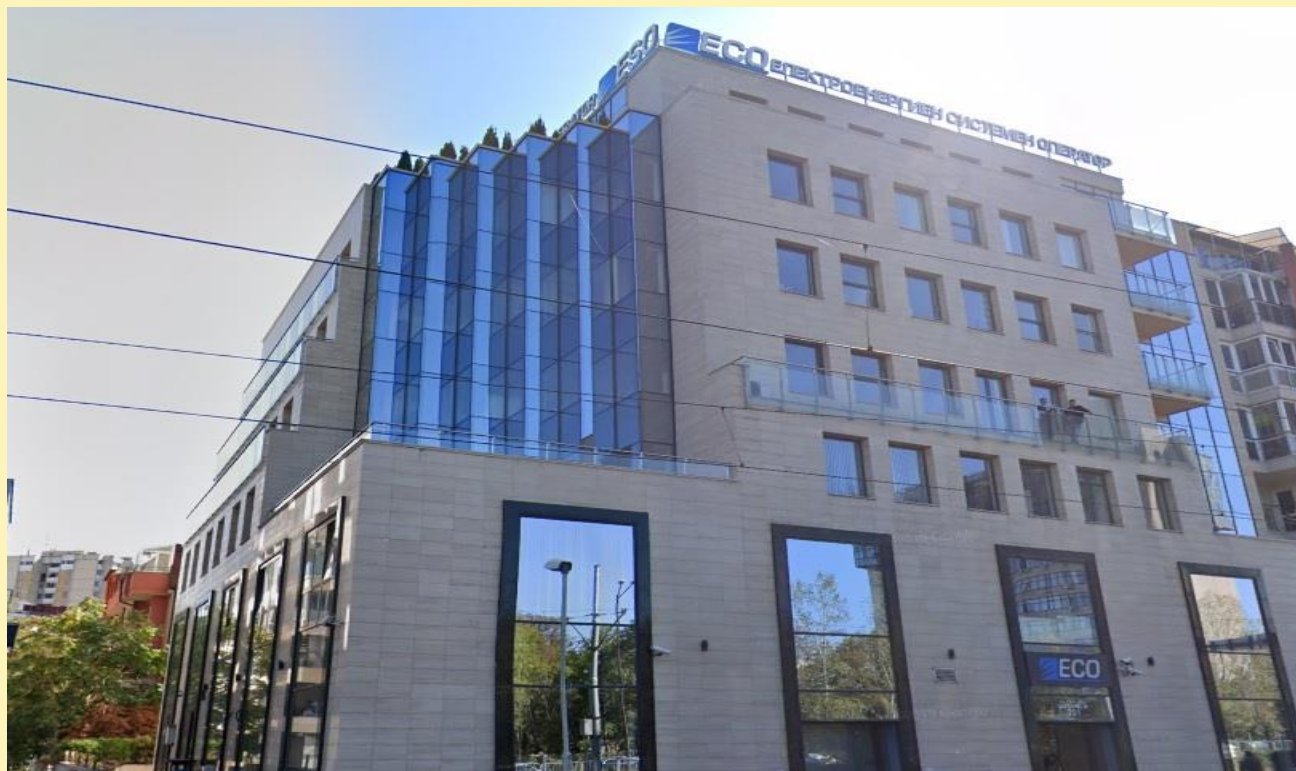




STATISTICAL POCKETBOOK 2021



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.

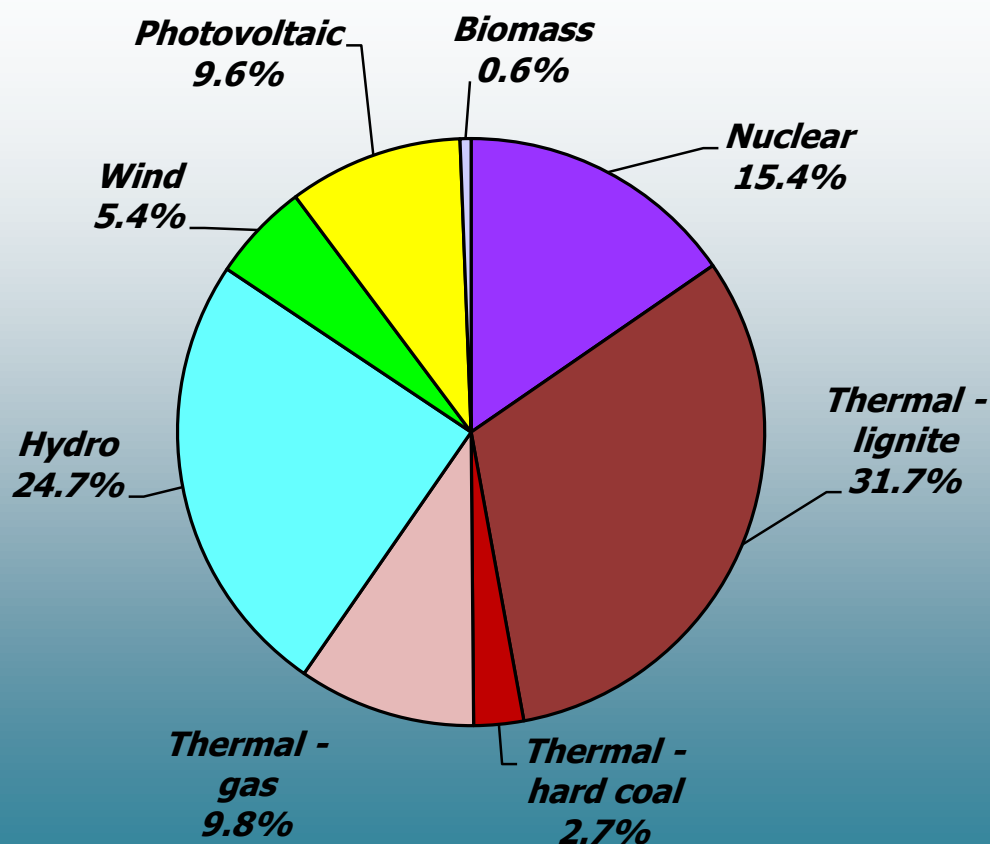
INSTALLED GENERATION CAPACITIES

2021

Generation type	MW	Variation 2021/2020, %	Share, %
Nuclear	2 000	0.0	15.4
Thermal - lignite	4 119	0.0	31.7
Thermal - hard coal	356	44.7	2.7
Thermal - gas	1 269	-6.7	9.8
Hydro	3 213	0.0	24.7
Wind	705	0.5	5.4
Photovoltaic	1 246	11.2	9.6
Biomass	79	0.0	0.6
Total	12 986	1.1	100.0

