Status of Hydropower in Serbia

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Outline

• Status of main energy resources
• Status of main HPS
• Status of Pump-Turbine HPS
• Status of small HPS
• Feed-in tariffs
• Possibilities
Status of all energy resources

- Thermal power = 5,171 MW
  - TPPs Nikola Tesla A and B
  - TPPs Kostolac A and B
  - TPPs Kolubara and Morava

- Hydro power = 2,835 MW
  - HPSs Djeerdap 1 and 2, plus …
  - HPSs Bajina Bashta, plus …
Status of all hydro power capacities

“Electric Power Industry of Serbia” has 16 HPSs with total power of 2,835 MW

System of HPSs “Djerdap”
(Djerdap 1, Djerdap 2, Pirot, Vlasinske)
1,537 MW
7,365 GWh per year
18% of total thermal and hydro
67% of total hydro
Status of all hydro power capacities

System of HPSs “Drinsko-Limske”
(Bajina Bashtya, RHE Bajina Bashtya, Uvac, Kokin Brod, Bistrica, Potpec, Zvornik)
1,294 MW
3,656 GWh per year
15.5% of total thermal and hydro
33% of total hydro
Status of all hydro power capacities

System of HPSs “Elektromorava”
(Ovcar Banja, Medjuvrshje)
13 MW
Status of all hydro power capacities

River Danube, Serbian part

HPS Djeerdap 1, Total 1058 MW
6 units, 178 MW each

HPS Djeerdap 2, Total 270 MW
10 units, 27MW each
Status of all hydro power capacities

HPS Pirot, Total 80 MW
2 units, 40 MW each

System Vlasina, 10 units, 129 MW,
285 GWh per year
HPSs Vrla 1, 2, 3 and 4
PumpSS Lisina
Status of all hydro power capacities

**HPS Bajina Bashta**, Total 364 MW
4 units, 91 MW each
1,819 GWh per year

**HPS RHE Bajina Bashta** (Reversible PT)
2 units, 307 MW each
Total 614 MW (pump mode 620MW)
800-1,000 GWh per year
Status of power production

Data per year

– Total approx. 35,000 GWh
– Total thermal power approx. 24,000 GWh
– Total hydro power approx. 11,000 GWh
Status of hydropower potential

Data per year

– Total potential estimated to 18,000 GWh
– Total used estimated to 11,000 GWh

– Unused potential of 5200 GWh mostly on rivers Morava, Drina, Lim and Danube predicted for big HPSs (>10 MW)
– The rest of 1800 GWh on other smaller rivers predicted for small HPSs (<10 MW)
Current situation

Big HPSs

Revitalisations finished:
- HE Ovchar Banja and HE Medjuvrshje (finances EPS)
- HE Bajina Bashta (finances EPS and KfW)

Revitalisations in progress:
- HE Djerdap 1 (finances EPS and Russian debt)
- HE Zvornik (finances KfW)
Current situation

Big HPSs (continued)

Revitalisations planned:
- Vlasinske HE
- HE Bistrica
- HE Potpec
- RHE Bajina Bashta (reversible pump-turbine)
Current situation

**New capacities** (design project phase):
- HE Ibarske
- HE Moravske
- HE Srednja Drina
- RHE Djerdap 3 (reversible pump-turbine)
  2400 MW, 5,500 MEUR, RWE-Innogy
- RHE Bistrica (reversible pump-turbine) = 680 MW
  4 units, 170 MW each, 600 MEUR

**Additional units:**
- HE Potpec, 4th unit
- HE Bajina Bashta 5th unit
Current on-going situation

River Drina
- Near Ljubovija – 2 HPSs = 300 MW, plus 12 small around
- MidDrina – 3 HPSs = 320 MW, EPS+Secci, 800MEUR
- UpperDrina – 4 HPSs = 238 MW, EPS+RWE interest ??

