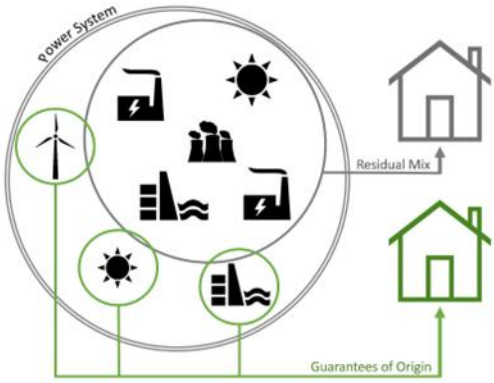
European Residual Mixes

Results of the calculation of Residual Mixes for the calendar year 2024

Version 1.0, 2025-05-30

1 Introduction

The purpose of a Guarantee of Origin (GO) system is to enable consumers to decide how the electricity they purchase is generated by selecting a supplier and a power product. GOs (RED II, Directive 2018/2001, Art. 19) provide a way to reliably track the origin of energy from production to consumption within the context of the international and complex power markets.



GOs are used (cancelled) by electricity suppliers[1], who must disclose the origin and environmental attributes of sold electricity (IEM Directive (EU) 2019/944, Annex 1 (5)). This process is called electricity disclosure.

A country's residual mix represents the shares of electricity generation attributes available for disclosure, after the use of explicit tracking systems, such as GO, have been accounted for.

Residual mix is a pre-requisite for reliable GOs

As long as not all consumption is tracked using GOs, a *residual mix* is needed to make the GO a reliable tracking instrument. The Residual Mix is the energy source mix excluding tracked energy generation attributes from the generation mix. A residual mix is a logical consequence of implementing energy attribute tracking as it ensures that the attributes represented by GOs are not double disclosed to other consumers through an implicit mix. In other words, without a residual mix, renewable electricity sold with GOs would be double counted because the same electricity would be disclosed to consumers buying "regular" electricity. The use of uncorrected generation statistics for purposes of disclosure should thus be avoided.

International harmonization of the residual mix calculation is needed

Due to the international nature of both the electricity markets and tracking systems, the volume of available generation attributes in the domestic residual mix differs from the volume of untracked consumption[2]. Thus, the calculation of residual mixes needs to be centrally coordinated and a common pool for balancing generation attributes must be used. This is achieved via the European Attribute Mix (EAM), which replaces the deficit of energy origin caused by exported GOs (and/or imported electricity). EAM acts as an "equalising reservoir" for generation attributes for national residual mixes. After the attribute balancing via the EAM the volume of available generation attributes in the residual mix is equal to the untracked consumption in every country. This is a precondition for the GO to be a credible tracking instrument in the context of international trading.

Residual mix is not needed in countries with "full consumption disclosure"

Residual mix is needed when consumption is only partially explicitly tracked. In so-called "full consumption disclosure domains" residual mix is not needed because all consumption is covered by cancelled GOs. Austria and Switzerland have a full disclosure system in place and hence the residual mix is zero. Also the Netherlands have full disclosure

[1] In some cases and countries it might be done also directly by end-consumers (or service providers on their behalf) for own electricity use.

[2] Untracked consumption = Electricity consumption for which the energy source is not explicitly disclosed through tracking instruments such as Guarantees of Origin.

regulation but, due to implementation details and calculation rules, residual mixes can still be calculated and are included in the results.

AIB residual mixes are calculated with the issuance-based method

The AIB European Residual mixes are calculated using the so-called issuance-based method. For more information refer to methodology material on: https://www.aib-net.org/facts/european-residual-mix. AIB calculated national residual mixes are official when adopted by national disclosure authorities. A number of disclosure authorities calculate national residual mixes themselves. Most of those are calculated with the same issuing-based method utilizing EAM from this report, but some countries use different methodologies.

2 Description of the Document

The main results of this document are the **European Attribute Mix** (EAM) and **the residual mixes for all 34 countries** included in the calculation[3]. A wide variety of additional information and graphs is presented as supporting material. The EAM (Table 1) is the mix of energy sources and the corresponding CO2 and radioactive waste that is collected from countries which have surpluses of energy attributes. The EAM is then used to fill up the national residual mixes in case of a deficit of disclosure attributes. The national surpluses and deficits to/from EAM are shown in Table 3 and Figure 3 and 4.

The **national residual mixes** for 34 European countries are shown in Figure 1 and 2 as well as Table 2. Note that the official residual mixes for each country are published by the respective national authorities. Also note that for countries without recorded explicit tracking, untracked consumption equals the total electricity consumption, and thus the residual mix is applicable for the disclosure of the entire electricity consumption.[4]

Energy sources in the residual mixes are divided in three main categories: renewable, nuclear and fossil, of which renewable and fossil are further divided into subcategories (Table 8). Selected subcategories are based on relevance in terms of volume and perceived consumer importance. The used categorization is also identical to all residual mix calculations since the 2013.

Figure 5 shows the direct greenhouse gas emissions as **direct CO_2 emissions per kWh** of produced electricity. Figure 6 shows the content of **highly active radioactive waste as mgRW/kWh**. Both environmental indicators are calculated for the European Attribute Mix (EAM), the production mix (PM), the residual mix (RM) and the total supplier mix (TSM) of European countries.

The total supplier mixes (TSMs) are presented in Table 4, Figure 7 and 8. The total supplier mix represents the total consumption mix of a country, i.e. it is the sum of attributes of 1) cancelled GOs as well as 2) the final residual mix. Thus, both explicitly tracked and available remaining electricity attributes are included in the TSM, which equals in physical volume with the country's total electricity consumption. For understanding, it might help to consider that without the international transferability of GOs and electricity, the TSM would equal the production mix of the country.

The production mixes of the countries are shown in Table 5. The evolution of attributes, on the European scale: how much renewables are in the Production mix, how much of those are left in the residual mix and lastly how much renewables are carried on to EAM is shown in the Figure 11 and Table 6.

The rest of the results are different kinds of comparisons between different mixes and different years, between the production and residual mixes as well as production and total supplier mixes of different countries. Finally Table 7 and Figure 16 show the difference between final residual mixes of 2022, 2023 and 2024.

***Note**: Any use of the data presented in this document should include a reference to AIB.*

***Note**: The calculated country and energy source/technology emission factors forming the base for the National Residual Mix calculations may not be sold, distributed or processed as part of a derivative tool.*

Partners

grexel

ecoinvent

[3] Austria, Bosnia & Herzegovina, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Great Britain, Greece, Hungary, Iceland, Ireland (All-Island), Italy, Latvia, Lithuania, Luxembourg, Malta, Montenegro, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland

[4] Calculation of the Residual Mix obviously can only take the volumes of explicit tracking systems into account if the respective data is public or known by the authority and respectively being made available to the one who conducts the calculation. This means that explicit tracking systems, for which no statistical data is available to the competent authority and/or AIB, cannot be reflected in the residual mix and are therefore likely to lead to double counting.

Disclaimer on data quality:

- Because of the 12 months lifetime of GOs, the residual mixes were calculated based on all recorded GO transactions during the assumed time period (1.4.2024 – 31.3.2025) for disclosure of 2024 consumption, irrespective of the underlying production year of these GOs. This ensures that over the years all GO transactions are considered in the calculation.
- Volumes which have been explicitly tracked without the use of transparent tracking instruments, e.g. by so-called contract based tracking, self-declarations etc., cannot be taken into account at all, if they are not reported by the competent authority.
- Due to the absence of reliable EECS GO statistics for Netherlands for the time period 11/2024-03/2025 the issuance and cancellation volumes were extrapolated based on the time period 04/2024-10/2024. The total issuance and cancellation data for 04/2024-10/2024 per energy source was divided with equivalent data for 04/2023-10/2023. This factor (by energy source) was used to multiply volumes of 11/2023-03/2024 (by energy source) to derive the volumes for 11/2024-03/2025. The additional volumes were added to national GO statistics to distinguish them more easily (other GO data is under EECS).
- Like last years, for Germany, it is assumed that RES production for which a GO is not issued falls under EEG and is deducted from the residual mix. This is considered as tracked consumption with energy source "renewable unspecified" (as no energy source specific info was provided for EEG) and adds to the Total Supplier Mix.

3 Data sources and references

The main data source for the calculation is information collected from the national competent authorities through an information request specifically for the purpose of residual mix calculation. Most notably this includes information on any possible national tracking systems (certificate or non-certificate based) and electricity generation.

Where not reported by the competent authority, the generation data is based on Eurostat (electricity generation by fuel as well as supply, transformation and consumption of electricity). Power import/export data from/to countries outside of the calculation area are collected from ENTSO-E Transparency platform.

EECS GO statistics are collected centrally from the AIB statistics. The volume of ex-domain cancellations[5] (including the target domains of these cancellations) is collected as part of data collection from competent authorities.

The base data for the direct CO_2-emissions is based on nationally reported information (where available) or the Ecoinvent database. The data for the radioactive waste has been compiled based on BDEW (2014), DECC (2014), the Platts World Database and IAEA PRIS. These indicators reflect the differences in waste rates produced by the types of nuclear power reactors used in the respective countries per kWh of electricity. Due to a lack of detailed data per reactor, the waste rates have been based on estimates of typical data for five major types of reactors used in Europe. However, where available, factors as reported by national authorities are used instead.

References

National Issuing Bodies and Disclosure Competent Bodies: Updates through the annual data collection

Generation data: Eurostat: Product - Products Datasets - Eurostat (europa.eu) and

Product - Products Datasets - Eurostat (europa.eu)

EECS Guarantee of Origin Statistics: Association of Issuing Bodies, Statistics | AIB (aib-net.org)

Sources for emission factors and radioactive waste:

Ecoinvent (2024): Ecoinvent database and bilaterally provided data.

BDEW (2014). Leitfaden “Stromkennzeichnung”, Berlin, Oktober 2014

DECC (2014), Fuel Mix Disclosure Data Table, 2014

IAEA PRIS. The IAEA Power Reactor Information System (PRIS), 2015, https://www.iaea.org/pris/

Platts: The Platts World Database, 2014

[5] A cancellation of a certificate for disclosure of electricity consumption in another country. Under AIB rules, ex-domain cancellations are not allowed between two countries connected to the AIB Hub.

Table of Tables

Table of Figures

4 Main result tables

The need for a methodology to determine a cross-border central residual mix emerges when a country exports more GOs than physical energy, thus creating a deficit of generation attributes. In principle the deficit/surplus of attributes is always the net effect of import/export of electricity and export/import of GOs respectively (for details, please refer to the residual mix methodology document). Such a deficit of attributes in the disclosure of energy supplied without being backed by GO cancellation needs to be complemented with an excess of attributes from countries that are net importers of GOs.

The European Attribute Mix (Table 1) contains all surplus generation attributes from countries with an excess of attributes. It is used to fill the gap in the residual mix in countries with a deficit of attributes in their residual mix. The exchange with the European Attribute Mix is graphically presented in Figure 3

Table 1: European Attribute Mix (EAM) 2024: Energy source distribution and environmental indicators

	RE total	RE unspecified	RE biomass	RE solar	RE geothermal	RE wind	RE hydro	Nuclear	FO total	FO unspecified	FO hard coal	FO lignite	FO oil	FO gas	CO2 (gCO2/kWh)	Rad waste (mg/kWh)
EAM	4,94 %	0,02 %	0,67 %	1,33 %	0,00 %	1,61 %	1,31 %	19,40 %	75,66 %	5,80 %	37,62 %	0,36 %	1,79 %	30,08 %	536,94	0,58

***EAM** = European Attribute Mix is used for balancing surpluses and deficits in national residual mixes caused by international trading of electricity and guarantees of origin.*

The introduction of a GO system provides a way to supply energy with specified attributes, but also impacts the remaining attributes of energy supplied without a GO. According to preamble 13 of 2018/2001/EC: 'residual energy mix' means the total annual energy mix for a Member State, excluding the share covered by cancelled guarantees of origin. If uncorrected generation statistics were used for the purpose of disclosure of untracked electricity consumption, then the renewable energy origin represented by GOs would be double counted. Table 2 and Figure 2 and 3 present the residual mixes of 2024 for 34 European countries as calculated by AIB. Note that the official residual mixes for each country are in principle published by the respective national authorities. The residual mix is not applicable for Austria and Switzerland in which all power consumption is tracked with GOs.

Table 2: Residual Mixes 2024

	RE total	RE unspecified	RE biomass	RE solar	RE geothermal	RE wind	RE hydro	Nuclear	FO total	FO unspecified	FO hard coal	FO lignite	FO oil	FO gas	Untracked %	CO2 (gCO2/kWh)	Rad waste (mg/kWh)
AT	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BA	39,27 %	0,00 %	0,00 %	2,04 %	0,00 %	2,80 %	34,43 %	0,00 %	60,73 %	0,00 %	60,73 %	0,00 %	0,00 %	0,00 %	100,00 %	777,02	0,00
BE	18,07 %	0,00 %	1,16 %	13,71 %	0,00 %	2,61 %	0,59 %	54,08 %	27,85 %	1,48 %	3,71 %	0,00 %	0,01 %	22,65 %	68,35 %	131,73	1,46
BG	13,97 %	0,00 %	0,45 %	7,48 %	0,00 %	1,99 %	4,04 %	47,88 %	38,16 %	0,51 %	4,07 %	25,89 %	0,16 %	7,53 %	96,44 %	379,53	1,67
CH	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CY	16,90 %	0,00 %	0,61 %	11,54 %	0,00 %	4,76 %	0,00 %	0,00 %	83,10 %	0,00 %	0,00 %	0,00 %	83,10 %	0,00 %	95,65 %	613,08	0,00
CZ	16,87 %	0,00 %	8,14 %	5,56 %	0,00 %	1,11 %	2,05 %	38,09 %	45,04 %	0,16 %	39,62 %	0,00 %	0,11 %	5,15 %	88,11 %	584,07	0,50
DE	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	100,00 %	8,03 %	52,48 %	0,00 %	2,20 %	37,29 %	5,87 %	724,56	0,00
DK	24,45 %	4,12 %	4,52 %	6,71 %	0,00 %	7,85 %	1,24 %	12,23 %	63,33 %	7,08 %	30,91 %	0,23 %	1,55 %	23,55 %	57,71 %	421,89	0,37
EE	11,55 %	0,01 %	1,69 %	6,13 %	0,00 %	2,82 %	0,91 %	12,76 %	75,69 %	29,31 %	24,75 %	0,24 %	1,18 %	20,21 %	80,21 %	611,96	0,38
ES	4,45 %	0,00 %	0,15 %	2,28 %	0,00 %	1,72 %	0,29 %	38,81 %	56,75 %	1,30 %	10,38 %	0,08 %	2,32 %	42,67 %	59,47 %	292,20	1,11
FI	11,25 %	0,01 %	4,77 %	4,19 %	0,00 %	0,90 %	1,38 %	30,94 %	57,81 %	6,61 %	29,66 %	0,20 %	1,95 %	19,40 %	30,07 %	405,59	0,93
FR	7,25 %	0,00 %	1,11 %	3,13 %	0,00 %	1,99 %	1,01 %	87,87 %	4,88 %	0,01 %	0,18 %	0,00 %	0,45 %	4,25 %	82,76 %	23,52	2,37
GB	3,29 %	0,01 %	0,34 %	1,49 %	0,00 %	0,80 %	0,65 %	23,86 %	72,85 %	5,01 %	19,40 %	0,18 %	1,42 %	46,84 %	86,35 %	420,76	1,42
GR	24,82 %	1,88 %	0,63 %	14,53 %	0,04 %	6,45 %	1,28 %	0,00 %	75,18 %	0,04 %	1,28 %	8,72 %	10,40 %	54,75 %	61,21 %	367,07	0,00

