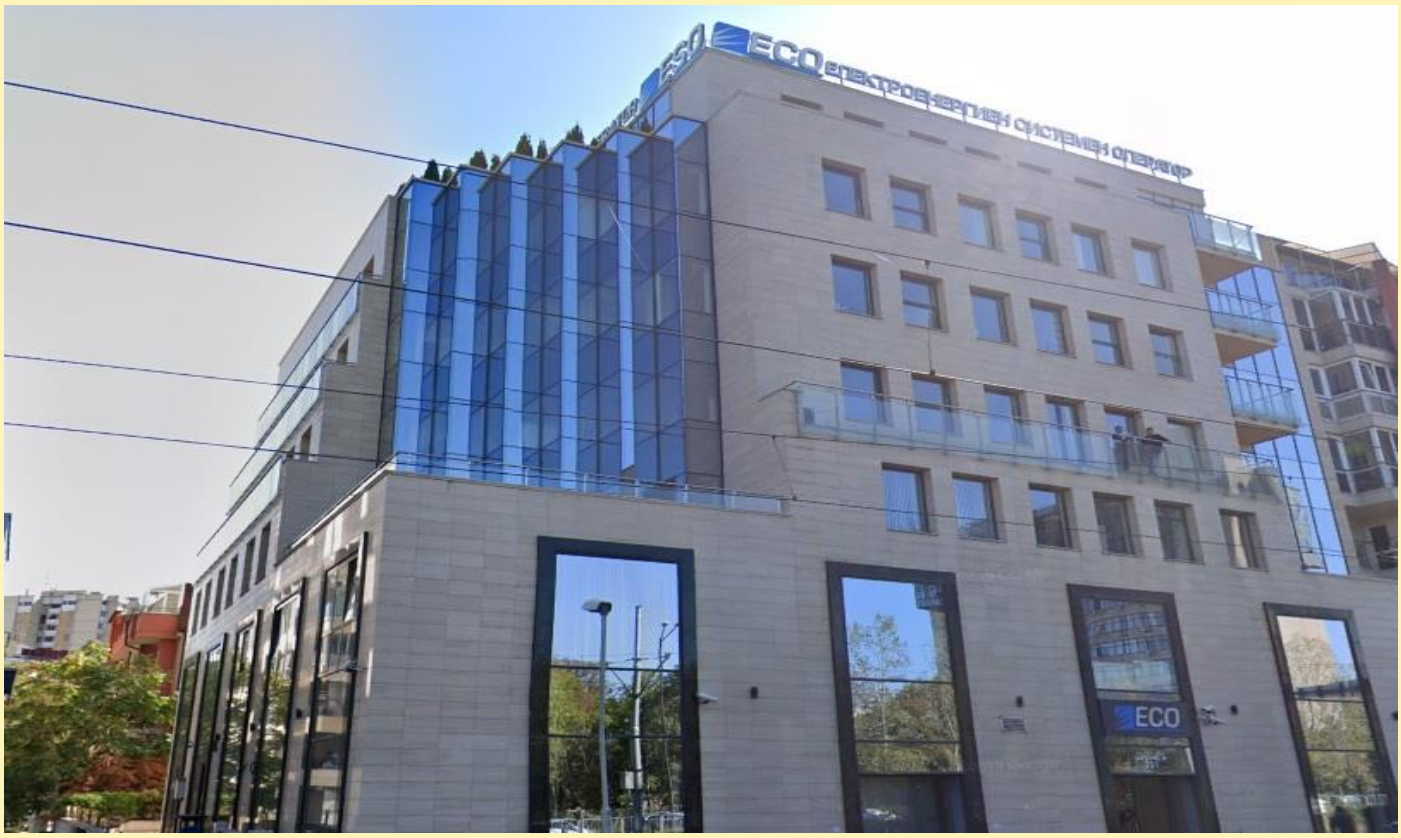
# STATISTICAL POCKETBOOK 2020

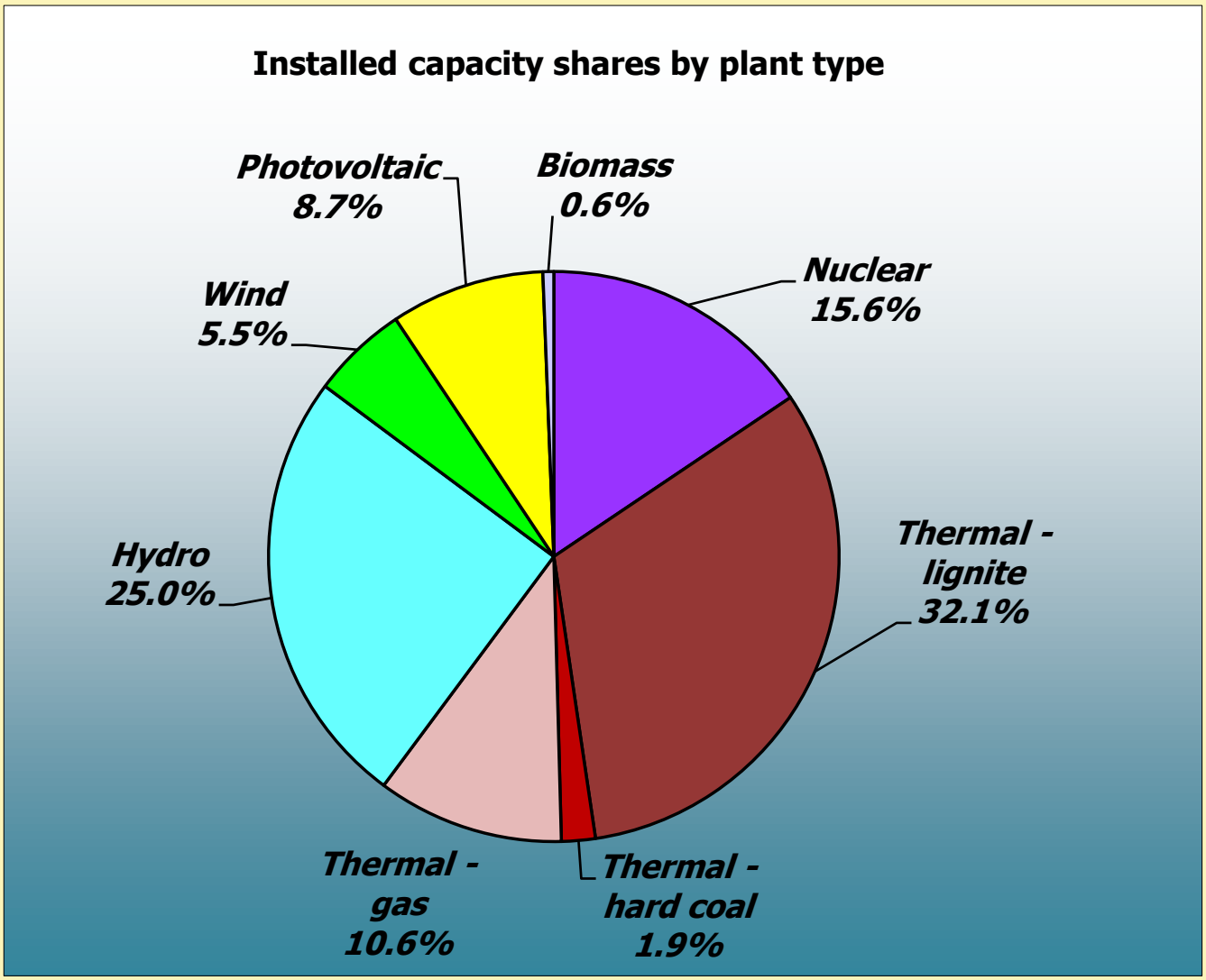
ESO EAD




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 2020

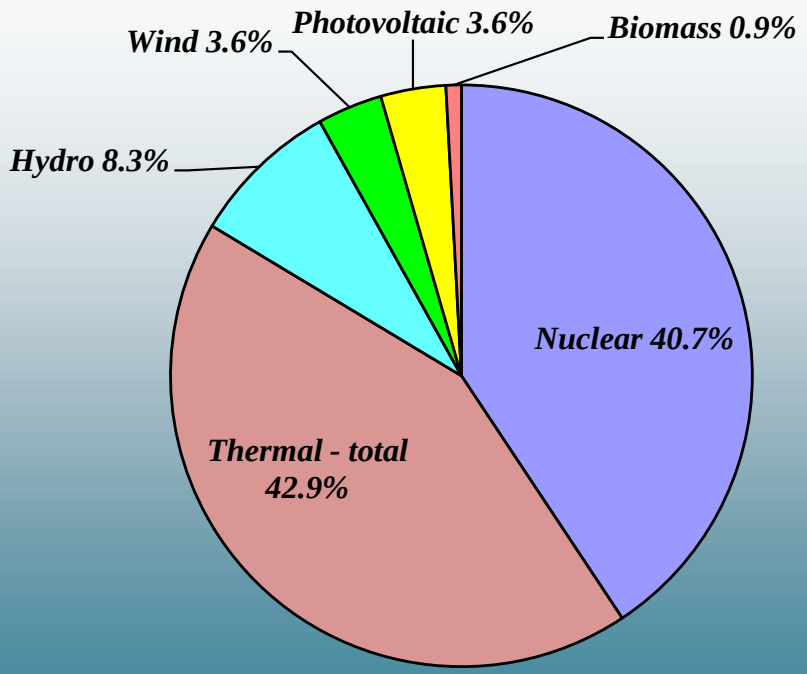
| Generation type | MW | Variation 2020/2019, % | Share, % |
|---|---|---|---|
| Nuclear | 2 000 | 0.0 | 15.6 |
| Thermal - lignite | 4 119 | 0.0 | 32.1 |
| Thermal - hard coal | 246 | -30.9 | 1.9 |
| Thermal - gas | 1 360 | 10.1 | 10.6 |
| Hydro | 3 213 | 0.1 | 25.0 |
| Wind | 701 | 0.0 | 5.5 |
| Photovoltaic | 1 121 | 5.9 | 8.7 |
| Biomass | 79 | 2.4 | 0.6 |
| **Total** | **12 839** | **0.6** | **100.0** |



## GROSS GENERATION 2020

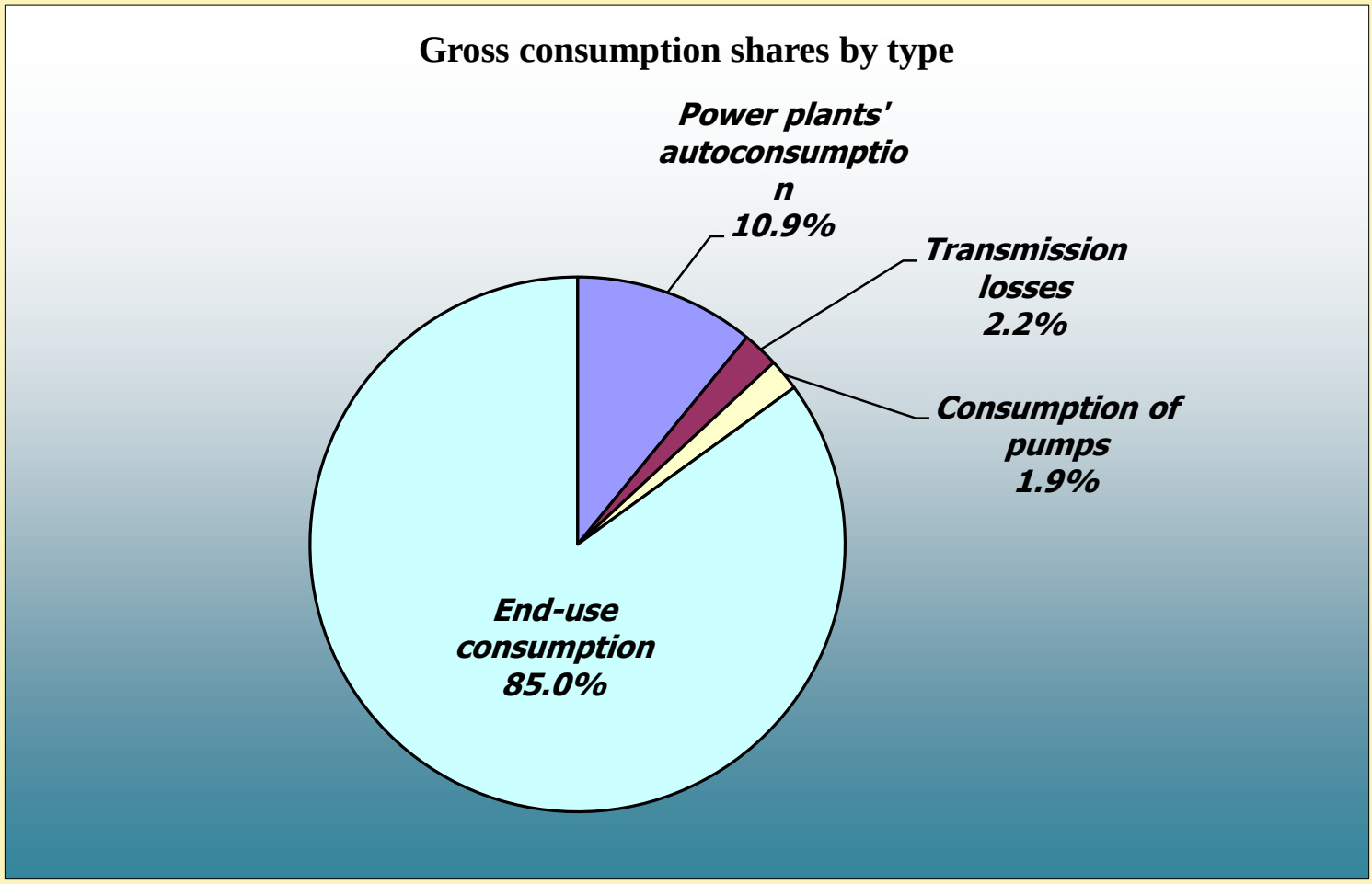
| Generation type | MWh | Variation 2020/2019, % |
|---|---|---|
| Nuclear | 16 629 828 | 0.4 |
| Thermal - total | 17 552 121 | -17.4 |
| Hydro | 3 393 161 | 0.4 |
| Wind | 1 478 095 | -0.8 |
| Photovoltaic | 1 478 255 | 18.0 |
| Biomass | 349 532 | -0.5 |
| **Total** | **40 880 993** | **-7.7** |

