ENERGY SECTOR in the Republic of Serbia Coal and Electricity

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and Climate Change in Energy Sector

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Republic of Serbia

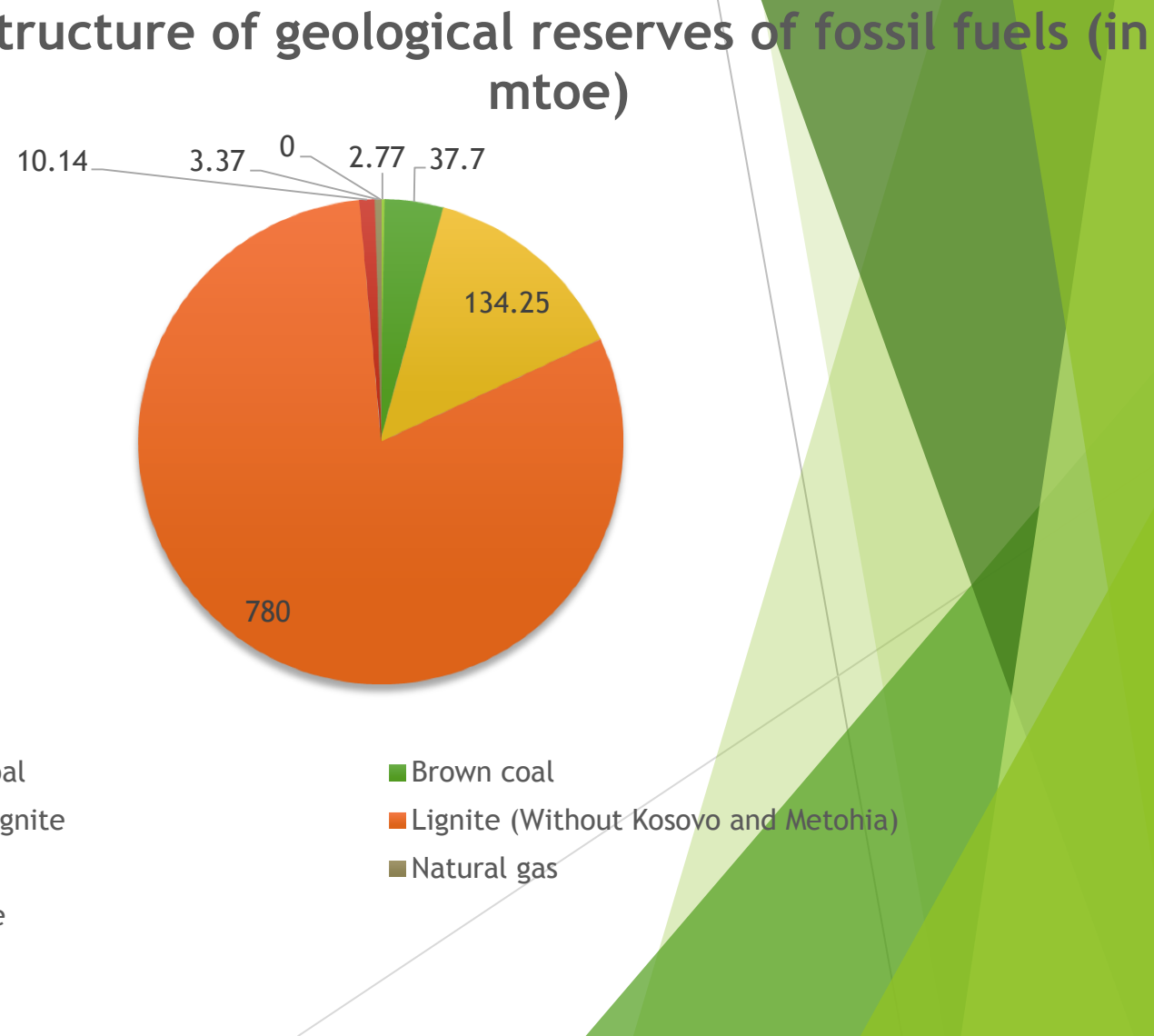
Structure of the Serbian Energy Sector

- **COAL SECTOR** (Underground, underwater and open pit exploitation, Processing of coal in the dryer, Import, export and trade in coal).
- **POWER SECTOR** (Generation, Electricity supply, Transmission and distribution, Organization of bilateral and balance market) **OIL SECTOR** (Exploitation, Import and Export of crude oil/derivatives, Production of oil derivatives, Storing of crude oil/derivatives, Pipeline Transport of crude oil, Distribution and trade of oil/ derivatives)
- **NATURAL GAS SECTOR** (Exploitation, Processing, Storage, Transport and Distribution)
- **HEAT SECTOR** (Heat production, distribution and supply)
- **INDUSTRIAL ENERGY SECTOR**
- **RES** (Production of electricity and heat, Production of solid, liquid and gas biomass, Import and export of biomass)

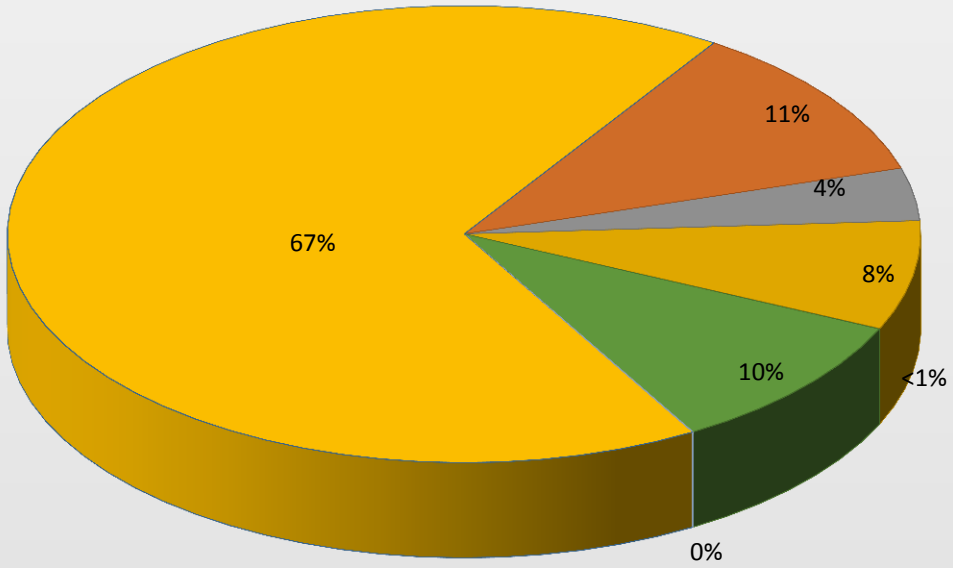
The energy resources and potentials of the Republic of Serbia include fossil fuels, conventional fuels (coal, oil and natural gas) and non-conventional fuels (oil shale), as well as the renewable sources of energy.

Proved and probable reserves of fossil fuels – 968.23 mtoe

Estimated total RES potential, technically available 5.65 mtoe per year.



Structure of primary energy production per energy sources in Serbia in 2013



- Угаљ/ Coal
- Нафта/ Oil
- Гас/ Natural gas
- Хидропотенцијал/ Hydro
- Геотермална енергија/ Geothermal energy
- Биомаса/ Biomass
- Биогас/Biogas, Енергија сунца/Solar energy, Енергија ветра/Wind energy

A total of 11.354 M toe of primary energy was generated in Serbia in 2013

Use of coal: Total amount, share of energy mix, total amount and share in electricity production and industry

The most significant coal reservoirs in the Republic of Serbia are the lignite reservoirs (soft brown coal). The geological reserves of lignite compared to geological reserves of other types of coal in the Republic of Serbia constitute 93%. Other types of coal (hard, brown lignite or solid brown coal) constitute only 7% of the geological reserves of the Republic. Of 8.88 billion tons of lignite, around 4.5 billion is located in the Kosovo and Metohia basin, whereas 3.99 billion of tons is located in central Serbia, i.e. in the Kolubara and Kostolac basin.

