Tenth EnerCEE Report

Hydrogen Strategies in the NECPs Of Bulgaria, Croatia, Latvia and Slovakia

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Energy in Central & Eastern Europe

About the project

The "Energy Country Profiles" on the enerCEE website provide in-depth information about the energy markets, energy policies and legal frameworks, administration, data on supply and demand, energy-related funds, and support mechanisms for renewable energy in 20 CEE- and SEE countries.

Challenges for CEE- and SEE Countries

While some CEE- and SEE countries joined the EU about a decade ago, some are still in their negotiation process for EU membership. It is a challenge for the candidate countries to adapt to energy targets and energy regulations as given by the EU to become an EU member state.

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According to the NECPs, they usually begin with an executive summary and overview of the current policy situation, their consolation, the involvement of national and union entities, their outcomes, and any regional cooperation the country has engaged in. In its main body, an NECP outlines the nation's goals, targets, and policy measures. Decarbonisation, Energy Efficiency, Energy Security, the Internal Energy Market, and Research and Innovation are the five key dimensions. A description of the current state and projections under existing policies and measures is followed by an assessment of the impact of planned policies and measures. The following comparison report will indicate in the footnotes which subsection of the NECP contains the information.

Overview

This report looks at the areas in which Hydrogen as an energy carrier has been mentioned in the NECP reports of Bulgaria, Croatia, Latvia, and Slovakia.

Hydrogen is attracting renewed and rapidly growing attention worldwide, as it can be used as a feedstock, fuel, or energy carrier and storage. It has many possible applications across the industry, transport, power, and buildings sectors. Depending on its production method, Co2-Emissions are low, thus offering a solution to decarbonize industrial processes and economic sectors where reducing carbon emissions is urgent and hard to achieve. Today hydrogen represents a modest fraction of the global energy mix. For hydrogen to contribute to climate neutrality, it needs to achieve a far larger scale, and its production must become fully decarbonized.

Given its great potential, interest in it is rising across the stakeholder landscape. Every week new investment plans are announced, often at a gigawatt scale. But it is not only investors seeing a business case; the European Commission published the European Hydrogen strategy in 2020 and continues to support research and platforms in the emerging hydrogen sector. European Member states have also caught on and published their national hydrogen strategies.

Hydrogen has been discussed as an option to decarbonize Transport, Industry and replace Gas in domestic energy consumption. In which areas the use of this hyped energy carrier is effective, sensible, or even feasible varies between Expert and between different publications and hydrogen strategies. As the process of electrolysis, to produce green hydrogen alone already takes energy, the storage is challenging, and most of the infrastructure is yet to be built, many areas may be decarbonized more effectively through means other than hydrogen.

This report explores what role Bulgaria, Croatia, Latvia, and Slovakia have sought for hydrogen in their countries according to their NECPs.

The NECPS, short for national energy and climate plans, are 10-year plans for 2021 to 2030 that EU nations had to create describing how they will contribute to the EU's energy and climate targets. The final NECP was submitted to the Commission by the end of 2019 under regulations on the governance of the energy union and climate action (EU/2018/1999).

With Bulgaria, Croatia, Latvia, and Slovakia four EnerCEE countries from different Central and Eastern European Regions were chosen to make a broad comparison across EnerCEE countries. The national plans contain the country's strategy concerning energy efficiency, renewables, greenhouse gas emissions reductions, interconnections, research, and innovation. All plans are written in a similar structure of subsections. In this EnerCEE report, the subsections according to the NECP report are noted in the footnotes.

BULGARIA

Research, innovation, and competitiveness

Hydrogen-based models and technologies are part of the priority areas on transport and energy in the Innovation Strategy for Smart Specialisation 2014—2020. Several national scientific programs in energy and climate have been developed in Bulgaria, mainly hydrogen-based technologies and eco-mobility. The program implementation period is 3 to 5 years, and the available budget is BGN 13 300 million.[1]

In a graphic on the final energy consumption by type of fuel and energy in the processing and construction sectors, hydrogen does not appear in any future estimates. [2]

A notable component of Bulgaria's plan is a target of 32GWh in renewable electricity-based hydrogen consumption for the transportation sector by 2030. By 2030, the nation anticipates that 47 GWh of power from renewable sources will be used to generate renewable hydrogen. A 20 MW installed capacity hydrogen generation pilot project is in the works.