**Annual gross generation shares by plant type**

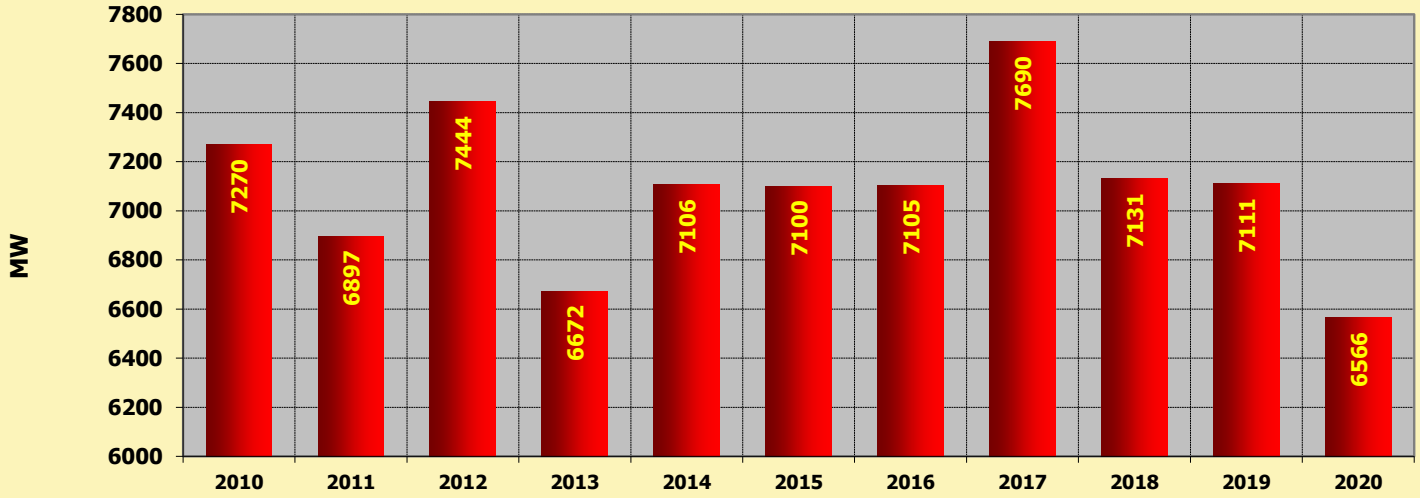


# GROSS CONSUMPTION 2020

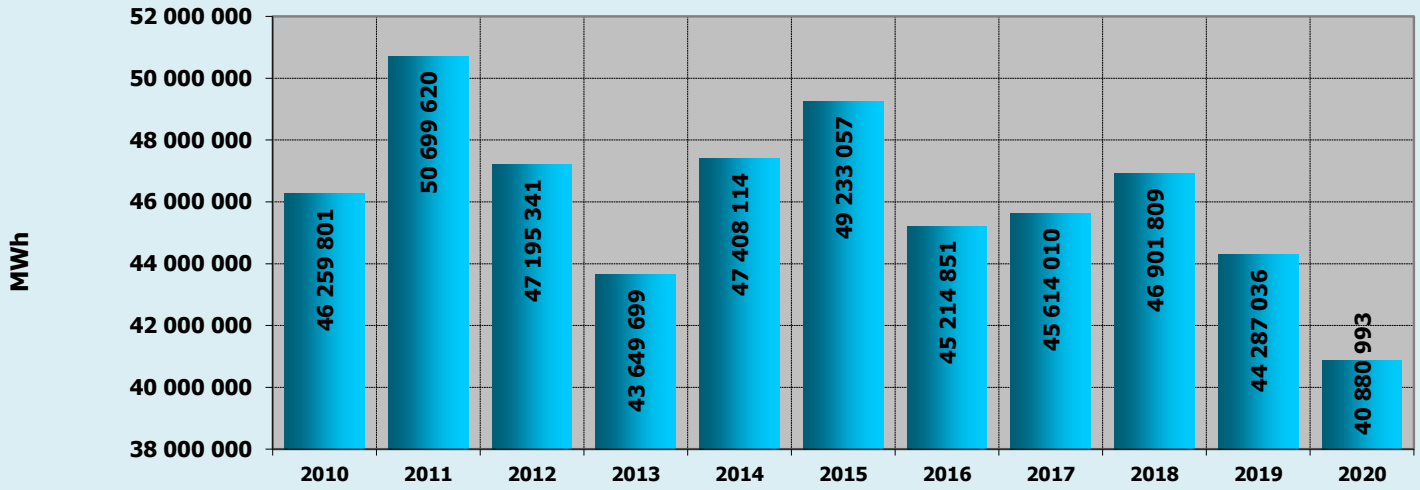
| Consumption type | MWh | Variation 2020/2019, % | Share, % |
|---|---|---|---|
| Power plants' autoconsumption | 4 082 214 | -8.6 | 10.9 |
| Transmission losses | 820 618 | -3.4 | 2.2 |
| Consumption of pumps | 719 855 | 10.8 | 1.9 |
| End-use consumption | 31 820 252 | -2.0 | 85.0 |
| **Total** | **37 442 940** | **-2.6** | **100.0** |