River Lim
- Brodarevo – 2 HPSs = 56 MW, REV (Canada), 140MEUR

River Velika Morava
- 5 HPSs – 150 MW, EPS+RWE-Innogy, 352MEUR
Current on-going situation

River Ibar
- 10 HPSs – 103 MW, EPS+Secci, 285MEUR

Plans for HPSs (long run):
- Ribarici
- RHE Ribarici (reversible)
- Vrutci
- Svodje
- Pakleshtica
- Arilje
Cadastre of small HPSs

• Since 1987, but officially since Nov.2014 856 locations for small HPS with all relevant data publicly available on web site of the Ministry for Energy

• Tenders for locations published and a lot of documentation for small HPSs in progress and finished, but not a single small HPS built and in operation
Current situation

Small HPSs:

- documentation finished:
  1. technical and for investment
  2. feasibility studies
  3. environmental impact assessment studies
  4. master (space and urbanistic) plans
  5. and finished pre actions needed considering opinions, conditions, approvals and permits.

for:

- 8 small HPSs defined and already in tender
- 8 small HPSs in accumulations for water supply systems
- 15 small HPSs owned by “Electric Power Industry of Serbia”
Feed-in tariffs

Small HPSs:

<table>
<thead>
<tr>
<th>Power MW - P</th>
<th>Price EURcent/kWh</th>
</tr>
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<tbody>
<tr>
<td>&lt; 0.2</td>
<td>12.40</td>
</tr>
<tr>
<td>0.2 – 0.5</td>
<td>13.727-6.633*P</td>
</tr>
<tr>
<td>0.5 – 1</td>
<td>10.41</td>
</tr>
<tr>
<td>1 – 10</td>
<td>10.747-0.337*P</td>
</tr>
<tr>
<td>10 – 30</td>
<td>7.38</td>
</tr>
<tr>
<td>10 – 30 on existing infrastr.</td>
<td>5.90</td>
</tr>
</tbody>
</table>
## Selling prices of EPS

### Tax of 20% inclusive

<table>
<thead>
<tr>
<th>Inhabitants (living houses, homes)</th>
<th>Single tariff measur. device EURcent /kWh</th>
<th>Higher tariff EURcent /kWh</th>
<th>Lower tariff EURcent /kWh</th>
<th>UTD EURcent /kWh</th>
<th>Available power tax EURcent /kWh</th>
<th>El.en. Supplier costs EURcent /kWh</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GREEN</strong> &lt;350kWh</td>
<td>4.04 (4.924)</td>
<td>(5.628)</td>
<td>(1.407)</td>
<td></td>
<td>(45.883)</td>
<td>(125.530)</td>
</tr>
<tr>
<td><strong>BLUE</strong> 351-1600</td>
<td>6.05 (7.386)</td>
<td>(8.440)</td>
<td>(2.110)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>RED</strong> &gt;1600kWh</td>
<td>12.11 (14.772)</td>
<td>(16.880)</td>
<td>(4.220)</td>
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</tr>
</tbody>
</table>
Legislation

Documents needed (24 of them):

1. Copy of location from master (urbanistic) plan or legal act on urban conditions
2. Legal act on purpose of land with conditions defined in respect to measures and conditions for environmental protection
3. Positive opinion of public company “Serbia water resources” (Srbijavode)
4. Positive opinion of public company “Electric Power Industry of Serbia” on electrical and energy conditions
Legislation

5. Positive opinion of “National hydro-meteorology institution”
6. Positive opinion of regional water resources company
7. Positive decision on water resources use conditions from the Ministry of Agriculture and water resources
8. Positive decision of the municipality of building up of the small HPS
9. License on energy production and connection to the electric energy grid
10. License for qualified acting in energy production activities
Legislation

11. Study on impact of small HPS building-up on environmental protection with previously defined conditions for nature and environment protection implemented

12. Positive opinion of the Ministry on the previous Study

13. Design project on the level of idea-solution.

14. Design project on the level main project (for execution)

15. Positive opinion of “Electric Power Industry of Serbia” on electrical part of the project.

16. Positive opinion of police fire protection department on the design documentation
Legislation

17. Conditions for cutting of green bushes and trees for the terrain preparation
18. Permission for works on building-up.
19. Start of works check-in.
20. Documentation of the final design status of completely built object and technical inspection pass.
21. Permission for work with water resources.
22. Permission for the use of the HPS.
23. Confirmation on having the special privileged status of the object.
24. Agreement on conditions of electric energy sale.
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Thank you for your attention!