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THE FUTURE OF THE ELECTRICITY SECTOR IN THE DANUBE REGION

NATIONAL ENERGY AND CLIMATE PLANS IN THE DANUBE REGION

- All DR countries highlight the importance of renewable energy sources for decarbonizing the electricity sector. New investments target mainly solar PV and wind energy, raising concerns about the integration of intermittent generation in the power system.
- Coal fired power generation is expected to decline but remains a fundamental component of power systems alongside nuclear and hydro capacities. Despite expanding variable energy sources there is no evidence of a "coal to gas" switch in the electricity sector.
- To meet the increasing need for market coupling and integration of wind and solar capacities, investments to reinforce transmission grids and the introduction of intraday and balancing markets are top priorities in DR countries.

This policy brief is part of a series based on the study National Energy and Climate Plans of the Danube Region commissioned by the Ministry of Foreign Affairs and Trade of Hungary in 2020.
Other policy briefs cover the natural gas (2021/05), heating and cooling (2021/06) and transport (2021/07)
The Danube Region is an EU regional cooperation strategy covering 14 countries that lie in the reservoir of the Danube, comprising EU Member States (AT, BG, CZ, parts of DE, HR, HU, RO, SK and SI) and Energy Community contracting parties (BA, MD, ME, RS, parts of UA). This policy brief focuses on the EU member countries of the Danube Region since the strategic documents of the non-EU countries are less detailed regarding sustainable transport development.

ELECTRICITY GENERATION MIX

Although the characteristics of the power mix have a profound impact on the electricity system, the virtues and shortcomings of the present generation fleet do not determine its future. Import dependency can be alleviated by diversification of suppliers and transport routes. Flexibility and reliability can be supported by demand response, smart grids, well-built transmission networks (and market integration), energy storage and sector coupling. Smart regulation (motivating RES producers to locate generation capacities near the network, to adjust their production to market prices and to keep to schedule) and liquid spot markets can soften the system costs and ease the stress caused by variable energy resources put into electricity systems.

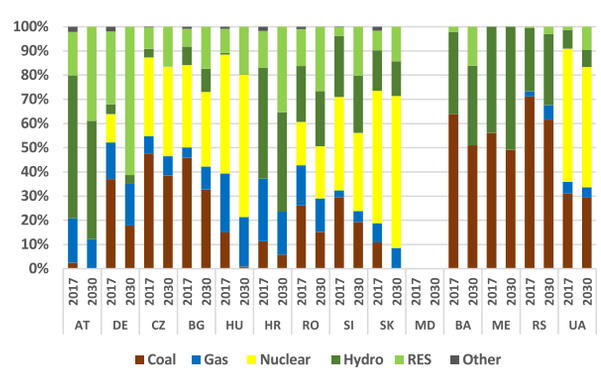
DR countries emphasize a commitment to decarbonize their electricity systems in their NECPs, but the strategies and roadmaps differ markedly. As can be seen on Figure 1, a few countries (e.g. Germany, Austria) are forging ahead with aggressive expansion of renewable generation, network development and market integration, while most CEE countries (Czechia, Slovakia, Hungary, Romania, and Bulgaria) plan for nuclear power to anchor low carbon power generation, remaining sceptical about the prospects of renewable electricity generation.

Coal fired power generation is expected to undergo significant contraction in all EU member countries but remains an indispensable element of European power systems to 2030. Only 3 EU DR countries plan to phase out coal in the next ten-year years (Austria, Hungary, Slovakia) with Germany and Czechia prolonging beyond 2030.

Several NECPs refer to gas as a transitional fuel without providing real plans for a "coal to gas" switch. New gas generation capacities will be put in operation in parallel to the decommissioning of old, inefficient plants, resulting in a small overall change in gas-based electricity production.

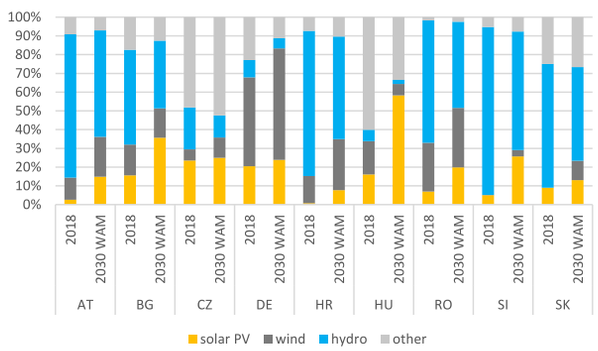
Non-EU DR countries (Bosnia and Herzegovina, Montenegro, Serbia) protected from carbon prices justify the preservation of their coal and lignite fired capacities for energy security. However, in the last few years dramatic changes unfolded in the region and intermittent renewable capacities expanded rapidly owing to their cost advantage, triggering revisions of these official energy strategies and embrace more of the green transition.

