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National Residual Mix Annual Report for Serbia for 2017

Belgrade, May 2018

1 The methodology of determining the origin of electricity

Pursuant to Article 87, paragraph 5 of the Energy law ("Official Gazette of RS", No. 145/14), the Ministry of Mining and Energy brings the Disclosure regulation ("Official Gazette of RS" No. 96/2017) (hereinafter referred to as "Disclosure regulation"). The Disclosure regulation prescribes the way in which the share of all types of energy sources of the sold electricity is calculated and shown to the end consumer, as well as the calculation control and verification.

The Transmission system operator, in accordance with Article 87, paragraphs 1 and 2 of the Energy law, calculates and publishes share of all types of energy sources in the electricity sold to end consumers in the Republic of Serbia.

In this calculation the Transmission system operator shall take into account, in particular, the cancelled and expired guarantees of origin.

The shares of energy sources are divided in accordance to the following 12 attributes (types):

1) Solar energy
2) Wind energy
3) Hydropower
4) Geothermal energy
5) Energy from biomass
6) Energy from renewable sources which source is not specified (Unspecified renewable energy sources)
7) Energy from hard coal
8) Energy from brown coal and lignite
9) Energy from the natural gas
10) Energy from oil
11) Energy from fossil fuels which source is not specified (Unspecified fossil energy sources)
12) Nuclear energy

2 Registry of guarantees of origin for Serbia in 2017

The Energy law stipulates that the Transmission system operator shall issue a guarantee of origin, at the request of a producer from renewable energy sources, and shall be responsible for its accuracy, reliability and protection from misuse. The Transmission system operator shall keep the Registry of guarantees of origin in an electronic form and publish the data from the Registry on its website. In 2017 there were no registered market participants in guarantees of origin system in the Republic of Serbia. As a result, in the Republic of Serbia, there were no cancelled, expired nor exported guarantees of origin.

3 Calculation of the share of all types of energy sources in total sold electricity

In accordance with the Disclosure regulation, the Annual Report on the National Residual Mix in the Republic of Serbia for 2017 contains the following data:

1) data on production and consumption of electricity in the Republic of Serbia, import and export of electricity, taking into account the structure of electricity,
2) data on issued, expired and cancelled guarantees of origin for electricity in the Republic of Serbia,
3) data on the structure of the national residual mix and the data used in determining the structure of the national residual mix,
4) the share of each particular energy source in the national residual mix.

3.1 Electricity production in the Republic of Serbia

Based on the data of the Transmission system operator and the distribution system operator, the structure of electricity produced in the Republic of Serbia in 2017 is:

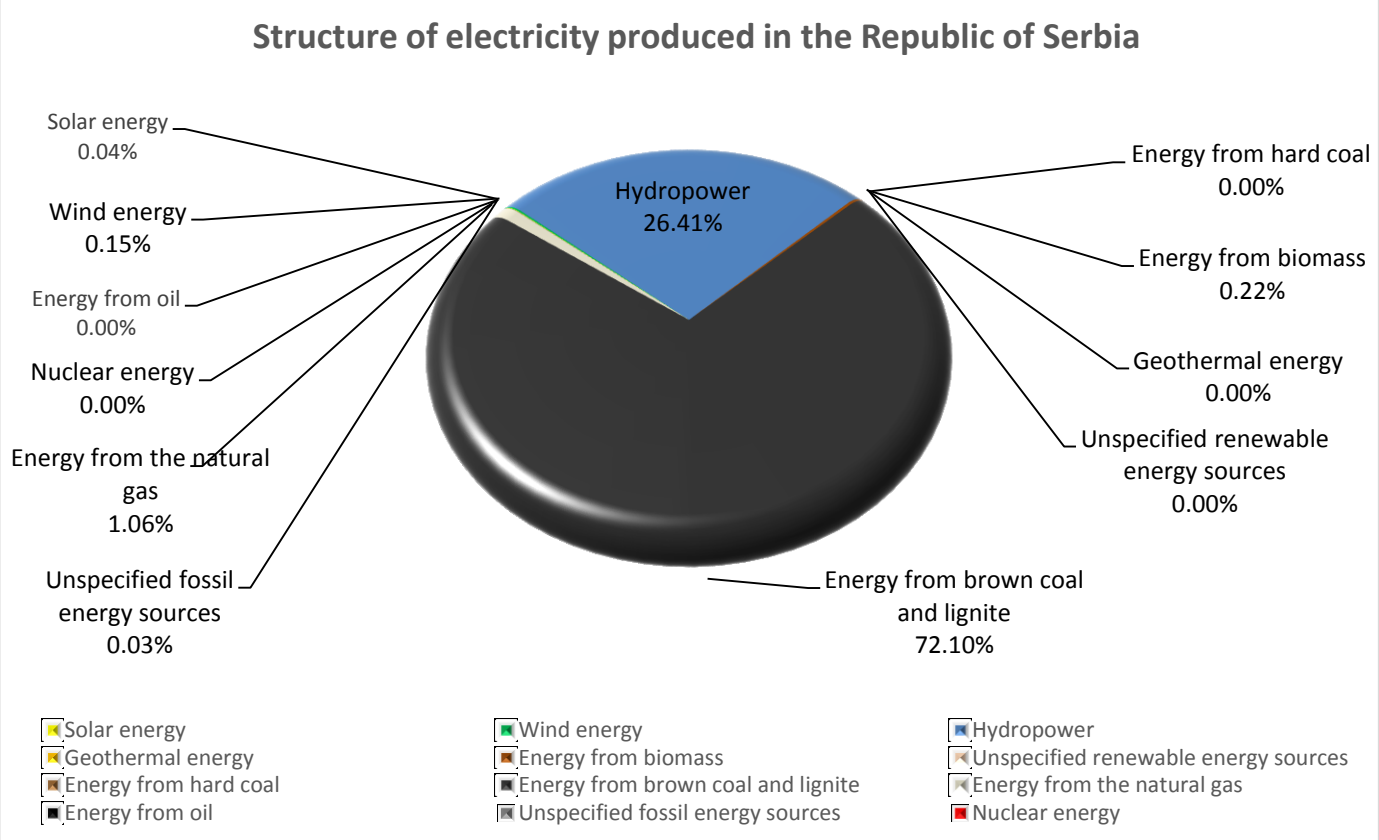

Chart 1 – Structure of electricity produced in the Republic of Serbia

The following table shows the production of electricity in MWh per type.

Type of electricity source	MWh
Solar energy	13,138.864
Wind energy	48,457.072
Hydropower	8,740,215.141
Geothermal energy	-
Energy from biomass	71,593.120
Unspecified renewable energy sources	-
Energy from hard coal	-
Energy from brown coal and lignite	23,864,340.300
Energy from the natural gas	350,573.028
Energy from oil	-
Unspecified fossil energy sources	11,242.474
Nuclear energy	-
Total:	**33,099,559.999**

Table 1 – Structure of electricity produced in the Republic of Serbia

3.2 Exchange of electricity with third areas

Based on the data of the Transmission system operator and the distribution system operator, the total electricity exchange of the Republic of Serbia with third areas in 2017 was:

The area with which Serbia has the import/export of energy	Energy direction (from the position of Serbia)	Quantity (MWh)
Hungary	Import	971,177.898
	Export	305,525.057
Romania	Import	2,096,516.862
	Export	137,730.068
Bulgaria	Import	2,124,455.971
	Export	9,490.665
Macedonia	Import	135,458.403
	Export	605,063.685
Montenegro	Import	358,808.775
	Export	443,194.544
Bosnia and Herzegovina	Import	449,987.241
	Export	1,476,765.171
Croatia	Import	115,983.710
	Export	830,074.023
Autonomous Province of Kosovo and Metohija[1]	Import	303,286.691
	Export	1,915,398.944

Table 2 – Exchange of electricity

[1] transferred electricity over the administrative line with the Autonomous Province of Kosovo and Metohija