Several national goals and financing targets related to research, innovation, and competitiveness are included in the NECP.

The long-term growth of a low-carbon economy, the enhancement of energy and resource efficiency in transportation, the modernization of current electricity networks, nuclear energy innovation, the competitiveness of the core energy-intensive industries, and the advancement of electric vehicles and hydrogen technologies are among the topics covered.

Guarantees of Origin

Directive (EU) No 2018/2001 requires the Member States to ensure the issuance of guarantees of origin for gas, including hydrogen. In connection with this, the provisions transposing Directive (EU) 2018/2001 in national law will be streamlined and supplemented to align with the new requirements stipulated in said Directive. [3]

[1] *Found in subsection "Overview and Process for Establishing the Plan / Overview of the current policy; Consultations and involvement of national and Union entities and their outcome."*

[2] *Found in subsection "National objectives and targets / Dimension: Decarbonisation."*

[3] *Found in subsection "Policies & Measures / Dimension: Decarbonisation"*

Production of Hydrogen from renewable sources

Bulgaria is planning on taking steps to launch hydrogen production via Power to X plant solutions. Surplus electricity generated from solar and wind power is expected to be used for hydrogen production.[4]

The Bulgaria government's policy on research, innovation, and competitiveness aims to promote research into the possibilities of deploying electrochemical power sources, such as hydrogen and fuel cell technologies. A pilot project for a hydrogen plant with a total installed capacity of 20 MW will be developed. Based on project results, an analysis of the further development of hydrogen power plants after 2030 will be conducted. The Ministry of Education and Science will implement other national research programs over 3 to 5 years. Next, to support the deployment in working environments of energy-saving innovations and options for the use of electrochemical sources of power, such as chargeable batteries, hydrogen energy, and fuel elements, will continue to be explored by conducting fundamental and applied research on hydrogen-based technologies and eco-mobility.[5]

Transport sector

During 2020—2030, the energy from renewable sources used in transport is expected to diversify by introducing new-generation biofuels and hydrogen (in 2030). Diversification of sources has been projected on introducing new-generation biofuels (1 095 GWh in 2030) and hydrogen (32 GWh by 2030). The consumption of electricity from renewable sources is also expected to double. A projected increase in the share of electric public transport and hybrid electric vehicles, coupled with the development of charging station infrastructure in urban areas, is projected to result in a reduction in registered GHG emissions.[6] The projection for renewable energy technology in transport for 2020 to 2030 shows that hydrogen is not expected to play a role until 2030. In 2030 2.7 ktoe are expected to be used.[7] The Bulgarian government's goals in research, innovation and competitiveness include developing electric cars and hydrogen technologies.[8]

Between 1988 and 1991, fuel consumption in transportation fell by 48 per cent due to the economic downturn. Fuel consumption has been increasing steadily since 1991, mainly due to road transport and trucking across borders. Private road passenger traffic is expected to continue to grow and remain an essential part of the industry. Regarding the use of renewable energy in transport, sources are expected to diversify with new-generation biofuels (352 GWh in 2030) and hydrogen (34 GWh in 2030).

In its projected final consumption of energy and energy from renewable sources in transportation for the period 2020-2040, the projected gross production of electricity is based on the assumption that electricity will be used for hydrogen production by Power to X plants at a ratio of 47 GWh Electricity to 34GWh hydrogen. These 34 GWh are estimated to be used in 2030 and make up 1.1% of the final consumption in transport. In 2035, 166 GWh are estimated to make up 5.0%, and in 2040, 256 GWh will make up 7.2%.

