DECARBONIZATION OF THE ELECTRICITY SECTOR IN SOUTH EAST EUROPE

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Overview

South East Europe is a diverse region with respect to energy policy and legislation, comprising a mix of EU member states, candidate and potential candidate countries. Despite this diversity, shared challenges and opportunities exist. The electricity network of the South East Europe region is highly connected, energy policies more harmonised and electricity markets better integrated – as a result of the EU accession process, the Energy Community Treaty and, more recently, the Energy Union initiative supporting a regional perspective on policy development. This report emphasises the regional dimension; it is complemented by national reports available on the South East Europe Energy Roadmap (SEERMAP) website (http://seermap.rekk.hu) [1].

The SEERMAP project uses a model-based assessment of different long term electricity investment strategies for Albania, Bosnia and Herzegovina, Bulgaria, Greece, Kosovo*, former Yugoslav Republic of Macedonia, Montenegro, Romania and Serbia. The SEERMAP region will need to replace more than 30% of its current fossil fuel generation capacity by the end of 2030, and more than 95% by 2050. This provides both a challenge to ensure a policy framework which will incentivise new investment, and an opportunity to shape the electricity sector over the long term in-line with a broader energy transition strategy unconstrained by the current generation portfolio.The aim of the analysis is to show the challenges and opportunities ahead and the trade-offs between different policy goals.

The project can also contribute to a better understanding of the benefits that regional cooperation can provide for all involved countries. Although ultimately energy policy decisions will need to be taken by national policy makers, these decisions must recognise the interdependence of investment and regulatory decisions of neighbouring countries. Rather than outline specific policy advise in such a complex and important topic, our aim is to support an informed dialogue at the national and regional level so that policymakers can work together to find optimal solutions.

Methods

Five models incorporating the electricity and gas markets, the transmission network and macro-economic system were used to assess the impact of three core scenarios. The European Electricity Market Model (EEMM) and the Green-X model together assess the impact of different scenario assumptions on power generation investment and dispatch decisions. The EEMM is a partial equilibrium microeconomic model. It assumes that the electricity market is fully liberalised and perfectly competitive. In the model, electricity generation as well as cross border capacities are allocated on a market basis without gaming or withholding capacity: the cheapest available generation will be used, and if imports are cheaper than producing electricity domestically demand will be satisfied with imports. The Green-X model complements the EEMM with a more detailed view of renewable electricity potential, policies and capacities. The model includes a detailed and harmonised methodology for calculating long-term renewable energy potential for each technology using GIS-based information, technology characteristics, as well as land use and power grid constraints. The three core scenarios can be described as follows:

- The ‘no target’ scenario reflects the implementation of existing energy policy (including implementation of renewable energy targets for 2020 and construction of all power plants included in official planning documents) combined with a CO2 price (which is only envisaged from 2030 onwards for non EU member states). The scenario does not include an explicit 2050 CO2 target or a renewables target for the electricity sectors of the EU member states or countries in the Western Balkans;

- The ‘decarbonisation’ scenario reflects a long-term strategy to significantly reduce CO2 emissions, in line with EU emission reduction goals for the electricity sector as a whole by 2050, driven by the CO2 price and strong, consistent RES support;
- The ‘delayed’ scenario involves an initial implementation of current national investment plans (business-as-usual policies) followed by a change in policy direction from 2035 onwards, resulting in the realisation of the same emission reduction target in 2050 as the ‘decarbonisation’ scenario. This is driven by the CO2 price and increased RES support from 2035 onwards.

The same emission reduction target of 94% was set for the SEERMAP region in the ‘delayed’ and ‘decarbonisation’ scenarios. This implies that the emission reductions will be higher in some countries and lower in others, depending on where emissions can be reduced most cost-efficiently. Due to the divergent generation capacities, the scenarios result in different generation mixes and corresponding levels of CO2 emissions, but also in different investment needs, wholesale price levels, patterns of trade, and macroeconomic impacts.

Results

The main investment challenge in the SEERMAP region is replacing currently installed lignite and oil based capacities, of which more than 30% is expected to be decommissioned by the end of 2030 and more than 95% by 2050. The model results show that the least cost capacity options under the assumed costs and prices are renewables (in particular wind, hydro and solar) in emission reduction target scenarios and a mix of natural gas and renewables in the ‘no target’ scenario.

The capacity mix changes significantly in all three core scenarios, with a shift away from fossil based towards renewable capacity. The changes in the capacity mix are driven primarily by increasing carbon prices and decreasing renewable technology costs. Oil capacity disappears after 2035 in all scenarios, while coal and lignite based capacity drops from an initial 24.2 GW in 2016 to 6.6 GW by 2050 in the ‘no target’ and ‘delayed’ scenarios, and to 1.2 GW in the ‘decarbonisation’ scenario. By 2050, most of the coal capacity can be found in Bosnia and Herzegovina, Kosovo* and Serbia in both the ‘no target’ and ‘delayed’ scenarios according to model results, with 2000, 1100 and 1400 MW capacity respectively. In the ‘decarbonisation’ scenario the entire coal capacity in the SEERMAP region is based in 3 countries: Bosnia and Herzegovina, Bulgaria and Greece.

Renewable capacity becomes increasingly important in all three scenarios. Investment in new wind capacities is significant, tripling in the ‘no target’ scenario from 6 GW in 2016 to around 20 GW in 2050. In the two scenarios with a decarbonisation target for 2050 the growth is even more significant, with wind capacity reaching 41 GW and 36 GW in the 2050 ‘delayed’ and ‘decarbonisation’ scenarios respectively. Relative wind capacity increase is especially high in the candidate and potential candidate countries (Albania, Bosnia and Herzegovina, Kosovo*, former Yugoslav Republic of Macedonia, Montenegro and Serbia), where most countries has no or limited experience in operating wind farms.

Conclusions

Whether or not countries in the region pursue an active policy to support renewable electricity generation, a significant replacement of fossil fuel based generation capacity will take place; coal and lignite based generation phase out gradually under all scenarios due to the increasing carbon price and oil disappears from the electricity mix by 2030. Decarbonisation will require continued RES support during the entire period. However, the need for support decreases as the electricity wholesale price increases and thereby incentivises significant RES investment even without support. The sensitivity analysis reveals that regional RES targets are significantly more cost-effective than national targets, to the point that the required RES support in a national target scenario is twice the level of the support needed in a regional support scenario. A regional system will also encourage harmonisation of other support elements such as permitting, grid connection rules, financing, taxation, etc. Last but not least, as revenues from the auctioning of EU ETS allowances are sufficient to cover RES support for most of the modelled period, a scheme to finance RES support from these revenues can be devised in order to relieve the burden on consumers.

References

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