## Absolute annual gross peak loads

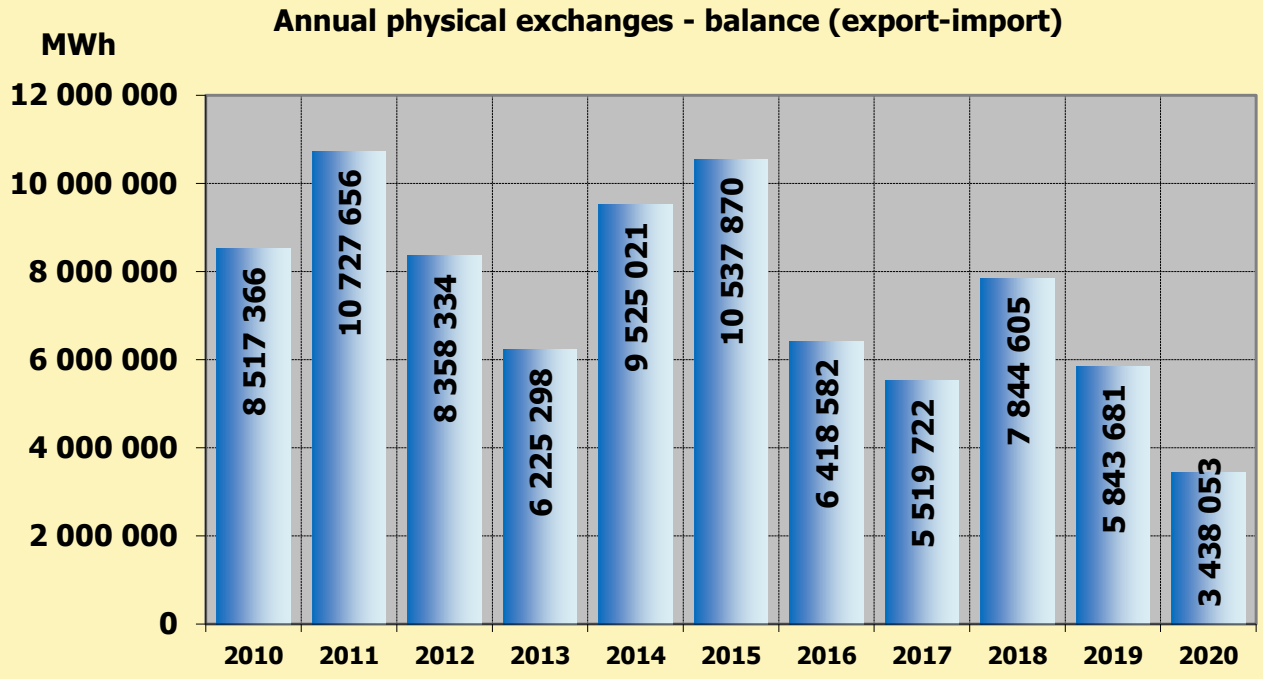


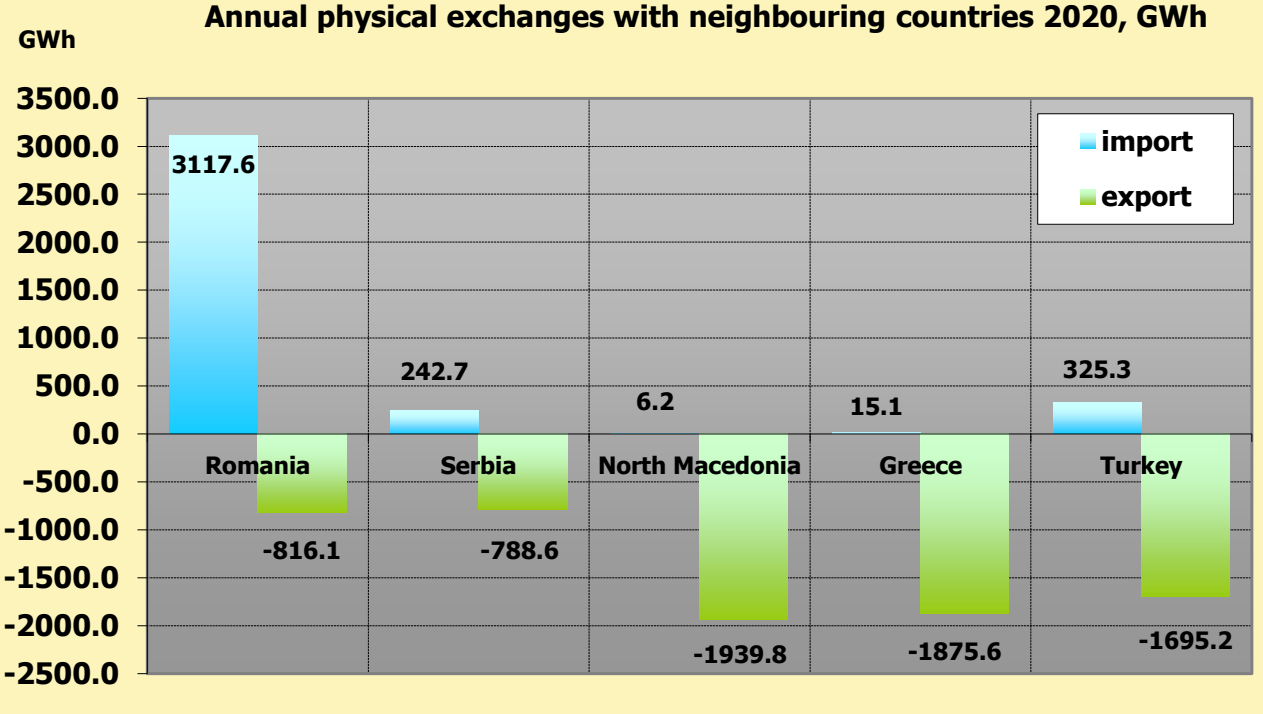

## Annual gross generation

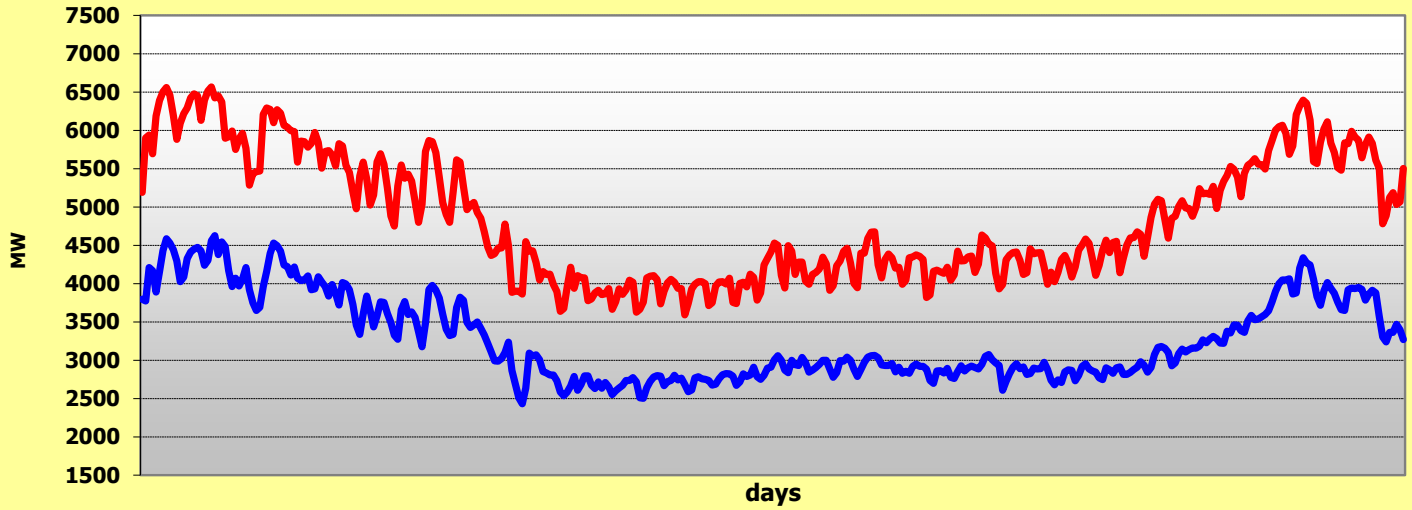


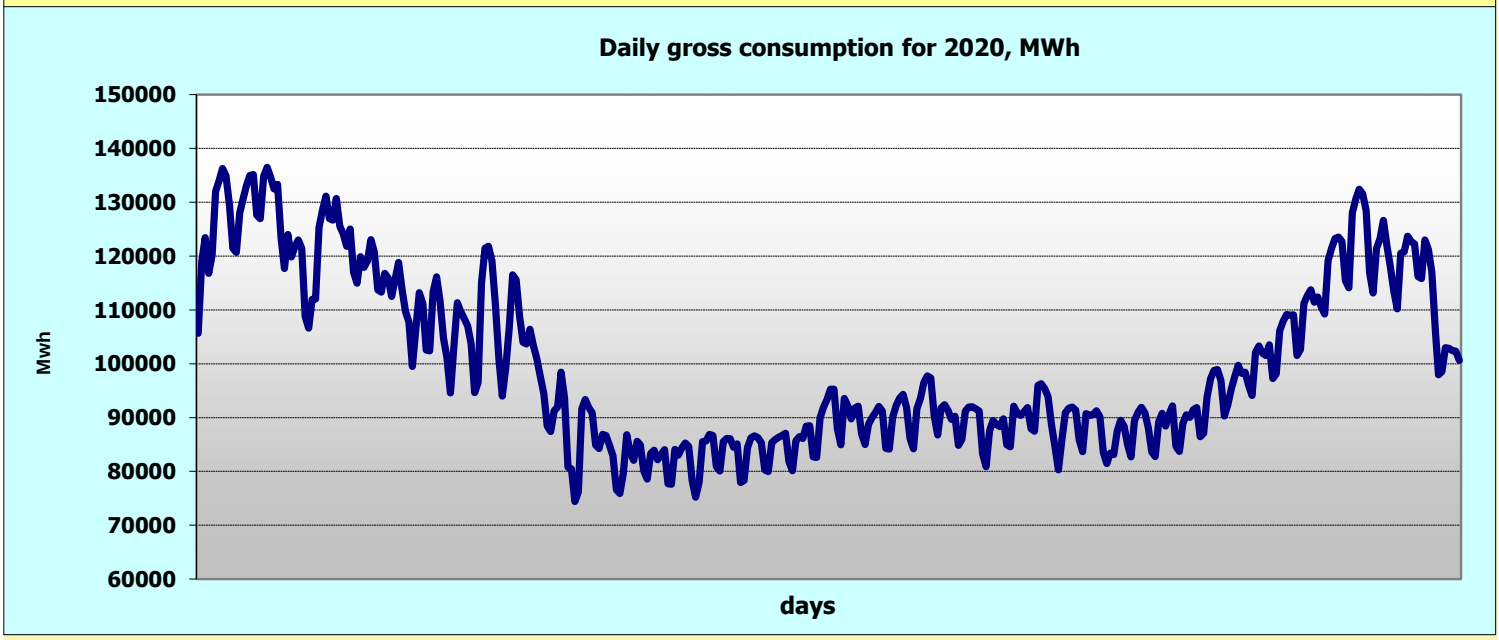
# PHYSICAL EXCHANGES 2020

| Exchange type | MWh | Variation 2020/2019, % |
|---|---|---|
| Balance (export-import) | 3 438 053 | -41.2 |

