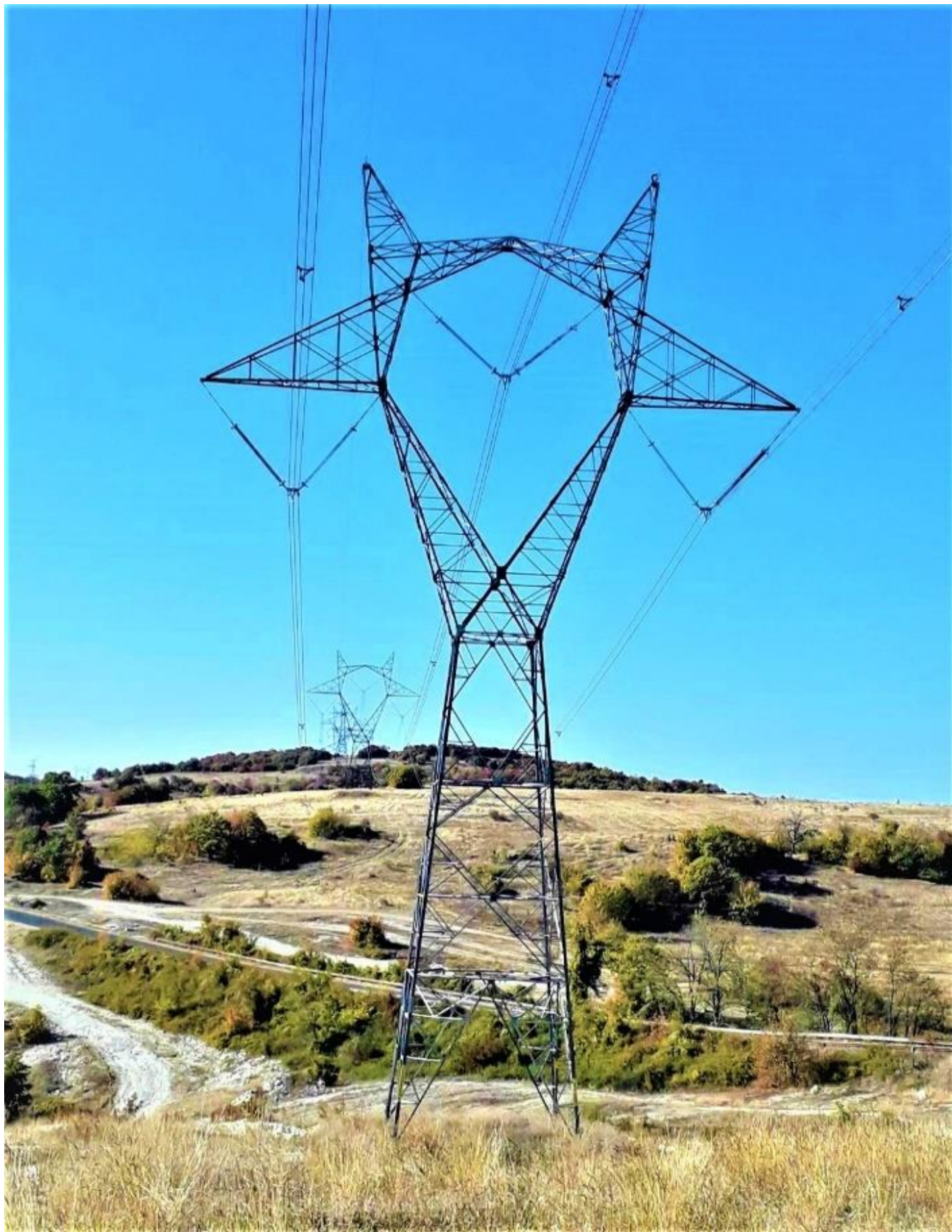




STATISTICAL POCKETBOOK 2022



ESO EAD



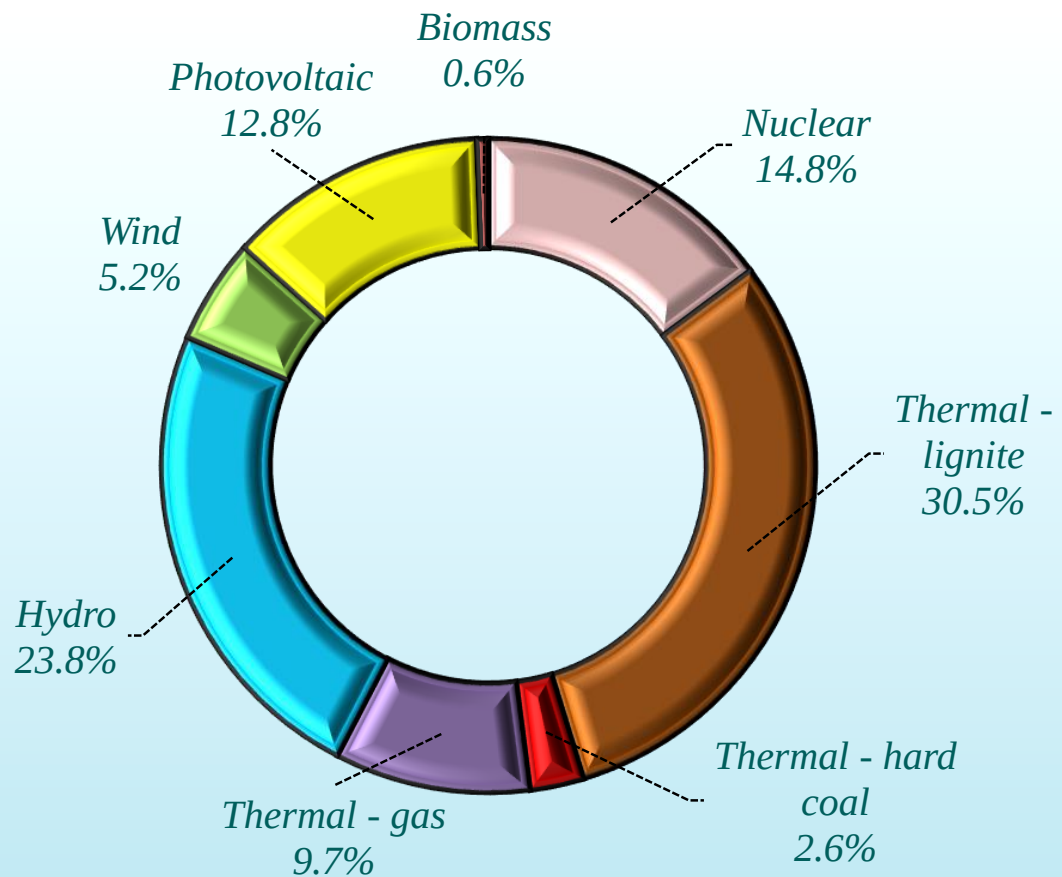
ESO is responsible for the common operational planning, coordination and control of the Bulgarian power system and its parallel synchronous operation with neighbouring systems. Its scope of activities also includes transmission grid operation, maintenance and reliable functioning, auxiliary network servicing, as well as maintenance and repair services in the energy sector. It also manages the power transit through the national grid and runs the electricity market. In performing parallel synchronous operation with ENTSO-E, ESO, being a key partner in the Balkan region, constantly strives to achieve higher transmission efficiency and asset management performance by introducing and using the newest methods of planning, control and monitoring.