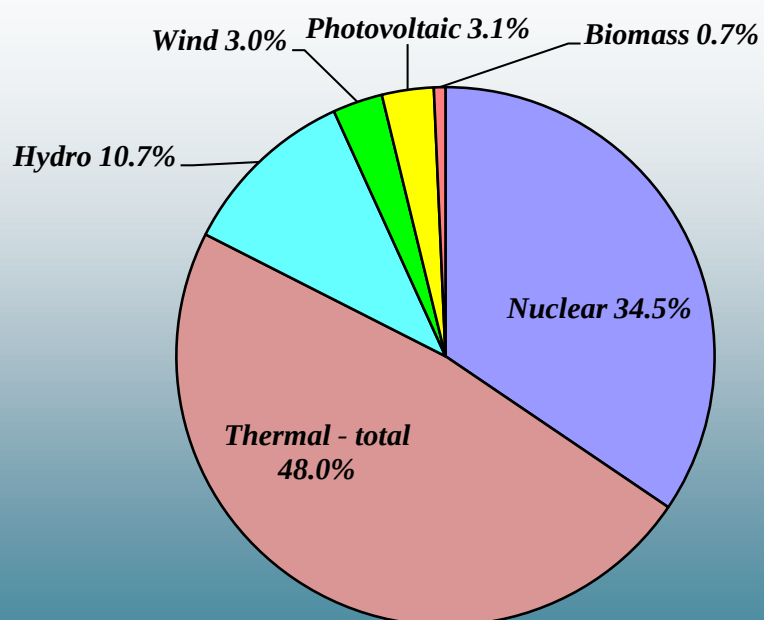
NOTE: Installed capacities data in the "Distribution Grid West" are from 2020, due to not available such data for 2021.

Installed capacity shares by plant type



GROSS GENERATION**2021**

Generation type	MWh	Variation 2021/2020, %
Nuclear	16 489 198	-0.8
Thermal - total	22 956 951	30.8
Hydro	5 127 000	51.1
Wind	1 434 190	-3.0
Photovoltaic	1 487 946	0.7
Biomass	330 996	-5.3
Total	47 826 281	17.0

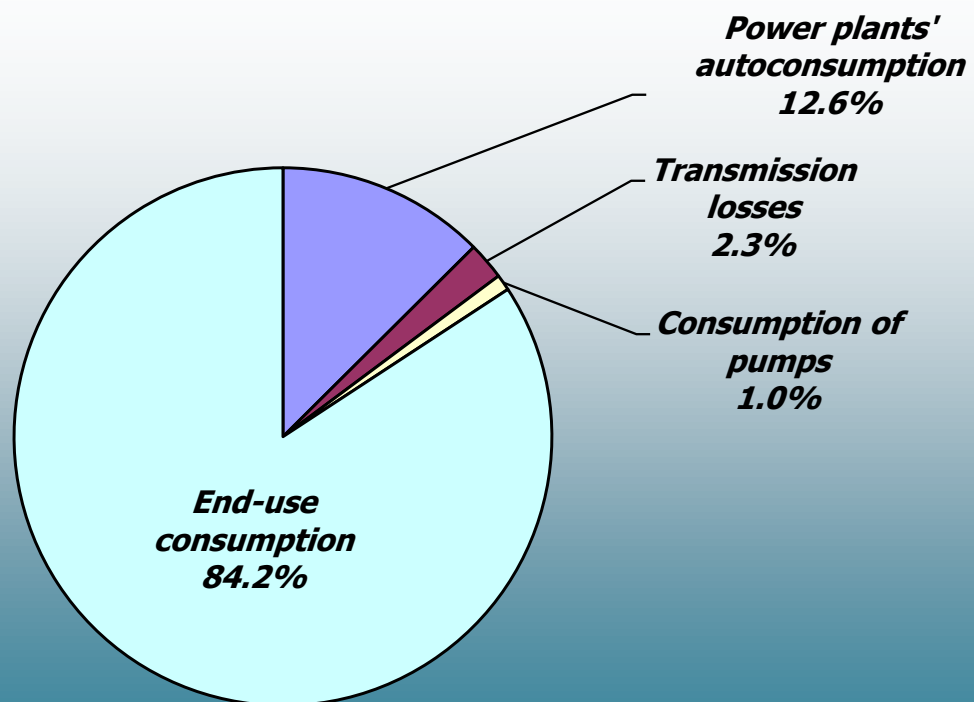
Annual gross generation shares by plant type

GROSS CONSUMPTION

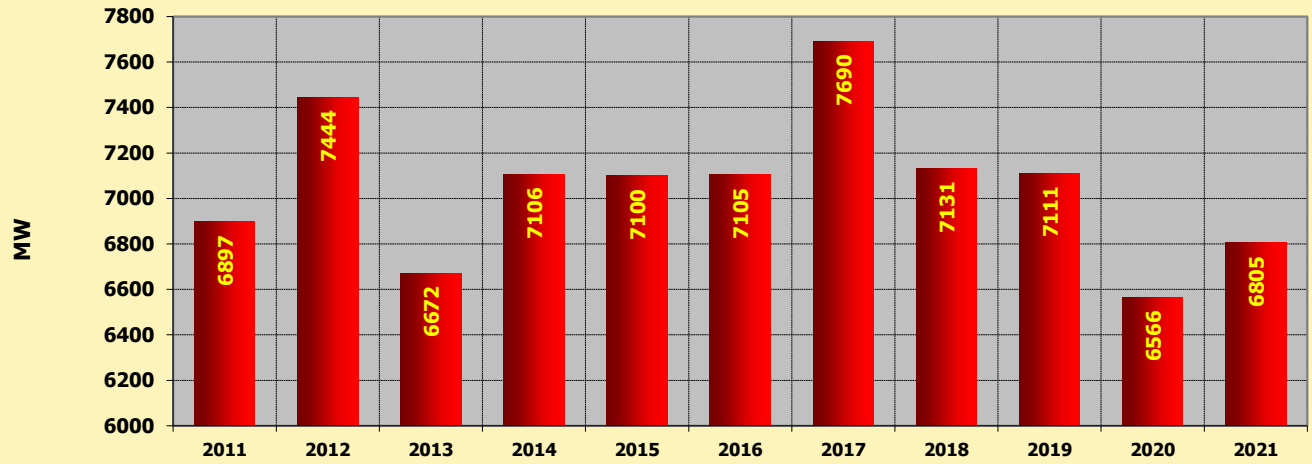
2021

Consumption type	MWh	Variation 2021/2020, %	Share, %
Power plants' autoconsumption	4 895 610	19.9	12.6
Transmission losses	879 484	7.2	2.3
Consumption of pumps	376 508	-47.7	1.0
End-use consumption	32 855 671	3.3	84.2
Total	39 007 273	4.2	100.0

