

# The Electric Power System

- Bosnia and Herzegovina -

- 2016 -

# Basic facts

- Area: 51.197 km<sup>2</sup>
- Population: 3.871.643
- Number of electricity consumers: 1.517.161
- Number of TSOs: 1
- Number of DSOs: 3
- Peak load: 2.105 GW
- Average interruption of electricity: N/A

# Global map of the grid and of its interconnections

## Interconnectors with:

- Croatia
- Serbia
- Montenegro



# Grid facts and characteristics

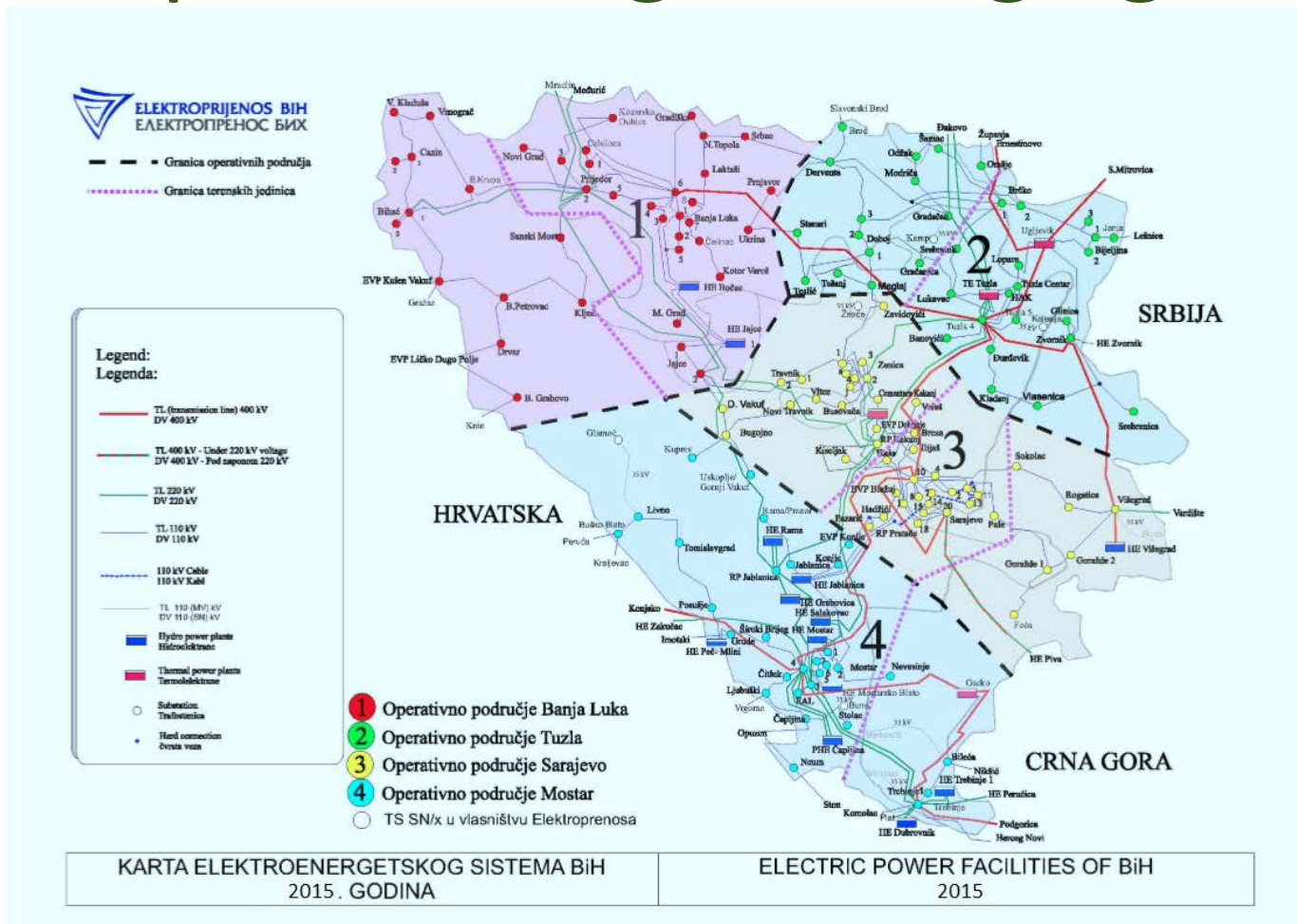
- ❑ 400 / 220 / 100 kV voltages
- ❑ 6.341,48 km of HV lines
  - 864,73 km – 400 kV
  - 1.524,80 km – 220 kV
  - 3.951,95 km – 110 kV(OHL 3.920,60 km and cable 31,35km)
- ❑ 145 substations
  - 10 substations – 400/x kV 6.390,5 MVA
  - 8 substations – 220/x kV 1.423 MVA
  - 128 substations – 110/x kV 5.043 MVA