INSTALLED GENERATION CAPACITIES

2022

Generation type	MW	Variation 2022/2021, %	Share, %
Nuclear	2 000	0.0	14.8
Thermal - lignite	4 119	0.0	30.5
Thermal - hard coal	356	0.0	2.6
Thermal - gas	1 307	3.0	9.7
Hydro	3 214	0.0	23.8
Wind	705	0.0	5.2
Photovoltaic	1 726	38.5	12.8
Biomass	77	-1.5	0.6
Total	13 505	4.0	100.0

Installed capacity shares by plant type

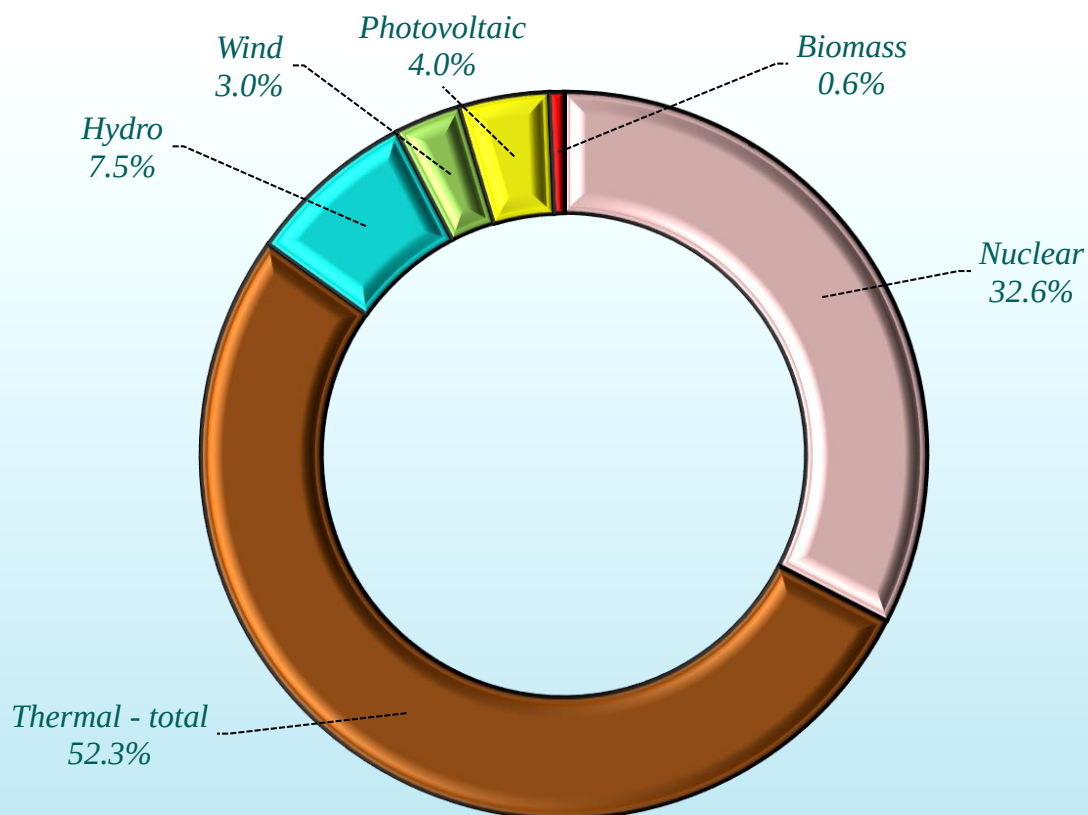


GROSS GENERATION

2022

Generation type	MWh	Variation 2022/2021, %
Nuclear	16 464 662	-0.1
Thermal - total	26 463 339	15.3
Hydro	3 810 674	-25.7
Wind	1 499 125	4.5
Photovoltaic	2 022 607	35.9
Biomass	318 391	-3.8
Total	50 578 798	5.8

Annual gross generation shares by plant type

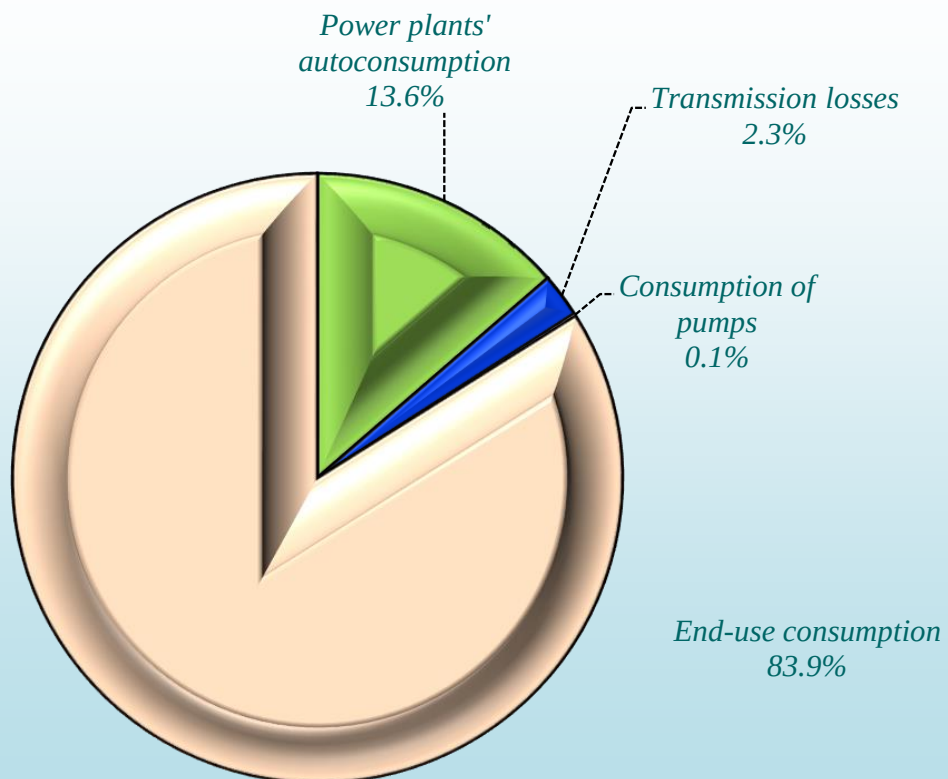


GROSS CONSUMPTION

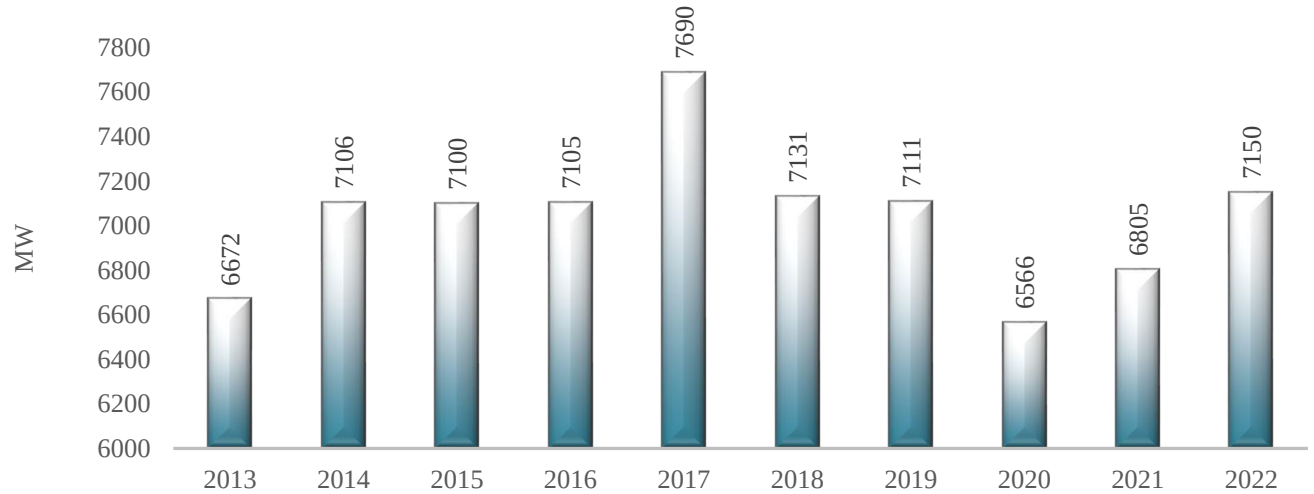
2022

Consumption type	MWh	Variation 2022/2021, %	Share, %
Power plants' autoconsumption	5 228 235	6.8	13.6
Transmission losses	876 757	-0.3	2.3
Consumption of pumps	49 150	-86.9	0.1
End-use consumption	32 179 826	-2.1	83.9
Total	38 333 968	-1.7	100.0

