

The role and importance of pumped storage in the operation of Serbia’s electricity system and regional implications

Rados Cabarkapa

Public Enterprise „Electric Power Industry of Serbia“, Belgrade,
Serbia

**“The Role of Energy Storage in Advancing Large Scale RES Penetration”,
IENE webinar, April 2021.**

Frequency disturbance – January 8, 2021



Source: Austrian Power Grid AG (screenshot from the video simulation)

- Currently ENTSOE interconnection has share of the stochastic RES (wind and solar) in generation mix of approx. 20% on yearly level.
- **What would happen when the share (on yearly level) of stochastic RES reach 50% in interconnection?**

Conclusions of the accident

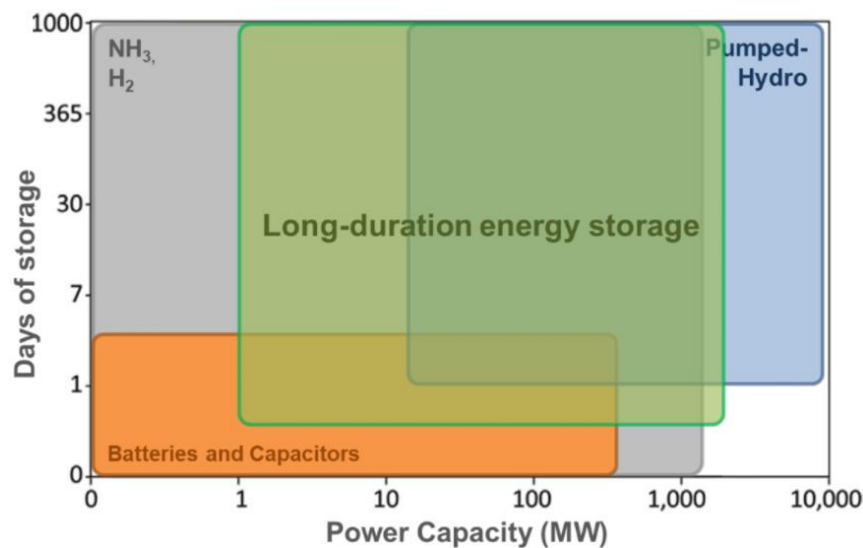


Source: Austrian Power Grid AG (screenshot from the video simulation)

Most of the needs perfectly match with characteristics and use cases of the pumped storage HPPs – Storage and flexibility

Comparison of different storage technologies

Power and storage capacity comparison of different technologies (source: www.idtechex.com):



We could compare storage technologies based on:

- **Size of storage and power capacity,**
- Cost and technology maturity,
- Round-trip efficiency,
- Time to build...

Considering the **stochastic** nature of wind and solar, we need pumped storage HPPs for the **longer periods of:**

- **low supply from RES generation** – periods of time in which little to no energy can be generated with the use of wind and solar power,
- **low residual load** (It shows how much capacity is left for conventional power plants to operate) – periods of time **when the power system shows inflexibility, especially for the holidays.**



Typical characteristics of the RES technologies

Some RES technologies have **typical daily or seasonal characteristics**. It could cause some interesting and important effects that could impact utilization and cost-effectiveness of the Pumped Storage HPPs:

- **Solar canibalization**
- **Pretty low power prices during spring.**

Also, Pumped Storage HPPs could be classified regarding the storage capacity into: **daily, weekly and seasonal (yearly)**.

Pumped storage HPPs with a larger reservoirs (weekly and seasonal) have competitive advantage over the PSHPPs with smaller reservoirs.

Risk, obstacles and challenges for the deployment of new PSHPPs

The most important obstacles and challenges for PSHPPs are:

- Lack of economically attractive new sites, the best locations for PSHPPs are already exploited,
- Long period of construction,
- Strict environmental laws,
- Lack of the price regulation and long-term predictability of market opportunities -
The unregulated and volatile price in the liberalized market did not steer in favour of the construction of the capital intensive (conventional) projects.
- **The most important, from the perspective of the generator companies - it is more favorable to invest into the low risk and pretty high return renewables.**

So, I would like to raise a question: How will build the storages if the generator companies do not have interest?