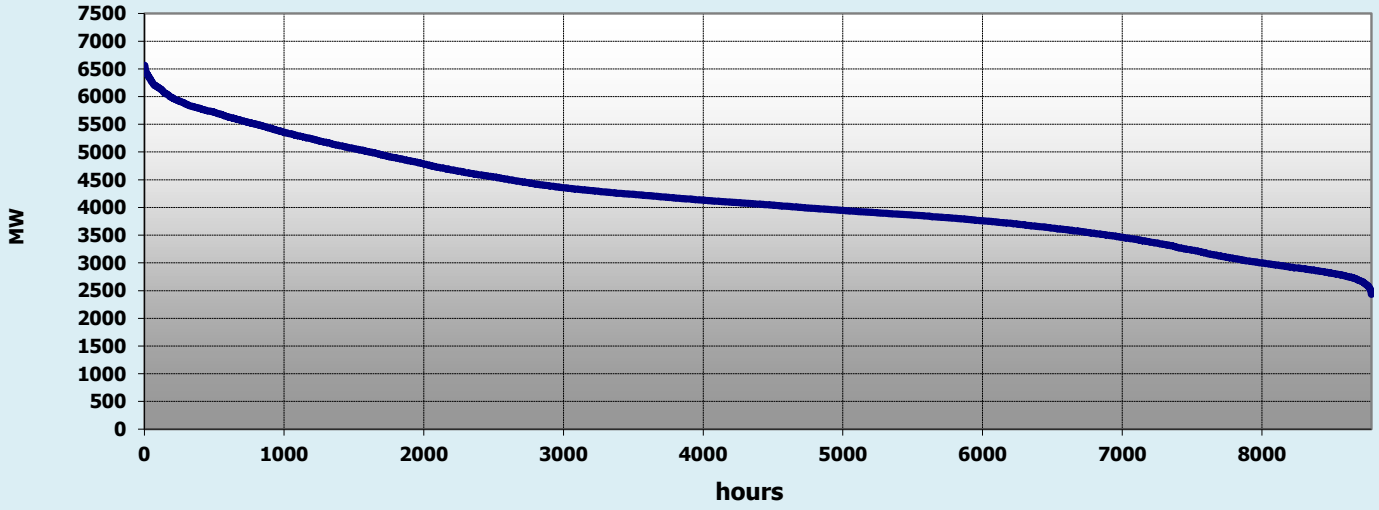


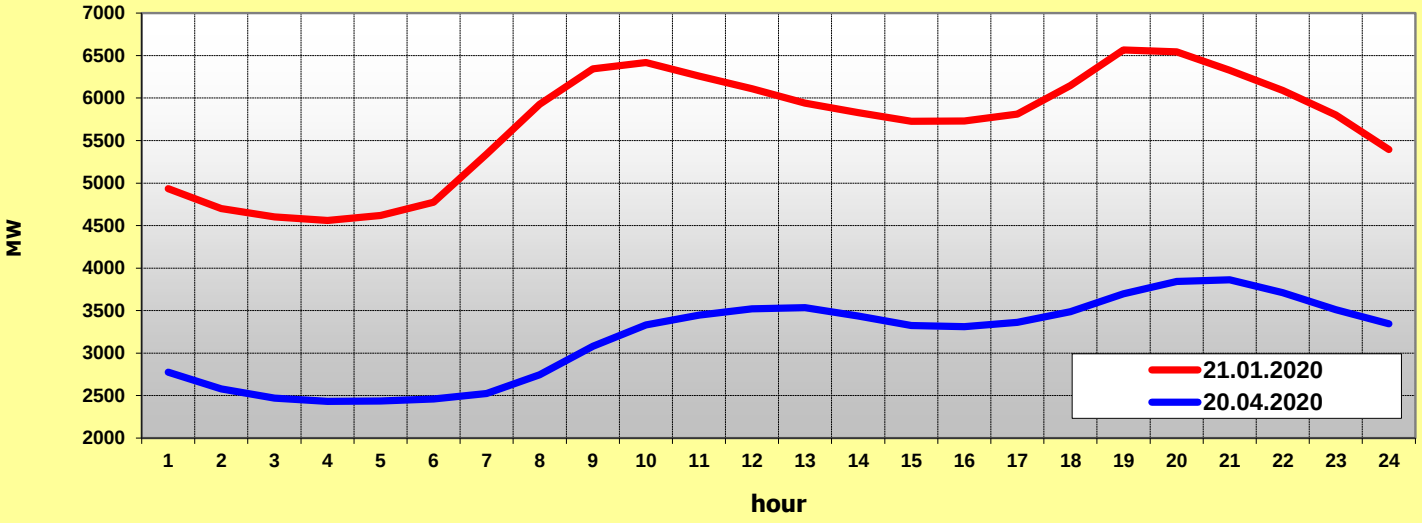

Daily minimum and maximum gross loads for 2020, MW
7500
7000
6500
6000
5500
5000
4500
4000
3500
3000
2500
2000
1500
MW
days


Daily gross consumption for 2020, MWh
150000
140000
130000
120000
110000
100000
90000
80000
70000
60000
Mwh
days

