



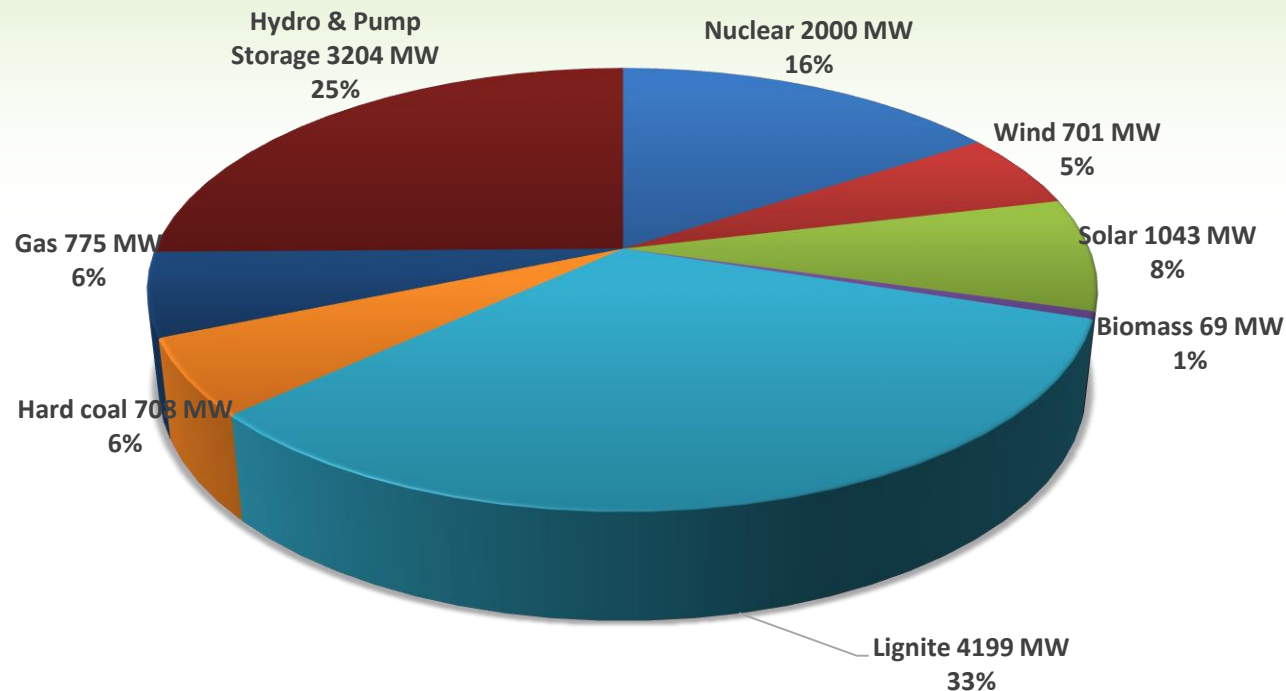
The Role of Lignite-fired Power Plants for Energy Security in Bulgaria

Olivier Marquette,
President, AES Bulgaria and Head of
Business Development, EurAsia
17 MAY 2019



Lignite Thermal Power Plants represent 33% of total installed capacity in Bulgaria

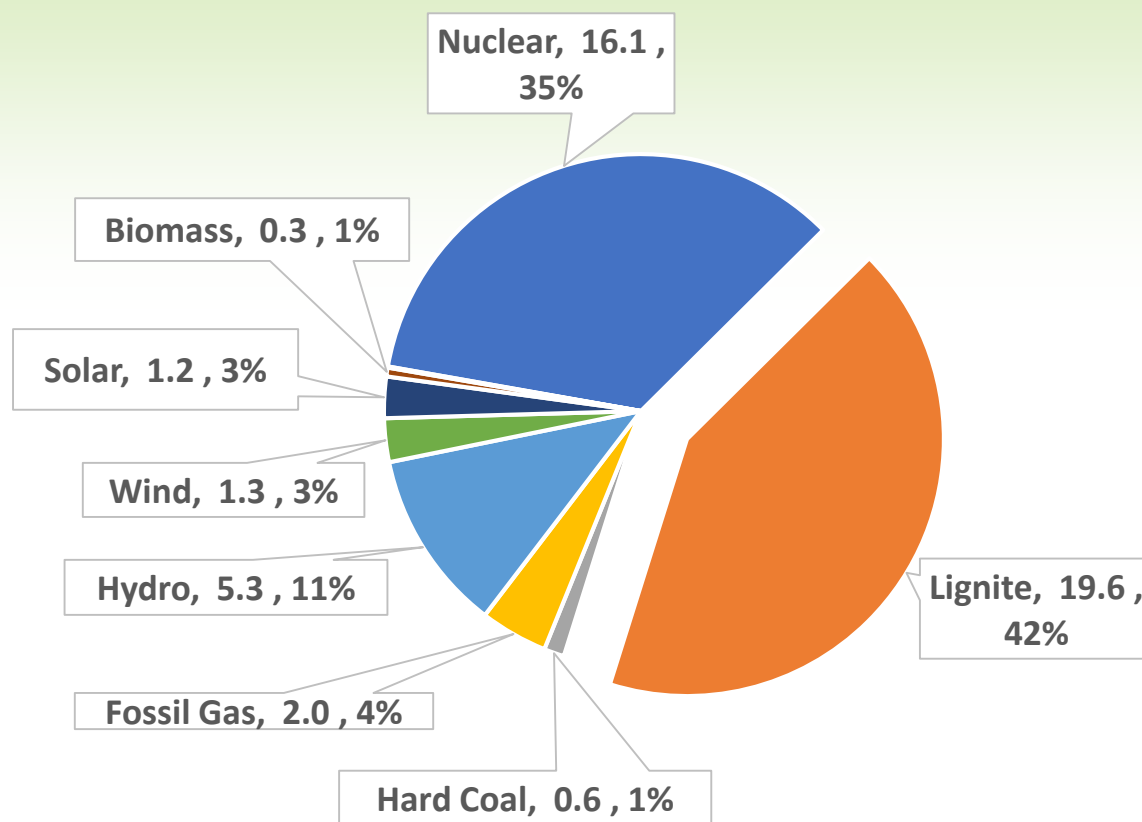
Total installed capacity in Bulgaria 12 701 MW