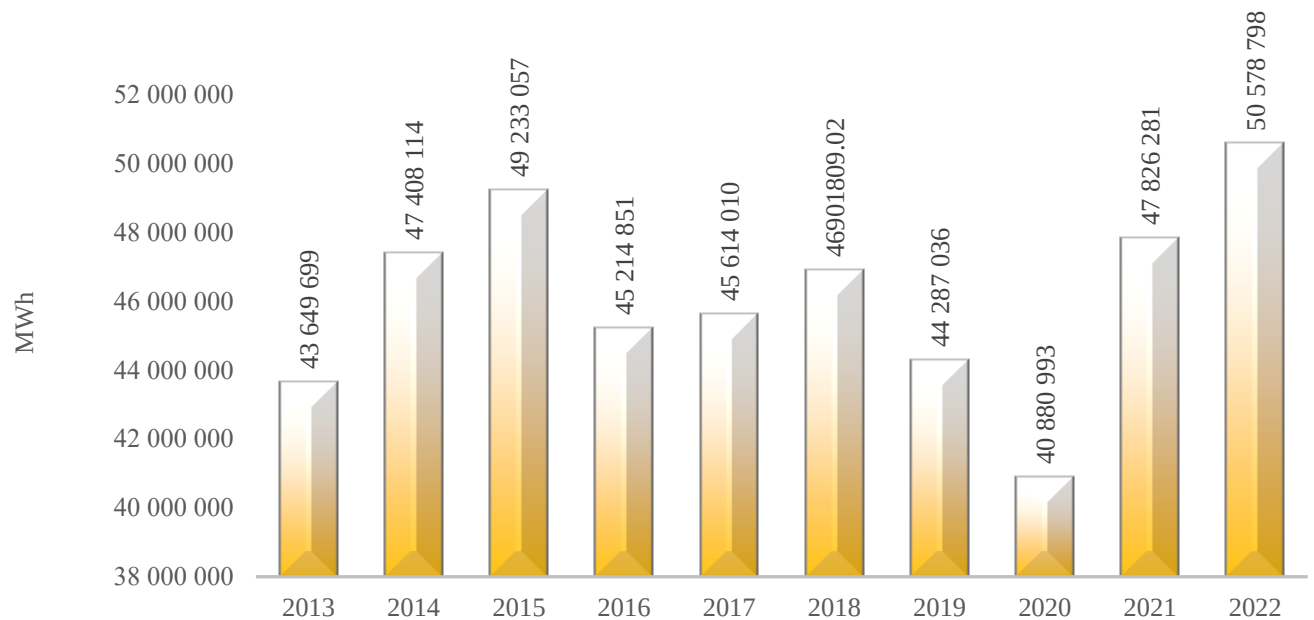
Gross consumption shares by type



ABSOLUTE ANNUAL GROSS PEAK LOADS



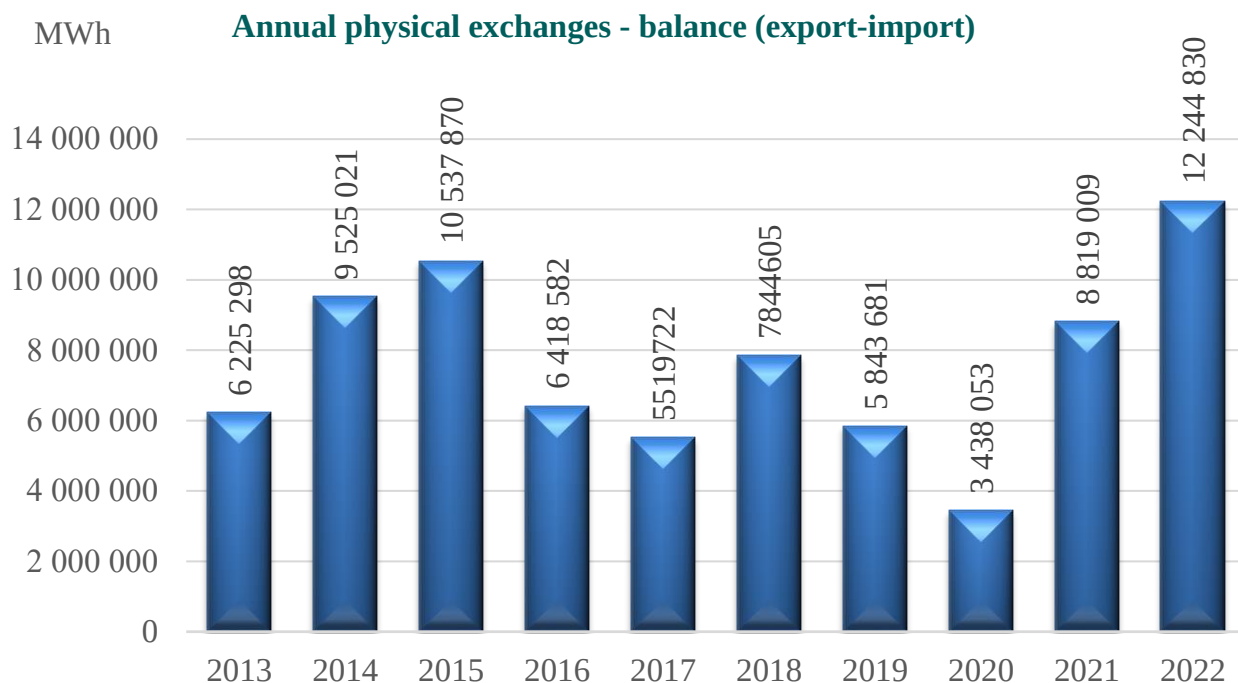
ANNUAL GROSS GENERATION



PHYSICAL EXCHANGES

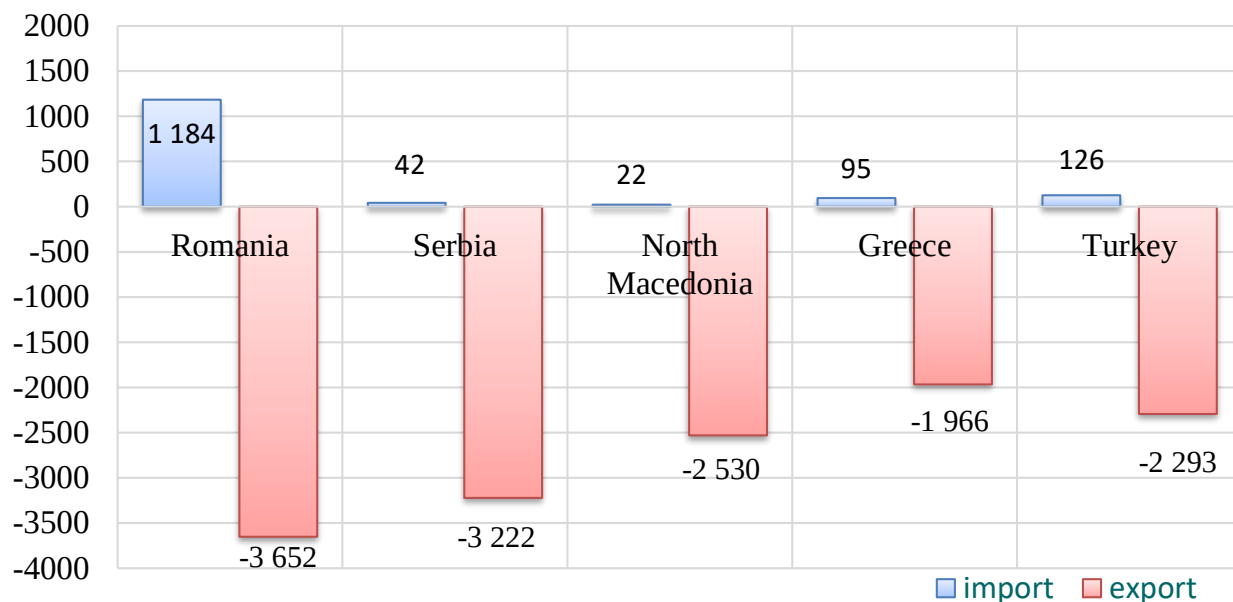
2022

Exchange type	MWh	Variation 2022/2021, %
