

# IPS of Ukraine

during winter period 2020/2021  
and on summer 2021



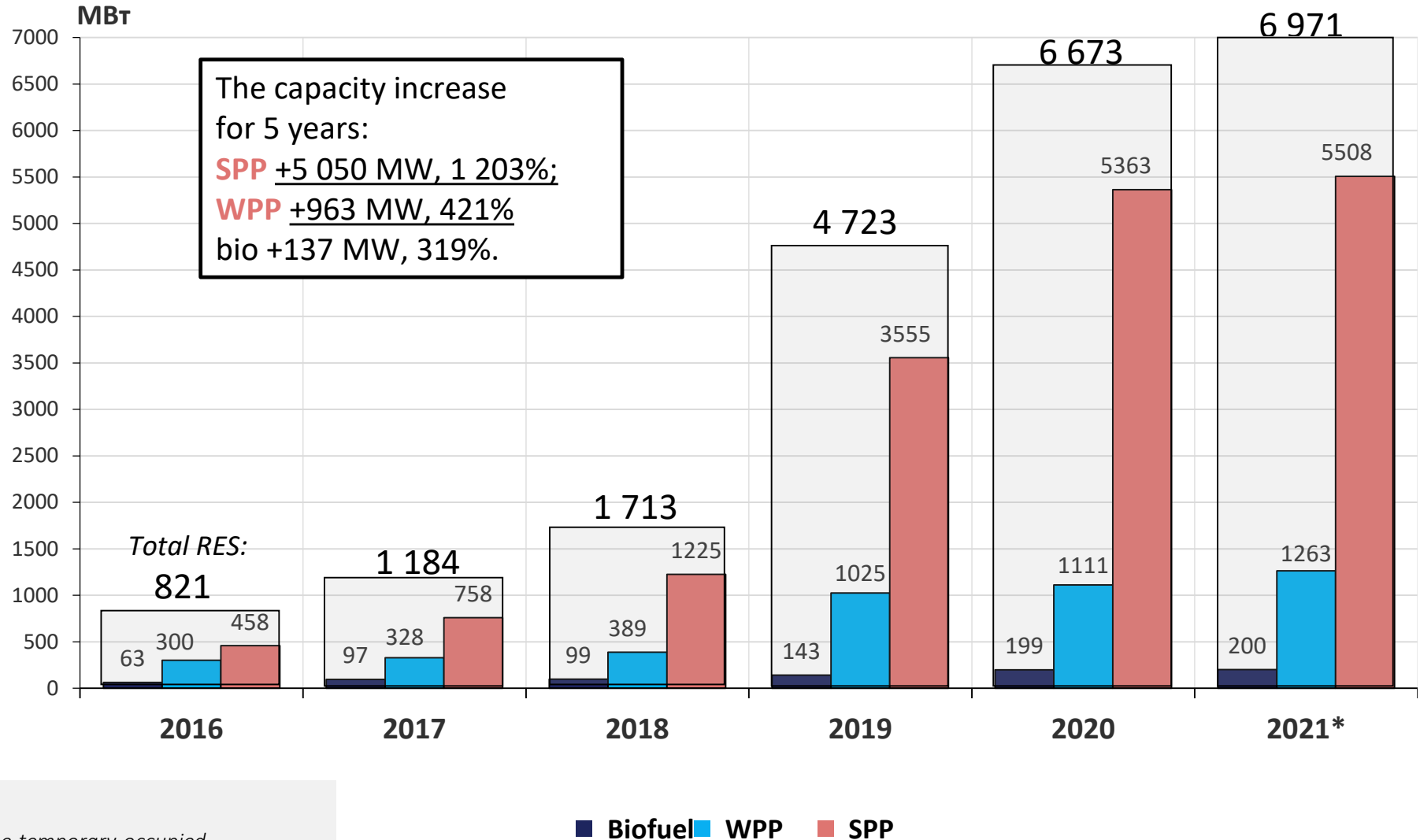
The Integrated Power System of Ukraine during last winter period was balanced, but balancing was complicated due to:

- decline in electricity consumption due to the introduction of quarantine restrictive measures in the country to prevent the spread of coronavirus COVID-19;
- increasing the share of renewable sources in the power balance in the absence of the required amounts of highly maneuverable capacities and energy storage systems in the power system;
- suboptimal repair site of the NPP power units with a concentration of repairs in the autumn-winter period and excess generation in the spring-summer period;
- Lack of coal in the storages of the thermal power plants at the end of the year to ensure sustainable operation.