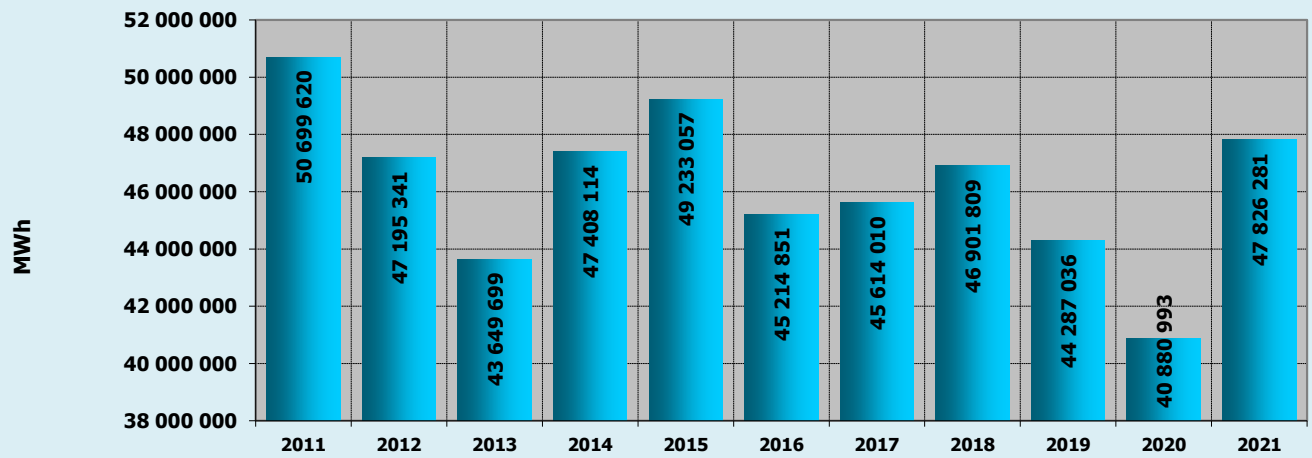
Gross consumption shares by type



Absolute annual gross peak loads



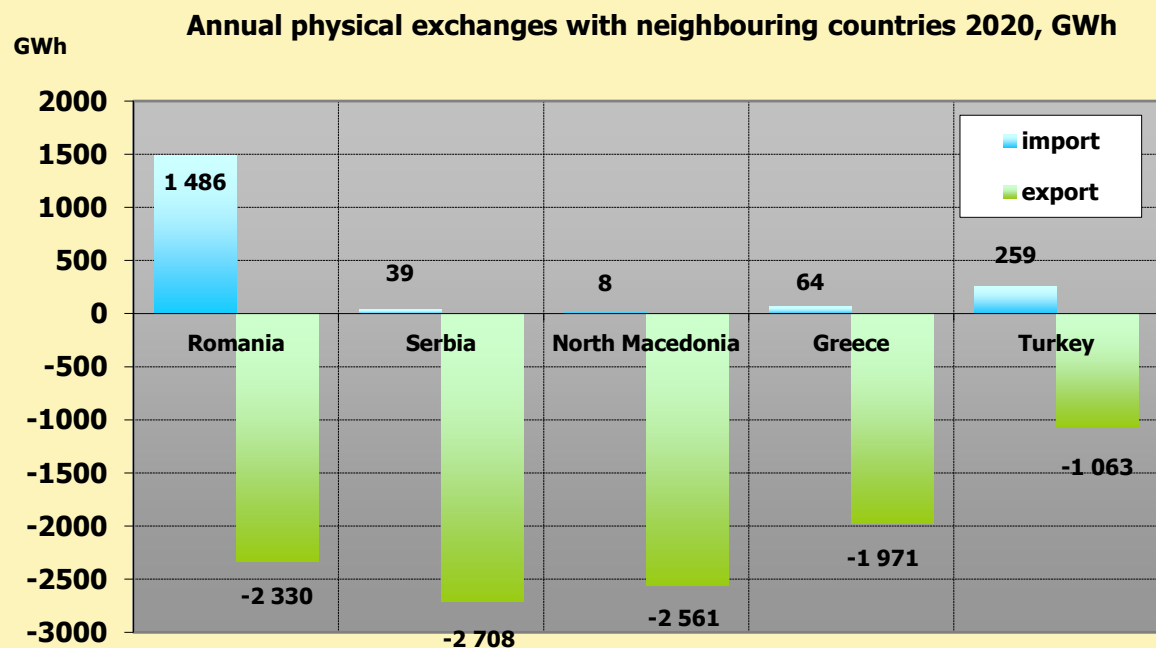
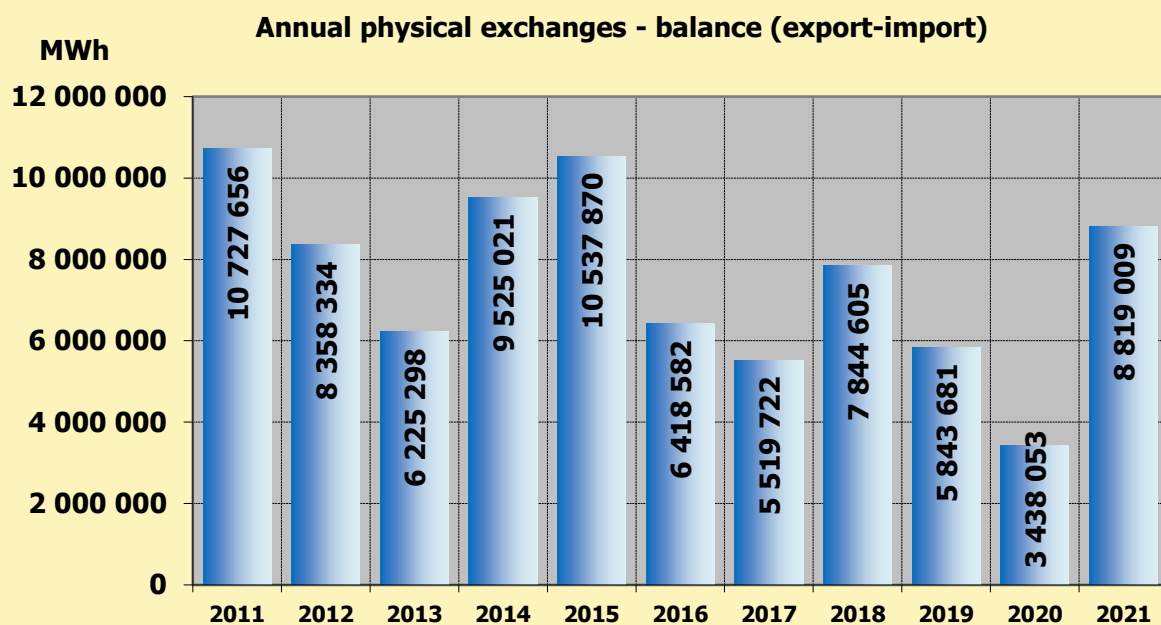
Annual gross generation