	RE total	RE un-specified	RE bio-mass	RE solar	RE geo-thermal	RE wind	RE hydro	Nuclear	FO total	FO un-specified	FO hard coal	FO lignite	FO oil	FO gas	Untracked %	CO2 (gCO2/kWh)	Rad waste (mg/kWh)
HR	12,40 %	0,01 %	0,54 %	3,04 %	0,00 %	4,72 %	4,09 %	12,16 %	75,44 %	3,64 %	29,25 %	0,23 %	23,46 %	18,86 %	76,84 %	573,17	0,36
HU	11,92 %	0,00 %	0,65 %	9,91 %	0,00 %	0,72 %	0,63 %	42,23 %	45,85 %	2,55 %	16,77 %	0,11 %	0,68 %	25,73 %	90,28 %	318,64	1,45
IE	22,65 %	0,00 %	2,04 %	0,25 %	0,00 %	18,14 %	2,22 %	0,00 %	77,35 %	0,00 %	7,45 %	0,00 %	0,31 %	69,60 %	5,45 %	365,61	0,00
IS	10,52 %	0,01 %	0,63 %	1,26 %	5,76 %	1,52 %	1,35 %	18,26 %	71,22 %	5,46 %	35,40 %	0,34 %	1,71 %	28,31 %	77,80 %	505,51	0,55
IT	9,49 %	0,00 %	0,75 %	7,14 %	0,00 %	0,39 %	1,21 %	4,73 %	85,78 %	68,77 %	9,16 %	0,09 %	0,44 %	7,33 %	63,35 %	441,20	0,14
LT	3,13 %	0,01 %	0,43 %	0,84 %	0,00 %	1,02 %	0,83 %	12,29 %	84,58 %	11,30 %	23,82 %	0,23 %	4,56 %	44,68 %	28,77 %	567,91	0,37
LU	63,20 %	0,00 %	3,24 %	50,48 %	0,00 %	2,59 %	6,88 %	5,13 %	31,67 %	6,95 %	9,96 %	0,10 %	0,47 %	14,19 %	19,25 %	213,07	0,15
LV	8,70 %	0,01 %	1,47 %	5,15 %	0,00 %	1,13 %	0,92 %	15,52 %	75,78 %	4,20 %	28,27 %	0,26 %	1,26 %	41,80 %	85,67 %	504,22	0,48
ME	34,98 %	0,00 %	0,00 %	0,57 %	0,00 %	3,42 %	30,99 %	0,00 %	65,02 %	51,75 %	0,00 %	13,27 %	0,00 %	0,00 %	99,50 %	622,51	0,00
MT	12,54 %	0,00 %	0,50 %	11,22 %	0,00 %	0,45 %	0,36 %	5,38 %	82,08 %	1,61 %	10,43 %	0,10 %	0,75 %	69,19 %	95,16 %	398,45	0,16
NL	31,70 %	0,00 %	3,64 %	27,76 %	0,00 %	0,16 %	0,14 %	2,85 %	65,46 %	0,58 %	23,17 %	0,04 %	2,72 %	38,95 %	43,80 %	382,47	0,08
NO	4,82 %	0,01 %	0,66 %	1,30 %	0,00 %	1,57 %	1,28 %	19,05 %	76,14 %	7,91 %	36,67 %	0,35 %	1,74 %	29,46 %	70,52 %	534,84	0,57
PL	9,29 %	0,00 %	0,77 %	8,04 %	0,00 %	0,13 %	0,35 %	1,63 %	89,08 %	1,44 %	70,07 %	0,03 %	0,15 %	17,39 %	83,06 %	808,30	0,05
PT	4,13 %	0,01 %	0,56 %	1,12 %	0,00 %	1,35 %	1,10 %	21,14 %	74,73 %	5,76 %	31,73 %	0,30 %	1,50 %	35,45 %	85,21 %	501,76	0,66
RO	47,65 %	0,00 %	0,41 %	6,79 %	0,00 %	12,59 %	27,87 %	20,88 %	31,47 %	0,30 %	12,96 %	0,02 %	0,17 %	18,02 %	99,34 %	233,02	3,61
RS	25,74 %	0,00 %	0,01 %	0,35 %	0,00 %	0,99 %	24,38 %	0,00 %	74,26 %	1,72 %	0,00 %	67,43 %	0,00 %	5,11 %	87,56 %	895,96	0,00
SE	50,70 %	0,00 %	7,47 %	28,20 %	0,00 %	7,75 %	7,28 %	32,54 %	16,76 %	13,78 %	0,08 %	0,00 %	1,22 %	1,69 %	8,42 %	85,52	0,88
SI	18,97 %	0,00 %	1,04 %	13,23 %	0,00 %	0,13 %	4,56 %	33,41 %	47,62 %	0,19 %	41,58 %	0,01 %	0,14 %	5,70 %	52,42 %	429,45	1,00
SK	10,67 %	0,30 %	4,41 %	0,98 %	0,00 %	0,69 %	4,28 %	41,39 %	47,94 %	3,84 %	17,33 %	0,42 %	2,55 %	23,80 %	81,95 %	334,33	2,00

***Untracked Consumption** = Electricity consumption not explicitly disclosed through tracking instruments such as Guarantees of Origin.*
***Note**: CO_2 and radioactive waste figures reported are destined for purposes of electricity disclosure only (rf. page 2).*
***Data Sources**: Information reported by national Competent Bodies; Association of Issuing Bodies (AIB); Eurostat*
Residual mix of Germany assumes all renewable energy production for which a GO is not issued is tracked under EEG

5 Graphs with detailed calculations results

5.1 Residual mixes 2024

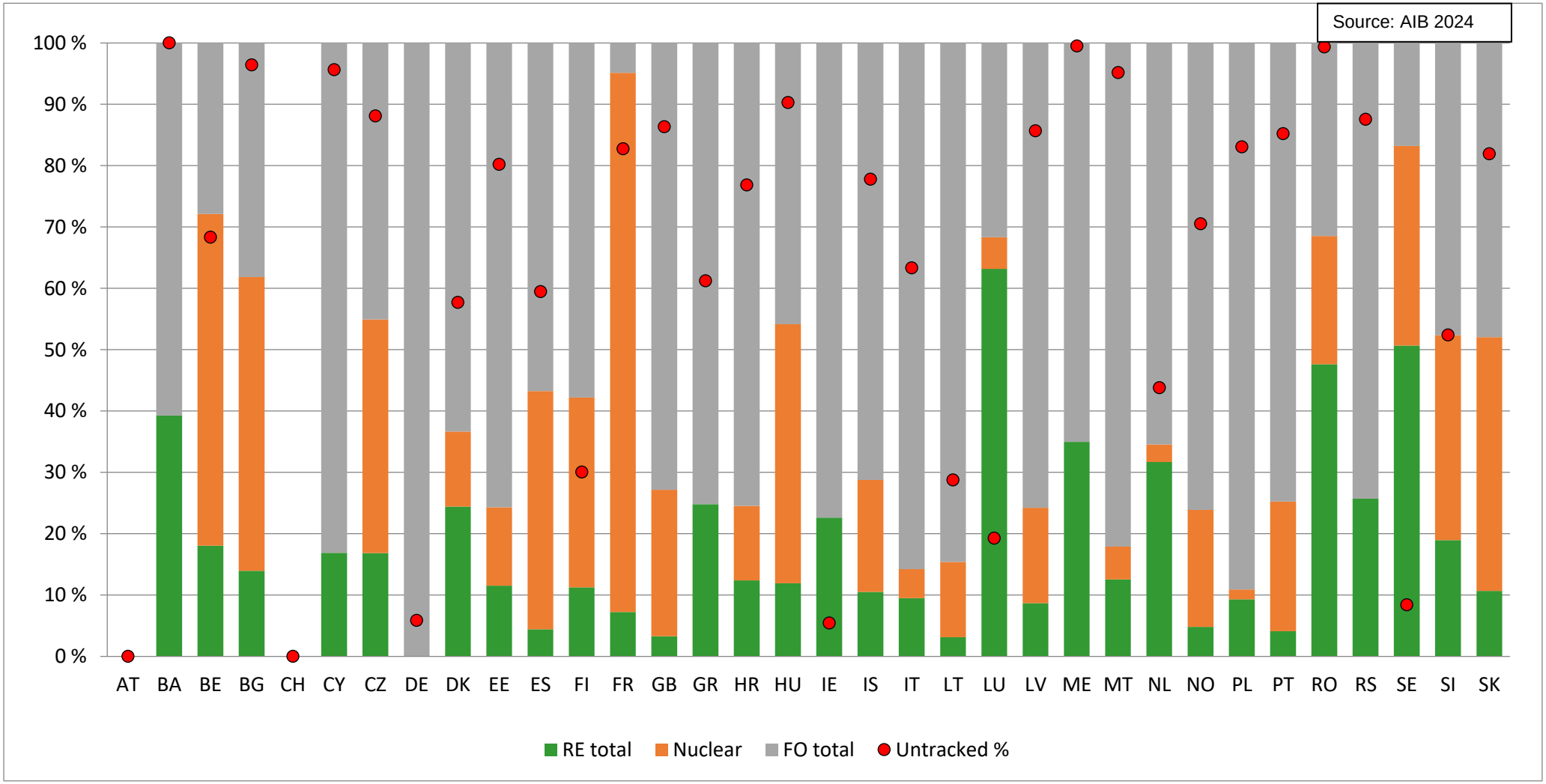


Figure 1 Residual Mixes 2024

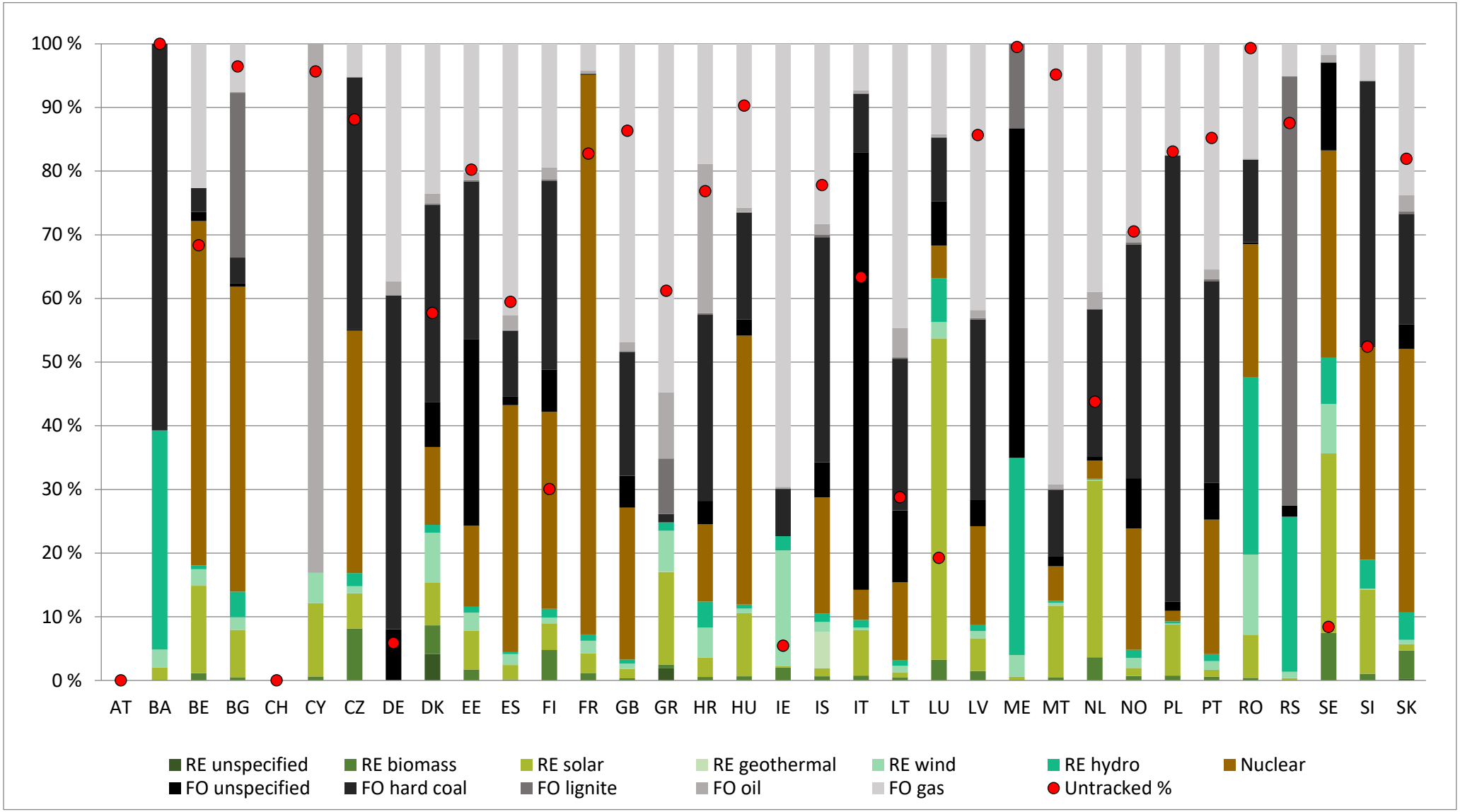


Figure 2 Residual Mixes 2024 (detailed fuel categories)

