In order to ensure the power system balance between the energy generated by the power plants and the energy needed by consumers, it is possible to rely on pumped-storage hydroelectric power plants for system balancing. They consume excess electricity during reduced consumption and deliver electricity into the network during high consumption periods.

Pumped-storage hydroelectric power plants are hydroelectric facilities that have the ability to change the function of their units, whereby the same unit can operate as an electric motor and a pump, as well as a generator and a turbine.

When the system operates as a pump, it accumulates water and is driven by a motor powered from the network. Thus accumulated energy is used by the same system, but under another operating regime, to generate electricity during the highest consumption periods.

Since it is difficult to manage the production of electricity generated by thermal power plants, and lately to a greater extent from wind farms, in periods of lower consumption (usually at night) there are surpluses of electricity, which is why in this interval the price is lower.

Pumped-storage hydroelectric power plants pay this lower electricity price and are used to accumulate water in the upper reservoir. After that, during higher demand intervals, they use the same water to generate electricity, which is then sold at a higher price.

There are several pumped-storage hydroelectric power plants in the region, together with the new-build projects.

Pumped-storage hydroelectric power plant Bajina Basta in Serbia was built as part of the Bajina Basta HPP, technologically comprising a lower reservoir (existing reservoir of the Bajina Basta HPP), supply and drainage system, powerhouse with two pumped-storage units of 307 MW, upper reservoir and dam.

The maximum capacity of the power plant in the generator regime is 614 MW, with an average annual generation between 800 and 1,000 GWh. The maximum input capacity in the pumping regime is 620 MW.

Bajina Basta PSHPP is an important reserve in the Serbia’s power system during the period of increased consumption of electricity or dry periods, leading to partial reservoir discharge.

Bajina Basta PSHPP has been in operation since 1982, and in many ways it is unique in the world, while its construction was a major engineering feat. By boring through the Tara Mountain with a long underground tunnel used to route the pipeline, two reservoirs were connected, negotiating the level difference of some 600 meters, which is one of the largest net heads in the world.

In the mid-sixties, a run-of-river hydroelectric power plant Bajina Basta was built in Perucac, one of the capital power facilities. However, throughout its operation, it was noticed that in Perucac the Drina River spilled over the dam in the spring and autumn, and a huge amount of water remained unused.

Therefore, it was decided to build a new pumped-storage hydroelectric power plant and to pump the Drina River water from Perucac up the Tara Mountain and store it in a new designated reservoir. Then, when energy is most needed, this water would be returned to the lower reservoir and used to generate the necessary electricity.
EPS announced that it would revitalize the Bajina Basta PSHPP in 2021.
Bistrica PSHPP, 600 MW and Djerdap 3 PSHPP, 600 MW are mentioned as potential projects of pumped-storage hydroelectric power plants in Serbia.
The pumped-storage hydroelectric power plant Capljina is located in Bosnia and Herzegovina, in the Herzegovina-Neretva canton, on the lower section of the Trebisnjica River. At the time of its construction, it was the first pumped-storage hydroelectric power plant in the former Yugoslavia.
Capljina PSHPP was commissioned in 1979. It is a highly flexible generating unit, as it was able to change the voltage to fifteen kilovolts in the nearest substation until 1991, during compensation operation based on empirical data.
The power plant has 420 MW of installed capacity, while its average annual generation is about 620 GWh.
According to the local media, the electricity generated in 2019 by Capljina PSHPP will be divided (50:50%) between Elektroprivreda Hrvatske zajednice Herceg Bosne (EPHZHB) and Elektroprivreda Republike Srpske (ERS).
In this way, for the first time after fifteen years, part of the electricity from this plant will be supplied to the ERS.
The agreement signed between the three sides – the ERS, its subsidiary Hydroelectric Power Plant on Trebisnjica (HET) and the public company Elektroprivreda Hrvatske zajednice Herceg Bosne (EPHZHB), based in Mostar – the power plant in Capljina will also be engaged by the ERS, which will have a positive impact on the power balance of the Republic of Srpska.
The pumped-storage hydroelectric power plant Velebit (formerly Obrovac) was built in Croatia, on the Zrmanja River, collecting waters of the Ricica and Opsenica rivers and Otuca and Krivaka streams on the Gracac Plateau.
In the pumping regime, it uses a night surplus of energy, pumping water from the lower reservoir at Zrmanja to the upper reservoir at the Gracac Plateau. In this way, the same water is re-used to generate electricity during the high demand periods.
Velebit PSHPP has two units able to operate in four operating regimes: generator, motor and two ways compensation operating regimes.
Construction of the plant began in 1978, it lasted for seven years and been in regular operation since 1984. The power plant annually operates from 4,000 to 4,500 hours, of which 50% in turbine, some 30% in pumping, and the remaining in compensating regime.
The power plant has two generators (each 138 MW), while the motor-pump capacity is 120