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[4] *Found in subsection "Policies & Measures / Dimension: Decarbonisation"*

[5] *Found in subsection "Policies & Measures / Dimension: Research, innovation and competitiveness"*

[6] *Found in subsection "National objectives and targets / Dimension: Decarbonisation."*

[7] *Found in subsection "National objectives and targets / Dimension: Decarbonisation."*

[8] *Found in the subsection "National objectives and targets / Dimension: Research, innovation, and competitiveness."*

Current situation of the low-carbon-technologies sector

The Innovation Strategy for Smart Specialisation 2014-2020 identifies as a priority area the development of clean technologies with a focus on transport and energy (energy storage, saving and efficient allocation, electric vehicles, eco-mobility, hydrogen-based models and technologies, waste-free technologies, technologies and methods that include by-products and materials from one production in other productions). The Ministry of Economy has launched the development of the Innovation Strategy for Smart Specialisation 2021–2027, along with an Action Plan for it.[9]

Investments & Market Risk

Bulgaria estimates investment needs for hydrogen power plants at 3.45 Mio € for 2021—2030.[10]

Eligible investments include an alternative fuels infrastructure with electricity, hydrogen, liquefied gases, and other low or zero-emission technologies and the production and supply of synthetic fuels from renewable or carbon-neutral energy sources.[11]

In terms of renewable energy development, Bulgaria plans to increase investment in wind farms and solar panels and increase the use of biomass power generation, which requires ensuring a stable supply. The transport sector will also play an essential role in decarbonization and the use of renewable energy in the period 2021-2030. It is transitioning to using alternative fuels and new hybrid and electric vehicle technologies. Since the transition to alternative fuel vehicles requires significant changes to the infrastructure, Bulgaria must develop infrastructure planning measures to allow the installation of electric vehicle charging stations and LPG and hydrogen fueling stations.[12]

Focus on:

Transport

Power-to-X from Renewables

Guarantees for Origin

[9] *Found in subsection "Current situation and projections with existing policies and measures/ Dimension: Research, innovation, and competitiveness"*
[10] *Found in subsection "Current situation and projections with existing policies and measures/ Dimension: Research, innovation, and competitiveness"*
[11] *Found in the subsection "Impact assessment of planned policies and measures / Overview of investment needs."*
[12] *Found in the subsection "Impact assessment of planned policies and measures / Overview of investment needs."*

CROATIA

Croatia sees the increased significance of hydrogen, especially in energy and transport systems, and aims to foster scientific research through regional cooperation and a hydrogen platform.

The NECP states that Croatia wants to make it possible for hydrogen to be incorporated into its energy and transportation networks. Croatia anticipates a final hydrogen consumption in the transportation sector of 0.01PJ, or 2.8 GWh, by 2040 and 3.5% of low-carbon vehicles by 2030. Croatia plans to construct hydrogen refuelling stations, offer financial incentives for energy-efficient vehicles (including hydrogen-powered ones), and create technical standards to speed market adoption to meet these goals.

The creation of an electric vehicle manufacturing capacity is one of the main goals of Croatia's final NECP. A specific motor vehicle tax will not apply to electric vehicles. The strategy suggests defining unique cofinancing lines for specific objectives, such as acquiring electric vehicles and vehicles powered by alternative fuels, in the framework of co-financing cleaner transportation projects.

Regional cooperation and research

In a regional workshop held in Ljubljana in July 2019 aimed at continuing the integration of energy markets and further strengthening the cooperation between transmission system operators, Croatia singled hydrogen as a crucial topic next to battery development and CO 2 capture and storage. Establishments of regional cooperation are planned primarily with the Republic of Italy and other Mediterranean EU Member States. The cooperation for hydrogen focuses on scientific aspects and the study of hydrogen.[13]

Establishing a Platform

According to NECP, Croatia will establish a hydrogen technology platform from 2021 until 2030. Its purpose is to identify the opportunities associated with hydrogen use, consider its use in the coming decade, and explore the possibilities of financially stimulating hydrogen production and consumption. The platform will bring together national stakeholders relevant to the research and application of hydrogen technology. It will also monitor the development of hydrogen technologies at the EU and international levels and serve as a link between national, EU, and international levels. [14]