Lignite Thermal Power Plants generate 42% of total electricity in Bulgaria

Total generation from lignite thermal power plants is 19.6 TWh

Generation by production type, TWh 2018



Thermal plants in the Maritza basin provide primary reserve to the electric system

- Primary Control is the ability to quickly restore the balance between production and consumption in the whole synchronous unification. It is achieved by giving control to the system operator dispatchers of the active power set point in the turbine regulators of selected conventional power plants of system importance.
- The determinable annual minimum 24 - hour active power reserve for primary control for Bulgaria has values in the range of 40-45 MW
 - ▶ TPP AES Galabovo – 1 of the 2 units – 15 MW
 - ▶ TPP Contour Global Maritza East 3 – 1 of the 4 units – 10 MW
 - ▶ TPP Maritza East 2 - 1 of the units 4-to 8– 10 MW
 - ▶ TPP Bobovdol - 1 of the 3 units– 10 MW
- Due to design and technological specific features, WPP (wind power plants), PhPP (photovoltaic power plants), DHPP (district heating power plants), small HPPs, BioPP and Factory TPPs cannot provide a reserve for primary control.

Thermal plants in the Maritza basin provide secondary reserve to the electric system

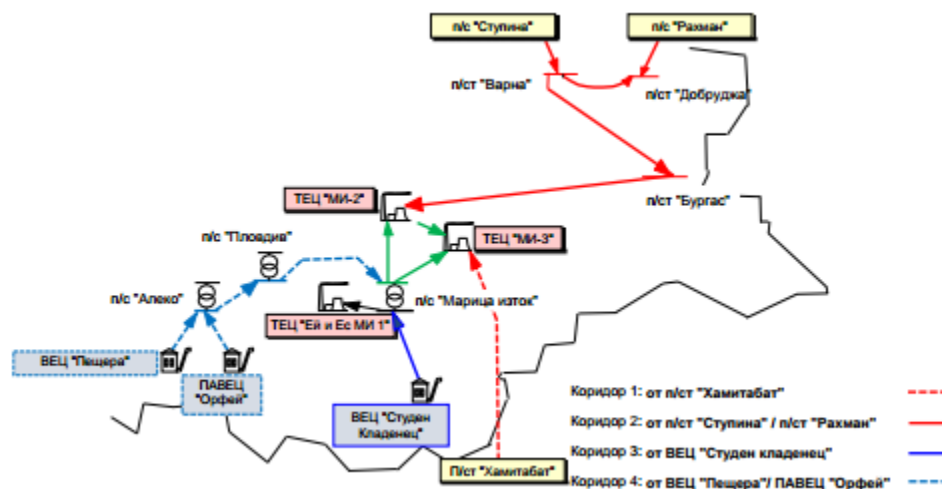
- Secondary Control of the frequency and power exchange is a real time automatic control by a central regulator of producers predetermined by the system operator.
- The units which are able to participate in the secondary frequency and exchange capacity control are the units at TPP ME1, ME2 and ME3, which are not currently in service at fixed maximum load. The load setpoint of these units should have the option of ramp up and ramp down. Such option is not available for the units in NPP Kozlodui and the renewable generations.
- The hourly usage of the units in TPP AES Galabovo for secondary control exceeds 7000 hours and in TPP Contour Global Marita East 3 - 5500 hours . This shows significant and defining participation of both power plants in providing the secondary control reserve.

Thermal plants in the Maritza basin ensure static and dynamic stability of the grid

- The stability of Electrical Energy System (EES) is its ability to self-restore its initial condition after disturbance.
- The large turbine generators in the condensation power plants and nuclear power plants have the most significant contribution to the constant stability of the EES.
- The two units of TPP AES Galabovo are equipped with system stabilizers in the excitation systems type PSS2B. The four units of TPP Contour Global Maritza East 3 are equipped with system stabilizers in the excitation systems type PSSH. The operating units of these power plants participate in the suppression of local and low frequency fluctuations of the active power and contribute significantly to the stability of the EES in the south-eastern part of the country as well as the entire EES of the country.

Thermal plants in the Maritza basin contribute to restore the grid in case of emergency

- The Units in the Maritza basin participate in the emergency response management of the EES as per the protection plan.



- Due to design and technological specific features, WPP, PhPP, DHPP, small HPP, BioPP and Factory TPPs cannot participate fully in the emergency response management of the EES and its restoration after severe technical failures.



Thank you

Olivier Marquette