MW. The average annual generation is about 430 GWh.
HEP announced that in 2019, Velebit PSHPP will invest KN 70 million (EUR 9.4 million) into modernization and upgrades.
Pumped-storage hydroelectric power plant and the Lepenica reservoir were built in 1987 on the same stream, the tributary of Lake Bajer. The construction of the Lepenica reservoir system has increased and improved electricity generation of the Vinodol HPP hydropower system.
Lepenica PSHPP uses the gross head of about 18 meters created by developing the earthfill dam. Installed turbine and pump capacities are 1.14 MW and 1.27 MW, respectively. Mean annual generation is 2.73 GWh.
When it comes to the new, regional pumped-storage hydroelectric power plant projects, in July 2018, construction of the Vrilo PSHPP started, on the Suica River near Tomislavgrad. The investment value is EUR 89 million euros, while the hydroelectric power plant is designed with two units with the total installed capacity of 66 MW. According to plans, the power plant will be commissioned in 2023.
Hydroelectric power plant in Vinodol is mentioned as a potential project in Croatia. Waters from the Gorski Kotar area could fall from the level of more than 750 meters into this power plant, while the system would provide 1,700 GWh of regulating energy per year. The investment was estimated at EUR is 1.4 billion euros.
For the Vinodol PSHPP, Elektroprojekt from Zagreb prepared a large part of the necessary technical documentation in 1980. Explorations were also performed and Phase I of the lower reservoir completed. All facilities/structures were included into the relevant spatial plans, supported by local population and outside the protected area of Natura 2000.
Vinodol PSHPP could include existing reservoirs of the Gorski Kotar Lokvark, Lepenica and Bajer, and infrastructure along the existing hydroelectric power plant Vinodol.
Although Romania does not have significant pumped-storage power plants, five hydroelectric power plants on the Olt River are equipped with pumped-storage hydro units able to operate in the pumping regime. They were used as pumped-storage plants only during the 2014 operational test, which is not taken into account in terms of operability.
In addition to the above five hydropower plants on the lower Olt River, Hidroelectrica operates five pump hydropower plants within the Lotru, Sebes and Dragan-Iad hydro-technical complexes, with a total capacity of 91.5 MW.
For years, Romania has been unsuccessfully trying to continue the construction of its first major pumped-storage hydroelectric power plant Tarnita-Lapustiste, in which more than five million euros have been invested so far, following the termination of the investor selection procedure in 2017.
From August 2014 to August 2016, Hidro Tarnita conducted the selection procedure for a private investor for the Tarnita-Lapustiste project. After the prequalification phase, there

were three Chinese consortiums in the game.
However, in September 2017, the government decided to cancel the selection procedure and consider other ways to attract investors, including a public-private partnership.
In 2014, the Government adopted a Regulation on Providing State Aid for Pumped-Storage Hydro Power Plants with Electricity Storage, such as the Tarnita-Lapustiste Project. State aid consists of the exemption from paying land tax for construction, exemption from the obligation to purchase green certificates and charges for cogeneration, exemption from the payment of tariffs to the company Trasnselektrika for electricity transmission, as well as all tariffs, fees, contributions and levies for managing water resources.
The construction of the Tarnita hydroelectric power plant, located 30 kilometres from the city of Cluj-Napoca, could last five to seven years. The project involves the construction of four units with a capacity of 250 MW, and its purpose is to balance the power system when commissioning of the Chernavoda 3 and 4 units happens. Some experts claim that the hydroelectric power plant would be inefficient under market conditions. The cost of the investment is estimated at over one billion euros.
The government estimates that supporting investments into the pumped-storage hydroelectric power plants is necessary to balance the national power system, which is characterized by a large RES share in the energy mix.