## Annual hourly gross loads duration curve for 2020

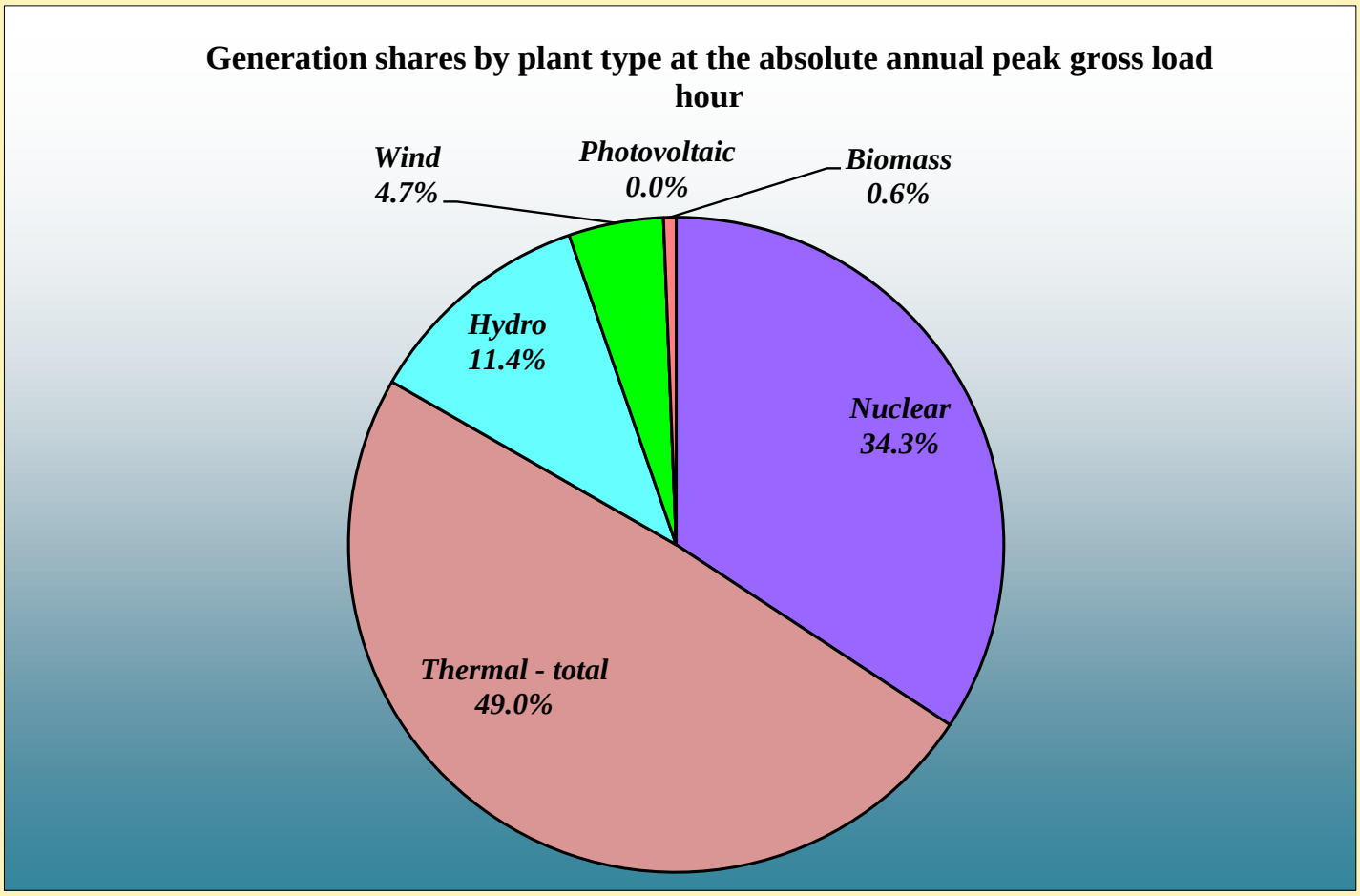



## Hourly load curves for the days with the absolute annual minimum and maximum gross loads 2020, MW

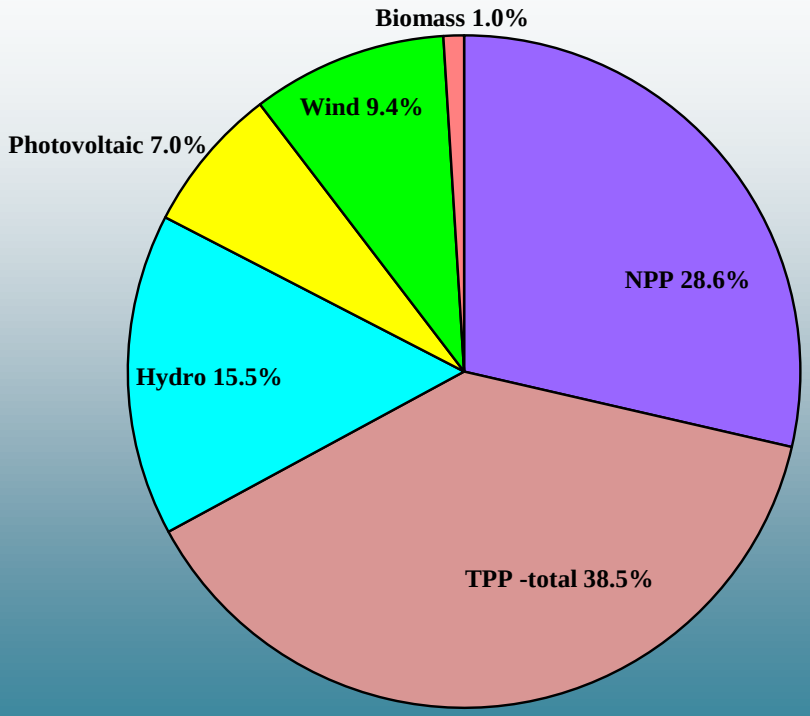


## GROSS SYSTEM POWER BALANCE FOR THE ABSOLUTE ANNUAL PEAK LOAD HOUR - 21 January 2020, 19:00 h.

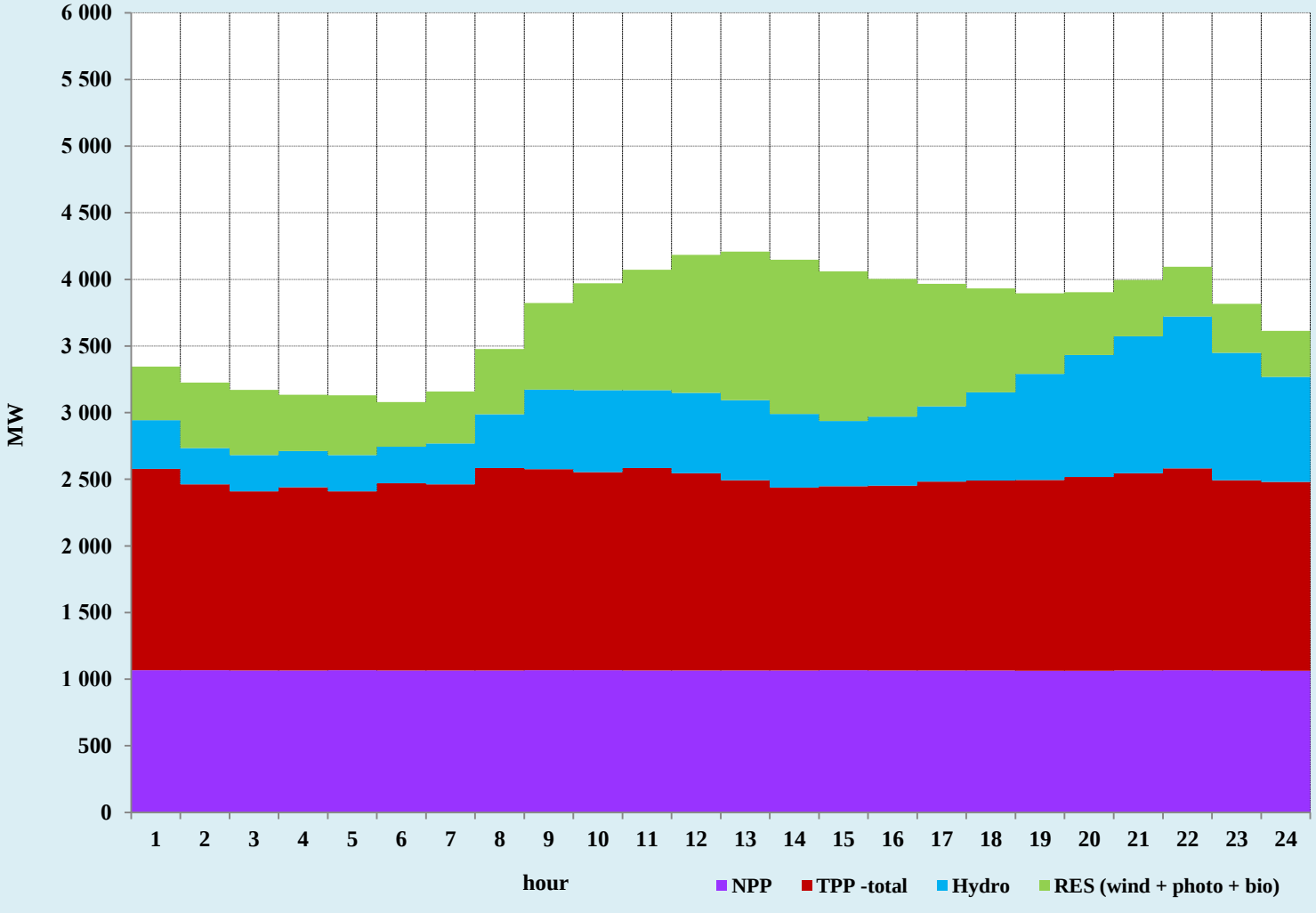
| Generation type | MW |
|---|---|
| Nuclear | 2161 |
| Thermal - total | 3092 |
| Hydro | 720 |
| Wind | 295 |
| Photovoltaic | 0 |
| Biomass | 39 |
| **Total** | **6307** |
| **Import** | **259** |
| BG peak load | **6566** |



**Shares by plant type in the total daily gross generation for the day with the highest share (17.41%) of RES (wind, photovoltaic, biomass) - 12 May 2020**



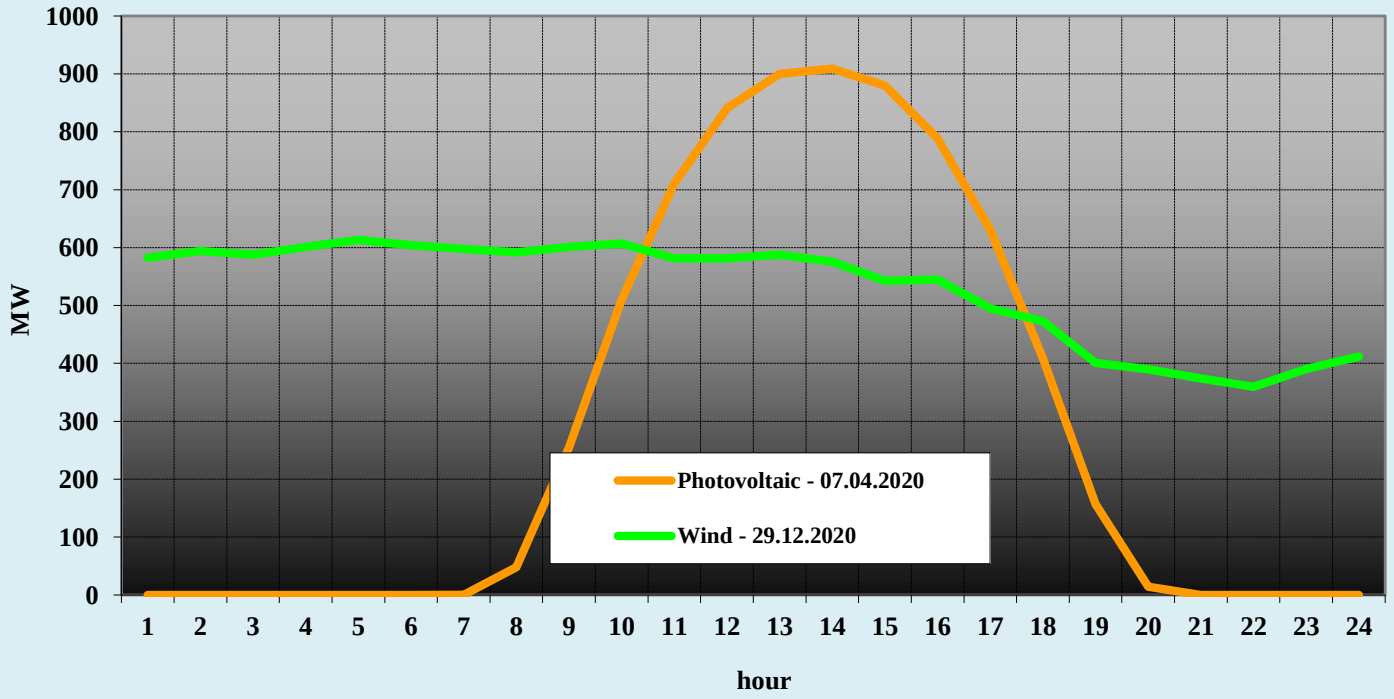

**Hourly gross generations by plant type for the day with the highest share (17.41%) of RES (wind, photovoltaic, biomass) in the gross total daily generation 12 May 2020**



**Highest shares in the gross total daily generation by plant type (groups) and dates of occurrence in 2020**

| Plant type / group | % | Occurrence date |
|---|---|---|
| **Hydro+Wind+Photovoltaic+Biomass** | **33.34** | 18.04.2020 /Sat/ |
| **Wind+Photovoltaic+Biomass** | **17.41** | 12.05.2020 /Tue/ |
| **Wind+Photovoltaic** | **16.43** | 12.05.2020 /Tue/ |
| **Hydro** | **23.25** | 18.04.2020 /Sat/ |
| **Photovoltaic** | **8.13** | 09.05.2020 /Sat/ |
| **Wind** | **11.44** | 21.05.2020 /Thu/ |
| **Biomass** | **1.19** | 19.04.2020 /Sun/ |
| **Nuclear** | **51.40** | 16.08.2020 /Sun/ |
| **Thermal - total** | **59.33** | 06.10.2020 /Tue/ |

**Daily generation curves of Wind and Photovoltaic for the respective days with the highest (MW) hourly generation for 2020**