Balance (export-import)	12 244 830	38.8

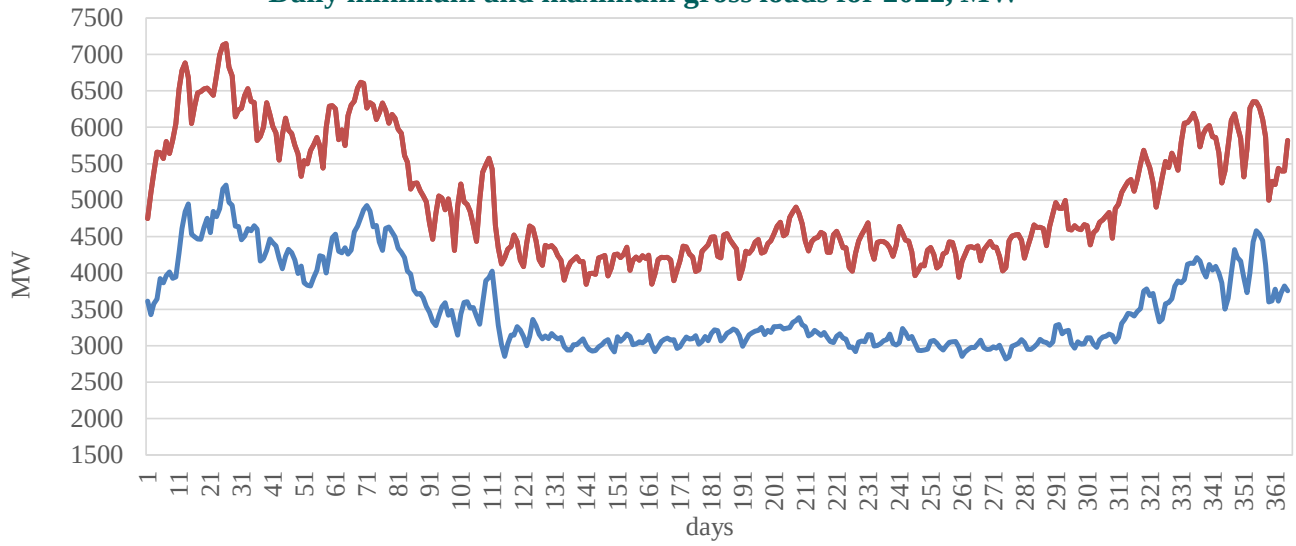


Annual physical exchanges with neighbouring countries 2022, GWh

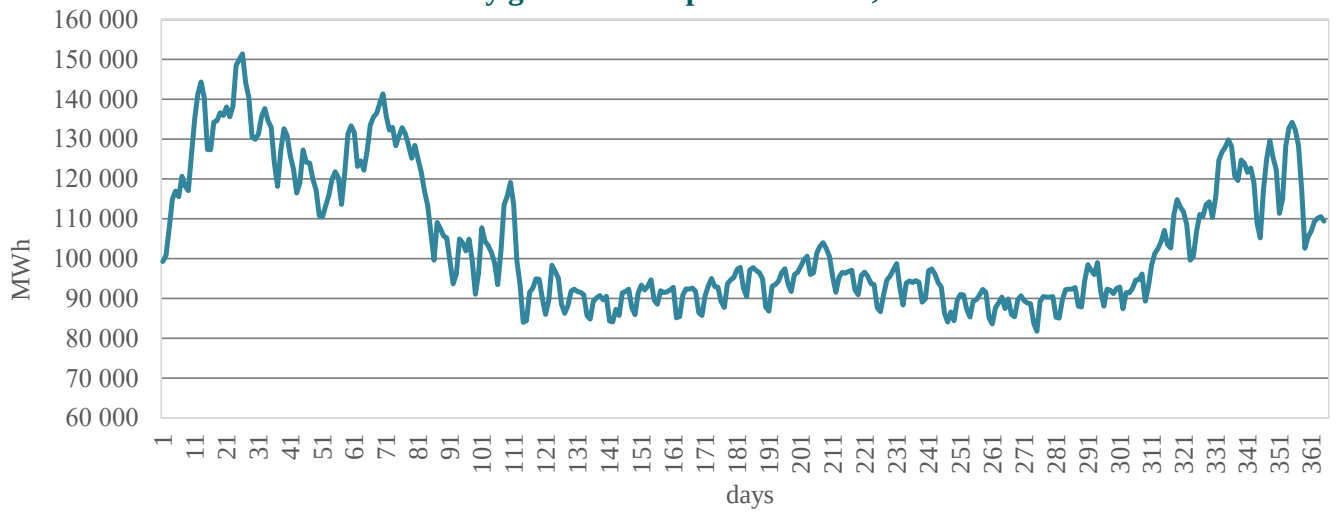
GWh



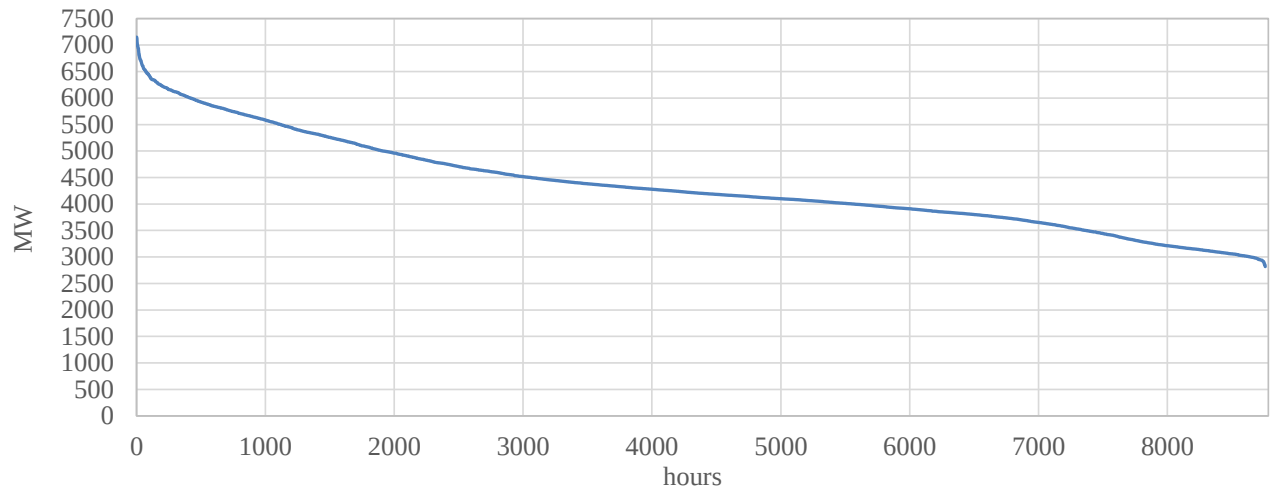
Daily minimum and maximum gross loads for 2022, MW