## The share of renewable energy sources:

In 2020, the share of renewable energy sources continued to increase. In 2020, the installed capacity of the SPP increased by 1807 MW, WPP - 86 MW. The maximum capacity in 2020 generated by the solar power plants was recorded on 30.08.2020 at 3424 MW (in 2019 - 1782 MW), the wind power plants on 16.04.2020 - 946 MW (in 2019 - 792 MW), as well as the maximum total capacity of renewable sources was on 30.08.2020 - 3871 MW (in 2019 - 2272 MW).

# INSTALLED CAPACITY OF RENEWABLE ENERGY SOURCES OF THE IPS OF UKRAINE in 2016-2021



The capacity increase for 5 years:  
**SPP** +5 050 MW, 1 203%;  
**WPP** +963 MW, 421%;  
 bio +137 MW, 319%.

*The values do not reflect the temporary occupied territories of Ukraine*

To ensure the balance of generation and consumption of electrical energy in the conditions of rapid growth of the RES and their unstable capacity, the lack of maneuvering capacity in the power system in 2020, the following measures were applied:

- usage of the Pumped storage power plant by the dispatcher command in pumping mode in the day zone;
- rescheduling the load of HPP compare to the their commercial schedule;
- usage of CHP's units for the compensation of daytime SPP peaks;
- regulation twice a day by the same TPP (start on the morning peak, after which a short stop in the cold reserve with the subsequent start to the evening maximum).

In cases when all the possibilities for balancing was used, dispatcher commands were given to reduce the generation of the RES to ensure the operational security of the power system. During 2020, there were 20 cases of RES congestions with maximum at 1656MW.

## Load of the NPP :

In 2020, the load schedule of the NPP wasn't optimal from the perspective of the power system - a significant concentration of repairs of power units in the autumn-winter period and a minimum number in the spring-summer period. Under such conditions, in order to prevent violation of the operational security of the power system from the end of February 2020 to the middle of October 2020, load the NPP units was reduced, in some periods up to 3,500 MW. Starting from November, the NPP capacity was lower than the power system was able to consume from the conditions of balancing capabilities.

## Consequences:

In November-December of 2020 this led us to the necessity to maximize the load of TPP power units to cover all electricity demand. This caused the intensive depletion of reserves at coal storages to a critical indicator in the middle of winter. Also there was unavailability of TPP because of coal lack. When temperature dropped down in January those factors led us to request the emergency assistance from Belarus up to 500 MW on 18 January 2021 and up to 850 MW on 2 February 2021.

Taking into account the experience of the previous autumn-winter period, TSO noted that the planning of coal reserves on TPP should be based not only on the forecast for electricity balance of IPS for 2021, but also take into account such risks of the system as possible increase in TPP generation and delays in the repairs ending of nuclear power units, increased electricity consumption due to adverse weather conditions.

## Maximum of 2020:

The 2020 annual maximum consumption of electric capacity of the IPS of Ukraine was on 08.12.2020 (Tuesday) at 17:00 at 23642 MW at a frequency of 50 Hz and a temperature of -4.0 ° C.

The minimum power consumption on this day was equal to 17015 MW. Daily electricity consumption amounted to 510.0 million kWh.