## IMPORTANT EXTREMES /GROSS/ 2020

| Daily maximum values | Energy | | Capacity | |
|---|---|---|---|---|
| | MWh | date | MW | date |
| National generation | 144 020 | Sat 08.02.2020 | 7 255 | Wed 02.12.2020 |
| National consumption | 136 493 | Tue 21.01.2020 | 6 566 | Tue 21.01.2020 |
| Nuclear generation | 51 927 | Tue 07.01.2020 | 2 166 | Sat 04.01.2020 |
| Thermal generation | 72 550 | Sun 09.02.2020 | 3 306 | Wed 02.12.2020 |
| Hydro generation | 20 973 | Sat 18.04.2020 | 1 710 | Thu 03.12.2020 |
| PV generation | 7 051 | Tue 07.04.2020 | 909 | Tue 07.04.2020 |
| Wind generation | 13 827 | Mon 06.04.2020 | 613 | Tue 29.12.2020 |
| Biomass generation | 1 026 | Wed 12.02.2020 | 45 | Sat 08.02.2020 |
| Net export | 26 013 | Sun 09.08.2020 | 1 390 | Sun 09.08.2020 |

| Day with | Value | Date |
|---|---|---|
| highest consumption, MWh | 136 493 | Tue 21.01.2020 |
| lowest consumption, MWh | 74 402 | Sun 19.04.2020 |
| highest peak load, MW | 6 566 | Tue 21.01.2020 |
| lowest peak load, MW | 3 592 | Sat 06.06.2020 |
| lowest minimum load, MW | 2 432 | Mon 20.04.2020 |
| highest minimum load, MW | 4 626 | Wed 22.01.2020 |
| highest load variation range, MW | 2 328 | Mon 30.11.2020 |
| lowest load variation range, MW | 909 | Sat 23.05.2020 |
| highest density coefficient of the daily load curve | 0.911 | Sat 27.06.2020 |
| lowest density coefficient of the daily load curve | 0.762 | Thu 31.12.2020 |
| highest positive hourly load ramp, MW | 698 | Mon 14.12.2020 |
| highest negative hourly load ramp, MW | -605 | Thu 31.12.2020 |

| Value | Number of days | Variation | Dates of occurrence |
|---|---|---|---|
| Longest series of consecutive days with increase of the maximum load | **5** | 1008 MW | 01.02 - 05.02.2020 |
| Longest series of consecutive days with decrease of the maximum load | **6** | 1070 MW | 24.03 - 29.03.2020 |
| Longest series of consecutive days with increase of the daily demand | **5** | 24 545 MWh | 02.02 - 07.02.2020 |
| Longest series of consecutive days with decrease of the daily demand | **6** | 18 982 MWh | 06.04 - 12.04.2020 |

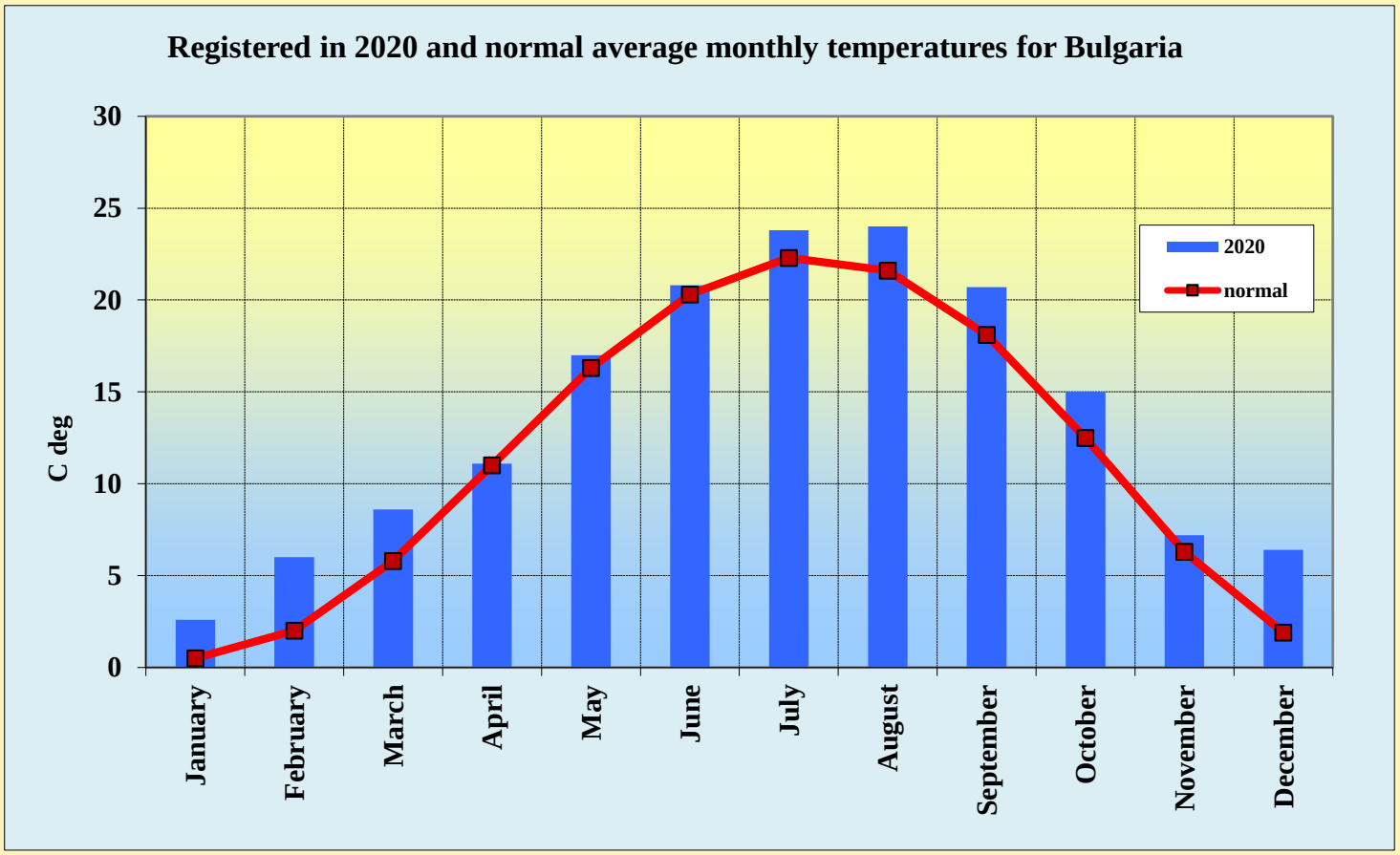
| Value | Variation | Dates of occurrence |
|---|---|---|
| Highest increase of the maximum load between two consecutive days | 739 MW (13.51 %) | 04.02- 05.02.2020 |
| Highest decrease of the maximum load between two consecutive days | 724 MW (13.15 %) | 24.12 - 25.12.2020 |
| Highest increase of the daily demand between two consecutive days | 18 546 MWh (19.22%) | 22.03 - 23.03.2020 |
| Highest decrease of the daily demand between two consecutive days | 12 891 MWh (13.76%) | 16.04 - 17.04.2020 |

## 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 |



## SUBSTATIONS 2020

| Substation type | Quantity | Transformer capacity |
|---|---|---|
| | number | MVA |
| 400 kV | 15 | 10 352 |
| 220 kV | 17 | 7 160 |
| 110 kV | 264 | 16 225 |
| **Total** | **296** | **33 737** |

## TRANSMISSION LINES

| Trasmission line type | Length |
|---|---|
| | km |
| 400 kV | 2 419 |
| 220 kV | 2 837 |
| 110 kV | 9 471 |
| **Total** | **14 727** |