5.2 Attributes to/from the European Attribute Mix 2024

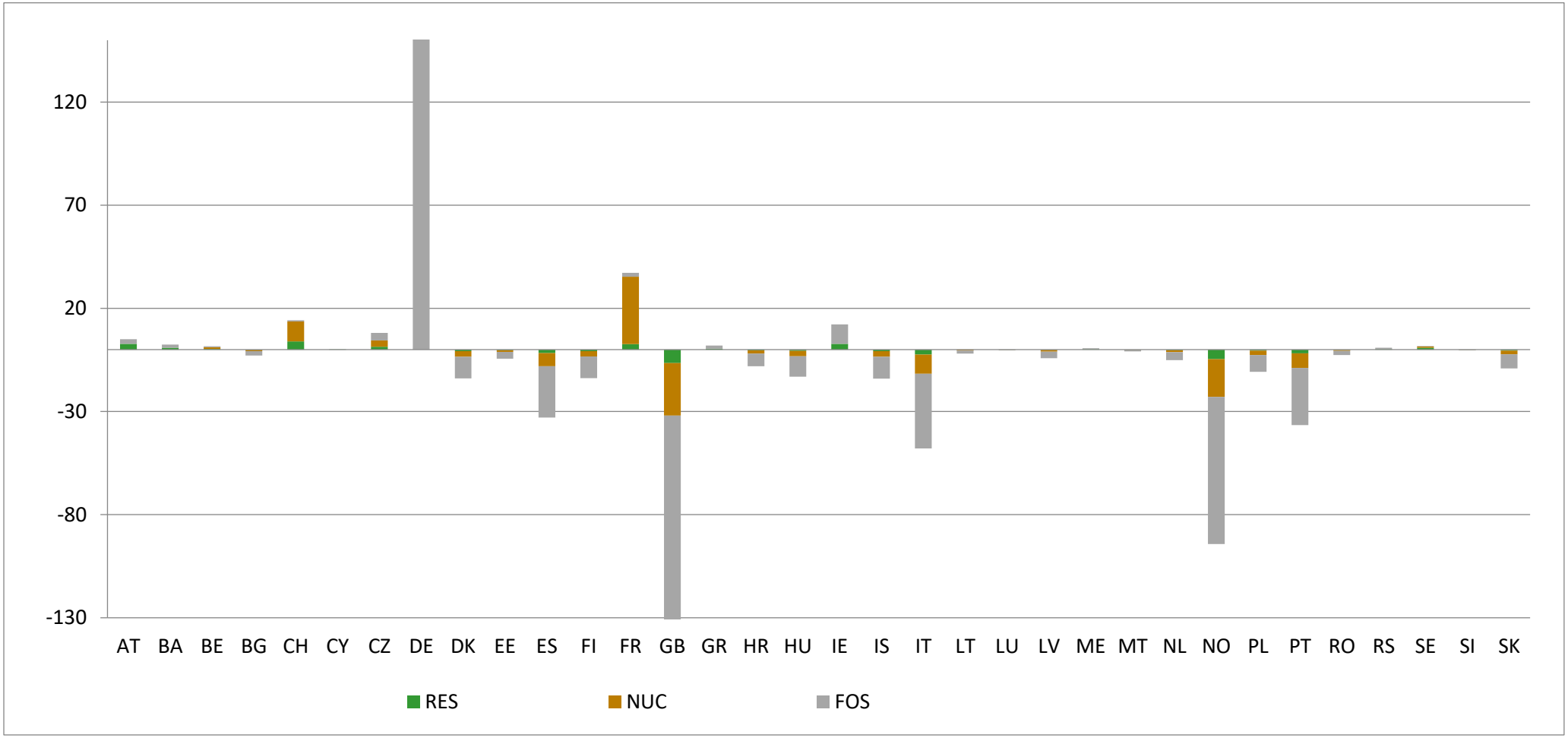


Figure 3: Attributes [TWh] to(positive)/from(negative) the European Attribute Mix 2024[6]

[6] In this figure, the renewable energy added to the EAM does not equal the renewable energy taken out of it, which may seem peculiar. There are two reasons for it: 1) temporal attribute deficit caused by issuing volumes being higher than expiry and cancellation volumes, and 2) some countries have negative renewable energy balance in domestic residual mixes (caused by variation in disclosure periods and GO lifetimes overlapping two disclosure periods). This negativity is transferred into the EAM before considering the domestic residual mix attribute surpluses and deficits.

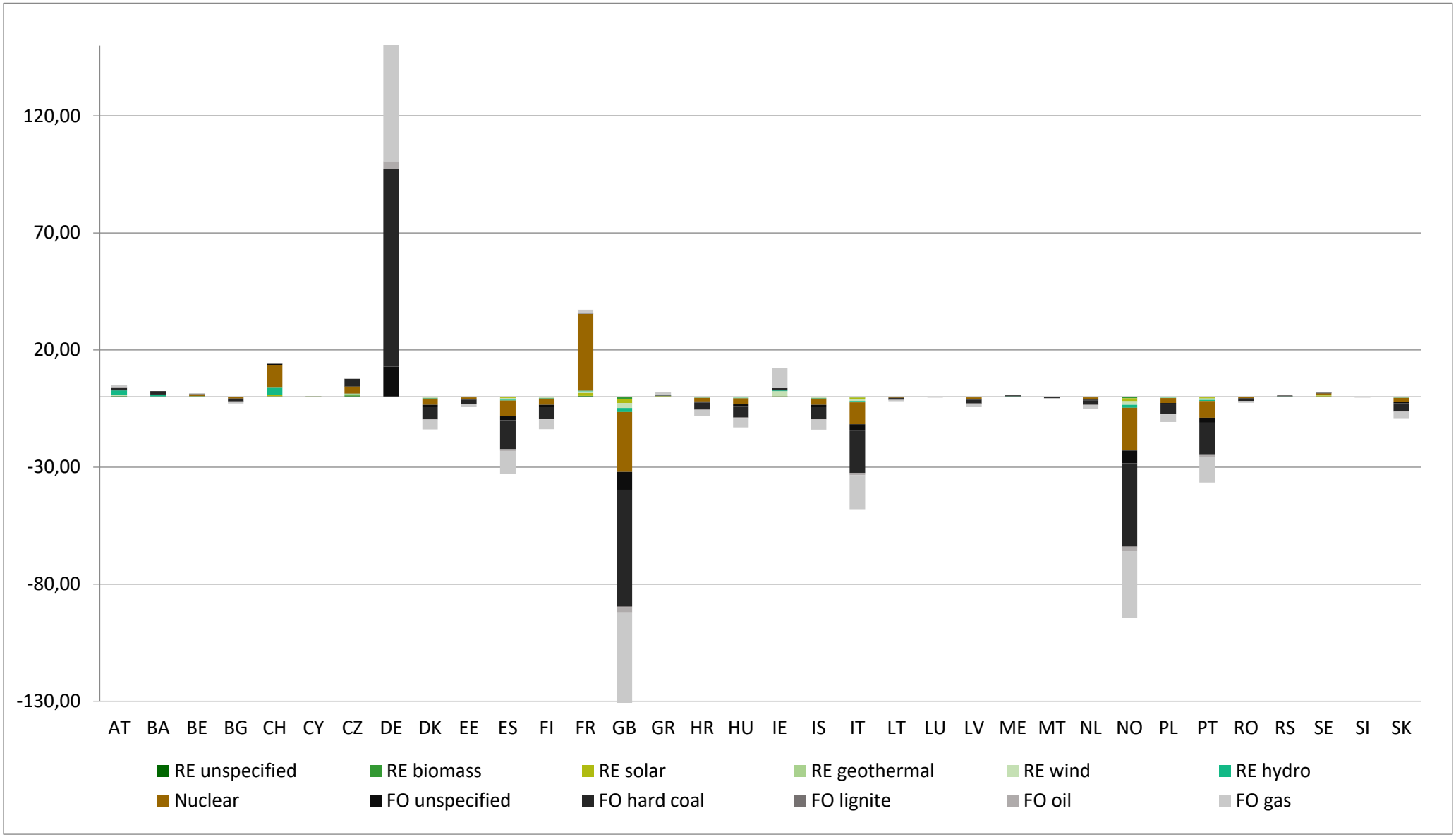


Figure 4 Attributes [TWh] to(positive)/from(negative) the European Attribute Mix 2024 (detailed fuel categories)

Table 3 Attributes [TWh] to/from the European Attribute Mix 2024[7]

Country code	Volume (TWh)	RE unspecified	RE biomass	RE solar	RE geothermal	RE wind	RE hydro	Nuclear	FO unspeci-fied	FO hard coal	FO lignite	FO oil	FO gas
AT	5,05	0,00	0,33	0,00	0,00	0,63	1,80	0,00	0,00	1,07	0,00	0,33	0,90
BA	2,46	0,00	0,00	0,05	0,00	0,07	0,85	0,00	0,00	1,49	0,00	0,00	0,00
BE	1,61	0,00	0,02	0,22	0,00	0,04	0,01	0,87	0,02	0,06	0,00	0,00	0,36
BG	-2,85	0,00	-0,02	-0,04	0,00	-0,05	-0,04	-0,55	-0,17	-1,07	-0,01	-0,05	-0,86
CH	14,21	0,00	0,25	0,52	0,00	0,03	3,14	9,74	0,48	0,00	0,00	0,00	0,06
CY	0,03	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,03	0,00
CZ	8,09	0,00	0,66	0,45	0,00	0,09	0,17	3,08	0,01	3,21	0,00	0,01	0,42
DE	160,52	0,00	0,00	0,00	0,00	0,00	0,00	0,00	12,89	84,24	0,00	3,54	59,85
DK	-13,98	0,00	-0,09	-0,19	0,00	-0,22	-0,18	-2,71	-0,81	-5,26	-0,05	-0,25	-4,21
EE	-4,36	0,00	-0,03	-0,06	0,00	-0,07	-0,06	-0,85	-0,25	-1,64	-0,02	-0,08	-1,31
ES	-32,98	-0,01	-0,22	-0,44	0,00	-0,53	-0,43	-6,40	-1,91	-12,41	-0,12	-0,59	-9,92
FI	-13,87	0,00	-0,09	-0,19	0,00	-0,22	-0,18	-2,69	-0,81	-5,22	-0,05	-0,25	-4,17
FR	37,20	0,00	0,41	1,16	0,00	0,74	0,37	32,69	0,00	0,07	0,00	0,17	1,58
GB	-131,67	-0,02	-0,89	-1,76	0,00	-2,12	-1,72	-25,54	-7,64	-49,54	-0,48	-2,36	-39,61
GR	1,95	0,04	0,01	0,28	0,00	0,13	0,03	0,00	0,00	0,02	0,17	0,20	1,07
HR	-8,08	0,00	-0,05	-0,11	0,00	-0,13	-0,11	-1,57	-0,47	-3,04	-0,03	-0,14	-2,43

[7] Same as in previous figure 3, the renewable energy added to the EAM does not equal the renewable energy taken out of it. For more information refer to footnote 4.

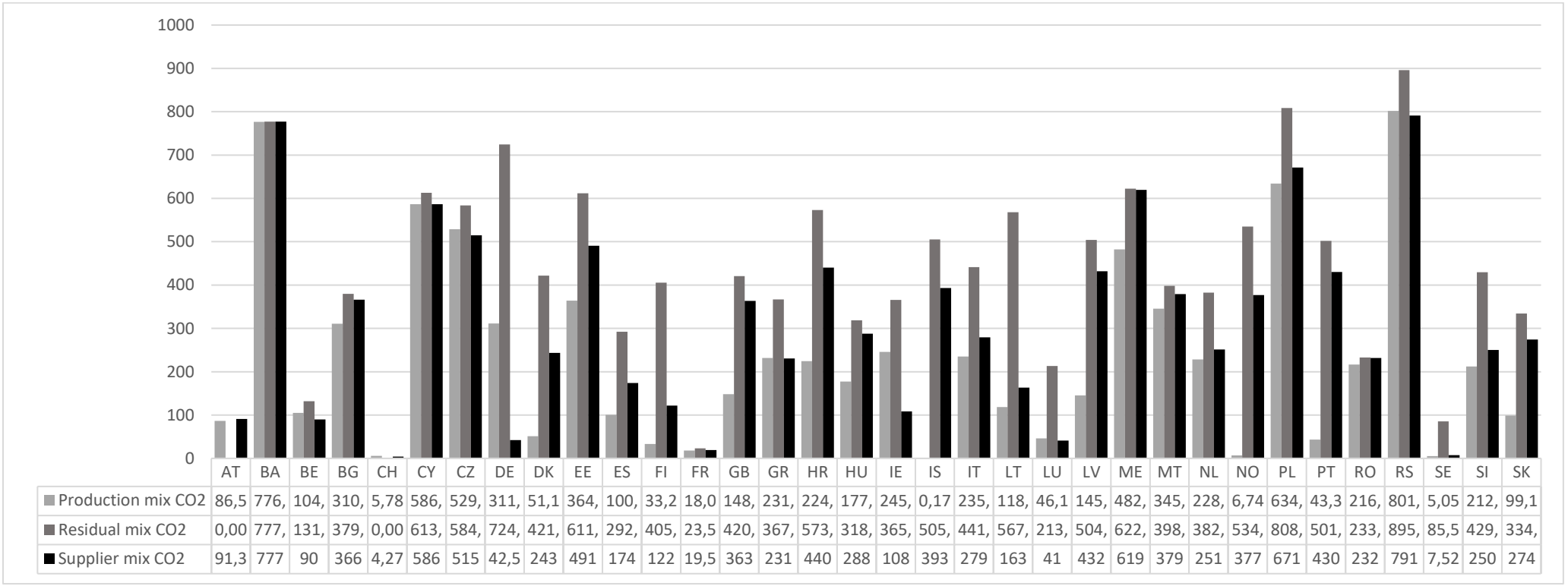
Country code	Volume (TWh)	RE unspecified	RE biomass	RE solar	RE geothermal	RE wind	RE hydro	Nuclear	FO unspeci-fied	FO hard coal	FO lignite	FO oil	FO gas
HU	-13,09	0,00	-0,09	-0,17	0,00	-0,21	-0,17	-2,54	-0,76	-4,93	-0,05	-0,23	-3,94
IE	12,21	0,00	0,25	0,03	0,00	2,21	0,27	0,00	0,00	0,91	0,00	0,04	8,49
IS	-14,05	0,00	-0,09	-0,19	0,00	-0,23	-0,18	-2,73	-0,82	-5,29	-0,05	-0,25	-4,23
IT	-47,96	-0,01	-0,32	-0,64	0,00	-0,77	-0,63	-9,30	-2,78	-18,04	-0,17	-0,86	-14,43
LT	-1,89	0,00	-0,01	-0,03	0,00	-0,03	-0,02	-0,37	-0,11	-0,71	-0,01	-0,03	-0,57
LU	-0,26	0,00	0,00	0,00	0,00	0,00	0,00	-0,05	-0,02	-0,10	0,00	0,00	-0,08
LV	-4,21	0,00	-0,03	-0,06	0,00	-0,07	-0,06	-0,82	-0,24	-1,59	-0,02	-0,08	-1,27
ME	0,72	0,00	0,00	0,00	0,00	0,02	0,22	0,00	0,37	0,00	0,10	0,00	0,00
MT	-0,82	0,00	-0,01	-0,01	0,00	-0,01	-0,01	-0,16	-0,05	-0,31	0,00	-0,01	-0,25
NL	-5,05	0,00	-0,03	-0,07	0,00	-0,08	-0,07	-0,98	-0,29	-1,90	-0,02	-0,09	-1,52
NO	-94,29	-0,01	-0,63	-1,26	0,00	-1,52	-1,24	-18,29	-5,47	-35,47	-0,34	-1,69	-28,36
PL	-10,74	0,00	-0,07	-0,14	0,00	-0,17	-0,14	-2,08	-0,62	-4,04	-0,04	-0,19	-3,23
PT	-36,61	-0,01	-0,25	-0,49	0,00	-0,59	-0,48	-7,10	-2,12	-13,77	-0,13	-0,66	-11,01
RO	-2,60	0,00	-0,02	-0,03	0,00	-0,04	-0,03	-0,50	-0,15	-0,98	-0,01	-0,05	-0,78
RS	0,91	0,00	0,00	0,00	0,00	0,01	0,22	0,00	0,02	0,00	0,61	0,00	0,05
SE	1,79	0,00	0,13	0,51	0,00	0,14	0,13	0,58	0,25	0,00	0,00	0,02	0,03
SI	-0,22	0,00	0,00	0,00	0,00	0,00	0,00	-0,04	-0,01	-0,08	0,00	0,00	-0,07
SK	-9,13	0,00	-0,06	-0,12	0,00	-0,15	-0,12	-1,77	-0,53	-3,43	-0,03	-0,16	-2,75