Short overview of the Serbian power system and plans

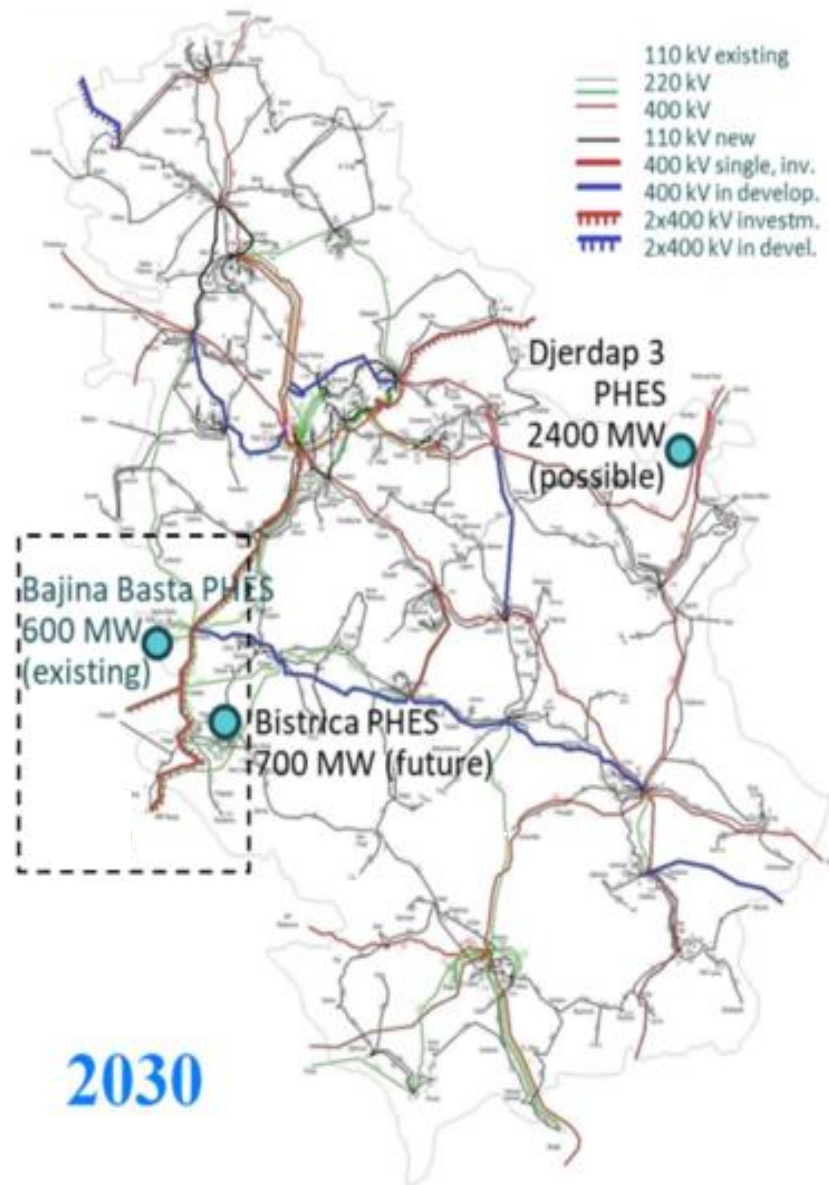
- Serbia has approx. 70% production from lignite TPPs, 25% production from HPPs and 5% other sources (CHPs and private Wind power plants)
- Preparation of NECP recently started and it is expected that Serbia reduces CO₂ emissions

Interconnection capacities in 2019



- EPS is considering building new PSHPPs on potential locations
- Serbia has central position in Balkan Region and 8 borders, well interconnected
- It is generally transit country with good location for energy arbitrage
- Experience with the exploitation of the seasonal PSHPP Bajina Bašta