# Structure of electrical power system

- ❑ Transco (Transmission system owner) and ISOB&H (System operator) are working closely in order to ensure power supply in the whole country.
- ❑ SERC (State Energy Regulator Commission) oversees Transco and ISOB&H operations.
- ❑ 3 Power utilities transfer it's energy to Transco's grid.

# Map of the high voltage grid



# Information on TSO(s)

- ❑ Name: Independent System Operator in Bosnia and Herzegovina (ISO) & Transco (Transmission system owner)
- ❑ Network length (km): 6.341,48 km
- ❑ Served area (km<sup>2</sup>): 51.197 km<sup>2</sup>
- ❑ Annual transmitted energy (TWh): 17,68
- ❑ website: <http://www.nosbih.ba> & <http://www.elprenosbih.ba>

# Cooperation of TSO and DSOs

- ❑ There are three DSO's, which are in the same time power utility companies (Generation and Distribution and Supply).
- ❑ Current activities are related to the legal and functional unbundling of DSO's and supply companies.
- ❑ On a daily basis they inform ISO B&H of planned activities.



# Responsibilities of TSO & DSOs

- This topic is very complex due to complex political situation (different entities have different laws, etc...) in the country.
- TSO operates levels od 400, 220 and 110 kV.
- DSO operates at lover voltage levels (35, 20, 10 kV).

# Energy structure of the country

☐ Thermal power plants	49,4%	8.712 GWh
☐ Hydro power plants	32,4%	5.426 GWh
☐ <u>From other systems</u>	<u>18,2%</u>	<u>3.445 GWh</u>
☐ TOTAL		17.583 GWh

Generation structure for 2015

# Installed capacity with reference to primary resources

- Installed capacities (GW), year 2015
  - Coal (lignite and brown coal): 1.8 GW
  - Hydro power: 2 GW
  - Distributed power generation (hydro and solar): 0.1 GW

# Energy production with reference to primary resources

## □ Electricity generated (TWh), year 2015

- Coal (lignite and brown coal): cca 60,5 % 8.712 GWh
- Hydro power: cca 37,7 % 5.426 GWh
- Distributed power generation: cca 1,8 % 269 GWh
- TOTAL 14.407 GWh

# Consumption per customer groups

- Industry 36,3%
- Traffic 0,8%
- Households 43,5%
- Other consumption 19,4% )

(source: Agency for Statistics - 2015)

# Location of energy sources

HPP are blue  
TPP are orange



# Development of small hydro power

- Here is the development of small hydro power plants throughout the years:

Year	≤2011	2012	2013	2014	2015	Total
Number	22	9	2	9	5	47
Power (MW)	19.62	5,02	8.05	8.25	12.76	53.7

# Development of wind power

- ❑ Currently there are no installed WPP.
- ❑ By the end of 2016, the following WPP's should start construction:
  - WPP Podveležje                      48 MW
  - WPP Kupres-1                        48 MW
  - WPP Debelo Brdo                    54 MW
  - WPP Jelovača                        36 MW
  - WPP Trusina                         48 MW



# Development of photovoltaic power

- Currently, there are small PV plants all over the country. Most of it is installed in the southern parts of B&H.