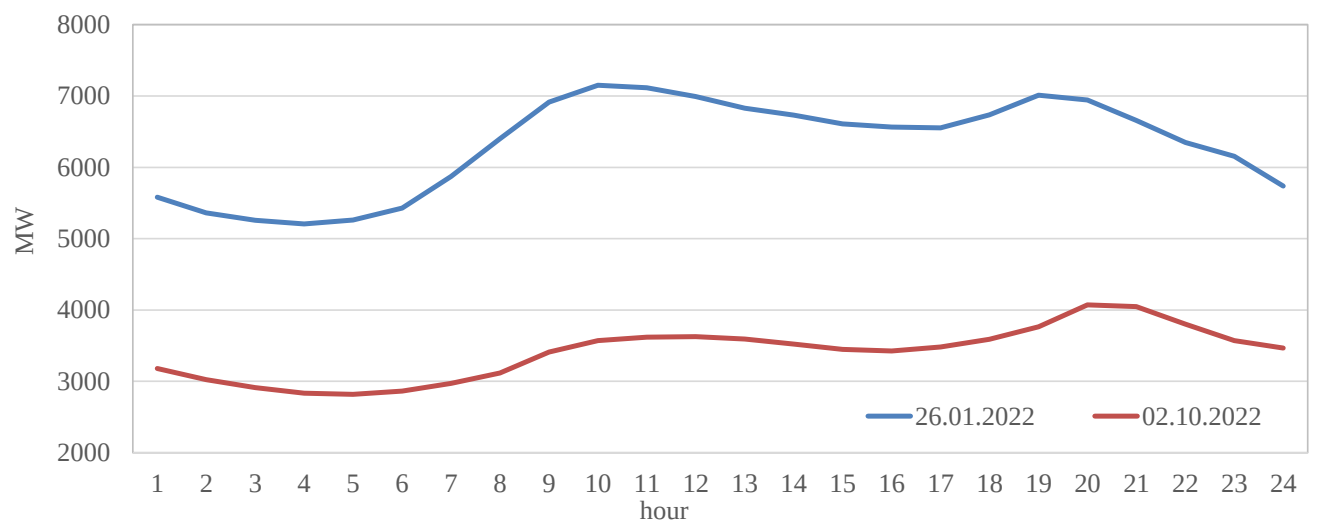
Daily gross consumption for 2022, MWh



Annual hourly gross loads duration curve for 2022



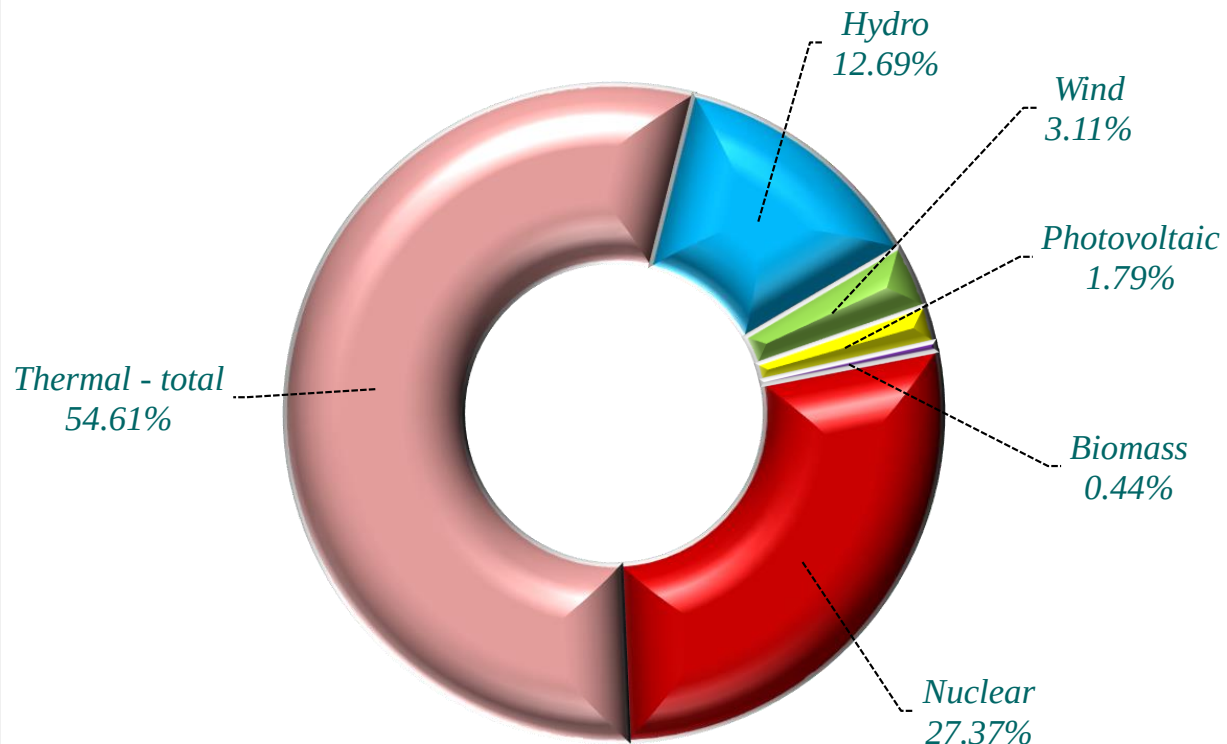
Hourly load curves for the days with the absolute annual minimum and maximum gross loads 2022