[13] *Found in subsections "Overview and Process for Establishing the Plan / Regional cooperation in preparing the plan" and "Policies & Measures / Dimension Decarbonisation."*

[14] *Found in subsection "Policies & Measures / Dimension Decarbonisation"*

Hydrogen in Transport

In the context of Policy measures for decarbonization, hydrogen is also an option for vehicles of all categories in the transport sector. An assessment of the current transport situation has shown a minor representation of vehicles powered by alternative fuels in the total number of vehicles. Croatia now aims to have at least 1% of alternative fuel vehicles in the total number of vehicles registered in the country by 2030. Croatia's projections of the most critical energy and climate indicators set its expectations higher, expecting electric, hybrid, and hydrogen-powered vehicles to reach 3.5% of total road passenger activity in 2030.[15]

Concrete measures:

1) Financial incentives for energy-efficient vehicles

To reach its goal, the country is planning on co-financing cleaner transport projects, which include incentives for co-financing the purchase of vehicles. Incentives for co-financing the purchase of vehicles will be primarily geared towards alternative fuels for which the assessment of the existing situation has shown a minor representation in the total number of vehicles and will be time-limited until the minimum representation of vehicles is achieved.

The funds needed for implementation are estimated at HRK 900 million and are set to come from auctioning of emission units, a special vehicle fee, a special environmental fee for the marketing of biofuels, and ESI funds. The EPEEF (Environment Protection and Energy Efficiency Fund) will hold the executive role that was established in 2003 and also functions as the National Energy Efficiency Agency. The Ministry of Environment and Energy will be monitoring the project. [16]

2) Strengthening the infrastructure for the distribution of alternative fuels

The measure will co-finance alternative fuel distribution infrastructure through a public call for proposals from the EPEEF as a necessary prerequisite for developing markets for vehicles and vessels using Hydrogen in Croatia. Funds needed for implementation are estimated at HRK 370 million and are set to come from auctioning of emission units, a special vehicle fee, a special environmental fee for the marketing of biofuels, the Modernization fund, ESI funds, and other sources. The EPEEF and the MSTI (Central Infrastructure Register) will be the executive bodies, and the Ministry of Environment and Energy, the monitoring Body. [17]

3) A gradual transition in the shipping sector

The measure will co-finance the conversion of the existing fleet of ships and the construction of new alternative fuel vessels, such as hydrogen-powered ones, through public calls from the EPEEF. Funds needed for implementation are estimated at HRK 300 million and are set to come from the sale of emission units through auctions, ACLMT tenders, ESI funds, and other sources. The EPEEF will be the Executive body, and the MSTI will be the Monitoring body.[18]

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[15] *Found in the subsection "Impact Assessment of planned policies and measures/energy system and GHG emissions and removals."*

[16] *Found in subsection "Policies & Measures / Dimension Decarbonisation"*

[17] *Found in subsection "Policies & Measures / Dimension Decarbonisation"*

[18] *Found in subsection "Policies & Measures / Dimension Decarbonisation"*

Energy Security and Petroleum Products

While Croatia acknowledges the rising importance of alternative fuels like hydrogen, it points out that in 2030/2050, the share of consumption of petroleum products will still be significant, and their uninterrupted supply needs to be ensured. One of the obligations of the Oil and Petroleum Products Market Act is to continuously maintain and invest in the safety of transportation and storage of oil and petroleum products. Hydrogen is not mentioned further in this context.[19]

Focus on:

Regional Cooperation

Establishing a Platform

Transport

[19] *Found in subsection "Policies & Measures / Dimension energy security."*

LATVIA

Hydrogen is viewed by Latvia as a "future alternative fuel to replace petroleum products" in the transportation sector in its final energy and climate plan. The strategy identifies several potential priority areas, such as developing an action plan for the deployment of infrastructure for hydrogen, as well as creative solutions for renewable technologies like the production and use of hydrogen.