Total coal reserves that can be exploited are significant and represent realistic basis for further long-term development of the energy sector in general and particularly for the electricity generation.

Exploitation and processing of coal

The exploitation of coal in the Republic of Serbia is performed within:

- Open Pit mines in three mining basins: Kolubara, Kostolac and Kosovo-Metohia, which are temporarily not operating as part of the energy system of Serbia.
- The mine with underground exploitation Vrška Čuka, Ibar mines, Bogovina, Soko, Jasenovac, Šravalj, Lubnica, Aleksinac.
- Mines with underwater exploitation, Kovin.

The mining basins Kolubara and Kostolac are part of PE "Elektroprivreda Serbia" (PE EPS).

Of the total domestic coal production, 98% comes from open pit mining, whereas the rest from underground and underwater exploitation. Since the domestic production mainly produces low-quality lignite, the need for higher quality types of coal is met through import. Hence, the domestic production meets 98.5% of the total demand for coal, and the rest is imported.

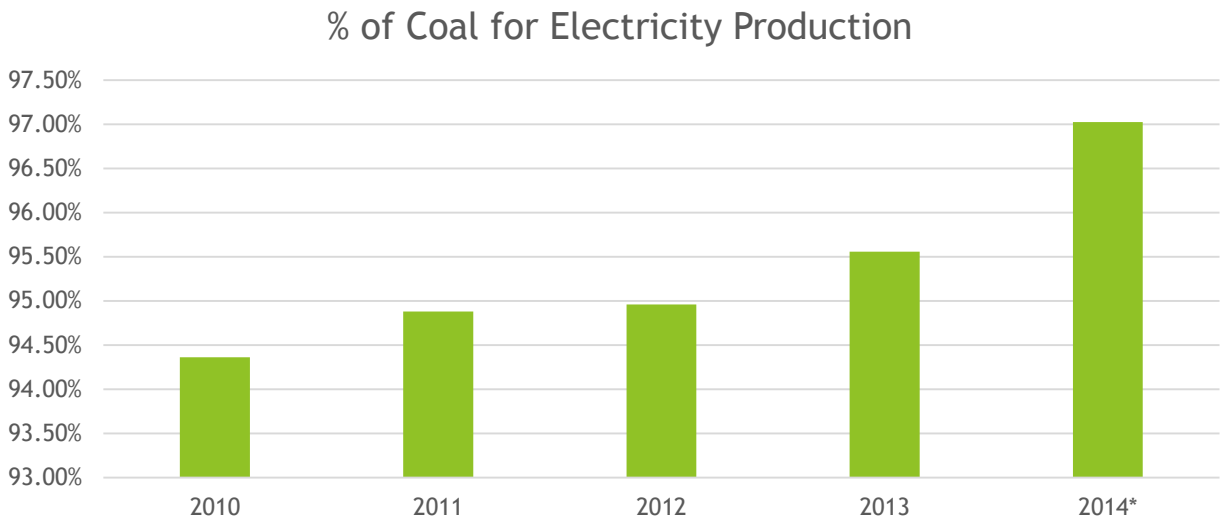
The total domestic coal production in 2013 amounted to 40297 t or 7.7 Mtoe