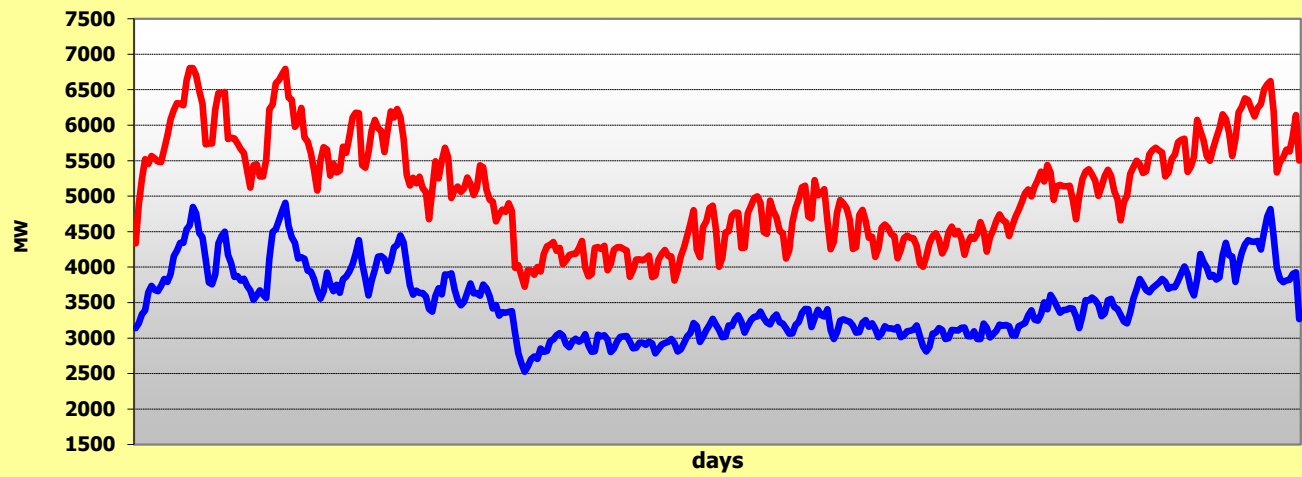
PHYSICAL EXCHANGES

2021

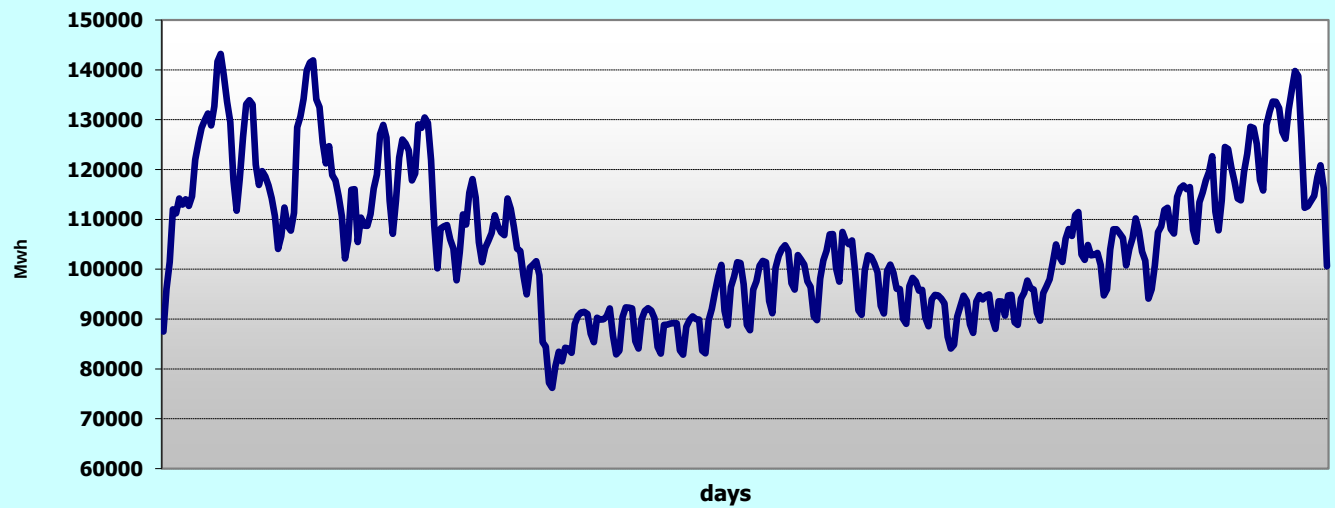
Exchange type	MWh	Variation 2021/2020, %
Balance (export-import)	8 819 009	156.5



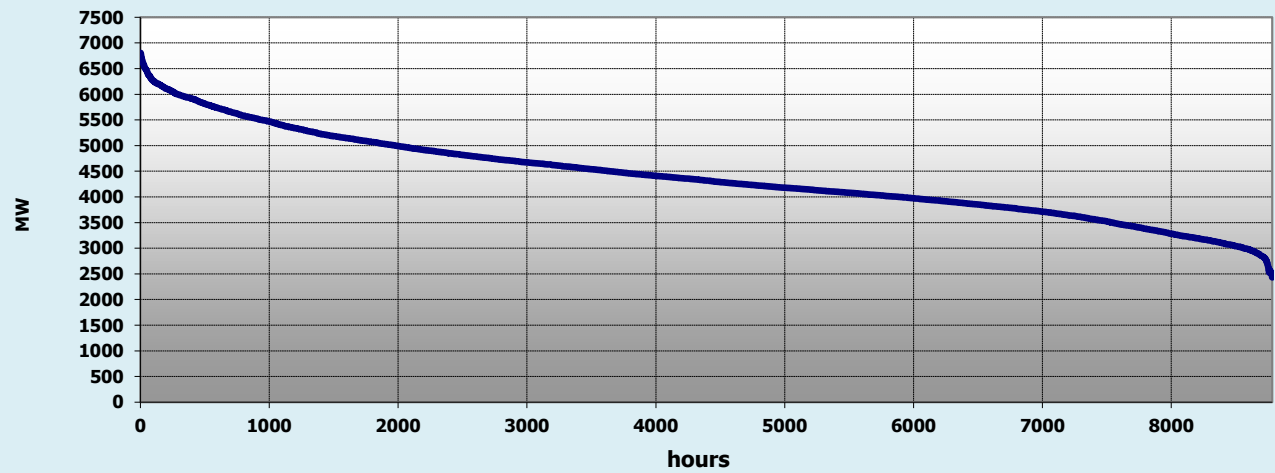
Daily minimum and maximum gross loads for 2021, MW