5.3 Environmental indicators 2024

According to directive 2019/944/EC, Annex 1(5), electricity suppliers shall (together with energy origin disclosure) disclose “information on the environmental impact, in at least terms of CO2 emissions and the radioactive waste resulting from the electricity produced by the overall energy mix of the supplier over the preceding year”. The calculation of the environmental indicators goes hand in hand with the calculation of energy source shares in the residual mix:

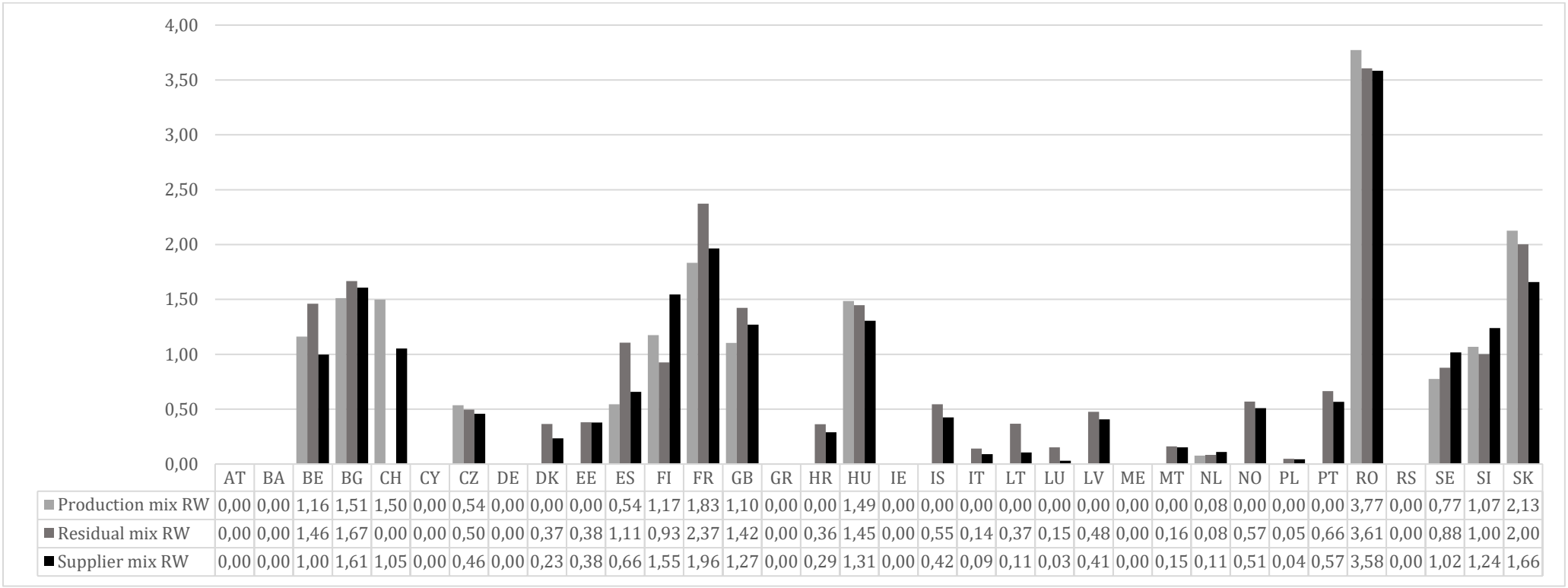
- The CO2 factor of the production mix is obtained by multiplying each energy in the production mix with the CO2 factor of that energy source for that country (nationally reported data or Ecoinvent database).
- The emissions of the Domestic Residual Mix are the emissions of the Production Mix adjusted with the Issued and Expired Attributes for each energy source respectfully,
- For surplus countries, CO2 factor in Final RM is equal to the CO2 factor in Domestic RM. For deficit countries, CO2 is added to the Domestic RM by multiplying the volume of deficit with the CO2 factor of the EAM.

The process is identical for radioactive waste, but the source data is as described in the introduction.



	AT	BA	BE	BG	CH	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GR	HR	HU	IE	IS	IT	LT	LU	LV	ME	MT	NL	NO	PL	PT	RO	RS	SE	SI	SK
Production mix CO2	86,5	776,	104,	310,	5,78	586,	529,	311,	51,1	364,	100,	33,2	18,0	148,	231,	224,	177,	245,	0,17	235,	118,	46,1	145,	482,	345,	228,	6,74	634,	43,3	216,	801,	5,05	212,	99,1
Residual mix CO2	0,00	777,	131,	379,	0,00	613,	584,	724,	421,	611,	292,	405,	23,5	420,	367,	573,	318,	365,	505,	441,	567,	213,	504,	622,	398,	382,	534,	808,	501,	233,	895,	85,5	429,	334,
Supplier mix CO2	91,3	777	90	366	4,27	586	515	42,5	243	491	174	122	19,5	363	231	440	288	108	393	279	163	41	432	619	379	251	377	671	430	232	791	7,52	250	274

Figure 5 Direct CO2 content in Production, Residual and Total Supplier mix 2024 [gCO2/kWh]



	AT	BA	BE	BG	CH	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GR	HR	HU	IE	IS	IT	LT	LU	LV	ME	MT	NL	NO	PL	PT	RO	RS	SE	SI	SK
Production mix RW	0,00	0,00	1,16	1,51	1,50	0,00	0,54	0,00	0,00	0,00	0,54	1,17	1,83	1,10	0,00	0,00	1,49	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,08	0,00	0,00	0,00	3,77	0,00	0,77	1,07	2,13
Residual mix RW	0,00	0,00	1,46	1,67	0,00	0,00	0,50	0,00	0,37	0,38	1,11	0,93	2,37	1,42	0,00	0,36	1,45	0,00	0,55	0,14	0,37	0,15	0,48	0,00	0,16	0,08	0,57	0,05	0,66	3,61	0,00	0,88	1,00	2,00
Supplier mix RW	0,00	0,00	1,00	1,61	1,05	0,00	0,46	0,00	0,23	0,38	0,66	1,55	1,96	1,27	0,00	0,29	1,31	0,00	0,42	0,09	0,11	0,03	0,41	0,00	0,15	0,11	0,51	0,04	0,57	3,58	0,00	1,02	1,24	1,66

Figure 6 Highly active radioactive waste content in Production, Residual and Total Suppler Mix 2024 [mgRW/kWh]

5.4 Total supplier mixes 2024

The total supplier mix (Table 4, Figures 7 and 8) represents the total consumption mix of a country, i.e. it is the sum of attributes of 1) cancelled GOs as well as 2) the final residual mix. Thus, both explicitly tracked and available remaining electricity attributes are included in the TSM, which equals in physical volume with the country's total electricity consumption. For understanding, it might help to consider that without the international transferability of GOs and electricity, the TSM would equal the production mix of the country.

Note: The supplier mix from Germany assumes all RES production for which a GO is not issued is tracked under the EEG and marked as renewable unspecified in the total supplier mix due to unavailability of energy source specific data for the EEG.

Table 4: Total Supplier Mix 2024

	Volume (TWh)	RE unspecified	RE biomass	RE solar	RE geothermal	RE wind	RE hydro	Nuclear	FO unspecified	FO hard coal	FO lignite	FO oil	FO gas	CO2 (gCO2/kWh)	Rad waste ()mg/kWh
AT	60,72	0,03 %	4,07 %	6,02 %	0,18 %	12,94 %	58,37 %	0,00 %	0,07 %	1,91 %	0,00 %	0,58 %	15,82 %	91,33	0,00
BA	11,56	0,00 %	0,00 %	2,04 %	0,00 %	2,80 %	34,43 %	0,00 %	0,00 %	60,73 %	0,00 %	0,00 %	0,00 %	777,02	0,00
BE	77,76	0,02 %	5,55 %	10,43 %	0,18 %	17,78 %	10,03 %	36,96 %	1,01 %	2,54 %	0,00 %	0,01 %	15,48 %	90,04	1,00
BG	33,59	0,00 %	0,46 %	9,36 %	0,00 %	2,70 %	4,50 %	46,18 %	0,49 %	3,93 %	24,97 %	0,15 %	7,26 %	366,03	1,61
CH	61,63	0,00 %	1,53 %	4,18 %	0,00 %	3,53 %	67,80 %	21,93 %	0,80 %	0,00 %	0,00 %	0,00 %	0,24 %	4,27	1,05
CY	5,24	0,00 %	0,73 %	15,23 %	0,00 %	4,56 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	79,48 %	0,00 %	586,43	0,00
CZ	60,21	0,02 %	8,95 %	6,04 %	0,11 %	3,30 %	6,67 %	35,22 %	0,14 %	34,91 %	0,00 %	0,10 %	4,54 %	514,64	0,46
DE	453,02	45,41 %	1,92 %	3,31 %	0,49 %	8,61 %	34,39 %	0,00 %	0,47 %	3,08 %	0,00 %	0,13 %	2,19 %	42,50	0,00
DK	38,44	2,42 %	4,47 %	11,41 %	0,00 %	32,46 %	4,87 %	7,82 %	4,09 %	17,84 %	0,13 %	0,89 %	13,59 %	243,46	0,23
EE	8,26	0,01 %	4,16 %	9,76 %	0,05 %	9,27 %	3,37 %	12,66 %	23,51 %	19,85 %	0,19 %	0,94 %	16,21 %	490,89	0,38
ES	247,84	0,00 %	1,83 %	10,70 %	0,00 %	19,00 %	11,64 %	23,08 %	0,77 %	6,17 %	0,05 %	1,38 %	25,38 %	173,77	0,66
FI	82,74	0,01 %	6,03 %	3,07 %	0,01 %	11,97 %	9,97 %	51,56 %	1,99 %	8,92 %	0,06 %	0,59 %	5,83 %	121,97	1,55
FR	449,20	0,01 %	1,45 %	4,33 %	0,01 %	7,26 %	10,17 %	72,73 %	0,01 %	0,15 %	0,00 %	0,37 %	3,52 %	19,47	1,96
GB	305,20	0,01 %	3,13 %	1,80 %	0,00 %	9,64 %	1,38 %	21,13 %	4,32 %	16,75 %	0,16 %	1,23 %	40,45 %	363,34	1,27
GR	56,56	1,15 %	1,62 %	18,18 %	0,05 %	22,48 %	8,42 %	0,00 %	0,03 %	0,78 %	5,34 %	6,36 %	35,58 %	230,64	0,00

	Volume (TWh)	RE unspecified	RE biomass	RE solar	RE geothermal	RE wind	RE hydro	Nuclear	FO unspecified	FO hard coal	FO lignite	FO oil	FO gas	CO2 (gCO2/kWh)	Rad waste ()mg/kWh
HR	16,78	0,01 %	4,11 %	2,98 %	0,00 %	6,82 %	18,39 %	9,72 %	2,80 %	22,48 %	0,17 %	18,03 %	14,49 %	440,41	0,29
HU	46,43	0,02 %	1,73 %	11,20 %	0,04 %	3,89 %	3,60 %	38,13 %	2,30 %	15,14 %	0,10 %	0,62 %	23,23 %	287,66	1,31
IE	42,53	1,29 %	5,59 %	10,90 %	0,00 %	40,97 %	16,47 %	0,00 %	0,00 %	0,41 %	0,00 %	0,02 %	24,37 %	108,23	0,00
IS	19,19	0,01 %	0,76 %	3,91 %	5,46 %	13,41 %	6,84 %	14,20 %	4,25 %	27,54 %	0,27 %	1,33 %	22,02 %	393,29	0,42
IT	310,83	0,07 %	5,89 %	9,94 %	2,00 %	8,10 %	16,66 %	2,99 %	43,56 %	5,81 %	0,06 %	0,28 %	4,64 %	279,50	0,09
LT	10,37	0,00 %	14,37 %	13,63 %	0,00 %	29,99 %	14,13 %	3,54 %	3,25 %	6,85 %	0,07 %	1,31 %	12,86 %	163,42	0,11
LU	5,13	0,09 %	1,98 %	10,80 %	1,66 %	14,26 %	64,12 %	0,99 %	1,34 %	1,92 %	0,02 %	0,09 %	2,73 %	41,03	0,03
LV	6,98	0,01 %	3,76 %	5,37 %	0,00 %	3,49 %	9,16 %	13,30 %	3,59 %	24,21 %	0,22 %	1,08 %	35,81 %	431,94	0,41
ME	3,26	0,00 %	0,00 %	0,57 %	0,00 %	3,90 %	30,83 %	0,00 %	51,49 %	0,00 %	13,21 %	0,00 %	0,00 %	619,41	0,00
MT	3,10	0,00 %	1,01 %	11,90 %	0,00 %	1,42 %	2,44 %	5,12 %	1,53 %	9,92 %	0,10 %	0,72 %	65,85 %	379,17	0,15
NL	115,92	0,00 %	3,00 %	16,97 %	0,00 %	26,88 %	0,72 %	3,99 %	2,16 %	10,40 %	0,02 %	1,19 %	34,66 %	251,44	0,11
NO	137,16	0,02 %	0,78 %	2,85 %	0,02 %	6,50 %	19,10 %	17,06 %	5,56 %	25,86 %	0,25 %	1,23 %	20,77 %	377,10	0,51
PL	154,20	0,00 %	3,23 %	8,53 %	0,00 %	11,29 %	1,47 %	1,49 %	1,20 %	58,20 %	0,03 %	0,12 %	14,44 %	671,39	0,04
PT	51,40	0,23 %	1,67 %	0,98 %	0,00 %	8,90 %	6,00 %	18,01 %	5,44 %	27,04 %	0,26 %	1,27 %	30,21 %	430,01	0,57
RO	50,74	0,00 %	0,41 %	6,88 %	0,00 %	12,92 %	27,76 %	20,74 %	0,33 %	12,87 %	0,02 %	0,17 %	17,90 %	232,04	3,58
RS	34,80	0,00 %	0,84 %	0,34 %	0,00 %	3,84 %	29,03 %	0,00 %	1,86 %	0,00 %	59,05 %	0,00 %	5,05 %	790,95	0,00
SE	136,29	0,06 %	7,09 %	3,64 %	0,01 %	15,63 %	34,41 %	37,68 %	1,23 %	0,01 %	0,00 %	0,10 %	0,14 %	7,52	1,02
SI	12,80	0,00 %	3,16 %	15,19 %	0,06 %	0,62 %	11,23 %	41,31 %	0,10 %	21,80 %	1,22 %	0,08 %	5,23 %	250,20	1,24
SK	26,33	0,25 %	4,76 %	2,61 %	0,00 %	2,83 %	15,83 %	34,42 %	3,15 %	14,20 %	0,34 %	2,09 %	19,53 %	274,11	1,66