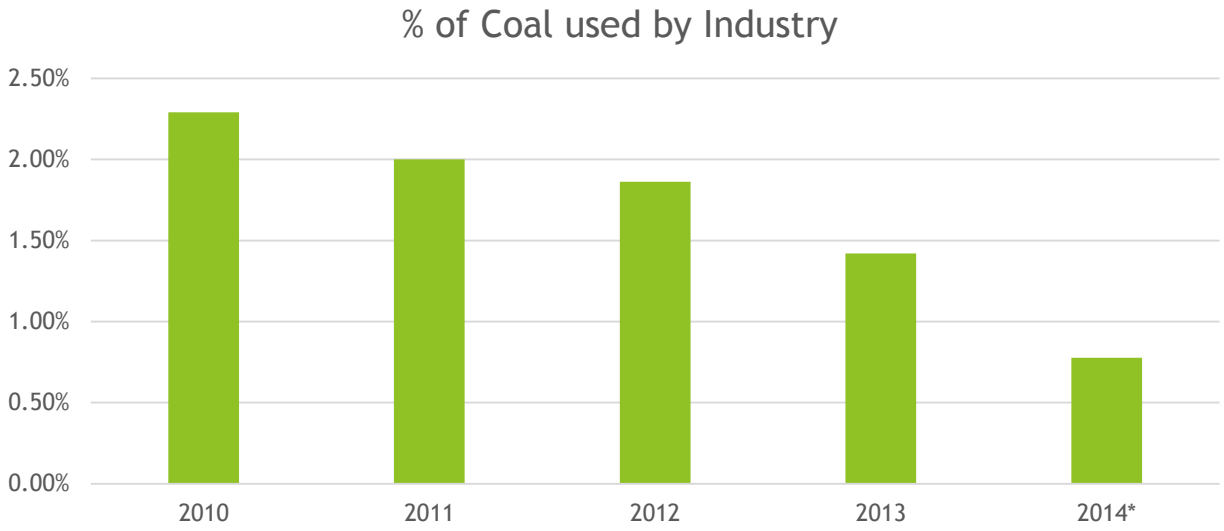
Balance of coal for 2010 - 2013

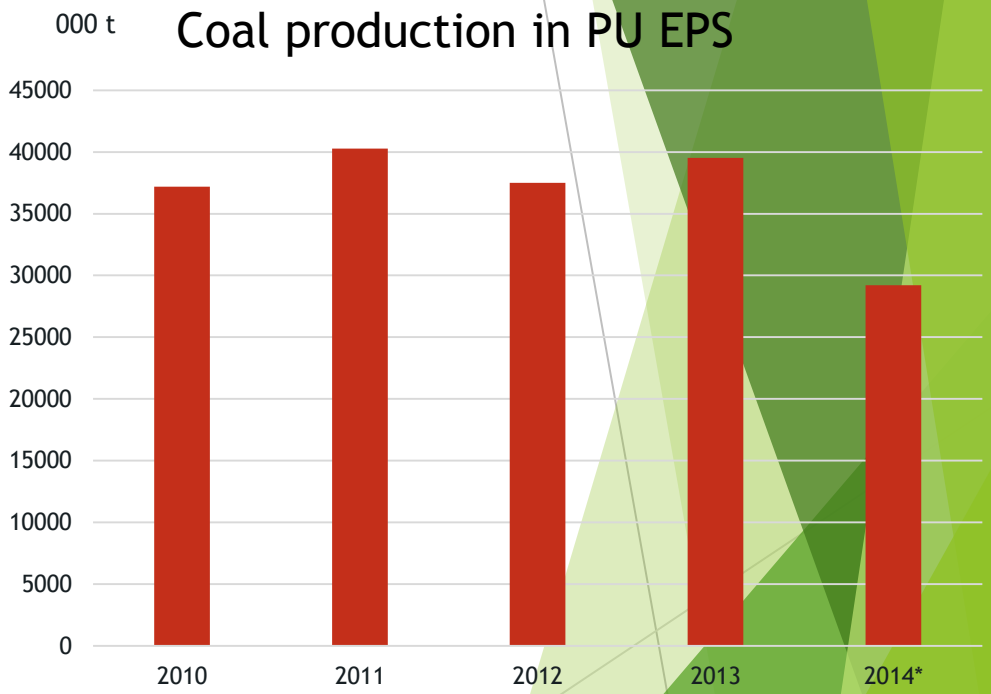
In 2013 The total amount of coal available for consumption amounted to 7.901 Mtoe. From this amount, 7.518 Mtoe was spent for the transformation processes, of which 6.994 Mtoe (93%) in thermal power plants, and 7% in industrial power plants, heating plants, blast furnaces and coal processing plants.