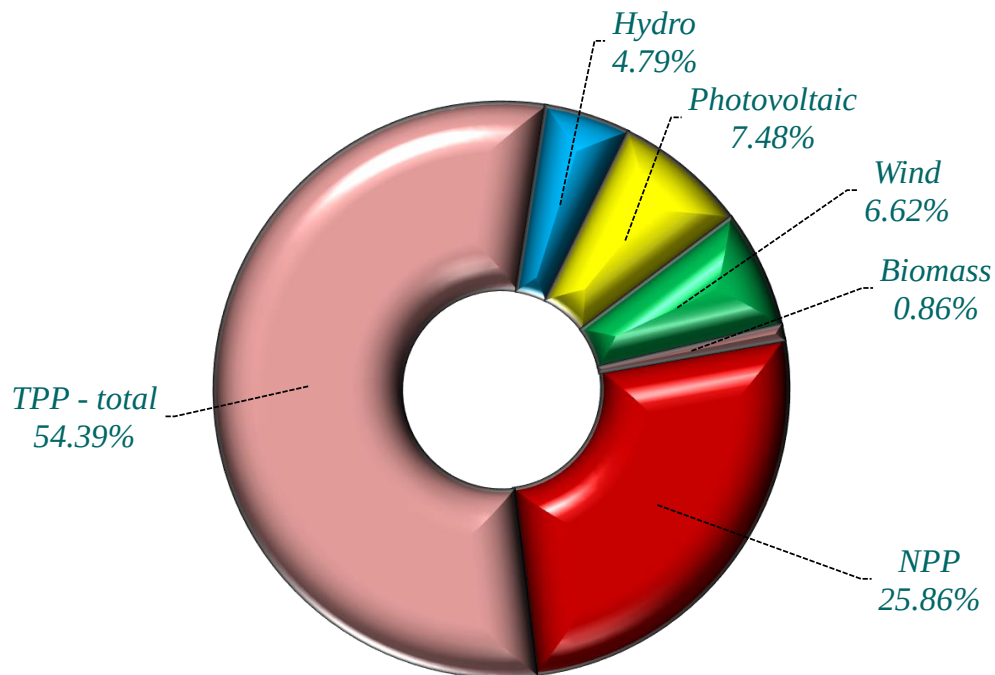
Gross system power balance for the absolute annual peak load hour - 26 January 2022, 10:00

Generation type	MW
Nuclear	2169
Thermal - total	4328
Hydro	1006
Wind	246
Photovoltaic	142
Biomass	35
Total	7926
Export	-776
BG peak load	7150

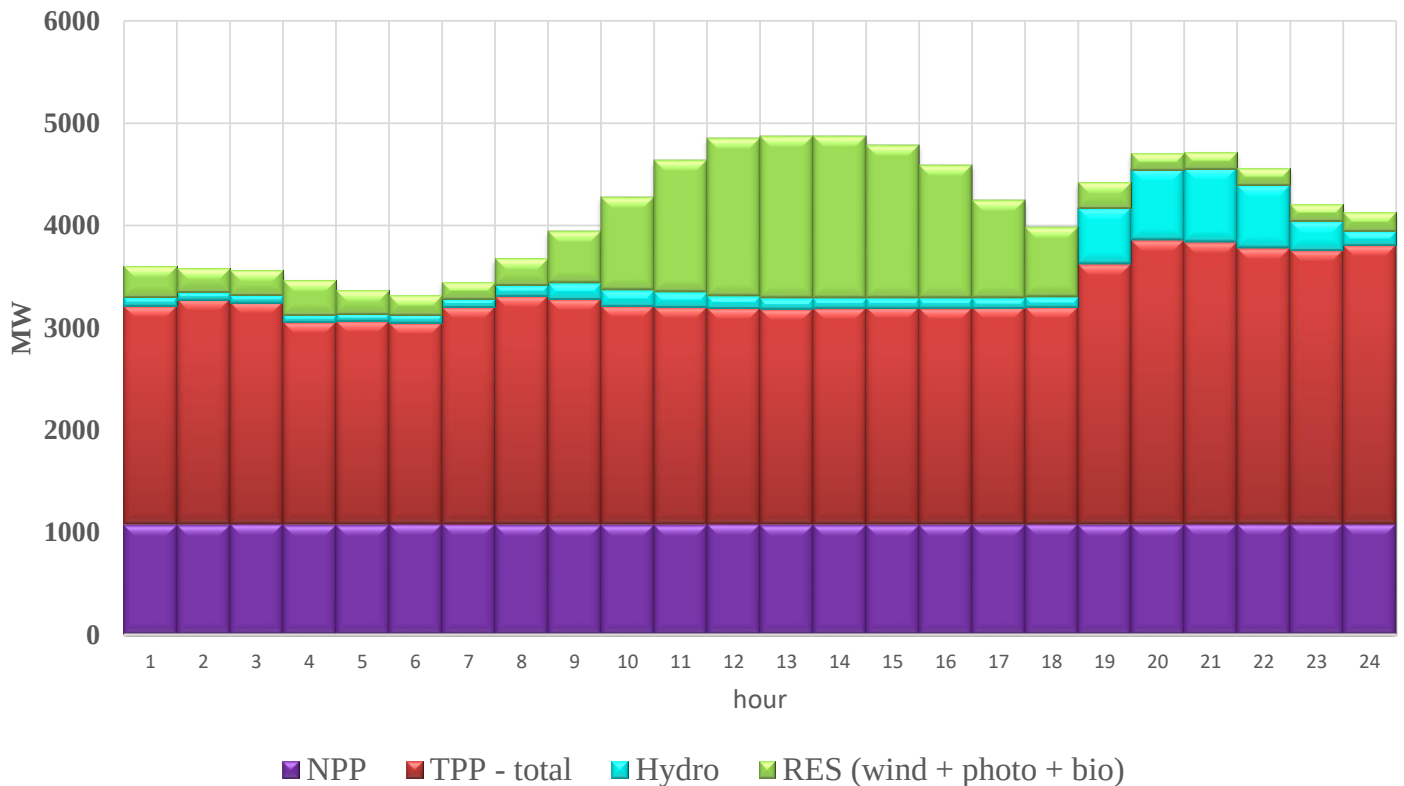
Generation shares by plant type at the absolute annual peak gross load hour



Shares by plant type in the total daily gross generation for the day with the highest share (14.96%) of RES (wind, photovoltaic, biomass) - 02 October 2022



Hourly gross generations by plant type for the day with the highest share (14.96%) of RES (wind, photovoltaic, biomass) in the gross total daily generation 02 October 2022



**Highest shares in the gross total daily generation by plant type (groups)
and dates of occurrence in 2022**

Plant type / group	%	Occurrence date
Hydro+Wind+Photovoltaic+Biomass	29.70	Wed 22.06.2022
Wind+Photovoltaic+Biomass	14.96	Sun 02.10.2022
Wind+Photovoltaic	14.10	Sun 02.10.2022
Hydro	20.41	Wed 22.06.2022
Photovoltaic	8.16	Sun 08.05.2022
Wind	9.64	Sun 11.12.2022
Biomass	0.91	Thu 06.10.2022
Nuclear	41.52	Sun 21.08.2022
Thermal - total	67.35	Thu 15.12.2022

**Daily generation curves of Wind and Photovoltaic for the respective days with
the highest (MW) hourly generation for 2022**



Daily maximum values	Energy		Capacity	
	MWh	date	MW	date
National generation	179 616	Wed 26.01.2022	8 389	Wed 26.01.2022
National consumption	151 402	Wed 26.01.2022	7 150	Wed 26.01.2022
Nuclear generation	52 105	Tue 29.03.2022	2 173	Sun 13.03.2022
Thermal generation	101 954	Wed 26.01.2022	4 351	Wed 26.01.2022
Hydro generation	26 723	Wed 22.06.2022	1 905	Tue 25.01.2022
PV generation	8 870	Sat 21.05.2022	1 136	Mon 19.09.2022
Wind generation	12 883	Tue 11.01.2022	606	Tue 22.03.2022
Biomass generation	932	Sun 13.11.2022	41	Mon 14.11.2022
Net export	57 377	Wed 15.06.2022	2 707	Sun 20.11.2022