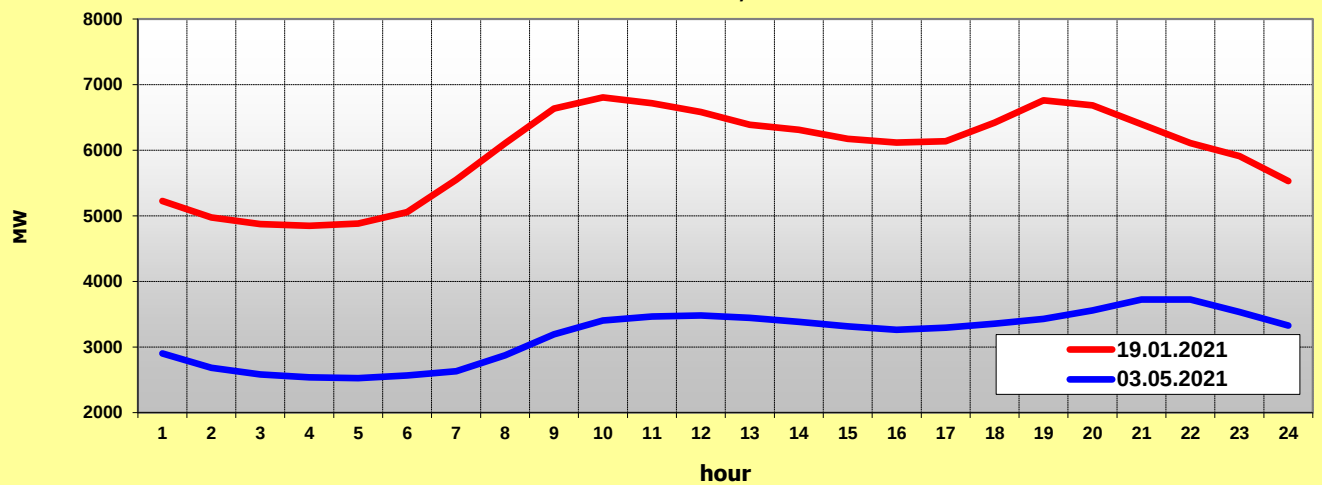
Daily gross consumption for 2021, MWh



Annual hourly gross loads duration curve for 2021



Hourly load curves for the days with the absolute annual minimum and maximum gross loads 2021, MW

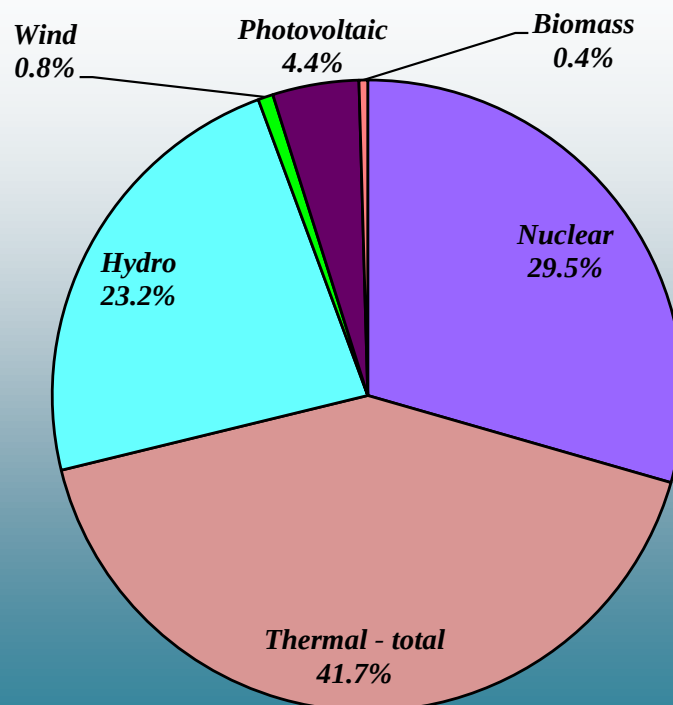


GROSS SYSTEM POWER BALANCE FOR THE ABSOLUTE ANNUAL PEAK LOAD

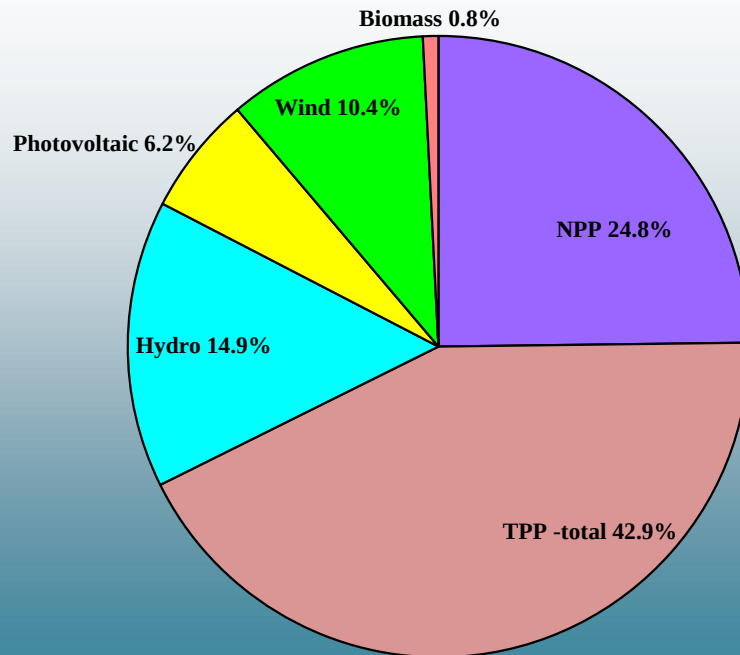
HOURLY - 19 January 2021, 10:00 h.

Generation type	MW
Nuclear	2104
Thermal - total	2981
Hydro	1655
Wind	55
Photovoltaic	316
Biomass	32
Total	7142
Export	-337
BG peak load	6805

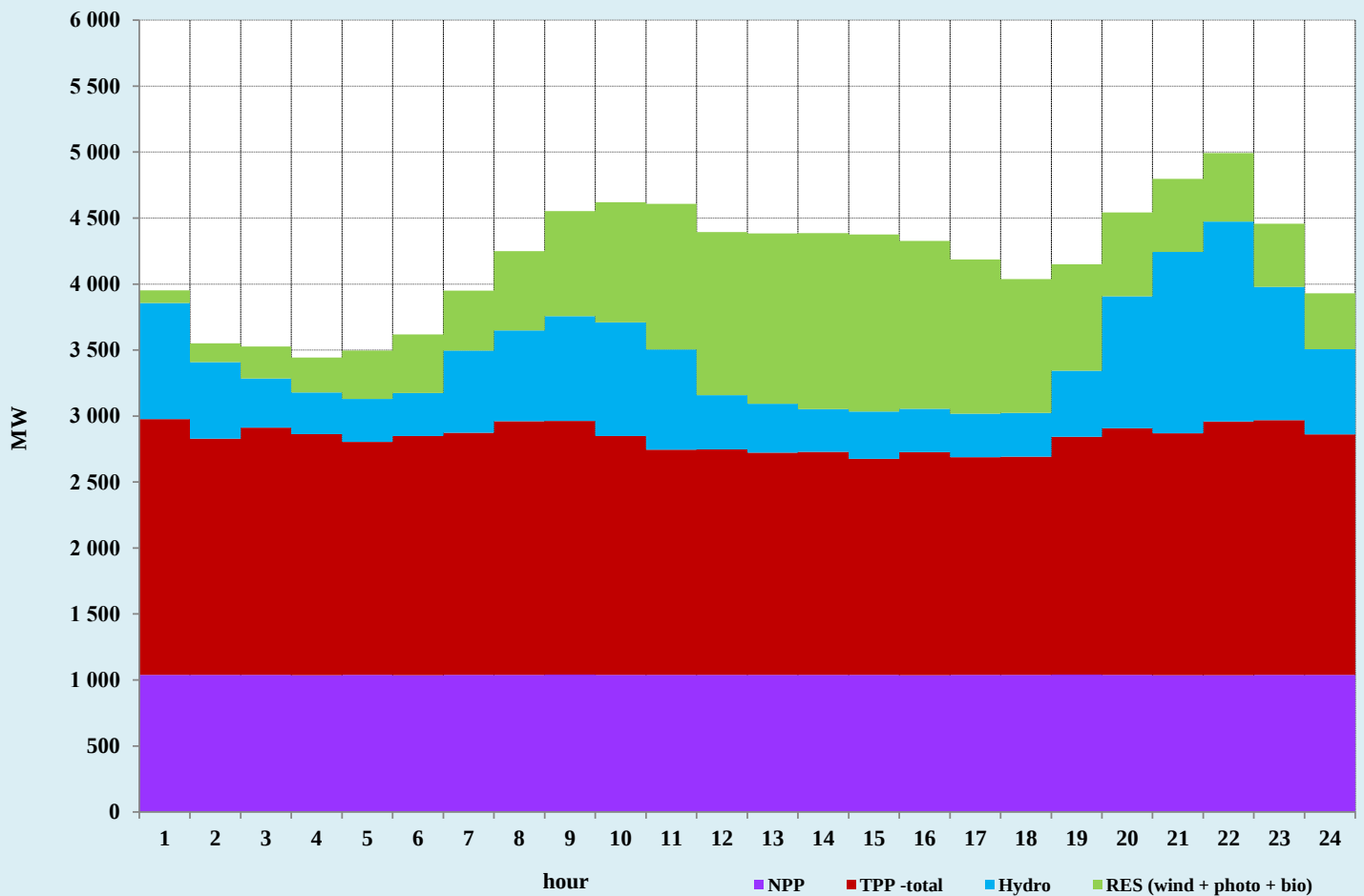
Generation shares by plant type at the absolute annual peak gross load hour