The following chart represents the Republic of Serbia electricity exchange with third areas - import:

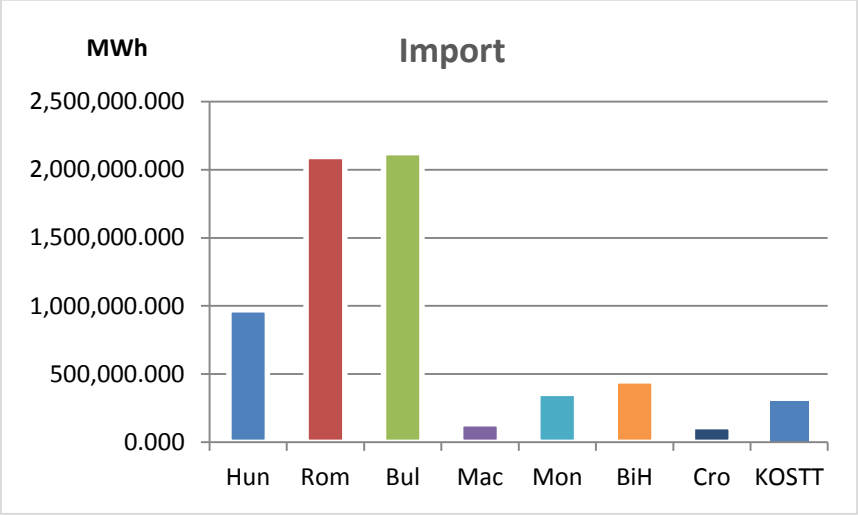

Chart 2 – Electricity exchange of the Republic of Serbia with third areas - import

The following chart represents the exchange of electricity of the Republic of Serbia with third areas - export:

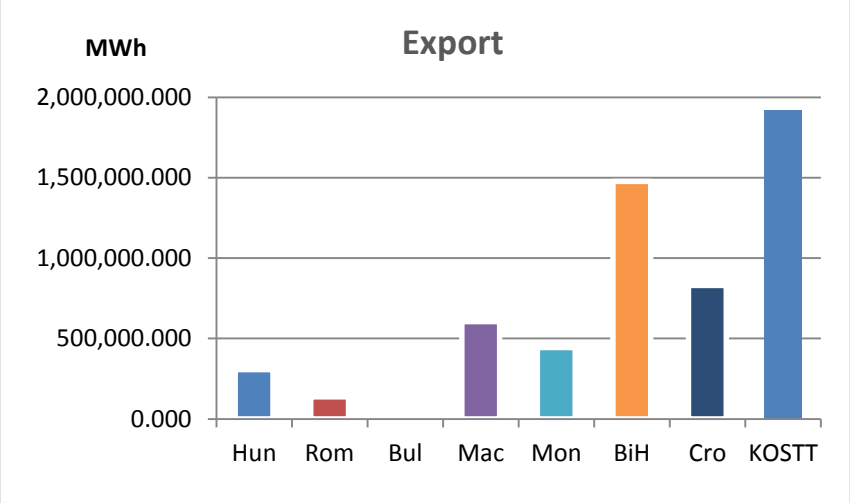

Chart 3 – Electricity exchange of the Republic of Serbia with third areas - export

Electricity imported from third areas is imported in the shares of the electricity generation structure in this field. The following table shows the production structure of these areas.

Structure of electricity production in %								
Type of electricity source	**HU**	**RO**	**BG**	**MK**	**ME**	**BiH**	**CR**	**KOSTT**
Solar energy	-	2.18	2.93	-	-	-	0.77	-
Wind energy	2.34	11.72	3.15	2.24	-	-	11.81	-
Hydropower	0.64	22.27	7.53	15.40	22.04	11.76	49.30	-
Geothermal energy	-	-	-	-	-	-	-	-
Energy from biomass	2.96	0.67	0.67	-	-	-	2.13	-
Unspecified renewable energy sources	0.34	-	0.03	-	-	-	2.54	-
Energy from hard coal	-	2.27	0.39	-	76.69	71.36	11.99	-
Energy from brown coal and lignite	16.35	25.30	49.60	82.36	1.27	16.88	-	-
Energy from the natural gas	23.19	17.14	1.31	-	-	-	13.18	-
Energy from oil	0.05	-	-	-	-	-	8.29	-
Unspecified fossil energy sources	2.88	-	-	-	-	-	-	100.00
Nuclear energy	51.26	18.46	34.39	-	-	-	-	-