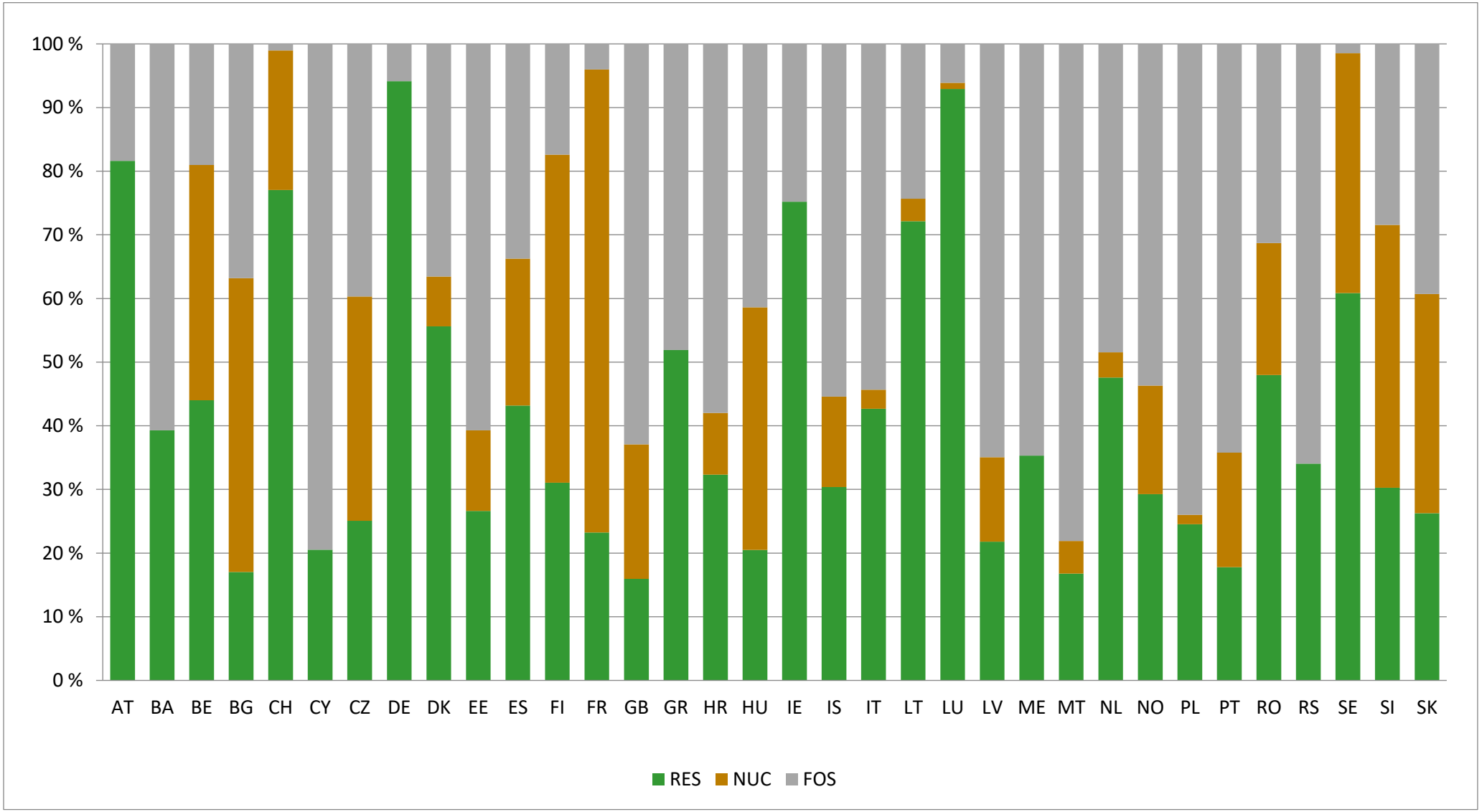


Figure 7 Total Supplier Mix 2024 (simple fuel categories)

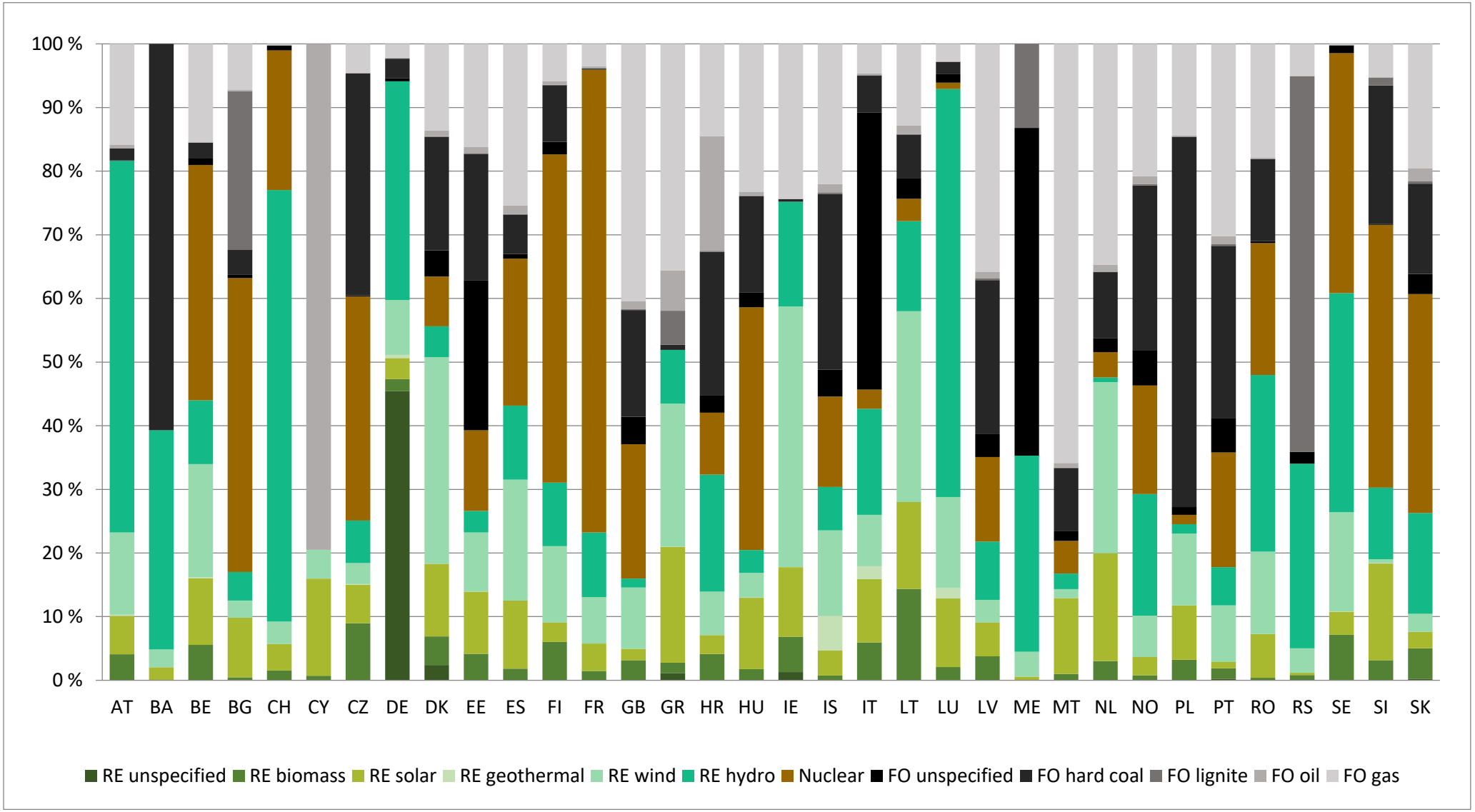


Figure 8 Total Supplier Mix 2024 (detailed fuel categories)

5.5 Production mixes 2024

Table 5: Production Mix 2024[8]

	Volume [TWh]	RE unspecified	RE biomass	RE solar	RE geothermal	RE wind	RE hydro	Nuclear	FO unspecified	FO hard coal	FO lignite	FO oil	FO gas	CO2 (gCO2/kWh)	Rad waste (mg/kWh)
AT	72,72	0,00 %	4,29 %	0,00 %	0,00 %	14,67 %	65,20 %	0,00 %	0,93 %	2,89 %	0,00 %	0,95 %	11,07 %	86,53	0,00
BA	14,03	0,00 %	0,00 %	2,04 %	0,00 %	2,80 %	34,47 %	0,00 %	0,00 %	60,69 %	0,00 %	0,00 %	0,00 %	776,55	0,00
BE	68,86	0,00 %	3,59 %	11,57 %	0,00 %	19,07 %	0,61 %	43,00 %	1,18 %	2,95 %	0,00 %	0,01 %	18,03 %	104,82	1,16
BG	34,64	0,00 %	0,47 %	14,90 %	0,00 %	3,97 %	8,02 %	43,18 %	0,00 %	0,71 %	24,18 %	0,00 %	4,56 %	310,74	1,51
CH	73,57	0,00 %	2,43 %	5,41 %	0,00 %	0,23 %	59,28 %	31,24 %	1,17 %	0,00 %	0,00 %	0,00 %	0,24 %	5,78	1,50
CY	5,27	0,00 %	0,76 %	15,87 %	0,00 %	3,87 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	79,50 %	0,00 %	586,55	0,00
CZ	68,07	0,00 %	7,32 %	5,25 %	0,00 %	1,02 %	3,93 %	41,27 %	0,15 %	35,59 %	0,00 %	0,10 %	5,37 %	529,13	0,54
DE	435,06	0,00 %	3,89 %	16,55 %	0,05 %	32,13 %	4,38 %	0,00 %	3,45 %	22,57 %	0,00 %	0,95 %	16,03 %	311,58	0,00
DK	36,17	2,57 %	20,48 %	10,44 %	0,00 %	56,85 %	0,06 %	0,00 %	2,10 %	4,41 %	0,00 %	0,26 %	2,82 %	51,18	0,00
EE	5,36	0,00 %	22,37 %	18,75 %	0,00 %	21,71 %	0,56 %	0,00 %	35,78 %	0,00 %	0,00 %	0,00 %	0,83 %	364,28	0,00
ES	258,07	0,27 %	1,49 %	18,87 %	0,00 %	23,64 %	12,28 %	20,16 %	0,00 %	1,15 %	0,00 %	1,12 %	21,02 %	100,66	0,54
FI	79,56	0,00 %	11,79 %	1,45 %	0,00 %	24,96 %	17,78 %	39,13 %	1,05 %	2,71 %	0,00 %	0,30 %	0,82 %	33,20	1,17
FR	532,34	0,00 %	1,98 %	4,66 %	0,00 %	8,80 %	12,87 %	67,95 %	0,01 %	0,14 %	0,00 %	0,34 %	3,26 %	18,07	1,83
GB	270,65	0,00 %	13,64 %	5,42 %	0,00 %	30,92 %	2,09 %	13,80 %	2,05 %	0,59 %	0,00 %	0,51 %	30,98 %	148,50	1,10
GR	57,59	1,21 %	1,25 %	20,15 %	0,00 %	22,32 %	5,87 %	0,00 %	0,03 %	0,00 %	5,62 %	6,70 %	36,85 %	231,97	0,00
HR	13,60	0,00 %	6,51 %	2,73 %	0,00 %	19,28 %	44,92 %	0,00 %	0,00 %	5,38 %	0,00 %	21,19 %	0,00 %	224,38	0,00

[8] The physical electricity imports and exports outside of the Residual mix calculation area are not included in these figures.

	Volume [TWh]	RE unspecified	RE biomass	RE solar	RE geothermal	RE wind	RE hydro	Nuclear	FO unspecified	FO hard coal	FO lignite	FO oil	FO gas	CO2 (gCO2/kWh)	Rad waste (mg/kWh)
HU	35,70	0,00 %	4,15 %	24,87 %	0,02 %	1,78 %	0,63 %	42,47 %	0,87 %	5,89 %	0,00 %	0,14 %	19,18 %	177,20	1,49
IE	36,99	0,60 %	2,59 %	2,37 %	0,00 %	38,18 %	2,11 %	0,00 %	0,00 %	2,92 %	0,00 %	0,12 %	51,09 %	245,57	0,00
IS	19,57	0,00 %	0,00 %	0,00 %	30,40 %	0,06 %	69,51 %	0,00 %	0,00 %	0,00 %	0,00 %	0,02 %	0,00 %	0,17	0,00
IT	259,84	0,00 %	5,07 %	13,88 %	2,03 %	8,49 %	19,48 %	0,00 %	51,04 %	0,00 %	0,00 %	0,00 %	0,00 %	235,24	0,00
LT	5,73	0,00 %	12,60 %	1,66 %	0,00 %	59,04 %	7,59 %	0,00 %	3,97 %	0,00 %	0,00 %	1,79 %	13,35 %	118,76	0,00
LU	1,52	0,00 %	18,00 %	34,24 %	0,00 %	31,34 %	8,84 %	0,00 %	3,53 %	0,00 %	0,00 %	0,00 %	4,05 %	46,18	0,00
LV	5,91	0,00 %	7,44 %	6,74 %	0,00 %	4,63 %	54,06 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	27,14 %	145,65	0,00
ME	3,45	0,00 %	0,00 %	1,80 %	0,00 %	8,45 %	50,94 %	0,00 %	0,00 %	0,00 %	38,81 %	0,00 %	0,00 %	482,21	0,00
MT	2,13	0,00 %	0,43 %	15,02 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,36 %	84,19 %	345,33	0,00
NL	120,14	0,00 %	5,32 %	18,10 %	0,00 %	27,35 %	0,07 %	2,83 %	1,28 %	8,03 %	0,00 %	1,11 %	35,91 %	228,58	0,08
NO	155,60	0,12 %	0,00 %	0,16 %	0,00 %	9,35 %	88,98 %	0,00 %	1,39 %	0,00 %	0,00 %	0,00 %	0,00 %	6,74	0,00
PL	154,20	0,00 %	4,46 %	9,79 %	0,00 %	15,68 %	1,34 %	0,00 %	0,79 %	55,58 %	0,00 %	0,00 %	12,35 %	634,03	0,00
PT	46,62	6,34 %	2,89 %	10,48 %	0,00 %	30,23 %	39,25 %	0,00 %	3,69 %	0,00 %	0,00 %	0,00 %	7,11 %	43,30	0,00
RO	47,80	0,00 %	0,39 %	7,08 %	0,00 %	13,18 %	29,32 %	20,96 %	0,00 %	11,62 %	0,00 %	0,08 %	17,37 %	216,47	3,77
RS	34,29	0,00 %	0,85 %	0,35 %	0,00 %	3,89 %	28,97 %	0,00 %	0,01 %	0,00 %	61,03 %	0,00 %	4,91 %	801,71	0,00
SE	169,79	0,00 %	5,95 %	2,44 %	0,00 %	24,04 %	37,89 %	28,70 %	0,74 %	0,01 %	0,00 %	0,10 %	0,13 %	5,05	0,77
SI	15,59	0,00 %	1,27 %	7,15 %	0,00 %	0,04 %	33,37 %	35,61 %	0,05 %	19,90 %	0,00 %	0,04 %	2,55 %	212,22	1,07
SK	27,97	0,29 %	4,92 %	2,40 %	0,00 %	0,02 %	17,23 %	60,75 %	1,35 %	1,37 %	0,26 %	1,74 %	9,69 %	99,13	2,13

5.6 Various total mixes 2024

Table 6 European Total Production Mix, Total Attributes in Final Residual Mixes and European Attribute Mix 2024[9]

	Production mixes	Residual mixes	European attribute mix
Volume [TWh]	3168,37	1784,53	242,06
RE unspecified %	0,18 %	0,10 %	0,02 %
RE biomass %	9,42 %	5,29 %	1,33 %
RE solar %	4,55 %	1,19 %	0,67 %
RE geothermal %	18,63 %	1,85 %	1,61 %
RE wind %	0,36 %	0,05 %	0,00 %
RE hydro %	18,25 %	2,59 %	1,31 %
Nuclear %	21,39 %	34,34 %	19,40 %
FO unspecified %	5,31 %	10,04 %	5,80 %
FO hard coal %	1,07 %	1,91 %	0,36 %
FO lignite %	7,97 %	18,54 %	37,62 %
FO oil %	12,08 %	22,55 %	30,08 %
FO gas %	0,77 %	1,56 %	1,79 %

[9] The EAM volume and percentages presented here do not exactly match numbers provided in Table 1. This is due to some countries having negative renewable energy balance in domestic residual mixes (caused by variation in disclosure periods and GO lifetimes overlapping two disclosure periods). This negativity is transferred into the EAM before considering the domestic residual mix attribute surpluses and deficits. This negativity correction is included in this Table 6 for statistics purposes. For any member state residual mix calculation the values from the Table 1 should be used.