Shares by plant type in the total daily gross generation for the day with the highest share (17.40%) of RES (wind, photovoltaic, biomass) - 18 May 2021



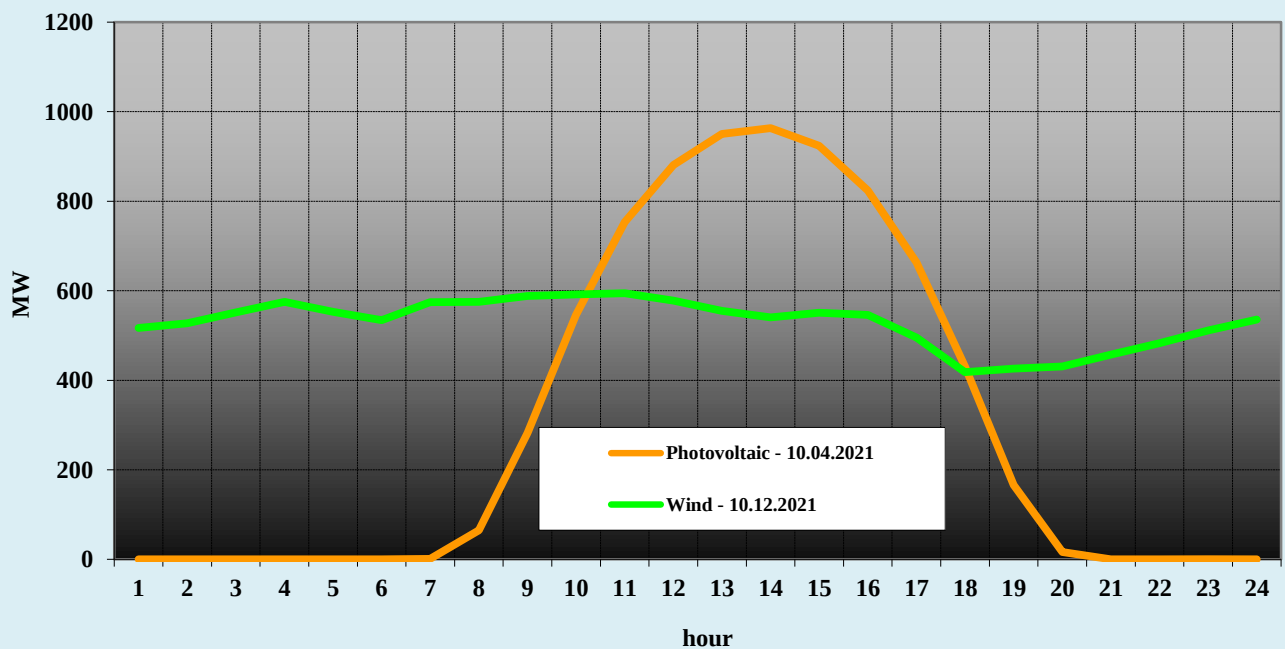
Hourly gross generations by plant type for the day with the highest share (17.40%) of RES (wind, photovoltaic, biomass) in the gross total daily generation 18 May 2021



**Highest shares in the gross total daily generation by plant type (groups)
and dates of occurrence in 2021**

Plant type / group	%	Occurrence date
Hydro+Wind+Photovoltaic+Biomass	33.29	Wed 19.05.2021
Wind+Photovoltaic+Biomass	17.40	Tue 18.05.2021
Wind+Photovoltaic	16.59	Tue 18.05.2021
Hydro	23.04	Sat 01.05.2021
Photovoltaic	7.15	Sun 09.05.2021
Wind	10.40	Tue 18.05.2021
Biomass	1.01	Sun 23.05.2021
Nuclear	49.85	Mon 07.06.2021
Thermal - total	69.52	Wed 27.10.2021

**Daily generation curves of Wind and Photovoltaic for the respective days with the highest (MW)
hourly generation for 2021**



Daily maximum values	Energy		Capacity	
	MWh	date	MW	date
National generation	177 851	Tue 21.12.2021	8 348	Thu 16.12.2021
National consumption	143 194	Tue 19.01.2021	6 805	Tue 19.01.2021
Nuclear generation	52 045	Fri 31.12.2021	2 171	Fri 31.12.2021
Thermal generation	95 313	Wed 22.12.2021	4 121	Sun 12.12.2021
Hydro generation	29 445	Tue 19.01.2021	2 142	Sun 09.05.2021
PV generation	7 466	Sat 10.04.2021	963	Sat 10.04.2021
Wind generation	12 709	Fri 10.12.2021	603	Mon 25.01.2021
Biomass generation	1 015	Wed 03.03.2021	45	Wed 03.03.2021
Net export	48 888	Wed 22.09.2021	2 449	Sun 19.12.2021