FIGURE 1. ELECTRICITY GENERATION MIX OF THE DANUBE REGION COUNTRIES 2017-2030 (%)



Source: National Energy and Climate plans of EU Member States, Energy Strategies and Energy Policies of non-EU countries[1]

FIGURE 2. CHANGE IN RENEWABLE ELECTRICITY GENERATION MIXES OF THE EU DR COUNTRIES, 2018-2030 (%)



Source of data:NECPs

RENEWABLE ELECTRICITY DEPLOYMENT

The 2030 Energy and Climate Framework of the EU requires member states to contribute to a 32% EU wide renewable energy target by 2030, expressed as a share of renewable sources in gross final energy consumption. While there are no targets for the share of renewable energy sources in electricity (RES-E share) the Governance Regulation (EU) 2018/1999 and the NECPs contain estimated trajectories for the renewable electricity shares.

Figure 3 shows a comparison of the past, current and future RES-E shares in the EU member states of the Danube Region countries. The biggest increase between 2018 shares and those targeted in the 2030 WAM scenarios in terms of percentage points can be seen in Germany (27 percentage points), Austria (19,9 percentage points), Croatia (15,7 percentage points) and Hungary (13 percentage points).

1 Power mix for Moldova is excluded owing to very unique circumstances: the electricity produced by entities located in the region of Transnistria (de jure part of Moldova, de facto independent state) is referred to as imported electricity, leaving Moldova with 383 MW installed power generation capacity, or 18% of total electricity consumption (IRENA (2019), Renewables Readiness Assessment: Republic of Moldova, https://www.irena.org/publications/2019/Feb/Renewables-Readiness-Assessment-Republic-of-Moldova, p.6)

2 Due to unclear and incomplete 2030 data renewable power mix for non-EU DR countries is excluded.

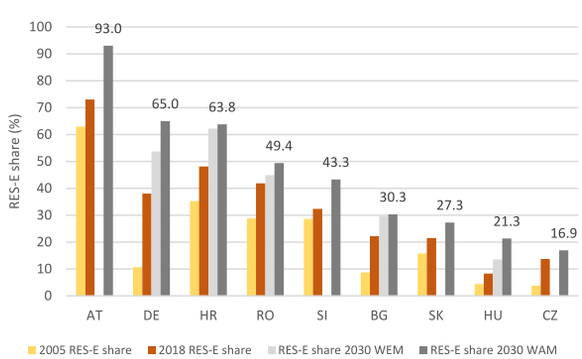
The non-EU strategic documents do not contain sectoral targets for renewable energy consumption, except for Moldova planning to reach 15% RES-E by 2030.

The growth in DR installed capacities to 2030 will be driven primarily by solar PV and onshore wind. Decreasing technology costs, good natural potential and low environmental concerns make solar PV the most attractive RES-E technology over the next decade. Solar PV installed capacities are expected to grow by 79 GW in EU DR (52 GW from Germany) and at least by 490 MW[3] in non-EU DR countries between 2018 and 2030. Onshore wind will also attract significant investment, with 40 GW new installed capacities in EU DR countries (31 GW of which in Germany, 13.6 GW being new offshore wind capacities) and 877 MW in non-EU DR countries.[4]

Traditionally most DR countries use hydro power as the central piece of the electricity portfolios due to favourable natural conditions and positive effects for grid balancing. Hydro power will have a major role in achieving the 2030 climate and energy targets in most EU DR countries, but capacities will be maintained or even decreased due to saturation of suitable sites and environmental concerns. Overall hydro capacities are expected to fall marginally in the EU DR countries (by 155 MW) but will increase in the non-EU DR countries (by at least 347 MW).[5] Strategic planners in non-EU DR countries are also concerned with the impact of hydro power on nature conservation. Those planning to modernise and build new hydro capacities are subject to spatial planning and site restriction measures.

