

Serbia, Bosnia: Energy projections RES-TPPs and power generation facilities expansion

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Solid fuels will continue to constitute the most important primary energy source in the Western Balkans, mainly if considering the regional endogenous lignite reserves especially in Bosnia, and Serbia. However, under the projections it is assumed that their long-term use and future participation in the regional power generation system will be highly sensitive on RES supporting policies, carbon prices or probably the development of the carbon capture, use and storage (CCUS) technology. As far as thermal generation as a whole is concerned, evidently the Western Balkan region will continue to rely on “black” energy (fossil fuels). Especially if considering the economic viability, the industrial development and the energy equity in these countries, mainly in terms of energy supply and electricity prices regulation, unavoidably thermal energy sources will remain the catalyst in the energy sector.

The diversification of energy sources and the environmental issues are accelerating the process that will transform the Western Balkans to a region for transportation, storage and power supply. The Western Balkans countries are geographically situated in the region of the Southeastern Europe, an area which has always functioned and still functions as a crossroad of cultures between the European and Asian continents. The Western Balkan countries are Albania, Bosnia & Herzegovina, Croatia, the Former Yugoslav Republic of Macedonia (FYROM), Montenegro, Serbia, and UNMIK/Kosovo**.

These countries are strategically located between hydrocarbon-rich regions including Russia, the Caspian basin and the Middle East, and the energy-consuming regions of the Central and the Eastern Europe. As a result, the Western Balkan region has the potential to act as a strategically dominant factor in the transit of hydrocarbon resources, and in the diversification of oil and gas supply, both for the considered region and Europe. The main characteristic of these countries is that with the exception of Albania, until the early 90's they were a single state, that of the former Yugoslavia. This means that these countries in many sectors, including those of energy and economy, show similarities, common structures, close relationships and interdependencies as they had shared the same infrastructure and financial operation before.

Because of the conflicts and the political instability during the decade of 1990 these countries suffered significant damage to their infrastructure. This is the main reason why they face serious problems and follow a different development in contrast to other European countries. Since then each country followed a separate course, at different political and economic pace.

In terms of regional energy policy and infrastructure development, the Western Balkan countries have all signed the Treaty establishing the Energy Community and agreed to follow the European Commission's Directives, where the main target is the creation of a regional

energy market compatible with the internal energy market of the European Union (EU). The objectives of the Energy Community Treaty concern the creation of a stable regulatory and market framework, to attract investment in power generation and networks, to provide secure and sustainable energy supply, to increase the energy efficiency, to improve environmental issues and mitigate the climate change in relation with energy supply in the region, and to create an integrated energy market allowing for cross-border energy trade and integration with the EU market.

Considering the structure of the primary energy supply in the Western Balkans, lignite occupies a considerable proportion (about 38%) of the total primary energy production in the region, especially in Bosnia, Kosovo, and Serbia, where it is the main fuel for the operation of thermal power generation plants (tab. 2). Oil comes next: its share is about 37%, followed by natural gas 13%, hydroelectric energy 7%, and renewable energy sources (mainly through wind farms) 5%.

As far as the electricity generation is concerned, Serbia occupies the largest total electricity generation, where lignite dominates as its share reaches the 74% of the total electricity produced. In Bosnia & Herzegovina, which follows Serbia considering the total generated electricity, thermal power generation dominates as it consists the 67% of the total generation. In Croatia, the electricity generation is (approximately) equally distributed between fossil fuels and renewable energy sources. It should be noticed that among the Western Balkans Croatian power system is the only one where wind farms have been incorporated so far. According to the European Wind Energy Association (EWEA), at the end of 2013 302MW of wind farms were in operation in Croatia. In Serbia, the construction of the first wind farm has already begun (within 2013), and it is expected to be completed in 2015. The use of lignite and natural gas with lower shares, are the main sources of the electric energy production in FYROM. Considering the Albanian power system, the structure of the local electricity generation heavily relies on the operation of the hydro power plants, and in lower levels on oil products. Consequently, Albania could be considered as a leader in the utilisation and exploitation (proportionally) of renewable energy sources in the region. The penetration of the solid fuel power plants in the Albanian power system will be one of the most important challenges to be faced, assuming that the electricity demand will rise in the long term.

As far as thermal energy generation is concerned, the projection shows that the power sector in the Western Balkans will continue to rely on the thermal power capacities until 2050.

The role of solid fuels in this area will remain very important, since the endogenous lignite reserves are significant and will have to be exploited at the most efficient way. In this case, such evolution would not be in accordance with the European Union legislation concerning the climate change mitigation and the its long term energy policy, or global agreements like the Kyoto Protocol. However, the viability of the regional power system is a matter of priority, as the energy sector is the backbone of the economy. Consequently, decisions concerning the operation and investment on coal-fired power plants will be an important part of the formulation of the action energy plan of these states in the future.

Natural gas power shows significant deployment in the long term, because of the low power

generation costs (especially if considering the operation of the natural gas-fired combined cycle power plants (NGCC) and their modest environmental impact), reaching 16.5% from the total electricity production by 2050. Moreover, as far as not only Western Balkans are concerned, but also the whole region of the South-Eastern Europe, it should be highlighted that South Stream natural gas pipeline is emerging as an important factor in the Western Balkan's energy supply and security, bringing closer Serbia, Croatia, Bosnia & Herzegovina, and Slovenia. At the same way, Trans Adriatic Pipeline (TAP) will supply and interconnect Turkey, Greece and Albania. The Baseline Scenario projections indicate that, according to tab. 4, electricity generation from crude oil and its derivatives will slightly increase in the long term, reaching an intermediate reduction in the period between 2015 and 2030. It is indicated that their shares will be limited at 1.2% in 2050.