Day with	Value	Date
highest consumption, MWh	143 194	Tue 19.01.2021
lowest consumption, MWh	76 198	Mon 03.05.2021
highest peak load, MW	6 805	Tue 19.01.2021
lowest peak load, MW	3 724	Mon 03.05.2021
lowest minimum load, MW	2 525	Mon 03.05.2021
highest minimum load, MW	4 906	Wed 17.02.2021
highest load variation range, MW	2 324	Tue 26.01.2021
lowest load variation range, MW	884	Sat 19.06.2021
highest density coefficient of the daily load curve	0.925	Sat 03.07.2021
lowest density coefficient of the daily load curve	0.788	Fri 31.12.2021
highest positive hourly load ramp, MW	630	Mon 22.03.2021
highest negative hourly load ramp, MW	-641	Fri 31.12.2021

Value	Number of days	Variation	Dates of occurrence
Longest series of consecutive days with increase of the maximum load	7	1516 MW	11.02 - 17.02.2021
Longest series of consecutive days with decrease of the maximum load	6	705 MW	01.02 - 06.02.2021
Longest series of consecutive days with increase of the daily demand	7	34 176 MWh	10.02 - 16.02.2021
Longest series of consecutive days with decrease of the daily demand	6	19 269 MWh	19.04 - 24.04.2021

Value	Variation	Dates of occurrence
Highest increase of the maximum load between two consecutive days	709 MW (11.38 %)	11.02- 12.02.2021
Highest decrease of the maximum load between two consecutive days	857 MW (13.85 %)	24.12 - 25.12.2021
Highest increase of the daily demand between two consecutive days	17 161 MWh (13.36%)	11.02 - 12.02.2021
Highest decrease of the daily demand between two consecutive days	14 054 MWh (11.12%)	24.12 - 25.12.2021

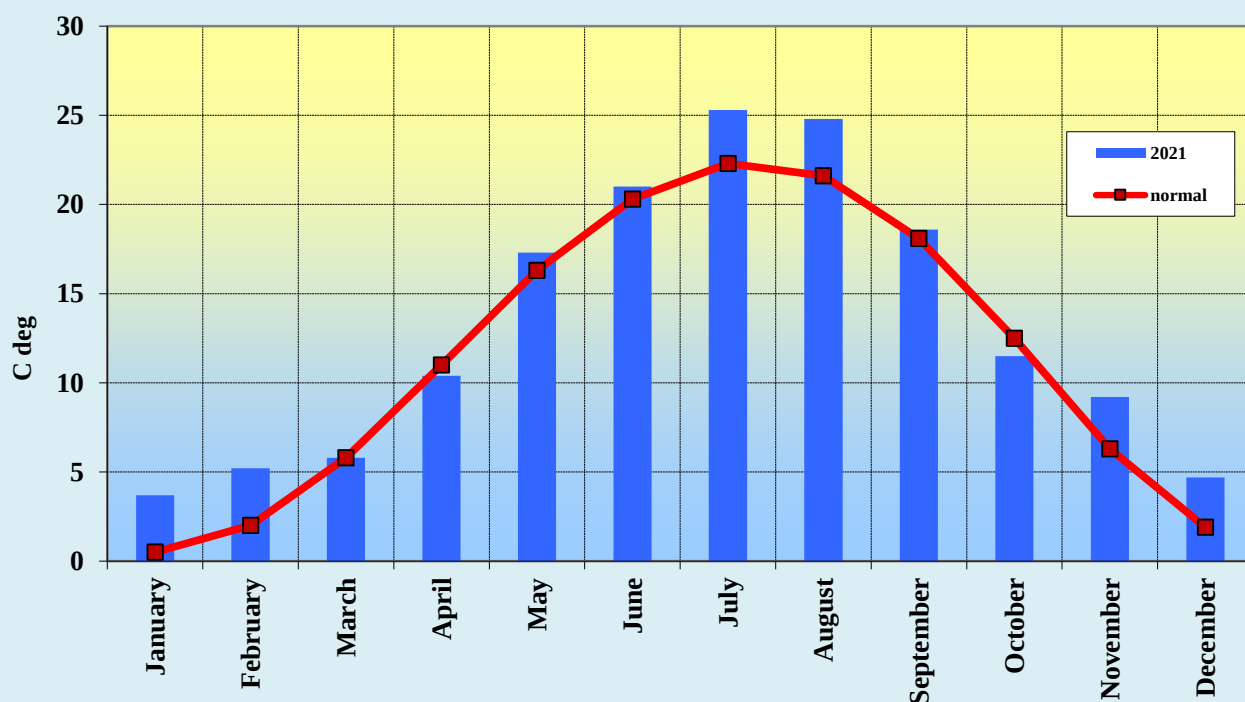
**TEMPERATURE SENSITIVITIES OF TYPICAL LOADS
FOR WORKING DAYS PER PERIOD TYPE, MW/C'**

Typical load	Heating period	Cooling period
night minimum	-87	32
day maximum	-125	40
evening maximum	-115	21

**AUTOMATIC MEASURING STATIONS
OWNED BY ESO EAD**

Station type	Quantity	Communication type
meteorological	19	SCADA - реално време
rain measuring	23	GSM - модем
hydrometric	8	GSM - модем
dam level measuring	3	GSM - модем
anemometric	7	SCADA - реално време

Registered in 2021 and normal average monthly temperatures for Bulgaria



SUBSTATIONS**2021**

Substation type	Quantity	Transformer capacity
	number	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	10 066
Total	15 808