ENERGY BALANCE OF COAL IN THE REPUBLIC OF SERBIA WITHOUT K&M	2010	2011	2012	2013
	Mtoe	Mtoe	Mtoe	Mtoe
PRIMARY PRODUCTION	7.228	7.823	7.277	7.669
IMPORT	0.766	0.802	0.412	0.31
EXPORT	0.039	0.008	0.006	0.035
STOCK CHANGES	-0.204	0.123	-0.06	-0.043
GROSS INLAND CONSUMPTION	7.75	8.741	7.623	7.901
TRANSFORMATION INPUT	7.124	7.862	7.038	7.518
THERMAL POWER PLANT	6.258	7.065	6.577	6.994
CHP	0	0	0	0
INDUSTRIAL COGENERATION PLANTS	0.192	0.173	0.097	0.124
DISTRICT HEATING PLANTS	0.066	0.078	0.072	0.069
BLAST FURNACE PLANTS	0.41	0.347	0.109	0.146
COAL TRANSFORMATION	0.198	0.2	0.183	0.185
TRANSFORMATION OUTPUT	0.452	0.472	0.291	0.294
BLAST FURNACE PLANTS	0.219	0.234	0.072	0.076
COAL TRANSFORMATION	0.234	0.239	0.218	0.218
LOSSES	0.055	0.053	0.02	0.016
TOTAL FINAL CONSUMPTION	1.023	1.298	0.856	0.661
FINAL NON-ENERGY CONSUMPTION	0.026	0.027	0.028	0.029
FINAL ENERGY CONSUMPTION	1	1.271	0.828	0.632
INDUSTRY	0.418	0.501	0.347	0.242
TRANSPORT	0	0	0	0
HOUSEHOLDS	0.297	0.388	0.307	0.259
AGRICULTURE	0.002	0	0	0
OTHER USERS	0.281	0.381	0.173	0.131