Research and Innovation

To increase its productivity from 2021 to 2027, Latvia focuses on production optimization, technological upgrades, and more significant investment in R&D and R&I. Their plan defines potential priority action lines for innovative solutions in the RES technologies field, including hydrogen. [20]

To achieve the plan's objectives, within research and innovation, hydrogen will play a role in the research into materials and engineering technologies for acquiring and storing renewable electricity (in particular, solar and hydrogen energy). Further, hydrogen can be mentioned in the context of Smart mobility as an alternative fuel.[21]

Transport

Latvia wants to improve its energy efficiency in transport by ensuring the transition to different alternative fuels, including hydrogen. To facilitate this transition, an alternative fuel infrastructure needs to be created, and the purchase of vehicles with lower or zero CO2 emissions must be promoted. [22]

Energy security

In the measure of modernizing various aspects of infrastructure, hydrogen will play a role in evaluating the possibilities of adapting the natural gas infrastructure to hydrogen and other gaseous fuels, as well as drafting an action plan for the development of hydrogen infrastructure and market conditions.[23]

[20] *Found in subsection "National objectives and targets / Research, innovation and competitiveness"*
[21] *Found in the subsection "Policies & Measures / Research and innovation."*
[22] *Found in the subsection "Policies & Measures /Transport."*
[23] *Found in subsection "Policies & Measures / Energy security, internal energy market."*

Regional cooperation

The Baltic States have coordinated the measures proposed in their plans and assessed the potential impact of the measures on neighbouring countries. Future technologies (energy storage, CCU, Hydrogen, etc.) will be sought in cooperation with the Nordic countries and the Baltic States. [24]

Focus on:

Research and Innovation

Energy Security

Regional Cooperation

[24] *Found in subsection "Impact assessment of planned policies and measures / Impact of policies and measures of the plan on the other EU Member States and regional cooperation."*

SLOVAKIA

According to Slovakia's NECP, one of their priorities next to diversifying energy sources and distribution routes is promoting the use of RES to produce electricity and hydrogen. Slovakia contemplates using decarbonized gases and hydrogen in its NECP as a means of ensuring environmental sustainability. Slovakia predicts that by 2030, the direct use of hydrogen will account for about 1% of its renewable objective for the transportation sector (2 ktoe hydrogen out of a total of 229 ktoe renewable fuels).

Heating Sector

Slovakia argues in its NECPs, that the high level of national gasification, with over 90% of the population having access to natural gas acts against the greater use of RES in the heat sector. It also argues that the transition to biomass in households is problematic from the air quality perspective, which could endanger compliance with EU legislation. One solution is to continue using natural gas and incorporating biomethane and hydrogen into the existing gas infrastructure over time.[25]

In estimating, the total contribution anticipated from each renewable energy technology in the Slovak Republic in transport, hydrogen is estimated to slowly enter the market in 2024 and strongly increase until 2030. [26]

Underground gas storage facilities

The possibility of using waste heat from existing compressors at the Veľké Kapušany station to drive the storage compressors is also being considered. This project explores the possibility of energy storage in the form of a mixture of natural gas and hydrogen. This would potentially accelerate the use of renewable energy sources, as it would allow the long-term storage of energy from renewable sources. [27]

Slovakia sees biomethane and hydrogen as promising fuels that also allow energy storage. The objective of supporting Hydrogen from RES is 100% coverage of the consumption of hydrogen filling stations and the partial replacement of hydrogen from fossil fuels in the industry (2030).[28]

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[25] *Found in subsection "Overview and Process for Establishing the Plan / Executive summary; Political, economic, environmental and social context of the plan."*

[26] *Found in subsection "National objectives and targets / Dimension: decarbonization"*

[27] *Found in subsection "National objectives and targets / Dimension: energy security."*

[28] *Found in subsection "Policies & Measures / Dimension: decarbonisation"*

Current situation of the low-carbon-technologies sector

One of Slovakia's measures in the hydrogen sector is the promotion of the production of Hydrogen from RES or low carbon hydrogen (meaning hydrogen that through carbon capture methods has a 60% lower carbon footprint than hydrogen production in the process of natural gas reformation). The hydrogen is to be used in transport and industry or high-efficiency cogeneration. It is anticipated in the NECP that this will partially replace hydrogen from fossil fuels. [29]

Slovakia sees nuclear energy as a low-carbon electricity source and wants to improve the safety and reliability of nuclear power plants. It also describes natural gas as a way to reduce carbon footprint. Biomethane or pure hydrogen is seen as a zero carbon footprint alternative, of which new aligned technologies like fuel cells should be promoted. [30]

The NECP announces new policies beginning in 2022 to assist waste recovery, biomethane production, and hydrogen production, but it provides no information on their extent, duration, or economic evaluation.