6 Comparisons

The following graphs and tables are not really results of the calculation, but meant for background information. They compare different mixes of the same year or the evolution of mixes on an annual level.

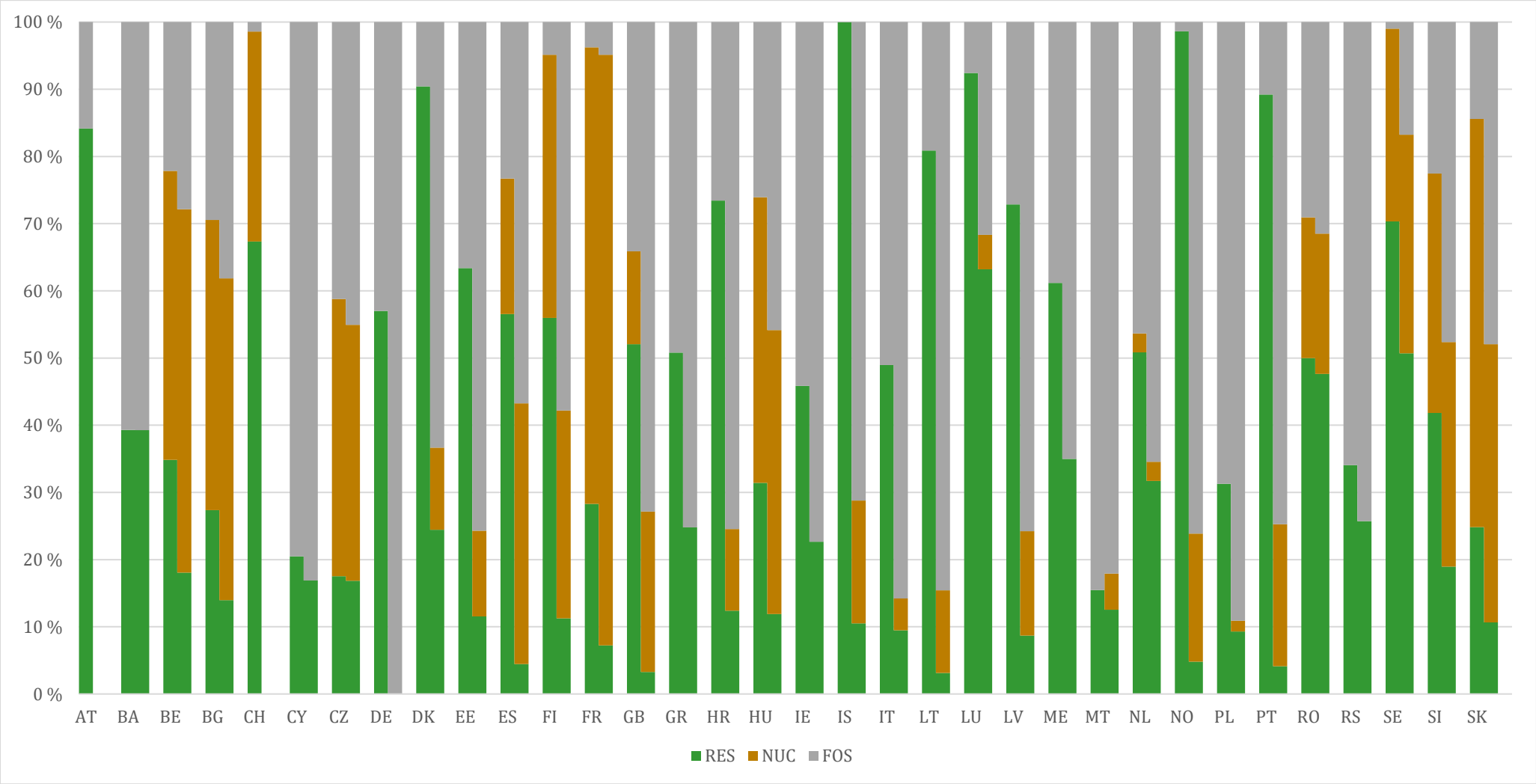


Figure 9 Production Mix (left) and Final Residual Mix (right) 2024 (simple fuel categories)

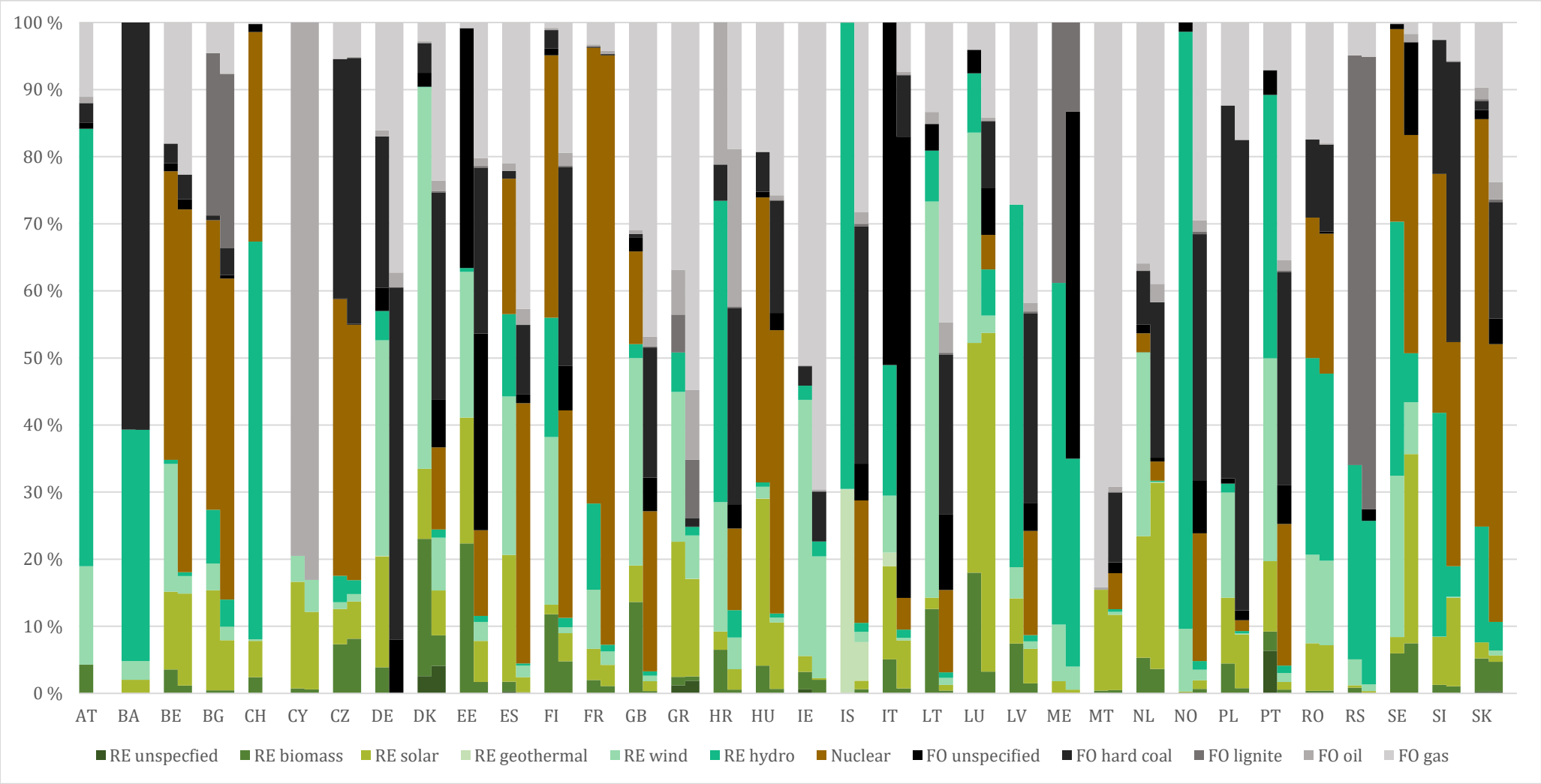


Figure 10 Production Mix (left) and Final Residual Mix (right) 2024 (detailed fuel categories)

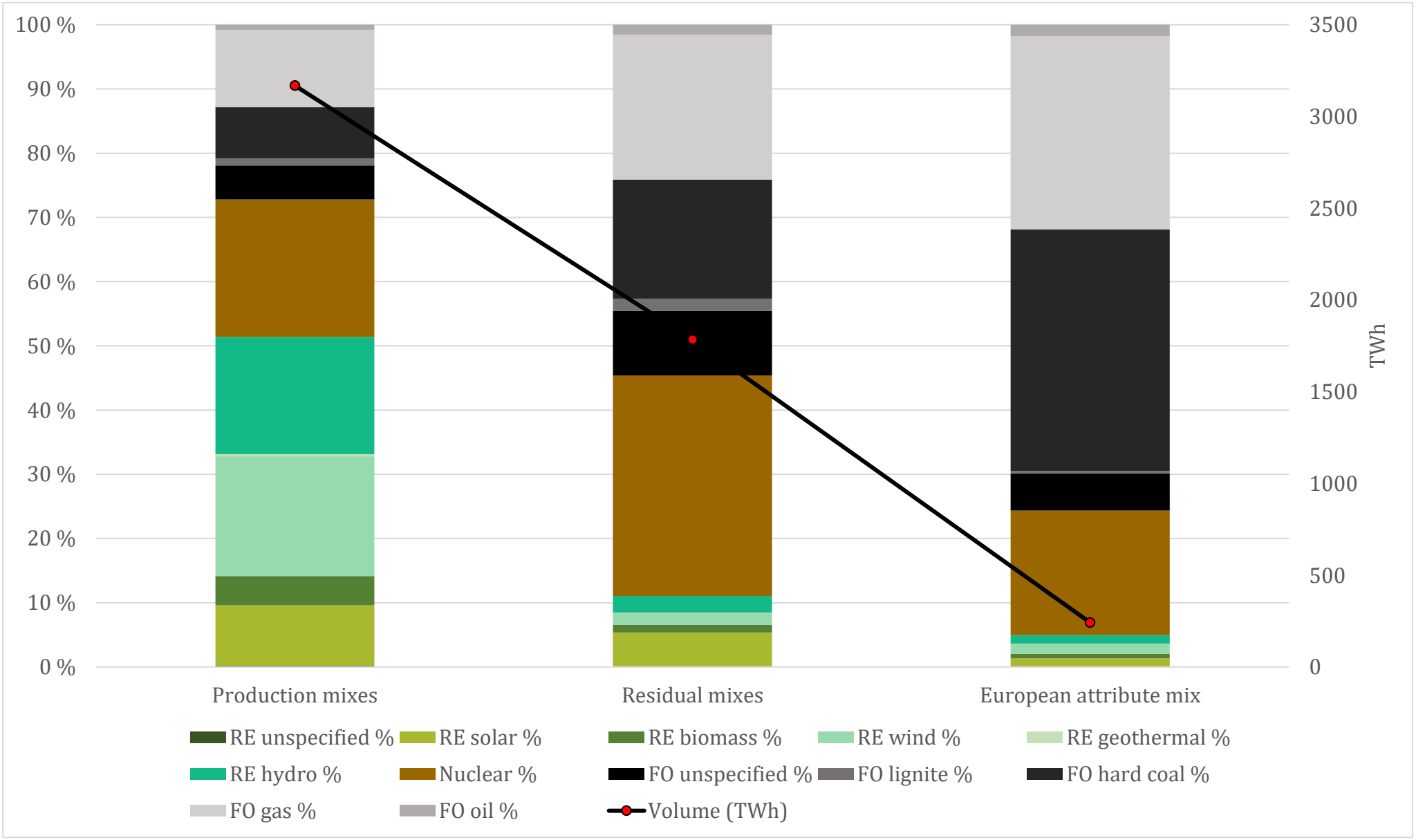


Figure 11 European Total Production Mix (left), Attributes in Final Residual Mixes (middle) and EAM (right) 2024

The following figures compare the production and total supplier mixes both in % and TWh. This provides an interesting viewpoint showing the difference of the production and consumption mix of countries. Countries with a “greener” consumption mix than their respective production mix are typically GO net importers and vice-versa.