Percentage of Coal Used by TPPs and by Industry

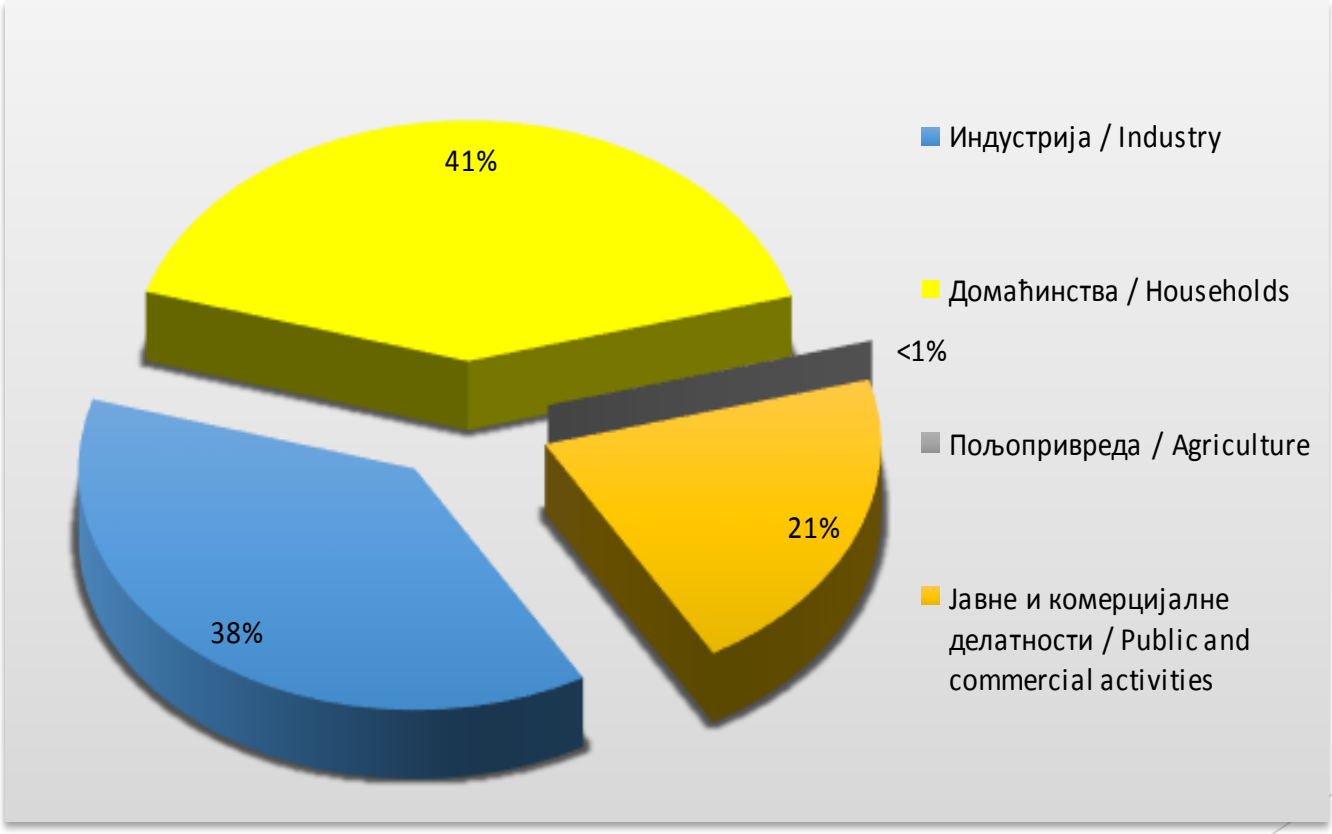




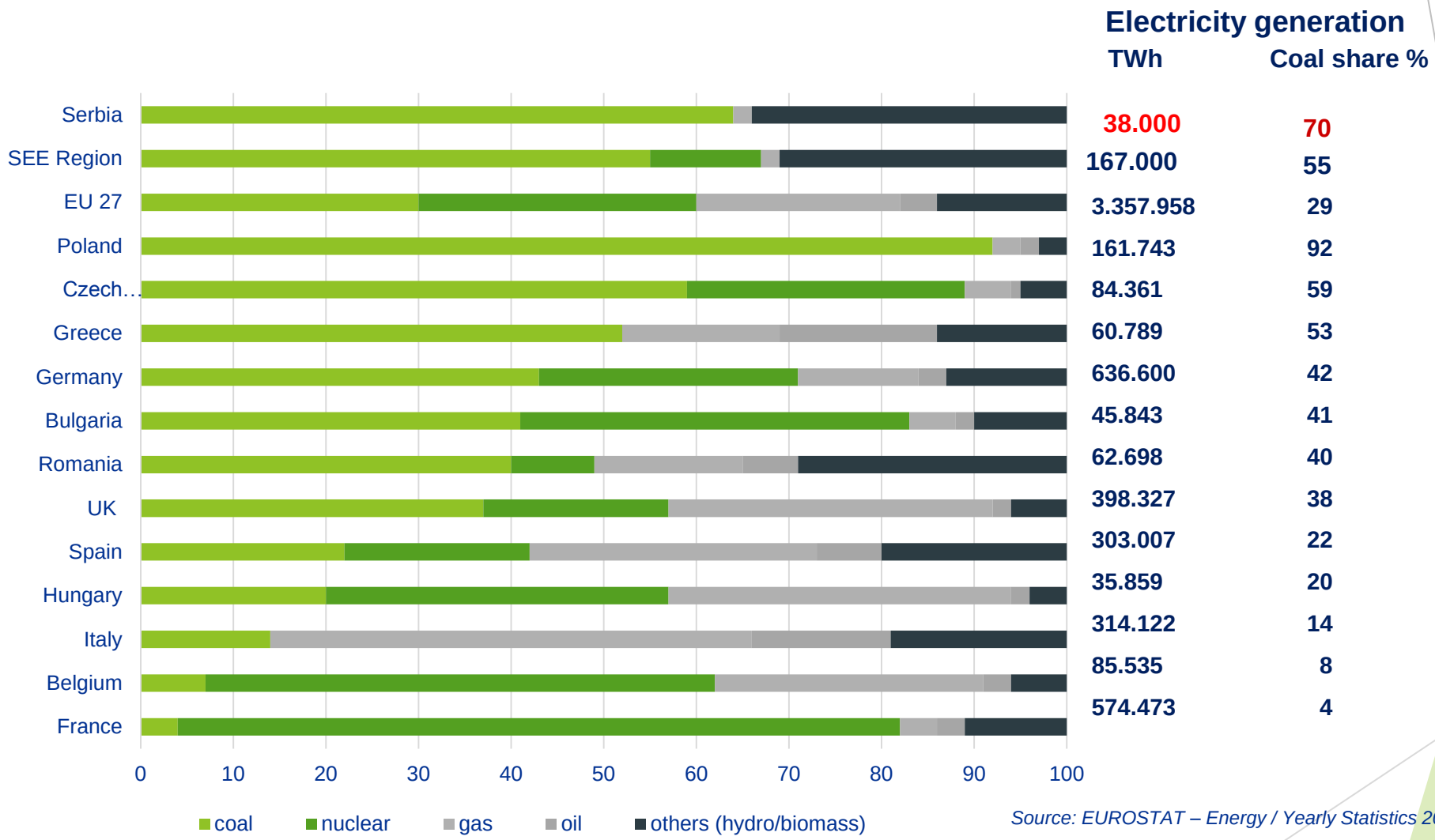


*Decreased production due to the floods

Structure of consumption of coal for energy purposes per sectors of final consumption during 2013