Transport sector

One of four points the NECP will focus on in the programming period 2021-2027 is supporting transport infrastructure for charging electric vehicles and for refilling hydrogen-powered vehicles.[31]

In 2015 Slovakia reduced tax on the motor vehicle types hybrid, CNG, and Hydrogen (Act No 361/2014)[32] The anticipated fuel consumption of hydrogen in the transport sector is estimated to begin in 2030 and reach over 2300 TJ in 2040. In comparison, 58 787 will still be covered by fossil fuels, less than the 98 940 TJ of fossil fuels used for transport in 2017.[33]

Focus on:

Transport

Underground Storage

Heating

[29] *Found in the subsection "Policies & Measures / Dimension: Decarbonisation."*

[30] *Found in subsection "Policies & Measures / Dimension: decarbonisation"*

[31] *Found in subsection "Policies & Measures / Dimension: decarbonisation"*

[32] *Found in subsection "Current situation and projections with existing policies and measures/ Dimension: Research, innovation, and competitiveness."*

[33] *Found in subsection "Impact assessment of planned policies and measures/energy system and GHG emissions and removals."*

Conclusion

All four countries mentioned hydrogen in the context of transport. Slovakia has reduced the tax for Hydrogen vehicles and has a section on supporting infrastructure for hydrogen filling stations. The consumption is also estimated to begin by 2030. Bulgaria also does not expect hydrogen to play a role in the transport sector until 2030, and Croatia further has set itself a target of 1% vehicles powered by alternative fuels until 2030 and sees hydrogen as an option in all categories of transport. Latvia wants to decarbonize the transport sector through alternative fuels for energy efficiency. Though the efficiency of hydrogen in the transport sector is questionable, the Latinas NECP report makes a point in needing to create an alternative fuel infrastructure.

Croatia, Latvia, and Bulgaria made mentioned hydrogen under research and innovation. In Latvia, the R&I around hydrogen will focus on research into materials and engineering technologies for acquiring and storing renewable electricity (in particular, solar and hydrogen energy) and smart mobility as an alternative fuel. Croatia's NECP does not go into detail on which technologies the research will focus on but on establishing regional research cooperation primarily with the Republic of Italy and other Mediterranean EU Member States. Bulgaria focuses its hydrogen-related research on eco-mobility.

Croatia and Latvia also express their ambitions toward cooperation with other countries and mention hydrogen in the context of energy security. Hereby Latvia mentions the need to adapt its natural gas infrastructure to carry hydrogen, while Croatia points out that even in 2030/3020 the share of petroleum consumption will still be significant.

Putting hydrogen into the context of low-carbon technology, Slovakia sees it playing a role but also mentions natural gas as a planned strategy to reduce emissions. Bulgaria points to the importance of producing hydrogen from renewable sources and describes its planned projects for hydrogen production through surplus electricity in this context.

Slovakia is the only country to see a future for hydrogen in the heating sector. It argues that because of the country's high gasification rate, a switch to other heating systems would be problematic. Its proposed solution is to continue heating with gas and slowly incorporating biomethane and hydrogen into the existing infrastructure over time. Slovakia also sees hydrogen as a promising fuel for energy storage.

All countries agree that the use of hydrogen will only begin to ramp up in 2030, as the infrastructure around it still need to be built. The descriptions of their planned projects to develop or do research around this missing infrastructure, as well as their target for 2030, vary between the NECPs. In most cases, stay rather vague. To what extent these preliminary plans and targets will be implemented remains to be seen. However, what the NECPs outline is that all countries see a future for hydrogen in their energy systems.