Day with	Value	Date
highest consumption, MWh	151 402	Wed 26.01.2022
lowest consumption, MWh	81 744	Sun 02.10.2022
highest peak load, MW	7 150	Wed 26.01.2022
lowest peak load, MW	3 843	Sat 21.05.2022
lowest minimum load, MW	2 818	Sun 02.10.2022
highest minimum load, MW	5 206	Wed 26.01.2022
highest load variation range, MW	2 263	Mon 19.12.2022
lowest load variation range, MW	783	Sat 09.07.2022
highest density coefficient of the daily load curve	0.932	Sat 09.07.2022
lowest density coefficient of the daily load curve	0.783	Sat 31.12.2022
highest positive hourly load ramp, MW	614	Sat 31.12.2022
highest negative hourly load ramp, MW	-586	Sat 31.12.2022

Value	Number of days	Variation	Dates of occurrence
Longest series of consecutive days with increase of the maximum load	6	805 MW	06.11 - 11.11.2022
Longest series of consecutive days with decrease of the maximum load	6	1 024 MW	21.03 - 26.03.2022
Longest series of consecutive days with increase of the daily demand	6	19 132 MWh	06.03 - 11.03.2022
Longest series of consecutive days with decrease of the daily demand	6	28 803 MWh	22.03 - 27.03.2022

Value	Variation	Dates of occurrence
Highest increase of the maximum load between two consecutive days	606 MW (14.08 %)	09.04- 10.04.2022
Highest decrease of the maximum load between two consecutive days	867 MW (14.78 %)	24.12 - 25.12.2022
Highest increase of the daily demand between two consecutive days	13 361 MWh (11.62%)	18.12 - 19.12.2022
Highest decrease of the daily demand between two consecutive days	14 595 MWh (12.45%)	24.12 - 25.12.2022

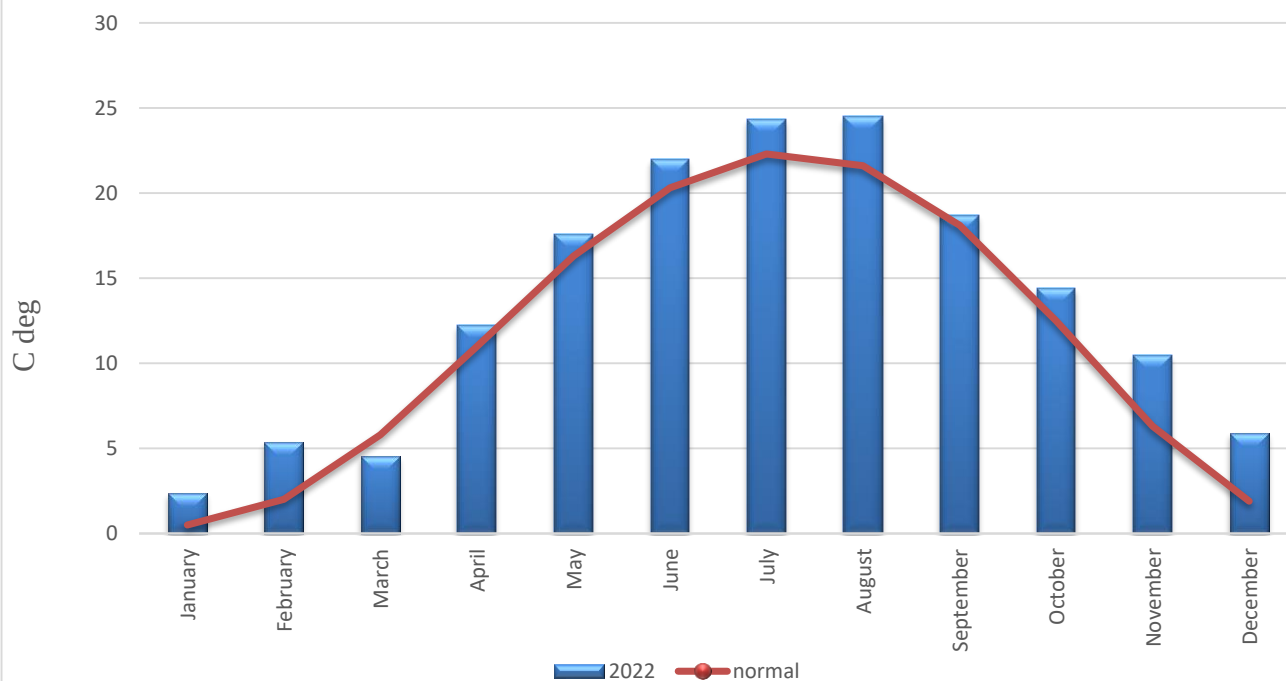
TEMPERATURE SENSITIVITIES OF TYPICAL LOADS FOR WORKING DAYS PER PERIOD TYPE, MW/C'

Typical load	Heating period	Cooling period
night minimum	-81	24
day maximum	-124	82
evening maximum	-105	65

AUTOMATIC MEASURING STATIONS OWNED BY ESO EAD

Station type	Quantity	Communication type
meteorological	19	SCADA - real time
rain measuring	23	GSM - modem
hydrometric	8	GSM - modem
dam level measuring	3	GSM - modem
anemometric	7	SCADA - real time

Registered in 2022 and normal average monthly temperatures for Bulgaria



SUBSTATIONS

2022

Substation type	Quantity	Transformer capacity MVA
400 kV	15	10 102
220 kV	17	7 160
110 kV	268	16 547
Total	300	33 809

TRANSMISSION LINES

Transmission line type	Length km
400 kV	3 032
220 kV	2 710
110 kV	10 164
Total	15 906