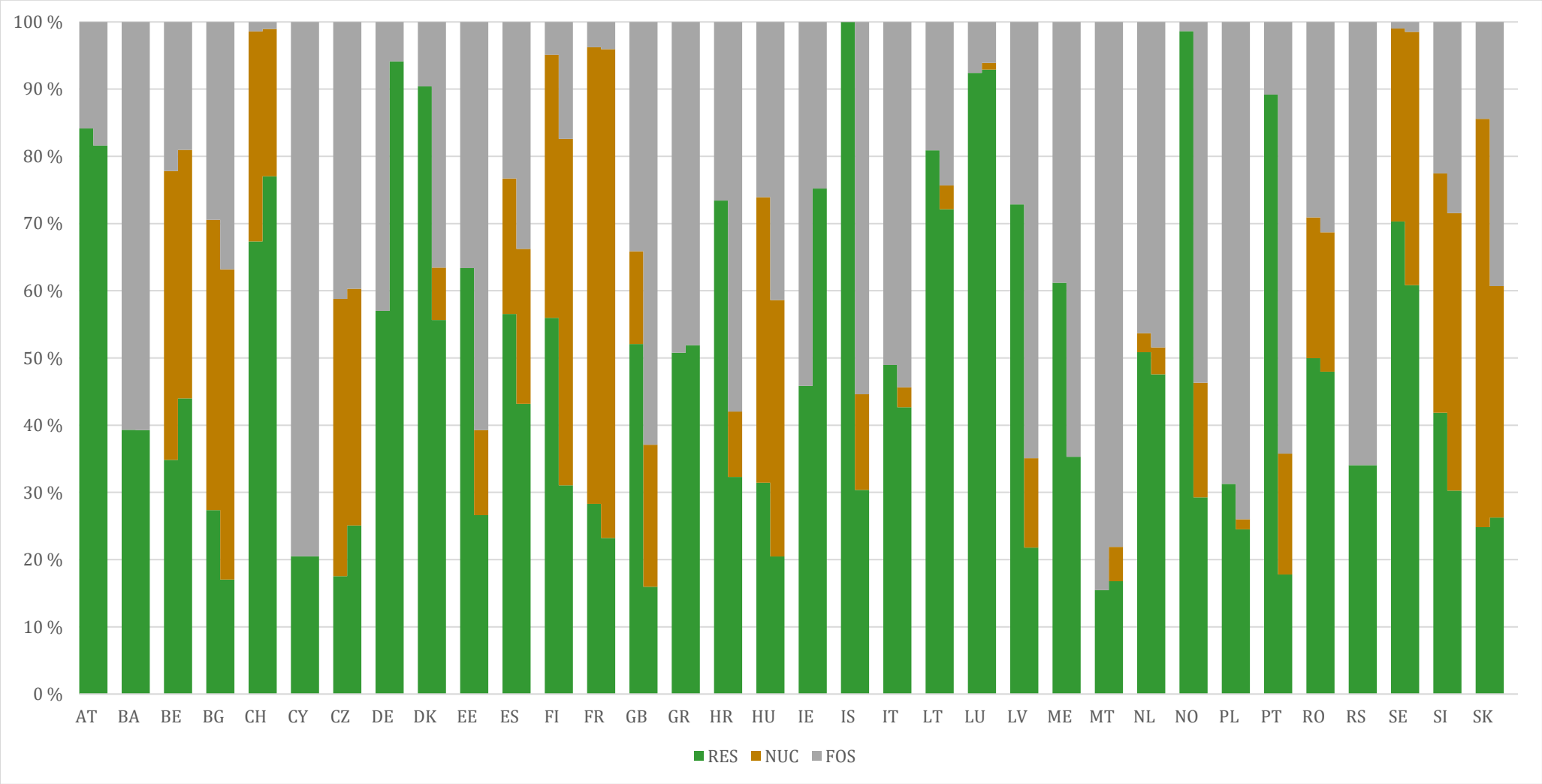


Figure 12 Production Mix (left) and Total Supplier Mix (right) 2024 % (simple fuel categories)

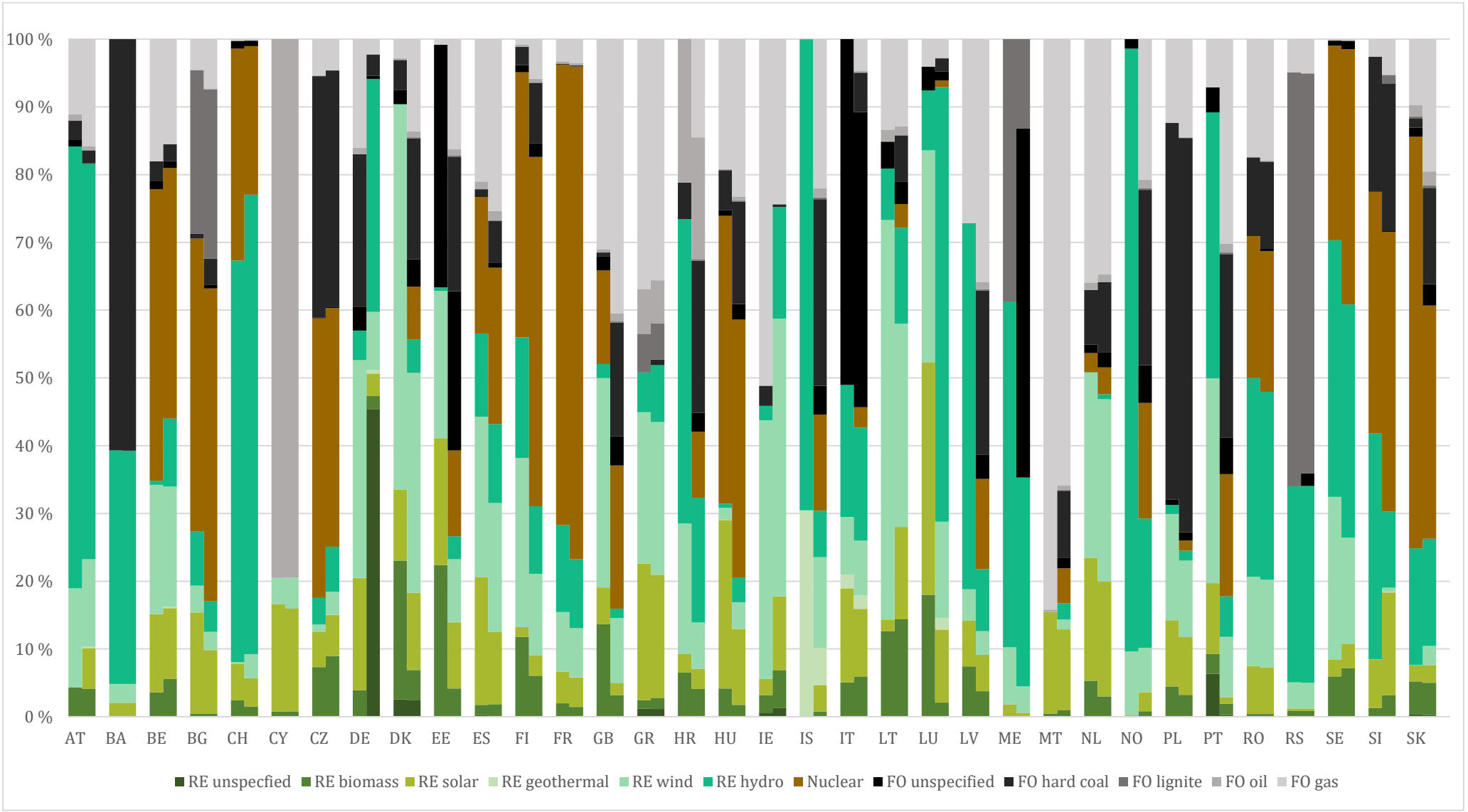


Figure 13 Production Mix (left) and Total Supplier Mix (right) 2024 % (detailed fuel categories)

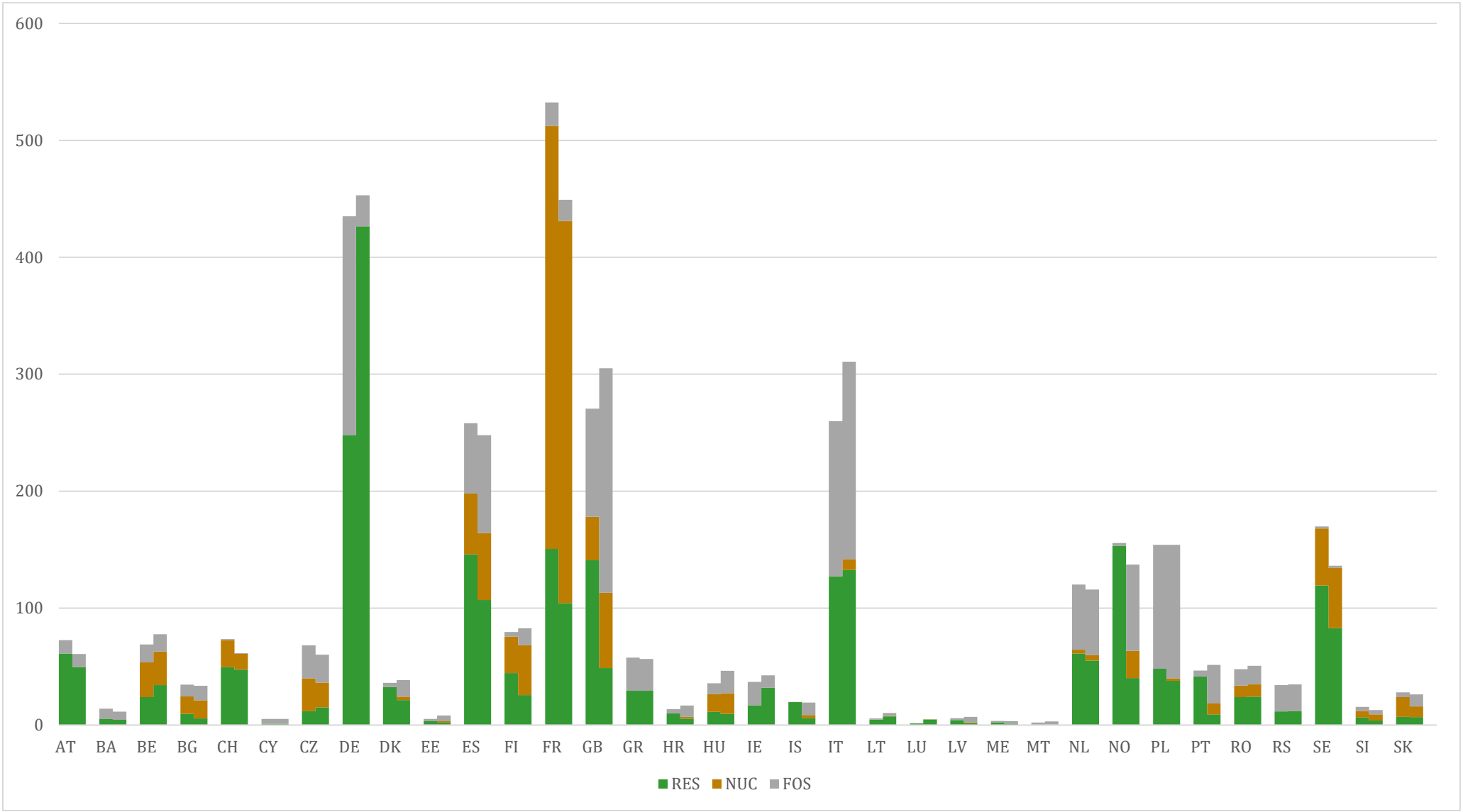


Figure 14 Production Mix (left) and Total Supplier Mix (right) TWh 2024 (simple fuel categories)

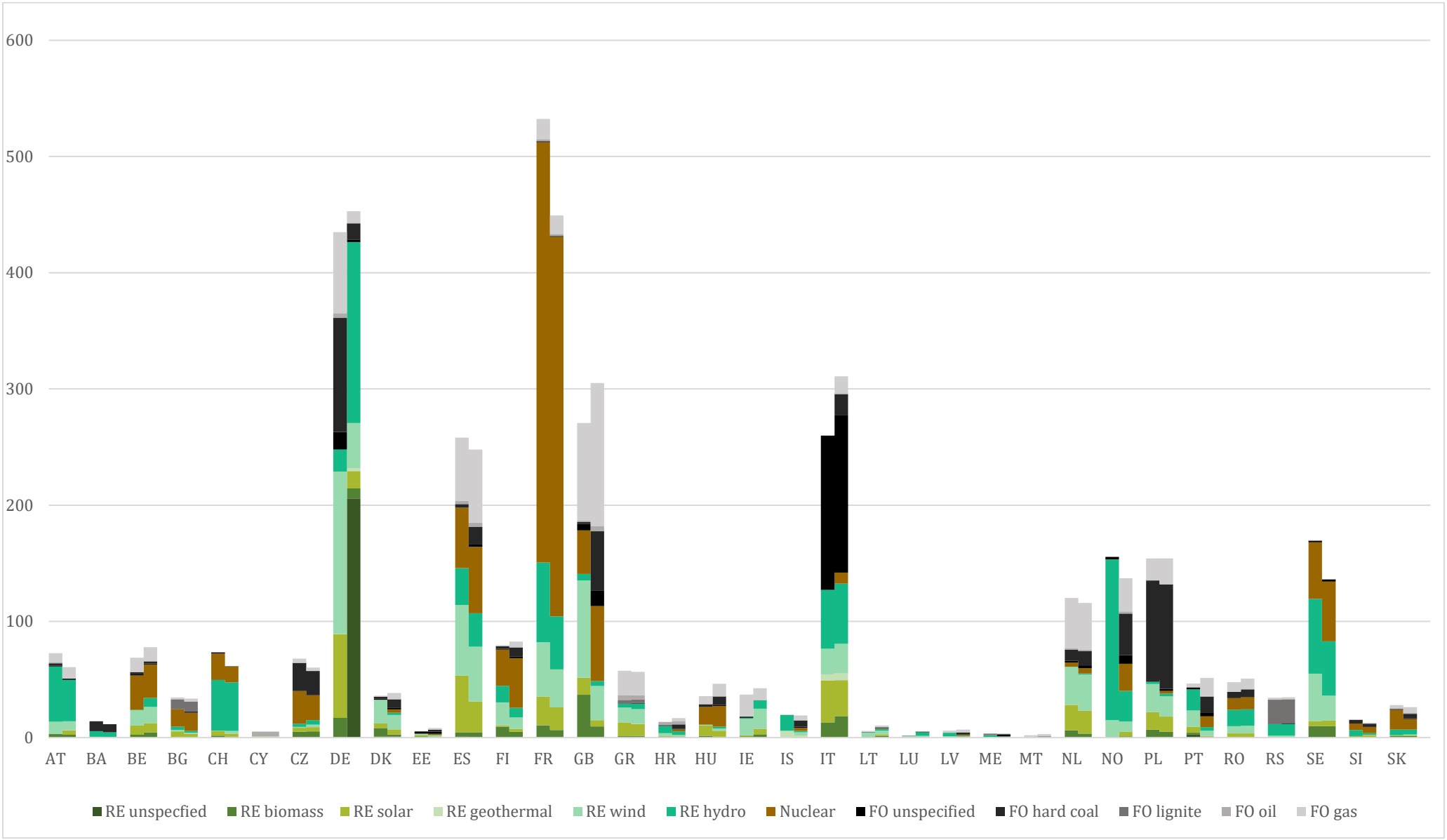


Figure 15 Production Mix (left) and Total Supplier Mix (right) TWh 2024 (detailed fuel categories)

Figure 16 and Table 7 compare the residual mixes of 2022, 2023 and 2024.