Most DR countries plan to continue to develop solid biomass and biogas installations, in many cases by conversion of end-of-life coal or lignite units, although at a smaller scale than solar PV and wind energy. According to the NECPs, solid biomass and biogas capacities will actually fall in Germany and Romania by 2030. Still electricity generation from solid biomass will play an important role in the renewable electricity mixes of the EU DR countries, with a share of above 20% in Czechia, Hungary and Slovakia in 2030.

FIGURE 3. RENEWABLE ELECTRICITY SHARES IN 2005, 2018 AND IN THE 2030 UNDER WEM AND 2030 WAM SCENARIOS (%)



Source of data: Eurostat (for 2018 data), NECPs (for 2030 values)

Geothermal power plants currently operate in Austria, Germany, Croatia, Hungary, and Romania. In addition, Slovakia, Czechia, and Serbia plan to start operating geothermal power plants till 2030. Due to high exploration and drilling risks and high costs relative to the alternative renewable energy sources, the significance of geothermal electricity generation will remain marginal. Installed capacities will reach a total of approx. 150 MW in 2030 according to the NECPs of the EU DR countries.

RENEWABLE ELECTRICITY POLICIES

RES deployment is mainly promoted through operating and investment support, but financial policies (e.g., exemptions from taxes and levies, preferential loans, etc.) and administrative policies are also in place (e. g. frameworks for self-consumption to enhance small scale investments). Tenders for ensuring a cost-competitive level of operating support are well established in Germany, Croatia, Hungary, and Slovenia, and are planned in four more DR countries. Amending legislation to make RES financially sustainable through competitive bidding and in line with State Aid Guidelines 2014-2020 is also a key issue for the countries of the non-EU DR countries. Montenegro has already held locational auctions for solar PV and onshore wind. Only two countries (HR and RO) have plans to create an attractive legal framework for RES private power purchase agreements (PPA), and two EU DR countries (AT and DE) have legislation in place related to energy communities. NECPs put little emphasis on information campaigns and awareness raising activities in relation of renewable electricity, which is at odds with the goal of putting consumers at the heart of energy transition.

Due to the expected growth in the intermittent electricity production of wind and solar, the question of renewable integration is highlighted in almost all NECPs and strategic documents, with non-EU DR countries calling for more analysis of grid constraints and investments in storage and balancing. Research in advanced technologies to enabling RES integration ranks highly among the research priorities listed in the NECPs.

ELECTRICITY GRIDS

Based on ENTSO-E's Ten-Year Network Development Plans (TYNDPs), NECPs provide a detailed description of major upgrades and capacity additions for the transmission network including the expansion and strengthening of internal transmission lines and planned interconnectors in priority corridors. Investments in cross-border lines promote market integration, increase competition, contribute to security of supply and help integrate intermittent/variable renewable capacities.

Another goal of EU DR countries is to demonstrate that their network development targets are in line with the EU

3 Uncertain data for the Energy Community countries for 2030, no data for Ukraine.
4 No data available for 2030 capacities in Ukraine.
5 Uncertain data for the Energy Community countries for 2030, no data for Ukraine.

2030 interconnectivity target of 15 % (defined as import capacity over installed generation capacity) and 30% (defined as import capacity over peak load).[6] CEE countries are well connected and many are already above these prescribed targets presently, although nominal transfer capacities tend to overestimate real transmission capabilities due to congestion on internal networks. Aside from inherent faults in the calculation of interconnectivity indices, this points to the importance of improving capacity calculation, congestion management and capacity allocation as a precondition for increased market integration.

Projects aiming to improve calculation and allocation of cross-border capacities, and investment into (cross-border) transmission infrastructure are of high importance for DR countries. The non-EU countries share in common an aging network infrastructure, small, immature, and illiquid markets and insufficient market infrastructure, while the peripheral EU DR region is highly interested in improved price convergence and security of supply.

Moldova and Ukraine face different challenges. Their top priority for transmission network development is electricity system integration into the EU energy market with synchronised operation on the ENTSO-E Continental Europe zone. Both countries suffer from high energy dependency, and market integration is considered as the most feasible way to improve energy security.

Concerning the distribution networks, NECPs include general ambitions to upgrade and modernize grids without outlining specific measures and pathways (as opposed to the transmission system). The only exception are deadlines and targets set for mass deployment of smart metering. About half of the DR countries have targets and measures in association with battery storage, energy communities, demand side response, aggregators, smart meters, and smart grids.