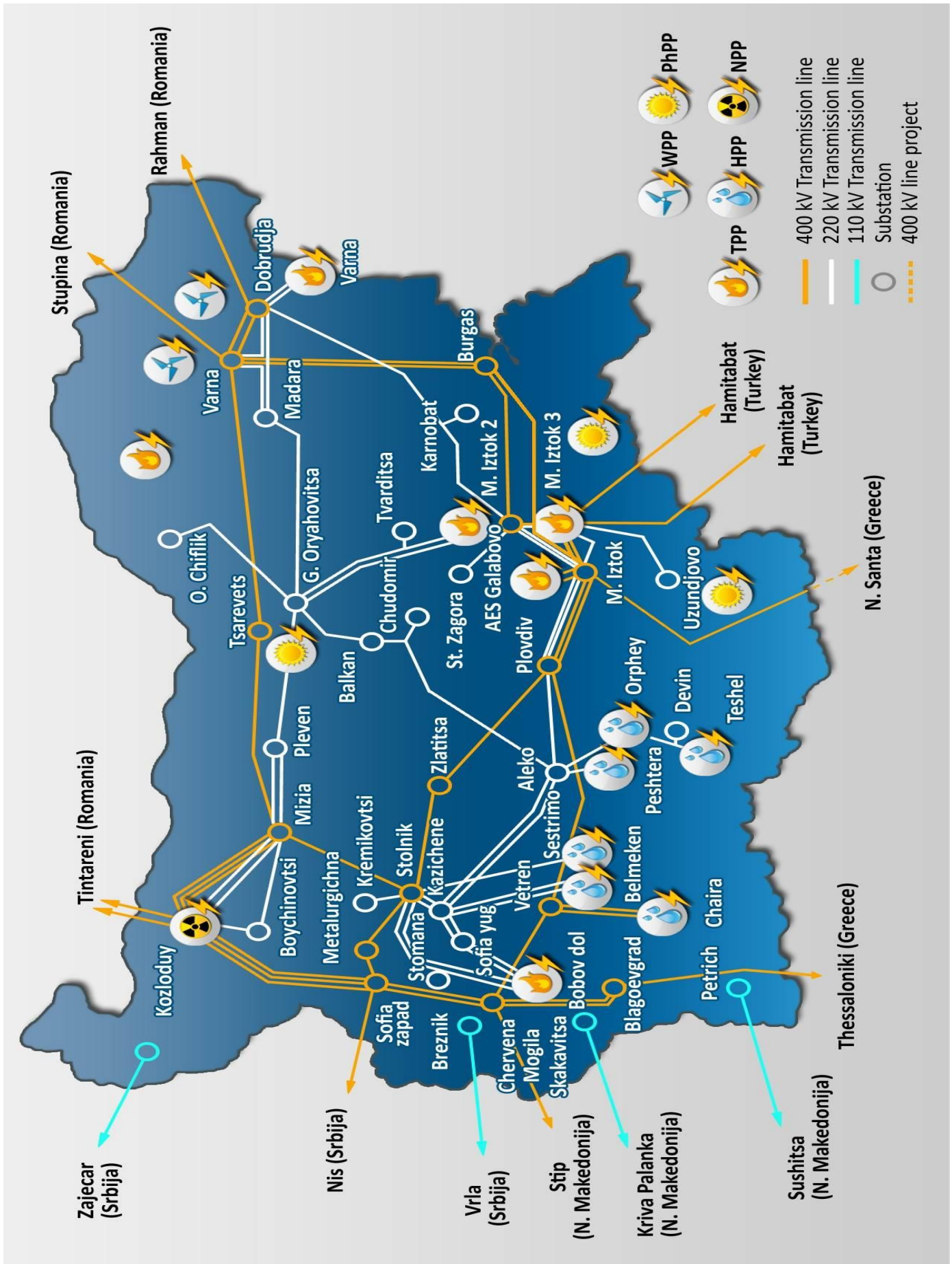
INTERCONNECTING TRANSMISSION LINES

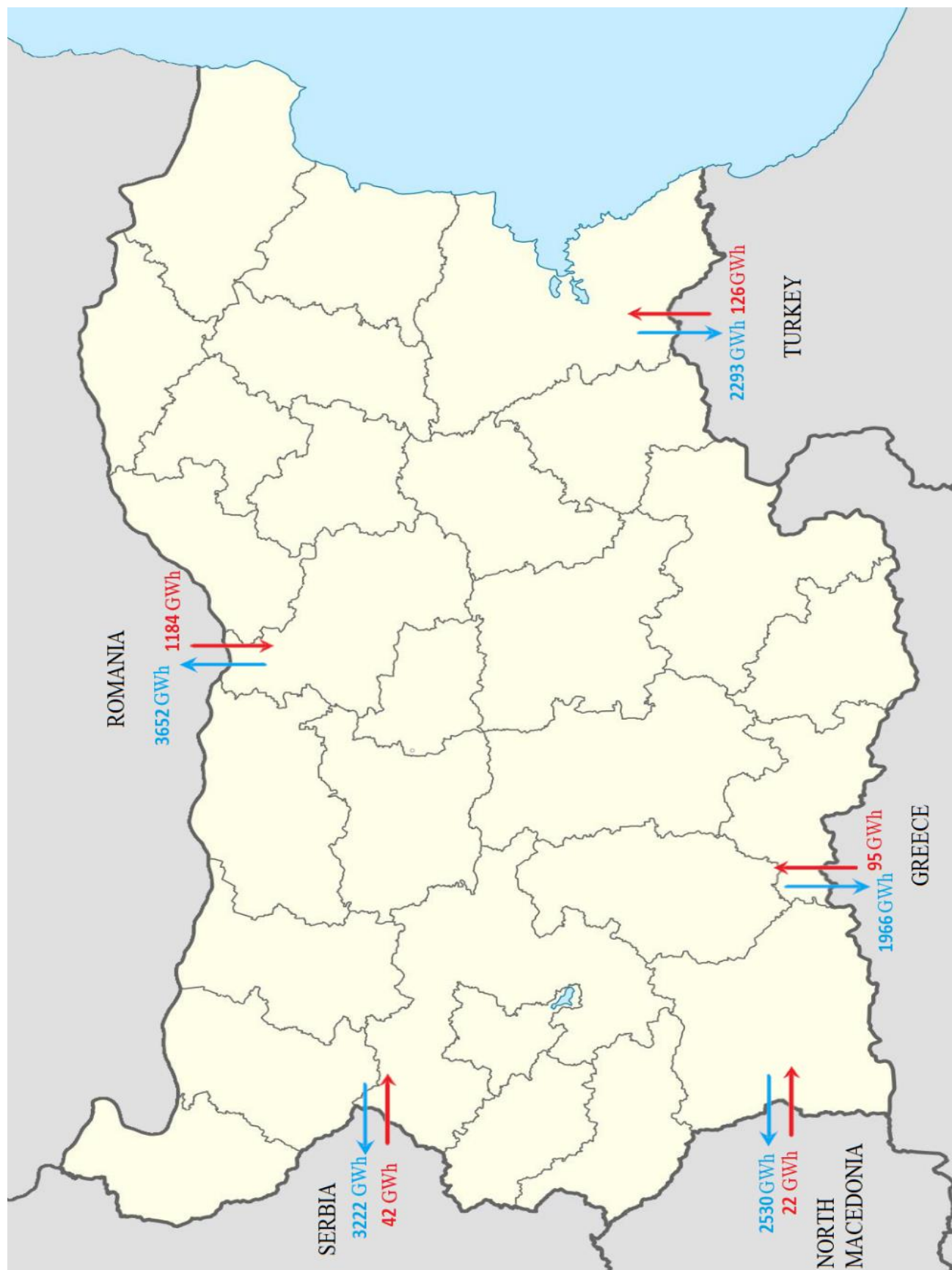
Transmission line	Neighbouring country	Neighbouring operator	Length, km
Druzhba	Romania	TEL	175
Tsantsareni 1	Romania	TEL	116
Tsantsareni 2	Romania	TEL	116
Saedinenie	Romania	TEL	153
Nishava	Serbia	EMS	122
Ruen	North Macedonia	MEPSO	150
Pirin	Greece	IPTO	177
Sakar	Turkey	TEIAS	149
Odrin	Turkey	TEIAS	159
Perperikon	Greece	IPTO	123

Month	ACTIVATED UPWARD BALANCING ENERGY, MWh	ACTIVATED DOWNWARD BALANCING ENERGY, MWh
January	53 305	47 879
February	23 808	63 150
March	48 682	67 536
April	52 695	41 538
May	50 138	22 856
June	84 878	25 767
July	94 400	16 791
August	130 098	11 500
September	94 474	14 936
October	99 636	11 782
November	118 379	11 763
December	118 878	26 351

Month	IMBALANCE PRICE FOR SHORTAGE, BGN/MWh	IMBALANCE PRICE FOR SURPLUS, BGN/MWh
January	377.28	59.65
February	258.08	56.32
March	330.18	52.23
April	282.76	44.58
May	303.92	43.76
June	368.14	47.44
July	531.93	42.98
August	692.74	40.85
September	602.46	41.61
October	356.30	35.10
November	390.69	35.10
December	418.06	33.90

220 kV and 400 kV TRANSMISSION NETWORK





CONTACT: ELEKTROENERGIEN SISTEMEN OPERATOR EAD

201 TSAR BORIS III Blvd., 1618 SOFIA, BULGARIA

tel: +359 2 9696 736; fax. +359 2 9696 739

e-mail: eso@eso.bg; www.eso.bg

© ESO EAD