The maximum generation capacity was 23947 MW, including:

TPP GK - 8171 MW;

large CHP- 1235 MW;

other CHPs– 1150 MW;

NPP - 9588 MW;

HPP - 1857 MW;

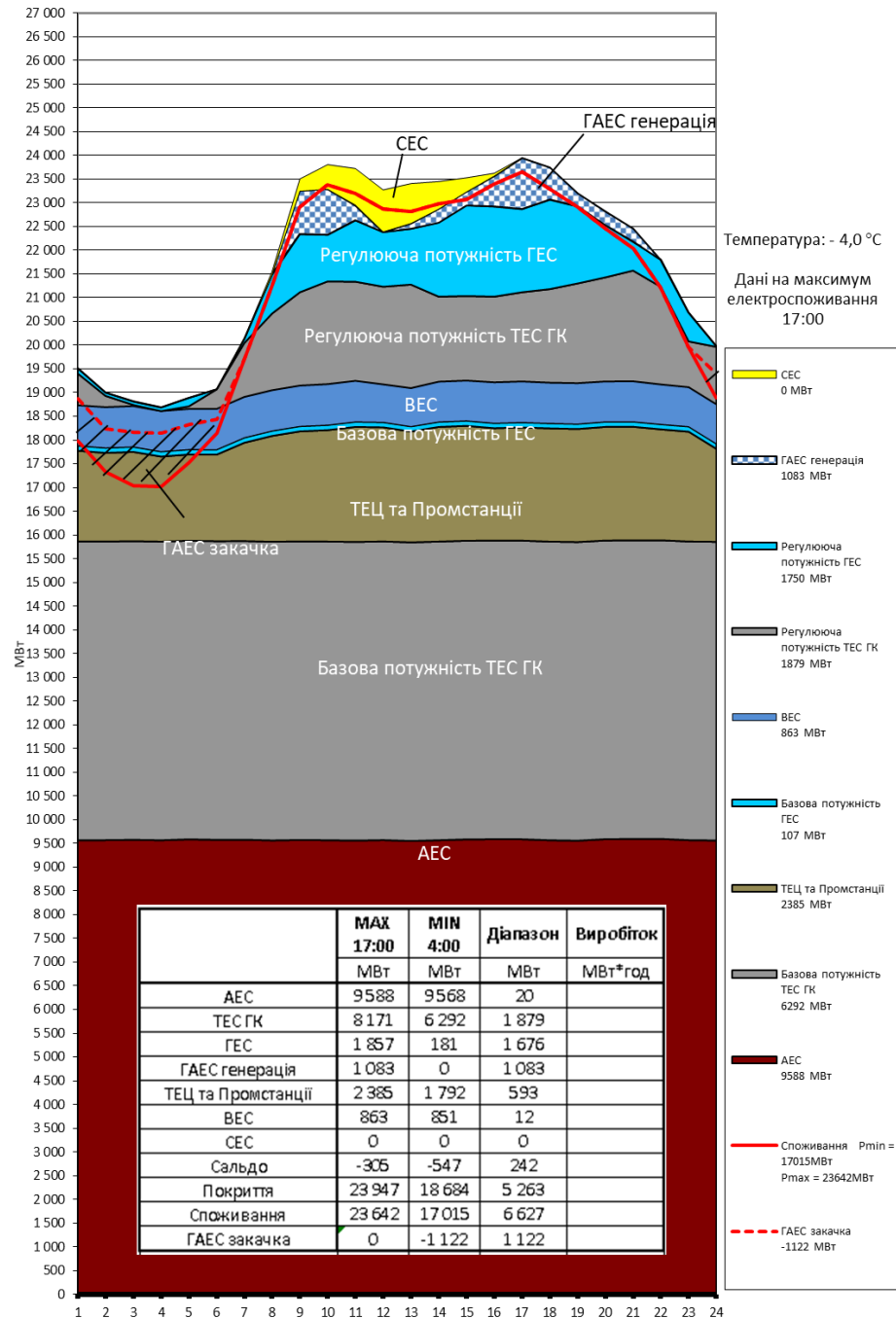
PSPPP - 1083 MW;

WPP - 863 MW.