Potential PSHPPs



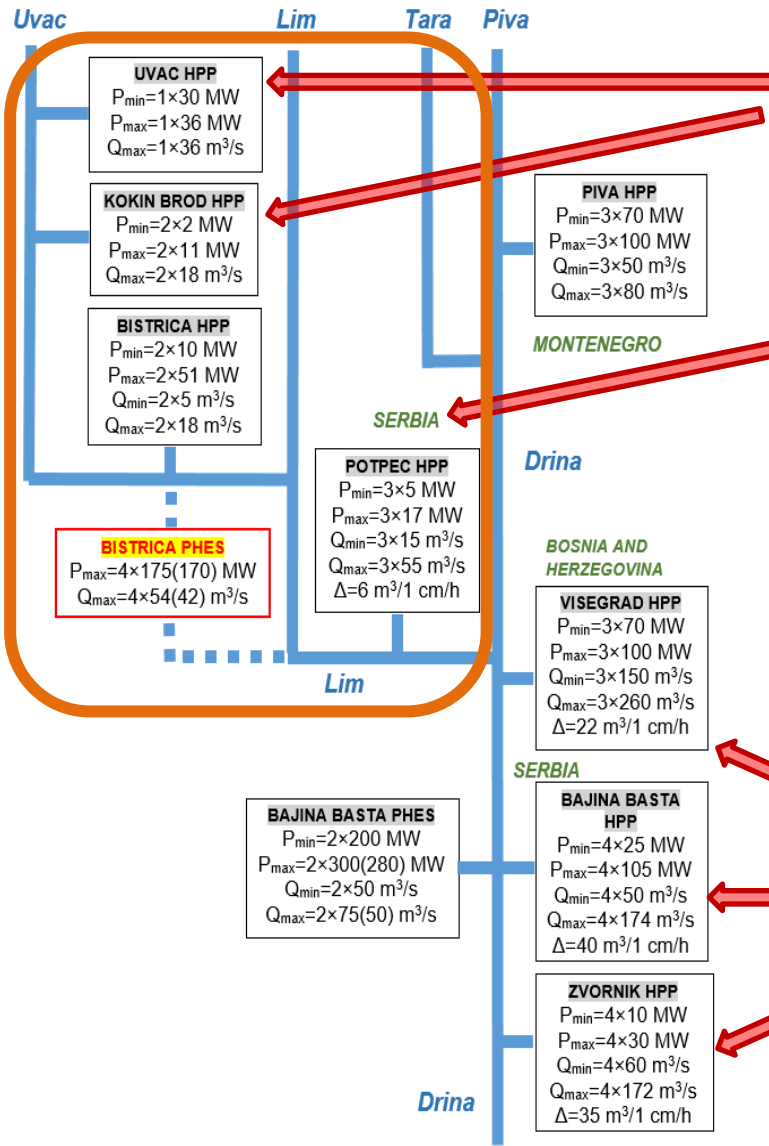
There are two potential PSHPP candidates:

- Mixed PSHPP Bistrica (700 MW, 65 GWh),
- Pure PSHPP Djerdap 3 (2400MW or 1200MW optionally).

- PSHPP Djerdap 3 requires huge investment costs,

- PSHPP Bistrica seems to be more realistic and suitable option for Serbian electric power system.

The role of possible PSHPP Bistrica in Serbian power system



Better evaluation and utilisation of the energy from the storages of “Uvac” and “Kokin Brod”

Reducing the overflow at “Potpec” HPP

Total storage capacity = 65 GWh + approx. 340GWh from background storages Uvac and Kokin Brod (with high availability and power capacity) It should be very beneficial also for region.

System of HPPs in the Drina – Lim Basin

Reducing the overflow at downstream HPPs

Preliminary assessments of PSHPP Bistrica and conclusions

- The preliminary assessments of PSHPP Bistrica have been performed and it shows cost-effectiveness.
- **Investments in renewables are more profitable with significantly lower risk.**
- Currently, a detailed Feasibility Study and Preliminary Design is developing.
- From the perspective of EPS, it seems that renewables are more favorable. On the other side, from the country's perspective, the security of supply is a very important issue, so we hope that **capacity mechanism or some other financial support** could be applied.
- Also, this project would have an **impact on the regional security of supply**, so we believe that the EU has the interest to support this project.

Thank you for watching

Any questions?

Radoš Čabarkapa, M.Sc.E.E., rados.cabarkapa@eps.rs

+381-64-833-30-50