## 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 |

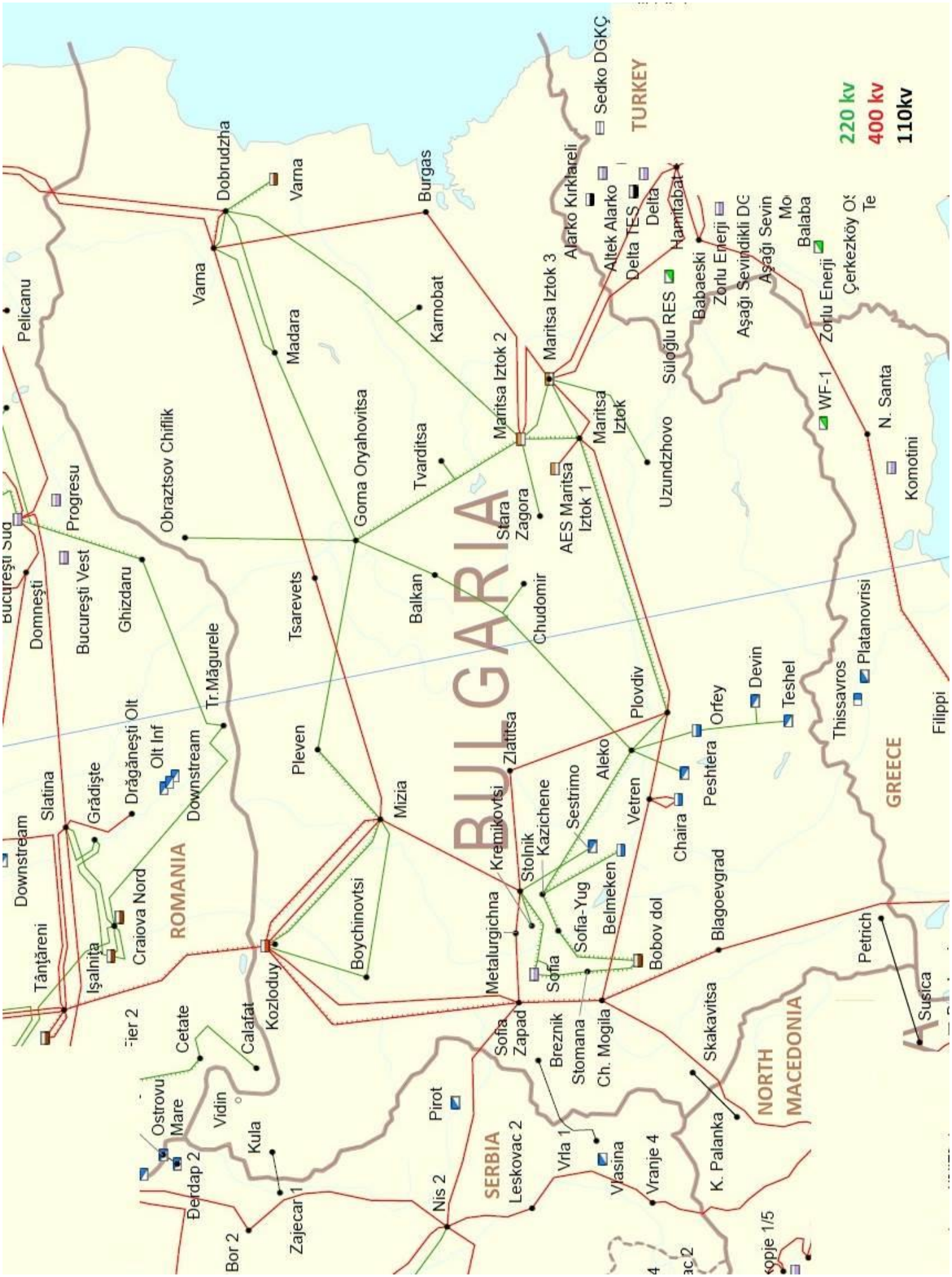
## BALANCING MARKET /NET ENERGY/ 2020

| Month | ACTIVATED UPWARD BALANCING ENERGY, MWh | ACTIVATED DOWNWARD BALANCING ENERGY, MWh |
|---|---|---|
| January | 35 523 | 58 882 |
| February | 27 844 | 58 161 |
| March | 31 918 | 88 298 |
| April | 21 642 | 85 235 |
| May | 15 081 | 77 170 |
| June | 21 558 | 29 499 |
| July | 25 533 | 38 702 |
| August | 19 996 | 37 336 |
| September | 22 491 | 31 170 |
| October | 42 580 | 38 078 |
| November | 40 172 | 40 541 |
| December | 42 269 | 55 992 |

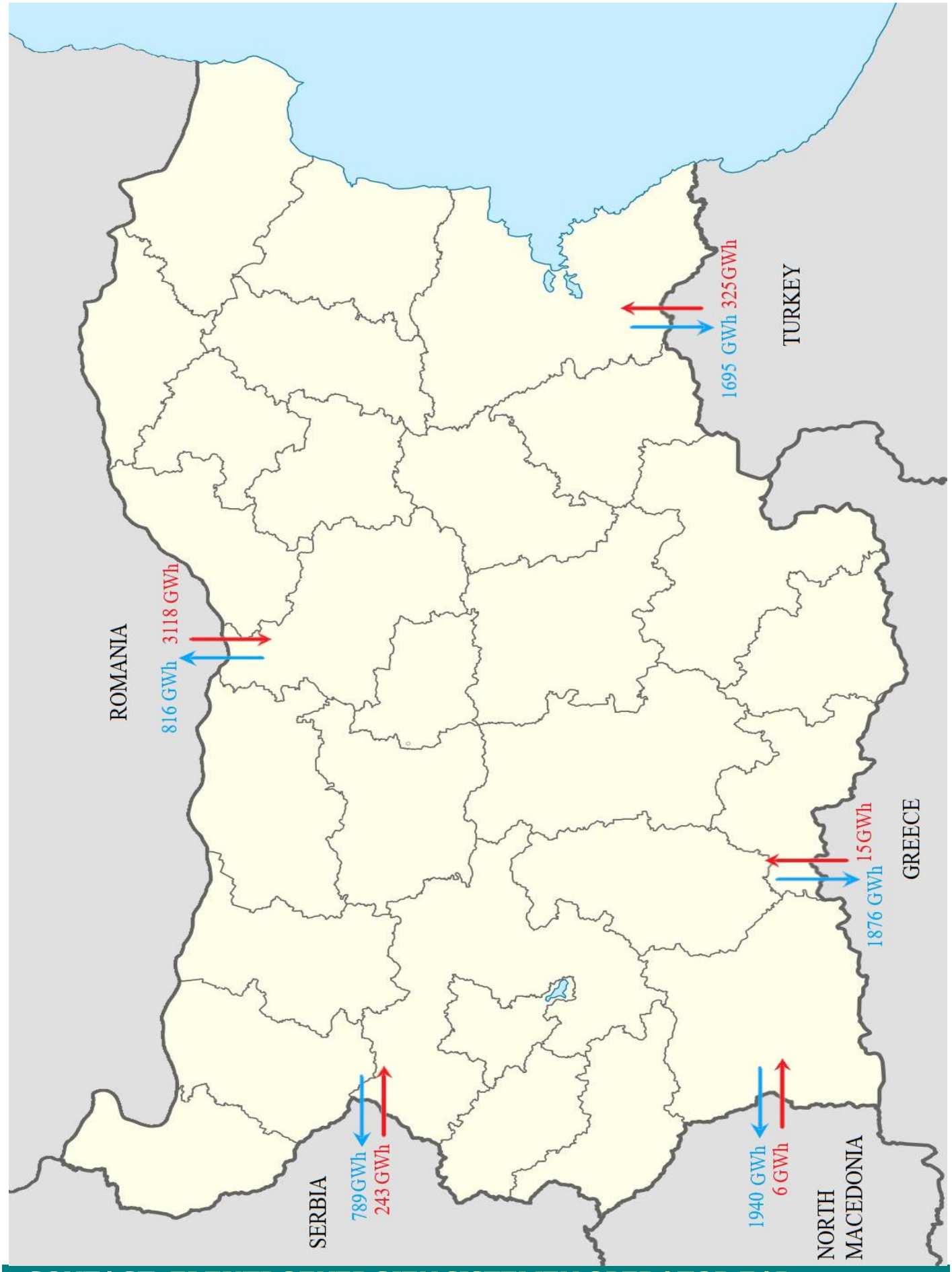
## BALANCING MARKET /PRICES/ 2020

| Month | IMBALANCE PRICE FOR SHORTAGE, BGN/MWh | IMBALANCE PRICE FOR SURPLUS, BGN/MWh |
|---|---|---|
| January | 194.56 | 11.78 |
| February | 166.58 | 12.52 |
| March | 151.38 | 12.09 |
| April | 152.82 | 9.75 |
| May | 145.42 | 11.41 |
| June | 151.40 | 16.67 |
| July | 173.66 | 12.87 |
| August | 167.25 | 11.52 |
| September | 190.60 | 12.31 |
| October | 185.82 | 12.20 |
| November | 189.92 | 13.33 |
| December | 195.01 | 13.04 |

# 220 kV and 400 kV TRANSMISSION NETWORK



# PHYSICAL EXCHANGES 2020

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