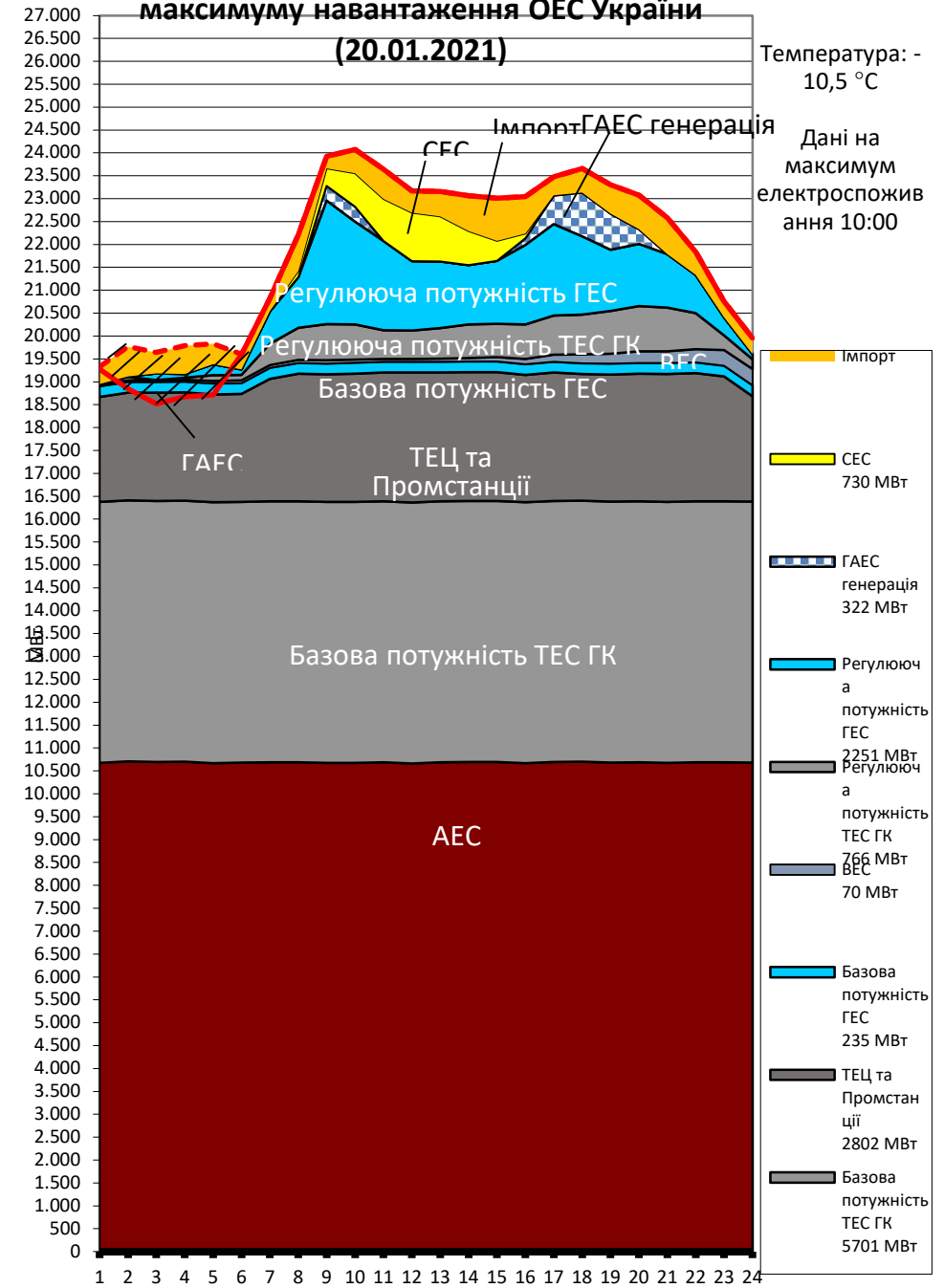
During 2020, to balance the regimes of the power system of Ukraine, the schedules of emergency shutdowns of consumers were not applied.



Графік покриття ОЕС України в день річного максимуму навантаження  
ОЕС України (08.12.2020)



Графік покриття ОЕС України в день річного максимуму навантаження ОЕС України  
(20.01.2021)



## IPS regimes in the spring-summer period

IPS regimes in the spring-summer period are difficult because of high base load in the power system, as well as the large generation of renewable energy sources, especially in the daytime period.