Intermittent renewables emerge under the Baseline conditions, attaining 6% of the total electricity generation by 2050. Furthermore, as far as renewable energy sources are concerned, it should be included that hydro power plants will continue to constitute a fundamental part of the regional power system, especially for covering the baseload demand. The projections show that the shares of hydro power will show intermediate fluctuations between 24% and 37% between 2015-2050.

Under the Baseline scenario assumptions, it is estimated that, in the Western Balkan region many power plants will be decommissioned or refurbished but there exist significant possibilities for further investment in new power capacities. The construction of new intermittent renewable power facilities and modernized lignite power plants will strengthen the achievement of perspective and long term planning, especially in terms of environmental sustainability and energy equity. The projection shows new investment in lignite power plants and shows also as optimal investment more than 10 GW of new natural gas power plants. In this way, the gasification process is in accordance with the regional energy policy towards the diversification of the energy mix and the security of energy supply. The solid fuel (lignite) power plants require further refurbishment and modernization. According to the results, considerable investments are projected.

The countries of the European Union and definitely the Western Balkans will face challenges concerning uncertainties in the energy sector, especially in terms of the affordability, equitability and security of the energy supply, and the mitigation of carbon dioxide emissions. These challenges require a general framework to establish policies and actions, combined with structural and technological changes in order to foster the exploration and investment in new power generation technologies, and to implement strategic plans concerning environmental issues, which would have an impact on energy options leading to a climate resilient economy. In order to address those challenges and to achieve the aim of competitive and sustainable energy development, the considered countries are summoned to develop a strategy for increasingly efficient use of energy and support of financial development in the coming decades.

Considering that energy demand is projected to increase since recession will probably relent, this strategy aims to prevent shortages and strengthen the industrial development.

In the Western Balkans the feed-in tariff system has been established, in order to accelerate

investment in renewable energy sources.

The inclusion of the subsidy price strengthens the contribution of renewable fuels (mainly those of solar and wind energy) to the power system, the potential of which has not been extensively exploited yet by those countries. The reference scenarios are actually simulations starting from the Baseline scenario to which various subsidy prices for electricity generation from renewables are included. The variable subsidy (renewable value) acts on the model as marginal revenue for power companies according to generation from renewables and equals to the marginal value of applying so that part of generation must come from renewable sources. The simulating sub-scenarios were six in total and the applied values were 15 €/MWh, 30 €/MWh, 40 €/MWh, 50 €/MWh, 60 €/MWh and 80 €/MWh (same values for generated electricity from all types of renewable energy sources) respectively. These values multiplied by the generated electricity from renewable energy sources shall be deducted from the total cost of electricity and will also be taken into account for the final pricing of electricity to consumers. In this way, the extra cost is compensated but enterprises are urged to generate from renewable sources.

The implementation of variable supporting policies (subsidy value) for renewables in the specific region is projected to have medium effects on the structure of the regional power energy system. The electricity generation by solid fuels and natural gas will continue to dominate. As the subsidy value rises, the shares of lignite decrease, but they are expected to remain considerable (more than 50%). The development of renewables in the Reference scenario includes a moderate rise of the shares of wind and solar electricity if compared with the baseline levels. Moreover, as far as natural gas is concerned, the policies for renewable still imply significant investment in the construction of new natural gas power plants, especially on combined cycle (NGCC). At this rate, the gasification and the modernisation of the power system of the region are estimated to be accelerated.

Thermal capacities will continue to dominate and consist the core of the regional power system. Power generation from solid fuels (lignite) and natural gas is further increasing in the Reference scenarios, but not at the same rate as in the Baseline. According to the projections, power generation from solids is expected to rise in the long term but their shares are estimated to be lower than the relevant from the Baseline scenario. Their values are estimated to be around 40% in the great majority of the sub-scenarios.

The adoption of strong RES shows to be effective in supporting further penetration of the renewables in the regional power system. However, as it was mentioned in Baseline Scenario, coal-fired power plants will still remain the most substantial part of the electricity generation system, and very essential for covering the baseload and medium-load demand and adapting to the intermittent electricity generation of some renewables.

As far as the gasification of the Western Balkan region is concerned, it is assumed that that the expansion of the gas power sector will not be significantly affected, if compared to the relevant level of the Baseline scenario. The shares of natural gas are projected to fluctuate between 10% and 15% in all the sub-scenario cases. Under the assumptions of the 80 €/MWh electricity generation is projected to be almost equally distributed between thermal and renewable facilities.

A reduction in the CO₂ emission values, CO₂ emissions are projected to fluctuate intermediately because of the increased participation of the renewable capacities in the electricity generation of the regional power system during the period between 2020 and 2035. According to the Reference scenarios results, many thermal power plants will be decommissioned and an optimal choice investment in new intermittent wind and solar power plants is projected.

The additional renewables in power generation are primarily from hydro, wind and solar, and secondarily from biomass and geothermal energy. Consequently, the CO₂ emissions will slightly or drastically (depending on the subsidy value levels) during this period. Wider expansion of solid fuel power plants after refurbishment, further investment and construction of new thermal capacities is the reason for the estimated rise of the CO₂ emissions for the periods 2015-2025 and 2035-2050. Moderate changes (in contrast to the Baseline scenario results) are projected to occur in the power generation structure in the medium values Reference scenarios (15 and 30 €/MWh). In the scenario of 80€/MWh, where almost half of the generated electricity is projected to rely on carbon free technologies in 2050, the carbon emissions values are projected to drop by 23.4% compared to the relevant values of the Baseline scenario.