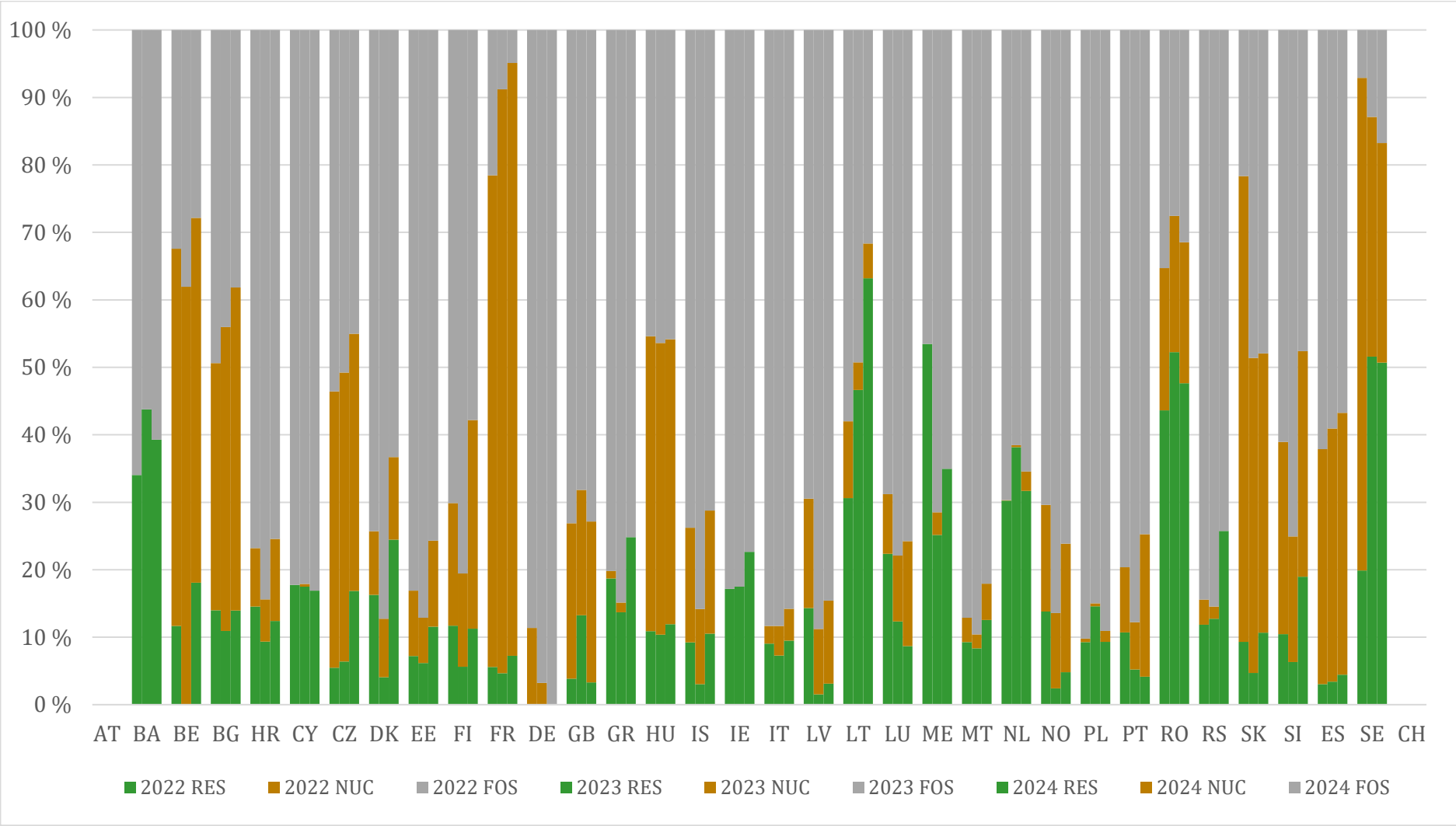


Figure 16 Residual Mixes 2022, 2023 and 2024

Table 7 Residual Mixes 2022, 2023 and 2024

		2022	2023	2024
AT	RES	0,0 %	0,0 %	0,0 %
	NUC	0,0 %	0,0 %	0,0 %
	FOS	0,0 %	0,0 %	0,0 %
BA	RES	34,0 %	43,8 %	39,3 %
	NUC	0,0 %	0,0 %	0,0 %
	FOS	66,0 %	56,2 %	60,7 %
BE	RES	11,7 %	0,0 %	18,1 %
	NUC	55,9 %	61,9 %	54,1 %
	FOS	32,4 %	38,1 %	27,9 %
BG	RES	14,0 %	10,9 %	14,0 %
	NUC	36,7 %	45,0 %	47,9 %
	FOS	49,4 %	44,0 %	38,2 %
HR	RES	14,6 %	9,3 %	12,4 %
	NUC	8,6 %	6,3 %	12,2 %
	FOS	76,8 %	84,4 %	75,4 %
CY	RES	17,7 %	17,5 %	16,9 %
	NUC	0,0 %	0,4 %	0,0 %
	FOS	82,3 %	82,1 %	83,1 %
CZ	RES	5,5 %	6,4 %	16,9 %
	NUC	40,9 %	42,8 %	38,1 %
	FOS	53,6 %	50,8 %	45,0 %
DK	RES	16,3 %	4,1 %	24,4 %
	NUC	9,4 %	8,7 %	12,2 %
	FOS	74,3 %	87,3 %	63,3 %
EE	RES	7,2 %	6,2 %	11,6 %
	NUC	9,7 %	6,7 %	12,8 %
	FOS	83,1 %	87,1 %	75,7 %
FI	RES	11,7 %	5,6 %	11,3 %
	NUC	18,2 %	13,8 %	30,9 %
	FOS	70,1 %	80,5 %	57,8 %
FR	RES	5,6 %	4,7 %	7,2 %
	NUC	72,9 %	86,5 %	87,9 %
	FOS	21,6 %	8,8 %	4,9 %

		2022	2023	2024
DE	RES	0,0 %	0,0 %	0,0 %
	NUC	11,4 %	3,2 %	0,0 %
	FOS	88,6 %	96,8 %	100,0 %
GB	RES	3,9 %	13,2 %	3,3 %
	NUC	23,0 %	18,6 %	23,9 %
	FOS	73,1 %	68,2 %	72,9 %
GR	RES	18,7 %	13,7 %	24,8 %
	NUC	1,1 %	1,4 %	0,0 %
	FOS	80,2 %	84,9 %	75,2 %
HU	RES	10,9 %	10,4 %	11,9 %
	NUC	43,7 %	43,2 %	42,2 %
	FOS	45,4 %	46,4 %	45,9 %
IS	RES	9,2 %	3,0 %	10,5 %
	NUC	17,0 %	11,1 %	18,3 %
	FOS	73,8 %	85,8 %	71,2 %
IE	RES	17,2 %	17,5 %	22,6 %
	NUC	0,0 %	0,0 %	0,0 %
	FOS	82,8 %	82,5 %	77,4 %
IT	RES	9,0 %	7,3 %	9,5 %
	NUC	2,6 %	4,4 %	4,7 %
	FOS	88,3 %	88,3 %	85,8 %
LU	RES	14,3 %	1,5 %	3,1 %
	NUC	16,2 %	9,7 %	12,3 %
	FOS	69,4 %	88,8 %	84,6 %
LV	RES	30,6 %	46,6 %	63,2 %
	NUC	11,4 %	4,1 %	5,1 %
	FOS	58,0 %	49,3 %	31,7 %
LT	RES	22,3 %	12,3 %	8,7 %
	NUC	8,9 %	9,8 %	15,5 %
	FOS	68,8 %	77,9 %	75,8 %
ME	RES	53,5 %	25,2 %	35,0 %
	NUC	0,0 %	3,3 %	0,0 %
	FOS	46,5 %	71,5 %	65,0 %

		2022	2023	2024
NL	RES	30,2 %	38,2 %	31,7 %
	NUC	0,1 %	0,3 %	2,8 %
	FOS	69,7 %	61,5 %	65,5 %
NO	RES	13,8 %	2,4 %	4,8 %
	NUC	15,8 %	11,2 %	19,0 %
	FOS	70,4 %	86,4 %	76,1 %
PL	RES	9,3 %	14,6 %	9,3 %
	NUC	0,5 %	0,4 %	1,6 %
	FOS	90,2 %	85,0 %	89,1 %
PT	RES	10,7 %	5,2 %	4,1 %
	NUC	9,7 %	7,0 %	21,1 %
	FOS	79,6 %	87,8 %	74,7 %
RO	RES	43,6 %	52,2 %	47,7 %
	NUC	21,1 %	20,2 %	20,9 %
	FOS	35,3 %	27,5 %	31,5 %
RS	RES	11,9 %	12,7 %	25,7 %
	NUC	3,7 %	1,8 %	0,0 %
	FOS	84,4 %	85,4 %	74,3 %
SK	RES	9,3 %	4,7 %	10,7 %
	NUC	69,1 %	46,7 %	41,4 %
	FOS	21,6 %	48,6 %	47,9 %
SI	RES	10,4 %	6,3 %	19,0 %
	NUC	28,5 %	18,6 %	33,4 %
	FOS	61,1 %	75,1 %	47,6 %
ES	RES	3,1 %	3,4 %	4,4 %
	NUC	34,8 %	37,5 %	38,8 %
	FOS	62,1 %	59,1 %	56,7 %
SE	RES	19,9 %	51,6 %	50,7 %
	NUC	73,0 %	35,5 %	32,5 %
	FOS	7,1 %	12,9 %	16,8 %
CH	RES	0,0 %	0,0 %	0,0 %
	NUC	0,0 %	0,0 %	0,0 %
	FOS	0,0 %	0,0 %	0,0 %

MT	**RES**	9,3 %	8,3 %	12,5 %
	NUC	3,6 %	2,1 %	5,4 %
	FOS	87,1 %	89,6 %	82,1 %

Annex 1: Fuel Categories

Table 8 Fuel category breakdown

Fact Sheet 5 compliance		Fuel code	Fuel description (including all subcategories)	Sub-table reference
Renewable	Unspecified & Other	F01000000	Renewable - Unspecified	
		F01040300	Renewable - Heat - Aerothermal	
		F01040400	Renewable - Heat - Hydrothermal	
		F01040501	Renewable - Heat - Process heat - Biogenic	
		F01050000	Renewable - Mechanical source or other - Unspecified	
	Solar	F01040100	Renewable - Heat - Solar	
	Wind	F01050100	Renewable - Mechanical source or other - Wind	
	Hydro & Marine	F01050200	Renewable - Mechanical source or other - Hydro & Marine	
	Geothermal	F01040200	Renewable - Heat - Geothermal	
	Biomass	F01010000	Renewable - Solid	
		F01020000	Renewable - Liquid	
		F01030000	Renewable - Gaseous	
Nuclear		F03010100	Nuclear - Solid - Radioactive fuel	
Fossil	Unspecified & Other	F02000000	Fossil - Unspecified	
		F02010000	Fossil - Solid - Unspecified	
		F02010400	Fossil - Solid - Municipal waste	
		F02010500	Fossil - Solid - Industrial and commercial waste	
		F02020000	Fossil - Liquid - Unspecified	
		F02030000	Fossil - Gaseous	T4
		F02040000	Fossil - Heat	
	Hard Coal	F02010100	Fossil - Solid - Hard coal	T1
	Brown Coal / Lignite	F02010300	Fossil - Solid - Peat	
		F02010200	Fossil - Solid - Brown coal	T2
	Natural Gas	F02030100	Fossil - Gaseous - Natural Gas	
		F02020200	Fossil - Liquid - Natural gas liquids	
	Oil	F02020100	Fossil - Liquid - Crude oil	
		F02020300	Fossil - Liquid - Petroleum products	T3

T1 Hard coal sub-categories		
0	F0201010	Unspecified
1	F0201010	Anthracite
2	F0201010	Bituminous coal
3	F0201010	Coking coal
4	F0201010	Coke-oven coke
5	F0201010	Lignite coke

T2 Brown coal sub-categories		
0	F0201020	Unspecified
1	F0201020	Sub-bituminous coal
2	F0201020	Lignite
3	F0201020	Brown coal briquette
4	F0201020	Peat briquette

T3 Petroleum products sub-categories		
0	F020203	Unspecified
1	F020203	Ethane
2	F020203	Naphtha
3	F020203	Aviation gasoline
4	F020203	Motor gasoline
5	F020203	Aviation turbine fuel
6	F020203	Other kerosene
7	F020203	Gas and diesel oil
8	F020203	Fuel oil low-sulphur
9	F020203	Fuel oil high-sulphur
10	F020203	Liquid petroleum gas
11	F020203	Orimulsion
12	F020203	Bitumen
13	F020203	Lubricants
14	F020203	Petroleum coke
15	F020203	Refinery feedstock

T4 Gaseous sub-categories			
0	F020300	Unspecified	Unspecified
20	F020302	Coal-derived gas	Unspecified
21	F020302	Coal-derived gas	Blast furnace gas
22	F020302	Coal-derived gas	Coke-oven gas
30	F020303	Petroleum products	Unspecified
31	F020303	Petroleum products	Propane
32	F020303	Petroleum products	Butane
33	F020303	Petroleum products	Refinery gas
34	F020303	Petroleum products	Chemical waste gas
40	F020304	Municipal gas plant	Unspecified
50	F020305	Process gas	Unspecified
51	F020305	Process gas	Carbon monoxide
52	F020305	Process gas	Methane
53	F020305	Process gas	Hydrogen (fossil sourced)
54	F020305	Process gas	Phosphor gas
55	F020305	Process gas	Oxy gas

Annex 2: Data Source Matrix

Table 9 Data Source Matrix

	Production data	Consumption data	Exchange with third countries	Tracking data Gos	CO2 emissions	Radioactive waste
AT	a	b	-	d,h	i	k
BA	a	b	-	f	i	k
BE	a	b	-	d,h	i	k
BG	Nationally provided information	Nationally provided information	c	e,f,h	i	k
CH	Nationally provided information	Nationally provided information	-	f	i	k
CY	Nationally provided information	Nationally provided information	-	d,f	i,j	k
CZ	a	b	-	d,h	i	j
DE	a	b	-	d,f,h	i	k
DK	Nationally provided information	Nationally provided information	-	d,h	i,j	k
EE	Nationally provided information	Nationally provided information	-	d,h	i	k
ES	Nationally provided information	Nationally provided information	Nationally provided information	d,f,h	i	k
FI	a	b	-	d,e,h	i	k
FR	Nationally provided information	Nationally provided information	-	d,e,h	i,j	k
GB	Nationally provided information	Nationally provided information	-	f,h	i,j	k
GR	Nationally provided information	Nationally provided information	c	d,h	i,j	k
HR	Nationally provided information	Nationally provided information	-	d,f,h	i	k

HU	a	b	c	d,h	i	k
IE	Nationally provided information	Nationally provided information	-	d,f,h	i	k
IS	Nationally provided information	Nationally provided information	-	d	i	k
IT	Nationally provided information	Nationally provided information	-	d,h	i	k
LT	a	b	c	d,f,h	i	k
LU	a	b	-	d,h	i	k
LV	Nationally provided information	Nationally provided information	Nationally provided information	d,h	i	k
ME	Nationally provided information	Nationally provided information	c	f	i	k
MT	Nationally provided information	Nationally provided information	-	h	i,j	k
NL	a	b	-	d,h	i	k
NO	Nationally provided information	Nationally provided information	-	d,e,h	i	k
PL	a	b	c	e,f,h	i	k
PT	Nationally provided information	Nationally provided information	Nationally provided information	e,f,h	i	k
RO	a	b	c	h	i	k
RS	Nationally provided information	Nationally provided information	Nationally provided information, c	d,f,h	i	k
SE	a	b	-	d,f,h	i	k
SI	a	b	-	d,f	i	j
SK	Nationally provided information	Nationally provided information	Nationally provided information, c	d,h	i	k

a https://ec.europa.eu/eurostat/web/products-datasets/-/nrg_cb_pem
b https://ec.europa.eu/eurostat/web/products-datasets/-/nrg_cb_em

c	Entso-e Transparency Platform Cross-Border Flows: https://transparency.entsoe.eu/transmission-domain/physicalFlow/show
d	EECS Activity statistics https://www.aib-net.org/facts/market-information/statistics/activity-statistics-all-aib-members
e	EECS Ex-domain cancellations by country, by energy source, collected from DCBs
f	DCB provided information on other reliable tracking means
h	Ex-domain cancellations from other countries
i	Ecoinvent
j	Nationally provided factors
k	http://reliable-disclosure.org/upload/250-D5.3_Direct_and_weighted_emissions.pdf

***** https://www.erneuerbare-energien.de/EE/Redaktion/DE/Downloads/eeg-in-zahlen-xls.html