	1.4	2.9	5.1	5.4	6.4
Hungary	4.4	6.9	12.7	14.4	14.3	13.3
Malta	0.1	0.1	1.0	5.2	6.2	7.2
Netherlands	2.0	2.5	3.9	5.7	5.9	6.6
Austria	22.7	23.7	29.9	32.8	33.0	32.6
Poland	6.9	6.9	9.3	11.7	11.3	10.9
Portugal	19.2	19.5	24.2	28.0	28.4	28.1
Romania	16.2	17.2	23.1	24.8	25.0	24.5
Slovenia	16.1	16.0	20.4	21.9	21.3	21.5
Slovakia	6.4	6.4	9.1	12.9	12.0	11.5
Finland	29.2	28.8	32.4	39.3	39.0	41.0
Sweden	38.7	40.5	47.2	53.6	53.8	54.5
United Kingdom	1.1	1.3	3.7	8.4	9.2	10.2
Iceland	58.8	60.0	70.3	70.3	72.7	71.6
Norway	58.0	59.7	61.2	68.7	69.8	71.2
Montenegro	:	35.7	40.6	43.1	41.5	40.0
North Macedonia	15.7	16.5	16.5	19.5	18.0	19.7
Albania	29.6	31.4	31.9	34.4	37.1	34.6
Serbia	12.7	14.3	19.8	21.9	21.0	20.6
Turkey	16.2	15.5	14.0	13.6	13.7	13.2
Kosovo*	20.8	20.0	18.3	18.5	24.4	22.9

* This designation is without prejudice to positions on status, and is in line with UNSCR 1244/1999 and the ICJ Opinion on the Kosovo Declaration of Independence.

Source: Eurostat (online data code: nrg_ind_ren)

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Table 7: Share of renewable energy in total energy calculated based on the accounting rules of Directive 2009/28/EC (SHARES tool)Percentage (%)Source: Eurostat (nrg_ind_ren)

Source data for tables and graphs

- Download Excel file

See also

- Renewable energy statistics
- Europe 2020 headline indicators

Main tables

- Energy (t_nrg) , see:

Energy statistics - main indicators (t_nrg_indic)

Database

- Energy (nrg) , see:

Energy statistics - quantities, annual data (nrg_quant)

Dedicated section

- Energy
- Europe 2020 indicators
- Sustainable Development Goals

Publications

- Energy balance sheets 2017 data (2019 edition)
- Energy, transport and environment indicators (2018 edition)

Methodology

- Share of energy from renewable sources (ESMS metadata file: nrg_ind_ren)
- Energy statistics - quantities (ESMS metadata file: nrg_quant)
- Energy balances (ESMS metadata file: nrg_bal)
- SHARES tool manual

Legislation

- Directive 2009/28/EC on the promotion of the use of energy from renewable sources
- Regulation (EC) No 1099/2008 on energy statistics
- Summaries of EU legislation: Common system for the production of energy statistics

- Renewable energy progress report 2017
- Renewable energy progress report 2015
- Summaries of EU legislation: Progress towards the EU's 2020 renewable energy targets
- Renewable energy progress report 2013
- Renewable Energy: a major player in the European energy market

External links

- European Commission - Energy - Renewable energy

- Concerted Action on the Renewable Energy Sources Directive

- EurObserv'ER

- United Nations Development Programme - Sustainable energy - Renewable energy

- International Energy Agency - Renewables

- International Renewable Energy Agency

View this article online at http://ec.europa.eu/eurostat/statistics-explained/index.php/Calculation_methodologies_for_the_share_of_renewables_in_energy_consumption