Table 3 – Structure of electricity generation from third areas

3.3 Structure of produced electricity in the incentive system

The structure of electricity produced in the incentive system is determined for the total electricity generated by the privileged electricity producers in the previous calendar year.

The Guaranteed Supplier determines and publishes on its website a report on the quantities and structure of electricity produced in the incentive system by the end of February of the current year, for the previous year.

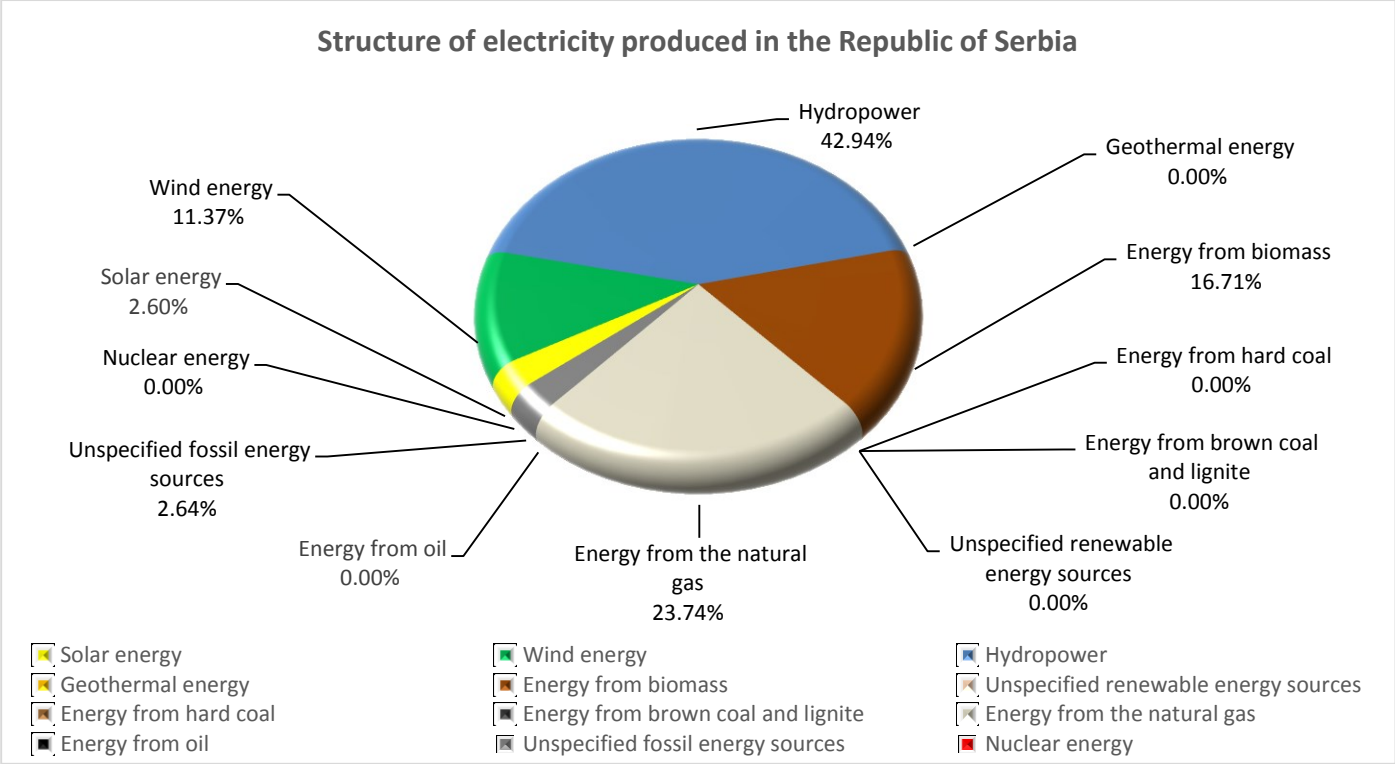

Chart 4 – Structure of generated electricity in the incentive system

Incentive system		
Type of electricity source	**MWh**	**%**
Solar energy	11,084.01	2.60
Wind energy	48,457.07	11.37
Hydropower	183,062.66	42.94
Geothermal energy	-	-
Energy from biomass	71,254.87	16.71
Unspecified renewable energy sources	-	-
Energy from hard coal	-	-
Energy from brown coal and lignite	-	-
Energy from the natural gas	101,203.92	23.74
Energy from oil	-	-
Unspecified fossil energy sources	11,242.47	2.64
Nuclear energy	-	-
Total:	**426,305.00**	**100.00**

Table 4 – Structure of electricity production in the incentive system

3.4 Consumption of electricity of unknown origin in the Republic of Serbia

The amount of consumed electricity of unknown origin is determined based on the amount of total electricity sold to end consumers in the Republic of Serbia and electricity for covering losses in the transmission and distribution system, cancelled guarantees of origin for consumption in the 2017 calendar year and total produced electricity in the incentive system in Serbia.

Consumption of electricity	**MWh**
Total consumption in the Republic of Serbia	33,931,993.071
Cancelled guarantees of origin for consumption in the 2017 calendar year	-
Total production in the incentive system in the Republic of Serbia	426,305.000
Total consumption of electricity of unknown origin	**33,505,688.071**

Table 5 – Consumption of electricity of unknown origin in the Republic of Serbia

3.5 National Residual Mix

The Transmission system operator shall calculate the National residual mix in accordance with the Disclosure Regulation and the Methodology for the Calculation and Disclosure of the Share of all types of energy sources in the electricity sold to the end consumers, based on:

1) data on the producer's produced electricity for each production unit that is connected to the transmission, distribution or closed distribution network,
2) data on total electricity sold to all end consumers in the transmission, distribution or closed distribution network,
3) data on electricity losses in the transmission, distribution or closed distribution network,
4) data on the realized electricity exchange by individual borders,
5) data on the exchange of attributes with a European mix of attributes in accordance with the Methodology for the Calculation and Disclosure of the Share of all types of energy sources in the electricity sold to the end consumers,
6) data on cancelled and expired guarantees of origin.

The National Residual Mix is shown on the following chart:

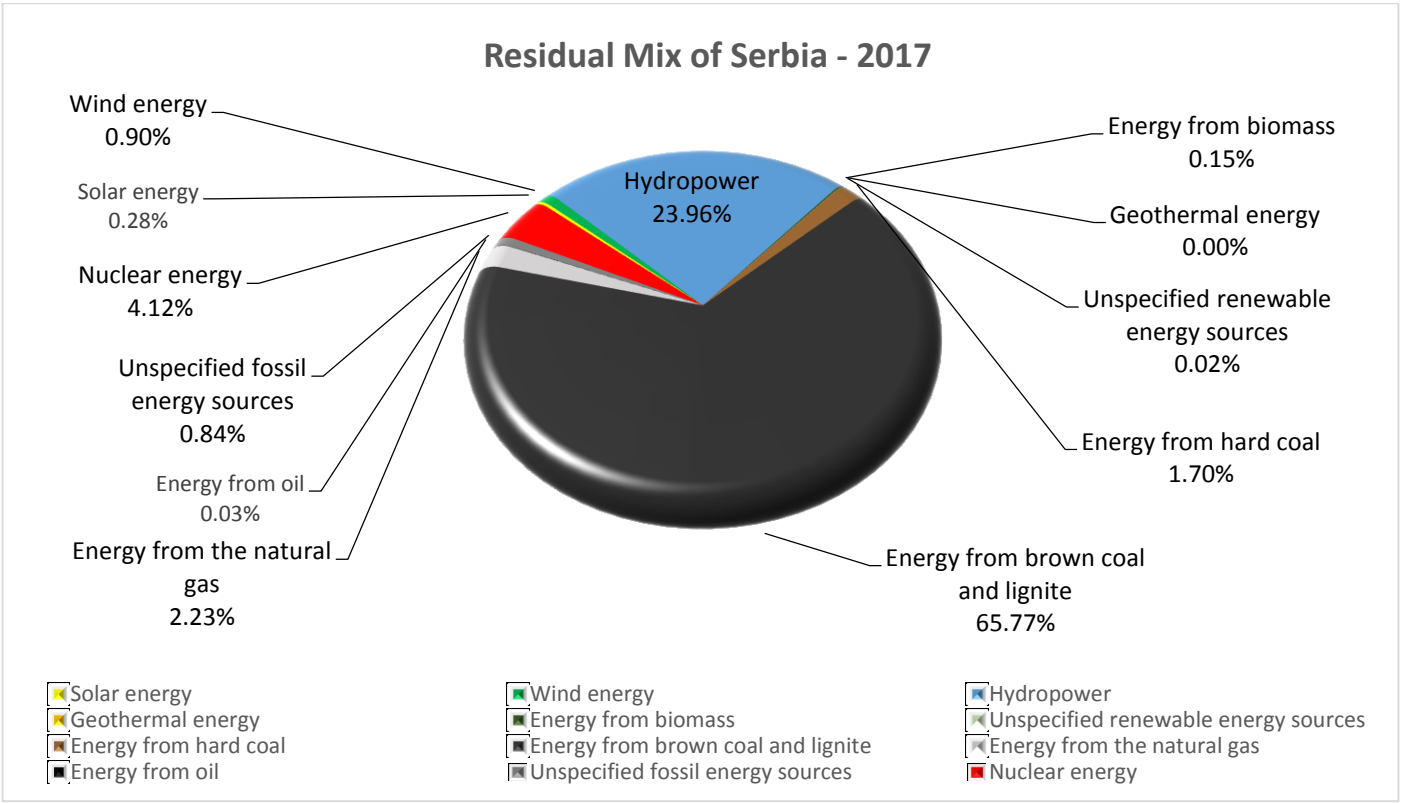

Chart 5 – National residual mix for 2017

The National Residual Mix is shown in the following table:

Residual Mix of Serbia		
Type of electricity source	**MWh**	**%**
Solar energy	94,823.328	0.28
Wind energy	300,530.525	0.90
Hydropower	8,028,633.261	23.96
Geothermal energy	-	0.00
Energy from biomass	51,172.197	0.15
Unspecified renewable energy sources	5,775.843	0.02
Energy from hard coal	568,949.624	1.70
Energy from brown coal and lignite	22,035,493.153	65.77
Energy from the natural gas	748,971.976	2.23
Energy from oil	8,614.595	0.03
Unspecified fossil energy sources	282,895.897	0.84
Nuclear energy	1,379,827.994	4.12
Total:	**33,505,688.393**	**100**

Table 6 – National Residual Mix of Serbia

4 Conclusion

All the data used for the purpose of calculating and compiling this report are collected from the following sources:

- Distribution system operator
- Transmission system operator
- ENTSO-E Transparency platform
- Report and the data from the Guaranteed Supplier
- Relevant institutions at European Union level

Pursuant to Article 87, paragraph 3 of the Energy Law, suppliers are obliged to calculate and present to the end consumers the data on the share of each electricity source in total electricity sold, based on the share of all types of energy sources in the sold electricity to the end consumers in the Republic of Serbia.

Suppliers are obliged to present the shares of all types of energy sources in electricity sold to their end consumers in 2017, in the form of reports, in accordance with the Disclosure Regulation, from 1st of July till 31st of July 2018.