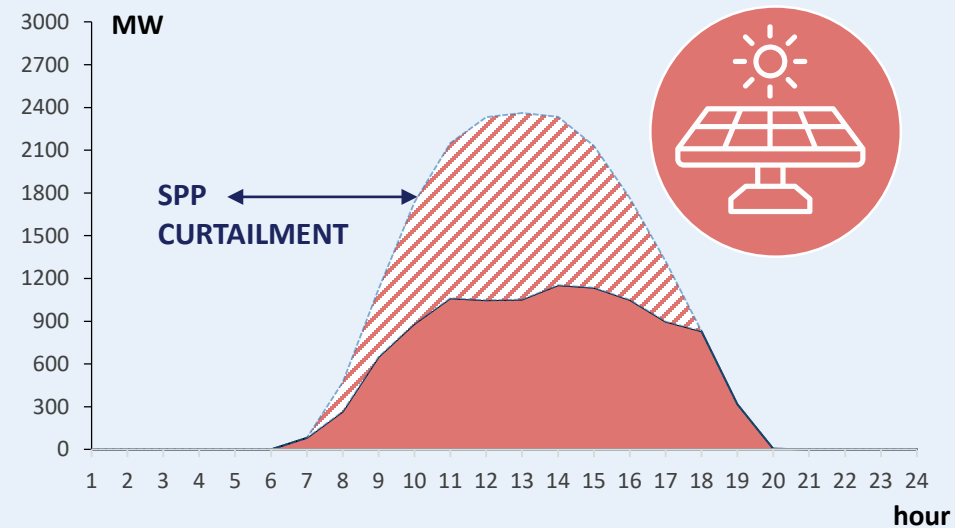
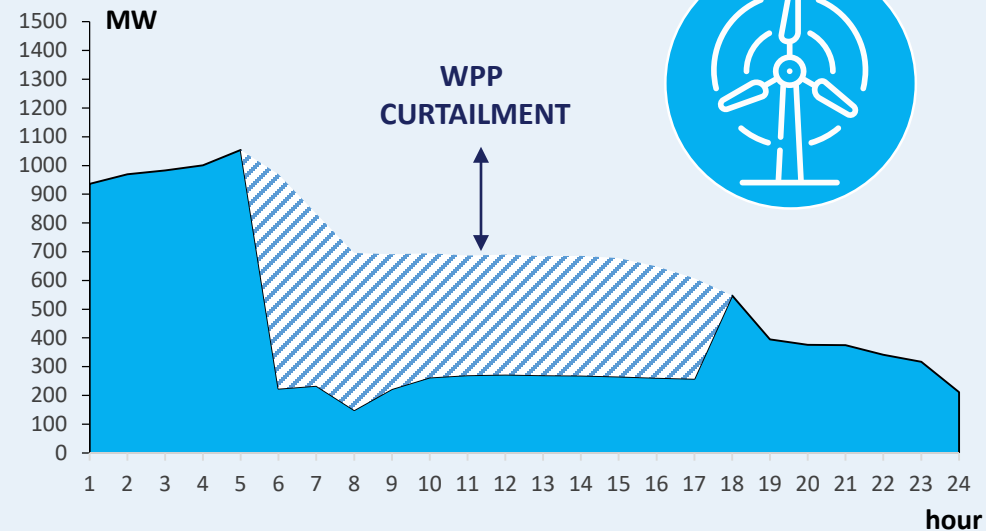
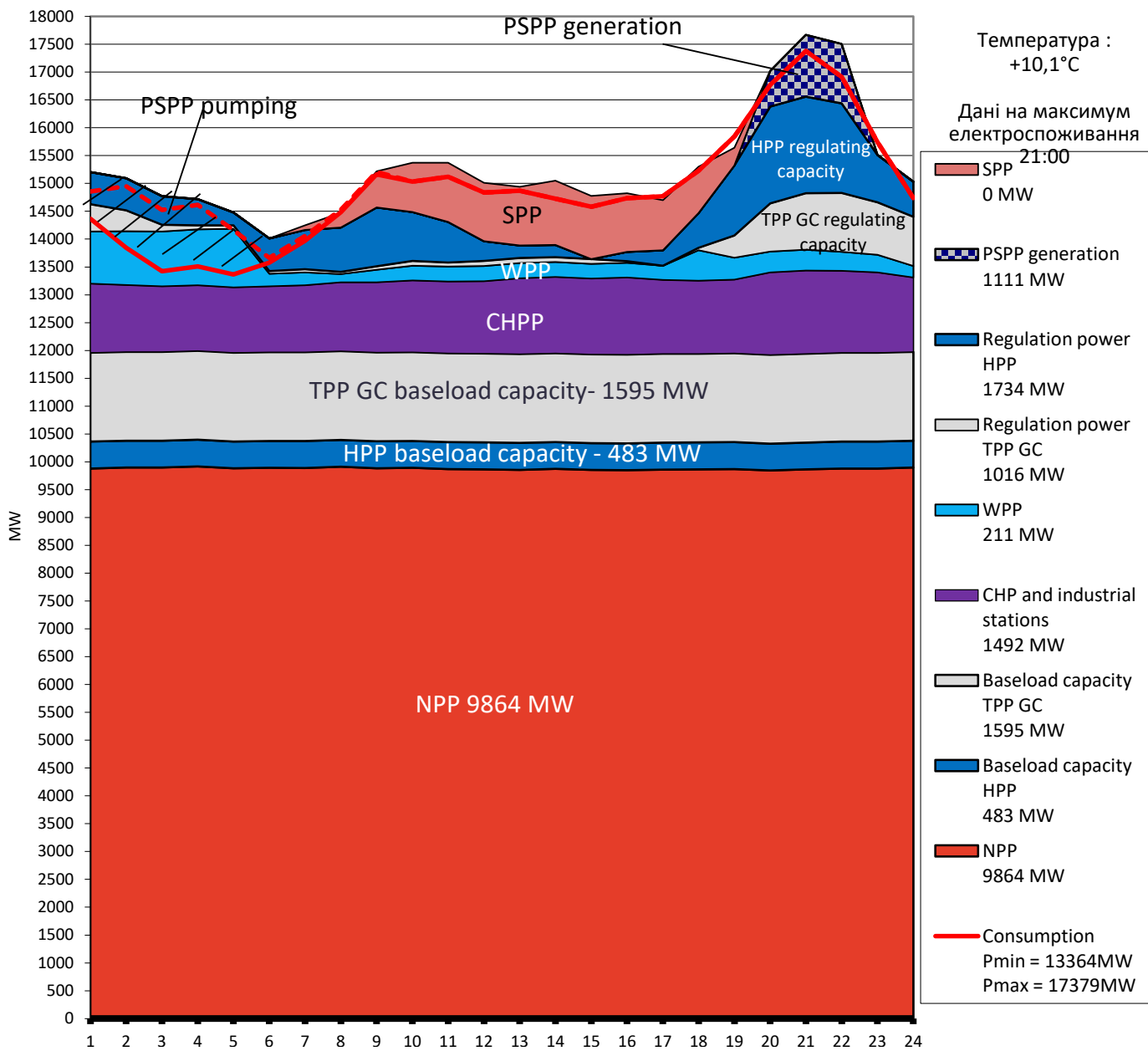
Thus, in 2021, to ensure the operational security of the power system, during 46 (20 in all 2020) days RES was curtailed up to 2500 MW.

The operating of IPS during flooded period was also complicated because the market positions of the PSPP and HPP on the bilateral contracts, the day-ahead market, the intraday market, was not optimal. For example reservoirs of HPP was overfilled. PSPP is mainly operated according to the dispatcher commands, and not by the market operations of its owner.

The end of the flood will reduce the water sources of rivers, the balancing capacity of HPP will be reduced and there will be a need to involve a significant number of TPP to cover the evening peaks of electricity consumption.

# ACTUAL COVERAGE SCHEDULE OF THE IPS OF UKRAINE ON 11.04.2021

Without «Burshtyn island»





**Thanks for attention!**