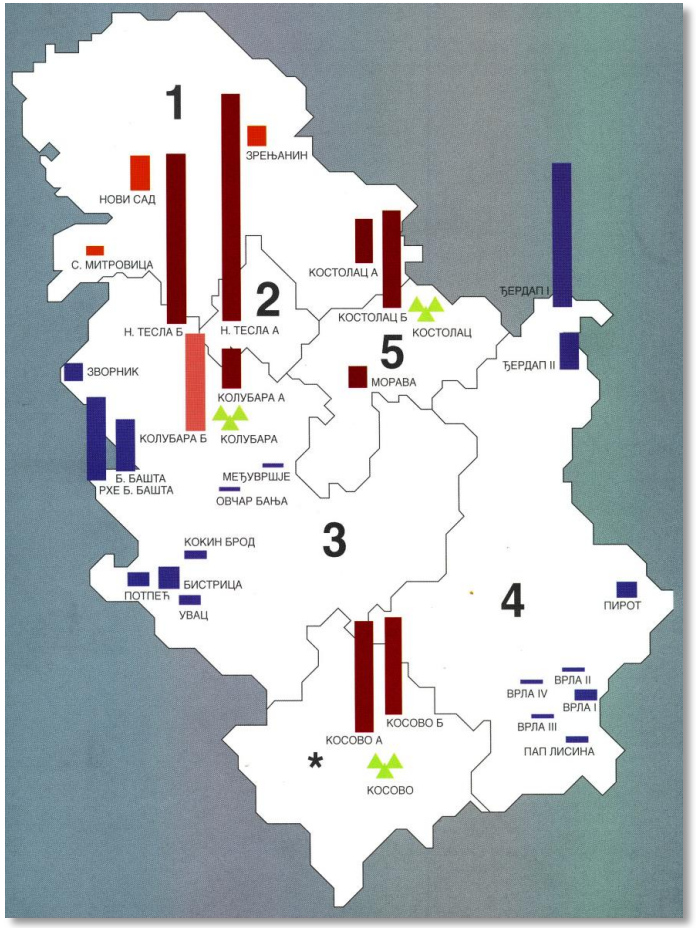


Electricity Production in Republic of Serbia



Source: EUROSTAT – Energy / Yearly Statistics 2006

PU EPS Electricity Production



Hydro power plants	2,835 MW
Thermal power plants	5,171 MW* 3,936 MW**
Combined heat and power plants	353 MW
Total	8,359 MW* 7,124 MW**
Electricity Production	37.5 TWh**
Number of customers	3.5 mil **
Number of employees	33,335**

Last power plant built in 1991.

*With K&M ** Without K&M, end of 2013

As of June 1999 PE EPS does not operate its Kosovo and Metohija capacities (K&M)

LCPs within the PU EPS

Plant name	Fuel type	MW	GWh/a	Start up	Load factor %
Nikola Tesla A1	L	210	1231	1970	73.6
NikolaTesla A2	L	210	1198	1970	71.6
Nikola Tesla A3	L	305	1923	1976	78.4
Nikola Tesla A4	L	309	1989	1978	81.1
Nikola Tesla A5	L	309	1999	1979	81.5
Nikola Tesla A6	L	309	1987	1979	81
Nikola Tesla B1	L	620	4151	1983	81.7
Nikola Tesla B2	L	620	4004	1985	78.8
Kolubara A1	L	32	175	**1956**	68.9
Kolubara A2	L	32	116	1957	45.5
Kolubara A3	L	64	135	1961	26.5
Kolubara A4	L	32	0	1961	0
Kolubara A5	L	110	626	1979	71.5

Plant name	Fuel type	MW	GWh/a	Start up	Load factor %
Kostolac A1	L	100	560	1967	71
Kostolac A2	L	210	1196	1980	71.5
Kostolac B1	L	348	1937	1987	69.1
Kostolac B2	L	348	1895	**1991**	67.6
Novi Sad 1	NG	135	189	1981	20
Novi Sad 2	NG	110	175	1984	20
Zrenjanin	NG	110	66	1989	10
Sr Mitrovica 1	NG	32	123	1979	50

Data Source: EnC Study on Modernization of LCPs

Low Efficiency

Efficiency of particular unit depends on the characteristics of the unit (i.e. age, implemented measures for the efficiency improvement during the overhauls) and it goes up to 35,2%

Potential Energy Efficiency Measures that would lead to the CO_2 reduction

Potential measures for the improvement of the TPPs efficiency:

- Improvement of the technical efficiency of steam boilers and turbines
- Introduction of Coal Homogenization System

Potential measures for the improvement of the distribution system efficiency:

- Reduction of Losses
- Reconfiguration of distribution network
- Voltage regulation Smart metering, etc.

Improvement of the efficiency in the mining sector

New TPP units that would replace the old ones

Introduction of CCS

RES…

Climate Change Policies

- Serbia has ratified the United Nations Framework Convention on Climate Change (UNFCCC) in 2001 and the Kyoto Protocol in 2008, as a non-Annex I Party.
- Draft Biennial Report to the UNFCCC:

  In 2013 Energy Sector: 49.661,06 GgCO2eq - 79,4% of total GHG Emissions in Serbia (62.520,88 Gg CO2)

  2010-2013 trend -2,6%

  1990 – Base Year Share of Energy Sector in total GHG emissions – 78,7%
- Given its status as an EU candidate country and member of the Energy Community, Serbia is developing its national policy initiatives in line with European policies on climate change and energy.
- Serbia announced the INDC pledge to cut emissions 9.8% by 2030, as measured against 1990 levels, ahead of the 2015 UNFCCC conference of parties in Paris.

Thank you for attention!

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