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

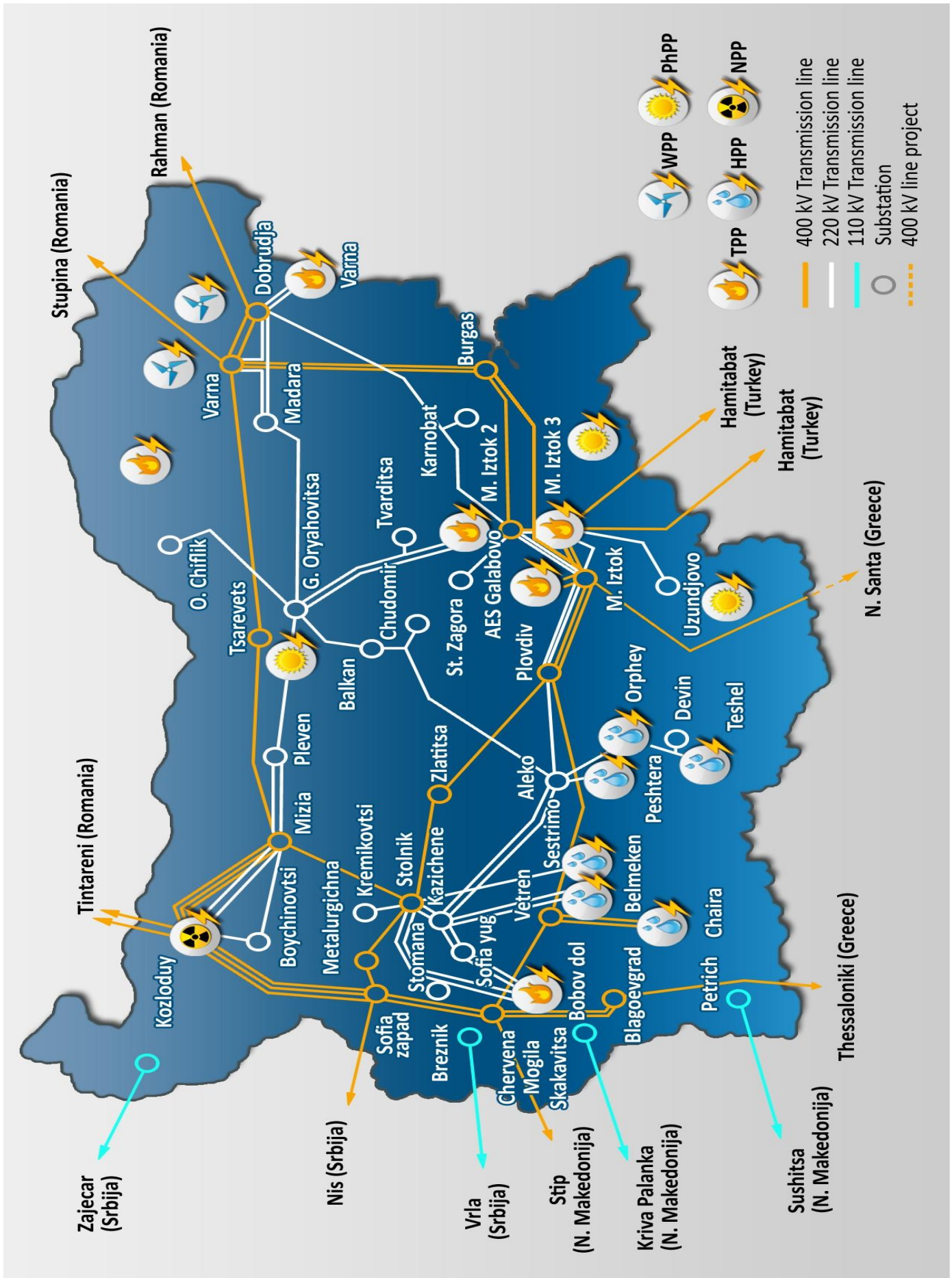
BALANCING MARKET /NET ENERGY/**2021**

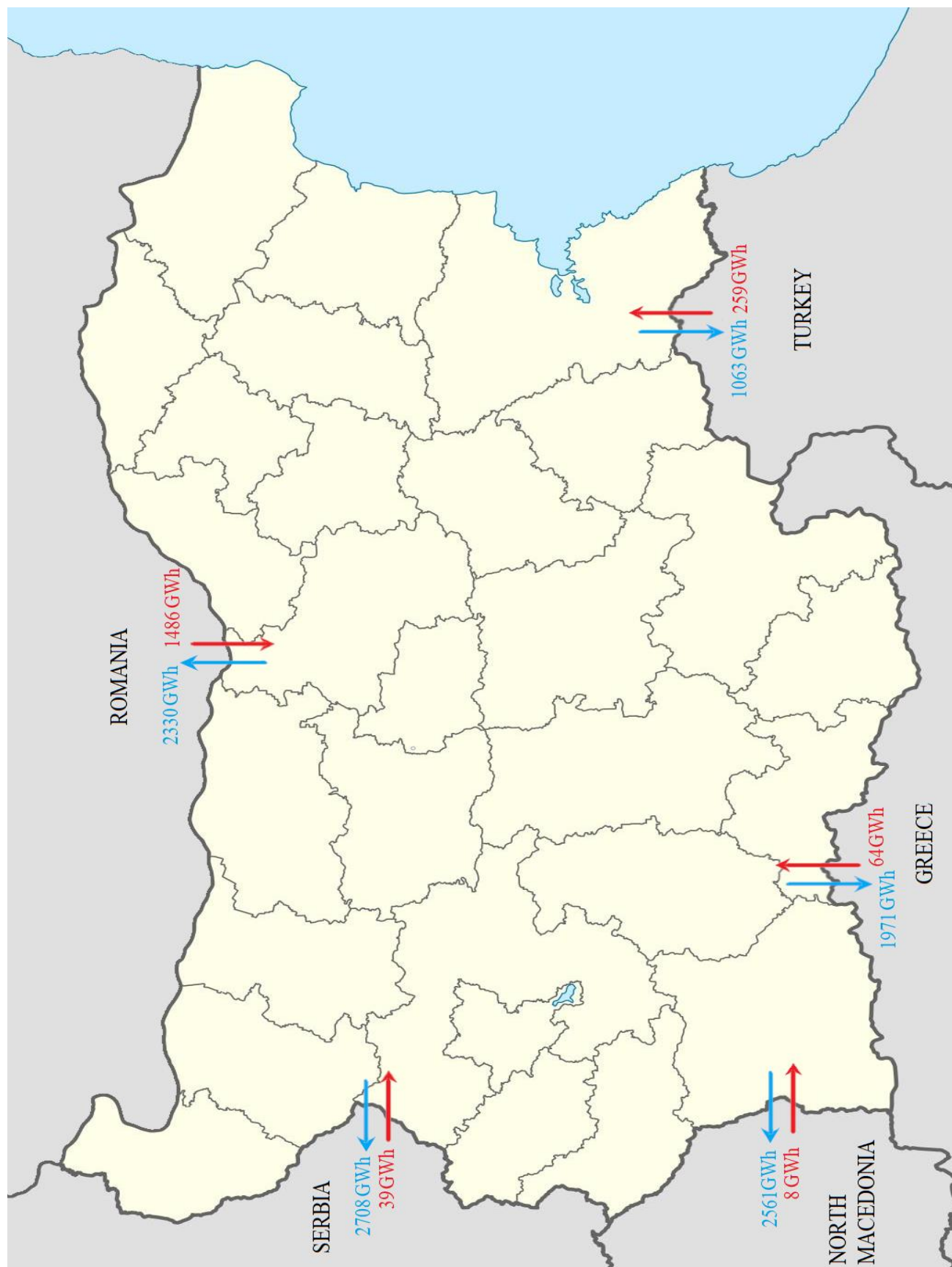
Month	ACTIVATED UPWARD BALANCING ENERGY, MWh	ACTIVATED DOWNWARD BALANCING ENERGY, MWh
January	60 628	53 706
February	27 078	57 797
March	26 529	65 000
April	35 539	55 236
May	22 271	62 260
June	33 028	29 998
July	37 060	33 508
August	37 004	46 269
September	32 598	44 806
October	59 626	33 567
November	71 010	24 554
December	102 630	19 307

BALANCING MARKET /PRICES/**2021**

Month	IMBALANCE PRICE FOR SHORTAGE, BGN/MWh	IMBALANCE PRICE FOR SURPLUS, BGN/MWh
January	192.91	13.88
February	182.67	11.81
March	172.49	12.94
April	189.53	13.40
May	196.25	9.89
June	215.73	15.21
July	224.29	16.19
August	302.65	10.12
September	321.80	9.56
October	398.94	13.69
November	418.79	14.03
December	461.72	16.25

220 kV and 400 kV TRANSMISSION NETWORK





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