INNOVATIVE SOLUTIONS

Forward looking initiatives among DR countries include several cross border smart system pilot initiatives, like the cross-border smart grid project linking Czech-Republic and Slovakia (ACON), the planned cross-border cooperation project between Hungary and Slovakia (Danube Intelligent grid), and the planned cooperation between Slovenian and Croatian for smart balancing and reserve markets (SINCO.GRID). Romania references installation of 400 MW energy storage by 2030. Based on the modelling outcome, the completion of targeted capacity would increase system adequacy by 10%.

Non-EU countries are still focusing on the reduction of technical and commercial network losses, increasing supply quality through the reconstruction and modernization of obsolete network equipment, the construction of missing substations and lines, optimisation of the network design, raising capacities, and automation of plant elements. Harmonisation with EU directives and energy packages is another priority beginning with unbundling (separation of the functions of the distribution system operator from the functions of supply) and upgrading of regulatory mechanisms (adopting incentive-based tariff setting methodology).

ELECTRICITY MARKETS

The development of intraday and balancing markets is a safeguard for integrating RES capacities and increasing balancing capabilities for security of supply. The intraday market coupling (Single Intraday Coupling, SIDC) is realized through 'local implementation projects' (LIPs), bringing together power exchanges and transmission system operators in a given area or region (Austria, Bulgaria, Czechia, Germany, Poland, Hungary, Romania, Croatia and Slovenia). The integration of balancing markets is expected to advance via transnational platforms for sharing and activating balancing energy bids with standard balancing products (manual Frequency Restoration Reserve, mFRR, and automatic Frequency Restoration Reserve, aFRR).

Non-EU countries are lagging behind in terms of market maturity in the absence of a proper institutional foundation to enter into market coupling projects. Their energy strategies highlight the importance of market liberalization, implementing EU energy regulation (unbundling of network operation, opening markets etc.), setting up market infrastructure (organizing power exchanges, operating day-ahead and intraday markets), promoting market competition and integration, and implementing price deregulation.

SUMMARY AND RECOMMENDATIONS

The main messages from the analysis of the NECPs for the electricity sector are:

- DR countries appear committed to taking steps toward decarbonizing their electricity sectors and increasing the role of renewable energy, however ambitions and development differ markedly.
- According to the envisioned 2030 energy mix, coal-based power generation will be diminished but remain an important source in several EU and the non-EU DR countries. This seems to neglect the exposure to increasing CO2 prices and the compromised economic viability of coal and lignite-based generation.
- Several NECPs refer to gas as a transitional fuel that will replace aging coal-fired power plants, but there is no evidence of the "coal to gas" switch in the electricity sector. A large group of CEE countries intend to replace coal-firing by nuclear and intermittent renewable power, without worrying about flexibility challenges.

6 There are three types of targets set by the EU: (1) 15%; (2) a nominal transmission interconnector capacity over 30% of peak load; (3) a nominal transmission capacity of interconnectors over 30% of renewable installed generation capacity (Towards a sustainable and integrated Europe. Report of the Commission Expert Group on electricity interconnection targets, 2017) The NECPs use the (1) and (2) metrics.

- While the current DR renewable energy capacity mix is predominately hydro-based, growth in the next decade will mainly be driven by solar PV and onshore wind energy raising concerns on integrating intermittent generation.

- Renewable energy investments are mainly promoted through operating and investment support, but financial and administrative policies are also in place. Tenders for ensuring a cost-competitive level of operating support are already carried out in Germany, Croatia, Hungary, Slovenia and Montenegro, and are planned in four other DR countries.

- In their renewable energy policies DR countries should put more emphasis on demand side issues, involving energy communities and active customers into the energy transition and enable the uptake of PPAs by removing legislative barriers.

- A clear path is envisaged for the development of the interlinked transmission networks guided by the long-term network development plans as required by EU policy. Specific goals, measures and deadlines related to distribution networks remain vague, reflecting gaps in the way national policies would tackle the problem of integrating increasing levels of intermittent generation.

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REKK FOUNDATION

The goal of the REKK Foundation is to contribute to the formation of sustainable energy systems in Central Europe, both from a business and environmental perspective. Its mission statement is to provide a platform for open-ended, European-wide dialogue between government and business actors, infrastructure operators, energy producers and traders, regulators and consumers, professional journalists and other interested private entities. The Foundation will develop policy briefs and issue papers with forward-looking proposals concerning challenges posed by energy and infrastructure systems and organize regional forums allowing stakeholders to become familiar with the latest technological and regulatory developments within the industry.

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