Year	2012	2013	2014	2015	Total
Number	5	17	29	46	97
Power (kW)	434	1.214	1.812	6.274	9.734



# RES installed capacity and production since 2000

- ❑ After the war in Bosnia and Herzegovina, two large hydro power plants were built, HPP Pec Mlini and HPP Mostarsko blato. Their total installed capacity is cca 90 MW.
- ❑ Besides that, there are 47 small hydro projects installed on distribution level, total capacity 53,7 MW.
- ❑ Wind power plants are not yet installed, several WPP are expected to start construction in 2016.
- ❑ In photovoltaics, there are 97 project that were built, with total capacity of 9.734 MW.



# Price development for industry consumers

□ 0,135 KM/kWh = 0,0691 €/kWh (without taxes)



# Price development for households

□ 0,138 KM/kWh = 0,0705 €/kWh (with taxes)

# Power balance in 2015

- ❑ Generation (TWh): 14.2
- ❑ Consumption (TWh): 11.7
- ❑ Imports (TWh): 3.7
- ❑ Exports (TWh): 5.9
- ❑ Losses (TWh): 0.36

# Energy exchanges in 2015

- ❑ Croatia: import 1,2 TWh, export 4,1 TWh;
- ❑ Serbia: import 2,1 TWh, export 0,26 TWh;
- ❑ Montenegro: import 0,5 TWh, export 1,6 TWh;
- ❑ through distribution network: import 0,06 TWh.

# Electricity market organisation

The electricity market in BiH include the wholesale and retail markets:

- Wholesale electricity market is a bilateral market in which licensed participants buy and sell electricity in a balanced power system.
- The retail electricity market is the market where take place transactions between final customers and their suppliers.



# Specific aspects of the electricity market

24

From 01.01.2016. in implementing are the new Market Rules:

- The functioning of the balancing market.
- The possibility of change and choice of supplier to customers on the distribution network.
- Market participants have the ability to regulate balance responsibility as an independent BRP or as a member of balancing group which is represented by another BRP (19 BRP in BiH).



# Balancing market

In accordance with the Law on the Establishment of the Independent System Operator, ISO BiH is responsible for the balance market in BiH, and the balancing market is defined as a "central market for the purchase and sale of electricity by the ISO BiH in order to maintain the continuous balance of supply and demand in real time, as well as additional mechanisms that implemented by the ISO BiH in order to ensure the provision of system services. "

# Balancing Services Provision

- ❑ Market based approach in procurement of ancillary services and balancing energy.
- ❑ Separated markets for capacity and balancing energy.
- ❑ Bids for energy - the daily balancing energy market.
- ❑ Products: aFRR and Mfrr.
- ❑ Price caps for all products except for downward tertiary regulation.
- ❑ Procurement of energy scheme - Contracted (aFRR, mFRR) and free offers for mFRR .
- ❑ Settlement Rule for Capacity and Energy: Pay-As-Bid.
- ❑ Cost recovery scheme:
  - Grid users for capacity
  - BRPs for energy

# Imbalance Settlement

- ❑ ISO BiH acts as Imbalance Settlement Responsible and allocates balancing costs to BRPs.
- ❑ Financial settlement of imbalances without exceptions, not even for RES.
- ❑ Dual pricing system - Marginal Control Energy Price for aggravating and for reducing imbalances.
- ❑ Price for positive imbalance – lowest energy price of activated downward control.
- ❑ Price for negative imbalance – highest energy price of activated upward control.
- ❑ Settlement Time Unit is 1 hour.

# Next Steps

- ❑ Development of an EU acquis-compliant electricity legislative framework in Bosnia and Herzegovina
  
- ❑ Organized Electricity Market :
  - Day-ahead Electricity Market ;
  
  - Connection of the day-ahead electricity market in BiH with the regional day-ahead electricity market in South East Europe ;
  
  - Intraday Market ;